OECD Pensions Outlook 2012

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Foreword

This first edition of the OECD Pensions Outlook *provides an analysis of pension policies in OECD countries, covering both public and private pension systems, as well as an assessment of trends in retirement income systems. Reference statistics are also included.*

This report is the joint work of staff of the Financial Affairs Division of the OECD Directorate for Financial and Enterprise Affairs and the Social Policy Division of the OECD Directorate for Employment, Labour and Social Affairs. It has benefited from contributions from national government delegates, particularly delegates to the Working Party on Social Policy and the Working Party on Private Pensions. The assessments of countries' pension systems do not necessarily correspond to those of the national authorities concerned.

The editorial team for this report was led by Juan Yermo. Chapters 1 and 3 were written by Edward Whitehouse. Chapter 2 was prepared by Anna Cristina D'Addio and Edward Whitehouse. Pablo Antolín provided useful input on private pension reforms in Chapter 1. Hervé Boulhol, Balázs Egert, Philip Hemmings and Peter Jarrett of the Economics Department provided useful input to Chapter 3. Participants at two World Bank seminars in June and November 2011 and, in particular, Robert Palacios and Anita Schwarz of the World Bank, engaged in fruitful discussions. Useful comments were also received at "Pension Systems in Emerging Europe: Reform in the Age of Austerity", a conference organised by the European Bank for Reconstruction and Development (EBRD) in April 2011.

Chapters 4 and 5 were prepared by Pablo Antolín, Stéphanie Payet, and Juan Yermo. Chapter 6 was written by Pablo Antolín and Juan Yermo. The statistical annex was prepared by Stéphanie Payet with input from Andrew Reilly on public pension indicators. Editorial support was provided by Edward Smiley and Kate Lancaster.

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Pensions: Past, Present and Future

It may not feel like it, but today's retirees are living through what might prove to have been a golden age for pensions and pensioners. Far fewer older people live in poverty than in the past: about a quarter fewer than in the mid-1980s. They can expect to live longer: 65 year olds today are projected to live 3.5 years longer than their parent's generation.

Today's and tomorrow's workers, in contrast, will have to work longer before retiring and have smaller public pensions. Their private pensions are much more likely to be of the defined-contribution type, meaning that individuals are more directly exposed to investment risk and bear themselves the pension cost of living longer.

The financial shock of 2007-08 has reverberated during the succeeding years with a profound impact on economies and the public finances in most OECD countries. Pension systems, already transformed by a wave of change over the previous decade, were further reformed, often under the pressure of fiscal consolidation and international financial markets. The most obvious change has been increases in pensionable age, adopted by more than half of OECD countries. In the long term, pension ages will be 67 or more in 13 countries, with a common age for both sexes in all but one country. Other, less visible measures to encourage people to work longer – tighter conditions for early retirement or greater rewards for continuing after the normal pension age – were implemented in 14 countries.

This is a welcome development for four reasons. First, working longer as people live longer improves the financial sustainability of pension systems, and in a less painful way compared with increasing taxes. Secondly, it ensures a fairer distribution of the costs of ageing across generations. And contributing for longer periods can mitigate the impact of planned reductions in pension benefits on retirement incomes. Thirdly, it suggests a clear break with failed past policies of pushing older workers out of the labour market and into early retirement, through long-term sickness or disability as well as old-age pensions. The ostensible reason for the failed policy was that it would free up more job opportunities for youth. But the evidence shows that this is just another example of the "lump-of-labour" fallacy: keeping older workers in the labour force does not reduce job opportunities for the young. Fourthly, extending working lives in a situation of slowly growing or even declining workforces should provide an important boost to economic growth in ageing economies. Given these clear benefits, the trend to higher retirement ages – even beyond 67 – should be encouraged. One effective and transparent way to do so is to tie institutionally the retirement age to life expectancy, as in Denmark and Italy.

Pension reforms over the past decade have also led to a reduction in public pension promises in many countries, typically between a fifth and a quarter. Such cuts have been necessary to ensure the financial sustainability of pension systems for both current and

future retirees. Since 2007, half of OECD countries took further steps to improve the sustainability of the public pension system, including changes to indexation requirements and benefit formulas.

On average in OECD countries, people starting work today can expect a net public pension of about half their net earnings if they retire after a full career at the official retirement age. This so-called "net replacement rate" from public benefits is less than 50% in half of OECD countries. In 13 of those countries, private pensions are mandatory. The law or social contracts require that all workers participate in such plans. As a result, total mandatory benefits – including these private schemes – offer a net replacement rate averaging about 69% on average in OECD countries.

Nevertheless, there is a large "pension gap" in a dozen OECD countries, with net replacement rates from mandatory schemes of less than 60%. In most of these countries private pensions are voluntary and rarely cover more than half of the workforce. A greater role for private pensions in these countries is inevitable to fill this pension gap. Even if further increases in retirement ages are implemented, private pension provision should be promoted to allow workers to draw on their savings in old age, complementing their working income and public pension benefits. This can be particularly attractive for those seeking flexible working conditions after a certain age or a phased retirement.

Making private pensions compulsory would be the ideal solution to eliminate the pension gap and ensure benefit adequacy. However, some countries have shied away from such a policy partly because of the concern that the contributions would be seen as a new tax. An alternative way to achieve a similar result is to enrol individuals into such plans automatically, while allowing them the possibility of opting-out within a certain time frame – so-called "auto-enrolment". By requiring people to opt out of rather than into retirement saving, it aims to use natural inertia to expand coverage. The first nationwide auto-enrolment retirement savings scheme in the OECD, the KiwiSaver introduced in New Zealand in 2007, has been highly effective in ensuring high participation rates among new employees, with opt-out rates as low as 20%. This kind of arrangement will be rolled out in the United Kingdom between 2012 and 2017, and other countries are likely to follow suit.

Another key policy that can be used to expand the role of private pensions is to provide financial incentives. The traditional way of encouraging people to save for their old age has been tax incentives. While some countries have recently extended tax incentives, Australia, Ireland, New Zealand and the United Kingdom have all moved to limit them to reduce the fiscal cost in the form of foregone tax revenues. Costs have been questioned elsewhere, including Germany.

The problem with the traditional design of tax incentives is that it benefits high earners most as they pay the highest marginal tax rates. Indeed, in most countries with voluntary pension systems, low-income workers are the least likely to participate in private pension plans. A more effective way to reach out to lower income individuals is to provide savers with flat subsidies and matching contributions capped at a certain level to ensure greater progressivity. Such financial incentives can benefit low earners more including those that pay no income tax or at a low rate. In Germany and New Zealand, two countries that have introduced such incentives for some of their retirement savings products, coverage rates are more similar across different income groups.

In addition to expanding private pensions coverage, policy makers need to act on three fronts to improve benefit adequacy. First, they should ensure that contributions to such plans are sufficient to meet retirement income goals. This is straightforward in mandatory systems, as in Australia, which recently announced an increase in the minimum contribution rate from 9% to 12% of wages. Secondly, they should limit leakage from such systems by restricting early withdrawals and lump-sum benefit payments. Thirdly, they should promote investment strategies and products that have low costs and mitigate risks during both the period of asset accumulation and retirement, when benefits are paid out. As they address these challenges, policy makers should pay great attention to the menu of investment and benefit options to simplify and facilitate complex financial decisions. They should also improve the design of defaults for those who do not make active choices so that they better meet individual needs and expectations.

"Which country has the best pension system?" is a question the OECD is often asked. But it is one that is very difficult to answer despite the widespread appetite for rankings and league tables. The true response is that there is room for improvement in all countries' retirement-income provision. They all face at least some challenges: coverage of the pension system, adequacy of benefits, financial sustainability or the risks and uncertainties borne by individuals. The outlook for pensions in OECD countries is therefore one of continued – and necessary – change.

Executive Summary

This first edition of the *OECD Pensions Outlook* takes a close look at the two main trends in pension design observed over the last two decades: first, the introduction of reforms to pay-as-you-go (PAYG), public pension systems such as later retirement and automatic adjustment mechanisms to pension benefits to improve the financial sustainability of these systems; second, the growth of funded private pension arrangements complementing PAYG public pensions. These developments are interlinked, as many pension reforms have ultimately led to a reduction in the replacement rate offered by PAYG public pension systems, increasing the need for later retirement and complementary forms of pension provision.

The crisis has accelerated pension reform initiatives, while private pension policy makers have focused their attention on regulatory flexibility and better risk management

Overall, the pace of pension reform has accelerated over the period 2007-2010. Changes include increases in pensionable ages, the introduction of automatic adjustment mechanisms and the strengthening of work incentives. Some countries have also better focused public pension expenditure on lower income groups. However, some recent reforms have raised controversy, such as the decision of some central and eastern European countries to pull back earlier reforms that introduced a mandatory funded component.

The financial, economic and fiscal crisis experienced over the last five years has exerted major stress on funded, private pension arrangements. Most countries' pension funds are still in the red in terms of cumulative investment performance over the period 2007-11 (–1.6% annually, on average, in real terms). Even when measured over the period 2001-10, the pension funds' real rate of return in the 21 OECD countries that report such data averaged a paltry 0.1% yearly. Such disappointing performance puts at risk the ability of both defined benefit (DB) and defined contribution (DC) arrangements to deliver adequate pensions.

Policy makers' reaction to the crisis was focused on regulatory flexibility and risk management. Initiatives include an extension in the period to make up funding deficits in defined benefit pension plans, greater flexibility in the timing of annuity purchases (to avoid locking in unattractive rates), and new rules on default contribution rates and investment strategies to ensure better member protection.

Other policies, though understandable given the economic situation, have been more controversial, such as the decision in countries like Australia, Denmark, Iceland and Spain to allow members to withdraw money from voluntary pension plans, and the reduction of

contribution rates to funded private pensions in some countries that may have a negative effect on adequacy. The retroactive tax levy introduced on Irish pension funds has also raised eyebrows in the international pension policy community.

The introduction of automatic adjustment mechanisms in public pension systems will improve their sustainability, but may raise adequacy problems

Over the last fifteen years, various OECD countries have introduced automatic links between demographic, economic and financial developments and the retirement-income system. The automaticity of adjustments means that pension financing is, to some extent, immunised against demographic and economic shocks. It provides a logical and neat rationale for changes – such as cuts in benefits – that are politically difficult to introduce.

However, any automatic stabilisation mechanism in place today, or implemented in response to the crisis, might pose problems in terms of adequacy of future benefits and the capacity of systems to protect the living standards of beneficiaries. What will be the destiny of systems based on such rules? These rules have already come under pressure in countries such as Germany and Sweden where discretionary amendments were made to the rule to avoid cutting benefits excessively at a time of economic downturn.

Furthermore, automatic adjustment mechanisms are often complex, difficult to understand and create uncertainty over future benefits. In order for individuals to adjust to these new pension designs – by working longer or saving more in private pensions, there is a need for gradualism and transparency in their implementation. A fair and predictable burden-sharing across generations should help individuals to adapt their saving and labour supply behaviour in line with the changes.

The pension reform reversals in Central and Eastern Europe provide a short term fiscal boost at the expense of lower pension benefits in the future

Other major pension reforms started in the late 1990s, when some central and eastern European countries replaced part of their PAYG benefits with mandatory DC pension plans managed by the private sector. Part of the contributions to the PAYG public pension systems were transferred to the funded tier, creating a short term fiscal cost but improving the long-term sustainability of the pension system. During the crisis, some of these reforms were partially reversed, with reductions in contributions to the funded, private pension system in countries such as Estonia (temporary) and Poland (permanent). In Hungary, the reversal has been complete. Even the accumulated assets in the mandatory pension funds were reverted to the state.

The analysis of pension entitlements shows that the main cost of these reversals will be borne by individuals in the form of lower benefits in retirement. These are of the order of 20% for a full-career worker in Hungary and around 15% with Poland's partial reversal, using the OECD's standard assumption of a 3.5% rate of return on investments (or 1.5% above wage growth). Even with somewhat lower investment returns individuals will lose out.

The effects on the public finances will be a short-term boost from additional contribution revenues but a long-term cost in extra public spending just as the fiscal pressure of population ageing will become severe. Overall, however, it is projected that the extra revenues would exceed the extra expenditure, except in the case of the Slovak Republic. This reflects a problem with the detailed design in the initial reforms, which tended to over-compensate people for choosing the funded private pension option. People naturally responded to these incentives, with more switching than most governments had budgeted for.

The coverage of funded, private pensions is insufficient in some countries to ensure benefit adequacy

The cuts in public pension benefits that future generations of retirees will experience in many OECD countries call for longer working periods and an expanded role for funded, private pensions. The latter is critical in countries where the public pension system offers relatively low pension benefits. Hence, policy makers need to closely monitor the coverage (enrolment or participation rates) of private pensions. Currently, coverage is uneven across countries and between individuals, especially in voluntary systems.

Some countries have made funded private pensions compulsory (*e.g.* Australia, Chile) or quasi-mandatory (*e.g.* Denmark, the Netherlands) to ensure that most workers are covered and therefore have access to a complementary pension. However, in other countries with relatively low public pension benefits, private provision remains voluntary and the highest coverage rates observed are around 50%.

Policy initiatives in Germany (Riester) and New Zealand (KiwiSaver) in the last decade, involving the introduction of financial incentives – and in the case of New Zealand also national auto-enrolment to the retirement savings programme – have been effective in raising coverage to the highest levels among voluntary pension arrangements (about 55% in New Zealand). The state's flat contribution subsidies provided to private pension plans have also promoted greater participation among lower income workers. Such workers do not normally benefit much from the tax incentives traditionally used to promote private pensions. The success of these countries in expanding coverage in a relatively short period largely vindicates these policies, though financial incentives can create a heavy burden on already stretched public budgets. Coverage gaps also remain in these countries, and overall enrolment rates are still below those observed in countries with mandatory or quasi-mandatory systems.

Return guarantees are generally unnecessary and counterproductive but in some countries they may be justified in order to protect pension benefits and raise public confidence and trust in the private pension system

The growing role of DC private pensions raises concerns over workers' exposure to investment risk. In the context of the recent crisis, some countries are considering whether investment performance guarantees may be introduced during the accumulation phase to reduce the risk of major investment losses for individuals. Guarantees, however, can mean

a substantial burden for the government. If provided by market players, guarantees involve an additional cost for plan members, the insurance premium to be paid to the provider.

Guarantees setting high minimum investment returns are generally expensive and therefore reduce substantially the net-of-fee benefit from DC plans. On the other hand, capital guarantees that protect the nominal value of contributions in DC pension plans (a 0% guarantee) have a relatively low cost, protect plan members from worst-case scenarios, and can thus help raise public confidence and trust in the funded pension system. Such guarantees may be most appealing in countries where funded private pensions are mandatory and account for a large share of overall retirement income.

However, such guarantees can only be introduced relatively easily in a very specific context: a fixed contribution period, a predefined investment strategy and having the same provider throughout the guarantee period. Allowing plan members to vary contribution periods or investment strategies, or change providers, would raise major challenges for an effective and efficient implementation of return guarantees. This would increase the complexity and cost of administering the guarantee. Where guarantee providers manage the investments, this is also likely to result in conservative asset allocations, especially under increasingly demanding prudential (*e.g.* solvency) regulations. The lower risk provided by guarantees would be associated with lower expected benefits.

A new roadmap for defined contribution pension plans: policies to strengthen retirement income adequacy

Given the growing role of DC plans in pension systems, there is a need to improve their design and regulation to strengthen retirement income adequacy. The following set of policy measures can help achieve this objective:

- Ensuring that DC plans are coherent between the accumulation and payout phases, and with the overall pension system.
- Establishing effective pension plan communication and improving financial literacy.
- Encouraging higher contributions to DC pension plans and for longer periods in order to enhance benefit adequacy.
- Improving the design of incentives to save for retirement.
- Promoting low-cost retirement savings instruments.
- Establishing default life-cycle investment strategies to protect people close to retirement against extreme negative outcomes.
- Improving protection against longevity risk by establishing a minimum level of annuitization for the benefit payout phase as a default option. Such option could combine programmed withdrawals with deferred life annuities indexed to inflation.
- Fostering the annuities market by enhancing transparency and communication, promoting further development of risk-hedging instruments, and encouraging cost-efficient competition.

Chapter 1

Pension Reform During the Crisis and Beyond

This chapter discusses trends in pension reform over 2007-11. This period has witnessed a major financial, economic and fiscal crisis, which accelerated the pace of pension reform. Policy initiatives include increases in pensionable ages, the introduction of automatic adjustment mechanisms in public pension systems and the strengthening of work incentives. The dismal financial market conditions of the last five years have also placed major stress on funded, private pension arrangements. Most countries' pension funds are still in the red in terms of cumulative investment performance over this period. Policy makers' reaction to the crisis have focused on regulatory flexibility and better risk management. They include an extension in the period to make up funding deficits in defined benefit pension plans, greater flexibility in the timing of annuity purchases (to avoid locking in unattractive rates), and new rules on default contribution rates and investment strategies to ensure better member protection.

1.1. Introduction

The crisis that hit OECD countries in 2008 has had three phases, all with profound implications for pension systems. The first element – the ***financial*** crisis – involved among other aspects a stock market crash in 2008, with valuations falling around one half, and a costly rescue package for banks and other financial institutions, with capital injections and other direct support equivalent to about 4% of GDP on average in G20 countries.

The financial crisis then spawned an ***economic*** crisis. Economic growth in OECD countries, which had run at about 3% a year in 2006 and 2007, came to a halt in 2008. In 2009, real gross domestic product (GDP) across the OECD fell by 3.8%. Only 3 of the 34 OECD countries – Australia, Israel and Poland – avoided a year of falling economic output. Unemployment across the OECD averaged less than 6% of the workforce in 2007, but rose to around 8.5% in 2009 and remained at a similar level through 2010 and 2011.[1]

The third phase has seen the financial and economic crisis develop into a ***fiscal*** crisis. Budget deficits across the OECD were about 1.2% of GDP in 2006 and 2007. In 2009, average government borrowing was 8.3% of GDP, with deficits exceeding 10% of GDP in seven member countries: Greece, Iceland, Ireland, Portugal, Spain, the United Kingdom and the United States. Many countries have embarked on fiscal consolidation. Nevertheless, budget deficits across the OECD are projected to decline slowly: to 6.6% of GDP in 2011, 5.9% in 2012 and 5.1% in 2013.[2]

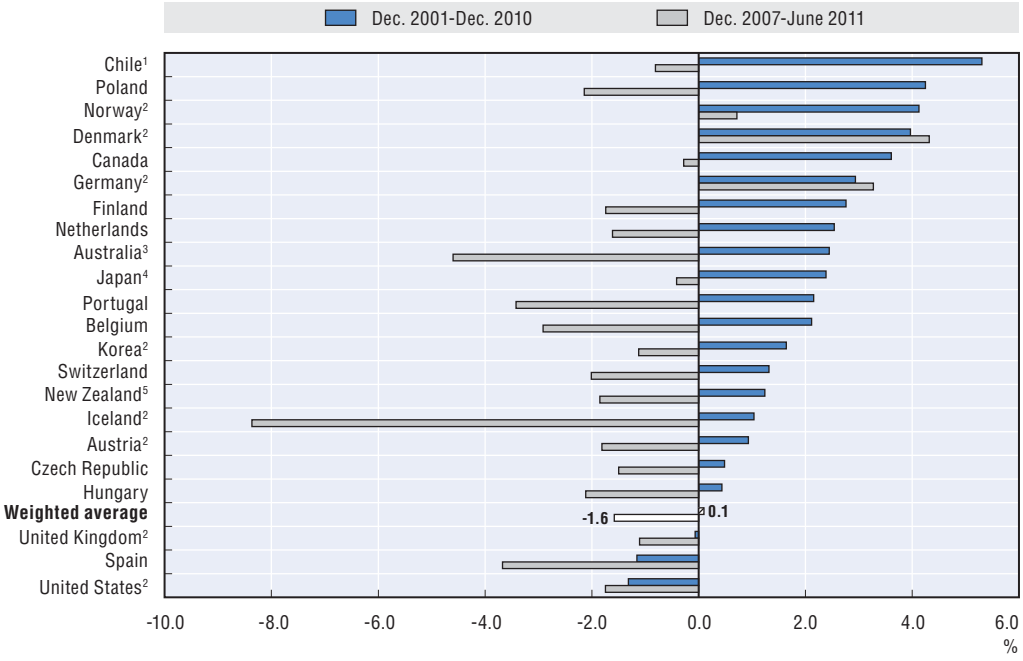
The crises have had an impact on all types of pension systems. Firstly, the crisis has had a negative impact on PAYG-financed public pensions, worsening their financial sustainability as contributions were hit by growing unemployment while expenditure on means-tested benefits increased.

Funded, private pension systems were also severely hit.[3] In 2008, pension funds across the OECD suffered a negative 10.5% real rate of return.[4] Although real rates of return were positive in 2009 and 2010 (at 6.0% and 1.4% respectively), they turned negative again in the first half of 2011 (–1.4%). As a result, most countries' pension funds were still in the red in terms of investment performance over the period 2007-11, with an average real net return of minus 1.6% annually across the OECD (see Figure 1.1). Even when measured over the whole decade 2001-10, performance was a paltry 0.1% yearly on average. Thanks to the continuing flow of contributions, OECD pension fund asset values crawled back to the level they had at the end of 2007 (USD 19.2 trillion in December 2010, 1.5% above the 2007 level), but the outlook remains fragile.[5]

These investment losses have had a direct negative effect on the retirement incomes of many pensioners, particularly in the run-up to retirement in defined contribution (DC) plans. They have also hit funding levels at defined benefit (DB) pension funds, which in countries like the Netherlands and Switzerland fell below 100% at the end of 2011, while in the United Kingdom funding levels fell to 80%. In turn, the weakened solvency status of pension funds has triggered benefit cuts in some countries like Iceland and the Netherlands.

Figure 1.1. **Average annual real net investment return of pension funds in selected OECD countries**

Dec. 2001-Dec. 2010 and Dec. 2007-June 2011



1. The average annual return for the long period is calculated over the period December 2002-December 2010.
2. The average annual return for the short period is calculated over the period December 2007-December 2010.
3. The average annual returns are calculated over the periods June 2002-June 2010 and June 2007-June 2011.
4. *Source:* Bank of Japan.
5. The average annual returns are calculated over the periods June 2001-June 2010 and June 2007-June 2010.

Source: OECD, *Global Pension Statistics*.

StatLink http://dx.doi.org/10.1787/888932598113

It is against this financial, economic and fiscal backdrop that national pension reforms have taken place. Two phases of change are apparent: in the first, changes to retirement-income systems were often part of economic-stimulus packages. There was also a range of reforms designed to address the structural weaknesses of pension provision that had been highlighted or exacerbated by the early stages of the crisis. During the second phase, pension reforms are playing an important part in fiscal-consolidation packages. Overall, the pace of change in retirement-income provision appears to have accelerated over the period 2007-2011, during and after the financial, economic and fiscal crisis.

1.2. Objectives of the pension system

This Chapter sets out the major elements of pension reforms in all 34 OECD member countries over the period from September 2007 to February 2012.[6] It also presents major, official reform proposals that have not been legislated but are very likely to influence public policies in the near future. These are organised into six different categories, which are linked to the different objectives of the pension system, along with a residual grouping for other changes. The groupings correspond to the main objectives and principles of retirement-income systems. These have been set out in numerous OECD reports.[7] They are:

- coverage of the pension system, by both mandatory (public and private) and voluntary (private) schemes;

- adequacy of retirement benefits to maintain a decent standard of living in old age, including both public and private pensions;
- financial sustainability and affordability of pensions to taxpayers and contributors;
- work incentives: minimising the distortions of the retirement-income system on individuals' labour-supply decisions and encouraging people to work longer as populations age;
- administrative efficiency: keeping the cost of collecting contributions, paying benefits and (where necessary) managing investments as low as possible; and
- diversification of retirement savings, between different providers (public and private) and different types of financing (pay-as-you-go and pre-funding), and measures to ensure security of benefits in the face of different risks and uncertainties.

The seventh category covers other types of change, including temporary measures as part of fiscal stimulus, development of and changes to public pension reserve funds and public-education initiatives.

This framework effectively illustrates the trade-offs involved in pension-system design and pension reform. For example, higher pensions would improve the adequacy of retirement benefits but would also worsen financial sustainability. In other cases, there are synergies between the different objectives. Encouraging later retirement also improves financial sustainability. Similarly, extending coverage of pensions should also improve adequacy of retirement benefits for today's workers. The categorisation of the different elements of reform packages is therefore not exclusive: some have effects across more than one of the objectives.

1.3. Overview of reforms

Table 1.1 shows the types of reform measures that countries have adopted in the period from the start of the crisis – September 2007 – to the most recent information available at the time of writing, February 2012. The detailed elements of the reform packages are described briefly further below, in Table 1.A1.1.

Nearly all countries have been active in changing retirement-income provision. The only exception is Luxembourg, which has seen no changes, although Iceland, the Netherlands, New Zealand, Slovenia and the United States have seen only relatively minor adjustments compared with the rest of the OECD.

The liveliest areas of change were financial sustainability, work incentives and diversification/security (half of OECD countries). Efforts to improve coverage and administrative efficiency were the least common areas of reform, with measures to enhance adequacy of retirement incomes taken in around a third of countries.

1.4. Coverage

Pension coverage of the working-age population is a significant policy concern in a number of OECD countries. First, lower income countries have many workers outside of the formal sector who are not in the formal pension system. Only about 60% of the labour force is covered in Chile and Turkey, for example. And this figure is well under 50% in Mexico.[8] This means that many people reach pensionable age with little or no pension entitlement.

Secondly, voluntary private pensions have long been an important complement to (relatively low) public pensions in Canada, Ireland, the United Kingdom and the United

Table 1.1. **Overview of pension-reform measures, September 2007-February 2012**

	Coverage	Adequacy	Sustainability	Work incentives	Administrative efficiency	Diversification/ security	Other
Australia		●	●	●	●	●	●
Austria	●		●	●			●
Belgium		●		●			
Canada		●				●	
Chile	●	●			●	●	●
Czech Republic		●	●	●		●	●
Denmark				●			●
Estonia			●	●	●	●	
Finland		●	●	●		●	●
France	●	●		●			
Germany	●	●		●			
Greece		●	●	●	●		●
Hungary			●	●			●
Iceland						●	●
Ireland	●		●	●		●	●
Israel	●					●	
Italy		●	●	●	●		
Japan	●				●	●	
Korea	●	●	●				
Luxembourg							
Mexico					●	●	
Netherlands						●	
New Zealand			●				●
Norway			●				●
Poland	●		●	●		●	●
Portugal	●			●			
Slovak Republic					●	●	●
Slovenia			●				
Spain		●	●	●			
Sweden		●			●	●	
Switzerland			●			●	
Turkey		●		●		●	
United Kingdom	●	●	●	●	●	●	●
United States							●

Note: See Table 1.A1.1 below for details of the reform packages.

States. Income from capital, predominantly private pensions, accounts for between 25% of income of over-65s (Ireland) and 40% (Canada).[9] This compares with an average of less than 5% in 11 continental European OECD countries – including France, Germany, Italy and Spain – where public pensions and other transfers account for an average of nearly 80% of incomes on old age. Where voluntary pension provision is important, the concern is partly that people are not contributing enough to secure a comfortable retirement income. But it is also that not enough people are contributing or that they are not contributing for long enough, both of which are aspects of the coverage issue.

Thirdly, voluntary private provision for old age will become increasingly important in a range of other countries as future public benefits have been cut back. The OECD's analysis of the impact of reforms shows that benefits for today's workers will be 23% lower than they would have been had the old rules continued on average in seven countries.[10] These countries – Austria, Germany, Italy, Japan, Korea, Portugal and Turkey – cut benefits "across-the-board", with equal impact on low and high earners. Another group protected low earners from some or all of the benefit reductions. Average earners in Finland, France and Sweden, for example, will receive pensions 15-20% less than under the old rules, while lower earners are less affected. This retrenchment of public pension provision was motivated by the challenge of fiscal sustainability. Indeed, it is moot whether the public purse could have continued to afford the benefits promised under the pre-reform rules. Nevertheless, this creates a significant "pension gap" in most of these countries. This will need to be filled with later retirement or private retirement savings if future pensioners are not to face a significantly lower standard of living in retirement than today's retirees.[11]

Within this context, about a third of OECD countries have taken significant steps to improve coverage in the period since September 2007. Four have introduced relatively modest measures to expand the numbers in the *public* pension arrangements: Austria (people providing care for family members), France (recipients of maternity benefits), Ireland (low earners) and Japan (the self-employed).

However, most efforts have been made to expand the reach of private pensions. Israel mandated occupational private pensions in 2009, building on already broad coverage of such schemes. Norway adopted a similar policy in 2007, just before the window of reforms analysed here. Chile will bring the self-employed into the mandate for private pensions. Chile, Germany and Poland all acted in the area of tax incentives for private pensions. However, a number of countries have reduced tax incentives or imposed stricter ceilings on them to cut their fiscal cost. (This is discussed under "Sustainability" below.)

A development with significance for the future direction of pension policy has been automatic enrolment of individuals into private pensions. By requiring people to opt out of private pension plans, this policy aims to use natural inertia to turn the reluctant into retirement savers. New Zealand's KiwiSaver, the archetype for such an arrangement on a national scale, began in July 2007 (again just before the window analysed here). Although less successfully than New Zealand, Italy also put in place a nation-wide auto-enrolment mechanism in the first half of 2007. The United Kingdom will phase in such a scheme from 2012 and the national pension arrangement in Ireland envisages a similar approach. In the United States, it has been made easier for employers to use automatic enrolment for their pension schemes. These policies to encourage participation in private pensions are discussed in greater detail in Chapter 4 of this volume.

1.5. Adequacy

Most countries that addressed issues of adequacy of retirement incomes in the past four-and-a-half years did so through changes to safety-net benefits. There were one-off increases in means-tested benefits in Australia, Canada and Korea beyond the normal rises due to indexation. Belgium, France and Spain followed the same policy with their means-tested benefits. New targeted programmes were introduced in Chile, Finland and Greece, in the last two cases at a significantly higher level than existing benefits. Additional tax reliefs were given to older people in Finland and Sweden which will be of greatest benefit to low-income retirees. The Czech Republic increased the value of the basic pension and the threshold in its earnings-related scheme up to which a 100% replacement rate is applied.

In four cases, improvements to adequacy took place in the context of an income poverty rate among older people significantly higher than the OECD average: Australia, Greece, Korea and Spain. In contrast, Canada, the Czech Republic and France have old-age poverty rates much lower than the OECD average, with Belgium placed at around the average.[12]

These measures improve the *current* adequacy of retirement incomes; the measures to increase coverage of public and private pension outlined above will improve the *future* adequacy of pensions. Another measure with an eye to the future is Australia's increase in mandatory contribution rate to private pensions from 9% to 12% of earnings by 2019. New Zealand is also planning to raise the default contribution rate in the KiwiSaver to 3% in 2013. Italy has also increased the contribution rate for the self-employed in the national DC system. Finally, other measures such as more generous indexation of benefits and increases in pensionable ages (described below) will also have a positive effect on adequacy.

1.6. Indexation

The way that pensions in payment are adjusted to reflect changes in costs and standards of living is generally described as "indexation". Most OECD countries have policies to link these benefits adjustments to indices, generally of wages or prices. Analysis of the adjustment of benefits in practice over a long time period has shown that governments have systematically over-ridden these rules and changed pensions by larger or smaller amounts than the rules would require.[13]

Such policies are again in evidence in the period analysed here. Some of them imply a more generous treatment – and so are mainly classified under "adequacy" in Tables 1.1 and 1.A1.1 – while others are less generous, and so are shown under "financial sustainability" in the Tables.

Starting with Germany, pensions were increased during the three years 2008 to 2010 by a cumulative 3.5% compared with an increase of just 0.1% specified under the link between indexation and financial sustainability of the system.[14] Finland, too, froze pensions rather than reduce them as the index would have implied. Countries faced with fiscal problems – Greece and Slovenia, for example – have frozen the nominal value of pensions for a period rather than increase them. Austria and Italy have frozen the value of larger pensions, although small and medium-sized pensions were increased in line with prices.

Other countries have changed the indexation rules. In Turkey and the United Kingdom, this involves a more generous procedure for public pensions than the one it replaced. The basic pension in the latter will increase by the highest of price inflation (as measured by the retail prices index, RPI), earnings growth and 2.5% per year. However, the United Kingdom has moved to less generous procedures for public-sector pensions and in the indexation

requirements imposed on defined-benefit occupational schemes. These will now use the consumer prices index (CPI), which is typically 0.5-1.0% below the RPI (due to the design of the two indices). Sweden altered the indexation rules that are implied by the "balancing mechanism" in its public pension scheme. Instead of the link in the "balancing mechanism" to the short-term investment performance of the reserve fund, a longer period will be taken into account. The cut in benefits imposed after the initial crisis was 3.0% rather than the 4.5% required under the old rules. As in Germany, this difference will be clawed back in the future.[15] Finally, Norway will move to less generous indexation policies and Hungary has made a number of changes.[16]

1.7. Pensionable ages

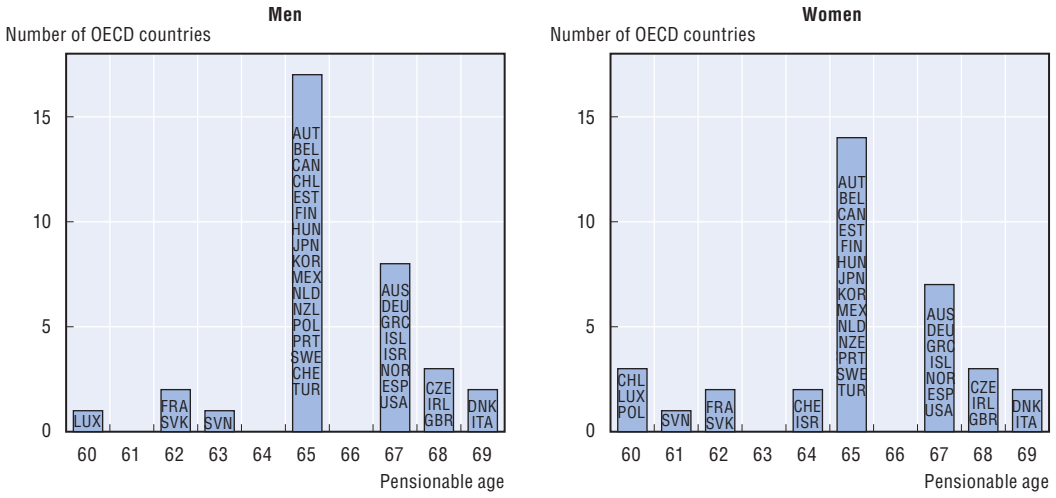
The pensionable age is the most visible of the many numbers in the pension system. Indeed, it is often the only one of which the majority of the population is aware. It provides a clear signal for people choosing when to cease work. This visibility means that increases in pension age have proved among the more contentious elements of pension reforms.

Tables A1 and A2 in the statistical annex show a time-series of the normal pension ages for men and women spanning a century: back to 1949 and forward – on current legislated plans – to 2050.[17] Despite the controversy, most OECD countries have already begun to increase pensionable ages, or plan to do so in the near future. The exceptions include the Netherlands (where a bill to increase ages to 67 is already before parliament), Poland (where the government has announced plans for a pension age of 67) and Sweden (where a commission is investigating the case for an increase). Iceland and Norway can comfortably be excused from increases in pension age: it is already 67 in both cases. In Austria, Belgium, the Slovak Republic and Switzerland, women's pension age is increasing, while that for men has not been changed. A referendum in Slovenia rejected an increase in pension age to 65, although an increase for women is already underway. This leaves only Chile, Finland, Luxembourg and Mexico with no change.

The distribution of pension ages in the long term, under current legislation, is illustrated in Figure 1.2. Age 65 remains the modal age at which people normally draw their pensions, accounting for 17, or half, of OECD countries for men and 14 countries for women. But 67 – or higher – is becoming the new 65. Some 13 countries (12 for women) are either increasing pension ages to this level or, in the cases of Iceland and Norway, are already there. Italy, which links pension age and seniority requirements to life expectancy from 2013 and Denmark, which plans to link pension age to life expectancy from the mid-2020s, are forecast nearly to reach age 69 in 2050. At the other end of the scale, there is only a handful of countries with pension ages below 65. Of these, the binding condition for people in France is generally the number of years of contribution rather than pensionable age (62 from 2017 on). For people with an incomplete contribution history, the pension age for a full rate pension will be 67 from 2022 on.

As noted previously, the Polish government aims to increase pension age for both sexes to 67. In Chile, the lower pension age for women applies only to the defined-contribution scheme: public benefits are available for both sexes only at 65. Along with Israel, Slovenia and Switzerland, these are the only countries that have currently legislated different pension ages for men and women in the long term.

Figure 1.2. **Pensionable age under long-term rules, by sex**



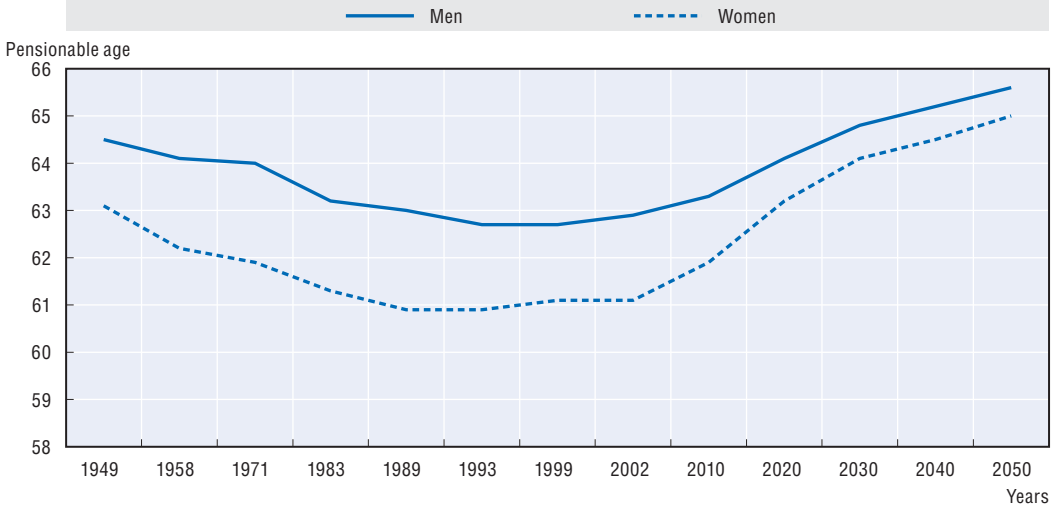
1. Ages have been rounded where necessary.

Source: Statistical Annex, Tables A1 and A2.

StatLink http://dx.doi.org/10.1787/888932598132

Figure 1.3 returns to the changes in pensionable ages over time, showing the OECD average age from 1949 to 2050. It surprises many that pension ages were often falling for over four decades, to a nadir of 62.7 for men and 60.9 for women in 1993. During that period, 10 OECD countries cut pension ages for men and 13 did so for women. The average pension age around 1950 had been 64.5 for men and just over 63 for women. From the low-point in 1993, the average pension age for men had risen by 0.6 years. The larger increase for women, of one year, reflects the equalisation of pension ages between the sexes in Australia, Belgium, Italy and Portugal, for example.

Figure 1.3. **Normal pension ages by sex, 1949-2050**



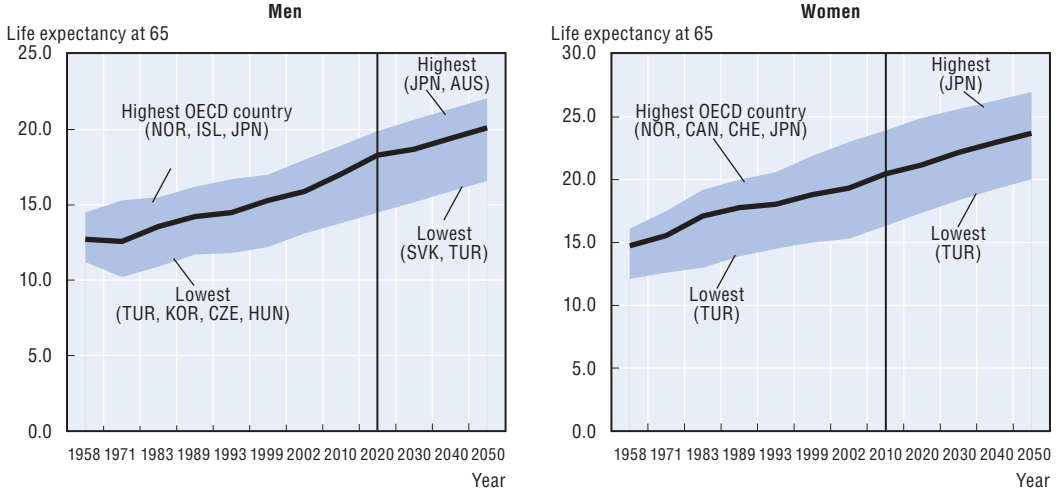
Source: Statistical Annex, Tables A1 and A2.

StatLink http://dx.doi.org/10.1787/888932598151

Pension ages are on the rise in most of the OECD: 19 out of 34 countries for men and 23 for women. Current legislation will push the pension age for men to 65.6 in 2050 and 65.0 for women. However, these hard-fought increases look less impressive in an historical perspective. Only in 2030 for men and 2020 for women will the average pension age in OECD countries be at the same level as many years ago, back in 1949.

Throughout most of the relatively long time horizon studied here, life expectancy has been increasing. This is illustrated in Figure 1.4, which shows the additional years of life that 65 year old men and women are projected to survive. The line gives the OECD average, while the shaded area presents the range across OECD countries. The only time that the life expectancy of 65-year-olds declined was for men in the early 1960s: otherwise, there has been a continuous increase in the expected duration of life for older people. In 2010, 65-year-old women could anticipate 20.5 years of life on average, ranging from 16.3 years in Turkey to 23.9 years in Japan. For 65-year-old men, the shortest life expectancies in 2010 were in Hungary, the Slovak Republic and Turkey at around 13.8 years. Men in Australia and Japan could expect to live 18.9 years after age 65, compared with an OECD average of 16.9 years. Life expectancy is projected to increase further in the future, to an average of 23.7 years for women and 20.1 years for men in 2050.

Figure 1.4. **Life expectancy at age 65 by sex, 1960-2050**

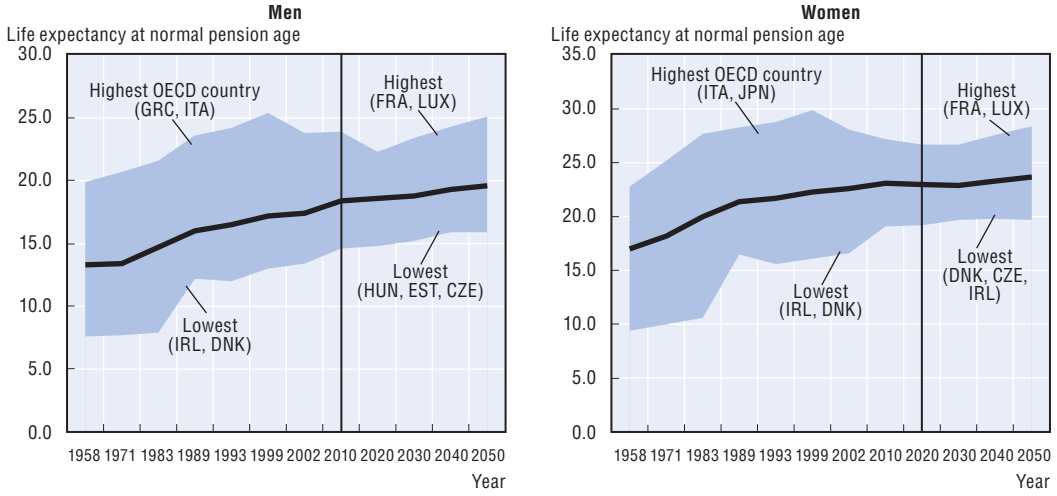


Source: OECD Health Database (1960-2005) and *United Nations Population Division Database, World Population Prospects – The 2010 Revision* (2010-2050).

StatLink http://dx.doi.org/10.1787/888932598170

Combining the analysis of pension ages and life expectancy over time, it is possible to calculate the expected duration of retirement; that is, life expectancy at normal pension age. The full results are shown in Tables A3 and A4 in the Statistical Annex. Figure 1.5 summarises these data. Between 1960 and 2010, the expected retirement duration for men grew by five years on average in OECD countries. About a quarter of this change was due to reductions in pension ages with the rest a result of longer lives. For women, the increase in life expectancy was larger: six years. Longer life expectancy made up four-fifths of this change, with reductions in pension ages accounting for the rest.

Figure 1.5. **Life expectancy at normal pension age by sex, 1960-2050**



1. Figures for Turkey – with much the longest life expectancy at normal pension age – have been excluded from the range covered. The countries indicated with the highest figures are therefore excluding Turkey.

Source: Statistical Annex, Tables A3 and A4.

StatLink http://dx.doi.org/10.1787/888932598189

Looking forward, life expectancy is forecast to continue increasing. Even with the increases in pension ages outlined above, the expected duration of retirement will expand on average across OECD countries. For men, this amounts to an extra 1.2 years of life expectancy after normal pension age by 2050. The increase for women – 0.6 years – is smaller, mainly due to larger increases in pensionable age. Only in a few countries will pension age increases keep pace with forecast improvements in life expectancy: the Czech Republic, Greece, Hungary, Italy, Korea and Turkey. In Austria, Estonia, the Slovak Republic and the United Kingdom, pension age increases exceed the projected growth in life expectancy for women, but not for men.

1.8. Work incentives

Often in addition to increases in pension ages, 14 countries have adopted other measures to foster longer working lives. Australia and France have improved incentives for people to continue working after the normal pension age in the pension system. Sweden aims to do the same through the tax and contribution system, providing an in-work tax credit to the over 65s at a higher level than for under 65s and an exemption from employee social security contributions. Portugal has also exempted older workers from contributions. Austria, the Czech Republic, France, Greece, Hungary, Italy and Spain have all tightened the conditions for receiving a pension early. Denmark has reduced the attractiveness of its voluntary early-retirement scheme, while Finland has tightened the conditions for the part-time pension and unemployment pathways into retirement. Poland will remove early-retirement privileges for large groups of workers. France and Ireland have taken steps within public-sector pension arrangements to encourage people to work longer.

Taken together with the increases in pensionable ages, nearly all OECD countries are taking action to ensure that people "live longer, work longer".[18]

1.9. Sustainability

Three routes to reducing pension expenditures – indexation of benefits, higher pension ages and tighter rules for early retirement – have been outlined in the preceding sections. But there has been a range of other measures designed to bolster the long-term financial sustainability of retirement-income provision. Korea will directly reduce the pension replacement rate for full career workers with average earnings from 60% to 40%. Changing the measure of earnings used to calculate benefits from the best five of the final ten to career-average should reduce costs of pensions in Greece. Final salaries are generally higher than those in earlier years, especially for the higher paid who see the most growth over their careers. Both Greece and Hungary abolished additional, seasonal pension payments (often called 13th month benefits). They are replaced with much more modest pension bonuses.

Norway – joining Italy, Poland and Sweden – introduced notional accounts. These schemes entail an automatic reduction in the level of pension benefits as life expectancy increases (conditional on claiming the pension at the same age). With the reform at end-2011, Italy made the transition of the system from defined benefit to notional defined contribution much quicker. The first reduction in new pensions due to a life-expectancy link in Finland took place in 2010. Spain, too, will adopt an automatic-adjustment mechanism after 2027, but the details have not yet been spelt out. Policies to put pensions on auto-pilot are discussed in Chapter 2 of this volume.

Many of the financial gains have been reaped through changing taxes. Australia, Ireland, New Zealand and the United Kingdom have moved to restrict tax incentives for voluntary retirement savings. In addition, Ireland is levying a tax of 0.6% of assets on pension funds for each of four years.

1.10. Administrative efficiency

Administrative costs of and charges for private pensions has remained a significant policy concern. This applies both to the 13 OECD countries where private pensions are mandatory or quasi-mandatory[19] and the many others where voluntary plans are an important part of the retirement-income system. Charges often eat up between 20% and 40% of individual's pension contributions, according to the International Organisation of Pension Supervisors.[20]

Australia and the United Kingdom are aiming to reduce costs substantially through centralisation of part of the management and record-keeping of the individual pension accounts. This echoes the model of a central clearing-house adopted with the earlier introduction of mandatory funded accounts in Sweden. The recent merger of this clearing-house with the management of public pensions aims to reduce costs further. Chile and Mexico have engineered lower costs for new entrants to the pension market: a new private provider in the former and the manager of individual accounts for public-sector workers in the latter. Administrative charges with these new providers are around 30% lower than the industry average. In both countries, new labour-market entrants are directed to low-cost providers (in Mexico, unless they actively choose another provider). Chile, Estonia and the Slovak Republic have changed the type of fees that fund managers can levy, with the last two also introducing ceilings on the amount that can be charged.

There are some cases where an improvement in administrative efficiency is the objective of changes to public pension provision. Greece started with 133 public pension institutions, which are first being rationalised into 13 and afterwards into just three. Japan has established an entirely new agency to manage public pensions, both to reduce costs and improve service. Italy merged two other major agencies in its main Agency for pension provision (INPS).

1.11. Diversification and security

There are three main kinds of measure under the heading of diversification and security. First, individuals have been given choice (or greater choice) over the way their retirement savings are invested in private plans in Australia, Estonia, Mexico and the Slovak Republic. Generally, this is accompanied by measures to move people automatically into less risky investments as they get closer to retirement via the use of lifecycle funds, a policy recommended by the OECD.[21] Lifecycle investment strategies will also become more prominent in the United Kingdom with the advent of the new national, auto-enrolment system. The default provider – the National Employment Savings Trust, or Nest – will provide these kinds of investments.

Secondly, Canada, Chile, Mexico, Poland, the Slovak Republic and Switzerland have relaxed some restrictions on pension funds' investments, allowing for greater diversification of their portfolios. By contrast, Iceland outlawed new foreign investment by pension funds in order to contain capital outflows during the financial crisis. But the effect of limiting diversification of investments in this way can increase risk, reduce returns or have both effects, to the detriment of future retirement incomes.

The third category of changes relate to pension funds' solvency: whether defined-benefit plans have enough assets to meet their liabilities. Canada, Ireland, Japan and the United Kingdom have improved protection for members of insolvent funds, particularly when those funds are terminated or wound up. Finland and the Netherlands temporarily relaxed solvency rules to allow funds longer to recover from the loss in asset values after the financial crisis. Similar measures in Canada, Ireland, Norway and the United States were discussed in OECD (2009) and Antolín and Stewart (2009).

1.12. Other reform measures

This category covers a diverse range of significant developments in pension policy. One set of changes involves the reversal of earlier reforms that had introduced mandatory private pensions into retirement-income provision. Some of these reversals are meant to be temporary, some permanent while some involve an entire retreat from compulsory individual accounts and others a partial change. Estonia, Hungary, Poland and the Slovak Republic are all affected: changes in these OECD countries along with those in other EU member states – Bulgaria, Latvia, Lithuania and Romania – are the subject of Chapter 3 of this report. The Czech Republic, in contrast, will soon introduce mandatory defined-contribution pensions.

Other countries have also retreated from earlier commitments to pre-fund future public pension liabilities. In Ireland, the assets in the public pension reserve were used to recapitalise the country's banks while further contributions to the fund have been suspended in the face of a large deficit on the government's budget. Contributions to the New Zealand Superannuation Fund have also been stopped, with one further contribution to be paid in 2020 with the fund being run down from 2021 onwards. The French

government began withdrawals from its fund (the Fonds de Réserve pour les Retraites) earlier than originally envisaged: in 2011 rather than 2020. Other countries, however, have maintained their commitment to partly pre-funding their public pension systems. This includes, among others, Australia, Canada, and Chile, which suffered less during the financial and economic crisis and are not facing fiscal difficulties.

In response to the financial crisis, many countries aimed to stimulate the economy and ease households' economic hardship with packages of measures, many of which involved the pension system. First, there were one-off payments to retirees in Australia, Greece, the United Kingdom and the United States. These were in addition to permanent increases in safety-net benefit levels in most cases. Secondly, some early access to pension savings was allowed in Denmark and Iceland, with the safeguard that funds ring-fenced for retirement were sufficient. The objective was to persuade people to spend the money to support domestic demand. Spain allowed early access to private-pension pots in the case of unemployment and financial hardship. Finally, Israel's government offered to protect older workers from further investment losses in their private pensions after November 2008.

1.13. Conclusions

The word "reform" has a sinister resonance for people resisting changes to retirement-income provisions. This is especially the case when benefits are being curtailed and pension ages are on the increase. Indeed, pension reform has brought protesters to the streets in a number of OECD countries in the past few years.

Despite this political pressure, the status quo has only rarely prevailed. Virtually all OECD countries have changed some parts of the retirement-income systems since the beginning of the crisis in September 2007.

The dominant motive for most of these recent pension reforms is undoubtedly financial sustainability. The most obvious change is increases in pension age, with around a third of OECD countries already having or soon to have a normal pensionable age of 67 or more. Just as significant – but not nearly so visible – have been other measures to restrict access to early retirement or to improve the financial incentives for people to work longer. Changes in indexation of pensions in payment, extensions in the period to calculate benefits, and cuts in benefit accrual rates also feature in many countries' reforms to make pensions more affordable. Chapter 2 of this volume looks at automatic measures designed to achieve financial sustainability in the long term.

Given how recent many of these reforms are, it is not yet possible to see whether they will mitigate the well-known effects of population ageing on future pension costs. Long-term financial projections, taking account of the impact of the changes, are available in only a few cases. Nevertheless, this Chapter has shown that future growth in life expectancy is expected to outstrip increases in pension ages in all but a handful of cases.

Efforts to improve financial sustainability mean lower public benefits for future generations of retirees. This will lead to "pension gaps" that need to be filled with later retirement and private pension savings. Chapter 4 looks at measures to encourage participation in private plans. But the way private funds invest, benefits are provided and they are regulated could also be improved. Many of these policy issues are discussed in Chapter 6.

The crisis has accelerated the pace of pension reform in OECD countries. Much has been achieved. But much remains to be done.

Notes

1. *Source:* OECD (2011c).
2. *Source:* OECD (2011c).
3. See Antolín and Stewart (2009) and the special chapter on "Pension Systems during the Financial and Economic Crisis" in OECD (2009).
4. Weighted average data, with the weights based on country's pension fund asset values. The calculation is based on about twenty countries that report investment performance data.
5. *Source:* OECD (2011b), Figure 1 and Table 3.
6. This chapter updates earlier analysis – "Recent Pension Reforms" in OECD (2009) and Whitehouse *et al.* (2010) – that covered the period from 1990 to 2008. Putting these together gives a comprehensive picture of pension reforms over 21 years.
7. OECD (1998, 2001, 2009 and 2011a), for example.
8. *Source: World Bank Pension Database*.
9. *Source: OECD Income-Distribution Database*. See Table A10 in the Statistical Annex of this volume and the indicator of "Incomes of older people" in Part II.3 of OECD (2011a). The special chapter on "Incomes and poverty in old age" – Part I.2 of OECD (2009) – and OECD (2008) provide a detailed discussion of methodology, definitions and data sources.
10. See the special chapter on "Incomes and poverty of older people" in OECD (2009) and Whitehouse *et al.* (2010) for more details.
11. See the indicator of "The pension gap" in Part II.6 of OECD (2011a) for recent empirical information along with the special chapter on "The pension gap and voluntary retirement savings" in Part II.4 of OECD (2009) and Antolín and Whitehouse (2008) for details of the calculations.
12. *Source:* The special chapter on "Incomes and poverty of older people" in OECD (2009). See also OECD (2008).
13. See Whitehouse (2009); Figure 4 in Chapter 2 shows the impact on the real value of benefits over time.
14. However, the German government intends to claw-back these increases in the future.
15. Chapter 2 of this volume provides greater detail on developments in the "automatic"-adjustment mechanisms in Germany, Sweden and other countries.
16. Automatic adjustment of pensions through changes in indexation is discussed more fully in Chapter 2 of this volume.
17. These "headline" pension ages differ in some cases from the "normal" pension ages set out in Chapter I.1 of OECD (2011a) and in Chomik and Whitehouse (2010). The earlier studies employed a strict definition of normal pension age : the age at which a full-career worker, starting at age 20, would be entitled to actuarially unreduced benefits. In countries where most workers claim the pension after the earlier possible age (*e.g.* Belgium) and those where most are likely to claim at the normal age in future (*e.g.* Germany and Spain), the higher headline pension age is shown in the Annex Tables A1 and A2.
18. The title of an OECD (2006) report on population ageing and employment policies.
19. Occupational plans in Denmark, the Netherlands and Sweden achieve near-universal coverage (80% or more of the labour force) and are therefore commonly described as "quasi-mandatory".
20. Gómez Hernández and Stewart (2008). See also Tapia and Yermo (2008).
21. See Chapter 6 of this publication and the special chapter on "Pension systems during the financial and economic crisis" in Part I.1 of OECD (2009).

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ANNEX 1.A1

Table 1.A1.1. **Details of pension-reform measures, September 2007-February 2012, by primary objective**

	Coverage	Adequacy	Financial and fiscal sustainability	Work incentives	Administrative efficiency	Diversification/security	Other
Australia		Mandatory DC contn 9↗12% 2013-19; tax rebate for 3.5 m low earners' DC accounts (May 2010). Additional increase in targeted benefits (age pension) of 12% for single pensioner, 3% for a couple from Sep. 2009: implies an increase in single person's rate to 66.3% of a couple's.	Cut in ceiling on voluntary private-pension contns getting tax relief. Replacement of DB schemes for public-sector workers with DC schemes.	Pension age for public scheme 65↗67 2017-23; earliest access age for private schemes 55↗60 by 2025; tax penalty on access to private pensions before age 60. Work bonus: concession in the income test that enables public pensioners to earn up to AUD 6 500 a year (single) and AUD 13 000 (couples). This is in addition to the income test free area of AUD 3 744 in the year 2010.	New clearing house for firms with < 20 workers from July 2010; measures to cut charges for DC pensions by 40% (Dec. 2010). New "MySuper" – simple, low-cost DC plan, to be introduced and replace all default schemes from July 2017. New "SuperStream" to improve admin. Consolidation of multiple DC accounts.	Cooper review recommends changes in investment choice in DC plans (July 2010).	One-off payment of AUD 1 400 to single pensioners and AUD 2 100 to couples in Dec. 2008 as part of economic-stimulus package. Tax bonus of up to AUD 900 to eligible taxpayers in 2009 as part of Nation Building Economic Stimulus Plan.
Austria	Extension of state payment of pension contributions to family carers to lower level long-term care benefits.		Only monthly pensions up to EUR 2000 were fully indexed to CPI in 2011	Access to early retirement tightened: higher minimum age, stricter rules on "substituted insurance periods" (Ersatzzeiten), abolition of buying retrospective insurance (for periods in full-time education) and 4.2% actuarial decrement to be applied for early retirement on this basis from 2014.			One-off lump-sum payments to lower-income pensioners (2010).
Belgium		Increase in minimum pensions beyond standard indexation.		Increase in employer contn to early-retirement benefits (April 2010).			
Canada		Enhanced means-tested benefits (guaranteed income supplement, GIS): new annual top-up of up to CAD 600 for single pensioners and CAD 840 for couples; annual cost of more than CAD 300 million on 680 000 beneficiaries.				Change in solvency rules for DB plans, protect workers when DB plans terminated, relax investment rules (Oct. 2009).	

Table 1.A1.1. **Details of pension-reform measures, September 2007-February 2012, by primary objective** *(cont.)*

	Coverage	Adequacy	Financial and fiscal sustainability	Work incentives	Administrative efficiency	Diversification/security	Other
Chile	Gradual extension of mandatory DC scheme to self-employed over 7 yrs from July 2008. Introduction of employer-sponsored voluntary private pension arrangements (APVC) from 2008; less restrictive conditions from 2011 due to low take-up: tax incentives can be accrued either when contributing or at retirement. Subsidy for contns for hiring young workers with low incomes.	New means-tested non-contributory benefit for all over 65s from July 2008; new supplements paid to 40% of lowest-income pensioners in 2008-09, rising to 60% from June 2011. Abolition of healthcare contn for low-income pensioners and reduce it for middle-to-high income retirees. Women and men to be charged the same premium for the disability and survivorship insurance (SIS). Since men are expected to have higher risk rates, the difference in premiums will be deposited in women's DC accounts.			New *Modelo* plan won contract to manage DC accounts for new entrants 2010-12: fees 24% lower than existing average; also won 2012-14 contract with 30% lower fees. Disability and survivors' insurance contracted through bidding; cost of insurance separated from fees paid to fund managers. Fixed fees to fund managers eliminated: only a percentage fee on contributions remains. Outsourcing authorised for many functions of plan managers and tax disadvantages to sub-contracting eliminated.	More flexible investments for DC plans: only structural limits remain while other limits fixed in secondary regulation with support of Technical Investment Council. Permitted foreign assets 60↗80% of portfolios of DC plans 2010-11. Investment choice between five funds per manager made easier by renaming funds "A" to "E" in a more informative way: riskier to conservative. Members can choose beforehand their fund allocation for their remaining time in the workforce. Shift in regulation to principles of risk-based supervision. Introduction of an adjustment factor for payment through programmed withdrawal to avoid people outliving their retirement resources; new estimation methodology for programmed withdrawal technical rate (TITRP) to improve projections of retirees' funds returns.	Users' committee for DC system with representatives of workers, pensioners and plan managers to evaluate and propose improvements to the system. Creation of fund for pension education. Creation of pension advisors to offer independent advice on individuals' options, funded out of individual's fund with maximum lifetime limit. Pension subsidy for women for each live birth: govt will pay into DC account or increase the value of public pension.
Czech Republic		Basic pension increase from 8.8% to 9.0% of average earnings; revision of benefit formula in response to Constitutional-Court ruling: extension of 100% replacement rate earnings below 42.8↗44.0% of average.	Ceiling on pensionable earnings introduced in response to Constitutional Court at 400% of average earnings.	Pension age 63↗65 for men, 59-63↗62-65 for women depending on number of children from 2028; requirement for full benefit 20↗35 yrs by 2019.		Option to divert 3% of contributions to a DC plan conditional on individuals making an extra 2% contribution, subject to a reduction in public-pension benefits.	Higher pensions for higher earners in reaction to Constitutional-Court ruling: replacement rates of 30% and 10% over particular slices of earnings to become a rate of 26% between the lower threshold (44% of average earnings) and the ceiling.

Table 1.A1.1. **Details of pension-reform measures, September 2007-February 2012, by primary objective** *(cont.)*

	Coverage	Adequacy	Financial and fiscal sustainability	Work incentives	Administrative efficiency	Diversification/security	Other
Denmark				Voluntary early retirement scheme (eferlon) scaled back: increase in eligibility age 60↗64during 2014-23 reducing pay-out period 5↘3 yrs; during 2012, choice between early-retirement benefits and a tax-free lump sum at eligibility age of DKK 143 300.			Early access to special pension savings with average balance of DKK 14 600 or USD 2 600 as part of economic stimulus.
Estonia				Pension age 63↗65 for men, 60.5↗65 for women 2017-2026.	Since 2011, pension fund managers can no longer charge a unit-issue fee. Since 2011 annual management fees are also subject to a ceiling set in relation to the amount of assets under management.	Stricter investment limits on the conservative (least risky) of 3 funds in DC plans; members able to switch funds three times (rather than once) a year from Aug. 2011.	Cut in contns to DC accounts to 0% in 2010, 2% in 2011, returning to 4% in 2012.
Finland	Coverage of earnings-related scheme extended to recipients of research grants (Jan. 2009).	Variation in value of targeted national pension scheme by municipality removed: pensions in lower/second municipality group increased (Jan. 2008). New minimum pension from March 2011, 17% higher than existing benefit for single people and 32% higher for couples. Indexation rule for targeted pensions temporarily changed in 2010 so as not to go below zero. Cuts in taxes on pensions of EUR 15-30 000 to bring pensioner tax into line with worker tax from Jan. 2008.	New earnings-related pensions were reduced according to increases in life expectancy (part of 2005 pension reform, applied for the first time in 2010).	Possibility of putting pension on hold while working (max. 2 years) extended to earnings-related pensions from private sector. Currently, temporary legislation covering 2010- 2014 (Jan. 2010). Eligibility age for part-time pensions increased to 60 for cohort 1953+ and the old-age pension after part-time pension slightly decreased. Eligibility age for unemployment pathway to pensions increased for cohort 1955+ to 60.		Temporary relaxation of solvency rules until 2012 to let DB plans hold on to riskier, higher-return assets. (first time Jan. 2009, validity extended April 2010)	Information on accrued pension rights sent every year to private-sector employees and self-employed from 2008.

Table 1.A1.1. **Details of pension-reform measures, September 2007-February 2012, by primary objective** *(cont.)*

	Coverage	Adequacy	Financial and fiscal sustainability	Work incentives	Administrative efficiency	Diversification/security	Other
France	Cash maternity benefits count as earnings for pension purposes. (Nov. 2010).	Pension age stays at 60 for hazardous and arduous jobs leading to 10% + disability, affecting 4% of retirees (Nov. 2010). Increases in minimum pensions beyond standard indexation.		Minimum pension age (subject to contn conditions) 60↗62 by 2017; age for full rate pension 65↗67 (Nov. 2011); increment for late retirement 3-4%↗5% from 2009; employers must have an action plan for employing workers aged 50+ by Jan. 2010 or face penalty social security contns. Actuarial reduction for early retirement from July 2008.			
Germany	Extension of tax incentive for private pensions due to expire at end of 2008.	Pension increases: 1.10% in 2008 (rather than 0.46% under 2005 rules), 2.41% in 2009 (rather than 1.76%), 0 in 2010 (–2.1%).		Increase in normal pension age 65↗67 for cohort 1964+.			
Greece		New means-tested benefit at higher level (July 2010).	Pensions frozen 2011-13; full-career earnings measure from best 5 of last 10 yrs; accrual rate 2.0%↘1.2%; replace seasonal bonuses with annual, flat-rate payment; tax of 5-10% on largest 10% of pensions. (July 2010) Introduce assets in addition to income test for solidarity benefits; 10% cut in lump-sum retirement payments for public-sector workers; extend freeze on pension values 2013-15 (June 2011).	Pension age linked to life expectancy from 2020; minimum age 60 for early retirement from 2011; contn yrs for full benefit 37↗40 yrs by 2015. Actuarial reduction of 6% per year of early retirement (July 2010).	Merger of 133 public schemes into 13 by October 2008 and subsequent plan to reduce these to 3 (July 2010).		One-off payment of EUR 100-200 to pensioners as part of economic stimulus.

Table 1.A1.1. **Details of pension-reform measures, September 2007-February 2012, by primary objective** *(cont.)*

	Coverage	Adequacy	Financial and fiscal sustainability	Work incentives	Administrative efficiency	Diversification/security	Other
Hungary			Replacing 13th month pension with bonus paid if GDP growth > 3.5%; index pensions to prices if GDP growth < 3%. In 2010-11, indexation to average of wages and prices, inflation from 2012.	Pension age 62↗65 in 2012-17; tighter conditions for early retirement.		Since 2007, private pension funds can establish voluntarily a life-cycle portfolio system (from 2009 this amendment became mandatory). This system offers to pension fund members the option to choose between 3 different portfolios (conventional, balanced and growth). However, nationalisation of pension funds makes this largely irrelevant.	Diversion of contributions from mandatory DC plans to public scheme from Nov. 2010 to Dec. 2011 worth USD 2bn. Closure of mandatory DC schemes in Dec 2011, transfer of assets (USD 14.6 bn) to govt; 100 000 of *circa* 3 m workers with DC accounts chose to retain DC schemes.
Iceland						Pension funds allowed to invest up to 20% of portfolio in unlisted securities rather than 10% (Oct. 2008). Pension funds can make no new foreign investments (Oct. 2008).	Large DB pension funds (34% of total assets) establish Iceland Investment Fund to stabilise domestic economy. Early access to private pensions above mandatory replacement rate (worth about 5% of GDP) as part of economic stimulus.
Ireland	Proposal for automatic-enrolment in DC plan. (Mar. 2010) Exemption from contns to public pension scheme for people earning < EUR 352 per week abolished. (Dec. 2010).		Tax levy of 0.6% on assets in private pension funds (each year 2011-14). Tax relief on private-pension contns for high earners from 41%↘20% from 2014; employer contns no longer tax deductible and treated as taxable benefit-in-kind for employees; earnings ceiling on tax deductible contns EUR 150 000 ↘115 000; lifetime limit on tax privileges EUR 5.4 m↘2.3 m; end of exemption from public pension contns with earnings < EUR 18 300 (from Dec. 2010). Pension levy on public-sector wages averaging 7.5% from March 2009.	Pension age 65↗66 from 2014 and ↗67 from 2021 and ↗68 from 2028. Pension decrement for early retirement of public-sector workers.		Pension insolvency payment scheme (PIPS) to help insolvent DB plans with insolvent sponsoring employers (Feb. 2010).	EUR 24 bn National Pension Reserve Fund, started in 2001, transferred to Ministry of Finance, largely used to recapitalise banks; contns (1.5% of GDP) suspended (Dec. 2010).

Table 1.A1.1. **Details of pension-reform measures, September 2007-February 2012, by primary objective** *(cont.)*

	Coverage	Adequacy	Financial and fiscal sustainability	Work incentives	Administrative efficiency	Diversification/security	Other
Israel	Mandatory DC occupational plans from Jan. 2009 with extension of coverage from Jan. 2010; employee contn rate 2.5%↗5% and employer, 2.5%↗10% from 2013.					Compensation of 50% of crisis-related losses in voluntary private plans to a limit: potential coverage of 15% of over 55s (Jan. 2009).	
Italy		Public pension contribution rates have been increased for the self-employed in the NDC system which will imply higher benefits.	More rapid transition to NDC system from 2012 onwards through pro-rating of benefits under NDC and the former DB scheme.	Pension age for women 60↗65 to match that of men; pension age for both sexes 65↗67 by 2021; pension age for women working in the public sector 61↗65 in 2012. Early retirement through seniority pensions (based on contribution yrs) limited. .	Merger of three agencies managing public pensions.		
Japan	Employees aged 60-65 can join employer-provided DC plans. Voluntary (e.g. self-employed) participants in earnings-related scheme aged 60-64 can also be covered by basic pension. Temporary period for self-employed etc. to make up gaps in contribution records 2-10 yrs ago.				New Japan Pension Service, a quasi-non-governmental agency under the Ministry of Health, Labour and Welfare, to run public schemes from Jan 2010.	New rules on wind-up of occupational plans require employers to set up a "feasible" plan through a clearance fund to buy-back pension rights of employees in the earnings-related, public scheme. Payment by instalments and reduction in total repayment permitted.	
Korea	Extend mandatory occupational/ severance-pay plans to firms with < 5 workers from Dec. 2010 (about 1.5 m people).	Means-tested pension 5↗10% of average earnings; coverage 60%↗70% of over 65s.	Target replacement rate of public scheme 60↘40% by 2028.				
Luxembourg							

Table 1.A1.1. **Details of pension-reform measures, September 2007-February 2012, by primary objective** *(cont.)*

	Coverage	Adequacy	Financial and fiscal sustainability	Work incentives	Administrative efficiency	Diversification/security	Other
Mexico					Abolition of fees on contns: only fees on assets can be levied; new entrants by default in lowest charging DC plan (March 2008); Pension ISSSTE, public scheme that manages account for public-sector workers, able to compete with private fund management companies (AFOREs): its admin. charges are about a third lower than the AFORE average.	DC plan for public-sector workers hired from Apr. 2007; existing workers aged < 46 to choose DC or remain in earnings-related scheme by Aug. 2008. Pension fund managers to offer 5 different plans with different risk-return characteristics from 2008. Limits for AA and A bonds from issuer other than Federal Government in 2008 from 35↗50% 5↗20%, respectively. New instruments were included under the alternative investments asset class in 2009.	
Netherlands				Pension age 65↗66 from 2020 and 67 from 2025 before parliament.		Recovery period for underfunded DB plans temporarily 3↗5 yrs (Feb. 2009).	
New Zealand	Default contribution rate for Kiwisaver cut 4%↘2% of wages, but increase to 3% from April 2013.		Retirement commission recommends *i)* pension age 65↗67 by 2023 with new means-tested benefit at age 65-66; *ii)* shift from wage indexation to 50:50 wages and prices; *iii)* concern over cost of KiwiSaver tax incentives, about 40% of contns so far. Treasury review recommends *i)* pension age 65↗69; or *ii)* shift from wage to price indexation; or *iii)* means-testing basic pension (Oct. 2009). Smaller tax incentives for KiwiSaver (automatic-enrolment DC scheme introduced in July 2007) and lower default contn rates for employees and employers from April 2009.				Suspension of contns to public reserve fund (New Zealand Superannuation Fund) until 2020; the fund will be drawn down from 2021.

Table 1.A1.1. **Details of pension-reform measures, September 2007-February 2012, by primary objective** *(cont.)*

	Coverage	Adequacy	Financial and fiscal sustainability	Work incentives	Administrative efficiency	Diversification/security	Other
Norway			Notional accounts scheme from Jan. 2011: fully for cohort 1963+ and partly for cohorts 1954-62; pensions linked to life expectancy, based on full-career earnings not 20 best yrs; indexation of pensions in payment to wages –0.75% rather than wages.	Flexible retirement age 62-75 with adjustments to benefit levels.			Use of reserves for stimulus.
Poland	New voluntary private pension plan with tax incentives to complement existing schemes.			Restrictions on occupations that can retire early, cutting eligible numbers by 80%, and then eliminating the scheme (Jan. 2009).		Fewer investment restrictions on DC accounts, including permitted equity share 40↗62% from 2020.	Contn rate for DC accounts 7.3%↘2.3% from 2011; gradual increase to 3.5% from 2017. Residual (5%↘3.8%) goes to second NDC scheme, with notional interest rate linked to GDP growth (rather than wage-bill growth as in current NDC scheme).
Portugal	New centrally managed voluntary DC plan from March 2008.			Lower social security contn rate for workers aged 65+. (Sept. 2009).			
Slovak Republic					Cut fees as % of assets and link them to investment returns from July 2009.	Introduction of three funds types – conservative, mixed and growth – supplemented by a new equity-index fund from April 2012. Principal guarantee on investment performance introduced, but will be restricted to the least risky (bond) fund from Apr. 2012. Reduction of ceiling on foreign mutual fund investment from 50% to 25% in 2009.	During two periods (first 6 months of 2008, Nov. 2008-June 2009), workers could switch contns back from DC accounts to public scheme. DC scheme made optional for new labour-market entrant, but compulsory again from April 2012.

Table 1.A1.1. **Details of pension-reform measures, September 2007-February 2012, by primary objective** *(cont.)*

	Coverage	Adequacy	Financial and fiscal sustainability	Work incentives	Administrative efficiency	Diversification/security	Other
Slovenia			Pensions frozen in 2011 (and 2012 if inflation < 2%) (Sept. 2010).	Proposal to increase normal pension age 63↗65 men, 61↗63 women 2021-2024; eligibility for early retirement on full pension 40↗43 yrs men, 37.25↗41 yrs women was rejected by referendum in June 2011.			
Spain		Increase in minimum pension 6.4% above standard indexation. Increase in survivors' benefits for those retired and aged over 65 with no public pension entitlement of their own 52↗60% of deceased's pensionable earnings (subject to income limits).	Automatic link between pension parameters and life expectancy from 2027, although details not specified.	Normal pension age 65↗67 between 2013 and 2027 but full benefit at 65 with 38.5 yrs contns; sustainability adjustment after 2027; early pension age 61↗63 (but 61 in times of economic crisis); contns for full benefit 35↗37 yrs; contn for early retirement 30↗33 yrs.			Hardship withdrawals of private pension savings allowed.
Sweden		New basic tax reliefs for over 65s introduced in 2009 and increased in 2010 and 2011.	Change to "balancing mechanism" underlying the NDC scheme: from 2009, calculation of balance based on average value of the buffer fund at the end of the past 3 yrs rather than the past yr. New rules meant cut in pensions of 3.0% in 2010 instead of about 4.5%.	In-work tax credit introduced in 2007: higher level for over 65s. Credit for older workers enhanced in 2008 and 2009. In 2011, maximum credit for under 65s of SEK 21 249 (at average municipal tax rate) compared with SEK 30 000 for over 65s. Employee payroll taxes and abolished for over 65s in 2008-9; employer taxes (except for 10.21% pension contn for cohorts 1938+) also abolished. Note that full social security contribution is 31.42 % for cohorts 1938+.	Swedish Pension Agency took over work of two separate agencies managing public and mandatory DC plans in Jan. 2010.	Review of investment rules and governance of buffer funds (collectively worth USD 132 bn at end of 2010) to report in August 2012.	Shift from DB to DC among some occupational plans.

Table 1.A1.1. **Details of pension-reform measures, September 2007-February 2012, by primary objective** *(cont.)*

	Coverage	Adequacy	Financial and fiscal sustainability	Work incentives	Administrative efficiency	Diversification/security	Other
Switzerland			Minimum rate of return on mandatory private pensions 2.75%↘2% from Jan. 2009. It will be cut further to 1.5% from 2012.			Ceiling on real-estate investments reduced from 50↘30%; ceiling on mortgage loans reduced 75↘50% from 2009.	
Turkey		Move from monthly price indexation to annual changes to a mix of inflation and GDP growth from Oct. 2008.		Pension age 60↗65 for men and 58↗65 for women by 2048.		Use of derivatives by pension funds for investment purposes permitted for the first time in 2010.	
United Kingdom	Large employers (250 plus employees) must automatically enrol workers into company scheme or the state-run National Employment Savings Trust (NEST) from Oct. 2012; medium sized employers (50 plus) from April 2014; employers with 30 to 49 employees from August 2015 and small employers (fewer than 30 employees) from April 2016. Phasing-in of contns from total of 2% of earnings in 2012 to 5% in 2016 and 8% in 2017.	Increase basic pension by higher of retail prices index (RPI), earnings growth or 2.5% from April 2011.	Indexation of pensions in payment and deferred pensions moved from retail prices index (RPI) to CPI for public-sector schemes and private schemes also permitted to change: CPI is typically 0.5%-1% per year below the RPI. Restriction of tax relief on pension contributions of GBP 50 000 from 2011-12, compared with GBP 255 000 in 2010-11.	Bring forward pension age increase 65↗66 to 2020, 6 yrs earlier than planned (Oct. 2010) and 66↗67 to 2026-28, 10 yrs earlier than planned (Nov. 2011).	New NEST scheme aims to reduce investment-management charges significantly compared with current DC plans.	Extension of financial-assistance scheme (FAS) to 140 000 employees, mainly in insolvent private DB plans at cost of GBP 900 m (USD 1.4 bn).	One-off payment of GBP 110 to pensioners (2009).
United States							One-off payment of USD 250 to all public-pension recipients (May 2009).

Notes: DB = defined benefit; DC = defined contribution; NDC = notional accounts; GDP = gross domestic product; CPI = consumer price index; ave. = average; admin. = administrative; contn = contribution; govt = government; yr(s) = year(s); cohort = date-of-birth groups.

Chapter 2

Putting Pensions on Auto-pilot: Automatic-adjustment Mechanisms and Financial Sustainability of Retirement-income Systems

This chapter analyses the automatic adjustment mechanisms introduced in public pension systems over the past 15 years. These mechanisms create automatic *links between demographic or economic developments and the retirement-income system, particularly benefit levels. While these mechanisms generate greater sustainability of pension promises they normally worsen benefit adequacy. Old-age safety nets may need to be reinforced to address these concerns. Furthermore, automatic adjustment mechanisms are often complex, difficult to understand and create uncertainty over future benefits. In order for individuals to adjust to these new pension designs – by working longer or saving more in private pensions, there is a need for gradualism and transparency in the implementation. A fair and predictable burden-sharing across generations should help individuals to act pro-actively by adapting their saving and labour supply behaviour.*

2.1. Introduction

The need for pension reform to meet the pressures of an ageing population and ensure the affordability of pensions has been apparent for some time. Trend increases in life expectancy, combined with declining fertility rates, in many developed countries are a challenge for public policy in general and pension systems in particular.

The combination of these demographic trends implies for many pension systems, *ceteris paribus,* a declining amount of contributions collected and an increasing amount of benefits paid. This situation has required repeated changes to pension-system parameters and rules that in general have only stabilised the system's financial situation temporarily.

These developments have prompted many countries over the past 15 years to introduce *automatic* links between demographic or economic developments and the retirement-income system. This important innovation is attractive for economic reasons as well as politically. The automaticity of adjustments means that pension financing is, to some extent, immunised against demographic and economic shocks. It provides a logical and neat rationale for changes – such as cuts in benefits – that would otherwise be politically difficult to introduce. Like other pre-commitment mechanisms in economic policymaking – in monetary and fiscal policy, for example – it is designed to ensure credibility with a clear rule: public pension schemes should not place an unexpected burden on the public finances in the future.

These automatic-adjustment mechanisms are designed, directly or indirectly, to help achieve financial sustainability. Section 2.2 shows that financial sustainability is a concept that is difficult to pin down, setting out various alternative approaches. It also discusses the time periods over which the finances should be assessed, contrasting short-term, relatively static conditions with long-term, dynamic approaches. Section 2.3 shows the different ways in which pension systems can adjust to demographic and economic changes and the policy instruments that can be used to ensure sustainability. The section also goes into greater detail on the precise design of adjustments to benefits. The concept of a public pension reserve fund as a financial buffer against demographic and economic shocks is introduced in Section 2.4. The implications for financial sustainability deriving from the various adjustment mechanisms is discussed in Section 2.5. The political economy of automatic adjustment mechanisms are discussed in Section 2.6, which sets out the attractions of this approach. Section 2.7 draws some conclusions.

2.2. Defining financial sustainability

Pension systems involve long-term social and financial commitments: promises to pay benefits during retirement to today's workers cover a period spanning many decades. The capacity to meet these promises is one of the most important issues in the design of retirement-income systems.

2.2.1. Sustainable rates of return on PAYG schemes

The starting point for the analysis of financial sustainability is the framework of Samuelson (1958), as extended by Aaron (1966). In this framework, a public pension system is affordable in the long term if on average it pays those who contribute to the system a rate of "return" equal to the growth of the labour force in real efficiency units. This is known as the Aaron-Samuelson condition (see Box 2.1 below).

Underlying this condition is the widely-shared assumption that average earnings in the economy grow over time in line with productivity gains. Employment has tended to increase in the past (with cyclical variations) but many OECD countries' workforces are projected to shrink in the future. Using data from the European Commission's (2009) *Ageing Report*, it is possible to show that cross-country differences in the sustainable rate of return on pay-as-you-go pensions are substantial. These projections suggest also that, *ceteris paribus*, the replacement rate must decline over time to achieve financial sustainability.

The Aaron-Samuelson framework, at this basic level, does not take full account of the impact of demographic change on the pension system. Population ageing that is driven by changes in fertility is implicitly accounted for by its impact on the size of the labour force. However, the effect of increasing life expectancy needs to be added in explicitly. Using data on pensionable age combined with information on developments in mortality and life expectancy, OECD (2011) estimates the "expected retirement duration", the additional years of life after normal pension age (on average) across countries and over time. This concept illustrates the length of the period over which pension benefits must be paid and it is an important determinant of the public cost of paying for pensions.

Offsetting some of the impact of longer lives on pension systems, many countries have increased pensionable ages or tightened the qualifying conditions for receiving early-retirement benefits. (These changes are extensively documented in Chapter 1 of this report and Chapters I.1 and I.3 of OECD, 2011.) However, reform measures to increase the effective age of retirement mean that increases in the number of people receiving pensions are expected to be lower than the growth of the population aged over 65: 0.8% per annum compared with 1.4% for the EU27 on average. In only two countries – Cyprus[1, 2] and Luxembourg – is the rate of growth of pension recipients expected to exceed the rate of growth of the population over 65.

Adding the change in employment (and the change in the number of pension recipients) gives an overall sustainable rate of return on pay-as-you-go pensions in the Aaron-Samuelson framework.[3] For the EU27 as a whole, this differential averages –0.9% a year, ranging from –0.2% in Denmark to less than –2% in Cyprus and Luxembourg.[4]

The Aaron-Samuelson condition set out in Box 2.1 below relates to rates of return over time, which implicitly assumes that the pension system starts out from some sort of financial equilibrium. In that case, the objective of "sustainability" over time can be met under certain conditions concerning changes in pension replacement rates relative to the rates of growth of those employed and pension recipients.[5] However, pension systems may not have a "sustainable" starting point. This can happen because of some demographic and macro-economic shocks that lead to increasing life expectancy or a very slow GDP growth. But an unsustainable starting point could also be due to too-high benefits, a too-low retirement age or too-low contributions.

Box 2.1. **The Aaron-Samuelson framework in practice**

Suppose that individuals live two periods. During the first period they work, while they spend the second period of time as retirees. Suppose also that the number of workers at time t is L_t and that their average wage is w_t.

Assume that the number of workers increases over time according to the following rule $L_t = L_{t-1}(1 + n)$ while the average wage grows according to $w_{t+1} = w_t (1 + g)$. Suppose that there is a social security programme paying benefit b in the second period and financed by a payroll tax in period 1 levied at rate c. The social security programme is financed on a pay-as-you-go (PAYG) basis such that the workers' generation will receive globally pension benefits in period t + 1 that will be paid out of the contributions of the next generation.

The total pension benefit the young generation (workers in period *t*) will receive when they retire will be equal to the total contributions paid by the next generation (worker generation in period *t* + 1) such that

$$\begin{aligned} P_{t+1} = R_{t+1}\,\overline{p} = C_{t+1} &= cw_{t+1}L_{t+1} \\ &= c(1+g)w_t(1+n)L_t \end{aligned} \tag{1}$$

Where $\overline{p}$ is the average pension level, which is a fraction of the wage earned in time t, $p = w_t q$, so that the replacement rate q is $q = \frac{p}{w_t}$; with R being the number of pensioners and q being the replacement rate. Equation (1) also expresses the budget constraint that the government faces in each period t if PAYG balance is assumed. In fact, the left-hand side of the equation represents the pension liabilities to the old-generation and the right-hand side represents the contributions paid into the system by the workers. This equality states that the total value of benefits paid is equal to the payroll tax rate times the total wage bill.*

Dividing eq. (1) by C_t, one obtains the pension rate that retirees get out of the contributions they paid when they were workers such that

$$\frac{P_{t+1}}{C_t} = \frac{C_{t+1}}{C_t} = \frac{cw_{t+1}L_{t+1} = c(1+g)w_t(1+n)L_t}{cw_tL_t = c(1+g)w_{t-1}(1+n)L_{t-1}} = (1+g)(1+n)$$

If the contribution rate is constant and the labour force participation rate is constant, this equality reduces to the standard Aaron-Samuelson condition which implies a return of approximately $n + g$ (equal to the rate of growth of the wage bill). This condition suggests that slow labour force growth and slow productivity growth reduce the rate of return to contributions to a PAYG system.

The condition also implies that the rate of return in a funded pension system will be lower than that generated by a PAYG pension system if

$$(1+r) < (1+g)(1+n)$$

If the inequality is reversed, the rate of return in a funded pension system will be higher than that generated by a PAYG pension system.

A corollary to the Aaron-Samuelson condition is the "paradox of social insurance" in which an individual can receive a higher rate of return when participating in a PAYG pension scheme than by participating in a funded pension scheme.

The intuition behind this paradox is the following: in a fully-funded pension scheme a generation of a size L_t finances its own retirement while in a PAYG a generation of size L_t finances the retirement of a generation of a smaller size. The paradox disappears in a situation of either slow population growth or of population decline and if there is negative growth in the real wage. This also implies that for countries experiencing population ageing, low fertility and low productivity growth, pre-funded privately defined contribution pension schemes may appear a "superior" alternative.

* It can be shown that, by rearranging the terms, the static-balance condition may equivalently be written as the equality between the contribution rate and the product of the average replacement rate and the average dependency ratio of the economy.

More technical studies have explored further the Aaron-Samuelson condition (*i.e.* that the implicit rate of return on pension contributions should be equal to the rate of growth in average earnings plus the rate of growth of employment) and its stability in the face of changes in other variables (see for example Robalino and Bodor, 2009; Settergren and Mikula, 2005; Vidal-Meliá and Boado-Penas, 2012).

2.2.2. Pay-as-you-go equilibrium

The Aaron-Samuelson condition is very clearly dynamic. But the "static" situation at different points in time also matters. This is addressed by the concept of "pay as you go equilibrium". In a strong form, this requires pension contribution revenues to equal public-pension expenditures in each and every period (now and into the future). In a weaker form, this balance between contributions and benefits does not need to hold every year: for example, in times of recession, "automatic stabilisers" might be allowed to operate, with revenues falling short of expenditures. Equally, in times of rapid growth, contribution revenues may exceed spending. In the weaker form, it is important that these revenues and surpluses balance over the economic cycle: *i.e.*, the condition is imposed symmetrically in both good and bad times.

Figure 2.1 shows the relationship between contribution revenues and total expenditures using data from European Commission (2009) for 2007 and projections for 2060. In 2007, the average ratio between contribution revenues and benefit expenditures for the 23 countries shown is 88% (the blue bars). In seven cases – the Czech Republic, Estonia, Ireland, Latvia, Luxembourg, Romania and Spain – pension contribution revenues exceeded expenditure in 2007. In the nine countries at the bottom of the chart, contribution revenues covered between half and three-quarters of expenditure.

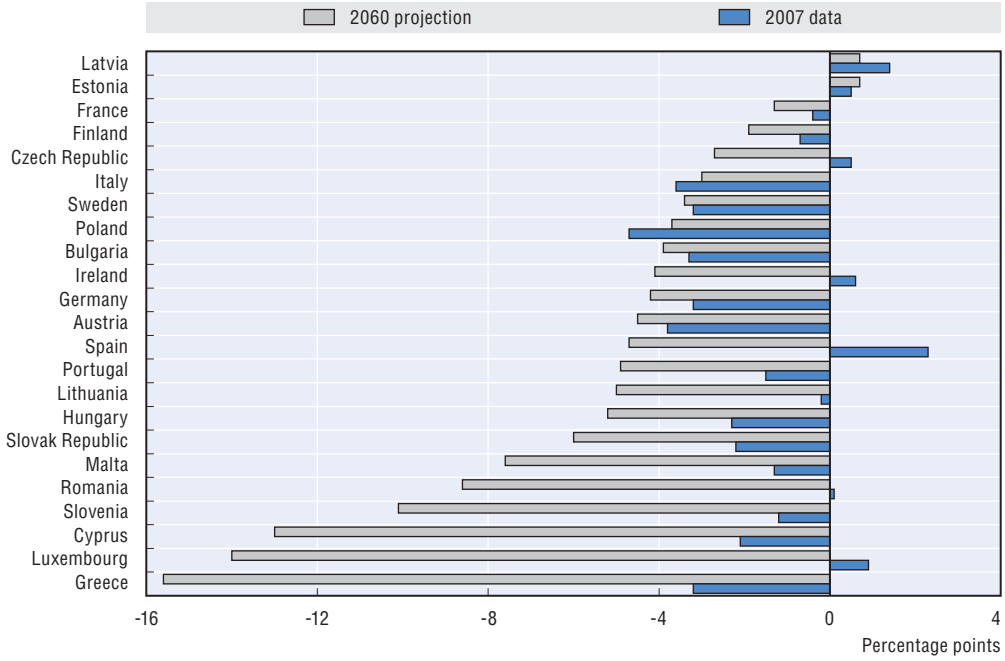
In some of these cases, this reflects a range of explicit policies. For example, some types of public pensions – especially resource-tested benefits or minimum pensions – are financed out of general government revenues. In others, the cost of credits for some periods out of paid work – caring for children or during a spell of unemployment – also comes out of the general government pot.

Nevertheless, in some countries contribution revenues increase significantly less than pension expenditures. In the absence of an explicit decision to finance part of the pension promise out of general taxation, the higher growth rate of benefits relative to contributions may be a sign of PAYG disequilibrium: benefit pay-outs that are already unsustainably high relative to contributions paid.[6]

Looking forward to 2060, the proportion of public-pension expenditures that will be financed by contributions is expected to fall from 88% to 64% on average. Only Estonia and Latvia are projected to have a pay-as-you-go surplus in 2060, compared with seven countries in 2007. In only three countries – Bulgaria, Estonia and Italy – are contribution revenues expected to grow faster than expenditures, and then only by a modest amount. In a few cases, there is only a small deterioration of revenues projected relative to spending: Austria, Finland, France, Germany, Poland and Sweden. The changes are largest in Ireland, Luxembourg, Romania and Spain. In four cases, the gap between contribution revenues and expenditures in 2060 is projected to be 10% of GDP or more, with a further six countries showing a difference of between 5% and 10% of GDP.

The relation between contribution revenues collected and pension benefits paid may be illustrated using benefit/cost ratios. These ratios illustrate the *lifetime* value of benefits

Figure 2.1. **Difference between public pension contribution revenue and pension expenditure, percentage of GDP, 2007 and 2060**



Note: Data are not provided for Denmark (with no contribution) and the United Kingdom (with only an overall contribution). For Belgium and the Netherlands – where there is an explicit pension contribution – data are not reported. Information for Ireland may be misleading: there is no separate pension contribution, so these data probably relate to the overall social-security contribution.

Source: OECD calculations based on European Commission (2009), "The 2009 Ageing Report: Economic and Budgetary Projections for the EU27 Member States (2008-2060)", *European Economy*, No. 2/2009, Tables A53 and A60.

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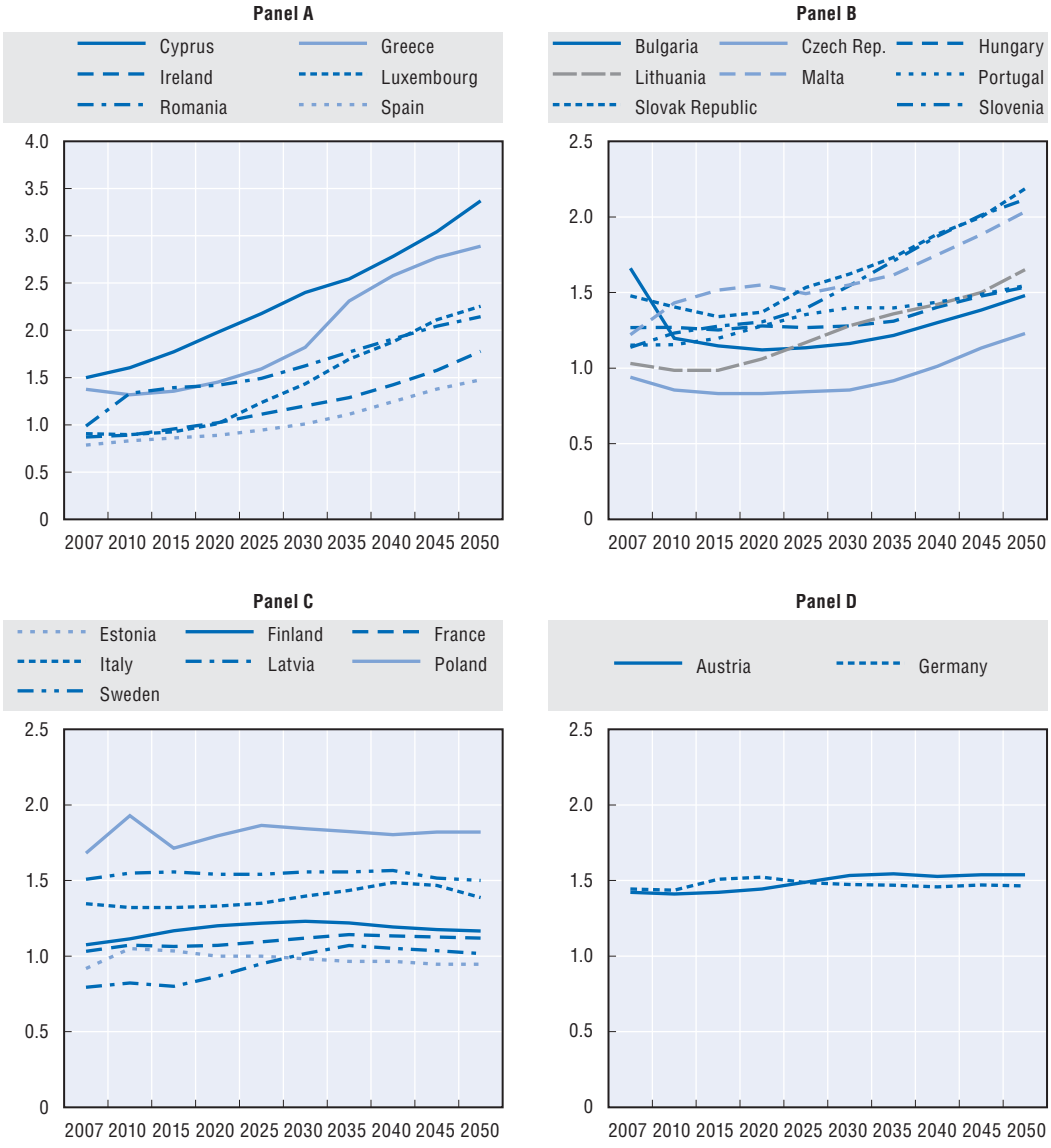
relative to the *lifetime* value of contributions. In steady-state, a benefit-cost ratio of one (with the appropriate discount rate) would indicate that the system is sustainable. Although population ageing is clearly not a steady-state, it is possible to produce sustainable benefit-cost ratios – adjusting for longer life expectancy and a smaller workforce – that will be below one (see also D'Addio and Whitehouse, 2012).

Figure 2.2 shows the ratio of public pension expenditure to contribution revenues using data for 2007 and projections through to 2060.[7] These charts are based on European Commission (2009) and thus the projections do not account for the impact of the reforms that have taken place since 2009, for example, in France, Greece, Italy and Spain. Countries have been divided into four groups based on the increase in the ratio over the projection period, starting with the largest increases in the top panel on the left and ending with the smallest increases in the bottom panel on the right.

Pension spending is currently slightly below contribution revenues in Ireland, Luxembourg, Romania and Spain. However, in Luxembourg and Romania, spending in 2060 might well be over double the revenues from contributions. For most of the countries in the bottom panels of Figure 2.2, the relationship between expenditure and revenues is projected to be broadly unchanged over the forecast period. In quite a number of these cases, expenditure is significantly larger than contribution revenues: in general, this reflects the fact that part of public spending on retirement benefits is financed out of general revenues rather than pension contributions. Indeed, it is not possible to show the

Figure 2.2. **Ratio of pension expenditure to pension contribution revenue, percentage of GDP, 2007-2060**



Source: OECD analysis of European Commission (2009), "The 2009 Ageing Report: Economic and Budgetary Projections for the EU27 Member States (2008-2060)", *European Economy*, No. 2/2009, Tables A53 and A60.

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ratio of pension expenditures to contributions for those countries – such as Belgium, Denmark, the Netherlands, Norway and the United Kingdom – where there are no separately identifiable pension contributions.

The calculation of benefit/cost ratios, however, raises a number of methodological problems. First, in about a third of EU/OECD countries there are either no contributions at all (retirement benefits are paid from general revenues) or there is no separately identifiable "pension" contribution (because it is part of an overall contribution including unemployment, industrial injury, sickness, disability etc. benefits). This limits the scope of the analysis.

Secondly, many public sources of retirement support, particularly resource-tested benefits, are explicitly not financed by contributions. Thus, the measure of sustainability used here has to exclude such benefits from the calculations. But that distorts the assessment of financial sustainability. These programmes are already significant sources of old-age incomes in many countries. And they will become more important over time as many countries have made substantial cuts in earnings-related benefits. This could lead to incorrect interpretation of the results.

Thirdly, the contributions also pay for benefits, such as those for disability and survivors, that are not included in the calculation of the benefit flow. Lastly, even if an expensive public, PAYG, earnings-related pension appears "sustainable" on this measure – *i.e.,* lifetime contribution revenues are greater than expenditures – there may still be concerns about high contribution rates and their economic impact.

For the reasons outlined above, these data cannot, in every case, be interpreted as a deficit of the pension system: some of the benefits included in the overall expenditure are explicitly financed from general government revenues. Moreover, the role of different components of the pension system is likely to change over time. For example, a reduction in earnings-related benefits as a result of pension reforms is likely to increase expenditures on safety-net programmes, such as basic, means-tested and minimum benefits. A useful, comprehensive definition of sustainability must take account both of the full range of benefits on the expenditure side and the full range of financing mechanisms on the revenue side.

2.2.3. Actuarial equilibrium

Instead of assessing contributions and expenditures in a single year or over an economic cycle, one can sum these over a long projection horizon. In this case the relevant concept is that of "actuarial equilibrium".

If the system is in balance over the whole period, there will be surpluses or deficits (of contribution revenues *versus* expenditures) in most years, with one or the other persisting for quite long periods. Within a PAYG system this could be achieved by linking the rate of return of the contribution of a specific cohort (and thereby the pension benefits) to the present value of future contributions. This difference between these two totals shows the so-called "financing gap" of the pension system. This longer horizon has very different implications. The current balance of the pension system may be in surplus. However, population ageing may mean that pension expenditures will exceed revenues if current contribution rates are maintained into the future. The actuarial equilibrium approach would therefore require remedial action now, while pay-as-you-go equilibrium would not.

An "actuarial" approach, therefore, considers both expenditures and contribution revenues and the balance between the two over time. This approach is popular with the World Bank and it is a standard presentation of the results from its PROST model (the Pension Reform Options Simulation Toolkit).[8]

2.3. Targets, instruments and mechanisms for implementation of automatic adjustment mechanisms

Financial sustainability is an important issue for most types of pension arrangements. This is most obvious in cases where benefits are financed on a pay-as-you-go (PAYG) basis, where current contributions pay for current benefits. In earnings-related schemes that are

financed on a funded basis – where there are assets to back future pension promises – or are partially pre-funded the financial problems are reflected in solvency difficulties. This group of schemes includes private defined-benefit schemes (in the Netherlands, for example) and public programmes with reserves (such as the defined-benefit schemes in Finland and the notional-accounts scheme in Sweden).

By contrast, with pure defined-contribution schemes – where benefits depend solely on the value of contributions and on the investment returns earned – financial sustainability is not an issue, although adequacy may be. At any point in time, the value of future pension liabilities is exactly the same as the value of the assets in the funds.

The most logical approach to financial sustainability involves some form of long-term (actuarial) equilibrium. This means that the pension system is in balance over time in the long-term: the stream of expected future contributions and other revenues over a suitably long horizon (50-75 years) is enough to pay for projected benefits over that period. However, it may be possible to use proxies for this direct measure of financial sustainability in an automatic adjustment mechanism.

The question is therefore about the instruments that can be used to correct situations of "actuarial" disequilibrium. Four types of instruments might be employed:

- adjustments in the benefit level (or the value of pension benefits) which directly reduce expenditures;
- adjustments in pension eligibility ages which cut spending by reducing the duration over which pensions are paid;
- adjustment in contribution rates which increases the revenues of the scheme,[9] or
- drawing on a reserve fund, providing one exists.[10]

There are some variations on these themes. For example, contribution revenues might be increased by extending the base (raising the ceiling, levying contributions on unearned income *etc.*) rather than increasing the rate. Benefit levels can be cut in different ways: across-the board (proportionally for all) or in a targeted way (with smaller cuts for low-wage workers than for high-wage workers). Effective benefit cuts can be imposed on existing retirees by changing the policy for indexing pensions in payment. Benefit cuts on current workers can be restricted only to new pension accruals or applied to the rights already accrued.

Three of the adjustments listed above (benefits, pension ages and contributions) can be introduced on an ad-hoc, discretionary basis or they can be part of an automatic adjustment mechanism. This section covers both cases, but focuses on the latter.

2.3.1. The adjustments of benefit levels

Changing the accrual rate – the amount of pension earned for each year of contributions – is the most direct way of affecting benefits. But such a direct approach is relatively rare. Far more common are indirect changes to the benefit formula. In practice, the adjustment factors of the benefits often depend on the behaviour of some demographic indicators (such as life expectancy and the old-age dependency ratio) or economic variables (such as growth in GDP or average earnings). However, only some of these indirect approaches can be considered as *automatic* adjustment mechanisms.

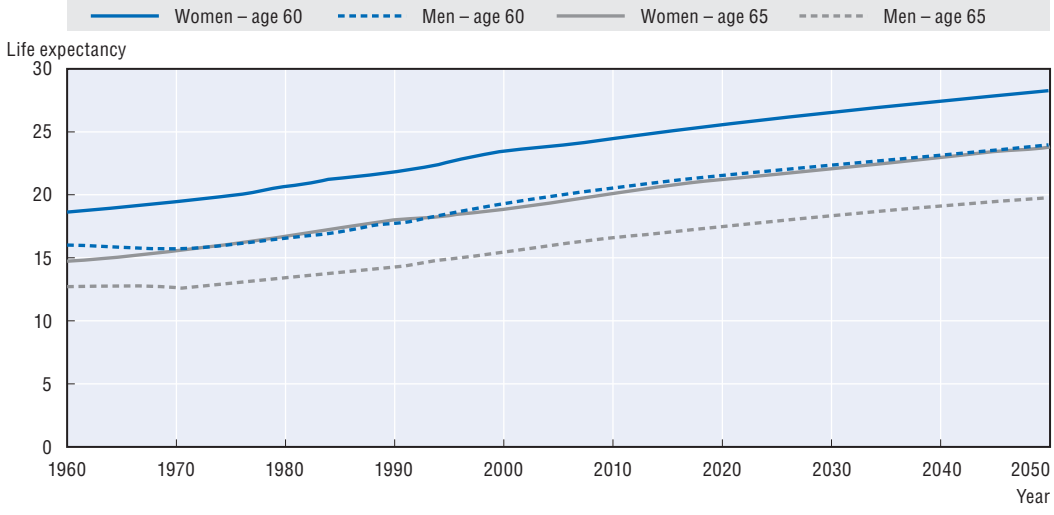
Effectively, there are three main mechanisms to adjust the benefit levels (or the value of pension benefits) in an automatic manner:

- Adjustments can be made in benefit levels to reflect changes in life expectancy.
- Adjustments can occur through valorisation of earlier years' earnings.
- Thirdly, adjustment can be made in the method of indexation of pensions in payment.

2.3.1.1. *Adjustments in benefit levels to reflect changes in life expectancy*

The UN demographic projections suggest further increases in life expectancy between 2010 and 2050.[11] The additional years of life expectancy at age 65 are projected to grow by 3 years for men and 3.5 years for women between 2010 and 2050 (Figure 2.3). As in the past, the lengthening of life expectancy at age 60 is greater, but by a smaller margin than observed between 1960 and 2010. Using data on pensionable age based on OECD (2011) combined with information on developments in mortality and life expectancy gives the number of additional years of life after normal pension age (on average) across countries and over time. This concept here called "expected retirement duration" illustrates the length of the period over which pension benefits must be paid. It is thus an important determinant of cost of paying for pensions.

Figure 2.3. **Life expectancy at age 60 and 65 by sex, OECD average, 1960-2050**



Source: Historical data on life expectancy from the *OECD Health Database 1960-95*. Recent data and projections of life expectancy in the future based on the *United Nations Population Division Database*, *World Population Prospects – The 2008 Revision*; and OECD (2011), *Pensions at a Glance 2011*.

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Offsetting some of the impact of longer lives on pension systems, many countries have made adjustments in benefit levels. Increases in pensionable age (see below) are in fact only one policy response to the fact that people are living longer. Around half of OECD countries have elements in their mandatory retirement-income provision that provide an automatic link between pensions entitlements and life expectancy. Table 2.1 sets out the changes that involve an automatic link between pensions and life expectancy.

Table 2.1. **Different ways of linking pension benefits automatically to life expectancy**

	Mandatory defined-contribution plan	Notional accounts scheme	Benefits linked to life expectancy	DB-to-DC shift in voluntary private provision
Australia	●			
Austria				
Belgium				
Canada			●	●
Chile	●			
Czech Republic				
Denmark				
Estonia	●			
Finland			●	
France				
Germany			●	
Greece				
Hungary				
Iceland				
Ireland				●
Israel	●			
Italy		●		
Japan			●	
Korea				
Luxembourg				
Mexico	●			
Netherlands				
New Zealand				
Norway	●	●		
Poland	●	●		
Portugal			●	
Slovak Republic	●			
Slovenia				
Spain				
Sweden	●	●		●
Switzerland				
Turkey				
United Kingdom				●
United States				●

Note: DC = defined-contribution; DB = defined-benefit.

In the context of public schemes, the link is implemented directly in some defined-benefit schemes (such as in Finland, Germany and Portugal). For example, in Finland, the "life expectancy coefficient" automatically adjusts the amount of pensions in payment as life expectancy changes. With this adjustment in force since 2010, the amount of new pension will depend on the development of life expectancy relative to the base level calculated in 2009. The change in life expectancy will be determined annually for the

62-year-old cohort using five year mortality data for people at least that old. In Portugal, the sustainability factor which determines the pension entitlement results from the relation between the average life expectancy at age 65 in 2006 and the one that will occur in the year before the pension claim. This factor applies to old-age pensions beginning from 1 January 2008 and to old-age pensions resulting from the conversion of invalidity pensions (it is applied at the date of conversion, when the pensioner reaches age 65).[12]

Still in the context of public schemes, some countries have introduced a link to life expectancy with the adoption of notional accounts (such as in Italy, Poland, Norway and Sweden, see Box 2.2).

Box 2.2. **Linking pensions to life expectancy: notional defined contribution pension systems (NDC) in Italy, Sweden and Poland**

In notional defined contribution pension systems, each worker is assigned an individual account in which contributions are recorded but not actually paid in. The system thus remains pay-as-you-go financed. At retirement, assumptions about life expectancy are used to convert the notional capital in each account into a stream of future pension payments. As life expectancy rises, for a given notional capital in each personal account the annual pension payment falls, with the aim of preserving the financial sustainability of the system. OECD countries that have introduced such systems differ, however, in the frequency with which the parameters of the notional systems are revised:

- Italy uses a "transformation coefficient", which is akin to the annuity rate in a funded defined-contribution scheme. This coefficient – which varies with the age at which the pension is claimed, with values determined according to a formula based on actuarial equivalence – is reviewed every three years in line with changes in mortality rates at different ages up to 2019 and every two years after that date.
- Poland and Sweden use an annuity divisor which is revised annually: in Sweden, the divisor is linked to individual retirement age and contemporaneous life expectancy (based on unisex mortality rates in the previous five years); in Poland, it is based on average life expectancy at retirement age.

If the contribution rate is held constant (which is generally the purpose of the switching from a "usual" PAYG toward a NDC PAYG), an automatic stabilising device may be needed to adjust financial imbalances of the pension system. The indexing rule of this kind of device is only present, however, in the Swedish pension system.

Depending on the notional rate of return used to credit individual accounts, notional defined-contribution systems will also have different implications in respect to valorisation of past earnings. In Italy, contributions are up-rated in line with the five-year moving average of nominal GDP growth, and in Sweden with earnings growth; in Poland, a new rule adopted in 2004 stipulates valorisation of notional accounts in line with real growth of the wage bill (a rule that could imply, in a context of lower growth in the labour force, significant falls in pension entitlements).

In sum, among countries with NDC schemes, there are considerable differences in how the pension accrues, how the accounts are treated and how the systems react to the imbalance.

In other contexts, the link to life expectancy in pensions has occurred in two other ways. First, many countries have introduced mandatory defined-contribution schemes to replace part or all of public pension provision (*e.g.* Chile, Estonia, Mexico, Poland, the Slovak Republic

and Sweden)[13] or added compulsory contributions on top of existing arrangements – comprising Australia, Israel and Norway.[14] Secondly, there has been a marked shift from defined-benefit to defined-contribution provision in voluntary, private pensions in countries such as Canada, Ireland, the United Kingdom and the United States and in the quasi-mandatory occupational plans in Sweden.

In both NDC and some mandatory defined-contribution schemes (like Sweden's), the accumulated contributions and investment returns are converted into a pension or annuity on retirement. The rate of conversion, like the annuity rate, depends on life expectancy. As life expectancy increases, a given amount of pension capital will buy a smaller annuity, *i.e.* benefit levels *automatically* fall as life expectancy increases.The implicit target is that the value of lifetime pension benefits should remain broadly the same for the same lifetime contributions.[15] In traditional defined-benefit schemes, in contrast, the per-period pension benefit remains the same as life expectancy increases and so the lifetime value of benefits also increases.

Another major development has been the expansion of voluntary, defined-contribution pension schemes. Because the focus of this chapter is on public schemes, the link to life-expectancy in voluntary DC schemes will not be discussed in detail. However, because notional accounts schemes (also called NDC) mimic the functioning of DC schemes, it is worth considering how the link to life expectancy operates in adjusting pension benefits. When people retire in a defined-contribution plan, the accumulated contributions and investment returns may be converted from a lump sum into a regular pension payment. In many countries, regular payments can take the form of programmed withdrawals or annuities.[16] The calculation of the regular payment will be based on projected life expectancy of retirees at the time of retirement. So, pension replacement rates will automatically be lower as life expectancy increases.

2.3.1.2. Adjustments of benefit levels through valorisation

Valorisation is implemented to reflect changes in costs and standards of living between the time that the pension entitlement was earned and when it is drawn. Valorisation of past earnings may not seem obvious in pension systems, but its impact on retirement incomes is large. This is a result of the *compound-interest effect*. A generic example illustrates the impact of changes in valorisation policy. Assuming a 2% annual real wage growth and an annual price inflation of 2.5%, then nominal earnings grow by 4.55% a year. For a full-career worker (*i.e.*, someone working from age 20 to 65), valorising past earnings using a price inflation adjustment factor results in a pension benefit on retirement that is 40% lower than a pension resulting from valorisation in line with economy-wide average earnings. This example illustrates the potential importance of the choice of valorisation method interacting with the compound interest effect.

Valorisation policy, therefore, has important implications both for adequacy and sustainability of pension systems. Financial sustainability is improved by a move to a less generous valorisation procedure. The distributional impact is complex. People with steeper age-earnings profiles (who tend to have higher lifetime earnings) will lose less from a shift from wages to prices valorisation than those with relatively constant real earnings. This is because prices valorisation puts a lower weight on earlier years' earnings (which are less important for a worker with a steep age-earnings profile) than does earnings valorisation. This is the reverse of the effect of extending the period over which earnings are measured to calculate benefits.

The majority of OECD countries with earnings-related schemes valorise past earnings in line with economy-wide wage growth. However, several countries have moved away from earnings valorisation in recent years. For example, valorisation for the public scheme in France is now to prices. The policy in the main second pension for private-sector workers of increasing the cost of a pension point in line with earnings and the value of a point in line with prices has the same effect on benefits as price valorisation (see Queisser and Whitehouse, 2006 and Box 3). Finland and Portugal will valorise pensions to a mix of price inflation and earnings growth.

Important in the context of this section are also the policy on the notional interest rate in notional-accounts schemes and for uprating the value of a pension point with points schemes which as Box 2.3 illustrates are exact equivalents.

Sweden and Germany adjust the incomes before (but also after) retirement according to the average wage growth, while other countries have less generous valorisation procedures. Using the rate of per capita wage growth rather than the rate of total wage growth makes it possible for benefits to grow faster than the wage base that finances them. This may happen when the labour force declines.

However, changes in the valorisation procedure such as those described above are not automatic adjustment mechanisms. They are just one-off discretionary policy changes. By contrast, in Japan changes in valorisation are part of the automatic balance mechanism introduced by the 2004 reform to account for the demographic shocks from an ageing population.

This mechanism consists of two components: *i)* the valorisation procedure; and *ii)* the indexation of pensions in payment. Before the introduction of this mechanism, past earnings were valorised in line with average wages until the beneficiary attained the age of 65. After the age of 65 the benefit was indexed in line with inflation. The mechanism acknowledges the role exerted by declining fertility rates (which potentially reduce the base of contributors) and increasing life expectancy (which increases the period over which pensions are paid) on the cost of the PAYG system. Thus, valorisation and indexation procedures are modified taking into account the rate of decline of active contributors and the yearly rate of increase in life expectancy at age 65: the "modifier" is subtracted from the valorisation/indexation factor. The modifier is equal to the rate of decline of active participants in social security pension schemes plus the yearly rate of increase in life expectancy at age 65.[17] If the financial equilibrium is achieved with this mechanism, the system reverts to the situation without the modifier.

2.3.1.3. Adjustments of benefit levels through indexation of pensions in payment

In some cases, there is a link between valorisation (*i.e.,* pre-retirement indexation) and post-retirement indexation. Nonetheless, indexation of pensions in payment is another instrument that allows for the adjustment of benefits.

Changes in the indexation of pensions during retirement were included in many reform packages in the 1990s. Most of these involve a move to a less generous procedure to reduce costs. For example, Hungary used to index pensions to earnings growth, but moved to a 50:50 split of earnings and price indexation in the reform of the late 1990s. To plug the government's growing deficit resulting from the crisis, it has now moved fully to price indexation.[18]

Box 2.3. **Relations between different types of pension schemes**

Publicly-provided, earnings-related pension schemes follow three broad types. It is useful to compare the relationship between the three using some basic algebra. Issues are here simplified by using simple, generic versions of the three different scheme types: defined-benefit, points, and notional accounts.

All three types of scheme are found in OECD countries. More than half of OECD countries have public defined-benefit schemes and in a further three, private defined-benefit plans are either mandatory or "quasi-mandatory" (*i.e.,* they achieve near-universal coverage through industrial-relations agreements). Four OECD countries have points schemes and three have notional accounts. In seven countries, there are no public or mandatory private earnings-related schemes. Of these, three have mandatory or quasi-mandatory defined-contribution provision while two have no compulsory public or private arrangements for providing income replacement in retirement, relying instead on basic schemes (see Queisser and Whitehouse, 2006).

A simple defined-benefit plan pays a constant accrual rate, a, for each year of service. It is based on lifetime average revalued earnings. The pension benefit can therefore be written as:

$$DB = \sum_{i=o}^{R} w_i (1+u)^{R-i} a$$

where w are individual earnings in a particular year (indexed i), R is the year of retirement and u is the factor by which earlier years' earnings are revalued. In most OECD countries, this is the growth of economy-wide average earnings.

In a points system, pension points are calculated by dividing earnings by the cost of the pension point (k). The pension benefit then depends on the value of a point at the time of retirement, v. Thus, the pension benefit can be written as:

$$PP = \sum_{i=o}^{R} \frac{w_i v_R}{k_i}$$

A significant public-policy variable is the policy for uprating the value of the pension point, shown by the parameter x in the equation below. By re-writing the pension-point value at the time of retirement as a function of its contemporaneous value, the equation becomes:

$$PP = \sum_{i=o}^{R} \frac{w_i v_i}{k_i} (1+x)^{R-i}$$

In notional accounts, the inflow each year is wages multiplied by the contribution rate, c. The notional capital is increased each year by the notional interest rate, n. At retirement, the accumulated notional capital is divided by a notional annuity factor, A, sometimes called the g-value. The pension benefit can be written as:

$$NA = \sum_{i=o}^{R} \frac{w_i c}{A} (1+n)^{R-i}$$

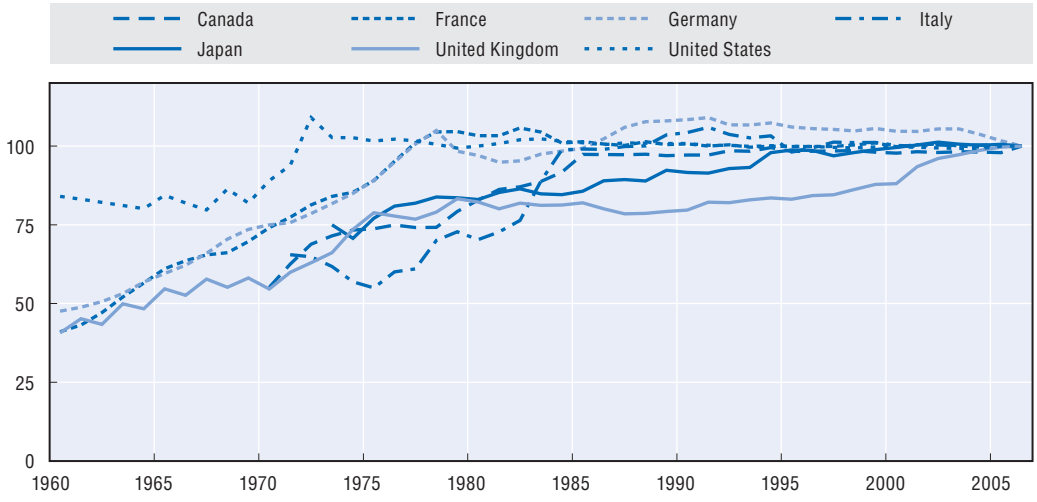
If the policy for valorising earlier years' earnings is the same as the uprating procedure for the pension point and the notional interest rate (*i.e.,* $u = x = n$), then the structure of the three equations is very similar. In this case, the accrual rate under a generic defined-benefit scheme (a) is equal to the ratio of the pension-point value to its cost (v/k) and to the ratio of the notional-account contribution rate to the annuity factor (c/A).

However, governments frequently override indexation rules. Often, this appears to operate in a pro–cyclical way: pension increases are larger than the rules require when the public finances are healthy while increases are postponed or reduced in times of fiscal

constraint. Figure 2.4 shows the history of pension adjustments in the seven major economies, going back to 1960 where data are available. For ease of comparison across time, changes in pension values have been converted to an index fixed at 100 in 2006. It is important to note that this chart does not show the average pension received by retirees in a particular year. The aim is to isolate the effect of indexation policies and practices on pensions from financial and economic conditions, pension reforms, etc.

Figure 2.4. **Impact of indexation practice on real value of pensions in payment**

(Index: 2006 = 100)



Source: Whitehouse (2009).

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Although indexation is a common practice, only in a limited number of OECD countries – Canada, Germany, Japan, Portugal and Sweden – is it "explicitly" related to the sustainability of the system. Some of these countries' practices are examined below.[19] For example, in Canada when an increase in contribution rates occurs (see Section 2.3.3), the indexation of pensions in payment is frozen for three years until the publication of the next actuarial report and the reassessment of the pension plan.

In Sweden, in addition to the life-expectancy link embedded in the calculation of the annuity, pensions in payment are indexed on real wage growth: they are adjusted according to the notional interest rate minus 1.6% (with 1.6% representing an assumption for the long-run growth of real earnings). If real wages grow at this pace, benefits are simply adjusted by the inflation rate. If real wage grow at a slower pace (less than 1.6%), the annuity will grow more slowly than inflation and in the opposite case, the annuity grows faster than the inflation rate. In a system where the indexation follows economic or wage growth, pensioners share some of the risks associated with economic fluctuations with workers.

However, the solvency of the system may also be affected by the trends in fertility rates and the size of the labour force. To account for this possibility, indexation of pensions-in-payment may also be "modified" when the automatic stabiliser built into the Swedish pension system is triggered by the evolution of the so called "balance ratio".

The balance ratio is computed as the ratio of the sum of the (current market of the value of the) buffer funds and the "contribution asset" to the pension liabilities.[20] The ratio

is computed on a three-year moving average to smooth temporal variations (Kõnberg *et al.*, 2005). When this ratio is less than one, the interest rate used to calculate accruals in the individual notional account is reduced and the mechanism reduces by the same amount the indexing rate of pensions in payment. These lower rates of accrual and indexation continue until the financial balance is restored. Conversely, if the balance ratio recovers and moves above one, the opposite adjustments should be observed: higher rates of accrual and indexation. Clearly, all of the adjustment occurs on benefits and accrued benefits while the level of contributions does not change

This mechanism is expected to work with stable population and therefore may not be well suited to situations of continuous population decline. In Japan, indexation is, for example, modified to account for population ageing (see Sakamoto, 2005). As noted above, the modifier is subtracted from the indexation rate. This correction is expected to reduce the indexation rate by 0.9 percentage points per year on average. A corollary of this adjustment of the indexation rate will be the reduction of the average replacement rate from 59% in 2004 to 50% by 2023. Differently from Germany, this factor only applies to benefits and not to contribution rates. Moreover if inflation declines or if per capita disposable income declines, the nominal value of the benefits will be maintained. The law contains in fact a provision to override the automatic stabiliser.

In Germany, the sustainability factor introduced by the 2004 reform is part of the mechanism that modifies pension benefits in relation to the system dependency ratio. The system dependency ratio accounts for demographic and economic factors. In fact, it is the ratio between the number of pensioners to the number of non-pensioners, *i.e.,* the contributors plus the unemployed (Börsch-Supan and Wilke, 2006). In addition to adjusting for the differential situations of contributors and beneficiaries, the sustainability factor is linked to an "equivalised" measure of contributors to pensioners (*e.g.* two contributors on low earnings might be considered as one equivalised contributor). If this ratio increases over a year, the indexation rate of the pension benefits is reduced but the reduction is not fully applied. The reduction is determined by a sustainability parameter which tries to share the burden of pensions between the retirees and the workers. If the sustainability factor were equal to one, the burden would be borne by pensioners alone; conversely if it were equal to 0, the burden would be borne by workers alone. The factor is now equal to 25%.

Finally, in Portugal the pension reform of 2007 introduced also a new indexation rule. For the purpose of calculating the pension according to the whole contributory career, the earnings amounts registered between 1 January 2002 and 31 December 2011 are valorised by an index weighted by prices (75%) and average earnings (25%) whenever the latter outstrips prices. The annual adjustment index cannot be higher than the CPI plus 0.5%. The indexes for the calculation basis adjustment will be reassessed after 31 December 2011.

This is not, of course, a comprehensive list of all the ways in which benefits may be reduced. However, these are the only ways that can be used as an automatic-adjustment mechanism.

2.3.1.4. An illustration of the impact of life-expectancy link on pension entitlements

To illustrate the effects of life-expectancy links in five alternative scenarios of mortality between 2010 and 2050, pension entitlements have been calculated for three benchmark countries (Italy, Finland and Slovenia). While Italy has a NDC system (see Box 2.2), Finland and Slovenia have public defined-benefit schemes, with automatic

adjustments for life expectancy in Finland and without them in Slovenia. The five scenarios are the median of the distribution of outcomes, the upper and lower quartiles and the 1st and 99th percentiles (see Table 2.2). The two key measures of entitlements computed are *replacement rates* and *pension wealth*.[21]

Table 2.2. **Life expectancy and annuity factors: Baseline data for 2010 and alternative projections for 2050**

	UN		OECD projection for 2050 by percentile of the distribution of projected mortality rates				
	Baseline	Projection					
	2010	2050	1st	25th	50th	75th	99th
Life expectancy at age 65 (years)							
Men	16.9	20.0	23.2	21.6	21.0	20.4	18.9
Women	20.5	24.0	26.9	25.5	24.9	24.3	22.9
Change from 2010 baseline (years)							
Men	*0.0*	*+3.1*	*+6.3*	*+4.7*	*+4.1*	*+3.5*	*+2.0*
Women	*0.0*	*+3.5*	*+6.4*	*+5.0*	*+4.4*	*+3.8*	*+2.4*
Annuity factor at age 65							
Men	13.7	15.7	17.7	16.8	16.4	16	15.1
Women	16.1	18.3	20	19.2	18.8	18.5	17.7
Unisex	14.8	16.9	18.8	17.9	17.5	17.1	16.2
Change from 2010 baseline (per cent)							
Men	*0.0*	*+14.6*	*+29.4*	*+22.4*	*+19.4*	*+16.6*	*+9.9*
Women	*0.0*	*+13.7*	*+24.4*	*+19.3*	*+17.0*	*+14.9*	*+9.7*
Unisex	*0.0*	*+14.2*	*+27.0*	*+20.9*	*+18.2*	*+15.7*	*+9.7*

Source: OECD (2011), *Pensions at a Glance 2011: Retirement-income systems in OECD and G20 countries*, OECD Publishing, Paris, Table 5.2.

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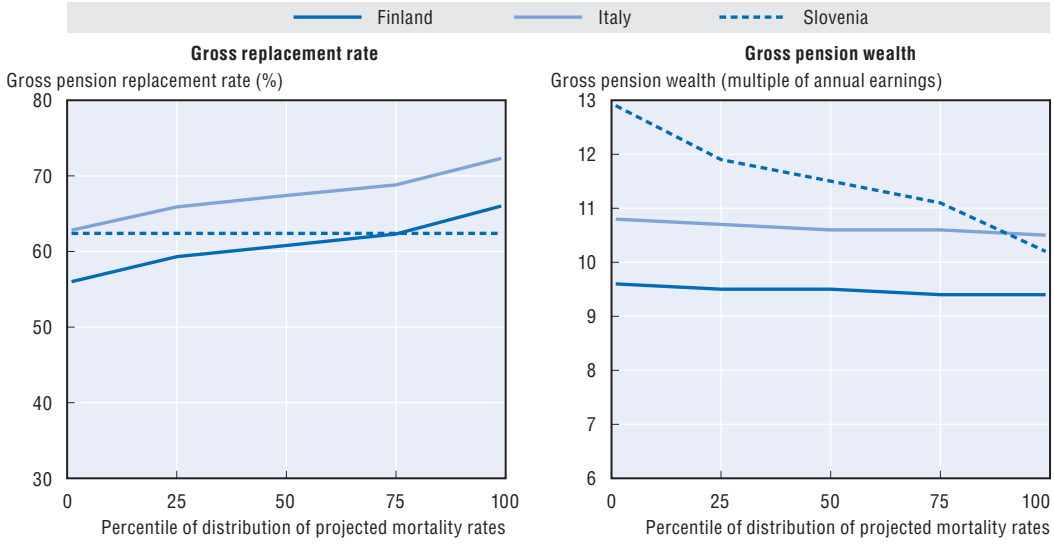
The left-hand chart in Figure 2.5 shows the replacement rate under the different mortality scenarios. All the results are for a man on average earnings. With Slovenia's defined-benefit plan, the replacement rate is constant at 62%. But in the other two cases, replacement rates are lowest at the highest life expectancy (1st percentile of the distribution) and highest with the lowest life expectancy (99th percentile). In Finland, for example, the replacement rate is 56% with the lowest mortality rates and 66% with the highest. Pension wealth is shown in the right-hand chart of Figure 2.5. In Slovenia, pension wealth is nearly 13 times annual earnings in the high-life expectancy scenario but just over ten times with low-life expectancy. There is a slight decline in pension wealth as mortality rates increase in Finland and in Italy, but this is substantially shallower than for Slovenia. For example, pension wealth is higher in Slovenia than in Italy in most cases, but if mortality improvements were especially slow, a man on average earnings in Italy would show higher pension wealth than in Slovenia.

Under a pure defined-benefit plan, replacement rates are constant while pension wealth varies with life expectancy. This is illustrated by the Slovenian case. Under a pure defined-contribution plan, the reverse is true: pension wealth is constant but the replacement rate varies with life expectancy. This is basically the situation in Italy with a NDC system. The chart also shows that an automatic link between benefits and life expectancy as in Finland's defined–benefit system has a similar effect on future benefits than an NDC system. However, the ultimate effect on financial sustainability is greater

Figure 2.5. **Pension entitlements under different life-expectancy scenarios: Man with average earnings**



Source: OECD (2011), *Pensions at a Glance 2011: Retirement-income systems in OECD and G20 countries*, OECD Publishing, Paris, Figure 5.2.

StatLink http://dx.doi.org/10.1787/888932598284

under an NDC system because benefits are also determined by the amount of contributions (via the imputed rate of return on the notional accounts).

In theory the individuals' response to such reforms should be that of working longer, but this outcome is in practice uncertain. Table 2.3 gives some indication of the extra length of work required for selected countries with a link to life expectancy in their mandatory retirement-income provision. It shows the current normal pension age and, using different projections for life expectancy in 2050, the age of claiming the pension that would deliver the same benefits.

In Finland, for example, there is no fixed retirement age for public, earnings-related benefits. However, access to resource-tested schemes – the national and guarantee pensions respectively – is restricted to age 65 and above. Under the median mortality scenario, an individual would have to work to age 66.3 years. The extra work adds to annual benefits in three ways: additional contributions; extra investment returns on accrued pension capital; and a shorter duration of retirement. In the low-mortality scenario, however, work until age 68 would be needed to maintain benefits, while a pension age of 65.9 would be sufficient in the high-mortality scenario. This pattern is broadly replicated in countries with NDC systems, such as Italy, Poland and Sweden. The extra years needed between 2010 and 2050 from Norway's current normal pension age of 67 are also similar. Typically, just less than one extra year's work will deliver the same benefit replacement rate as existed in 2010 under the high-mortality scenario, 1.5 years in the median case and around three years with the most rapid mortality improvements.

In the Slovak Republic, the extra years of work required are fewer, reflecting the significance of elements of the pension package not linked to life expectancy. In Portugal, the extra years of work needed to offset life-expectancy-related reductions in benefits are also small. This reflects the large increments to accrued benefits for people working after the normal pension age. This can be as high as 12.0%, well above the OECD average of 4.8%.

Table 2.3. **Pension ages needed to equalise benefits in 2010 and 2050 under different mortality scenarios: Man on average earnings, selected countries**

	Current normal pension age	Pension age delivering equal replacement rate in 2050		
		Low mortality	Median mortality	High mortality
Chile	65	68.8	66.2	65.7
Estonia	63	64.2	63.7	63.3
Finland	65	68.8	67.3	65.7
Italy	65	69.1	67.3	65.8
Mexico	65	68.7	66.2	65.7
Norway	67	70.9	69.6	67.7
Poland	65	68.7	67.7	65.7
Portugal	65	67.3	66.4	65.4
Slovak Republic	62	63.6	63.1	62.4
Sweden	65	68.8	67.4	65.7

Note: The figures have been updated from those published in OECD (2011) because of the update of mortality data.
Source: OECD pension models.

StatLink http://dx.doi.org/10.1787/888932598911

2.3.2. Pensionable age and other eligibility criteria

Increases in pensionable age – the second instrument to achieve "actuarial equilibrium" have become increasingly common: more than half of OECD countries are increasing the statutory pension age (see Chapter 1 in this report and Chapter 1 in OECD, 2011). In most cases the increases are expected to take place according to schedules fixed by the law. Normal pension ages will vary between 60 and (around) 69 in OECD countries once reforms are fully in place, with an average of 65.6 and 65 years for men and women respectively in 2050.

In the context of defined-benefit schemes, there are two unambiguously positive effects from increasing pensionable age. First, the benefit will be paid for a shorter period thereby reducing the cost over the individual's lifetime. Secondly, people will be working longer and thus contribute more to the system. Offsetting this, the extra pension component of social contributions will mean that people will usually have a larger benefit entitlement. The degree of offset depends on the implicit return on those additional contributions. If a system pays a high return, then the cost of the extra benefits will outweigh the extra pension contribution revenues over time.[22]

With notional accounts and defined-contribution plans, the relevant pension schemes' finances are unchanged with an increase in the pension age. The shorter duration over which benefits are paid is reflected automatically in a higher per-period benefit. Furthermore, the additional contributions match the additional accrual of benefits.[23]

In all three types of pension schemes, there may be an offset to expenditure savings from a higher pension age. This is because people who would have retired on an old-age pension may now effectively leave the labour market *early* through other pathways, such as unemployment, long-term sickness or disability benefits. These effects are difficult to quantify. Working in the opposite direction, people working longer and accruing higher benefits might reduce the burden of paying safety-net benefits to retirees who had low earnings.

2.3.2.1. Linking pensionable age to life expectancy?

A link between benefit levels and life expectancy is a common feature of the pension reforms of OECD countries as noted above. Advocates of these reforms have argued that individuals will respond by working longer as successive cohorts live longer and benefits for a given retirement age are consequently lower.

While the majority of OECD countries have put in place gradual increases in the retirement age, an explicit link between pensionable age and life expectancy is still rare.[24] Denmark, for example, has indexed retirement age to life expectancy. Legal provisions have been introduced that allow the retirement age to be indexed in line with the increases in life expectancy after an initial increase of the retirement age to 67. The eventual increases will result from a review of life expectancy done on five-year intervals starting from 2015. However, previous approval of the Danish Parliament is required for any increase in the retirement age.

Greece and Italy have also recently introduced reforms that will index the retirement age on life expectancy from, respectively, 2021 and 2013. In Greece, the 2010 reform has introduced a mechanism that indexes both the statutory retirement age (65 years) and the minimum retirement age (60 years) to life expectancy from 2021 onward.

In Italy, the 2011 pension reform has speeded up the introduction of the link between life expectancy and retirement age. Initially foreseen in 2009 (and made operational in 2010), the indexation to life expectancy will start in 2013 (instead of 2015) and will be reviewed every three years. From 2019 the review will take place every two years, in order to align the revision of eligibility conditions with the revision of conversion coefficients in the NDC system. The age threshold for being entitled to the means-tested social allowance will be also indexed to life expectancy.

France has a sort of automatic adjustment mechanism too, though it operates via maintaining constant the ratio between the duration of activity and the expected duration of retirement (⅔ and ⅓). A review of life expectancy should trigger a change in the length of the contribution period.

Finally in the Czech republic, to account for increases in life expectancy the standard retirement age will be gradually increased by 2 month per year of birth without any upper limit for men (and later on for women too) under the latest pension reform. The pension eligibility age for women will be increased by 4 months and from 2019 by 6 months to be unified with men (fully for individuals born in 1975 at the age 66 years and 8 months).

2.3.3. Contribution rates

The third instrument mentioned is designed to generate extra revenues for the pension system through increases in contribution rates. Public schemes are often financed from employer and employee social security contributions (*i.e.*, taxes on wages) or from general government revenues. On average in OECD countries, contributions for public pensions raise revenues equivalent to about 70% of public expenditure on pensions. Thus, in most cases, there is some element of general revenue in the financing of benefits.[25]

With a national defined-benefit scheme, such a change has the expected, positive effect on the scheme's finances. With notional accounts, however, this is not the case. There is a short-term boost to government revenues under notional accounts, for example, but this will be balanced by a broadly equivalent increase in future benefit expenditures (again, depending on the degree of "actuarial fairness" in the detailed design of the scheme).

Increases in the contribution rate are very often unpopular measures and can have adverse economic effects. There are potential offsets in economic behaviour in all three types of pension systems. Higher employee contributions will have the effect of an increase in taxes and may therefore reduce labour supply. Higher employer contributions increase employers' labour costs and so may reduce labour demand. In both of these cases, employment will be lower, offsetting some of the revenues raised by higher contributions.

As noted above, most countries have ruled out increases in contribution rates explicitly or implicitly (by adopting notional accounts). However, there are some examples where changes in contribution rates are used in combination with measures on the benefits side of the equation: three countries have mechanisms in place to increase contribution. In one country, Japan, this mechanism is temporary: in fact contribution rates will increase until 2017. In Canada, the contribution rate may be increased conditional on: *i*) the Canada Pension Plan showing in its actuarial report that the legislated rate is lower than the minimum contribution rate required for the sustainability of the plan; and *ii*) that the federal and provincial ministers do not reach agreement on an alternative solution.

In Germany, the sustainability factor is not used only to index initial benefits but also to increase contribution rates. One parameter of the new formula (*i.e.* α) allows the weight of the adjustment to be shared between pensioners and contributors. This parameter has been set equal to 0.25 by the German pension reform because this value would allow payroll taxes not to increase beyond 20% by 2020 and 22% by 2022. Hence, Germany is the only country where there is effectively an automatic link between contribution rates and the pension system's finances.

2.4. Automatic adjustment mechanisms and the use of a buffer fund

In theory, all earnings-related schemes can be financed in one of three ways:

- by *full funding*, where the aim is to have assets equal to the present value of liabilities;
- by *partial funding*, where there are assets but these are less than liabilities by design; or
- on a *pay-as-you-go* basis, where current revenues pay current benefits and there are no assets.

Public, defined-benefit schemes are partially funded by design in Canada and Finland. They are pay-as-you-go financed in about half of OECD countries, including Austria, Belgium, France, Greece and Italy, although some have put aside temporary reserves to meet future pension liabilities. The former point scheme in Norway was partially funded, for example, but pay-as-you-go financed in Germany. Notional accounts are partially funded in Poland and Sweden, but pay-as-you-go financed in Italy.

As illustrated in Figure 2.6 below, nearly half of OECD countries have built up public pension reserves to help pay for state pensions in the future, either by design or on a temporary basis. In these countries, public pension reserves were worth nearly 10% of GDP on average in 2009, some USD 5.4 trillion.

"Pre-funding" with public reserves can be used in any PAYG system and not just in those with built-in automatic adjustment mechanisms. Indeed, pre-funding with public reserves tries to avoid two problems that might otherwise occur. First, a worse treatment of large cohorts of retirees (*e.g.* the baby-boom generation); and second, an excessive

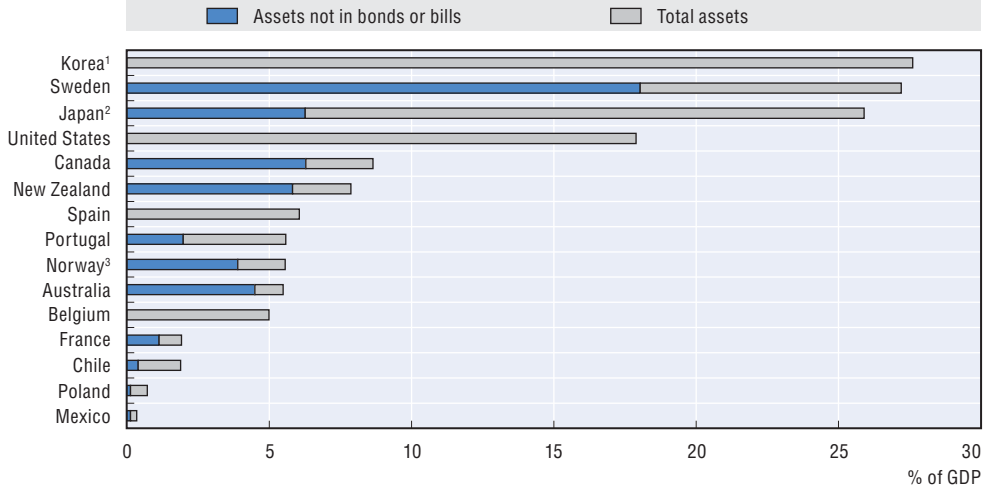
reduction of the benefits provided by PAYG pension schemes, that would be necessary to maintain a balanced budget in the absence, for example, of an increase in the contribution rates. Different options are possible to set up and finance public reserve funds.[26]

In France, the Pension Reserve Fund (FRR) was introduced in 1999 and is fed by different sources of revenues (*e.g.* taxes but also the surplus of the National Old-Age Insurance). In the Netherlands, the reserve fund AOW was created in 1997. It is fed by the surplus of the fiscal year. In both countries, the respective funds are expected to contribute to pensions financing from 2020. In the case of Sweden, a mechanism for pre-financing has been "inherited" from the past. Indeed, the "old" pension system had accumulated large reserves since the 1960s. Even if the main purpose of these funds was not that of creating a pre-financing mechanism, a significant portion of the funds is still available.

In the United States, the Social Security Act of 1935 created the OASDI (Old Age, Survivors and Disability Insurance). The surpluses of the system feed into the reserve fund, which are primarily invested in special Treasury bonds. According to the most recent projections from the Chief Actuary, the reserves should begin to be drawn down from 2015 and be exhausted at some point in the 2030s.

More than half of the total reserves shown in Figure 2.6 are accounted for by the social-security trust fund in the United States although, relative to national income, the US reserves are smaller than those of Japan, Korea and Sweden.

Figure 2.6. **Assets in public pension reserves, 2010, per cent of GDP**



1. The breakdown of assets is not available for Korea.
2. Data for Japan refers to 2009.
3. The "Government Pension Fund – Global" in Norway is not included in the chart. The capital in the "Government Pension Fund – Global" was 113 per cent of GDP in 2009. The use of the fund is however not directly tied to the pension system, but to the government finances in general through a fiscal rule.

Source: Table A27 in the Statistical Annex to this volume.

StatLink http://dx.doi.org/10.1787/888932598303

The figure also illustrates an important element in assessing the degree of pre-funding of pension liabilities. Overall, an average of 60% of these reserves is invested in bonds and bills. In some cases, such as the United States, all of the so-called assets of the reserves are government IOUs.

The blue bars in Figure 2.6 show the assets of pension-reserve funds that are invested in assets other than government bonds. The residual, apart from bonds and bills, is worth just 3.7% of GDP on average. That amounts to less than six months of pension spending. Furthermore, some countries such as France and Ireland have run down part of their reserve funds recently to pay for some of the effects of the crisis. Public pension reserves are also very small or non-existing in the other 17 OECD countries.

The limited role of public-pension reserves contrasts with the far more significant pre-funding of pension liabilities in private pension plans. The assets accumulated by OECD pension funds amounted to USD 19.2 trillion in 2010, or just over two-thirds of annual GDP (OECD, 2011).

It is no accident that, in both cases where the long-term health of the pension system is evaluated – Canada and Sweden – there is also a large public pension reserve fund. With most OECD countries experiencing a rapid population ageing, there are strong arguments to put money aside now to avoid large rises in taxes and contributions in the future. One approach is to assess the finances of the pension system over a long horizon and then set the parameters – contribution rates, benefit levels, pension ages etc. – such that the system is in equilibrium. With ageing, this should mean that the system runs surpluses now that will be drawn down in the future to pay for an older population's benefits. The scale of these surpluses will, of course, vary with the economic cycle.

2.5. Implications for financial sustainability

Most of the mechanisms discussed in this chapter are based, in practice, on current variables, such as life expectancy at the normal pensionable age, the system dependency ratio (number of pensioners relative to number of contributors), growth in average earnings, employment or GDP. Only in two cases (Sweden and Canada) are long-term projections of the finances of the pension system taken into account. This difference in the timing over which the assessment of financial sustainability is made is crucial. For it is only if the future financial path of the pension system is taken into account that preparations can be made now for anticipated changes, such as population ageing. In other cases, much of the remedial action occurs later: when current workers claim their benefits, for example.

Moreover, automatic adjustment mechanisms are not themselves a guarantee that pensions systems will achieve and maintain financial sustainability. This is the case even though there are rules that allow the system to adapt to changes, either demographic or economic, and even though the system's adjustment is not left to any political discretionary changes. This is true both for countries with automatic adjustment mechanisms in defined-benefits and for those that have NDC schemes. (See *e.g.* Barr and Diamond, 2011.)

This happens because in PAYG pension systems financial sustainability depends on the evolution of the dependency ratio and thereby on the evolution of the number of contributors and pensioners – and on the decisions to work and to retire. (See the analysis presented in Section 2.2 and more particular Figure 2.2.)

Automatic adjustment mechanisms which affect benefit levels may also influence the supply of labour. Projections of pension expenditures by the European Commission suggest that in most of the countries that have, for example, introduced NDC schemes the cost-containing effect of these systems will require a significant extension of working lives and increase in employment rates (see European Commission, 2009). In other cases, the

cost-containment effect will be achieved with reductions of benefits. Both the extension of working lives and alternative forms of savings can help to strike a balance between adequate benefit levels and sustainable contributory burdens.

As a corollary, therefore, those pension systems that take into account both the stock and the flow of contributors, now and in the future, will be more in a position to face the challenges of financial sustainability in the long-term. Measures that promote effectively longer working lives are therefore crucial for the long-term sustainability of these innovative pension reforms.[27]

Moreover, automatic adjustment mechanisms in pension system are too recent to make it possible to assess their performance in the long-term. For example, while the predicted impact of the various automatic adjustment mechanisms linked to life expectancy may look similar, the evolution of life expectancy is uncertain. Therefore, only when these mechanisms have been working for longer periods of time, will it be possible to shed more light on their actual effect on the value of pensions, on the supply of labour and on the sharing of risks and burdens across generations.

Automatic adjustment mechanisms most often imply that the financial costs of longer lives will be shared between generations subject to a rule, rather than spreading the burden through potentially divisive political battles. Traditionally, pension benefits typically depend on the number of years of contributions and a measure of individual earnings. In theory, at least, this meant that the annual value of the pension was the same whatever happened to life expectancy. However, this defined-benefit paradigm that dominated both public and private pension provision in the second half of the 20th century has been diluted. Pension systems around the world have become much more diverse.

Increasing life expectancy suggests that future benefits need to be cut, contributions raised or working lives prolonged to financially sustain pension systems. Living longer is desirable. A longer life and a larger lifetime pension payout due to increased life expectancy confer a double advantage. Therefore some link between pensions and life expectancy may be optimal. It is hard to see why people approaching retirement should not bear at least some of the cost of their generation living longer than previous generations.

The rapid spread of these adjustments has a strong claim to be the most important innovation of pension policy in recent years (see *e.g.* Bosworth and Weaver, 2011; Turner, 2009; Billig and Millette 2009). These changes have important implications for the way the cost of providing for pensions as life expectancy increases is shared. Increasingly, this will be borne by individual retirees in the form of lower benefits.

A key question is then: should all of the cost of longer lives be shifted onto new retirees, in the form of lower benefits or a requirement to work longer for the same benefit? The issue is complex because each individual has a lifecycle that includes periods as a contributor and as a beneficiary. The optimum is therefore unlikely to be a complete link between pensions and life expectancy. The determination of the optimum link, if any, would need a deeper study.

Having said that, why have countries overwhelmingly chosen to link benefit levels to life expectancy rather than pension age? If people simply continue to retire at the same age as present, then benefits will fall as life expectancy grows. The idea is that people will work longer to make up the shortfall. However, there is virtually no mechanism in place to ensure that they do so.

A link of pension age to life expectancy might make at least as much or more intuitive sense to voters as a benefit link. For example, it may be better suited to countries with redistributive public pension programmes, such as Belgium, the Czech Republic, Canada, Ireland, Korea, and the United Kingdom.

However, what constitutes best or good practice is less clear cut. There is clearly a trade-off: greater certainty over the retirement age and/or benefits *versus* greater certainty over the amount of contributions or taxes paid when working.

Life-expectancy risk is but one of many risks involved in pension systems. For example, with defined-contribution pensions, where financial sustainability is not an issue, the value of retirement income is also subject to investment risk.[28] The recent economic and financial crisis has shown that losses can be substantial (OECD, 2009) – in particular for people close to retirement whose remaining working life is not long enough to enable them to recover their pension wealth losses (D'Addio and Whitehouse, 2010; Antolín and Stewart, 2009; and Yermo and Severinson, 2010). Also, other objectives of the retirement-income system – such as ensuring low earners have an adequate standard of living in retirement – may conflict. Reducing already small pensions to reflect increases in life expectancy might risk a resurgence of old-age poverty.

Together, these factors suggest that individual retirees should bear some but not all life-expectancy risk. However, further work is needed to analyse the optimum sharing of risks between generations.

The key message of this chapter is that analysis of pension policy should not adopt a piecemeal approach. A comprehensive approach, covering all the different parts of the system is essential. On balance, a link between pension ages and life expectancy, rather than benefit levels, could be the preferred solution. This can, however, act in concert with benefit links in notional accounts, defined-contribution plans and through adjustments in other earnings-related schemes.

2.6. Political economy of automatic adjustment mechanisms

All reforms aimed at addressing the sustainability of pension system are politically contentious as they are perceived to reduce earned entitlements and are thus very likely to encounter strong opposition from some interest groups. For example, the reduction of pension benefits may be opposed both by current retirees and workers close to retirement. Similarly, an increase in the contribution rates or in the pension age may give rise to opposition from both young and old people, as witnessed recently in a number of European countries undertaking pension reforms.

Therefore, policy makers have often tried to make some changes very difficult to understand or they have delayed their introduction to a moment where governments will have ended their mandate. A more extreme solution that some countries have chosen is to exclude the majority of current workers from the reforms and focus implementation only on young and future workers.

It is also clear that solutions in this domain are not easy because as population ages, the electorate ages too. The resistance to such reforms is therefore deemed to increase in the future. In this context, automatic adjustments represent an attractive alternative. They are in fact designed to protect the pension system's long-term health from short-term political pressures. Thus, the political risk of a pension reform is largely reduced. For

example, in those situations where there is a link between life expectancy and benefit levels, an increase of life expectancy will automatically drive a reduction of benefits because of its inclusion in the formula.

One crucial aspect for the "political" acceptance of this kind of mechanism is, however, the *way it is designed*. First, the mechanism may be activated on the realization of an outcome that is either projection-based or trend-based. Projections are extrapolated on the basis of specific assumptions that hold over relatively long periods of time. The effect of forecasting errors and uncertainty may compound over time and may induce substantial differences in the variables that one tries to control. By contrast, mechanisms based on trend realisations rest on actual data. However, this solution is not without problems either, because such mechanisms may display a high degree of volatility and may confound short-term and long-term effects.

Second, the *strength of the mechanism* may differ according to whether the automatic adjustment mechanisms are implemented in the perspective of preventing a situation of crisis, or in contrast, in the perspective of solving a crisis. In the former case, clearly the mechanisms are set up to work for the longer term and may give better results than those set up in emergency situations.

Third, the *frequency of the review* of pension sustainability matters. Infrequent reviews tend to drive larger changes in the parameters triggered by the mechanism than those required by shorter-term review. For example, in Italy the review of the transformation coefficients to account for longer life expectancy was originally fixed to ten years (but never implemented in practice). The outcome of this review would have likely encountered stronger opposition than if it had happened on a shorter basis – the modifications induced would have certainly been larger. The recent reform in Italy shortened in fact the frequency of the review to three years from 2010 until 2019 and to two years afterwards.

Another component of the design of automatic adjustment mechanisms is *the speed of the adjustment*. The faster the speed of the adjustment (for example, a rise in retirement age that occurs in 5 rather than in 20 years), the higher is the probability of strong opposition. Political pressures may still arise in the presence of automatic adjustment mechanisms when the affected groups realise what this means for their benefit or retirement age. In some countries, legislators have intervened and overridden the adjustment mechanisms.

A fifth essential characteristic of the design is the degree of *automaticity*. The degree to which adjustments to pension systems are, in practice, automatic, varies significantly. There have been examples of delays in implementation and, in other cases the heat of the political debate has not been reduced by agreement on the technicalities of these adjustments.

A sixth important feature is about the *distribution of losses*, *i.e.* who will support the adjustments deriving from the triggering of the mechanism. In terms of political risk, the consequences will be different depending on whether they affect current or future retirees more.

Finally, an important feature of the design of automatic adjustment mechanisms is the provision of some form of protection for the most vulnerable. Safety-nets have provided great support to those on low incomes in many OECD countries in the aftermath of the crisis.

In conclusion, automatic adjustment mechanisms may be very difficult to implement for various reasons. Pressure from interest groups and social norms concerning benefit entitlement may interfere with the design of the mechanisms and their functioning. In other cases, lack of time, funding or expertise may lead to delays in the introduction of the mechanism. Politicians may also decide to suspend or to change the way such mechanisms will be implemented once they have been announced – as for example in Germany and Sweden in the aftermath of the crisis to maintain the pensioners' living standards (see *e.g.* Scherman, 2009).

2.7. Summary and conclusions

Population ageing – mainly driven by increasing life expectancy, declining fertility rates and larger cohorts approaching retirement – exerts an increasing fiscal pressure on the public budgets of most OECD countries. A major political challenge is therefore how to balance the financial sustainability of pension systems and the adequacy of retirement incomes, by noting, nonetheless that unsustainable pension systems will not be able to deliver any generous benefit promise. In parallel, pension systems delivering inadequate benefits may call for future actions to cover the needs of the most vulnerable and may become unsustainable in their turn.

The analysis of financially sustainable designs for pension systems is complex. It is also necessarily incomplete. The majority of the approaches considered impose the condition that public pensions should be financed by contributions on wages. While this has conventionally been the case, there are good reasons to reconsider this practice. It makes sense to consider the two flows separately. First, what is the profile of public expenditure on pensions over time? Secondly, how should this be financed? By "contributions" or by general revenues? For example, there may be concerns that pension contributions – effectively a tax on wages – may have negative effects on work incentives. It might make sense instead to finance public pension benefits out of some other revenue source: consumption taxes, for example. Public pensions are to some extent a matter of tax and transfer policy: taxes, paid by all age groups, and transfers, paid to older people.

Concerns over sustainability have led many OECD countries to introduce a variety of mechanisms that try to automatically stabilise expenditures of public pension systems. Their action focuses typically on the automatic adjustment of pension benefits, pension age and – more rarely – contribution rates with demographic variables or some measure of the pension system's financial health.

The choice between the instruments analysed in this report has significant implications because it involves trade-offs with other objectives of the pension system.

Starting with the implications of the different mechanisms considered for financial sustainability, it is possible that the cuts in benefits imposed by automatic adjustment mechanisms in order to achieve financial equilibrium might eventually result in a benefit level too low for retirees to live on. This situation may lead to substantial erosion of pension benefits as long as population ages. One shortcoming of the mechanisms is in fact that they try to maintain the contribution rate constant by making all the adjustments fall on the benefit side. Most countries have safety-net benefits for low-income retirees: extra spending on these benefits might offset much of the savings made elsewhere.

There is scope for pension ages to rise in many OECD countries. However, at some point, again, increasing pension ages further must reach a limit where it is unreasonable to expect most people to be able to continue working – although views on where that limit lies may differ significantly (see on this Whitehouse and Zaidi, 2008 and D'Addio and Queisser, 2011). Moreover, increases in pension ages alone may be insufficient to ensure that people work longer if there are other barriers (on the demand side, for example) to older workers finding and retaining jobs (OECD, 2011).

Similarly, there is a limit to increases in contribution rates. Indeed, some countries have adopted automatic adjustment mechanisms specifically to exclude or restrict future increases in contribution rates.

Automatic adjustment mechanisms are often very complex and difficult to understand. Moreover, because they often make pension promises depend on some future economic or demographic developments, their implications (and potentially the individual losses they can cause) are not fully known today.

A clear information strategy about the probable future cuts in benefits related to increasing life expectancy or slower economic growth might, however, have important repercussions on the acceptance of the mechanisms. Workers, especially those near retirement, might strongly oppose these changes because they would have neither the time nor the capacity to adapt to the new situation.

Automatic adjustment mechanisms do not necessarily address the behavioural challenges faced by countries today: how to entice people to work longer or to save more? People faced with lower benefits may choose to work longer to increase their pension entitlements, but there is no mechanism ensuring that they will actually do so.

Any automatic adjustment mechanism in place today, or implemented in response to the recent crisis, might in fact pose problems in terms of adequacy of future benefits and the capacity of systems to protect the living standards of beneficiaries. What will be the destiny of systems based on such rules? There is no doubt that as at present, there will be pressure to intervene to correct the systemic failures of such systems and even remove automatic stabilisers if they are perceived to be functioning badly.

It is important that the question of the *adequacy* of benefits, and thus of the social sustainability of pension systems, will not be left out of the debate. Maintaining financial and actuarial balance might be pursued together with a set of rules or principles to ensure that benefit levels would remain adequate.

Nevertheless, automatic adjustment mechanisms that are designed and implemented so that changes occur gradually, that they are transparent and share the possible burden fairly across generations might help individuals to act pro-actively by adapting their saving and labour supply behaviours.

Notes

1. Footnote by Turkey: The information in this document with reference to "Cyprus" relates to the Southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognizes the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the "Cyprus issue".

2. Footnote by all the European Union member states of the OECD and the European Commission: The Republic of Cyprus is recognised by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.

3. The Aaron-Samuelson framework, however, is not universally applicable to different countries. It requires that public pensions are financed from public-pension contributions levied on earnings. Denmark and Australia, for example, does not levy contributions to pay for public pensions. Ireland and the United Kingdom levy an overall "social-security" contribution designed to finance a range of benefits.

4. The standard Aaron-Samuelson condition implies a return of approximately $n + g$ (equal to the rate of growth of the wage bill).

5. In fact it is easy to show that in a PAYG system, under the hypothesis of constant total output, if the labour force shrinks, the total contributions (c*w*L) paid into the system will also decrease. A contemporaneous increase in the number of pensioners and in their average life expectancy implies that the total pension bill will increase. This, clearly, might create a deficit in the pension-fund. To maintain its balance, there are only two options: either to reduce the average pension or to raise the contribution rate.

6. Unfortunately, the lack of suitable data does not allow one to disentangle the effects of intended cross-subsidies out of general revenues from pay-as-you-go disequilibrium.

7. The distinction between "sustainability" and "affordability" is also important and relevant. This introduces some important nuances. Increases in public pension spending over time might be paid for, but only if – with pay-as-you-go schemes – younger generations are willing to shoulder a growing burden of contributions and taxes. It is unclear what exact assumptions have been used in the projections for contribution revenues, but in most cases they are based on unchanged contribution rates. Evidence on equilibrium contribution rates would very likely require an increase from the current rate needed to pay for pensions. The policy issue then becomes whether such projected increases are affordable to future workers.

8. Another favoured concept of the World Bank is "implicit pension debt" (IPD). This effectively measures the present value of the liabilities of the public pension system to pay future benefits that have already been accrued. Holzmann *et al.* (2004) discuss the concept in more detail and provide calculations for 35 countries. It is not possible to calculate IPD estimates from the data provided to the Ageing Working Group (European Commission, 2009).

9. Governments could use other means to finance the deficit between pension liabilities and contributions (*e.g.* by shifting the costs onto future generations, or by other government revenues such as direct or indirect taxes). But these are not properly speaking "automatic stabilisers" of pension systems. This chapter will therefore not discuss these options.

10. As it is explained in Section 2.4, some OECD countries have set up reserve (or buffer) funds designed to help the funding of public pension schemes in "critical" times, for example when the baby-boom generations will reach retirement and/or the contributors' basis will start to erode.

11. This analysis uses the figures from the United Nations population division for OECD countries (*World Population Prospects – 2008 Revision*) as in OECD (2011).

12. See OECD (2011).

13. Further details can be found in OECD (2011) and Whitehouse (2007, 2009). Hungary introduced mandatory defined-contribution plans in 1998 but has now effectively abolished them: see Chapter 3 in this volume for a detailed discussion.

14. The existing arrangements have different forms. For example, Australia's public pension is a non-contributory, flat-rate payment funded from general revenue. It is not related to past employment. A mandatory defined contribution scheme, Superannuation Guarantee, was introduced in 1992. It is funded by employers and employees and based on time spent in the workforce.

15. Other features of the pension system may also help to provide good work incentives. See for example the analysis in Chapter 3 in OECD (2011).

16. See Chapter 6 in this volume for a full discussion of the different ways of structuring the payout phase of DC pension plans.

17. An approximation is used for the increase in life expectancy, *i.e.* a constant adjustment of 0.3 per cent per year.

18. Other countries have changed indexation policy for pensions in payment moving to a less generous policy (provided real earnings are growing). These include Finland (from 50:50 between earnings and prices to 80% prices and 20% earnings), France (wages to prices), Poland (various changes, most recently from 20:80 earnings and prices to 100% prices) and the Slovak Republic (100% wages to 50:50 wages and prices).
19. In many cases, changes in the indexation mechanisms mean that the purchasing power of pensions is preserved, but that pensioners are not participating in the increasing standards of living enjoyed by workers. When poverty thresholds are set in relation to household income, price indexation leads to higher relative poverty rates among pensioners as the economy grows.
20. The contribution asset in a given year is the result of the product of contribution rates by the expected turnover duration. The turnover duration is computed as the difference between the earnings-weighted average age of persons contributing to the system and the pension-weighted average age of beneficiaries receiving annuities from the system. This expected turnover duration represents the average number of years during which the system can finance current pension liabilities. Estimates for 2010 put the expected turnover duration at 31.6 years.
21. The effect of life expectancy on these two variables is shown net of the additional effect that increases in life expectancy have in Italy's NDC system, because of higher age at retirement and (assuming continuous careers) longer contribution periods and therefore higher pension wealth at retirement.
22. There are other taxes and contributions that still benefit the public purse, but the focus here is just on the pension system.
23. Exactly in the defined-contribution case and under certain assumptions of "actuarial fairness" in the case of notional accounts: see Queisser and Whitehouse, 2006.
24. See also Chapter 1 in this volume for a more exhaustive list.
25. See the indicators of "Public expenditure on pensions" and "Contributions" in OECD (2011) or their equivalents in OECD (2009).
26. For a detailed discussion see Yermo (2008).
27. See D'Addio *et al.* (2010); and D'Addio and Whitehouse (2012).
28. Decreases in interest rates also affect the solvency of DB schemes. See on this OECD (2009).

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Chapter 3

Reversals of Systemic Pension Reforms in Central and Eastern Europe: Implications for Pension Benefits

Since the late 1990s, some central and eastern European countries reformed their pension systems structurally, partly replacing their PAYG-financed public pensions, with fully-funded, defined contribution plans. During the crisis, some of these have been partially reversed, with reductions in contributions to the funded, private pension system in countries such as Estonia (temporary) and Poland (permanent). In Hungary, the reversal has been complete. Even the accumulated assets in the mandatory pension funds were reverted to the state. The analysis of pension entitlements shows that the main cost of these reversals will be borne by individuals in the form of lower benefits in retirement. The effects on the public finances will be a short-term boost from additional contribution revenues but a long-term cost in extra public spending just as the fiscal pressure of population ageing will become severe. Overall, however, it is projected that the extra revenues would exceed the extra expenditure.

3.1. Introduction

This chapter analyses pension systems in eight Central and Eastern Europe countries. Four of these – Estonia, Hungary, Poland and the Slovak Republic – are members of the OECD and the European Union (EU). The other four – Bulgaria, Latvia, Lithuania and Romania – are EU member states. All these countries reformed their pension systems in the late 1990s and early 2000s. Nearly all of these reforms saw "systemic" change to retirement-income provision: the introduction of individual, defined-contribution pensions as a substitute for part of public pension provision. Notable exceptions to this trend in the region were the Czech Republic and Slovenia, although legislation to introduce individual accounts has been approved by the Czech parliament.[1]

The global financial and economic crisis of 2008-09 hit most of these countries hard with severe implications for their pension policy (see chapter 1 on "Pension reforms during the crisis and beyond"). Economic growth decelerated from the strong 7-8% a year in 2006 and 2007 to a much lower rate in 2008 and actually went into reverse in 2009. The average fall in output for the eight countries analysed in this chapter was more than 8.5%, compared with less than 4% in OECD countries. The Baltic states were hit particularly hard, with gross domestic product (GDP) falling by around 15% in 2009. Recovery started more slowly in Central and Eastern Europe, but is now expected to outstrip growth in the OECD area in 2011-13.[2]

Before the crisis, the public finances of Central and Eastern Europe showed modest deficits of around the same magnitude as the OECD area. Despite the more severe economic downturn, the eight countries studied here managed to contain the increase in fiscal deficit below the increase observed on average in the OECD area: average government borrowing rose to 6.8% of GDP in 2009, 1.5 percentage points less than in the OECD area. The differential widened to 2.0 percentage points in 2010.[3]

Against this difficult economic and fiscal background, central and eastern European countries changed their pension systems again. Over the last three years, some of these countries have implemented important parametric reforms (see Chapter 1 of this report). For example, Bulgaria, Estonia, Hungary, Romania have all legislated for phased increases in pension ages, and these countries plus Latvia and Poland have tightened access to early-retirement benefits. Hungary has abolished its "13th-month" pension and moved to a less generous indexation procedure for pensions in payment.

There have also been reversals of the earlier, systemic reforms in different ways. These changes are the focus of this chapter. In some cases, these reversals are meant to be temporary. In Estonia, for example, contributions to private plans were suspended in 2010, reduced to 2% in 2011 and will return to 4% in 2012. Similarly, Lithuania cut the contribution rate from 5.5% to 2% in 2010 before returning it to 5.5% in 2011. In both cases, the contributions that were channelled to defined-contribution plans were diverted to the public pension scheme. In Poland, the reversal was partial: the contributions going into individual accounts were cut from 7.3% to 2.3% from 2011 with an increase to 3.5%

from 2017. Latvia's policy was a mix of these approaches. The 8% contribution to private plans was reduced to 2% in 2010, but increased to 4% in 2011 and will be 6% from 2012 onwards. This is a partial reversal of the original plans, which would have seen a 10% contribution rate from 2010. Romania postponed the intended increase in contributions for 2010, but in 2011, the phased increases (eventually to 5%) were resumed, albeit at a rate below the original plan.

In Hungary, the reversal of the systemic reform is complete and permanent: all contributions were reverted to the public scheme from 2011, although a temporary suspension had already been implemented in November 2010. The change is also, in effect, retrospective: the assets in private pensions were appropriated by the government.[4] In other cases of temporary or partial reversal, balances in existing accounts were left intact. This is therefore by far the most dramatic change in retirement-income policy among these countries. Indeed, Argentina is the only other country to nationalise private-pension assets in this way.[5]

This chapter takes a microeconomic approach to look at the effects of these pension reform reversals, focusing on future pension entitlements of individual workers. Some macroeconomic evidence – on the recent and future finances of pension systems in aggregate – is also provided, but this is not the main focus. Section 3.2 explores the design of the reformed retirement-income arrangements, focusing in particular on the value of entitlements for different workers and the structure of the pension package. Section 3.3 examines the issue of "switching": the choice of pension schemes offered to individuals at the time of the reforms. It also examines switching behaviour and its implications for the aggregate financial flows of the pension system in the future. The impact of pension reform reversals is examined in detail in Section 3.4, which first looks at the theoretical effect of a permanent reversal and then discusses the effect of actual policies. By examining the impact of reversals over the whole lifecycle (as a pension contributor and then a beneficiary), the potential aggregate impact is analysed. Section 3.5 concludes.

3.2. Structure of reformed pension systems before reversals

The eight countries analysed in this chapter reformed their pension systems in the late 1990s and early 2000s in a systemic way: replacing part of the public, PAYG-financed pension benefits with a new, fully-funded, defined-contribution pension scheme. Under these plans, contributions are diverted from the public pension system and instead invested in an individual account. The accumulation of contributions and investment returns is then used to provide a regular pension payment upon retirement, generally through the purchase of an annuity. These plans are commonly described as "second-pillar" schemes.

3.2.1. The defined-contribution component

The size of these schemes differs substantially between countries. Contributions ranged from 5% of earnings in Bulgaria and 5.5% in Lithuania up to 9% in the Slovak Republic and 10% in Latvia (Table 3.1) under the original plan at the time of the systemic reforms.

In four cases, the defined-contribution plans were introduced gradually, with the contribution rate rising over time. This was the case in Bulgaria, Hungary, Latvia, Lithuania and Romania. In all cases, individuals covered by the defined-contribution arrangement saw part of their social security contributions diverted into their individual account.

Table 3.1. **Architecture of reformed pension systems**

	Year	Type of public scheme	DC contribution rate
Estonia	2002	Basic + points	4% + 2%
Hungary	1998	DB	6 ↗ 8%
Poland	1999	NDC	7.3%
Slovak Republic	2005	Points	9%
Bulgaria	2002	DB	2% ↗ 5%
Latvia	2001	NDC	2% ↗ 10%
Lithuania	2004	Basic + DB	3.5% ↗ 5.5%
Romania	2006	Points	2% ↗ 6%

Note: DB = defined benefit, DC = defined contribution, NDC = notional accounts.
Source: OECD pension models; national officials.

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In Estonia alone, individuals were required to make a contribution themselves (of 2% of earnings) on top of the contributions diverted from the public scheme (4%). (The Czech Republic will adopt a similar approach when its reform is implemented.)

3.2.2. Publicly provided components

All of the reformed pension systems maintained a public, earnings-related pension scheme. These are almost wholly provided on a "pay-as-you-go" basis, whereby current contributions from today's workers are used to pay current benefits to today's pensioners. Unlike the defined-contribution plan, there is no accumulation of assets to back the pension promises made to today's workers. These schemes are commonly called "first pillars". This structure differs from the wave of reforms that swept Latin America at around the same time. Defined-contribution arrangements in countries such as Chile, El Salvador and Mexico replaced *all* of public, earnings-related provision of retirement incomes with defined-contribution plans. The state's role in providing pensions in Latin America was generally limited to safety-net benefits, such as minimum pensions – that are called "zero pillars" in the World Bank's current pensions taxonomy.[6]

These public earnings-related schemes come in three different types. All three of them are found in the reformed pension systems of the eight countries analysed here (Table 3.1).

Defined-benefit schemes tend to dominate in OECD countries, with 20 of the 34 having such plans as part of their pension system.[7] These schemes provide a benefit related to some measure of an individual's earnings, typically by an "accrual rate". Public schemes of the defined-benefit type are found in three of the eight countries reviewed in this chapter: Bulgaria, Hungary and Lithuania.

Equally common are points schemes, the design chosen by Estonia, Romania and the Slovak Republic. With these plans, individuals amass pension points dependent either on their earnings or contributions when working. At the time of retirement, the accumulated points are converted into a periodic payment using a pension-point value. These schemes are fairly rare in the rest of the OECD: only Germany and one of the main schemes in France have such a structure.

The final type of earnings-related public scheme – notional accounts – is found in Latvia and Poland. Within the OECD, Italy, Norway and Sweden also have these arrangements. Contributions are recorded in individual accounts and a notional interest rate – generally linked to macroeconomic variables such as average-earnings or GDP

growth – is applied to the balance. At the time of retirement, an actuarial formula is used to transform the accumulated balance into a periodic pension payment. This calculation is similar to the procedure of converting a real, financial balance of money into an annuity in defined-contribution schemes. Hence, the commonly used moniker for notional accounts of "notional defined-contribution" (NDC) schemes.[8]

In fact, these three different types of scheme are close cousins. First, the accrual rate in defined-benefit schemes – the proportion of earnings replaced by pensions for each year of contributions – is equivalent to the ratio of the contribution rate to notional accounts divided by the annuity factor used to transform accumulated notional capital into a regular pension. These are both equivalent to the ratio of the cost of a pension point to the value of a pension point. Secondly, most defined-benefit schemes (those not based on final salaries) have a procedure of "valorisation" or pre-retirement indexation. The measure of earnings used to calculate benefits is adjusted for changes in the costs or standards of living between the time the pension entitlement was earned and the time of retirement. This is the precise corollary of the notional interest rate (in notional accounts schemes) and the policy for the uprating of the pension-point value (with points schemes). These important identities are discussed in more detail in Queisser and Whitehouse (2006) and Whitehouse (2010).

The final point to note from Table 3.1 is that both Estonia and Lithuania have basic pension schemes. These are flat-rate amounts paid to all people of pension age meeting certain qualifying conditions.[9] Similar schemes are also found in 13 of the 34 OECD countries. Unlike defined-benefit, points or notional-accounts schemes, the payment does not depend on individual earnings.

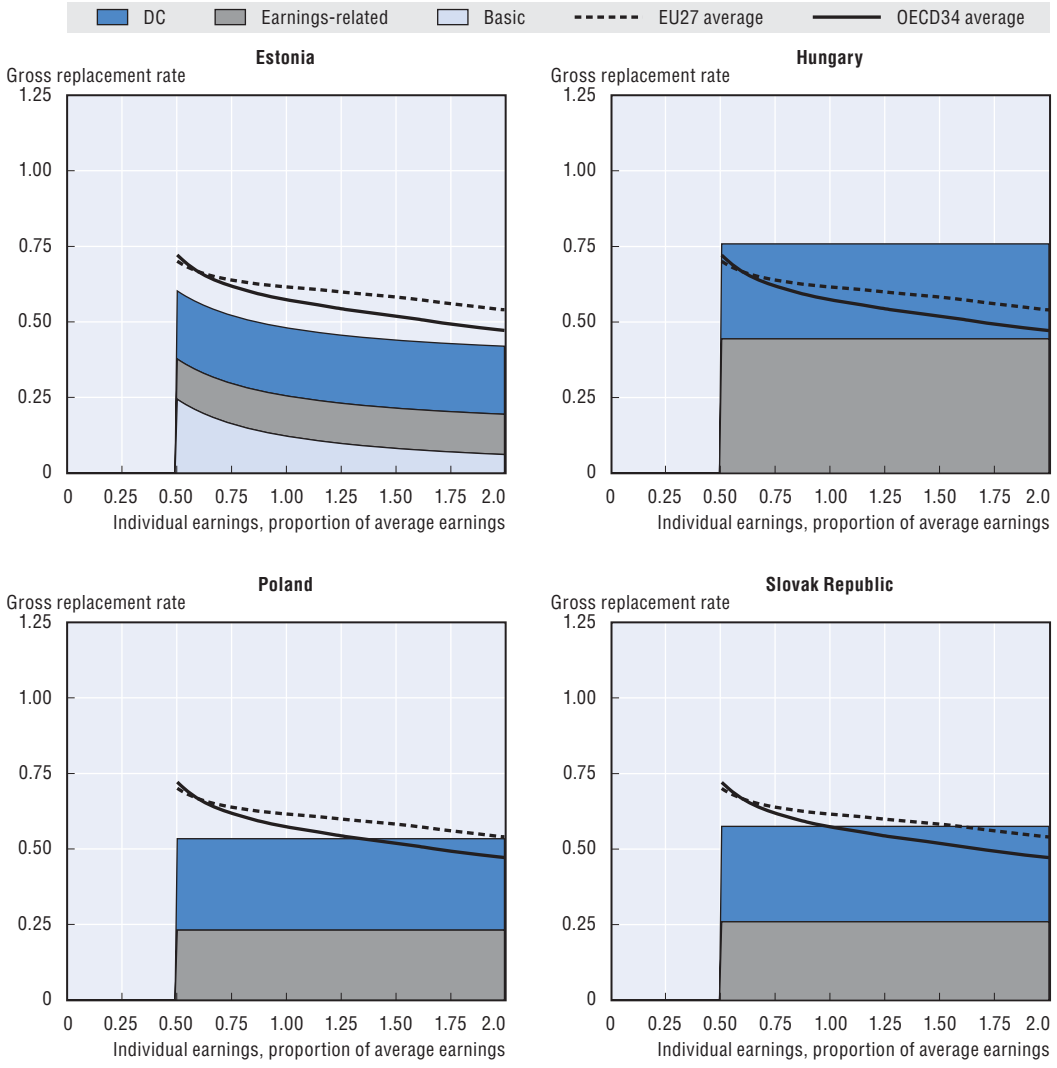
3.2.3. Gross pension replacement rates

To understand the difference in pension architecture between the eight countries analysed in this chapter it is useful to look at the implicit pension entitlements for different typologies of individuals. Figures 3.1a and 3.1b show the gross pension replacement rate on the vertical axis: that is, the value of the pension relative to individual earnings. The horizontal axis shows individuals at different levels of earnings, ranging from half to double the average (mean) for the country. This broad earnings range typically covers 90% or more of employees at any point in time.

The calculations are carried out for people with a full-career, which is defined as working each year from age 20 to the normal pension age for the country. Individuals are assumed to remain at the same point in the earnings distribution throughout their careers. The calculations are forward looking: they assume that the full career is spent working under the long-term rules envisaged in the pension system before any recent reversal of reforms: a "steady-state" calculation. Standard macroeconomic, financial and actuarial assumptions are used: notably, 2% annual growth in real earnings, a real investment return after administrative charges of 3.5% on defined-contribution plans and a discount rate (or riskless interest rate) of 2%. National mortality rates by sex and single year of age – important for many of the actuarial calculations – are those derived from the projections of the Population Division of the United Nations for 2050.[10]

These results are based on 2008 parameters and rules: that is, after the systemic reform had taken place but before any reform reversals (full or partial, temporary or permanent) had taken place. For OECD countries, they match those found in the latest edition of *Pensions at a Glance* (OECD, 2011a).[11]

Figure 3.1a. **Gross replacement rates by earnings and component of the pension system, before reversal: OECD countries**



Note: Replacement rates are not calculated for earnings below half of the average. This is because they get closer to infinity as earnings approach zero.

Source: OECD pension models.

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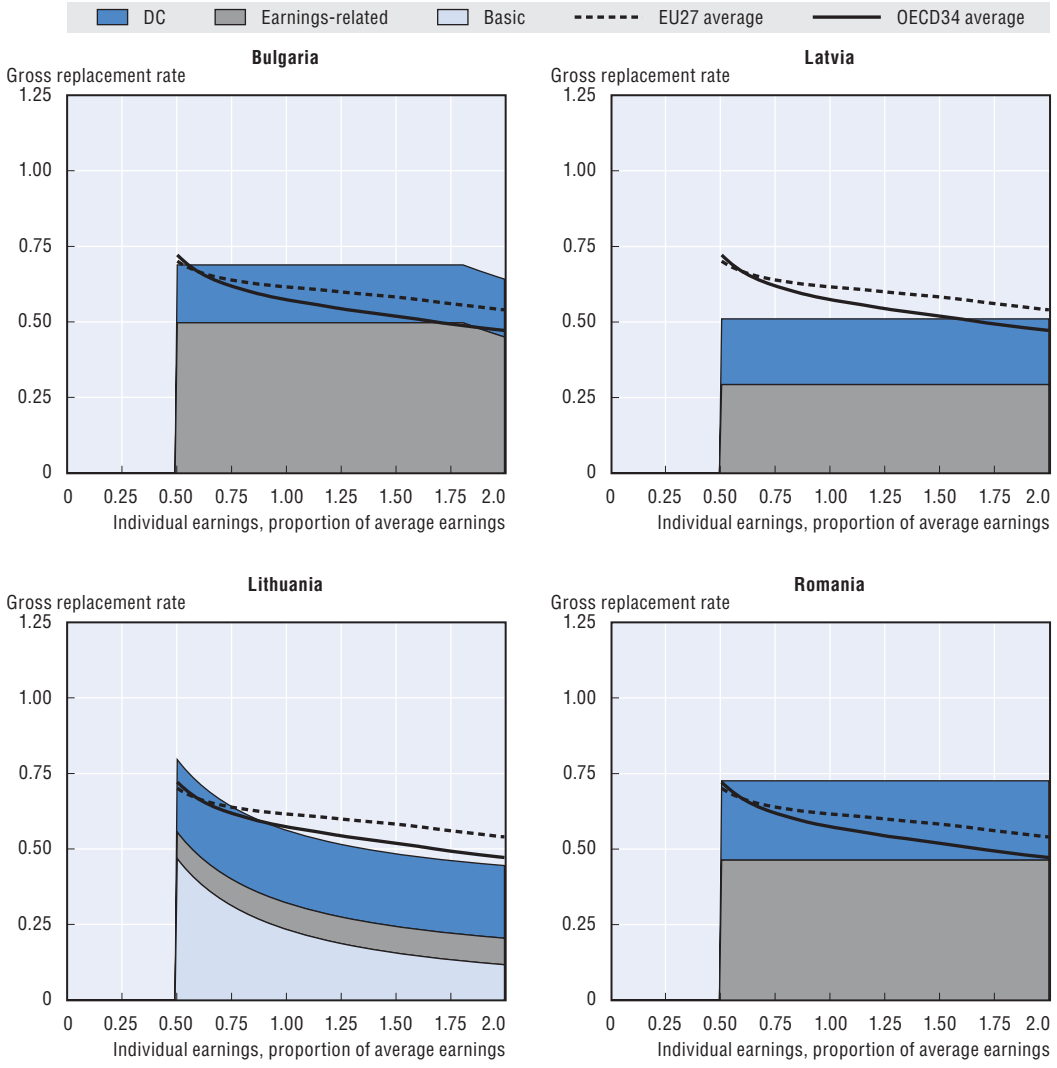
The four OECD countries are shown in Figure 3.1aa and the other four EU member states in Figure 3.1bb. In each chart, the unweighted (simple) average replacement rate at each level of earnings is shown both for the 34 OECD countries and the 27 EU countries. These averages, shown as lines, are a useful point of reference. The average replacement rate in both the OECD and EU is nearly 75% for those on the lowest earnings (half of the average earnings). For both aggregates, the average gross replacement from mandatory retirement-income programmes declines with earnings, reflecting the fact that many countries have redistributive features in their pension systems. However, the decline is rather steeper for the OECD average, such that high earners – with double economy-wide average pay – would have a replacement rate approaching 50% on average in the EU27 and somewhat less than 50% in the OECD34.

Figure 3.1b. **Gross replacement rates by earnings and component of the pension system, before reversal: Non-OECD, EU countries**



Note: Replacement rates are not calculated for earnings below half of the average. This is because they get closer to infinity as earnings approach zero.

Source: OECD pension models.

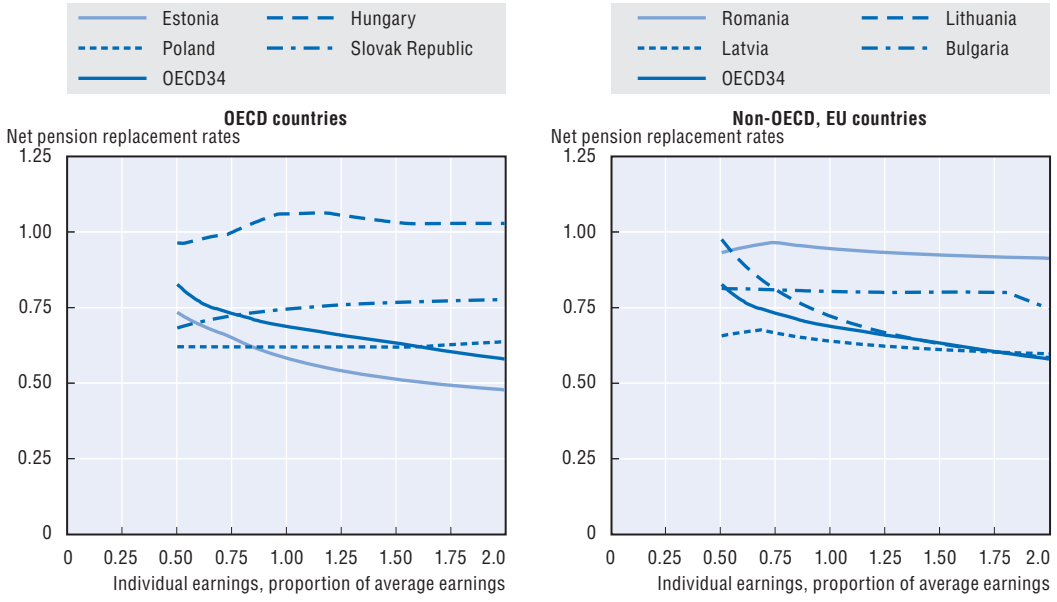
StatLink http://dx.doi.org/10.1787/888932598341

For the eight countries analysed, the overall gross replacement rate is also broken down by the main components of the total pension package. In three cases, Bulgaria, Hungary and Romania, the overall gross pension replacement rate is above the OECD and EU averages for full-career workers across all or nearly all of the earnings range. In contrast, the replacement rate is below the OECD average in most cases in the three Baltic States. Finally, the pattern in Poland the Slovak Republic is one of below-average replacement rates for low earners and above-average for high earners.

3.2.4. *Net pension replacement rates*

Figure 3.2 extends the analysis to take account of income taxes and contributions paid both on earnings when working and on pensions during retirement. The charts show the *net* replacement rate: pension after taxes and contributions relative to earnings after taxes and contributions.

Figure 3.2. **Net pension replacement rates by earnings, before reversal**



Source: OECD pension models.

StatLink http://dx.doi.org/10.1787/888932598360

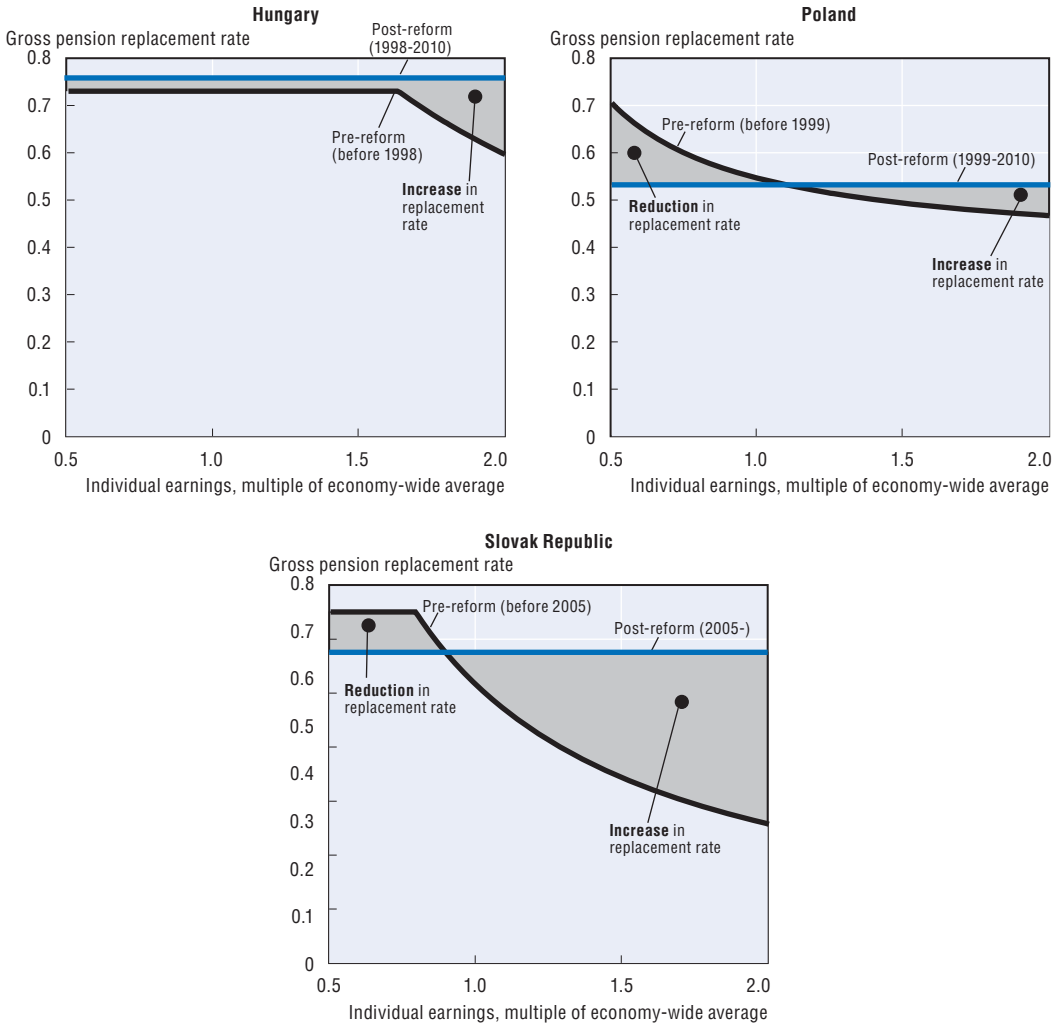
Net replacement rates are typically higher than gross: pensioners generally pay no social security contributions or do so at a lower rate than workers. Income tax systems also tend to be progressive, and pensioners often receive additional basic income-tax reliefs than workers. In Hungary, for example, these additional reliefs mean that only the very rich (off the scale of the chart) pay any income tax. In other countries, such as Bulgaria and the Slovak Republic, pensions in payment are not subject to income tax. The differential in the net replacement rates of the eight countries and the OECD average is generally greater than in gross terms. This applies over a larger range of earnings in Lithuania, Poland and the Slovak Republic, for example.

3.2.5. *Distributional impact of systemic pension reforms*

The decline of gross (and net) replacement rates with increasing individual earnings broadly matches the pattern shown in the cross-country OECD and EU averages in only two cases: Estonia and Lithuania. These are the only two countries of the eight analysed that have a basic pension component. In the other six countries, the replacement rate for full-career workers is broadly constant across the earnings range (although the ceiling on pensionable earnings in Bulgaria has a noticeable, though modest, effect). This closer link between individual earnings (and so contributions) and their benefits was an important objective of many of these reforms: for example in Hungary, Poland and the Slovak Republic. The idea was that a tightening of the link between earnings and benefits would have improved incentives to work and to comply with the system.

The reform packages therefore involved a removal of the redistributive features of the old pension systems at the same time as the systemic reform (introducing defined-contribution schemes). Figure 3.3 shows the impact of the pension reform on the pattern of gross replacement rates with earnings for the case of three OECD countries. Hungary's pension system both before and after the 1998 systemic reform resulted in constant replacement rates over much of the earnings range illustrated. However, since 1998, the ceiling on pensionable earnings has increased significantly relative to average earnings.

Figure 3.3. **Impact of systemic reforms on pension entitlements by earnings**



Note: "Post reform" cases show the position in 2008 with the systemic reform in place. Calculations are for a new labour-market entrant in that year, including all legislated changes to the pension system. Where individuals had a choice, they are assumed to have taken the mixed public and private defined-contribution option and not remained solely in the public scheme (if and when this was possible).

Source: OECD pension models.

StatLink http://dx.doi.org/10.1787/888932598379

The pictures for Poland and the Slovak Republic both show a pattern of lower expected benefits for the low paid and higher benefits for higher-income workers as a result of the reform. This was due to parametric reforms to the public scheme that took place at the same time as the introduction of a defined-contribution plan. The pre-reform system in Poland had both basic and earnings-related components (rather like the post-reform situation in Estonia and Lithuania). In the Slovak Republic, there was a maximum pension (worth a little under two-thirds of economy-wide average earnings), which capped the value of benefits for people earnings above 80% of average earnings.

This analysis has important implications for the incentives argument for a closer link between individual earnings and benefits. Figure 3.3 shows that some workers (mainly low earners) had less of an incentive to work and contribute after the reform than before, while incentives were improved for other groups (high earners).

Most OECD countries' pension reforms went in the opposite direction, with greater targeting of benefits on low earners. Pension cuts in Finland, France, Mexico and Sweden (for example) negatively affected middle and high earners while protecting low earners from all or part of the effects. Countries such as Australia, Norway and the United Kingdom have increased pension benefits, with the increases targeted on low earners.[12]

3.2.6. Structure of the retirement-income package

The relative role of the different components of the pension system can be evaluated by averaging the value of entitlements under each scheme for workers at different level of earnings. This calculation is carried out using data on the national earnings distribution of each country. The results are shown in Table 3.2.

Table 3.2. **Structure of the retirement-income package after systemic pension reform**

	Structure of pension package (%)		
	Basic	Earnings-related	Defined contribution
Estonia	29.1	28.2	42.7
Hungary		56.4	43.6
Poland		41.5	58.5
Slovak Republic		47.6	52.4
Bulgaria		71.5	28.5
Latvia		56.0	44.0
Lithuania	43.5	15.1	41.4
Romania		63.8	36.2

Source: OECD pension models.

StatLink http://dx.doi.org/10.1787/888932598949

The new defined-contribution schemes were expected to play the smallest role, among the eight countries analysed, in Bulgaria, making up about 29% of the retirement-income package. In most other cases, the private share of total pensions was expected to be around 40%, with substantially higher figures – above 50% – for Poland and the Slovak Republic. On average across the earnings range, the basic pension was projected to provide over 40% of aggregate benefits in Lithuania and under 30% in Estonia. Safety-net benefits – such as means-tested schemes, minimum pensions and social assistance – are computed by the OECD pension models. But in none of these countries would full-career workers on half average earnings or more be entitled to such support.

3.3. Switching at the time of systemic reform

To understand the new pension systems completely, it is important to revisit the issue of the "switching" rules that were applied.[13] In all eight countries analysed, some or all workers were given a choice at the time of reform between: *i)* staying in a reformed public pension scheme alone; or *ii)* having a mix of public and private, defined-contribution provision of retirement incomes. The extent of this choice is shown in Table 3.3. In Lithuania, for example, everyone was offered the two-way choice. In Hungary and the Slovak Republic, all existing workers could choose but new entrants to the labour-market had to take the second option of mixed public/private provision.[14] The other five countries extended the switching mandate to younger workers already in the labour force, with older workers having a choice.

Table 3.3. **Design of switching rules in reformed systems by age**

	New entrants	Existing employees	Reduction in earnings-related benefit for switchers (%)
Estonia	Mandatory	Mandatory < 20, voluntary 20-60	20
Hungary	Mandatory/voluntary	Voluntary	26
Poland	Mandatory	Mandatory < 30, voluntary 30-50	37
Slovak Republic	Mandatory/voluntary	Voluntary	50
Bulgaria	Mandatory	Mandatory < 30, voluntary > 30	n.a.
Latvia	Mandatory	Mandatory < 30, voluntary 30-49	44
Lithuania	Voluntary	Voluntary	62
Romania	Mandatory	Mandatory < 35, voluntary 35-45	n.a.

Source: Mattil, B. and E.R. Whitehouse (2005), "Rebalancing Retirement-Income Systems: The Role of Individual Choice under Mixed Public/Private Pension Provision", *mimeo.*, OECD, Paris.

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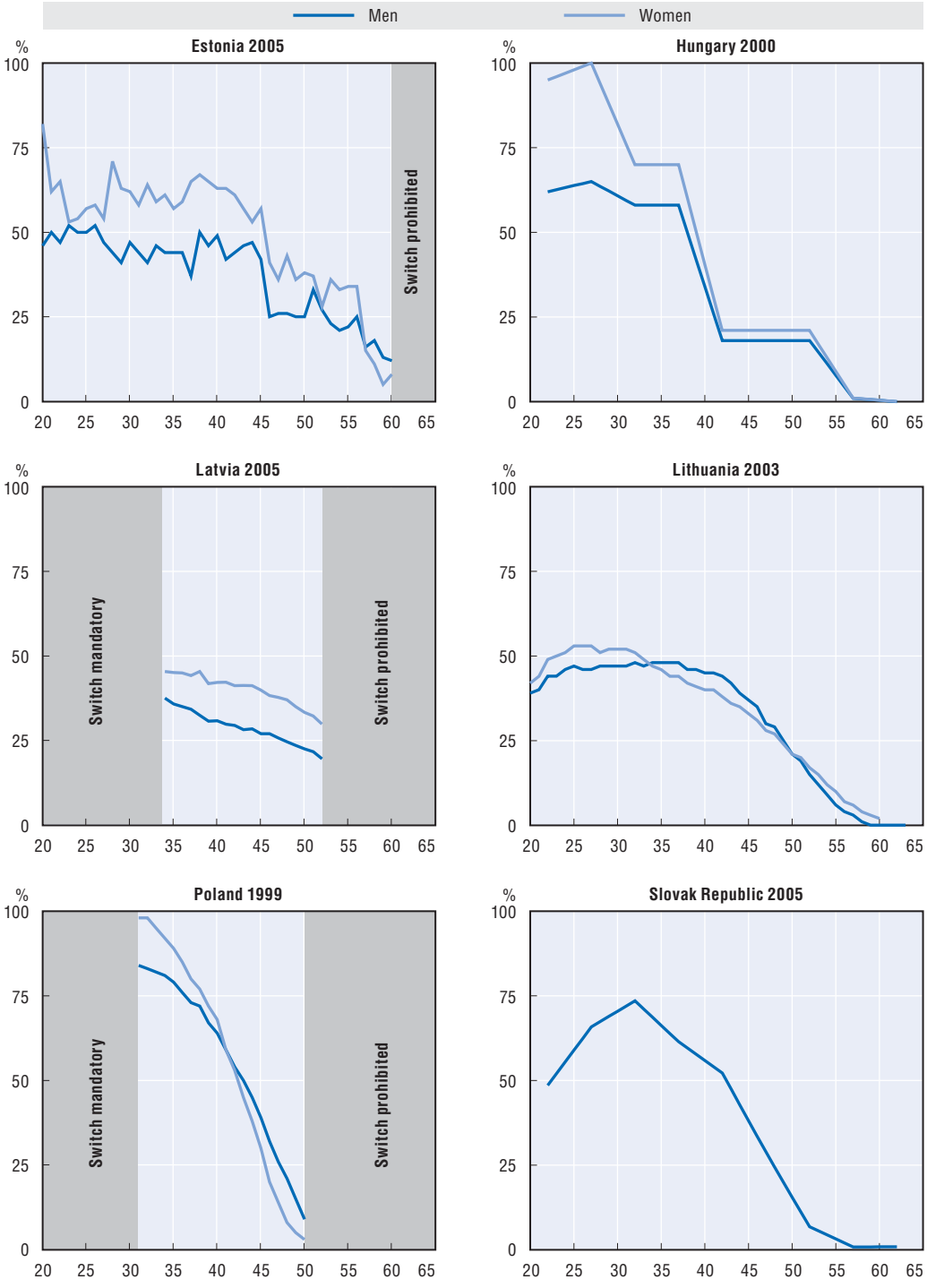
The "terms of trade" of this switch are crucially important to understanding both the incentives at the time of reform and impact of reform reversal on individuals' retirement incomes. Table 3.1 above showed one side of the deal: the amount of contributions individuals could divert from the public pension schemes into their defined-contribution accounts. The *quid pro quo* was that they would get lower benefits from the public scheme. This reduction in benefit is shown in the final column of Table 3.3.

Moving from the perspective of the individual to that of the public finances, the effect of switching was a short-term budgetary cost in the form of the contributions diverted from the public pension system into individual's accounts. But this would be compensated for in the future by a reduction in public spending on pensions. With rapid demographic ageing, these defined-contribution accounts represented a down-payment on the future costs of a greyer population. This would allow the demographic pressure on future taxpayers and contributors to be mitigated and smooth the burden over time.

3.3.1. Switching behaviour

What choices did people make at the time of reform? Figure 3.4 shows that even in the three countries where it was not mandatory, the majority of younger workers chose to switch to the new public/private pension option. Switching rates declined with age across the groups offered a choice, often sharply. This is unsurprising, as the incentive to switch was strongly, negatively correlated with age.[15] When people were offered the option of returning to the public scheme alone – as they were at various times in Hungary and the Slovak Republic – few chose to do so.

Figure 3.4. **Switching behaviour: Percentage of employees choosing mixed public/private provision by age**



Source: Mattil, B. and E.R. Whitehouse (2005), "Rebalancing Retirement-Income Systems: The Role of Individual Choice under Mixed Public/Private Pension Provision", *mimeo.*, OECD, Paris.

StatLink http://dx.doi.org/10.1787/888932598398

By 2010, the assets accumulated in private pension funds were worth from 0.9% of GDP in Romania to 15.8% in Poland. Data for six of the eight countries studied in this chapter are shown in Table 3.4. The assets in the Czech Republic and Slovenia, shown for comparison, relate to voluntary private pension arrangements. Differences between the countries with mandatory private pensions in 2010 principally reflect the size of the contribution rate going into private schemes and the length of time since the reform was introduced.

Table 3.4. **Transition costs and pension fund assets, 2010, per cent of GDP**

	Accumulated assets in private pension funds	Transition cost (contribution revenues diverted to individual accounts)
Estonia	7.4	1.1
Hungary	14.6	1.2
Poland	15.8	1.7
Slovak Republic	7.4	1.2
Bulgaria	5.7	n.a.
Latvia	n.a.	2.3
Lithuania	n.a.	1.1
Romania	0.9	0.4
Czech Republic	6.3	
Slovenia	2.5	

Note: n.a. = not available. There is no transition cost for the Czech Republic or Slovenia because they have not introduced individual accounts.
Source: Statistical Annex, Table A18 and OECD (2011) "Pension Markets in Focus", Issue No. 8, July, OECD, Paris; Égert, B. (2012), "The Impact of Changes in Second Pension Pillars on Public Finances in central and eastern Europe", *OECD Economics Department Working Papers*, No. 942, OECD Publishing, Paris, Table 1.
StatLink http://dx.doi.org/10.1787/888932598987

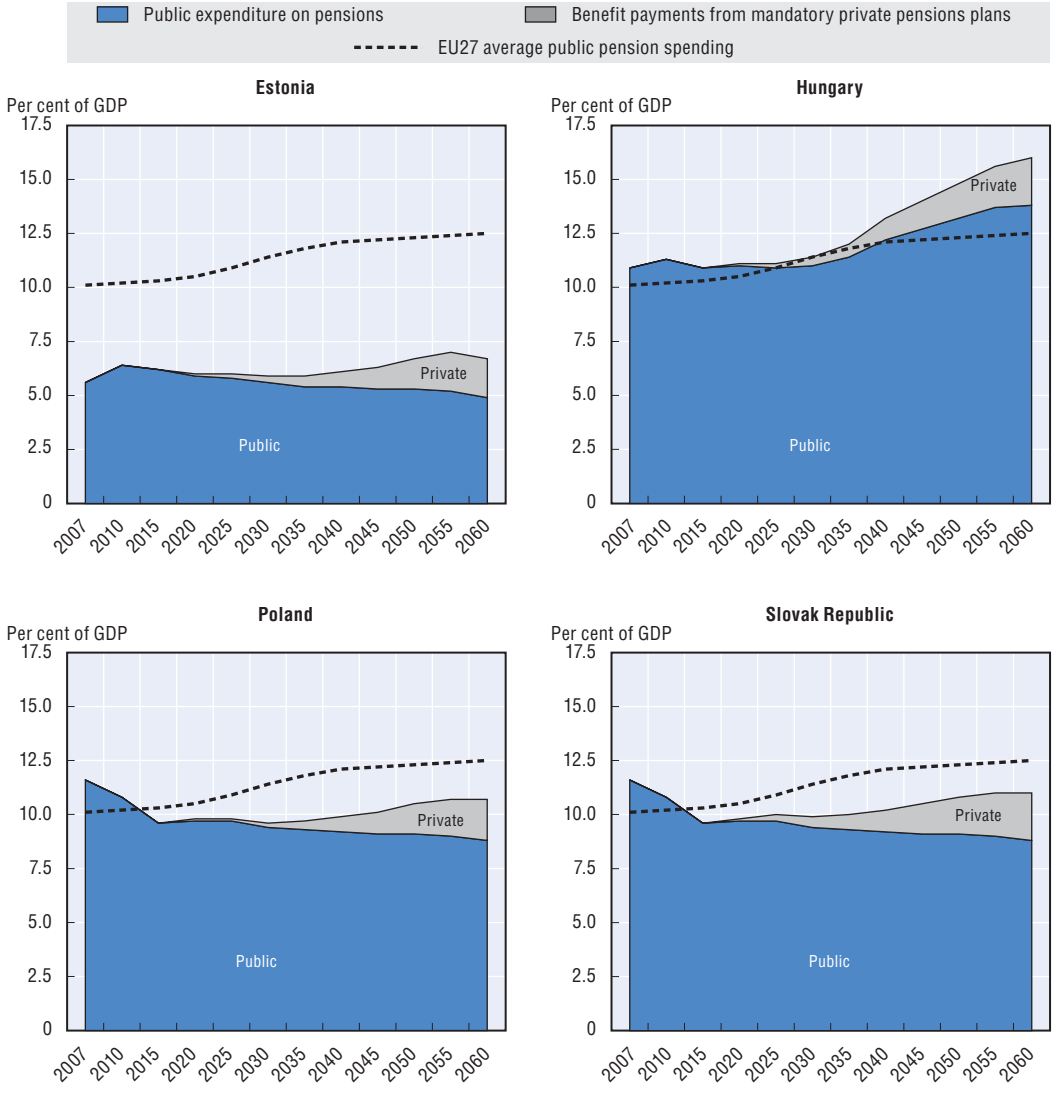
3.3.2. Implications

A concern of policy makers in many countries in the region was that more people switched than they had anticipated. This meant that the magnitude of contributions transferred into individual accounts was often larger than what had been budgeted, requiring the resources to pay for current pay-as-you-go benefits to be found elsewhere. OECD calculations suggest transfers worth between 1.1% and 2.3% of GDP in six countries, with a significantly lower figure for Romania. This "transition cost" of money diverted from the public purse into individual accounts is shown at the right-hand side of Table 3.4.

The long-term impact of the reforms on the finances of pension systems are illustrated in Figures 3.5a and 3.5b. The charts show the aggregate flows of money from projections that used 2007 as their base year and were published by the European Commission (2009a). In each case, the blue shaded area shows the percentage of GDP expected to be paid in public pensions up to the forecast horizon of 2060. The grey shaded area shows the total benefit payments expected from mandatory private pension schemes. For reference, the black line shows the unweighted (simple) average of expenditure for all 27 EU member states.

In the base year of 2007, only Hungary and Poland among the eight countries analysed spent more than the EU average on public pensions with the Baltic States generally spending much less than the average. The long-term projections show broadly stable

Figure 3.5a. **Total value of benefits from public and mandatory private pensions before reform reversals: OECD countries**



Source: European Commission (2009), "The 2009 Ageing Report: Economic and budgetary projections for the EU27 Member States (2008-2060)", *European Economy*, No. 2, Ageing Working Group, Economic Policy Committee, Brussels, Tables A53 and A58.

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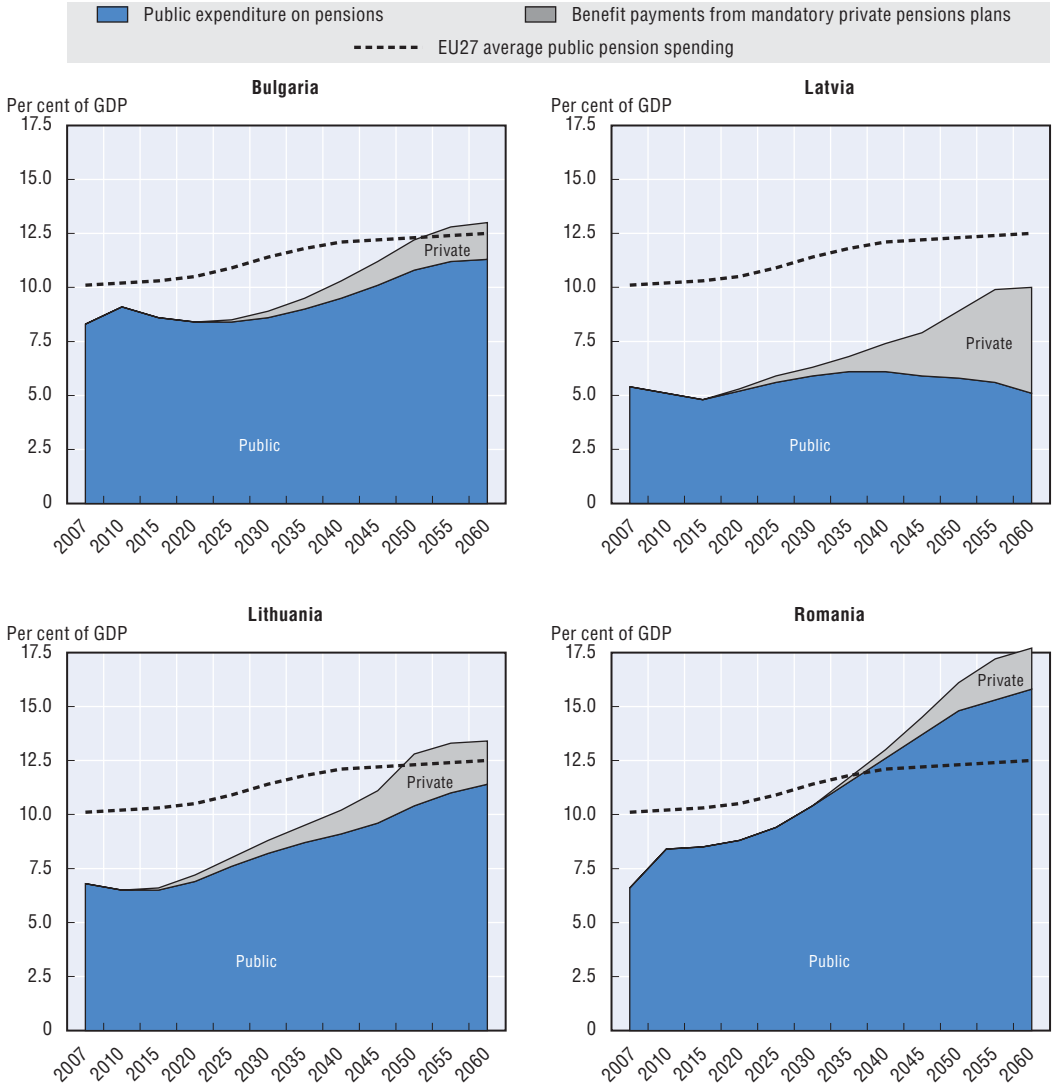
public pension expenditure for Estonia and Latvia, with Poland (almost alone among the whole EU) expecting a significant decline. Hungary's public pension spending was expected to remain at or above the EU average over the whole period, while Romania expected a particularly rapid rise from somewhat below to well above the EU average.

The value of private pensions, with the exception of Latvia, was expected to be relatively modest at the end of the forecast horizon. The 2060 aggregate figure for private benefits was projected to be between 1.7% and 2.2% of GDP for the other seven countries. This is rather surprising given the microeconomic analysis of pension entitlements and the evidence on the number of people switching to the new arrangements. By 2060, all new retirees would generally be expected to have spent all their working lives in the new

Figure 3.5b. **Total value of benefits from public and mandatory private pensions before reform reversals: Non-OECD, EU countries**



Source: European Commission (2009), "The 2009 Ageing Report: Economic and budgetary projections for the EU27 Member States (2008-2060)", *European Economy*, No. 2, Ageing Working Group, Economic Policy Committee, Brussels, Tables A53 and A58.

StatLink http://dx.doi.org/10.1787/888932598436

system. What seems to be at work (except in Latvia) is the particular assumptions used in the financial projections. In particular, average-earnings growth is assumed to be relatively high in the short and medium term for the countries under study here, reflecting more rapid productivity growth than in the "old" EU member states.[16] However, the rate of return on investments is assumed to be the same at all times for both "old" and "new" EU countries. Since it is the difference between average-earnings growth and investment returns that determines the replacement rate from a defined-contribution plan, then it is to be expected that these figures show a much smaller level of benefits from private pensions than do the OECD pension models.

3.4. Impact of reform reversals on individual entitlements

Of the eight countries analysed, Hungary largely removed the defined-contribution component of its pension system. Poland and Latvia have permanently reduced the mandatory contribution rate from the levels envisaged at the time of the systemic reform. Estonia and Lithuania have temporarily reduced the contribution rate, while Romania has postponed planned increases in the rate. Undoubtedly, the financial and economic crisis has been a major factor driving these decisions. Given current economic conditions in Europe and understandable wariness of private pensions following their investment losses, one may wonder what the impact of a full reversal of these reforms would be on pension benefits.

For the four relevant OECD countries, this section looks at the impact of a complete reversal of these pension reforms on the value of people's entitlements. This analysis has some of the characteristics of a "thought experiment". First, it considers workers spending a whole career either under the mixed public/private scheme or the public scheme alone. This abstracts from the complications in interpreting the results of people spending parts of their working lives under different retirement-income arrangements. Secondly, it assumes that the parameters and rules that were legislated in 2008 – including changes that were to be phased in in the future – are fully in place for the whole career. Most importantly, this includes the parameters that determine the terms of trade for switching: the contribution rate to the private plan and the reduction in public benefits that individuals face in return for these contributions. The analysis assumes that these terms of trade effectively work in reverse when people are forced to switch back from mixed public/private to pure public provision.

Table 3.5 shows the main empirical results. On the left-hand side of the Table, the components of the gross replacement rate for a switcher are set out. In Estonia, for example, a switcher could expect a public benefit of 26% of earnings and a private pension of 15%. In the cases of Hungary, Poland and the Slovak Republic, these replacement rates apply across the earnings range (see Figure 3.1aa). In Estonia, the numbers here relate to an average earner. There are different figures for men and women for Poland because, currently, pension ages are 65 for men and 60 for women.[17] This means that women have lower replacement rates because of a shorter career over which benefits can accrue.

Table 3.5. **Switching and reform reversals: Gross pension replacement rates**

	Switcher			Non-switcher	Changes in pensions (%)	
	Public	Private	Total	Public	Total pension	Public pension
Estonia	25.9	15.0	40.9	29.2	*–28.5*	*+13.1*
Hungary	44.4	31.4	75.8	60.1	*–20.8*	*+35.2*
Poland – men	23.4	30.2	53.7	37.4	*–30.3*	*+59.7*
Poland – women	17.6	22.1	39.7	28.1	*–29.3*	*+59.7*
Slovak Republic	26.0	31.6	57.5	51.9	*–9.7*	*+100.0*

Source: OECD pension models.

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The next column of Table 3.5 shows the replacement rate for a non-switcher, or equivalently, for a switcher who goes back to the public system. This pension obviously all comes from the public scheme. These gross replacement rates are, in every case, lower: by around 10% in the Slovak Republic, 20% in Hungary and 30% in Estonia and Poland. The

final column of Table 3.5 shows what happens to public pensions alone in the two cases. A non-switcher's public pension is only 13% higher than that of a switcher in Estonia, but the difference is 60% in Poland and 100% in the Slovak Republic. This gives some idea of the additional future costs involved in providing higher public pensions for people who had to switch back by a reform reversal.[18]

3.4.1. Impact of macroeconomic assumptions on the results

All of these calculations use the OECD's standard assumptions of 2% annual growth in real average earnings and 3.5% rate of return on investments net of administrative charges, as discussed previously. This is applied to the whole of the 40-45 year period over which pension rights accumulate. Under these assumptions, switching increased the total pension entitlement in all four countries analysed.

Most, if not all, people will have different views about the appropriate assumptions to use for these two important variables. Rather than present a huge array of results from a sensitivity analysis, it is better to turn the problem on its head. It has been noted that the replacement rate from a defined-contribution pension depends on the difference between average-earnings growth and investment returns. What, then, is the differential that would equalise total benefits between a switcher (from the public scheme) and a non-switcher (from public and defined-contribution plans)?

The answer is that pensions would be higher for the switcher if investment returns were greater than wage growth minus 5% in Estonia. The financial crisis notwithstanding, it is unlikely that investment returns over the time horizon involved in retirement saving fall short of growth in earnings to such a large extent. In the original reformed system of Poland, the rate of return that would equalise benefits for a switcher and non-switcher is wage growth minus 2% for men, with a somewhat larger differential of 2.3% for women. The figure for Hungary is wage growth minus 1.6% and for the Slovak Republic, wage growth plus 0.9%. All of these are rather smaller than the differential of plus 1.5% assumed in the standard OECD calculations. This means that it is highly improbable that switchers would find their mixed public/private pension smaller than that provided to non-switchers with public benefits alone.

3.4.2. Potential impact on entitlements of actual reversal policies

In practice, only Hungary has entirely reversed the systemic element of the pension reform not only by diverting future contributions back to the state but also by nationalising the assets in pension funds.

Poland's partial reversal can also be analysed using the OECD pension models. In the medium term, the contribution rate to private pension will be 3.5%, compared with 7.3% for the first decade or so after the reform. The residual 3.8% will be put in a second notional account, but with the notional interest rate linked to a five-year moving average of GDP growth, rather than growth of the covered wage bill (average earnings plus employment) as in the earlier notional account. (Between 2011 and 2017, the contribution to this second notional account will fall from 5.0% to 3.8%.) Taking the long-term values, the smaller contribution rate to private pensions will reduce the replacement rates for a switcher by just over one half compared with Table 3.5. The new notional account is projected to provide a replacement rate of 7.3% for men and 5.5% for women on top of the public benefit shown in Table 3.5. Overall, the replacement rate for men is projected to decline from 53.7% to 45.2% and for women from 39.7% to 33.6%.[19]

The Slovak Republic has encouraged people to switch back, although few chose to do so. Moreover, the policy was stopped by a new administration. Nevertheless, for those individuals that did switch back, the analysis in Table 3.5 holds.[22]

3.4.3. Potential impact on pensions and contributions over the lifecycle

The *quid pro quo* for higher public pensions after reform reversal – from the government's viewpoint – is that it collects extra contribution revenues from non-switchers. To capture this effect, the analysis must move to a lifecycle perspective, considering both contributions received by the government and benefits paid out.

The results are set out in Table 3.6. The first column shows the long-run pension ages legislated in 2008.[23] Given the OECD's assumption of a career beginning at age 20, the simple calculation of the number of years of contributions for a full-career worker are then presented in the second column. The percentage of earnings diverted into defined-contribution pensions after the reform is shown next. These are then used to calculate the lifetime value of these diverted contributions. They are shown as a multiple of annual average earnings. Thus, in Estonia's case, a 4% contribution diverted for a period of 43 years adds up to 1.7 times annual earnings at the time of retirement.

Table 3.6. **Switching and reform reversals: Lifetime values of contributions and pension benefits**

			Diverted contributions		Lifetime pension				Balance-sheet effect	
					Value		Differences			
	Pension age	Cont'n years	Rate (%)	Value	S	NS	Rel. (%)	Abs.	Abs.	Rel.
Estonia	63	43	4.0	1.7	4.1	4.6	*+13.1*	0.5	1.2	3.2
women	63	43	4.0	1.7	5.3	6.0	*+13.1*	0.7	1.0	2.5
Hungary	65	45	8.0	3.6	6.0	8.1	*+35.2*	2.1	1.5	1.7
women	65	45	8.0	3.6	7.4	10.0	*+35.2*	2.6	1.0	1.4
Poland	65	45	7.3	3.3	4.2	6.7	*+59.7*	2.5	0.8	1.3
women	60	40	7.3	2.9	4.4	7.1	*+59.7*	2.6	0.3	1.1
Slovak Republic	62	42	9.0	3.8	4.4	8.8	*+100.0*	4.4	–0.6	0.9
women	62	42	9.0	3.8	5.4	10.8	*+100.0*	5.4	–1.6	0.7

Note: Life time values shown as a multiple of annual average earnings. S = switcher; NS = non-switcher; rel. = relative difference in percentage terms; abs. = absolute difference as a multiple of annual individual earnings.
Source: OECD pension models.

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The next columns look at the other side of the balance sheet: showing the value of the lifetime public pensions payable. These are calculated using standard actuarial techniques based on mortality rates by sex and age. The flow of benefits during retirement is turned into a lump sum value at the time of retirement. The public pension for an Estonian man is worth 4.1 times his annual earnings over retirement in the switching case. Values for women are higher than those for men because they live longer on average.

The relative difference in lifetime pensions between switchers and non-switchers is the same for lifetime benefits as it was for replacement rate (shown earlier in Table 3.5). The absolute differences vary from 0.5 times annual earnings for Estonian men to 5.4 times for Slovak women.

The final two columns combine the information on lifetime contribution and benefit flows. The absolute difference shows the overall impact on the finances of the pension system of each individual over their lifecycle. In Estonia, for example, a male switcher costs 1.7 times annual earnings in lost contributions with a gain of just 0.5 times earnings in lower benefits: the net cost is 1.2 times annual earnings. The differentials are of a similar size in Hungary and lower in Poland, especially for women. Only in the Slovak Republic are the future benefit savings worth more over the lifecycle than the extra contribution revenues foregone.

3.5. Conclusions

The detailed analysis of pension entitlements presented in this chapter show that the main cost of pension-reform reversals will be borne by individuals in the form of lower benefits in retirement. These are shown to be of the order of 20% for a full-career worker in Hungary and around 15% with Poland's partial reversal, using the OECD's standard assumption of a 3.5% rate of return on investments (or 1.5% above wage growth). However, even with lower returns on investment – greater than 2% below wage growth in Poland and 1.5% in Hungary – individuals will lose out.

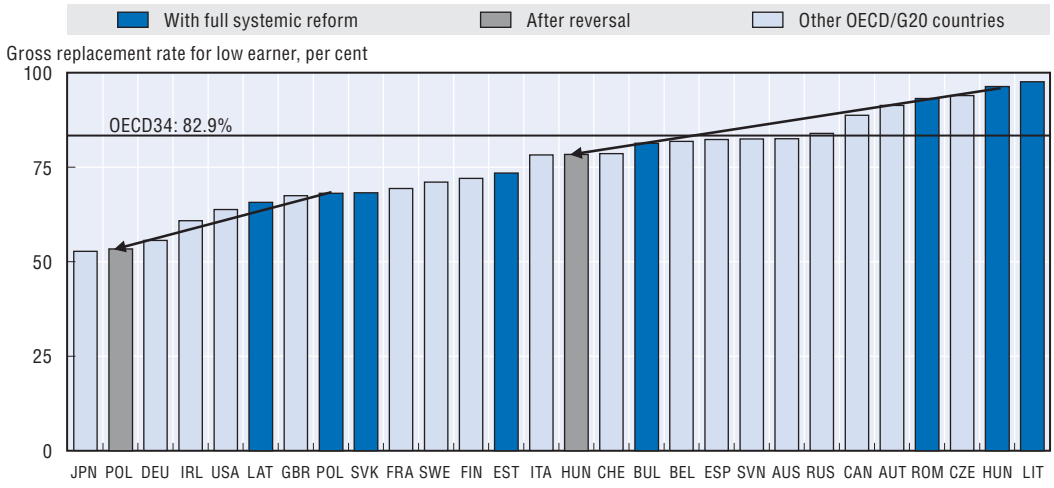
The effects on the public finances will be a short-term boost from additional contribution revenues but a long-term cost in extra public spending just as the fiscal pressure of population ageing will become severe. Overall, however, it is projected that the extra revenues would exceed the extra expenditure, except in the case of the Slovak Republic. This reflects a problem with the detailed design in the initial reforms, which tended to over-compensate people for choosing the private pension option. People naturally responded to these incentives, with more switching than most governments had budgeted for. This repeated the earlier mistake of over-compensation, especially for younger workers, that had occurred in the United Kingdom in the late 1980s (see Disney and Whitehouse, 1992).

The OECD's vision for pensions policy – most recently set out in *Pensions at a Glance 2011* – is concerned with the delicate balance between adequacy of pension benefits and financial sustainability of retirement-income systems into the long term. There are three main routes to adequate benefits at an affordable cost.

The first is to promote longer working lives. This allows benefit levels to be maintained while the finances of the pension system benefit, both from the shorter duration of payments and a longer period contributing. As discussed in this Chapter and in Chapter 1, most of the eight countries studied have increased pension ages and tightened eligibility for early retirement.

The second way of balancing adequacy and sustainability is through targeting benefits on those most in need. With the exceptions of Estonia and Lithuania, the countries studied have a very strong link between contributions and benefits. Indeed, the analysis showed that the systemic reforms in Poland and the Slovak Republic significantly reduced the redistributive features of the pension system. This is the opposite direction than that taken in most reforms undertaken by OECD countries. Figure 3.6 shows the net replacement rate for a low earner, with pay of one half of the economy-wide average. It illustrates the way in which the partial reversal in Poland has exacerbated the weakness of the safety-nets protecting the retirement incomes of low earners. Before the reversal, the net replacement rate at half average earnings was already low, just above the United Kingdom. After the

Figure 3.6. **Net replacement rate of low earner, selected OECD and G20 countries**



Source: OECD (2011), *Pensions at a Glance 2011: Retirement-Income Systems in OECD and G20 Countries*, OECD Publishing, Paris; OECD pension models.

StatLink http://dx.doi.org/10.1787/888932598455

reversal, it falls to the second lowest, between Germany and Japan. The full reversal reduces the net replacement rate in Hungary from above the OECD average to about 10 percentage points below, between Italy and Switzerland in the rankings.

The implication is that some countries risk a resurgence of old-age poverty in the future unless safety-net benefits are strengthened. This could involve either a basic pension, of the sort provided in the Czech Republic, Estonia and Lithuania. An alternative would be a broader resource-tested benefit (not paid to the richest pensioners), as offered in Australia, Canada and Sweden for example.

Returning to the dilemma in balancing adequacy and sustainability, the third policy proposed by the OECD is to have a diversified and balanced pension system. This means a mix of providers – public and private – and of financing mechanisms: pay-as-you-go and pre-funding. Recuperating contribution revenues that should go to private pension plans in some of the countries studied here has proved an attractive way out of short-term fiscal problems. But reversing systemic pension reforms, which sought to encourage more private provision for retirement, is regrettable. Taking the long view, a diversified pension system is both the most realistic prospect and the best policy.

Notes

1. See OECD (2011b) and Hemmings and Whitehouse (2006) for further discussion of the Czech case.
2. *Source:* Eurostat and OECD (2011c).
3. *Source:* Eurostat and OECD (2011c).
4. In practice, individuals could keep their private-pension accounts but at the high cost of forfeiting all public-pension rights. This would leave them worse off relative to the public-pension promise unless private pensions deliver spectacular investment returns. A little over 100 000 people out of approximately 3 million with individual accounts chose this option.
5. See Box 1.5 in Part I.1 of OECD (2009).

6. Some Latin American countries, such as Costa Rica and Uruguay, retained a public, earnings-related scheme when defined-contribution plans were introduced: see Whitehouse (2007). Holzmann and Hinz (2005) present the World Bank taxonomy.
7. See the indicator of "Architecture of national pension systems", pp. 106-7 in OECD (2011a).
8. See Whitehouse (2010) and Chapter 2 of this volume for more details.
9. In some cases – such as Canada, the Netherlands and New Zealand – the conditions relate only to residency in the country. In other countries – Ireland, Japan and the United Kingdom, for example – individuals are also required to pay social security contributions for a certain number of years. See the detailed discussion in OECD (2011a).
10. The methodology and assumptions are set out in greater detail on pp. 116-7 of OECD (2011a).
11. The only difference is in the case of Poland, where the calculations have been adjusted such that the notional interest rate reflects the projected decline in employment over the next 50 years. This is based on the projections in European Commission (2009).
12. See Whitehouse *et al.* (2009).
13. See Palacios and Whitehouse (1998); Disney, Palacios and Whitehouse (1999) and Mattil and Whitehouse (2005) for a more detailed analysis and a discussion of the implications for pension policy.
14. However, in both Hungary and the Slovak Republic the mandate on new workers to join the defined-contribution plans was removed for a time.
15. This is illustrated in detail in Palacios and Whitehouse (1998); Disney, Palacios and Whitehouse (1999) and Mattil and Whitehouse (2005).
16. For the EU15, the rates of earnings growth assumed are 1.7% or 1.8% except for Italy (1.5%), Finland and Portugal (both 1.9%). For the new member states studied here, the earnings-growth assumption varies between 2.4% (Hungary) and 3.0% (Bulgaria). See Table 4 in European Commission (2009b).
17. The government has announced plans to equalise pension ages for men and women at 65 and then increase them for both sexes to 67. However, this has not been legislated at the time of writing and so it has not been modelled.
18. Because of the basic pension in Estonia (which is unaffected by switching choices), the analysis in Table 3.5 varies with individual earnings for that country. For a low earner (half of average), the additional public pension cost for a non-switcher is 8.9% compared with 13.1% for an average earner. Similarly, for a high earner (1.5 times average pay), the additional cost is 15.7%.
19. Figures from the Polish Ministry of Finance show much lower replacement rates than the OECD pension models. This is primarily driven by an assumption of 1% growth in earnings over and above economy-wide average earnings growth. Using final pay as the denominator for the replacement rate calculation gives a lower replacement rate. These figures also assume that the real rate of return on investments will be higher for the defined-contribution component after the partial reform reversal. This is because it is assumed that a higher share will be invested in riskier, higher-return assets (such as equities) following the changes.
20. The Polish government figures show the replacement rate unchanged after the partial reform reversal. The limit on investment in equities will gradually rise from 40% of the pension funds' portfolio in 2010 to 90% from 2034. Equities are assumed to yield a higher investment return offsetting the reduction in the proportion of earnings going into pension funds.
21. The calculations presented here are based on unchanged investment returns. First, it would have been possible to loosen investment restrictions with the existing contribution rate. Secondly, it is a controversial issue whether equity returns really are superior or whether any excess return over bonds simply reflects the additional risk taken by retirement savers.
22. Temporary suspensions of contributions in other countries are rather harder to model. The key determinant of their impact is obviously exactly how temporary they prove to be. If current plans for a resumption of payments into defined-contribution accounts at the original rate are followed, then the overall impact will be small in the context of a 40-45 year career. The calculations of the impact of a permanent reversal, as in Table 3.5, do not hold.
23. Estonia has subsequently announced a phased increase in pension age to 65.

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Chapter 4

Coverage of Private Pension Systems: Evidence and Policy Options

To adapt pension systems to demographic trends, many countries are reducing pay-as-you-go public pension levels and lifting retirement ages. In this context, funded private pensions could play a major role to avoid adequacy gaps. Yet, as this chapter shows, the coverage of funded pensions, as measured by enrolment rates, is highly uneven across countries and between individuals, especially in voluntary systems.

Some countries have made funded pensions compulsory (e.g. Australia, Chile) or quasi-mandatory (e.g. Denmark, the Netherlands) to ensure that most workers are covered and therefore have access to a sufficiently high complementary pension. However, in other countries with relatively low pay-as-you-go public pension benefits, funded private provision remains voluntary. The low level of funded pensions' coverage in such countries should be a major policy concern. Recent policy initiatives in Germany and New Zealand, involving the introduction of financial incentives (and auto enrolment in New Zealand) have been effective in raising coverage to the highest levels among voluntary pension arrangements, but coverage gaps remain that need to be addressed.

4.1. Introduction

Private or more generally, funded pensions play an important role in the retirement income systems of many OECD countries. This role is expected to grow as recent pension reforms in many OECD countries will lead to a reduction in pay-as-you-go (PAYG) public pension benefits. While prolonging working lives may partly offset these benefit cuts, there is no guarantee that this will happen in practice. Furthermore, unlike public pensions, private pensions are voluntary in many countries. As a result, participation in and contributions to these plans are largely the result of decisions made by employers and individuals, leading to wide disparities in coverage and contribution rates across the population and between countries. Differences may also occur in mandatory private pension systems if there is a high level of informality in labour markets.

Policy makers need to analyse these disparities and trends in order to determine whether individuals of different ages and socio-economic characteristics are using private pensions sufficiently to complement their public pension benefits and, if not, what policy measures may be needed to improve the situation. There is therefore a critical need for comparable and reliable information on private provision in order to better monitor retirement income adequacy and the role of private pensions across different groups of the population. Key indicators of the contribution of private pensions to the adequacy of retirement income are the access that individuals have to such provision (enrolment), the contributions made into private, defined contribution (DC) pension plans, the rights accrued in private, defined benefit (DB) plans, and the net returns from these systems. While a high participation rate is not enough to ensure retirement income adequacy from private pension plans – it should be associated with high contribution levels and good performance – it is a necessary condition to achieve it.

This chapter therefore assesses private pensions' coverage for selected (mainly high-income) OECD countries, focusing on enrolment rates as a measure of coverage. It also provides some explanations for the differences observed across countries, and draws some policy conclusions. The chapter first looks in Section 4.2 at the overall pension system and evaluates whether there is a need for private pension savings as a complement to PAYG public pensions. Section 4.3 then identifies countries where the overall participation in private pensions may be too low by comparing different types of private pension systems across OECD countries. Section 4.4 shows, focusing on eight selected OECD countries and using an analysis of household survey data, that coverage is unevenly distributed across individuals. Finally, Section 4.5 provides a set of policy options to increase participation in and contributions to private pension plans. Section 4.6 concludes, arguing that other than making private pensions mandatory, automatic enrolment coupled with financial incentives and matching contributions is most effective in increasing and broadening the coverage of private pensions, as well as increasing contribution rates.

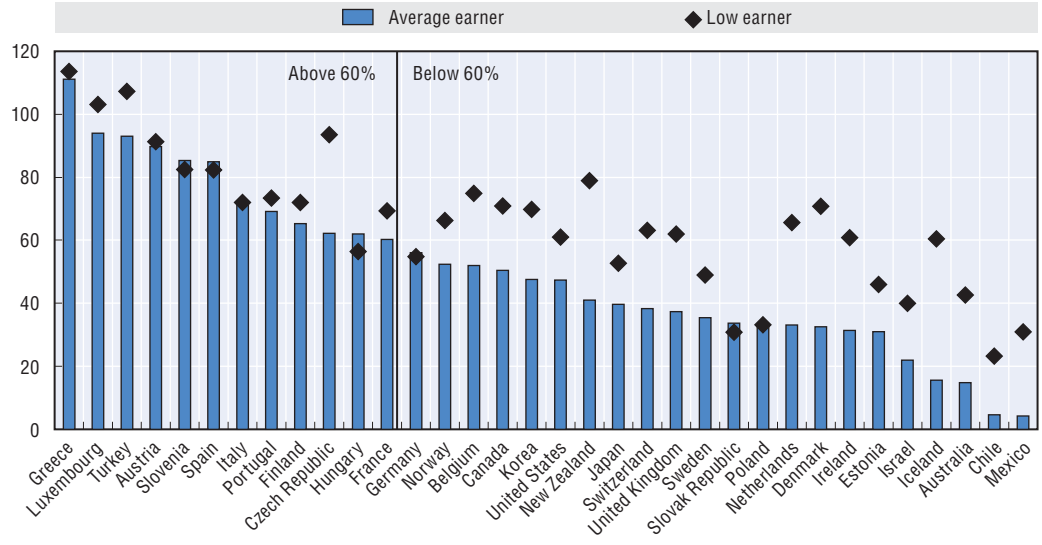
4.2. The need for private/funded pensions as a complement to public/pay-as-you-go pensions

The analysis of the coverage of funded or private pensions needs to be done in the context of the overall structure of each country's pension system. In countries where public pensions, financed on a PAYG basis in most cases, already provide high benefits to individuals, private, or more generally, funded pension plans may not need to cover a large share of the population and offer high replacement rates. On the other hand, in countries where public pension benefits are low, it is critical to assess participation rates in complementary, private pension arrangements and the contributions made or benefit rights accrued by different population subgroups.

Most OECD countries have already moved or are moving towards a more diversified pension system, where PAYG pensions need to be complemented with funded pension arrangements and other savings in order to ensure retirement income adequacy. While the crisis has damaged the short-term prospects for funded pension arrangements, most countries remain committed to such a diversified model of retirement income provision. Based on current pension rules, the average individual in at least two thirds of the OECD countries needs to complement her public pension benefits with funded, private pensions in order to maintain her standard of living after retirement.

Following OECD (2011), there are countries where PAYG pensions currently play a predominant role, such as Greece, where the net (after tax) PAYG pension benefit that a new entrant to the workforce on average earnings can expect to receive at retirement after a full career is 110% of net, final salary.[1] At the other extreme, in Mexico, the PAYG pension is provided in the form of a state subsidy to the mandatory funded pension accounts. This subsidy represents about 4% of the net, final salary for the typical worker on average earnings. PAYG pension benefits in other OECD countries fall between these two extremes (see Figure 4.1).

Figure 4.1. **Net pension replacement rates from PAYG pension systems for average and low earners**



Source: OECD (2011), *Pensions at a Glance 2011: Retirement-income systems in OECD and G20 countries*, OECD Publishing, Paris.
StatLink http://dx.doi.org/10.1787/888932598474

Net pension replacement rates for workers on average earnings from PAYG pension systems are not expected to reach 60% of the worker's final salary in twenty-two of the thirty-four OECD countries (for a worker entering the labour market at age 20 in 2008 and retiring at the normal retirement age). While the target replacement rate varies across countries and individuals, in countries where this level is not reached there is likely to be a great need to complement public pension benefits with additional income sources (private pensions and other savings) to maintain a similar standard of living after retirement. Even for low income workers (those on half average earnings), there are eleven countries (Australia, Chile, Estonia, Germany, Hungary, Israel, Japan, Mexico, Sweden, Slovak Republic, Poland) for which the replacement rate is expected to fall below 60%. Hence, the complementary role of funded pensions is of prime policy importance in these countries.

In addition, countries with high replacement rates from PAYG pensions may face sustainability problems in the future.[2] To the extent that these countries address this sustainability problem by lowering replacement rates from PAYG pensions, and unless working lives are extended, they may need to consider increasing coverage and contributions in funded pension plans in order to maintain future retirement income levels at an adequate level.

4.3. Coverage of funded/private pensions in OECD countries

While funded and private pensions are growing in importance as sources of retirement income in practically all OECD countries, they reach very different levels of coverage across countries. As discussed in Box 4.1, there are different measures of coverage that may be used. For the purposes of comparing aggregate coverage rates among countries with relatively high per capital income levels, a useful metric is the percentage of the working age population (those aged 15 to 64) that is enrolled in a private pension plan (either occupational or personal).

As shown in Table 4.1, using this measure, low private pensions coverage is most evident in OECD countries where private pensions are voluntary. Of all such countries, the highest rates of coverage observed are around 50% of the working age population in countries such as the Czech Republic, Germany, New Zealand and the United States. This 50% coverage level may not be sufficient, however, as these countries have replacement rates from public pensions around or below 60%. Hence, to the extent that workers on average earnings have coverage rates that are representative of the overall population – an issue to be further analysed in the next section – the expansion of private pension coverage should be a major policy priority.

Moreover, in these countries private pensions' coverage has generally been steady over recent years. Only a few countries have experienced a substantial increase in coverage. One of the most striking cases is New Zealand, where until the introduction of the "Kiwisaver" scheme in 2007, coverage rates had declined to less than 10% of the working age population. By 2010, the "Kiwisaver" scheme – which is based on automatic enrolment and government subsidies – had achieved a coverage rate of around 55%. Another country that has achieved a substantial increase in coverage is Germany, reaching 47% of households in which the head is aged between 16 and 64 by end 2008. As discussed in Section 4.5, this increase is linked to the introduction of the *Riester* pensions, which benefit from an important government subsidy. These plans experienced an increased in coverage from 2.5% of the working age population in 2001 – when they were introduced – to 10.2% in 2005 and 26.7% at the end of 2010.

Box 4.1. **Different measures of coverage**

Members *versus* contributors

Several measures coexist of private pension coverage (see Turner *et al.*, 2003). Individuals can be considered as covered by a private pension plan or enrolled in a plan, if they have a positive account balance, have accrued benefits, contribute to a plan, or if contributions are being made on their behalf.

This chapter considers that to be a member of a private pension plan, an individual must have assets or accrued benefits in a plan. Hence, an individual who does not contribute (for various reasons, including unemployment) or on behalf of whom contributions are not made during a year would still be considered as a plan member if she has assets accumulated or benefits accrued in the plan. The ultimate goal is to evaluate how much people have to finance retirement, so there is a need to account for all possible sources of income at retirement and therefore to consider those individuals who have assets in funded plans independently of whether they actively contribute today or not.

In countries with high levels of informality however, the measure of coverage based on the ownership of assets loses some relevance. Informal workers may have participated once in the private pension system and hence accumulated assets in a plan. They may however stop contributing during long periods, so that the benefits they may receive at retirement from such plans would not fit their needs. Complementary measures based on contribution frequency are therefore needed in such cases, in order to gauge the extent to which individuals will draw sufficient benefits from private pension plans.

Reference population for the calculation of the coverage rate

There is no standard reference population for the calculation of the coverage rate. The literature uses either the working age population (those aged 16 to 64), the labour force (those aged 16 to 64 either employed or unemployed), or the employed population. The choice of the reference population should be driven by the source used for the calculation and the policy question to address.

When using administrative data, only the aggregate number of pension plans members in a given country is available, whatever the labour force status of the individuals. Dividing this aggregate figure by the country's total labour force or total employment may lead to inaccurate measures of the coverage rate as some pension plan members may actually be out of the labour force (*e.g.* in Spain 17.4% of all the individuals enrolled in a pension plan are out of the labour force). The working age population, which includes all individuals independent of their labour market status, may therefore be used as a reference when coverage is measured with administrative data. The main issue when using this reference population is that the coverage rate then depends on the labour force participation rate in each country. Countries with lower labour force participation rates would be more likely to have lower coverage rates as a share of the working age population, while this may not be the case as a share of the labour force.

When using survey data, the labour force status of each surveyed individual is known. In particular, as surveys usually ask for individuals' professional activity, both workers in the formal and informal sector are included. It is therefore usually possible to calculate the coverage rate for any kind of reference population, depending on the policy question to address. From the perspective proposed in this chapter, the labour force seems to be the most relevant reference population to calculate the coverage rate of private pension plans.

Box 4.1. **Different measures of coverage** *(cont.)*

The Table below compares the coverage rate using as the reference population the working age population or the labour force. Using the labour force allows focusing on those individuals who are the most likely to save money in such plans because of employment and to also take into account unemployed individuals who may have accumulated assets through previous employment. In addition, it makes more sense to exclude those of working age who are out of the labour force, such as students or non-working spouses for instance, as they are not targeted by occupational pension plans. However, discouraged workers are not taken into account, while they could also have accumulated assets through previous employment.

Coverage rate of private pension plans in selected OECD countries using different reference populations

	As a % of the working age population	As a % of the labour force
Australia	85.7	90.6
Germany	47.1	51.6
Netherlands	88.6	93.4
Spain	18.6	22.7
United Kingdom	43.3	53.0
United States	47.1	56.7

Source: OECD calculations using survey data.

StatLink http://dx.doi.org/10.1787/888932599082

Despite the relative success of these countries in raising coverage over a relatively short time span, by far the highest coverage rates are found in countries with mandatory private pension arrangements. Australia, Chile, Estonia, Finland, Iceland, Israel, Sweden (Premium Pension System – PPS) and Switzerland have coverage rates around or above 70% of the working age population. Iceland has the highest coverage rate of any OECD country, at 85.5% of the working age population. In all these countries, private pensions are mandatory: employees must join a pension plan and minimum contribution rates (or benefits) are set by the government.

The only countries where mandating private pension provision has yet failed to generate such high coverage rates are Mexico, Norway, and Poland. Norway's coverage rate, at 66%, is somewhat lower than the other countries with mandatory systems but this may be explained by the recent and gradual introduction of compulsory enrolment. A similar factor may explain Poland's 55% coverage rate, as the private pension system was only made mandatory for new entrants to the labour force and existing workers who were under 30 years old at the time of the pension reform. The coverage rate should increase over time as the structure of the working age population becomes increasingly dominated by employees for whom private pensions are mandatory. Labour market informality however may put a lower ceiling to Poland's lower coverage rates, just as it does in Mexico (58%), where the private pension system became mandatory for all workers at the time of the reform.

Other occupational pension systems that achieve high coverage can be classified as quasi-mandatory: through industry-wide or nationwide collective bargaining agreements,

Table 4.1. **Coverage of private pension schemes by type of plan, 2010**

As a % of the working age population

	Mandatory/Quasi-mandatory	Voluntary		
		Occupational	Personal	Total
Australia	68.5	n.a.	19.9	19.9
Austria	n.a.	12.3	25.7	. .
Belgium	n.a.	42.3	. .	. .
Canada[1]	n.a.	33.5	33.1	. .
Chile	73.7	n.a.	. .	. .
Czech Republic	n.a.	n.a.	61.2	61.2
Denmark	ATP: 83.8	n.a.	23.6	23.6
	QMO: 58.0			
Estonia	67.1	n.a.	. .	. .
Finland[2]	75.5	7.4	21.3	28.8
France	n.a.	17.3	5.3	. .
Germany	n.a.	22.5	36.9	47.1
Greece	n.a.	0.3	. .	. .
Hungary[3]	45.4	n.a.	18.9	18.9
Iceland[1]	85.5	n.a.	42.0	42.0
Ireland[4]	n.a.	31.0	12.0	41.3
Israel	75.9	. .	. .	. .
Italy	n.a.	7.6	6.2	13.3
Japan	n.a.	. .	. .	. .
Korea	n.a.	14.6	36.5	. .
Luxembourg	n.a.	3.3	. .	. .
Mexico	57.7	1.6	n.a.	1.6
Netherlands	88.0	n.a.	28.3	28.3
New Zealand	n.a.	8.2	55.5	. .
Norway	65.8	. .	22.0	. .
Poland	54.8	1.3	. .	. .
Portugal	n.a.	3.1	5.6	. .
Slovak Republic[5]	43.9	n.a.	. .	. .
Slovenia	n.a.	. .	. .	38.3
Spain[6]	n.a.	3.3	15.7	18.6
Sweden[4]	PPS: ~100	n.a.	27.6	27.6
	QMO: ~90			
Switzerland	70.1	n.a.	. .	. .
Turkey[7]	0.9	0.2	4.2	. .
United Kingdom	n.a.	30.0	11.1	43.3
United States	n.a.	41.6	22.0	47.1

QMO = Quasi-mandatory occupational.

Coverage rates are provided with respect to the total working age population (*i.e.* individuals aged 15 to 64 years old) for all countries except Ireland and Sweden for which coverage rates are provided with respect to total employment.

1. Data only represent individuals who contributed to a pension plan in 2010.
2. The data for mandatory private pension plans refer to the statutory earnings-related pension system (*e.g.* TyEL plans).
3. After the government decision to effectively close down the mandatory private pension system at the end of 2010, the vast majority of the members transferred their pension rights to the state's PAYG pension system. At the end of September 2011, only 1.5% of the working age population was still in the mandatory private pension system.
4. Coverage rates are expressed as a percentage of the employed population, not of the working age population.
5. The data for mandatory private pension plans refer to both mandatory and voluntary personal plans as the split is not available.
6. Data refer to 2005/06.
7. Data for occupational voluntary plans do not include provident funds (VASA).

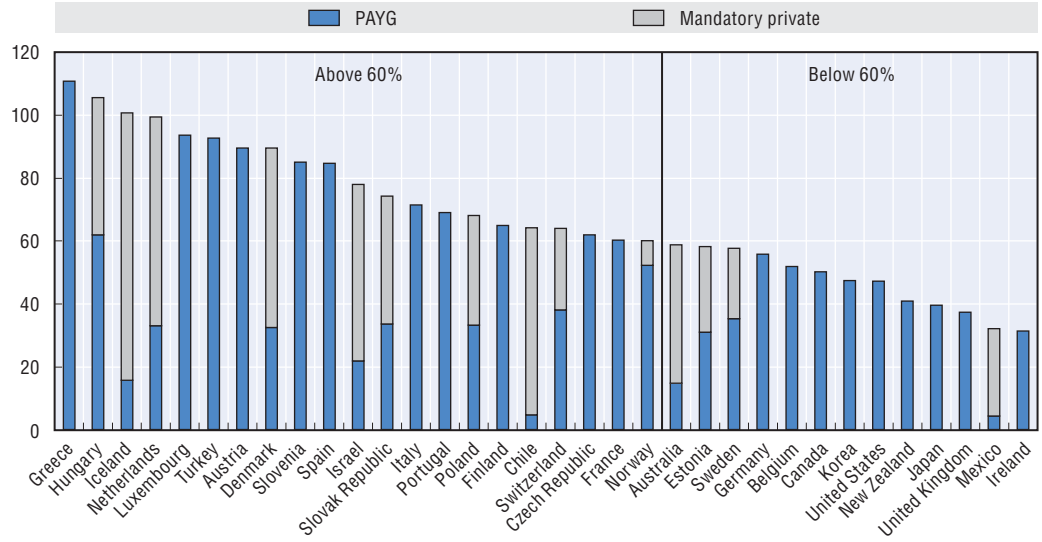
Source: OECD, *Global Pension Statistics*, estimates and OECD calculations using survey data.

StatLink http://dx.doi.org/10.1787/888932599044

employers establish schemes that employees must join. As not all sectors may be covered by such agreements, these systems are not classified as mandatory. Examples include the occupational pension systems in Denmark, the Netherlands and Sweden. In these countries, the coverage is close to the one in countries with mandatory systems, with 60% or more of the working age population covered.

All in all, thirteen of the thirty-four OECD countries have some form of mandatory or quasi-mandatory private pension system in place, which generally ensures a high coverage of the working age population. When combining PAYG and mandatory or quasi-mandatory private pension systems, net pension replacement rates for workers on average earnings are above 60% of the worker's final salary in these countries, except in Australia, Estonia, Sweden and Mexico. In total, thirteen OECD countries have an aggregate net replacement rate below 60%.

Figure 4.2. **Net pension replacement rates from PAYG and mandatory private pension systems for average earners**



Source: OECD (2011), *Pensions at a Glance 2011: Retirement-income systems in OECD and G20 countries*, OECD Publishing, Paris.
StatLink http://dx.doi.org/10.1787/888932598493

Two other OECD countries, Hungary and the Slovak Republic, used to have mandatory private pension systems but have recently changed enrolment rules, with a dramatic effect on coverage, especially in Hungary. In this country, the government decided to effectively close down the mandatory private pension system at the end of 2010. Contributions to the system were suspended between 1 November 2010 and 31 December 2011, the whole social security contributions flowing to the Pension Insurance Fund thereafter. The vast share of pension fund assets accumulated by members was transferred back to the state. As a result, coverage of the mandatory system plunged from 45.4% of the working age population at the end of 2010 (as shown in Table 4.1) to 1.5% at the end of September 2011. From 2012 on, the mandatory private pension system does not exist anymore. The former members of the mandatory private pension system will only accrue public pension rights.

Between 2005 and 2007, participation in the Slovakian private pension system was mandatory for workers entering the labour force for the first time and voluntary for the others. Starting 1 January 2008, people joining the labour market for the first time can

choose whether to put their mandatory contribution into the public or private system. Workers already in the system at that time had an opportunity to opt back into the public system between November 2008 and June 2009. The only compulsory feature that remains in the system is that, once workers choose to participate or stay in the private pension system, they cannot opt out anymore. Figure 4.3 shows that the coverage rate stopped increasing after the reform was put in place (40% in 2007) and even declined in 2008 and 2009 (to 36.5%) due to the possibility to opt out of the system during a short period of time.

Figure 4.3. **Slovak Republic: Coverage rate of private pension funds before and after the reform**

As a % of the working age population

Source: OECD, *Global Pension Statistics*.

StatLink http://dx.doi.org/10.1787/888932598512

So far, the discussion on coverage has focused on whether people are enrolled in private funded pension plans. However, sometimes, especially when there are high levels of informality in the economy, it is important to distinguish between being enrolled and making contributions and being enrolled but failing to contribute (see Box 4.1). Informality is a major obstacle to achieving high coverage, even in countries with mandatory or quasi-mandatory private pension systems. Individuals working in the informal sector are rarely covered by any contributory pension arrangement, whether public or private. Furthermore, when the incidence of informal employment is high, many of those who are enrolled in the private pension system are not contributing on a regular basis.

Therefore, in countries with high levels of informality, the measure of coverage based on participation as used in Table 4.1 needs to be complemented with measures based on contributors[3] (ideally, contribution frequency and levels during a person's career) in order to better gauge the extent to which individuals will draw sufficient benefits from private pension plans. As shown in Table 4.2, when coverage is measured as the ratio of contributors to working age population, the coverage rate drops substantially in countries such as Chile (by 40 percentage points)[4] and Mexico (by 38 percentage points) which have mandatory pension systems.[5] In other OECD countries with less informality, the drop in the coverage rate only applies to voluntary plans and is far less important (maximum 14 percentage points for voluntary personal plans in Australia). It is also larger for personal pension plans than for occupational plans.

Table 4.2. **Contrasting measures of coverage**

As a % of the working age population

	Type of plan	Members	Contributors
Australia	Occupational mandatory	68.5	68.5
	Personal voluntary[1]	19.9	6.2
Chile	Personal mandatory	73.7	33.1
Germany	Occupational voluntary	22.5	13.3
	Personal voluntary	36.9	25.9
Mexico	Personal mandatory	57.7	19.2
Spain	Occupational voluntary	3.3	3.2
	Personal voluntary	15.7	14.8
United States	Occupational voluntary	41.6	40.2
	Personal voluntary	22.0	. .

1. Personal voluntary plans include all superannuation plans other than mandatory occupational plans. Additional employee voluntary contributions are considered to be made in the occupational plan, not in a personal voluntary plan.

Source: For Chile: Pensions Supervisor. Mexico: the number of members comes from the OECD, *Global Pension Statistics*, while the number of contributors comes from the AIOS 2010 Statistical Bulletin. For the other countries: OECD calculations using survey data.

StatLink http://dx.doi.org/10.1787/888932599063

4.4. Assessment of the coverage of private pensions in 8 OECD countries

This section assesses the coverage rate of private pension plans in 8 OECD countries with a breakdown by socio-economic characteristics.[6] Coverage is defined as the percentage of individuals in the labour force that are enrolled in a private funded pension plans, independently of whether they are currently contributing or not.[7] The labour force, rather than the working age population is chosen as the denominator to calculate the coverage rate because survey data is used. Box 4.1 explains this choice and also contrasts the two measures of coverage for six of the countries analysed in this section.

The previous section showed that private pensions cover a large part of the working age population (over 50%) in many OECD countries. In this section, it is shown that even for some of these countries such coverage is uneven, with some groups of the population having very low enrolment rates in private pension arrangements. In order to understand coverage gaps, especially in countries where private pensions are voluntary, and their implications for retirement income adequacy, it is necessary to break down coverage by various socio-economic characteristics. An in-depth analysis of coverage (and contribution levels) can also help evaluate the different policy options that can be used to improve access to private pensions and increase contribution levels.

This section presents the main results of calculating indicators on coverage from private pensions in eight OECD countries (Australia, Germany, Ireland, Italy, the Netherlands, Spain, the United Kingdom and the United States).[8] Coverage is calculated according to age, income, gender, type of employment (full-time *versus* part-time), and type of contract (permanent *versus* temporary) using household survey data. Calculations have been produced by extracting, processing, checking and organising the information from household survey data in each country, using software that allows programming and statistical analysis (Stata and SAS). This is a heterogeneous group of countries: in six of them (Germany, Ireland, Italy, Spain, the United Kingdom and the United States) private pensions are voluntary, while they are mandatory in Australia[9] and quasi-mandatory in the Netherlands. As shown in Table 4.3, coverage rates range from 21.1% in Italy to 93.4% in the

Table 4.3. **Coverage rate of private pension plans in selected OECD countries**
As a % of total labour force or total employment

	Total[1]	Occupational plans	Personal plans
Australia (2006) – M + V[2]	90.6	78.0	15.7
Australia (2006) – V[2]	24.7	19.6	6.6
Germany (2008)[3]	51.6	24.9	40.5
Ireland (2009)[4]	41.3	31.0	12.0
Italy (2010)[5]	21.1	11.7	9.4
Netherlands (2010)[6]	93.4	92.9	30.4
Spain (2005)	22.7	4.1	19.1
United Kingdom (2009)	53.0	38.7	12.9
United States (2009)	56.7	51.6	25.2

Note: Coverage rates are provided with respect to the total labour force for all countries except Ireland for which coverage rates are provided with respect to total employment.

1. The sum of the coverage rates by type of plan does not equal the coverage rate for the total as individuals may have both occupational and personal plans simultaneously.
2. The first row includes all individuals enrolled in any superannuation fund, whether contributions are being made by the employer only (mandatory), both the employer and the individual (mandatory and voluntary), or the individual only (voluntary). It also includes individuals not contributing or for whom no contributions are being made on their behalf into a pension plan in which they have assets. The second row only includes individuals voluntarily contributing to any superannuation fund.
3. The coverage rate represents the percentage of households where at least one of the partners is enrolled in private pension plans, and in which the head is younger than 65 and at least one of the partners is in the labour force.
4. The coverage rate represents the percentage of employed individuals enrolled in private pension plans and aged between 20 and 69.
5. The coverage rate represents the ratio between the total number of pension accounts and the total number of individuals in the labour force.
6. In the Netherlands, occupational pension plans are quasi-mandatory, while personal pension plans are voluntary.

Source: OECD calculations using the Household, Income and Labour Dynamics in Australia (HILDA) survey, the German SAVE survey, the Irish Quarterly National Household Survey (QNHS), the OECD Global Pension Statistics data set (for Italy), the Dutch DNB Household Survey (DHS), the Spanish Survey of Household Finances (EFF), the British Family Resource Survey (FRS), and the American Survey of Income and Programme Participation (SIPP).

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Netherlands. In Australia, where employers are obliged to contribute[10] to occupational pension plans, while individuals are not, 90.6% of those in the labour force are enrolled in private pension plans, but only 24.7% make personal voluntary contributions to those plans.

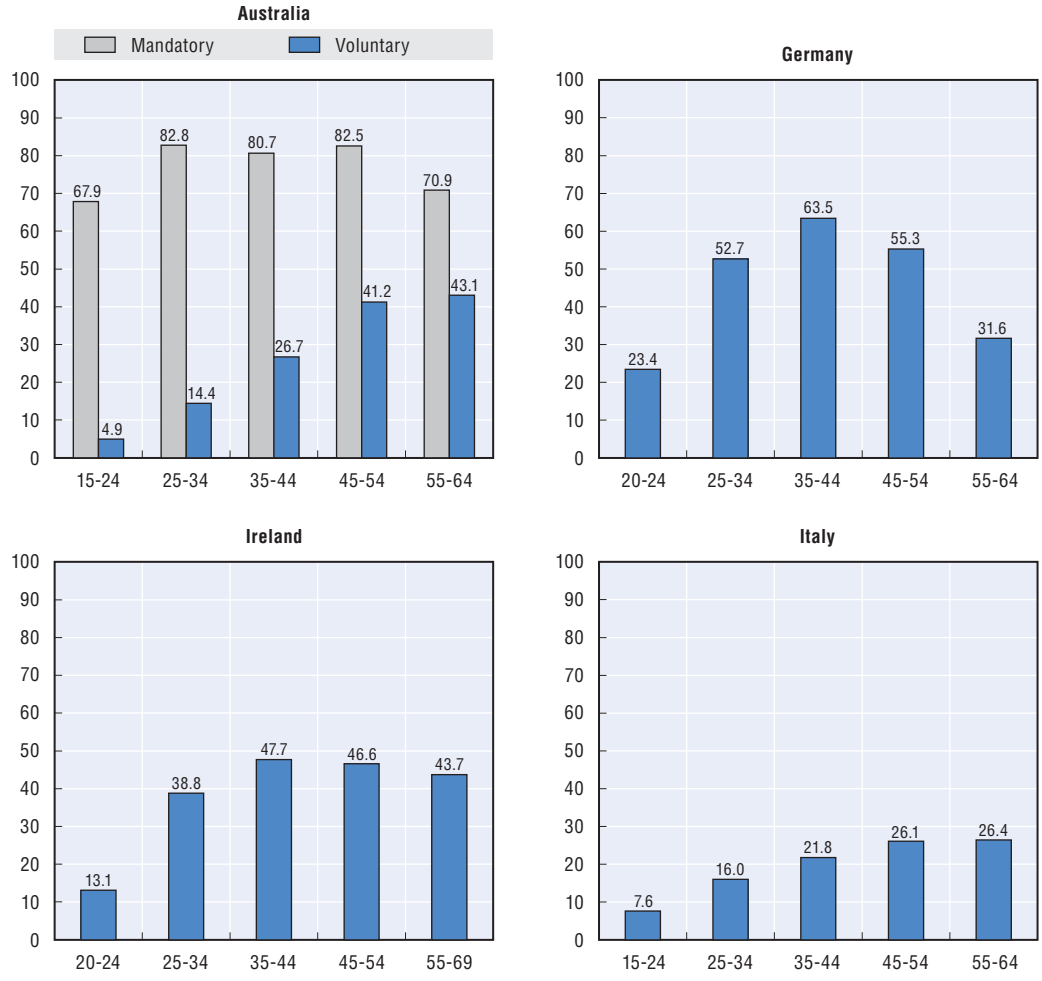
4.4.1. *Coverage rates of private pension plans by socio-economic characteristics*

Calculations show that younger individuals tend to be less often enrolled in privately managed funded pensions, especially in voluntary systems. In Germany, Ireland, Italy, Spain, the United Kingdom, and the United States, where private pensions are voluntary, as well as in the voluntary part of the Australian and Dutch systems, coverage increases with age. Figures 4.4a and 4.4b show that the share of the labour force enrolled in voluntary private pension plans is significantly lower for individuals aged between 25 and 34 than for individuals aged between 35 and 44 (the difference between these two age groups ranks from 5.8 percentage points in Italy to 17.6 in Spain). This suggests that individuals start saving in voluntary private pension plans rather late and may be too late to have adequate pension benefits at retirement.

In contrast, coverage is relatively constant across age groups in mandatory or quasi-mandatory private pension plans, as illustrated for Australia and the Netherlands. In these two countries the coverage rate for those aged 15 to 24 is lower than for other age groups. In Australia, the system is mandatory (employers need to make contributions) for employed persons aged between 18 and 70 years old[11] earning more than AUD 450 a

Figure 4.4a. **Coverage rate of private pension plans according to age**

As a % of total labour force



Note: Coverage rates are provided with respect to the total labour force for all countries except Ireland for which coverage rates are provided with respect to total employment.

Source: OECD calculations (see Table 4.3).

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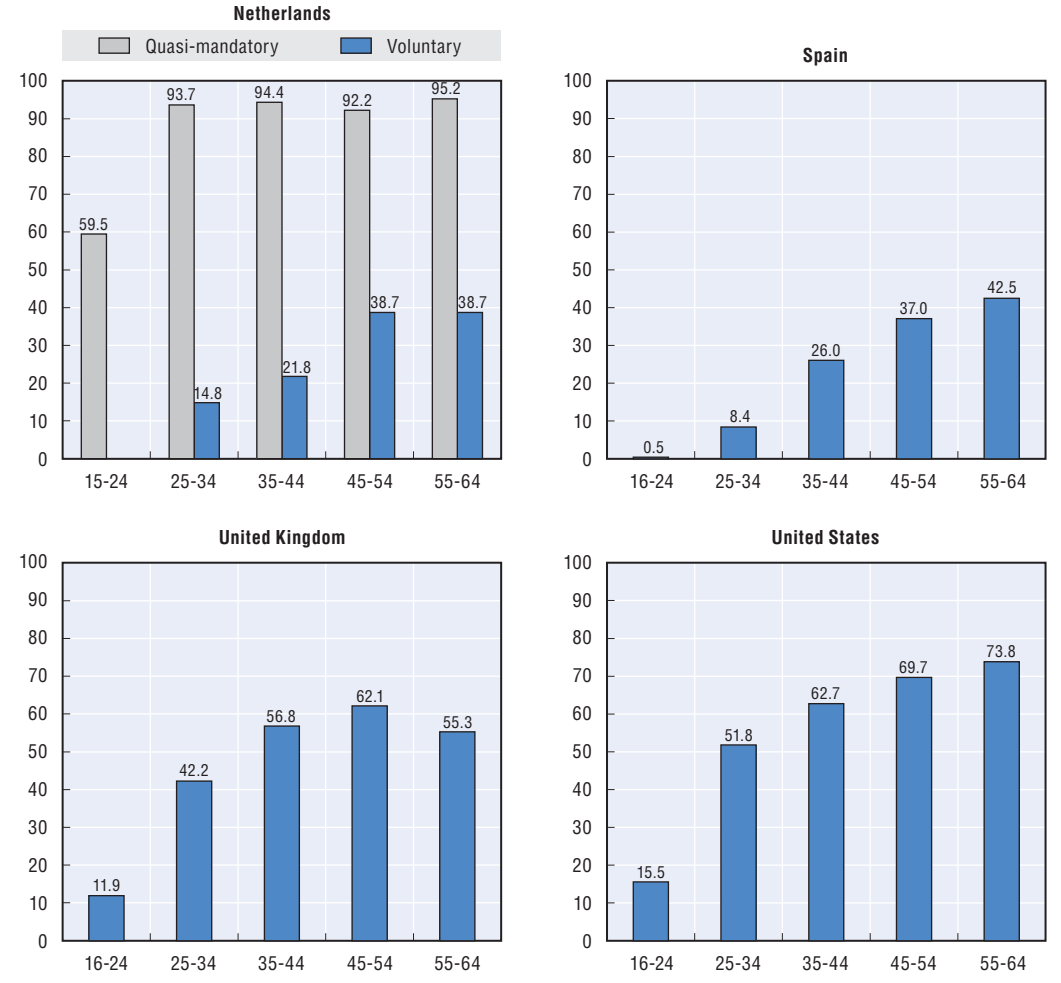
month. Therefore, the system is not mandatory for many in the very young group (those aged 15 to 24) and, moreover, the share of people earning less than AUD 450 a month is greater in the very young group than in other groups. In the Netherlands, the very young tend to work disproportionally in sectors without mandatory coverage. In addition, the young tend to have more temporary contracts than other age groups. People in temporary contracts are less likely to be enrolled in private pension plans.

Finally, it is interesting to note that in Germany coverage drops significantly for individuals aged 55 to 64. This is explained by the relatively higher share of low income people at old ages and the direct relationship between coverage and income (as shown below, low income individuals tend to be less often enrolled in private pension plans). Indeed, in Germany the share of households where the head is aged 55 to 64 and in the three lowest income deciles (39.8%) is higher than for those where the head is aged 45 to 54 (23.8%) or those aged 34 to 44 (22.8%).

Figure 4.4b. **Coverage rate of private pension plans according to age**

As a % of total labour force



Source: OECD calculations (see Table 4.3).

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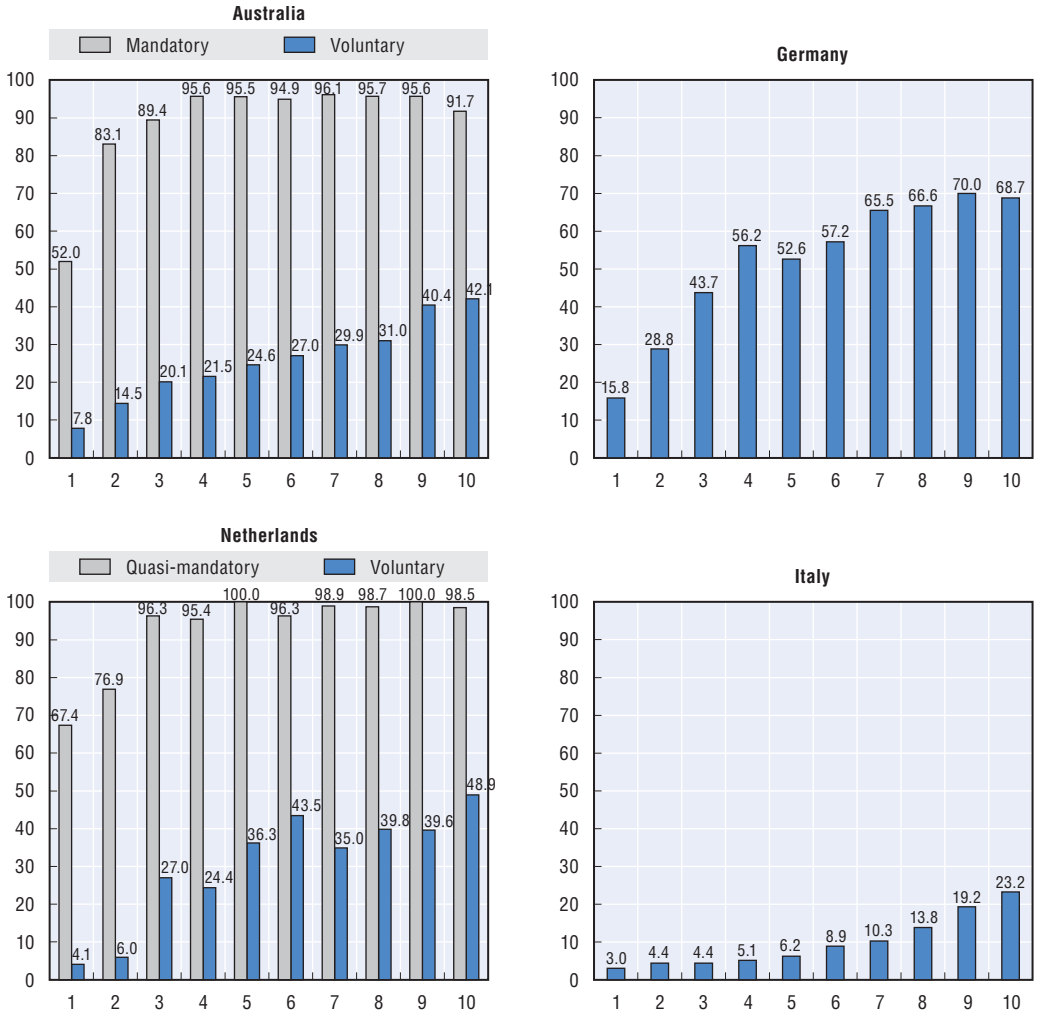
Figures 4.5a and 4.5b show that coverage also increases with income, especially in voluntary systems. In all the countries for which this information is available (all except Ireland), coverage rate in voluntary private pensions generally increases with income, reaching a plateau after the 7th or 8th income deciles.[12] In Australia and the Netherlands, when focusing on the mandatory or quasi-mandatory part of the system, the plateau is reached much earlier, after the 2nd or 3rd deciles and the coverage rate among the poorest income groups is above 65%.[13] In voluntary systems however, the coverage among the poorest income groups is quite low, at around 15%, except in the United States where it reaches 29%. This may have important implications for income inequalities in old age, especially if replacement rates from PAYG pensions are not sufficient for low earners.

In contrast, only some of the countries analysed show a gap in coverage by gender. The largest gap is observed in the Netherlands (where the coverage rate of voluntary personal pension plans for men is higher than the one for women by 16.4 percentage points), followed

Figure 4.5a. **Coverage rate of private pension plans according to income**

As a % of total labour force



Source: OECD calculations (see Table 4.3, except for Italy for which the Survey of Household Income and Wealth has been used).

StatLink http://dx.doi.org/10.1787/888932598550

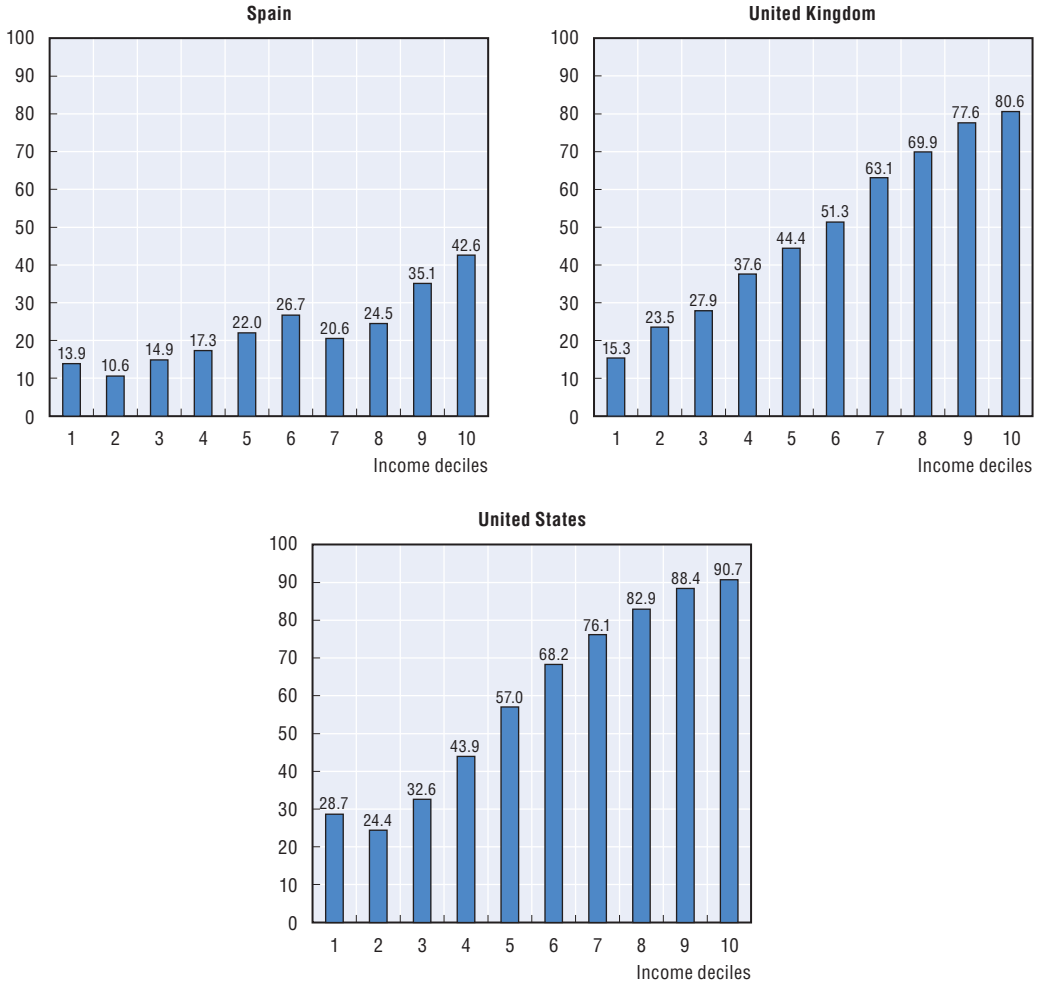
by Ireland (10.3 p.p.), Italy (5.4 p.p.), and Spain (3.0 p.p.). In Germany, the United Kingdom and the United States, the difference in coverage between men and women is negligible (Figure 4.6).

The gender difference in Ireland may be explained by the large gap in coverage between full-time and part-time workers. Figure 4.7 indeed shows that full-time workers in Ireland are more often enrolled in private pension plans than part-time workers (25.4 p.p. difference). In addition, data from the Irish Quarterly National Household Survey show that women tend to be more often in part-time jobs (in 37.1% of the cases) than men (11.5%).

It may seem surprising that in the United Kingdom there is no gender effect on coverage like in Ireland, as the difference in coverage between part-time workers and full-time workers is also large (31.6 p.p.). Indeed, as shown by data from the British Family

Figure 4.5b. **Coverage rate of private pension plans according to income**

As a % of total labour force



Source: OECD calculations (see Table 4.3).

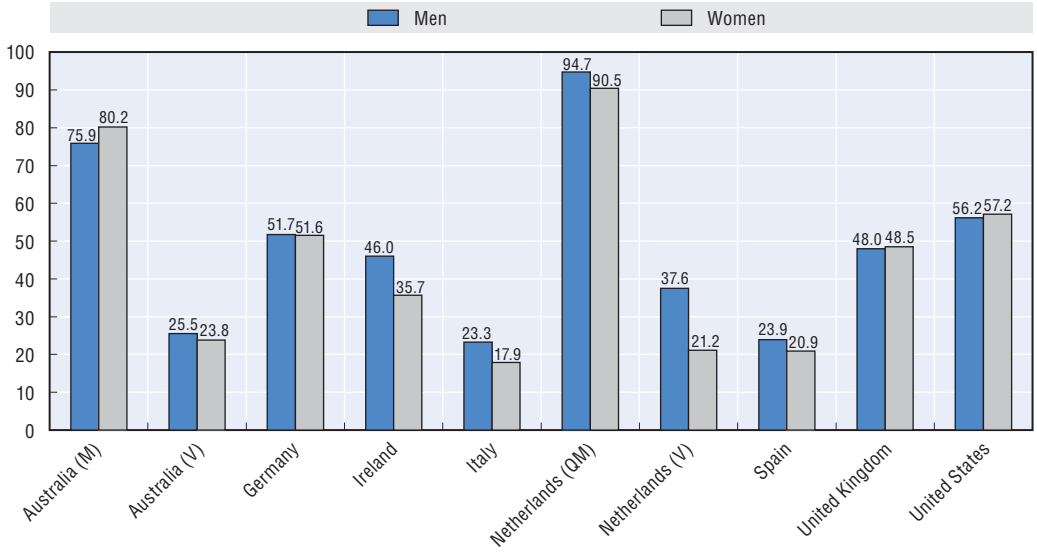
StatLink http://dx.doi.org/10.1787/888932598550

Resource Survey, 8.7% of women and 2.5% of men in the United Kingdom have a part-time job. However, the coverage rate of women in part-time jobs is higher (32.7%) than the one of men in the same category of jobs (17.8%), which explains why the overall coverage is broadly similar for both genders. The same explanation applies for Australia.

Finally, the coverage rate is lower for workers having a temporary contract than for workers having a permanent contract in all the countries for which this information is available (Figure 4.8). The difference is particularly important in Germany, the Netherlands, and Spain where the coverage rate of workers having a permanent contract is at least 17 percentage points higher than the one of workers having a temporary contract. The lower coverage rate of workers with temporary contracts can also partially explain why younger individuals tend to be less often covered than their elders as, in all the countries analysed, the proportion of workers having temporary contracts decreases with age.

Figure 4.6. **Coverage rate of private pension plans according to gender**

As a % of total labour force



Note: Coverage rates are provided with respect to the total labour force for all countries except Ireland for which coverage rates are provided with respect to total employment.

Source: OECD calculations (see Table 4.3).

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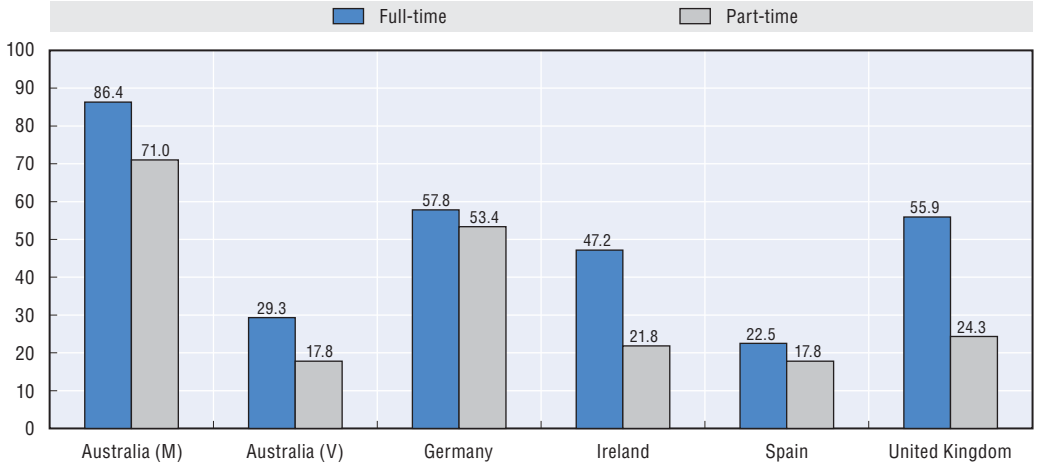
Figure 4.7. **Coverage rate of private pension plans according to the type of employment**

As a % of total labour force



Note: Coverage rates are provided with respect to the total labour force for all countries except Ireland for which coverage rates are provided with respect to total employment.

Source: OECD calculations (see Table 4.3).

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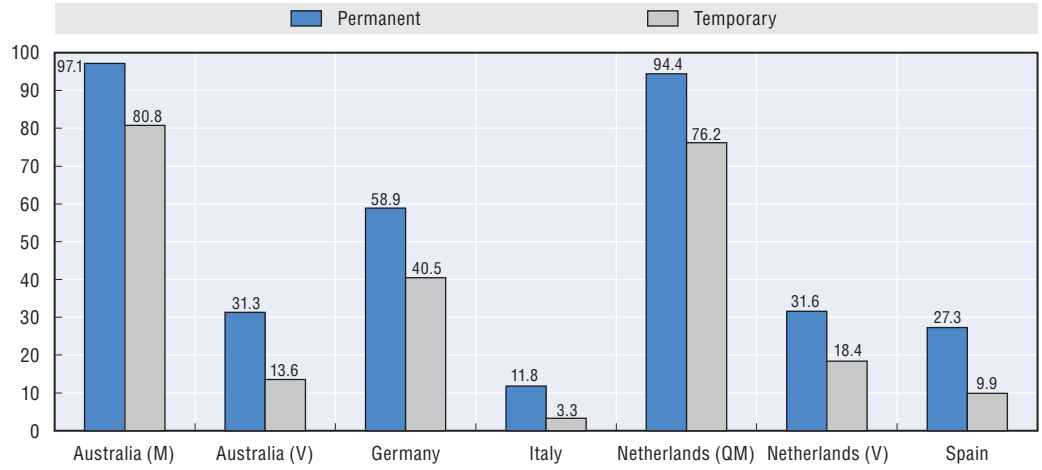
Figure 4.8. **Coverage rate of private pension plans according to the type of contract**

As a % of total labour force



Source: OECD calculations (see Table 4.3, except for Italy for which the Survey of Household Income and Wealth has been used).

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4.5. Policy options to increase coverage

This section assesses policy options to increase coverage in private pensions. Uneven coverage rates could be the result of differences in workers' access to private pension plans as well as differences in the set of incentives and alternatives faced by eligible individuals. Options to overcome obstacles to achieve high and uniformly distributed levels of coverage include compulsory and automatic enrolment, providing financial incentives, developing financial education programmes, as well as facilitating and simplifying provision of, access to and choice in private pension arrangements. Finally, the interaction between public and private pensions needs to be considered, particularly as means-tested benefits can strongly affect labour and savings decisions.

4.5.1. *Compulsory enrolment*

As shown in Section 4.3, making enrolment into private pensions compulsory is ultimately the most effective policy in raising coverage levels. In high income level OECD countries, the difference in coverage rates between countries with mandatory and voluntary private pension systems is as much as 30 percentage points. Both mandatory (as in Australia) and quasi-mandatory solutions (as in the Netherlands) can ensure high coverage rates.

As a policy, compulsory enrolment can be supported by evidence from the behavioural economics and psychology literature that shows individuals being bad at committing to save for retirement. Procrastination, myopia and inertia lead many individuals to postpone or avoid making the commitment to save sufficiently for retirement even when they know that this is ultimately in their best interest. Compulsory enrolment also ensures a more equal distribution of any tax benefits or other government incentives offered to private pension arrangements.

The main limit to compulsory enrolment is formal sector employment. It is very hard to get workers outside the formal economy and economically inactive individuals to contribute to any form of contributory pension arrangement (public or private). This explains why compulsory enrolment generally works well in high income OECD countries but has been less successful in achieving high coverage rates in countries such as Chile or Mexico.

There are also potential disadvantages to compulsory enrolment that need to be considered. First, making a system compulsory requires setting a specific contribution rate, which may be inefficient for some workers, especially if it forces them to become more indebted or diverts funds from other necessary expenses such as educating children, or from investing in property or one's own business. As argued by Blake *et al.,* (2011), though, this problem can be at least partly addressed by setting age-dependent contribution rates. Second, mandatory contributions to pensions may be perceived as a tax, discouraging people from working. Third, compulsory enrolment can lead to a ratcheting down effect, where existing provision is reduced if the target set by the government is lower than prevailing practice. Fourth, compulsory enrolment may not be necessary for all individuals depending on the design of the overall pension system. Low income workers for instance may not need to contribute in private pension plans if they already enjoy high replacement rates from the public pension system.

4.5.2. *Automatic enrolment*

An alternative to compulsory enrolment that has gained popularity in recent years is automatic enrolment. At its essence, it involves signing up people automatically to private pensions but giving them the option to opt out with different degrees of difficulty. The policy relies on individual behavioural traits such as inertia and procrastination. Automatic enrolment has long been used by employers in the United Kingdom and the United States on a voluntary basis and there is a long body of empirical research supporting a positive impact on coverage.[14]

The popularity of automatic enrolment has increased in the United States with the passing of the Pension Protection Act in 2006, which made it much easier for companies to automatic enrol their employees into pension plans. In 2012 the United Kingdom also saw the introduction of nation-wide automatic enrolment for all those workers who are not currently covered by a private pension arrangement. Employers must automatically enrol and pay minimum contributions for any workers aged at least 22 but under age 65 or State Pension age, depending on when they were born, who earn more than GBP 7 475 in a year. A new national, trust-based pension scheme has been established by the government (the National Employment Savings Trust, NEST) that may be used by employers looking for a relatively low-cost alternative to establishing their own plan or hiring existing private sector pension providers. Chile also introduced auto enrolment starting in 2012 for the self-employed working in certain tax categories. From 2015 on, though, contributing will be mandatory for these categories of workers, who will pay contributions through their annual income tax declaration. Ireland is also considering introducing a national auto enrolment retirement savings system.

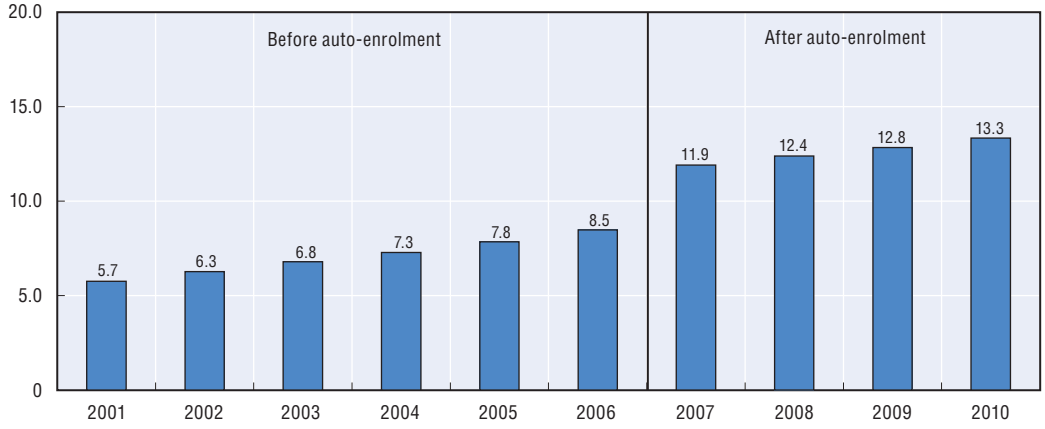
The first two OECD countries that introduced automatic enrolment at the national level were Italy and New Zealand. In Italy, automatic enrolment was introduced in 2007. For all salaried employees, it involved the payment into the pension funds of the future flow of the severance contributions (*Trattamento di fine rapporto*, TFR), set at about 7% of salary. Individual workers were given a period of six months in order to decide whether to opt out of this arrangement, keeping their rights regarding the TFR as in the past. The pension fund that would receive the TFR contribution was generally indicated by labour agreements.

According to COVIP, the Italian pension supervisor, the reform involved about 12.2 million private-sector employed workers, and several hundreds of thousands of companies. As a result, 1.4 m additional workers enrolled in private pensions between end 2006 and end 2007; only a small minority enrolled just automatically, while the vast

majority of new members did express their will to enrol and pay additional contributions, so as to get matching contributions from employers. In the space of one year the working age population coverage rate increased from 8.5% to 11.9% (see Figure 4.9).

Figure 4.9. **Italy: Coverage rate of private pension funds before and after auto-enrolment**

As a % of the working age population



Source: OECD, *Global Pension Statistics*.

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While the increase in coverage was significant it was below expectations and at odds with the experience in other countries. Rinaldi (2011) argues that the relative failure of the TFR reform is mainly due to the fact that the TFR is highly valued by both employers and employees. It provides a cheap form of financing to smaller employers, hence they may have encouraged workers to opt out. The TFR is also attractive for employees because it offers a return guarantee and it can be drawn when they leave their firm. The implementation of the automatic enrolment programme was also mired by some implementing difficulties, such as its introduction one year earlier than originally planned, and a sub-optimal definition of the default option and of the communication strategy aimed to support the reform. Indeed, the government may have had mixed interests, since after the reform employers with 50 employees or more have to pay the annual contributions financing the TFR into a public fund for employees who opt out. Therefore, any increase in pension fund enrolment has a cost for the public budget.

The other main example of automatic enrolment into private pension arrangements is New Zealand's KiwiSaver which was introduced in July 2007 (see Rashbrooke, 2009). Employers must enrol new employees into the scheme and individuals have two months to opt out. The minimum contribution is 2%, which is deducted from employee earnings, and an employer contribution of 2% of salary is added.[15] The government also fully matches employee contributions up to NZD 10 per week, and "kick-starts" each individual account with NZD 1 000.[16] If an employee makes no decision to either opt out or actively choose a KiwiSaver provider, Inland Revenue automatically assigns that employee to one of six "default" providers, as selected and registered by the government. Existing employees not subject to the auto-enrolment rule can also join (opt-in) the KiwiSaver plan on a voluntary basis.

As of end 2010, there were 1 610 453 members in KiwiSaver, according to Inland Revenue statistics, or about 55% the working age population. So far, the proportion of

workers opting out has averaged around 30%, following a declining trend.[17] Unsurprisingly, opting out is more widespread among younger workers (37% of 25-34 years old, for example) than older (25% for people aged 55 or over).[18] According to Inland Revenue's statistics, as at the end of 2010, only 36.6% of KiwiSavers can be said to be in the plan because of automatic enrolment, while opt-in via the employer constituted 13.7% of enrolment, and opt-in via a KiwiSaver provider was 49.7%. The government subsidies provided to the Kiwisaver accounts and relatively liberal withdrawal rules (described in the corresponding subsection below) may have also played an important role in ensuring high levels of participation as shown below.

The KiwiSaver also provides a crucial insight into the importance of the default contribution rate. Members joining the KiwiSaver before 1 April 2009 where assigned to a default contribution rate of 4%. Since April 2009 the default contribution rate was moved down to 2%. Inland Revenue statistics show that as of 30 June 2011, 80% of people who joined the KiwiSaver after April 2009 contribute 2%, the default, while 62% of those who joined when the default contribution rate was 4%, still contribute 4%. The focal importance of the default and inertia are clearly at play here, showing how important it is to get the default contribution rate right. From 1 April 2013 the default contribution rate will increase to 3%.

4.5.3. *Financial incentives*

Historically, tax incentives (tax deductions and credits) have been the main type of financial incentive provided by governments to promote private pensions. Such incentives benefit higher income households most (as they are subject to the highest tax rates). However, the largest coverage gaps are concentrated among lower and middle income households who may draw little benefit from tax incentives. In order to enhance the financial value incentives for such households some countries have introduced flat subsidies to private pensions. Countries where governments pay flat subsidies to private pension accounts include the Czech Republic, Germany, Mexico (the *Cuota Social* paid to the mandatory individual account system), and New Zealand.

Matching contributions from either the employer or the state can also help increasing coverage and contributions in private pension plans. Matching contributions enable certain groups to be targeted. For example, governments can match contributions only for women, the young (as in Chile) or low income individuals (as in Australia). In New Zealand, on the other hand, matching contributions from both the government and employers are available for all workers. Matching contributions are also common in some voluntary, occupational pension plans (*e.g.* 401(k) plans in the United States), where sponsoring employers match the contribution made by employees up to a certain amount percentage of the worker's salary.

New Zealand offers an interesting case study as both flat subsidies and matching contributions are used at the relatively generous levels described above. According to Inland Revenue's 2009/10 annual report, most people in New Zealand are joining KiwiSaver because they consider it to be a good way to save for retirement. The financial incentives from the government and employers play a major part in the positive perception of the KiwiSaver and may partly explain why the proportion of the working age population that chose to opt in into the KiwiSaver (i.*e.* excluding the auto-enrolled) is larger (35.2%) than the coverage rate of occupational superannuation schemes (8.2%). There are however other motivations to join KiwiSaver, as shown in Table 4.4. In particular, its default and other design features make the KiwiSaver an easy and effective way to save for retirement and for purchasing a home.[19]

Table 4.4. **Most important motivations and barriers to membership**

Reasons for joining KiwiSaver	% of members
Securing a retirement income	75
Government and employer contributions	77
Easy way to save	72
Reasons to enrol children	% of members who have enrolled their children
Government kick-start contribution	83
Saving for retirement	59
Saving for a home	54
Teaching children good savings habits	52
Reasons for not joining KiwiSaver	% of non-members
Could not afford to join	32
There are better ways to provide for one's financial security/It is better to pay off mortgage or student loan debt	30
Simply had not got around to joining	26
Concern about the lack of security for the money or the fact that current and/or future governments may make changes to the scheme as membership deterrents	25

Source: Inland Revenue's Annual Report July 2009-June 2010.

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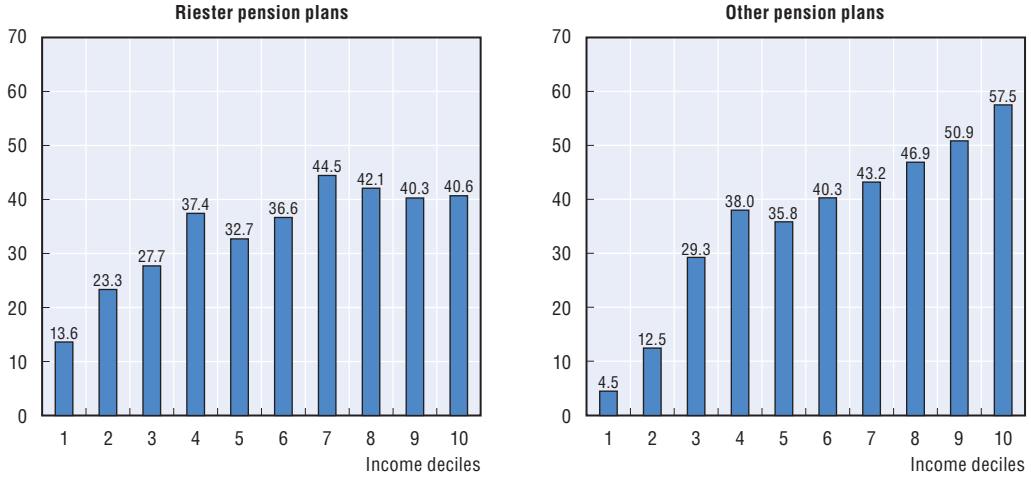
The financial incentives (flat subsidies and matching contributions) largely explain why the coverage rate (as reported by Inland Revenue statistics) is very similar across income groups in New Zealand, a rather unique feature among voluntary, private pension systems. The Kiwisaver plan provides strong financial incentives for existing employees to opt-in and for new employees to remain (not to opt-out).

Germany also experienced an important increase in coverage thanks to the introduction of *Riester* pensions in 2001 as part of a major pension reform. *Riester* products can be purchased by anyone covered by the social insurance system and who is subject to full tax liability. Participants qualify for subsidies or tax relief from the government, the level of which depends on the respective contribution rate and number of children. To receive full state subsidy, pension participants must invest at least 4% of their previous year's income in a *Riester* plan.[20] Since 2008, the basic annual state subsidy is EUR 154 for single persons, EUR 308 for married couples (when each partner has his/her own plan) and EUR 185 for every child (EUR 300 for children born in 2008 or after). Only very low income households can get the full subsidy without investing 4% of their income if they contribute at least EUR 60 annually. This exception holds for people receiving minimum social benefits, low income workers (earnings less than EUR 800 per month) and non-retired inactive people without income. Alternatively, both own contributions and state subsidies can be deducted from the participant's taxable income, up to EUR 2 100.[21] This is usually more advantageous for workers with higher-than-average earnings. The coverage rate of *Riester* pension plans was 26.7% of the working age population at the end of 2010.

Unlike occupational and other personal pensions in Germany, *Riester* pensions generally achieve a better distribution of coverage across income groups. Figure 4.10 below shows the percentage of households where at least one of the partners is enrolled in a private pension plan other than a *Riester* plan (right panel) or in a *Riester* plan (left panel). When *Riester* plans are excluded, the higher is the income of the household the higher is the coverage rate of private pension plans. Coverage rates for *Riester* pensions are on the other hand more homogeneous across income groups and actually peak for individuals in the medium income groups (4th and 7th deciles). The distribution of coverage rates by

Figure 4.10. **Germany: Coverage rate of private pension plans according to the income of the household and the type of plan, December 2008**

As a % of total labour force



Source: OECD calculations using the 2009 SAVE survey.

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income is also more concentrated for *Riester* pension plans than for other private pension plans. In particular, *Riester* pension plans achieve higher coverage rates for low income households (*e.g.* 13.6% of the labour force in the 1st decile) than other private pension plans (4.5%), even though the average coverage rate of *Riester* plans is lower.

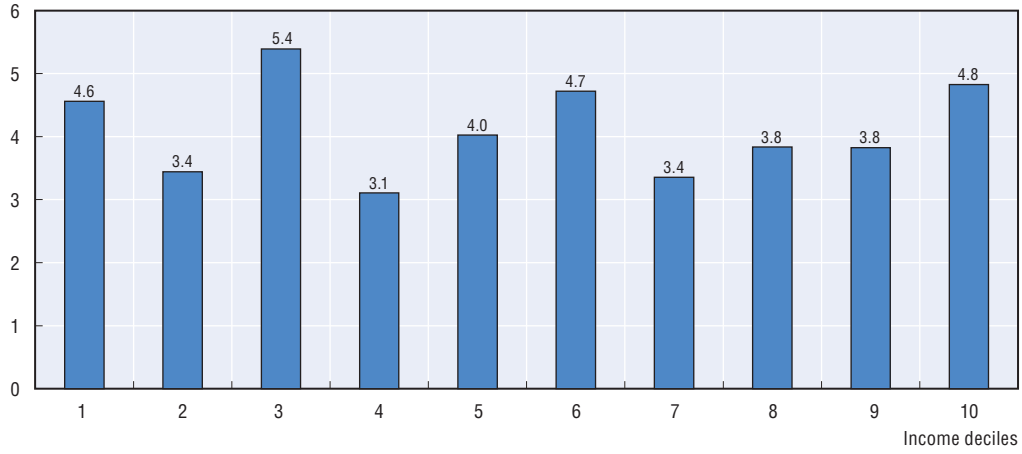
The main difference between *Riester* pensions and other pension arrangements is that they are predominantly of the personal kind and that they benefit from a substantial government subsidy. The fact that they are personal should in principle make them less accessible to low earners. However, as the system has been primarily designed so as to be accessible to low earners (through the minimum annual contribution of EUR 60 for people receiving minimum social benefits for instance), it is actually easier for them to get the full state subsidy. This is most probably the prime factor behind the comparatively high coverage rates among low earners.

Additionally, the design of the government subsidy in *Riester* plans may explain why contribution rates do not follow any clear pattern by income (Figure 4.11). As indicated above, the subsidy in *Riester* plans is similar for everyone independently of income and, consequently, introduces a strong incentive to enrol but it does not provide strong incentives to make contributions above the minimum required. The actual contribution rate is actually rather constant across the income scale, around the 4% minimum required by the legislation to obtain the full state subsidy.

In Australia, since 2003, the Superannuation Co-contribution scheme provides dollar-for-dollar matching contributions from the government for low income earners who make additional contributions to their superannuation fund, up to a maximum of AUD 1 000 per year. On the other hand, unlike Germany and New Zealand, there is no flat subsidy. The target population for co-contributions is those who, during the previous financial year, lodged an income tax return, were aged under 71, their total income was below the maximum threshold and their eligible income was at least 10% of total income. According to the Australian Taxation Office, of that target population, only 15.7% were entitled to a

Figure 4.11. **Germany: Contribution rates in *Riester* pensions according to the income of the household, December 2008**

As a % of household net income



Source: OECD calculations using the 2009 SAVE survey.

StatLink http://dx.doi.org/10.1787/888932598664

co-contribution in the 2010-11 year of processing. This has been reducing each year since the 2007-08 year peak of 20.3%. The reduction in co-contribution matching rates from 150% to 100% for eligible personal contributions made after 1 July 2009, combined with a reduction in the maximum entitlement from AUD 1 500 to AUD 1 000 can partially explain why fewer low income individuals make use of this system.[22]

In Australia, low income people are less likely to be enrolled and contributing than other income groups, but those contributing tend to contribute a higher share of their wage than other income groups. Coverage and contribution rates in the voluntary component of the Australian superannuation system (Figure 4.12) suggest that despite the matching, low income individuals still have lower coverage rates than other income groups in Australia.[23] However, among those who contribute to their superannuation account voluntarily, low income individuals tend to have a higher contribution rate than other income groups. For low income people to take advantage of the maximum matching requires a larger contribution effort than for higher income groups.

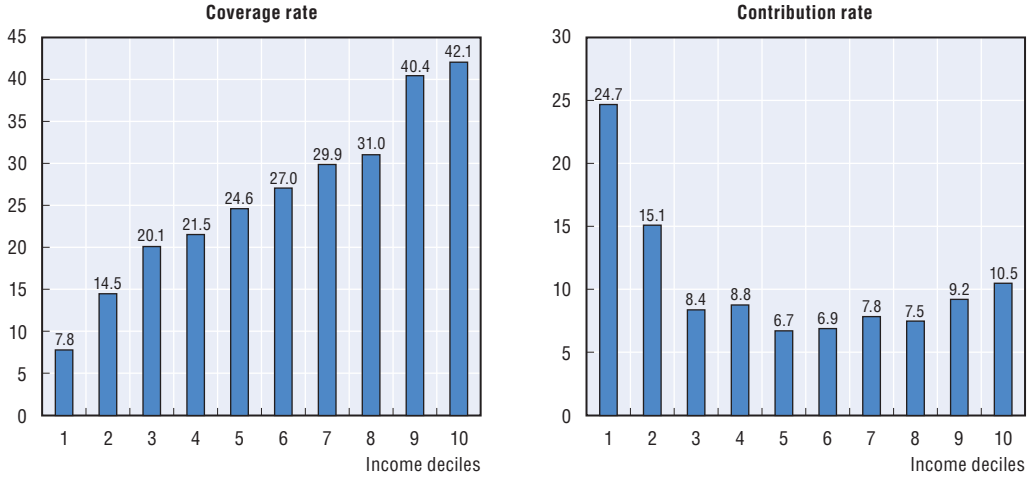
The Australian, German and New Zealand experiences highlight the strong impact that subsidies and matching contributions can have on coverage and contribution rates. The German experience suggests that flat subsidies have a positive effect on the coverage rate for low income individuals, while the Australian case shows that matching contributions encourage higher contributions but are not necessarily effective in raising coverage among low income groups. New Zealand, which combines both subsidies and matching contributions, achieves the highest coverage rates among low income workers groups when compared to other groups.

4.5.4. *Financial education*

Financial education programmes can also be used to promote coverage in private pension arrangements. However, the evidence on the effectiveness of these programmes – primarily from the United States –, is rather mixed. For instance, there is little evidence that printed media has any impact on participation or savings rates (Bernheim and

Figure 4.12. **Australia (voluntary component): Coverage and contribution rates according to income**

As a % of total labour force and as a % of individual gross earnings



Source: OECD calculations using the 2006 HILDA survey.

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Garrett, 2003), while there is some evidence that at-work retirement seminars help raise coverage and contributions among lower income workers (Lusardi, 2004).

Some of the most effective programmes are those that aim at explaining the rationale for saving in simple terms using effective communication tools borrowed from the advertising and marketing world. Lusardi, Keller, and Keller (2008) describe a planning aid that simplifies the decision to save and helps employees make an active choice. The planning aid provides several pieces of information to help overcome identified barriers to saving and uses marketing techniques to motivate participants to save. The programme's success can be judged by the tripling of contribution rates after its introduction.

4.5.5. *Facilitating and simplifying provision, access and choice*

In countries with voluntary occupational pension arrangements, small companies are often discouraged from establishing a pension plan because of the associated administrative costs and regulatory burden. Some countries, such as the United States and, more recently, Canada have addressed this problem by creating a framework for a simpler type of pension arrangement. The United States has the Simplified Employee Pension (SEP) Plan while Canada introduced the Pooled Registered Pension Plan (PRPP) in December 2010.[24] In both cases, these plans are of the defined contribution type and are administered by financial institutions. In Canada's case, the PRPPs are intended to be a low-cost portable vehicle, offered by licensed providers and attractive for small and medium sized employers and the self-employed.

A more direct route to promoting low-cost provision has been taken in the United Kingdom, where the government has established a relatively low-cost pensions provider, NEST, that will be run with charges of 2% on contributions and 0.3% on assets. While there has been some criticism of this charge level, it compares rather well with the typical fees charged by commercial pension providers. NEST's main target are low-income employees, who have currently the lowest coverage rate of private pensions.

Employee participation in existing private pension arrangements can also be improved by simplifying the steps and choices that must be taken for joining a plan. Choi, Laibson, and Madrian (2009) study the effect of Quick Enrolment in the United States, a programme that simplifies the decision of whether or not to enrol by assigning those who do enrol into a pre-set contribution rate and asset allocation. Employees may change these parameters if they wish, but they do not have to make an active choice when they join the plan. The programme had a clear positive impact on coverage, tripling participation rates in 401(k) plans among new hires from 5% to 19% in the first month of enrolment. When the programme was offered to previously hired nonparticipants, participation increased by 10 to 20 percentage points.

Access to private pension arrangements can also be improved by ensuring that providers reach out effectively to the uncovered population, particularly those groups that are most difficult to enrol such as the self-employed and rural-sector workers. An interesting case is the Indian New Pension Scheme, which is mandatory for government officials, but voluntary for informal sector workers. Enrolment is performed by so-called "points-of-presence", the first point of contact between members (or potential members) and the NPS system. Banks, post offices, depository agencies, and pay and accounts offices are all permitted to conduct the NPS related business as "points-of-presence". This should greatly assist individuals' participation, particularly those living in remote rural area where many financial institutions are absent and the establishment of new branches is not financially practical.

4.5.6. *Possibility of withdrawals*

For individuals, a major worry about putting money into private pension arrangements, whether mandatory or not, is that they are not able to withdraw it until retirement. Yet, there may be cases where accessing some of those funds could help solvent a major shock, such as defraying health expenses that are not covered by the health system (or private insurers). For this reason, some countries allow withdrawals from retirement saving systems under specific, exceptional circumstances. Such rules may reassure savers and increase the attraction of private pension arrangements.

Some countries have a rather liberal approach to withdrawals. In New Zealand's Kiwisaver, after the first 12 months of membership, automatically enrolled workers may take a "contribution holiday" for a minimum of 3 months, up to 5 years at a time for any reason. Participants may also withdraw all of their funds at any time in the event of serious illness or permanent disability, if they face significant financial hardship (such as a dependent's medical care or education) or if they wish to use the funds to make a down payment on the purchase of a first home after at least 3 years of saving in a KiwiSaver account. Similar rules on so-called hardship withdrawals apply in the United States for 401(k) plans, IRAs and other qualified plans. In addition, funds may be withdrawn at any time before age 59.5, but are subject to a 10% tax penalty in addition to the going income tax rate.[25] Allowing early withdrawals, even when subject to a tax penalty, may divert too much of the money initially intended to finance retirement and pose retirement income adequacy issues.

4.5.7. *Disincentives created by means-testing*

In many countries, basic, public pension benefits and in particular the social safety net is means-tested. Under means-testing, public benefits are withdrawn more or less rapidly depending on the individual's other income sources (and in some cases, his or her wealth).

Incentives to save for retirement in complementary arrangements can be severely affected, at least for low and middle income employees. In recent years, some countries have addressed this problem by reducing the so-called withdrawal rate, that is, the rate at which public pensions are reduced with growing private pension income. For instance, in Chile, the 2008 pension reform introduced a universal, basic pension benefit that lowered the withdrawal rate to about 30%. In the United Kingdom, the withdrawal rate was close to 100% until 2003, when it was lowered to about 40% with the introduction of the Pension Credit (OECD, 2011).

The ultimate effect of means-testing on savings and labour supply decision is ambiguous, as there are both substitution and income effects. However, as they generally make individuals worse off, particularly those on lower earnings, there is a strong argument to keep withdrawal rates low. Some countries have gone as far as eliminating means-testing altogether, by introducing universal, flat-rate pensions where the only eligibility conditions are age and a residency test. Examples of such universal pensions include the Netherlands and New Zealand.

4.6. Conclusions

The complementary role of funded, private pensions is of prime policy importance as in many OECD countries replacement rates from public, PAYG pension systems are not expected to reach a level that would allow all individuals to avoid a significant reduction in their standard of living in retirement. In as many as 22 of the 34 OECD countries, based on current legislation, replacement rates offered by public, PAYG pensions to new entrants to the labour force are not expected to reach 60% for workers on average earnings. In all these countries, therefore, funded pensions are needed to ensure retirement income adequacy.

Comparing the different funded pension systems across OECD countries shows that the highest coverage rates (defined as being enrolled in a private pension plan) are found in countries with mandatory or quasi-mandatory private pension arrangements. In countries where private pensions are voluntary, the rates of coverage observed range from around 13% to 50% of the working age population, while mandatory systems have coverage rates around or above 70%. While a high participation rate is not enough to ensure retirement income adequacy from private pension plans – it should be associated with high contribution levels and good performance – it is a necessary condition to achieve it.

In order to understand gaps in the coverage of private pensions, especially in countries where these plans are voluntary, and their implications for retirement income adequacy, coverage is broken down by various socio-economic characteristics for 8 OECD countries (Australia, Germany, Ireland, Italy, the Netherlands, Spain, the United Kingdom and the United States). This analysis concludes that coverage is uneven across individuals, especially in voluntary systems. Population subgroups experiencing the lowest coverage rates are individuals younger than 35, mid-to-low income individuals, part-time workers and workers having temporary contracts. On the other hand, women are found to have similar coverage rates than men, except in Ireland, Italy, and the Netherlands, where women have substantially lower coverage.

The assessment of policy options to broaden coverage and increase contribution levels suggests that compulsory enrolment is the most effective one in achieving high and uniformly distributed levels of coverage. A national mandate for private pensions can be

particularly justified in countries where public pension benefits are relatively low. However, compulsory enrolment has some potential drawbacks, as it may force some people to become more indebted or divert funds from other necessary expenses such as educating children, or from investing in one's own property or business. Furthermore, making private pensions compulsory is a politically difficult reform. An alternative to compulsory enrolment that has gained popularity in recent years is automatic enrolment. It was introduced in 2007 in Italy and New Zealand at the national level with different levels of success and is being introduced from this year in the United Kingdom.

While the increase in coverage was significant in Italy after the TFR reform (from 8.5% to 11.9% of the working age population in the space of one year), it was below expectations and at odds with the experience in other countries. New Zealand, on the other hand, has achieved one of the highest coverage rates among voluntary pension systems, around 55% of the working age population in the space of four years. While the auto-enrolment feature has been a key factor in raising coverage, it only applies to new employees. Existing ones have to opt in. The substantial government subsidies and government and employer matching contributions provided to the Kiwisaver accounts, and the relatively easy design (with various pre-set default settings) may have also played an important role in ensuring high levels of participation in this new system. In particular, New Zealand stands out among countries with voluntary systems for achieving a relatively stable coverage rate across individuals of different income, a feature otherwise unique to mandatory systems.

Government subsidies in the form of matching contributions have also been effective in raising the coverage of *Riester* pensions in Germany, particularly among lower income workers. Unlike occupational and other personal pensions in Germany, *Riester* pensions generally achieve a better distribution of coverage across income groups and reach relatively high coverage rates among low earners. Subsidies and matching seem to broaden coverage across income groups and to entice low income contributors to contribute more than otherwise.

Other important policy options to boost coverage are financial education and facilitating and simplifying the conditions to join a plan and the choices to be made. These policies have also proved effective at increasing coverage and contribution rates. In particular, some successful financial education programmes have been developed that explain the rationale for saving in simple terms using effective communication tools borrowed from the advertising and marketing world.

It should also be noted that the effectiveness of all these policies designed to increase coverage is largely restricted to workers in the formal economy. In countries with large informality, achieving high coverage rates and regular contributions to private pension systems is a much greater challenge. Auto-enrolment, financial incentives and other policies can help, but high coverage rates are unlikely to be achieved until income levels and formal sector employment increase sufficiently.

Finally, it should be remembered that promoting the coverage of and contributions to funded, private pensions is only part of the solution to ensure the adequacy of benefits paid by these plans. Policy makers also need to address other challenges facing these arrangements, such as management costs and investment risk. The crisis has demonstrated that regulatory and supervisory frameworks need to be reviewed and adapted to better promote benefit security in private pension plans.

Notes

1. This estimate is based on rules in place prior to the latest, crisis-induced pension reform in 2011.
2. See Chapter 2 of this publication for a discussion on the sustainability of public pension promises in different OECD countries.
3. Or more generally, participants who are actively accumulating additional pension assets via contributions or additional benefit rights (in defined benefit plans).
4. Informality may not be the only possible cause for the divergence between coverage among members and contributors. For the Chilean case, Berstein and Tokman (2005) find that one of the main reasons men have for not contributing is being self-employed (the savings mandate did not apply to this employment group). In the case of women one of the main reasons is being outside the workforce.
5. For a detailed description of pension coverage in these and other Latin American countries, see OECD (2010), Ribe *et al.,* (2010) and Mesa-Lago (2008). Hu and Stewart (2009) discuss options to increase coverage among informal sector workers.
6. This section draws from the report "Indicators of coverage, contributions and benefits in private pensions, selected OECD countries" forthcoming in the *OECD Working Papers on Finance, Insurance and Private Pensions* series. This report benefited from the financial support of the European Commission.
7. Calculations have been done as well for the case of contributors alone. Results show the same patterns as those described in this section for all people enrolled in a plan independently of whether they currently make contributions or not. The corresponding data and results are available upon request.
8. For a detailed description of the overall pension systems in these countries, see the IOPS country profiles at *www.iopsweb.org/document/14/0,3746,en_35030657_38606785_41578062_1_1_1_1,00.html*.
9. The mandatory private pension system, called the Superannuation Guarantee, applies to all employees aged between 18 and 70 years old earning more than AUD 450 a month. Coverage for the self- employed is not mandatory, but there are tax advantages if one contributes.
10. Employers may contribute more than the mandatory 9% of an ordinary time wages base. This rate will gradually increase to 12% from 1 July 2013 to 1 July 2019.
11. The Australian government is removing the maximum age limit for superannuation guarantee payments for employees from 1 July 2013.
12. When focusing on personal pension plans only, the coverage rate does not reach a plateau for high income individuals but rather continues growing, except for Germany and the Netherlands.
13. In Australia, the system is mandatory for employed persons aged between 18 and 70 years old earning more than AUD 450 a month. This is why only 68% of the individuals in the lower income decile are covered.
14. Madrian and Shea (2001) and Beshears *et al.* (2006) found that automatic enrolment in two different US firms increased coverage by as much as 35 percentage points, although the effect diminished with the tenure of employees. Substantial increases in participation have been documented in other papers (*e.g.* Choi *et al.,* 2004, 2006, Thaler and Benartzi, 2004), while other papers have found that participation rates have remained high for several years (Choi *et al.,* 2004, 2006). Evidence from the United Kingdom is also generally supportive. Horack and Wood (2005) looked at 11 company pension plans in the United Kingdom of which two had introduced automatic enrolment and had low initial levels of coverage. With the introduction of automatic enrolment, coverage in these firms increased by 33 and 17 percentage points.
15. From 1 April 2013 minimum employee and employer contributions will rise from 2% to 3%.
16. A NZD 40 annual fee subsidy was eliminated in 2009.
17. The opt-out rate for the year to 30 June 2010 was 18%.
18. As discussed in OECD (2009).
19. For instance, deductions at source, savings lock-in, and the various default settings of KiwiSaver mean that, should they wish to, all an individual needs to do is to enrol and the decisions are made for them.
20. Both own contributions and state subsidies are taken into account to calculate this rate.

21. If the tax relief resulting from the deduction of *Riester* savings (both own contributions and state subsidies) from the taxable income is above the state subsidy, the tax authority pays to the participant the difference between both amounts in the form of a tax repayment.

22. From 1 July 2012, the co-contribution will be further reduced to provide 50 cents for each dollar contributed, up to a maximum of AUD 500. The Australian government will however provide a new superannuation contribution for low income earners (earning up to AUD 37 000) which will effectively refund the tax paid on concessional contributions, up to a maximum of AUD 500 per year. This contribution recognises that low income earners currently do not receive a tax concession for contributing to superannuation.

23. However, in Germany, the *Riester* system also shows lower coverage than other income groups, but higher coverage among low income groups when comparing with other pension plans.

24. PRPPs do not exist yet. A federal-provincial framework for a new workplace retirement savings vehicle was released in December 2010, and federal legislation is currently being reviewed.

25. In the United States, 401(k) plan members may also obtain loans drawn from their individual accounts. However, as these have to be paid back, they only have a small impact on asset accumulation (see Beshears *et al.,* 2010).

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Chapter 5

The Role of Guarantees in Retirement Savings Plans

This chapter examines the role of guarantees in retirement savings arrangements, in particular minimum investment return guarantees during the accumulation phase. The main goal is to assess the costs and benefits of different return guarantees. The analysis uses a stochastic financial market model where guarantee claims are calculated as a financial derivative in a financial market framework (like e.g. *the valuation of a put option). In this context, the chapter highlights the value of capital guarantees that protect the nominal value of contributions in pension plans. However, such guarantees can only be introduced relatively easily in the very specific context considered in this chapter. Allowing plan members to vary contribution periods or investment strategies, or change providers, would raise major challenges for an effective and efficient implementation of return guarantees. It would increase the complexity and cost of administering the guarantee.*

5.1. Introduction

The financial and economic crisis has highlighted the uncertainty of retirement income derived from retirement savings plans, in particular those based on defined contribution (DC) formulas. Indeed, some people with DC pension plans saw their accumulated pension saving dwindle as they were heavily exposed to risky assets. DC plans are becoming more prevalent in OECD countries as a means to finance retirement. They are already the main source to finance retirement in many OECD countries where they are part of the mandatory pension system (*e.g.* Australia, Chile, Mexico, and the Slovak Republic), and they are rapidly expanding in other countries where they are still voluntary as a result of new policy measures to facilitate access to these plans (*e.g.* Canada, Ireland, New Zealand, and the United Kingdom). As a result, several ideas are being put forward to alleviate the impact of market risk on DC pension plans. Two main proposals being considered are the establishment of default life cycle investment strategies and the introduction of minimum return guarantees during the accumulation phase.

Previous OECD work has focused on default investment strategies and recommended to have them organised around life cycle strategies as one of the approaches to mitigate the impact of market risk on retirement income derived from DC pension plans.[1] This chapter focuses on another approach highlighted as a strategy to alleviate the impact of market risk on retirement income: introducing investment return guarantees, in particular minimum return guarantees (MRG). Introducing minimum return guarantees could alleviate the impact of market risk on DC pension plan members by setting a floor on the value of the accumulated savings at retirement, either in nominal or real terms. Guarantees could therefore strengthen and complement the risk-reducing properties of life-cycle investment strategies.

The assessment of whether to introduce investment return guarantees during the accumulation phase in DC plans needs to be done in the context of the overall pension system. If public pensions (and occupational DB plans) already provide sufficient protection, guaranteeing that retirement income will always be above a certain minimum threshold, investment return guarantees may lose some of their purpose. Furthermore, even if public and other DB pensions are low, the value of guarantees in DC plans has to be compared against the cost of providing such guarantees – the fee or insurance premium to be paid for the guarantee – and their impact on investment strategies (and hence on net of fees, risk-adjusted returns). Section 5.2 discusses first the guarantees embedded in public systems that provide a floor to retirement income. For example, low income workers rely more on state pensions for retirement, which generally include a minimum pension; and, state pension provision itself has built-in automatic stabilisers and old-age safety nets.

However, even in such cases there may still be value in introducing investment return guarantees in DC pension plans. Indeed, one popular fear over funded DC pension plans is that one may end up with a level of savings at retirement that is less than the amount of

contributions. Guaranteeing that investors will at least get back the money they contributed (in nominal terms) makes saving for retirement in DC pension plans more attractive and may help increase coverage. Section 5.2 discusses secondly the type of guarantees in DC plans that exist in several OECD countries and provides a classification of these guarantees.

Based on the analysis contained in a background report,[2] Section 5.3 provides an assessment of the cost of providing minimum return guarantees in DC plans for a predefined investment strategy. It also evaluates different approaches to finance the cost of these guarantees. This section first describes the main characteristics of the minimum return guarantees analysed. It also explains the approach taken to determine the cost of different types of guarantees and to assess their impact on retirement income. Secondly, it compares the price of the different types of guarantees, as measured by the fee that the individual has to pay for them, and assesses the sensitivity of the cost to changes in different parameters. Thirdly, Section 5.3 assesses the impact of the different types of guarantees on different retirement income outcomes. It looks at the lump sum accumulated at retirement and at the distribution of replacement rates. A sensitivity analysis also assesses the impact of model parameters and specific scenarios on the results. Section 5.4 presents a series of challenges in the practical introduction of minimum return guarantees, such as the possibility of switching provider and investment choice. It also addresses the question of who may provide such guarantees and how such providers should be regulated. The last section concludes with several policy recommendations.

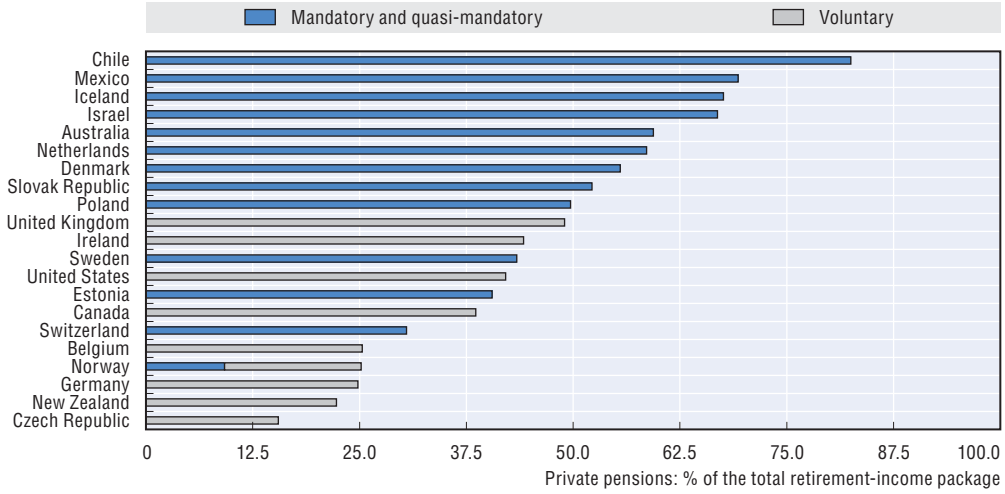
5.2. Guarantees in pension systems

Privately managed, funded pension plans are an increasingly important part of retirement income systems. As shown in Figure 5.1, private pensions will account for over 50% of total pension benefits of workers that start their careers today in countries such as Australia, Chile, Mexico, Poland, Slovak Republic, and the United Kingdom. In these countries, private pensions for new entrants to the labour force are provided predominantly in the form of defined contribution arrangements, where members bear all investment risk during the accumulation stage. As a result, pension benefits are likely to exhibit a great degree of variability both within and across generations, even for workers with similar wage, contribution and longevity profiles.[3]

In general, lower income workers tend to be less affected in relative terms by investment risk in defined contribution arrangements because, firstly, they tend to rely more on state pensions for retirement income provision, and secondly, because state pension provision itself often has built-in automatic stabilisers and old-age safety nets that partly compensate for investment losses on individual retirement accounts. On the contrary, middle and higher income workers are generally fully exposed to investment risk in defined contribution plans. However, not all countries (at least outside the OECD) have state pension systems. Moreover, in absolute terms a low or negative investment return may have a more serious impact on low income workers, as it may bring them closer to the poverty line.

One way to reduce the impact of investment risk equally across workers, without differentiating by income levels, is to introduce investment performance guarantees, in particular minimum return guarantees. Such guarantees can come in different forms but

Figure 5.1. **The role of private pensions in the overall retirement income package by type of provision**



Note: Countries with mandatory or quasi-mandatory private pension systems may also have a voluntary part which is not shown here. The calculations are based on national pension rules and parameters applying in 2008.

Source: OECD (2011), *Pensions at a Glance 2011: Retirement-income systems in OECD and G20 countries*, OECD Publishing, Paris.

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their main objective is to provide a floor to the value of savings that an individual will accumulate at retirement for a given contribution record. Deferred, indexed annuities provide an even stronger form of protection than minimum return guarantees as they ensure that the level of retirement income does not fall below a certain value throughout the retirement period. However, the cost of deferred annuities is higher than that of the minimum return guarantee embedded in those products as they also protect against longevity risk.

5.2.1. *Public pension automatic stabilisers and old-age safety nets*

The overall impact of investment risk on retirement income depends on the automatic stabilisers and anti-poverty safety nets built into countries' pension systems. Most countries have provisions that help prevent retirees from falling into poverty in their old age, which may buffer the impact of investment losses on retirement income for some people. Resource-tested benefits and taxes may act as "automatic stabilisers" by reducing the full brunt of the effect of investment risk on retirement income.

Resource-tested schemes in public retirement income programmes interact with the value of private pensions providing an automatic stabiliser for net retirement incomes. Most public retirement-income programmes – basic pensions and earnings-related schemes – will pay the same benefit regardless of the outcome for private pensions –, but not so for many resource-tested schemes. In Australia, Chile and Denmark, for example, most current retirees receive resource-tested benefits. The value of these entitlements increases as private pensions deliver lower returns, protecting much of the incomes of low- and middle-earners. The withdrawal rate of the benefit against other income sources is currently 50% in Australia and 30% in Chile and Denmark. In Australia, for example, each extra dollar of private pensions results in a 50 cent reduction in public pension. Conversely, a dollar less in private pensions results in 50 cents more from the public pension. Around

85% of older people in Australia and 65% in Denmark receive at least some benefit from resource-tested schemes. In Chile, the scheme introduced in 2008 is being rolled gradually and is expected to cover 60% of older people by 2012. The proportion of older people receiving such resource-tested schemes is also relatively high in Canada, Ireland and the United Kingdom (20-35%). Low earners will have their overall pensions protected by resource-tested programmes. In all these cases, public retirement-income programmes act as "automatic stabilisers", meaning that some or most retirees do not bear the full brunt of the effect of the financial crisis on their income in old age.

However, not all resource-tested schemes use incomes from private pensions in calculating entitlements. The value of the guarantee pension in Sweden, for example, depends only on the value of the public, earnings-related scheme (which has a notional-accounts formula), assuming that the contribution to the mandatory funded system (2.5% of wages) is also paid into the public scheme. Losses in private pension savings are thus not compensated for Swedish pensioners, except if negative returns on the funded system coincide with declines in the average wage level (which determines the imputed return on the notional accounts).

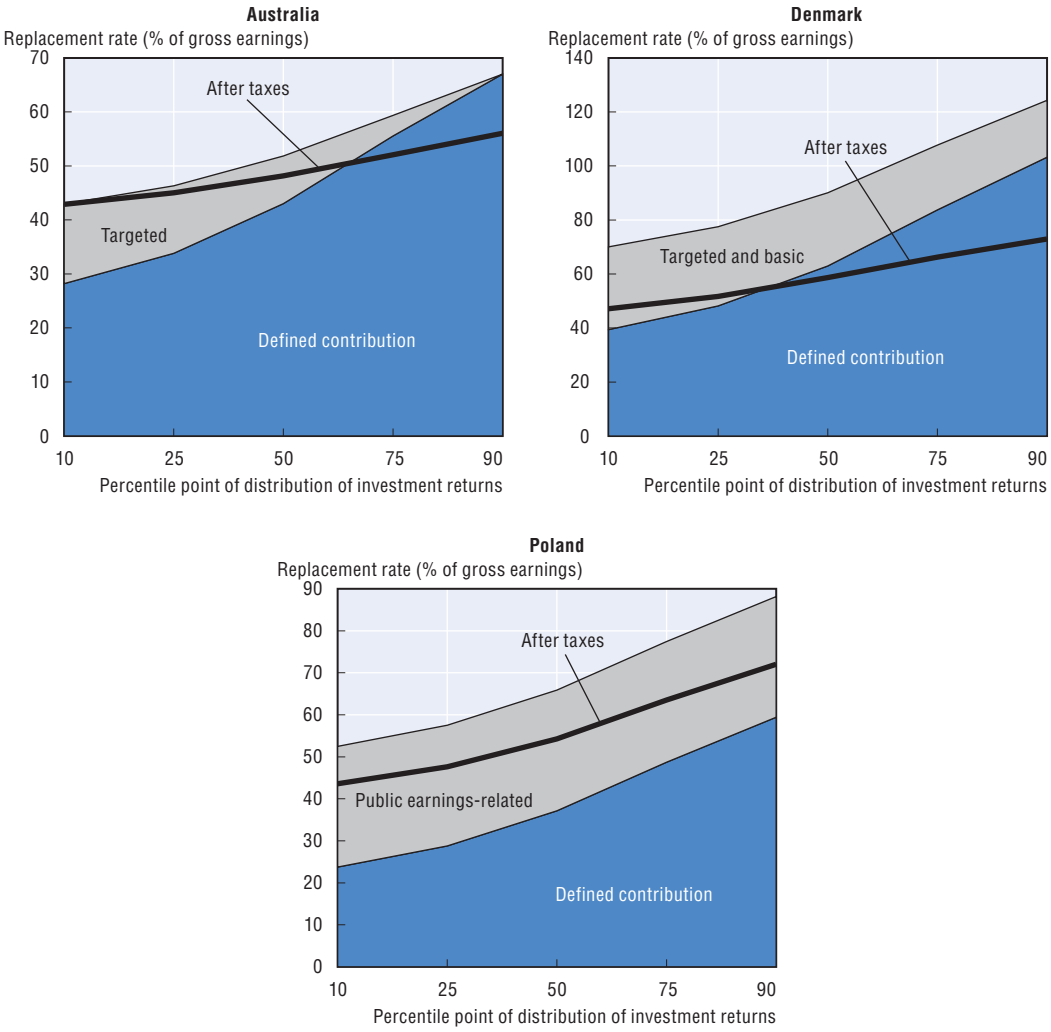
A second automatic stabiliser of net retirement incomes, faced with investment risk, comes through the personal income tax.[4] In most OECD countries, pensions in payment are taxable. An average earner could expect to pay about 30% of his or her pension in tax in Denmark and Sweden. In Belgium, Germany and Norway, the average earner would pay about 20% of retirement income in taxes and this figure is around 15% in Poland. If investment returns turn out to be poor, then governments will collect less in taxes on pensions. The result is that individuals' net retirement incomes will fall by less than the decline in pension funds' asset values.[5] In contrast, pensions are not taxable in Hungary and the Slovak Republic which raises the relative position of pensioners relative to workers but eliminates the possibility of using the tax system as an automatic stabiliser of retirement incomes. The compensating effect of the tax system is also very limited in countries such as Australia, Canada, Ireland, and the United Kingdom where the effect of special credits, allowances and reliefs for pension income or for older people mean that only retirees with very large incomes from voluntary pensions would pay much in income tax.

Putting these two effects – taxes and resource-tested benefits – together, automatic stabilisers have much the largest effect in Denmark, which is arguably the country where investment risk is lowest anyway, because of the minimum investment returns and guaranteed annuity conversion rates offered in such plans. The dampening effect on net retirement incomes is also substantial in Belgium, Poland and Sweden and is large in the United Kingdom and the United States.

The impact of these automatic stabilisers in reducing the variability of retirement income can be evaluated by calculating the pension benefits from the different sources for workers with different wages.[6] Figure 5.2 shows the projected replacement rates by different percentiles of the distribution of investment returns for workers with a full career, a portfolio of 50% domestic equities and 50% domestic government bonds, and OECD average mortality rates. In Australia, the defined-contribution pension is 2.3 times higher in the best rather than worst scenario for returns. Overall income, including means-tested benefit, varies by a factor of just 1.4. In Denmark, the ratio of total pension in the best and worst cases before taxes is 1.8 compared with 1.5 after taxes are taken into account. It is important to highlight that this difference decreases when considering after tax pensions.

The tax system seems to smooth out the impact of market returns on retirement income. As shown in Figure 5.2, the impact of taxes is also noticeable in Poland, but is less marked than in the other two countries.

Figure 5.2. **Gross pension replacement rate and taxes and contributions paid on pensions with different rates of investment return**



Source: OECD (2011), *Pensions at a Glance 2011: Retirement-income systems in OECD and G20 countries*, OECD Publishing, Paris.

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5.2.2. *Investment return guarantees*

Investment return guarantees establish either a floor to the rate of return on pension contributions or a minimum that must be obtained beyond which an additional return may be offered. Guaranteed returns may be mandatory or offered on a voluntary basis by pension plan sponsors and providers. When return guarantees are offered by companies that sponsor DC plans, the plans inherently take on defined benefit (DB)-features. This is the case for example of so-called cash balance plans in countries like Japan and the United States. Investment return guarantees also used to be common features in savings products sold by life insurance companies, where the insurer underwrites the guarantee.

The main characteristics of return guarantees are the following:

- Whether it is a fixed or a minimum return.
- Their level, and whether it is set on nominal or real terms.
- The period over which they apply.
- The extent to which they may be reset during the application period.

The level of return guarantees is clearly one of its most important features, as it determines the minimum value of the accumulated savings at retirement. In this regard, one may distinguish between absolute return guarantees – which are set against a pre-specified return (*e.g.* 2% annually), and relative return guarantees – which are set in relation to a market benchmark, a synthetic investment portfolio or the average performance of pension funds in the industry. Only absolute return guarantees pre-determine the minimum value of the accumulated savings. The minimum value of accumulated savings under a relative guarantee will vary with market performance.

Pension legislation in some OECD countries requires DC pension plan providers (or sponsors) to offer an absolute rate of return guarantees:[7]

- In the **Czech Republic**, pension fund managers must guarantee the nominal value of contributions made by plan members every year. Contributions cannot receive a negative rate of return in a single year.
- In **Japan**, since 2001 defined contribution plans must provide at least one capital guaranteed product (guarantee of principal) among their investment alternatives.
- In the **Slovak Republic**, since 2009 pension fund management companies are required to guarantee a zero% rate of return every six months. They are responsible for making up the difference if they do not achieve the minimum return. If the rate of return is exceeded, they can charge a management fee on the investment earnings.
- In **Switzerland**, pension funds (which operate the mandatory system – law BVG/LPP) must currently meet a minimum return threshold of 2%, having started at 4% when the system was set up in 1985. The minimum return has been changed over the past decade to reflect market conditions. It was cut to 3.25% in 2003 and to 2.25% in 2004. It was raised to 2.5% in 2005 and 2.75% in 2008, and then lowered in January 2009 to 2%. It is intended that in future the minimum interest rate will become a floating rate linked to the average market yield on seven-year Swiss government debt. The minimum return is applied when calculating a workers' accumulated fund when they switch plans and at retirement. The minimum return can be (and usually is) the actual return credited to members' accounts. The annuity conversion rate is also fixed by law and was lowered recently to 6.4%.

Absolute return guarantees also apply by law in Belgium and Germany but as they are the responsibility of sponsoring employers, the plans are treated as DB under both the law and international accounting standards (IAS19):

- Occupational pension plans in **Belgium** must since January 2004 (as a result of the Vandenbroucke Law) provide an annual minimum return of 3.75% on employees' contributions and 3.25% on their own contributions. This minimum return must be used when calculating the entitlements of workers that change plans. The actual market return must be applied if this is higher than the minimum guaranteed return. The employers that sponsor the plan are by law responsible for this engagement.

- The new **German** pension plans introduced under the *Riester* reform in 2001 must guarantee a minimum rate of return of 0% in nominal terms, hence ensuring the protection of the nominal capital invested. The minimum return must be met on the accumulated savings at retirement. If a member switches plan provider during the accumulation phase, he or she gets from the new provider a guarantee on the cash value in the account at the time of transfer plus any new contributions. Employers are by law responsible for meeting this guarantee in the case of *Riester* pensions offered as part of an occupational pension plan. Most *Riester* pensions, though, are sold directly by pension providers to individuals (personal pension plans). *Pensionskassen* (a type of pension fund) must also guarantee at retirement date the contributions plus interest compounded at a fixed rate, currently set by law to at least 2.25% per annum. Every year, plan members accumulate either this guaranteed minimum return on previous contributions or 90% of the fund's annual return, if higher. The guarantee is ultimately backed by the plan sponsor.

There are also some OECD countries where pension funds must meet a relative return guarantee, defined in relation to the industry average or some market benchmark:

- In **Chile**, pension fund managers must ensure that returns fall within a band that is defined differently depending on the type of fund chosen by the member. For the funds with the lower equity exposure (C, D and E) the band is defined as the greater of 2 percentage points below the weighted-average real rate of return over the previous thirty-six months and 50% of the weighted-average real return. For the funds with the higher equity exposure (A and B), it is defined as the greater of 2 percentage points below the weighted-average real rate of return over the previous thirty-six months and 50% of the weighted-average return. The rate of return regulation has changed various times since the establishment of the system.
- In **Denmark**, ATP, the operator of a nationwide, mandatory DC plan, must provide a minimum return guarantee of member's contributions. However, ATP itself fixes the level of the guarantee. It used to be set in absolute terms, but in 2009 they changed to a relative return guarantee, where the minimum is reset regularly in line with long-term interest rates.
- In **Poland**, pension fund managers must ensure that returns fall within a band that is defined as the greatest of 4 percentage points below the weighted-average real rate of return over the previous twelve months and 50% of the weighted-average return.
- In **Slovenia**, DC plan providers must meet a minimum return that is defined as 40% of the average annual interest on Slovenian government bonds.

5.3. Costs and benefits of minimum return guarantees in retirement savings plans

The objective of this section is to compare from a cost-benefit perspective the different return guarantees that can be applied during the accumulation phase in a retirement savings plan. Previous analysis of a similar nature include Pennacchi (1998), Lachance and Mitchell (2003), Biggs *et al.* (2006), Munnell *et al.* (2009), Grande and Visco (2010), and McCarthy (2009). All these studies, with the exception of McCarthy (2009), focus only on the cost of providing guarantees. Pennacchi (1998), Lachance and Mitchell (2003), and McCarthy (2009) use an analytical solution (Black-Scholes option pricing formula) to calculate the cost of return guarantees. The other three papers, on the other hand, are in line with the methodology used in this section as they are based on a stochastic approach (Monte Carlo simulation).

Munnell *et al.* (2009) also investigate the question of guarantees in the United States from a historical and a prospective context. They calculate how much members' DC accounts would have had to be compensated to meet different levels of guarantees. Based on historical data and an all-US equities portfolio, they find that, no group turning 65 in the 84 years till 2008 would have seen a lifetime return of less than 3.8%, assuming they had contributed for 43 years. Hence any guarantee would have to be above this level to have made any difference to the final pension that members would have received from their DC account.

Grande and Visco (2010) consider a compulsory government guarantee of a minimum return to defined contribution pension scheme members. For a life cycle strategy, they calculate the cost of the 0% nominal return guarantee (capital protection) as less than 0.1% of the assets invested, while the guarantee of a return equal to the economy's nominal growth rate would have a cost of 0.93% to 1.20% depending on the period of investment.

McCarthy (2009) values return guarantees from the perspective of a utility-maximising life cycle investor. He finds that rational demand for investment guarantees in retirement accounts is small if guarantees are fairly priced. However, he considers only 5-year rolling return guarantees, which are generally more costly – and hence less appealing – than guarantees calculated over the longer contribution period typical of DC pension plans (twenty to forty years).

The analysis in this section first examines the cost of different types of minimum return guarantees (MRG) for DC pension plans, depending on the guaranteed level (0%, 2% or 4%), the design of the guarantee (floating or fixed minimum return, valid at retirement only or in every period) and the structure of the fees (paid annually or at the end of the accumulation period). The analysis also looks at the cost of different MRG for different contribution periods, 20 and 40 years.

In addition to the price a guarantee provider would charge individuals for each guarantee, the analysis also considers two other measures of costs: the total amount of fees paid by the individual throughout the accumulation period and the total cost, which also includes the compound loss of not having invested all contributions, as annual fees are paid out of contributions.

The analysis then looks at the impact of different types of guarantees on retirement income outcomes. The chapter assesses the probability that each guarantee would be exercised, the probability that the individual would have been better off with a guaranteed portfolio than with a portfolio not guaranteed, and the distribution of replacement rates. Sensitivity analyses are also conducted by changing some of the parameters of the model and looking at specific market scenarios.

5.3.1. *Types of guarantees considered*

This section discusses the characteristics of minimum return guarantees in the context of retirement income protection from DC pension plans. It first describes the different types of guarantees analysed, which can be found in different countries or are currently discussed for DC plans. The analysis focuses on six kinds of guarantees for which the structure of the fees is identical, *i.e.* fees are paid and calculated annually, as a percentage of the accumulated net assets value[8] or as a percentage of every contribution paid. They differ according to the guaranteed level (0% nominal, 0% real, 2% nominal or 4% nominal) and the design of the guarantee (floating or fixed minimum return, valid at retirement only or in every period). For

one of the guarantees, two additional structures of fees are analysed. Fees can be calculated as a reduction on the potential surplus, calculated annually or at the end of the accumulation period. The potential surplus in one period is defined as the difference between the amount of assets accumulated in the portfolio until that period and the amount of assets that would have been accumulated for the same period in a portfolio with a return equal to the guaranteed level (if the difference is negative, the surplus is null). Secondly, this section explains the approach used to determine the cost of different guarantees and to assess their impact on retirement income.

Table 5.1 summarises the characteristics of the minimum return guarantees analysed.[9] The first column describes the characteristics of a *capital guarantee* as proposed by German *Riester* pensions, in which the lump sum at retirement equals at least the nominal sum of contributions made. The minimum return guarantee of 0% nominal is valid at retirement only. If the lump sum at the end of the accumulation period is above the guaranteed lump sum (in this case, the nominal sum of contributions), the surplus (*i.e.* the difference between the two lump sums) is fully transferred to the individual. Each year, the individual is charged an annual fee paid out of contributions or of accumulated net assets (the analysis calculates the fee in both cases).

Table 5.1. **Description of the minimum return guarantees analysed**

	Capital guarantee (%)	2% guarantee (%)	Inflation-indexed capital guarantee (%)	Ongoing capital guarantee (%)	Floating guarantee (%)	4% guarantee		
						With annual fees (%)	With ongoing haircut (%)	With final haircut (%)
Guaranteed level	Nominal 0%	Nominal 2%	Real 0%	Nominal 0%	1-year interest rate	Nominal 4%	Nominal 4%	Nominal 4%
Guarantee applies	At retirement	At retirement	At retirement	Ongoing	At retirement	At retirement	At retirement	At retirement
Fixed *vs.* floating	Fixed	Fixed	Fixed	Fixed	Floating	Fixed	Fixed	Fixed
Surplus	All	All	All	All	All	All	Haircut	Haircut
Charge	Annual fee	Annual fee	Annual fee	Annual fee	Annual fee	Annual fee	Annual haircut	Final haircut

The second guarantee provides a minimum return of 2% nominal. Except for the guaranteed level, this *2% guarantee* is comparable in every respect to the capital guarantee: the guarantee is only valid at retirement, the minimum return is fixed throughout the accumulation period, the surplus is fully transferred to the individual and the fee is paid annually. It is similar to what can be found in Switzerland, where the minimum rate of return for mandatory occupational pensions equals 2%.

The third guarantee examined protects the capital from inflation. The lump sum at retirement equals at least the sum of contributions in real terms. This *inflation-indexed capital guarantee* provides a minimum return of 0% in real terms.

This chapter also examines a capital guarantee that holds during the whole savings phase and not only at retirement. This *ongoing capital guarantee* is similar to the capital guarantee above, but requires that at each point of time (*i.e.* on an annual basis) the accumulated assets equal at least the nominal sum of contributions made until then. This kind of guarantee exists in the Czech Republic.

For the fifth guarantee examined, the guaranteed rate of return is not fixed along the savings phase. This *floating guarantee* depends on the development of the 1-year interest rate until retirement. The current 1-year interest rate is assigned to each annual contribution made

and is valid until retirement so that, at each point of time, there is a different minimum return. This is similar to the ATP system in Denmark, where most of the contributions (80%) are guaranteed based on the rates the ATP can obtain in the market when contributions are paid.

Finally, the chapter compares three guarantees that provide the same minimum return of 4% nominal, but differ in respect to the structure of the fees. The *4% guarantee with annual fees* is comparable to the previous types of guarantees: the individuals are charged an annual fee paid out of contributions or of accumulated net assets. For the two others, the individuals are charged a fee only if the portfolio provides a surplus, *i.e.* only if the amount of assets accumulated in the portfolio is above the amount of assets that would have been accumulated in a portfolio with a 4% nominal return. For the *4% guarantee with ongoing fees*, the fee is calculated as a reduction ("haircut") on the annual potential surplus, while for the *4% guarantee with final fees*, the fee is only paid at the end of the accumulation period and corresponds to a reduction on the final potential surplus. For these two guarantees therefore, the surplus is not fully transferred to the individual; instead a reduction is applied to the surplus to calculate the fee.

The guarantees in which the fee is charged as a reduction on the potential surplus are not implemented yet in any DC pension plan around the world. However, insurance companies and mutual funds already use this approach to charge fees. It may create a strong incentive for the guarantee provider to achieve high returns as he is paid only if the actual return on the portfolio is higher than the guaranteed level, as long as the provider and the asset manager coincide in a same entity and they do not hedge that risk.[10] The approach using the reduction on the final surplus may be difficult to implement in the context of pension plans as the guarantee provider has to wait until the end of the accumulation period before receiving a payment. Furthermore, solvency capital issues arise with this approach. These issues are however out of the scope of this study.

The study first sets a price for each type of guarantee using a stochastic financial market model. In this model, the guarantee provider is neutral, meaning that the present value of the expected future guarantee fees equals the present value of the expected future guarantee claims. The guarantee claims are calculated by valuing the guarantee as a financial derivative in a financial market framework (like *e.g.* the valuation of a put option). This can be achieved assuming that the guarantee provider hedges himself using a synthetic portfolio.[11] Market-consistent scenarios of a 40 years horizon are generated by an appropriate stochastic financial market model using 10 000 Monte-Carlo simulations of different asset returns and inflation. The model is consistent with market prices of derivatives like equity futures, equity options, or swaptions. The value of the guarantee is the average of the present value of guarantee fees, or claims, over all scenarios. This pricing model abstracts from administrative costs as well as solvency rules and related regulations. In real life, fees would therefore be higher than the ones calculated in this model.

The price of each type of guarantee determined in the financial market model is then used to assess the impact of the different types of guarantees on retirement income. The model assumes that the guarantee provider applies this price to every single individual whatever the realisation of the world.[12] If the price is determined so that the guarantee provider is neutral, different realisations of the world and different structures of fees may imply different retirement income outcomes for the individuals. The model therefore produces 10 000 new stochastic simulations of the savings accumulated at retirement given stochastic simulations of investment returns for different asset classes and inflation.

The model assumes a generic capital market model, described in detail in Scheuenstuhl *et al.* (2010). In particular, the interest rate term structure is upward sloping ranging from 3.5% to 5.5%, the expected inflation is about 2%, the equity risk premium is set at 3% and the equity volatility is about 20%. The lump sum accumulated at retirement is the result of people contributing 10% of wages each year to their DC plan for forty years, with wages growing from an initial wage of 10 000 currency units by 3.782% on average annually, according to a stochastic inflation rate with median 2% and a career-productivity factor depending on the age of the employee.

Contributions to DC plans are invested in a life-cycle investment strategy with a constant exposure to equities of 80% between age 25 and 55 that decreases linearly during the last 10 years to 20%. The model calculates the lump sum obtained in case of a guarantee and in case of no guarantee. The guarantee implies the payment of a fee, which can be deducted, depending on the structure of the fee, either annually from the accumulated net asset value,[13] annually from the potential surplus, or at the end of the accumulation period from the final potential surplus, using the price determined in the financial market model. At retirement, set at age 65, the assets accumulated are used to buy a fixed life annuity.

5.3.2. *What is the cost of different guarantees?*

This section discusses the cost of the different types of guarantees. Table 5.2 first shows the price of the guarantee fee according to the kind of guarantee and to the structure of the fees.

Table 5.2. **Price of guarantees by type of guarantee and by approach considered to pay the guarantee fee**

	Capital guarantee	2% guarantee	Inflation-indexed capital guarantee	Ongoing capital guarantee	4% guarantee with annual fees	Floating guarantee	4% guarantee with ongoing haircut	4% guarantee with final haircut
% of net asset value	0.06	0.22	0.24	0.39	0.89	1.22	–	–
% of contributions	1.24	4.94	5.58	18.36	18.71	26.09	–	–
% of surplus	–	–	–	–	–	–	1.60	–
% of final surplus	–	–	–	–	–	–	–	24.06

Source: OECD calculations, based on Scheuenstuhl *et al.* (2010).

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The price of the guarantee increases when the guaranteed level increases. When the individual is charged an annual fee, the higher is the guaranteed level, the higher is the price. It applies both when the fee is calculated as a percentage of the accumulated net asset value or as a percentage of every contribution paid. Thus, it is cheaper to guarantee the capital than any other level. To buy this guarantee, the individual has only to pay, each year, 0.06% of the accumulated net asset value or 1.24% of the contributions made. If the individual wants also to protect the capital from inflation, the annual fee increases significantly, from 6 to 24 basis points of the accumulated net asset value. The more expensive guarantees are the 4% guarantee and the floating guarantee. For instance, as much as 26% of the contributions need to be paid each year for the floating guarantee. The price is higher for higher guaranteed level as the guarantee provider has to compensate for higher guarantee claims.

Table 5.2 also shows that the price of the guarantee also depends on the design of the guarantee. Indeed, the capital guarantee is more expensive when it holds over the whole accumulation phase than when it is only valid at retirement. The price of the fee increases by 33 basis points (as a percentage of the accumulated net asset value) with the ongoing guarantee. Additionally, the floating guarantee is more expensive than the fixed 4% guarantee:[14] there is a difference in the fee of 33 basis points between the two if the fee is deducted from the accumulated net asset value. This is due to the fact that the interest rate term structure has a positive slope in most of the Monte-Carlo simulations of the financial market model and starts at the rate of 3.9% for a 1 year maturity for all simulations. Therefore, the floating guarantee eventually guarantees more than 4% on average over the whole accumulation period in most of the simulations, leading to a higher price as compared to a fixed 4% guarantee. The sensitivity analysis below shows that the results change if the interest rate term structure is shifted downwards.

In order to compare the different structures of fees, two standard cost measures are calculated. The first one corresponds to the sum of all guarantee fees paid (indexed to inflation) expressed as a percentage of the lump sum accumulated at 65 obtained in case of no guarantee. The second cost measure corresponds to the percentage loss in the lump sum accumulated at 65 obtained in case of a guarantee as compared to obtained in case of no guarantee.[15] For both cost measures, Table 5.3 shows the median value of all scenarios.

Table 5.3. **Median cost of the guarantee by type**

	Capital guarantee (%)	2% guarantee (%)	Inflation-indexed capital guarantee (%)	Ongoing capital guarantee (%)	4% guarantee with annual fees (%)	Floating guarantee (%)	4% guarantee with ongoing haircut (%)	4% guarantee with final haircut (%)
Sum of fees paid as a % of the lump sum at 65 in case of no guarantee	0.86	3.33	3.67	6.08	12.20	15.96	5.74	7.67
% loss in the lump sum at 65 in case of a guarantee as compared to no guarantee	1.28	4.98	5.49	7.14	18.30	23.81	6.99	7.67

Source: OECD calculations, based on Scheuenstuhl *et al.* (2010).

StatLink http://dx.doi.org/10.1787/888932599158

Using the first measure of cost, the cheapest guarantee remains the capital guarantee. The discounted sum of fees paid represents 0.9% of the lump sum at 65 obtained in case of no guarantee. The more expensive guarantee is the floating guarantee: the discounted sum of fees paid represents 16% of the assets accumulated at 65 obtained in case of no guarantee.

For the same level of guarantee, the median total cost depends on the structure of fees. Indeed, when the fee of the 4% guarantee is paid annually, the median total cost is significantly higher and represents 12% of the lump sum obtained in case of no guarantee, as compared to 6% when the fee is paid as a reduction on the potential annual surplus and 8% when the fee is paid as a reduction on the potential final surplus. The guarantee is less expensive on average when the fee is paid in the form of a reduction on the potential surplus because in case the surplus is null, the individual is not charged any fee, and because of the opportunity cost as fees are mostly paid towards the end.[16] However, the dispersion is higher when considering guarantees using a reduction on the surplus: for instance, the cost at the 95th percentile is the same when fees are paid annually and when fees are paid at the end of the accumulation period (17.5% of the lump sum obtained in case of no guarantee).

Both guarantees using a fee based on a reduction of the surplus share the same weakness regarding solvency capital issues. The main weakness of the 4% guarantee with a reduction on the final surplus is that the guarantee provider has to wait until the end of the accumulation period before receiving any payment from the pension plan member. He therefore needs to do reserves (the related cost is not included in this study). Charging fees on the potential annual surplus (instead of final surplus) only partially solves this issue, as in more than 25% of the cases the individual does not pay any fee during the first 36 years of the contribution period. The more significant part of the payments is done at the end of the accumulation period, when the surplus is potentially high. This is the reason why the costs associated with both guarantees using a reduction of the surplus are close to each other, as compared to the cost of the guarantee with annual fees.

When the compound loss on contributions resulting from the annual fee payment is taken into account, the total cost of the guarantees can increase significantly. The second cost measure includes another component, which is the compound loss on contributions as a result of annual fee payments. Indeed, when annual fee payments are required, the part of the contributions that is used to pay the annual fee is not invested and does not produce any return. This implied cost does not exist when the fee is paid at the end of the accumulation period, as a reduction on the potential final surplus. In that case, the full contributions are invested, which allows a higher lump sum at 65 (before the payment of the fee). This is the reason why the 4% guarantee with a reduction on the final surplus has the same median total cost with both measures of cost (7.67% of the lump sum at 65 obtained in case of no guarantee). For the other types of guarantees, in which fees are paid annually, the total cost is higher with the second measure. While the difference between the two costs measures varies between 0.4 and 1.8 percentage points for most guarantees, it is much more important for the 4% guarantee with annual fees (+6.1 percentage points) and the floating guarantee (+7.8 percentage points). This is because the fees paid represent a higher share of the accumulated net asset value each year for these two guarantees. Therefore, the part of the cost represented by the compound loss on contributions is more important.

5.3.2.1. *Sensitivity analysis*

The sensitivity of the price of the guarantees is assessed by changing model assumptions at the starting point (*i.e.* at age 25) regarding the volatility term structure, the interest rate term structure and the inflation term structure.[17] In particular, Table 5.4 shows that a shift of –1% of the interest rate term structure increases significantly the price of all guarantees, except the floating guarantee. Under such assumptions, the price of the floating guarantee is lower than the one of the 4% guarantee with annual fees: the individual is charged 1.24% of the accumulated net asset value each year for the floating guarantee and 1.80% for the 4% guarantee. In addition, Table 5.4 also shows that a shift of +10% of the volatility term structure makes the capital guarantee even more appealing, as the gap between its price and the price of the other guarantees increases. For instance, the difference between the price of the 2% guarantee and the capital guarantee represents 16 basis points for the baseline model and 24 basis points when the volatility term structure is shifted by +10%.

The analysis also shows that the life cycle investment strategy in which assets are invested during the accumulation phase has an impact on the price of guarantees. Three different life cycle investment strategies are analysed, in which the exposure to equities

Table 5.4. **Impact of a shift of the term structures of interest rate and volatility on the price of guarantees**

	% of accumulated net asset value						% of annual surplus	% of final surplus
	Capital guarantee (%)	2% guarantee (%)	Inflation-indexed capital guarantee (%)	Ongoing capital guarantee (%)	4% guarantee with annual fee (%)	Floating guarantee (%)	4% guarantee with ongoing haircut (%)	4% guarantee with final haircut (%)
Baseline	0.06	0.22	0.24	0.39	0.89	1.22	1.60	24.06
Parallel shift of –1% of interest rate term structure	0.11	0.42	0.47	0.54	1.80	1.24	3.78	45.38
Parallel shift of +10% of volatility term structure	0.11	0.35	0.38	0.54	1.15	1.70	1.77	28.04

Source: OECD calculations, based on Scheuenstuhl *et al.* (2010).

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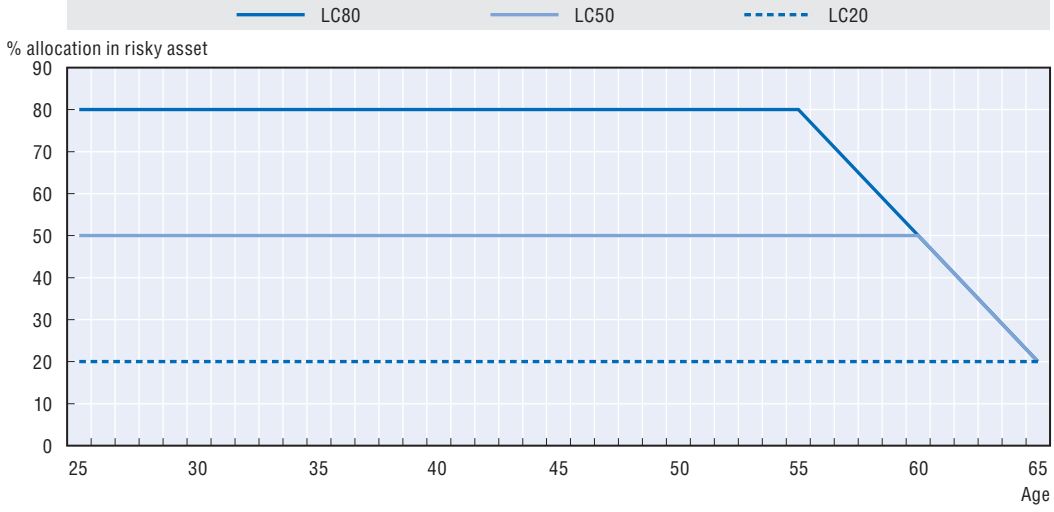
starts with 80%, 50% or 20% respectively (see Figure 5.3). As shown in Table 5.5, if the guaranteed portfolio is invested in a strategy with a lower starting exposure to equities, the price of all guarantees is lower, except for the 4% guarantee with a reduction on the ongoing surplus. Additionally, it shows that the ongoing guarantee becomes less expensive than the 2% guarantee and the inflation-indexed capital guarantee when the investment strategy is less exposed to equities.

Finally, when the contribution period is shortened from 40 to 20 years, the price of all guarantees increases substantially. The lower is the contribution period the higher are the fees because the individual has less time to recover from potential market crashes in a 20 year period and therefore the probability that the guarantee would be exercised is much higher. Higher costs would also occur in systems where there are frequent payouts

Figure 5.3. **Shapes of the different life cycle investment strategies analysed (LC80, LC50, LC20)**



Note: "LC80" represents the life cycle investment strategy that keeps a constant exposure in equities of 80% from age 25 to 55 and decreases thereafter linearly this exposure to 20%. "LC50" represents the life cycle strategy that keeps a constant exposure in equities of 50% from age 25 to 60 and decreases thereafter linearly this exposure to 20%. "LC20" represents an investment strategy with a fixed exposure in equities of 20%.

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Table 5.5. **Impact of investment strategies and the length of the contribution period on the price of guarantees**

	% of accumulated net asset value						% of annual surplus	% of final surplus
	Capital guarantee (%)	2% guarantee (%)	Inflation-indexed capital guarantee (%)	Ongoing capital guarantee (%)	4% guarantee with annual fees (%)	Floating guarantee (%)	4% guarantee with ongoing haircut (%)	4% guarante with final haircut (%)
Contribution period: 40 years								
LC 80	0.06	0.22	0.24	0.39	0.89	1.22	1.60	24.06
LC 50	0.03	0.14	0.15	0.15	0.71	0.90	1.63	22.02
LC 20	0.01	0.06	0.07	0.02	0.49	0.44	1.57	18.87
Contribution period: 20 years								
LC 80	0.24	0.89	0.84	0.91	4.04	3.32	18.95	83.27

Note: "LC80" represents the life cycle investment strategy that keeps a constant exposure in equities of 80% from age 25 to 55 and decreases thereafter linearly this exposure to 20%. "LC50" represents the life cycle strategy that keeps a constant exposure in equities of 50% from age 25 to 60 and decreases thereafter linearly this exposure to 20%. "LC20" represents an investment strategy with a fixed exposure in equities of 20%.
Source: OECD calculations, based on Scheuenstuhl *et al.* (2010).

StatLink http://dx.doi.org/10.1787/888932599196

(*e.g.* where payouts are available, with guarantees, upon job changes, a change in investment option or a change in provider) even if contributions continue thereafter. The cost of guarantees may be prohibitive in such systems.

The analysis so far has examined the cost of different types of minimum return guarantees for DC pension plans, depending on the guaranteed level (0%, 2% or 4%), the design of the guarantee (floating or fixed minimum return, valid at retirement only or in every period) and the structure of the fees (paid annually or at the end of the accumulation period). The remaining important question to address is to what point these guarantees are useful to protect retirement income from DC pension plans in a world of uncertainty about rates of return on investment and inflation. This issue is taken up in the next section.

5.3.3. *What is the impact of different guarantees on retirement income outcomes?*

This section looks at the impact of the type of guarantee on retirement income outcomes. Three different outcomes are considered: the probability that a guarantee would be exercised (*i.e.* the probability that the guarantee provider needs to pay the guaranteed benefit to the individual), the probability that the lump sum accumulated at 65 obtained in case of a guarantee is higher than the one obtained in case of no guarantee, and the replacement rate an individual would get after buying a fixed life annuity with the accumulated assets. The section ends with sensitivity analyses to assess the impact of different volatility, interest rate, and inflation term structures, different investment strategies and different contribution periods on replacement rates.

Individuals paying for a minimum return guarantee are buying an insurance that may be exercised in very few cases. As shown in Table 5.6, the capital guarantee would be exercised in only 0.5% of the cases, and would provide a higher lump sum accumulated at 65 than in case of no guarantee in only 0.5% of the cases also. Individuals paying for a capital guarantee therefore buy an insurance to protect themselves against extreme negative cases that are rare in which they would lose what they put in their DC pension plans. This applies also for the other guarantees, where the probability that the guarantee would be exercised is higher when the guaranteed level is higher (except for the ongoing

Table 5.6. **Exercising of the guarantee and cases in which the guarantee provides a higher lump sum**

	% cases the guarantee is exercised	% cases better off with the guarantee
Capital guarantee	0.49	0.48
2% guarantee	5.75	4.78
Inflation-indexed capital guarantee	6.48	5.22
Ongoing capital guarantee	83.45	18.20
4% guarantee with annual fees	35.32	21.26
Floating guarantee	40.33	21.72
4% guarantee with ongoing haircut	23.09	21.26
4% guarantee with final haircut	21.26	21.26

Source: OECD calculations, based on Scheuenstuhl *et al.* (2010).

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capital guarantee that would be exercised in 83% of the cases at least once during the accumulation period). Additionally, the 4% guarantee is less often exercised when the fee is paid as a reduction on the potential surplus (either annual or final) because the cost associated with such structures of fees is lower.

The distribution of replacement rates by type of guarantee (see Table 5.7) shows that the median replacement rate and the replacement rate at the 95th percentile are higher for the capital guarantee as compared to other types of guarantees. Replacement rates provided by the capital guarantee are however lower than the ones obtained in case of no guarantee in most of the cases, as individuals buy an insurance to protect themselves against extreme negative cases. Only the replacement rates at the 0.5th percentile are higher in case of a capital guarantee as compared to no guarantee. In those cases, the capital guarantee allows individuals not to lose what they put in their pension plan.

Table 5.7. **Probability distribution of replacement rates by type of guarantee**

	0.5th percentile	5th percentile	Median	95th percentile
No guarantee	20.5	30.0	68.4	184.2
Capital guarantee	20.8	29.7	67.5	181.5
2% guarantee	25.5	30.8	65.0	173.5
Inflation-indexed capital guarantee	27.0	30.9	64.6	172.4
Ongoing capital guarantee	22.9	30.8	64.7	169.4
4% guarantee with annual fees	34.2	39.0	56.8	145.0
Floating guarantee	28.5	33.5	56.6	140.3
4% guarantee with ongoing haircut	34.8	40.1	63.2	150.7
4% guarantee with final haircut	34.8	40.3	63.2	152.4

Source: OECD calculations, based on Scheuenstuhl *et al.* (2010).

StatLink http://dx.doi.org/10.1787/888932599234

The analysis also shows that paying the fees as a reduction on the potential surplus allows protecting individuals from very low replacement rates without losing too much of the upside potential. These guarantees provide the best replacement rates at the 0.5th and 5th percentiles. In addition, they provide also high replacement rates at the median and at the 95th percentile, which are lower than those observed for low guaranteed level (capital guarantee and 2% guarantee for instance), but higher than those observed for similarly high guaranteed level (4% guarantee with annual fees and floating guarantee).

5.3.3.1. *Sensitivity analysis*

This section analyses the impact of the different types of guarantees on replacement rates under specific market stress scenarios. Each scenario analysed has a different real rate term structure and inflation level, but for all of them the equity return index is declining (these are therefore cases in which the guarantees may need to be exercised).[18] High inflation favours the guarantee that protects capital from inflation, as in scenarios where inflation is high, the inflation-indexed capital guarantee provides a higher replacement rate than the one provided by the 2% guarantee. Additionally, if the real rate term structure increases or is high during the whole accumulation period, the floating guarantee is the one providing the highest replacement rate.

The analysis also looks at the impact of the life cycle investment strategy and the length of the contribution period on retirement income outcomes. Table 5.8 shows that lower equity allocations decrease the number of cases in which the guarantee would be exercised, for all types of guarantees. Consequently, the number of cases in which the lump sum is higher with a guarantee than without is also lower for all types of guarantees. When the contribution period declines (*e.g.* from 40 to 20 years), the reverse situation is observed: the number cases in which the guarantee would be exercised increases and there are also more cases in which the individuals are better off with a guarantee than without. Moreover, the comparative advantage of the guarantees using a reduction on replacement rate is less important when the portfolio is less exposed to equities and when the contribution period is shortened. These guarantees still provide a higher protection for worst case scenarios in both situations, but the gap in the replacement rate at the 5th percentile with other types of guarantees is lower. For instance, lower equity allocations increase the replacement rates for worst case scenarios for all guarantees, except when the guaranteed level is 4%, because with such high guaranteed level, in all worst case scenarios (5th percentile) the guarantee would be exercised, whatever the equity allocation.

Table 5.8. **Impact of the investment strategy and of the length of the contribution period on the probability that the guarantee would be exercised and on the replacement rate at the 5th percentile**

	Contribution period: 40 years				Contribution period: 20 years	
	LC80		LC50		LC80	
	% cases the guarantee is exercised	Replacement rate at the 5th percentile	% cases the guarantee is exercised	Replacement rate at the 5th percentile	% cases the guarantee is exercised	Replacement rate at the 5th percentile
No guarantee	–	30.0	–	34.0	–	10.6
Capital guarantee	0.49	29.7	0.06	33.8	0.99	10.4
2% guarantee	5.75	30.8	2.12	33.3	13.81	10.6
Inflation-indexed capital guarantee	6.48	30.9	2.56	33.1	14.35	10.7
Ongoing guarantee	83.45	30.8	66.25	33.6	82.85	10.5
4% guarantee with annual fees	35.32	39.0	30.41	39.0	86.49	11.7
Floating guarantee	40.33	33.5	33.27	34.1	76.98	11.0
4% guarantee with ongoing haircut	23.09	40.1	19.15	40.2	39.93	12.0
4% guarantee with final haircut	21.26	40.3	17.21	40.3	26.95	12.0

Note: "LC80" represents the life cycle investment strategy that keeps a constant exposure in equities of 80% from age 25 to 55 and decreases thereafter linearly this exposure to 20%. "LC50" represents the life cycle strategy that keeps a constant exposure in equities of 50% from age 25 to 60 and decreases thereafter linearly this exposure to 20%.
Source: OECD calculations, based on Scheuenstuhl *et al.* (2010).

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5.3.4. *Summary of cost-benefit analysis of return guarantees*

This section has examined the cost of different minimum return guarantees and the impact of these guarantees on retirement income outcomes. The main conclusions from this section are the following:

- *The capital guarantee is the cheapest one to provide but also offers the least protection against investment risk*. Individuals willing to avoid losing the money they put in their DC pension plans (with a fixed life cycle type investment strategy starting with 80% of assets in equities) during the whole accumulation period (40 years) would only need to pay a fee equivalent to 6 basis points annually of the accumulated net asset value of the portfolio. As the guaranteed level is low, the probability that the guarantee would be exercised is also low, but in the worst case scenarios (with a probability of 0.5%), it would prevent the individuals from losing part of the money they put into the DC account. Even this low cost, however, represents approximately an additional 1% of contributions compared to the case where there are no guarantees. This cost, which can be interpreted as an insurance premium, is equivalent to a reduction in retirement income for the average investor. Higher guarantees are naturally costlier. For instance, the floating rate guarantee has a cost that represents about 16% of contributions before the application of the guarantee.
- *The price of the guarantee varies with the contribution period, the investment strategy and initial capital market conditions*. The cost of the guarantee is higher the shorter is the contribution period and the riskier is the investment strategy. Halving the contribution period to 20 years would quadruple the cost of the capital guarantee applied at retirement to 0.24% of assets. Reducing the allocation to equities from 80% to 50% would halve the cost to 0.03% of the assets managed in the DC account. These figures are also calculated on the basis of a specific, baseline financial market scenario. Changing the initial capital market conditions (*e.g.* parallel shifts in the interest rate term structure) would lead to higher cost estimates.
- *The compound loss on contributions can increase significantly the cost of a guarantee*. To guarantee a minimum rate of return on pension assets has a cost for the individual, who is actually buying an insurance against extreme negative scenarios. Traditionally, individuals have to pay an annual fee. These annual payments introduce however an additional cost, corresponding to the compound loss on contributions, as not all contributions are invested and produce returns. This cost can be high, especially for high guaranteed level for which fees are more important. Changing the structure of the fees, by charging the individuals on the potential surplus at the end of the accumulation period is a way to eliminate this additional cost.
- *Changing the structure of the fees may be appropriate for high guaranteed level, but solvency capital issues still need to be addressed before implementing them*. When comparing three structures of fees for a 4% guarantee, the analysis shows that charging fees as a reduction on the potential surplus above the guaranteed level as compared to annually implies lower costs and higher replacement rates. However, using a fee as designed in this study on the potential annual or final surplus also implies that the guarantee provider receives most or all of the payments at the end of the accumulation period. Related reserving costs have not been taken into account in this analysis and would need to be considered.

5.4. Practical challenges of minimum return guarantees in DC plans

The analysis in the previous section was based on a pension system with very specific (and generally restrictive) characteristics. The contribution rate and contribution period are fixed, the life-cycle investment strategy is preset and investors cannot switch pension provider. Under such conditions it is relatively easy to estimate the cost of the guarantee and the benefits in terms of protection from extreme downside investment risk. Such a situation may be most relevant for default funds in mandatory DC systems, where individuals are assigned to a given provider, life cycle strategy and contributions are mandatory up to a certain age.

To the extent that individuals can choose freely between pension providers and investment options and can vary their contribution levels and period, the calculation and operation of minimum return guarantees becomes rather complex if not practically impossible to manage in an efficient manner.

A second practical problem of guarantees is ensuring that the guarantor honours its promises, which requires careful design of capital and solvency regulations and an evaluation of the role of the state *vis-à-vis* the private sector in meeting what is ultimately a form of catastrophic or "tail-risk" insurance.

5.4.1. *Are return guarantees and individual choice compatible?*

If a provider does not know how the contributions will evolve over time, the guarantee price would need to be set for each contribution. The price will therefore increase over time as contributions made closer to retirement are invested over a shorter time period. While administrative feasible (if burdensome) and theoretically fair, such an age-based profile for the guarantee price may be considered discriminatory towards older plan members.

To the extent that members can switch pension provider, the question arises of whether the guarantee can be transferred to the new provider. In order to do so, some form of compensation mechanism between providers would be necessary, where the accumulated value of the guarantee fee paid by the member is transferred to the new provider. A simple approach would be the sum of the prior fees, with interest. But this ignores the risk factors applicable when the investment is transferred to the new provider: age (or other proxy for distribution) and surplus/deficit at the time of the transfer.

An easier solution that could be applied when a plan member switches provider is to cancel the existing guarantee, as in the German *Riester* pensions. Members however are then exposed to possible losses if there is a shortfall in the market value of the accumulated savings relative to the existing plan's guaranteed value.

An alternative solution is used in Slovenia, where the guarantee is triggered when the member switches provider. This eliminates the need for a compensation mechanism and ensures protection of the accumulated savings at the original guaranteed value. However, it creates an incentive for members to activate the guarantee at times of negative returns by switching provider. Providers would react to such behaviour by raising the cost of the guarantee, which may become prohibitively expensive. Making the guarantee ongoing (as in the Czech Republic and Slovakia) rather than applicable only at retirement would also solve the portability problem, but as was shown earlier would also raise the cost of the guarantee dramatically.

The return guarantees considered in this chapter are also conditional on having a preset investment strategy. This allows the provider to calculate the risk of not achieving the minimum return over the contribution period considered. If members were allowed to switch investment strategy, the cost of the guarantee would automatically change. Furthermore, the new cost would be calculated for a guarantee applied over a shorter contribution period, which would raise it in relation to the original period. Allowing free individual choice in the presence of guarantees also introduces a form of moral hazard, as investors may choose riskier investment options in the knowledge that their downside risk is limited. This moral hazard effect, however, can be controlled by adjusting insurance premia upwards to compensate for the riskier investment strategies. Regulators could also set limits on exposures to riskier asset, such as equities, as is the case in countries such as Chile, Estonia, Mexico and Poland. Life cycle funds in the United States (such as target date funds) also have a predetermined maximum exposure to equities throughout the investment period that is established by the product provider.

If the provider of the guarantee controls to some extent the investment of the pension fund, the guarantor has a clear incentive to reduce as much as possible investment risk.[19] For instance, in Slovakia when the 0% guarantee was introduced after the financial crisis, the pension fund managers moved to more conservative investment strategies, with higher bond and bank deposit allocations. Part of their equity portfolio was sold, crystallising the losses suffered in 2008. Companies that sponsor DC plans with return guarantees also often control the underlying investments. This is for instance the case of cash balance plans in the United States, which are classified as DB for regulatory and accounting purposes. In the occupational pension systems in Belgium and Switzerland, the pension funds also usually control directly the investment strategy. Investment choice in Switzerland is only available in some pension funds and only for contributions above the required minimum.

5.4.2. Who should provide the guarantee and how should providers be regulated?

Investment performance guarantees were historically common in the savings products offered by life insurers in many OECD countries. Some of these contracts run for decades and are therefore similar to the type of guarantees considered in this chapter. Over the last decade, banks have also actively sold mutual funds with principal protection, though contracts rarely run for more than a few years. Hence, in principle, there are two main possible commercial providers for investment return guarantees, banks and insurers. Other possible private providers of such guarantees are pension funds (and hence members, in a mutuality context) and sponsoring employers (as in cash balance plans).

In order to ensure that guarantee providers honour their promises, regulations usually set capital adequacy rules (in the case of banks) and solvency margins (in the case of insurers). One policy concern over the presence of guarantees under these regulatory frameworks is that they can have procyclical effects, requiring larger capital demands in down markets. If guarantees were to be offered by commercial institutions, it is also essential to create a level-playing field between different sectors, ensuring an equivalence between regulatory requirements and hence a similar degree of robustness of the guarantor in case of market turbulence.[20]

In particular, a policy question arises over what type of capital or solvency framework should be applied to investment management companies that offer such return guarantees. In Germany, for instance, an investment management company that offers a

Riester-type pension plan is subject to a (conditional) solvency capital requirement because of the capital guarantee,[21] which is weaker than the upcoming Solvency-II-regulation of capital guarantees sold by insurers. Furthermore, providers of guaranteed mutual funds in Europe are not subject to specific capital requirements concerning these products. Concerns over this situation were raised in the European Commission 2005 Green Paper on the enhancement of the framework for investment funds.[22] Any failure of a company to keep its promise would considerably damage consumer confidence in the whole sector and its reputation. This is why adequate capital requirements for the asset management company providing the guarantee need to be established as is already the case with other providers of capital guarantees.

Two recent papers argue that the government would be the more realistic guarantee provider. To support that argument, both Munnell *et al.* (2009) and Grande and Visco (2010) first highlight the existence of the counterparty risk over long-term horizons linked to the private provision of minimum return guarantees. Bankruptcies, like the ones observed during the recent financial crisis, severely hamper individuals' confidence that the firm providing the guarantee would still be there for the payoff in 40 years time.

Another argument for direct government involvement is its ability to access hedging products to insure against the possibility of having to cover the guarantee in situations of sharp economic downturns. Credit-worthy governments may indeed issue long-term bonds at advantageous prices, while private insurers do not have access to such products.

Additionally, the pooling of all guarantee claims in a single public fund would allow for better risk-sharing opportunities. This in turn would imply that the fees charged to the individuals to manage the guaranteed portfolios would be lower than the ones a private sector provider would set. A centrally managed guarantee provider would also be consistent with free switching between DC plan providers.

However, public minimum return guarantees may also raise some issues. First, public pension systems already have serious sustainability issues in some countries. If the government guarantee minimum returns in DC pension plans, it will increase again its liabilities, which may not be opportune. Second, a public guarantee would play the role of a safety net against stock market collapse for DC pension plan members. This may favour the risk of opportunistic behaviour by the insured, who may be encouraged to over-expose themselves to financial risks. This risk could be mitigated by imposing a ceiling on the share of risky assets in the pension fund's portfolio. However, this would ward off less risk adverse individuals from the public minimum guarantee, while private sector providers could provide different guarantee levels at different prices depending on the individual's risk aversion.

5.5. Conclusion and policy recommendations

The purpose of DC return guarantees is to provide a floor or minimum income at retirement to prevent people from having inadequate pensions. However, in many OECD countries public pensions' automatic stabilisers and old-age safety nets already provide such a floor. The more generous such protection is, the smaller will be the share of retirement income affected by market risk. Such forms of public protection are also more comprehensive and, in general, more valuable than the one offered by minimum return guarantees, as they guarantee a minimum level of income throughout retirement rather than a minimum value for the accumulated savings at retirement (as is the case for return guarantees).

Therefore, some people may argue that there may not be a need for minimum return guarantees in DC pension plans. Yet, public guarantees generally do not alleviate the impact of market risk for medium to high income individuals, or they do so partially at best. Moreover, in countries where retirement income from DC plans is the main source to finance retirement or where such plans are mandatory, there may be substantial risks also for low income individuals, as even small declines in retirement income from the DC component can lead to severe hardship.

Additionally, minimum return guarantees, in particular the capital guarantee, may help overcome popular fears over saving for retirement in DC pension plans. Surveys highlight that people's negative feelings about saving in DC pension plans often stem from the fear of losing even part of the nominal value of their contributions. Therefore, it may be beneficial to introduce capital guarantees – that guarantee the nominal value of contributions – to increase the attractiveness of saving for retirement in DC accounts and promote coverage in these plans.

The decision over whether or not to require return guarantees in DC pension plans must therefore be considered in the context of the pension system as a whole. If the public pension system already provides high replacement rates, the value of an additional guarantee for private DC pension plans will be low. On the other hand, in cases where most of the individuals' retirement income comes from DC pension plans (because the public pension system provides low benefits), investment return guarantees become more valuable and the government may have greater fiscal leeway to finance them.

The second key issue to consider is that guarantees have to be paid for, and that this cost reduces the expected value of benefits from DC plans relative to a situation where there are no guarantees. Section 5.3 shows that the cost of guaranteeing that people will get back at least their contributions is quite affordable as long as the contribution period is sufficiently long. Guarantees above the capital guarantee, on the other hand, can be very expensive. Investors may prefer stronger guarantees such as an inflation guarantee or a minimum real return of 2%. The analysis in Section 5.3 shows that these stronger guarantees may be too costly.

The analysis also highlights that the cost of the guarantee varies with the contribution period and the investment strategy and initial capital market conditions. Consequently, even if the capital guarantee looks affordable in a context of a long contribution period and a fix investment strategy, its cost can increase dramatically for shorter contribution periods and riskier investment strategies.

The analysis also shows that changing the structure of how the cost of these guarantees is paid, may increase the amount of assets accumulated at retirement. The cost of providing minimum return guarantees can be covered through charging a fee on contributions or on assets accumulated independently of how the portfolio performs. They can also be covered by charging a hair-cut on investment surpluses when the portfolio outperforms. Therefore, fees charged on the surplus may introduce incentives for providers – only if the provider and the asset manager coincide in a same entity and they do not hedge that risk – to perform well as they only get paid when the actual portfolio balance is higher than the value of the portfolio determined by the guarantee (*e.g.* the portfolio balance that would result from assuming a minimum return of 2%). Additionally, a fee on the surplus has the advantage that contributions are fully invested (the fee is not deducted from the contribution) and accumulated, and therefore the full contribution earns returns reducing therefore the cost in terms of assets accumulated at retirement.

Unfortunately, such fees also have a severe drawback. Providers hold a future promise to be paid depending of investment surpluses, which may not materialise. Therefore, a fee on surpluses requires providers to set aside capital buffers that may be higher than those required in the case of regular annual fees. This would increase the cost of providing the guarantees, a cost that is not considered in the analysis throughout this chapter. If such costs were to be included in the assessment of payment structures, they would diminish the attractiveness of fees on the surplus.

Policy makers should also consider various challenges relating to the introduction of guarantees. One of the basic features of DC plans is the possibility for individuals to choose provider. If one allows switching between providers, it may be necessary to introduce a compensation mechanism, which needs to be carefully designed to ensure transparency and fairness. Another challenge relates to the design of the investment strategy and regulations including solvency rules to ensure that providers are adequately provisioning and managing risks to meet the guarantee.

The main recommendation of this chapter is that regulators and policy makers should assess the potential advantages and costs of introducing capital guarantees, at least in mandatory DC systems where these plans account for a large part of retirement income. Such guarantees protect retirement income against a highly unlikely, but also highly adverse market scenario, complementing the protection offered by the public pension system. They can also increase the attractiveness of saving for retirement in DC pension plans as people will always get back at least what they contributed. Capital guarantees are also relatively cheap to provide, as long as the contribution period is sufficiently long. However, there are some serious implementation challenges that would need to be addressed, such as the compatibility of the guarantee with free choice of investment and provider. Short of making guarantees mandatory, governments could consider requiring that at least one of the investment options offered in DC plans has a minimum guaranteed return, although the possibility of leaving the guaranteed option would raise its cost substantially. Similarly, making the guaranteed investment the default option (for those who do not choose any alternative) is also controversial, as on average it would lead to a lower level of retirement income compared to a similar investment with no guarantee.

Finally, regulatory issues regarding capital requirements for asset management companies providing capital guarantees need to be addressed, both from a consumer protection and a level playing field angle. Unless a consistent regulatory framework for all commercial providers of capital guarantees is implemented, the security level of products including capital guarantees may decline as a result of regulatory arbitrage. Given that guaranteed products are increasingly traded cross-border this issue can best be solved at an international level.

Notes

1. See for instance Antolín *et al.* (2011).
2. Scheuenstuhl *et al.* (2010).
3. See Antolín (2009).
4. See Keenay and Whitehouse (2003a and b) for an analysis of the role of the tax system in old-age support. It is important to note also that the stabilising effect of the tax system does not occur in taxation systems under which pension contributions, but not distributions, are taxed (TEE).

5. Whitehouse *et al.* (2009), Table 4, provides detailed data. This paper also analyses the impact of taxes on net retirement incomes with different investment returns.

6. For the calculation method, see Whitehouse *et al.* (2009).

7. For a review of these guarantees, see Turner and Rajnes (2003 and 2009).

8. The accumulated net asset value corresponds to the value of assets accumulated, net of the fees paid in previous periods.

9. A formal description of the guarantees analysed is provided in the annex. More details can be found in Scheuenstuhl *et al.* (2010).

10. When the guarantee provider and the asset manager are different, there may not be any incentive for the asset manager to create higher returns. Moreover, it may the case that the guarantee provider hedges capital market fluctuations. In this case, the provider would not have any incentive as higher returns would not translate into higher benefits, they are hedged against losses and gains.

11. A simple numerical example is provided in the Annex. More details can be found in the accompanying technical paper (Scheuenstuhl *et al.*, 2010).

12. The model assumes a representative individual of a cohort entering the model at age 25 under generic conditions regarding equity returns, interest rates term structure and inflation (*e.g.* the initial 1-year interest rate equals 3.9%). This means that the initial point at age 25 is identical for every Monte-Carlo simulation. Thereafter, between age 26 and 65, each of the 10 000 simulations has a different realisation of equity returns, interest rates term structure and inflation. The identical starting point may constrain the scenarios and limit the variability of the outcomes. This issue is partly addressed in the sensitivity analysis.

13. The financial market model analyses two different types of annual fees: an annual payment calculated as a percentage of the accumulated net asset value of all contributions and an annual payment calculated as a percentage of every contribution paid (see the annex). To assess the impact of different types of guarantees, only the first type of payment is used.

14. The floating guarantee is compared to the 4% guarantee as the initial return under the floating guarantee is equal to 3.9%, which is similar to the fixed 4% return.

15. It corresponds therefore to the difference between the lump sum accumulated at 65 obtained in case of no guarantee and the lump sum accumulated at 65 obtained in case of a guarantee, expressed as a percentage of the lump sum accumulated at 65 obtained in case of no guarantee.

16. This would not have been necessarily the case if the two additional structures of fees (as a reduction on annual or final surplus) had been applied to a lower guaranteed level. For instance, the number of cases in which the surplus is null would be much lower if only the capital were to be guaranteed, leading to higher costs for guarantees using a reduction of the surplus as fees.

17. The full results of the sensitivity analysis can be found in the accompanying technical paper (Scheuenstuhl *et al.*, 2010).

18. For more details on the market stress scenarios, please refer to the accompanying technical paper (Scheuenstuhl *et al.*, 2010).

19. The question of the optimal investment strategy in the context of a return guarantee has been studied by Pezier and Scheller (2011). They specifically address the type of guarantees offered by *Pensionskassen* in Germany and find that the annual guarantee requirements lead to inefficient low risk portfolios. They recommend that the guaranteed return is applied to the cumulative performance of the fund at maturity instead of yearly.

20. Guarantees can also be provided by non-commercial pension funds, in which case their solvency is often additionally underwritten by the sponsoring employer and an insolvency protection scheme without the need for further capital adequacy requirements.

21. A calculation of the regulatory capital charge can be found in Maurer and Schlag (2002).

22. Annex, p. 19.

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ANNEX 5.A1

*Formal Description of the Different Types of Guarantees Analysed**

In order to price each guarantee so that the guarantee provider is neutral, it is necessary to find, for each type of guarantee, the guarantee fee such that the present value of the expected future guarantee fees equals the present value of the expected guarantee claims. For the capital guarantee for instance, the lump sum (LS) at retirement (T) equals at least the nominal sum of contributions made. This can be written as:

$$LS^{Capital}(T) = \max\left[NAV(T), \sum_{t=1}^{T} Contributions(t)\right],$$

where NAV(T) is the net asset value of all contributions invested into the life cycle strategy.

This can be decomposed into the net asset value of all contributions invested into the life cycle strategy and an additional optional component corresponding to an option contract which pays off if the lump sum at retirement is lower than the sum of all contributions made (the guarantee):

$$LS^{Capital}(T) = NAV(T) + \max\left[0, \sum_{t=1}^{T} Contributions(t) - NAV(T)\right]$$

Depending on how the guarantee fee is paid, the calculation of the net asset value differs. This chapter analyses four different approaches to pay the guarantee fee.

- An annual payment calculated as a percentage of the accumulated net asset value of all contributions invested into the life cycle investment strategy

This approach applies to all guarantees except the ones using a fee on the surplus. Each year, the net asset value is reduced by the guarantee fee following this formula:

$$\forall t \in [2;T],\ NAV(t) = [NAV(t\text{-}1) \times (1 + Return(t\text{-}1,t)) + Contributions(t)] \times (1 - GPrice_1\%)$$

- An annual payment calculated as a percentage of every contribution paid

This approach applies to the same guarantees as above. Each year, the net asset value is reduced by the guarantee fee following this formula:

$$\forall t \in [2;T],\ NAV(t) = NAV(t\text{-}1) \times (1 + Return(t\text{-}1,t)) + Contributions(t) \times (1 - GPrice_2\%)$$

- An annual payment calculated as a percentage of the potential surplus above the guaranteed benefit

* This annex is drawn from "Assessing the Nature of Investment Guarantees in Defined Contribution Pension Plans", by Scheuenstuhl, G., Blome, S., Karim, D., Moch, M. and Brandt, S., risklab germany/ IFA-ULM, November 2010 (*www.oecd.org/dataoecd/32/20/48795228.pdf*).

This approach only applies to the 4% guarantee with an ongoing fee on the surplus. Each year, the net asset value is reduced by the guarantee fee following this formula:

$$\forall t \in [2;T],\ NAV(t) = NAV_{BH}(t) - Surplus(t) \times GPrice_3\%,$$

where $NAV_{BH}(t) = NAV(t\text{-}1) \times (1 + Return(t\text{-}1,t)) + Contributions(t)$ is the net asset value before the reduction and $Surplus(t) = \max\left[0,\ NAV_{BH}(t) - \sum_{i=1}^{t} Contributions(i) \times (1 + 4\%)^{t-i}\right]$ is the potential surplus.

- A single payment calculated as a percentage of the potential surplus above the guaranteed benefit at the end of the accumulation period

This approach only applies to the 4% guarantee with a reduction on the final surplus. The guarantee fee is directly deducted from the lump sum at retirement following this formula:

$$\forall\ t \in [2;T],\ NAV(t) = NAV_{BH}(t) = NAV(t\text{-}1) \times (1 + Return(t\text{-}1,t)) + Contributions(t),$$
$$\text{and } LS^{Finalhaircut}(T) = NAV(T) - Surplus(T) \times GPrice_4\%$$

Basic example of the idea behind how the fair price of a guarantee is calculated

In order to determine the price of the capital guarantee for instance, it is necessary to find $GPrice_1\%$ (or $GPrice_2\%$) such that the present value of the expected future guarantee fees equals the present value of the expected future guarantee claims, where:

Includes guarantee fees

$$LS^{Capital}(T) = NAV(T) + \underbrace{\max\left[0, \sum_{t=1}^{T} Contributions(t) - NAV(T)\right]}_{\text{Guarantee claim}}$$

To value a guarantee at a fair price means valuing the guarantee as a financial derivative in a capital market framework (like *e.g.* the valuation of a put option). This is illustrated in the simple numerical example below – the accompanying technical paper has a detailed description of the mathematical modelling.

Let assume that the holder of a stock (valued at 100 units: S_0) wants to protect his investment and does not want to lose more than 5% of his investment. The objective is to determine the cost of such a protection (*i.e.* determine the fee). The holder is assumed to pay the fee first and then to invest 100. Additionally it is assumed that, after one year, the stock can take two values with the same probability (120 or 90) and that the investor wants a guaranteed level of 95. This can be achieved by buying an appropriate option:

Stock		Option		Stock + option = guaranteed portfolio
$S_{up} = 120$		$G_{up} = 0$		$S_{up} + G_{up} = 120$
$S_0 = 100$	+	$G_0 = ?$	=	
$S_{down} = 90$		$G_{down} = 5$		$S_{down} + G_{down} = 95$

The payoff of the option G_0 can be achieved with a replicating portfolio: a fraction Δ of the stock is sold to buy a zero-bond B.

- If the stock is worth 120 after one year: $G_{up} = B - \Delta S_{up} = B - 120 \times \Delta = 0$ (1).
- If the stock is worth 90 after one year: $G_{down} = B - \Delta S_{down} = B - 90 \times \Delta = 5$ (2).

- The value of the option is the present value of the replicating portfolio. Assuming a discount rate of 3%, this gives: fee = $G_0 = B/(1 + 3\%) - \Delta S_0 = B/(1 + 3\%) - 100 \times \Delta$ (3).

This is a system of 3 equations with 3 unknown variables (B, Δ and fee) with a unique solution: B = 20, Δ = 1/6 and fee = 2.75. The same kind of method (use of a replicating portfolio) can be used for more complex guarantees and more realistic assumptions regarding the fluctuations of the underlying asset classes.

Chapter 6

A Policy Roadmap for Defined Contribution Pensions

This chapter discusses policy options for improving the design of defined contribution pension plans with the aim of strengthening their role in retirement income adequacy.

6.1. Introduction

This chapter takes stock of the OECD work on defined contribution (DC) pension plans and presents policy makers with options for strengthening retirement income in these plans.

Saving for retirement is a long process that begins when one joins the labour market for the first time and ends when one passes away. It includes the active years when the main goal is to accumulate resources to finance one's retirement, the moment of retirement, and the choice of how to allocate one's accumulated resources to finance the retirement years. During the active years one sets aside for savings a certain proportion of labour income. In DC pension plans, this money is invested in assets according to certain investment strategies and earns a return. Once one reaches retirement, the assets accumulated would need to be allocated to provide a retirement income.

Retirement income depends on several factors, some controllable and others uncertain and risky. The controllable factors are those over which policy makers, regulators, employers, providers or individuals have some degree of choice. These are choice variables or plan parameters that refer to the general design of the pension system. They include the rate at which contributions are made (*i.e.*, the contribution rate), the length of time individuals put money into the plan, and the time at which individuals retire (*i.e.*, the contribution period). It also comprises the investment strategy, and the way assets accumulated are paid out at retirement (*i.e.* the structure of the payout phase). But there are other factors that are inherently uncertain, such as spells of unemployment (which impede setting money aside for retirement), the real wage career growth path (which determines the amount that can be saved), the return on investments, inflation, interest rates, and longevity. These risk factors can have a large impact on retirement income and its adequacy.

Concerns about the retirement income adequacy from DC pension plans began even before the 2008 financial and economic crisis. Contributions to DC pension plans in some countries were considered to be low, in particular when compared to contributions to defined benefits (DB) plans. There were also serious doubts that individuals were fully prepared to make all the decisions involved in DC plans. DC pension plans put all the risks squarely on individuals, but the level of engagement and financial literacy among the general population is typically low. The financial and economic crisis added to these existing concerns by showing that retirement income from DC pension plans can be very volatile. Some suffered large losses on their retirement savings just before their retirement, because they had high portfolio allocations to risky assets. In other countries, requirements to annuitize immediately at retirement compounded the problem of low retirement income. Additionally, rising unemployment reduced both contributions and the length of the contribution period.

6.2. Three guiding principles: Coherence, adequacy and efficiency

Coherence, adequacy and efficiency are the three principles underpining the recommendations in this chapter. Public pay-as-you-go (PAYG) financed, funded DB and DC pensions are all complementary. Together they are integral parts of a country's pension system. Thus, there is a need for DC pension plans to be coherent with the overall structure of the pension system. Moreover, DC pension plans also need to be coherent internally; that is, the accumulation and payout phases of DC pension plans need to be consistent, which requires that the investment strategies used to build up assets are properly aligned with the form that the payout phase takes.

The adequacy of total retirement income is also partly a function of DC pension plans, which are normally complementary to other sources to finance retirement. The issue of what constitute an adequate retirement income is highly controversial. First, the most common measure used to assess the adequacy of retirement income, the replacement rate,[1] has some major weaknesses.[2] For example, replacement rates are calculated at the time of retirement and fail to account for inflation.[3] Thus, they fail to signal problems of declining purchasing power or poverty as people age. Secondly, the level of the replacement rate that constitutes an adequate retirement income is far from straightforward and may vary with income levels. A general rule of thumb is a target replacement rate of 70%, around two-thirds of the final salary, based on the assumption that mortgage costs amount to one-third of income and that they are paid off just before retirement. However, for low income individuals, the level of retirement income may need to be higher than a replacement rate of 70% to be deemed adequate. Otherwise there is a risk that individuals may fall below the poverty line. Retirement income from DC pension plans is an integral part of this overall target replacement rate. The analysis in this chapter uses for illustrative purposes 70% of final salary as the overall target retirement income and a 30% replacement rate in DC pension plans.[4]

The design of DC pension plans also needs to be efficient. This chapter assesses efficiency in terms of reducing the impact of extreme negative outcomes on retirement income. For example, there are many investment strategies to choose from in the return-risk frame. However, if the main concern of policy makers and individuals is to avoid sharp falls in retirement income as a result of extreme events (*e.g.* the 2008 crisis) then they will set, at least as defaults, investment strategies that may avoid or limit these sharp drops, in particular for people close to retirement. Efficiency is also required to ensure the adequacy of retirement income. For example, the assets accumulated must be allocated efficiently if retirees are to be protected from longevity risk. The chapter also addresses the impact of efficiency and competition on fees as well as the effects of competition between providers of payout products.

6.3. Policy messages for better DC pension plans

With all of the above in mind, this chapter introduces 12 policy options for improving the design of DC pension plans and thus strengthening their role in retirement income adequacy.

6.3.1. The design of DC pension plans needs to be coherent

6.3.1.1. The design of DC plans needs to be coherent with the overall structure of the pension system

Policymakers directly determine key features of DC pension plans, such as contribution rates and retirement ages, where such plans are mandatory. Regulations and tax incentives also affect indirectly the design of both mandatory and voluntary DC plans. When designing DC plans or their associated regulations and tax treatment, policymakers should consider the ultimate role of such plans in the overall retirement income system. Separate assessments should be carried out for different socio-economic groups in the population.

The amount of retirement income that DC pension plans should aim to deliver depends on the overall structure of the pension system. Retirement income and associated replacement rates in DC pension plans should be higher in countries where they are the main source of funds to finance retirement. In countries where PAYG-financed public pensions and DB funded pensions already provide high benefits, DC pension plans will only need to target a low replacement rate to achieve overall retirement income adequacy.

The first step in the design of DC pension plans and associated regulations should therefore be for regulators and policymakers to consider a target retirement income. In order to identify such a target, regulators and policy makers need to consider both choice and risk variables, including the amount of contributions, retirement ages, contribution periods, labour market conditions, returns on investment, and life expectancy.

Much has been said already in previous chapters (in particular Chapters 1 and 2) about policy initiatives to increase retirement ages and extend working periods in order to improve benefit adequacy. The other key choice parameter that warrants close analysis is the contribution rate. A simple analysis shows that this is not always set at sufficiently high levels in OECD countries (see Box 6.1).

Other plan design features that can have a major impact on benefit levels are the extent to which withdrawals from the account are allowed. Clearly, the more flexible are withdrawal rules, the more likely it is that money will be taken out from the account, reducing the ultimate balance. While some countries allow withdrawals in case of major shocks (so-called

Box 6.1. **To what extent are DC contribution rates consistent with the size of public pension systems**

Throughout the OECD, DC pension plans are gaining foot. Already nine OECD countries (Australia, Chile, Estonia, Israel, Mexico, Norway, Poland, Slovak Republic, and Sweden) have established mandatory DC plans, in some cases as a result of a pension reform that has involved a transfer of part of the social security contributions to the new DC component. Iceland and Switzerland also have mandatory fully-funded arrangements with fixed contribution rates, but as a result of return or benefit guarantees, the plans resemble DB arrangements. Other countries, such as Italy, New Zealand, and the United Kingdom have introduced national automatic enrolment arrangements that aim to extend DC coverage to a large segment of the previously uncovered population. In most other OECD countries, DC pension plans are also growing in importance as voluntary complements to the public pension system.

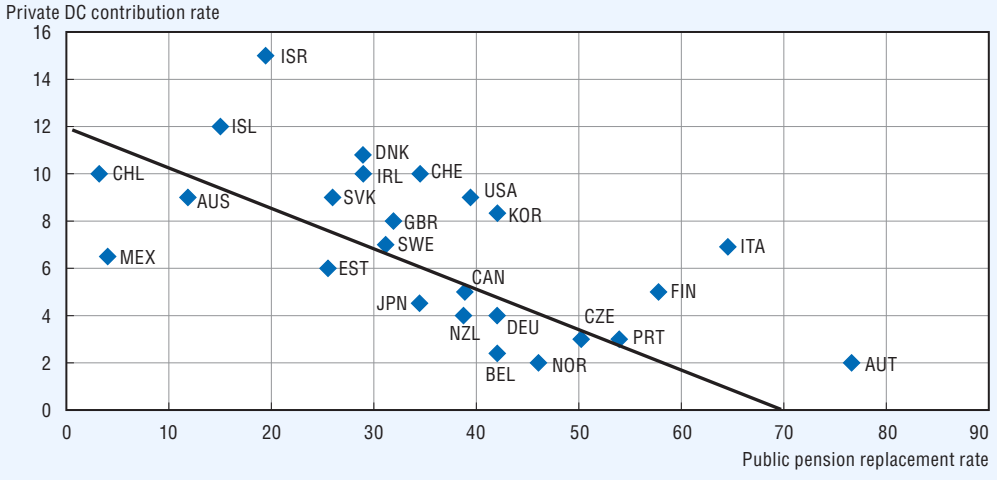
Box 6.1. **To what extent are DC contribution rates consistent with the size of public pension systems** *(cont.)*

Despite the growing importance of DC plans, contribution rates are not always set at a level that would seem appropriate to reach an adequate level of retirement income. The chart below compares projected public pension benefits with the mandatory contribution rate in mandatory DC plans or the typical or average contribution rate to voluntary DC plans, depending on the country. The public pension projections are shown as replacement rates (benefits as a percentage of final salary) for a young male worker earning average wages and entering the workforce in 2008 who accumulated benefit rights throughout his whole career and retires at the official or normal retirement age (as in OECD, 2011).

The graph shows a broadly inverse relationship between public pension benefits and DC contribution rates. However, there are some countries that clearly stand out in having both relatively low public pension benefits and DC contribution rates that do not seem to be sufficiently high. Such countries include Belgium, Germany, Japan, New Zealand, and Norway. These are also among the countries that fall below the black diagonal line, which shows the combination of public pensions and DC contribution rates (with a 40-year contribution period) that delivers an overall replacement rate of 70% on average. Other countries below the black line include Australia, Chile and specially Mexico. The Australian government recently announced that it would raise the mandatory contribution rate from 9 to 12%, which would bring the country above the red line.

It should be noted also that not all workers will have a full career, so the necessary contribution rates to compensate low public pensions may be higher than those depicted in the chart. Also, the contribution rates depicted for voluntary DC plans are averages for the country. Some employees will benefit from higher contribution rates than those considered here, while others will have lower contribution rates. The chart also ignores voluntary contributions to existing mandatory DC plans, as information on this is scant.

Public pension gross replacement rate *vs.* DC contribution rate



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hardship withdrawals), allowing access to the account for other purposes would be inconsistent with the retirement income goal of pension plans. A similar rationale justifies restrictions on the extent to which pension benefits can be paid as lump-sums.

The design of the accumulation and payout phases of DC plans also needs to be coherent with the overall pension system. During the accumulation phase, contributions and returns on investment build up into a certain amount of assets that will be used to finance retirement. Where the DC plan is mandatory or is the mainstay of the pension system, investment regulations, and in particular default options, may be designed so as to avoid excessive risk-exposures.

The length of the retirement period that needs to be financed depends on the age at retirement as well as on life expectancy. If a significant level of retirement income is already annuitized through public PAYG-financed and funded DB pensions, the payout phase of DC pensions may allow for more choice and flexibility. On the contrary, if DC pensions are the main source of retirement income, retirees may need to annuitize a larger share of their assets accumulated in DC plans in order to reduce the risk of outliving their wealth.

6.3.1.2. Coherence requires policymakers to monitor all risks affecting retirement income in DC pension plans

Any assessment of retirement income in DC pension plans that fails to account for risks affecting retirement income will fall short. The financial and economic crisis has highlighted the importance of the volatility of retirement income in DC pension plans. Antolín (2009) shows indeed how volatile retirement income in DC pension plans would have been in several OECD countries by calculating the impact of market conditions on hypothetical replacement rates in DC pension plans.

Retirement income in DC pension plans is uncertain as a result of financial and demographic risks. Future values of returns on different asset classes, and thus returns on portfolio investment, inflation and interest rates are unknown. Consequently, individuals cannot know in advance the amount of assets they will have accumulated at retirement and the resultant retirement income. It is known that the assets accumulated at retirement will need to finance certain amount of time in retirement. However, the length of the retirement period is unknown as it depends on uncertain life expectancy. Therefore, independently of the way individuals allocate the assets accumulated at retirement life expectancy will also make retirement income uncertain.

Future retirement outcomes are also uncertain because of unpredictable labour markets. Labour-market risk originates from the possibility that individuals suffer spells of unemployment or inactivity during their working lives, and from the uncertainty surrounding the trajectory of real wages during one's career.

During episodes of unemployment or inactivity, individuals may be forced to discontinue contributions set aside to finance retirement. As a consequence of these interruptions, the amount of assets accumulated to finance retirement would tend at the end of one's career to be lower than in the absence of such episodes. Additionally, spells of unemployment or inactivity may also affect wages. People that suffer spells of unemployment may re-enter the labour market at lower wages than they enjoyed at their previous job. This would tend, other things equal, to reduce their total amount of contributions and the amount of assets accumulated relative to an uninterrupted career (without spells of unemployment).

Real-wage gains during a career vary across individuals, according to their socio-economic situation (*e.g.* occupation, educational level and income). In general, real wages experience the largest gains during the early part of a person's career as productivity grows rapidly at young ages, with lower gains, even negative gains, in the latter part. This pattern results in real-wage paths that for some people reach a plateau at the end of their careers (high real-wage gains), while for others, real wages plateau earlier, around ages 45 to 55 (medium real-wage gains) and fall thereafter. A minority experience flat real wages throughout their working lives. Therefore, assessments of the adequacy of retirement income are incomplete if the likelihood of unemployment or the existence of different real-wage paths are not taken into account.

The main results from using a stochastic model to assess the impact on retirement income in DC pension plans of labour, financial and demographic risks can be summarised as follows:[5]

- The impact of labour, financial, and demographic risk is far from negligible. There is close to a 60% probability that replacement rates may fall short of expectations if uncertainty is not taken into account.
- Replacement rates in extreme negative situations can be dangerously low.
- The dispersion of replacement rates around the median replacement rate is relatively high.
- The examination of the relative impact of each of the risks shows that labour-market risk (either regarding employment prospects or real-wage growth career paths); as well financial-market risk (uncertainty about returns on investment and inflation) has the largest impact on retirement income from DC pension plans.
- The timing at which unemployment occurs in one's career affects retirement income. Those who suffer unemployment earlier in their careers will have lower retirement income than those who endure it at the end of their careers, as a result of the compound interest rate and the portfolio size effects.

6.3.1.3. The design of the accumulation and pay-out phases needs to be internally coherent

The accumulation and the pay-out phases need to be properly aligned. If the accumulation phase of DC pension arrangements is flexible (*e.g.* voluntary, the choice of asset allocations is flexible) then it may make sense to have flexibility in the payout phase. Similarly, if the accumulation phase is more restrictive (*e.g.* it is mandatory, or has restrictions about asset allocations), then the payout phase may also need to be restrictive, in particular, if the assets accumulated in DC plans are the main source of income to finance retirement.

Additionally, the assessment of investment strategies during the accumulation phase needs to take into account the structure of the payout phase. For example, investment strategies that may provide a better trade-off between potential replacement rates and replacement rates in extreme negative situations when the payout phase is structured around life annuities, may provide worse trade-offs when the payout phase is organised around programmed withdrawals or lump-sums. Also, if only annuities are allowed in the payout phase, the investment strategy during the accumulation phase needs to be designed so as to mitigate annuity rate risk. This can be achieved by moving the portfolio towards long-term fixed-income securities as the annuity purchase date approaches.

6.3.2. Ensure effective communication and address financial illiteracy and lack of awareness

In DC arrangements, individuals face a myriad of complex choices that will determine the adequacy of their retirement income, from how much to save to what kind of benefit payout option to choose. The OECD *Guidelines for the Protection of Rights of Members and Beneficiaries in Occupational Pension Plans* cover various aspects of disclosure that need to be addressed via appropriate regulation.[6]

Apart from ready access to the plan's documents and other relevant contractual material, individuals should be provided with a regular individualised benefit statement, which apart from a record of contributions and the account balances should also provide clear benefit projections under prudent assumptions. Such projections should ideally include information on how much higher benefits could be if additional contributions were to be made to the DC plan or if the age of retirement was to be delayed.

Members also need to be able to access freely and readily comparative information about the cost and performance of different pension providers and instruments as well as the main features of the different benefit options that they may select at retirement. Members and beneficiaries should also be notified in timely fashion if required employer and member contributions have not been made to the pension plan.

Disclosure materials need to be written in a manner to be readily understood by the members and beneficiaries to whom they are directed. This may be a particularly challenging task for members with very low levels of financial literacy, some of whom may not even understand basic concepts such as compound interest or the difference between a stock and a bond. Hence, communication policies need to be complemented with financial education programmes both at schools and among the adult population.

The OECD *Recommendation on Principles and Good Practices for Financial Education and Awareness,* approved by the OECD Council in 2005[7] provides some general guidance, including the need for such programmes to be provided in a fair and unbiased manner and to be co-ordinated and developed with efficiency. The OECD *Recommendations on Good Practices for Financial Education Relating to Private Pensions*[8] provide further detail on such programmes, which should include public awareness and communication efforts as well as more traditional educational programmes aimed more directly at raising financial literacy levels.

National Pension Communication Campaigns (NPCCs) should be used by governments at times of major pension reforms to inform individuals about the changes made and how they will affect their pension entitlements, but also to help individuals take necessary action (for instance, join a pension plan or increase contributions) or "nudge" them towards specific choices (for example, from the old to the new pension system). However, care should be taken with public campaigns to distinguish between financial education and political advocacy for a particular form of pension or retirement income system.

NPCCs need to be targeted as broadly as possible, as lack of understanding of pension issues tends to be fairly widespread. In addition specific programmes targeted at the most vulnerable groups, such as migrants and those with the lowest income and savings levels, can also have a significant positive impact. Ultimately, such programmes should work towards making individuals aware of their limited knowledge about financial matters, and about pension products in particular, stressing the risks of not having an adequate income in retirement.

NPCCs have been shown to increase understanding of the pension system and the need to save, which would be expected to lead to greater coverage rates (Atkinson *et al.*, 2012). In addition, employment based campaigns have been shown to increase participation and contribution rates in pension schemes (OECD 2005b). Agnew *et al.* (2007) find that financial literacy among workers in 401(K) plans is positively associated with higher participation rates or lower rates of people opting out in automatic enrolment plans, underscoring the importance of ongoing workplace financial education for participants in both voluntary and automatic enrolment plans.

Apart from improving awareness about the need to save for retirement, more effective information disclosure could also help in improving coverage as individuals will be better placed to make a decision. OECD work on communicating risks in DC pension plans (Antolín and Harrison, 2012) shows that effective communication strategies may help increase contributions by helping plan participants learn that higher contributions increase the likelihood of achieving the target replacement rate.

Finally, governments should work to ensure that financial education relating to pensions is started as early as possible – for example, as part of school curricula – in order to encourage individuals to start saving from as young an age as possible. This is particularly important in relation to DC systems. Governments should also ensure that financial education on pensions is available on an on-going basis at key points throughout an individual's life, such as when starting work, getting married and having children and around retirement.

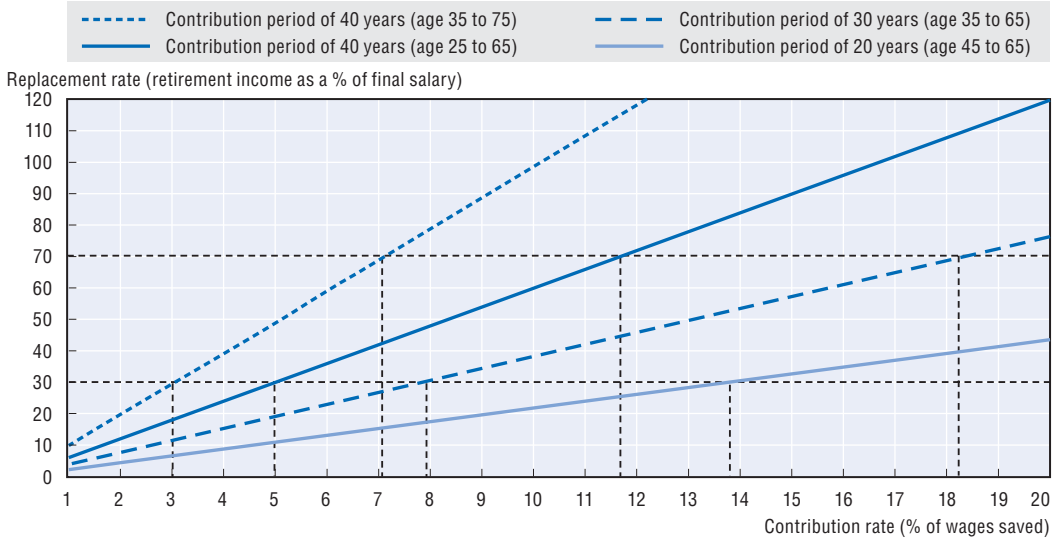
While important, such initiatives may only be expected to result in improvements in financial literacy over a long period. Furthermore, they will be insufficient to address the many concerns over cognitive biases and other aspects of individual behaviour, from procrastination to overconfidence, let alone the structural information asymmetry between pension providers and consumers. They can however complement and strengthen consumer protection regulations and other policy interventions discussed in other sections of this chapter, such as default investment options.

6.3.3. Encourage people to contribute and contribute for long periods

The best way to reduce uncertainty and to improve the chances of achieving an adequate retirement income is to contribute large enough amounts and for long periods. One of the main reasons to shift from DB to DC pension plans is that they provide a clear and direct link between contributions and benefits.[9] DB pension plans promise certain pension benefits. As a result, the link between contributions and pension benefits is far from straightforward.[10] In DC pension plans, however, the link is direct: what one puts into the account determines what one can take out at retirement, depending of course on investment returns. Therefore, the level of contributions would have a direct effect on retirement income and related replacement rates in DC pension plans. Indeed, Figure 6.1 shows how replacement rates increase as contribution rates increase. Focusing on the thick blue line for a contribution period of 40 years, increases in contribution rates raise the potential replacement rate that can be achieved at retirement. For example, moving from a contribution rate of 5% to almost 12% increases the potential replacement rate from 30% to 70% *ceteris paribus*. Obviously these results are dependent on the values that the other parameters assume over time, especially the contribution period and the return on portfolio investment.

Longer contribution periods allow for higher retirement income for a given level of contributions. The length of the contribution period determines for how long amounts contributed accumulate and benefit from compounding of interest. Hence, the longer is the contribution period the longer assets accumulated earn returns and the less money people need to put aside regularly to build assets to finance retirement. Consequently, the contribution rates needed to achieve a certain target retirement income decrease with the length of the contribution period. Figure 6.1 shows that a target replacement rate of 30% (70%) can be achieved, *on average*, by contributing almost 5% (12%) over a 40 year period. However, if the contribution period is only 30 years, the amounts one would need to set aside to achieve the same replacement rate would equal more than 8% (18%) of wages. For a contribution period of only 20 years, a 30% replacement rate could be achieved only by contributing almost 14% of wages, while the contribution rate necessary for achieving a 70% replacement rate rises to above 30%.

Figure 6.1. **Contribution and replacement rates**



Note: Contribution and replacement rates when assets are invested in a portfolio comprising 60% equities and 40% fixed income, assuming a nominal rate of return of 7%, a nominal discount rate of 4.5%, and a life expectancy of 20 years at age 65.

Source: OECD calculations.

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Our estimates suggest that lengthening the contribution period by postponing retirement is the more efficient approach to increase retirement income. For example, the contribution effort needed to achieve a given replacement rate is lower when increasing the contribution period by postponing retirement than by joining the labour market earlier. Postponing retirement simultaneously increases assets accumulated to finance retirement and reduces the retirement period that those assets need to finance. Figure 6.1 shows that one needs to contribute 5% of wages to achieve a replacement rate of 30% when the contribution period increases 10 years from 30 to 40 years by contributing from age 25 to age 65. However, if all else is the same but the contribution period is lengthened to 40 years by retiring later (*i.e.* contributing from age 35 to 75), the contribution rate needed to achieve a 30% replacement rate would be lower, at only 3.1% of wages.

In addition to the impact of changes in the contribution period, changes in portfolio returns, interest rates, inflation and life expectancy also affect retirement income in DC plans. They all change the amount of contributions needed to achieve a given replacement rate. Table 6.1 below shows that lower returns on portfolio investment or on interest rates increase the amount of contribution needed to achieve a target replacement rate and *vice versa*. Additionally, Table 6.1 also shows that the amount of contributions needs to increase with the length of the retirement period. However, the marginal increase in contributions falls the higher is the life expectancy.[11]

Table 6.1. **Contribution rates needed to achieve a certain target replacement rate – deterministic case**

Target RR	Rate of return on investments (%)			Interest rate – Discount rate (%)			Life expectancy at retirement (yrs)		
	5	7	9	3.5	4.5	5.5	10	20	30
30	7.7	5.0	3.1	5.5	5.0	4.6	3.1	5.0	6.3
70	18.0	11.7	7.3	12.8	11.7	10.7	7.1	11.7	14.6

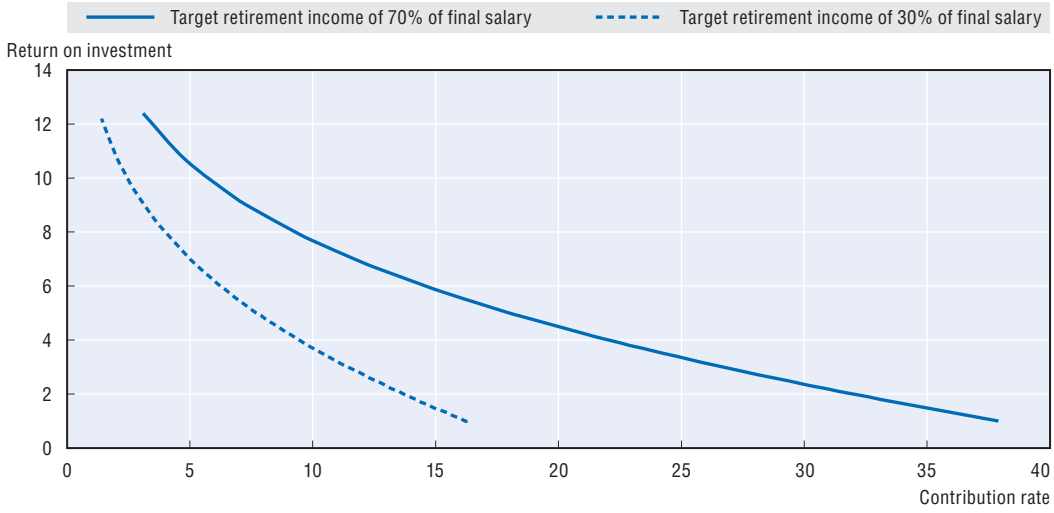
Note: Contribution and replacement rates when assets are invested in a portfolio comprising 60% in equities and 40% in fixed income, assuming a nominal rate of return of 7% (unless stated differently), a nominal discount rate of 4.5% (unless stated differently), and a life expectancy of 20 years at age 65 (unless stated differently).
Source: OECD calculations.

StatLink http://dx.doi.org/10.1787/888932599272

Policy makers and individuals should keep in mind potential returns on investment but focus on contribution rates. The interaction between contributions and the rate of return on investments is crucial to achieve a target retirement income. As expectations about future investment returns are highly uncertain, it is important to avoid overly optimistic assumptions. Historical returns on portfolio investment point out towards average annual nominal returns of around 7.5% over a 40 year period.[12] However, the current economic context and the experience of Japan over the last two decades suggest that returns on investment may remain low for the foreseeable future. Moreover, pension funds and asset managers are adjusting downwards their expectations about future returns on investment. Consequently, it is important to assess how contributions need to change were returns on investment to be lower. In this framework, Figure 6.2 shows this relationship between returns on investment and contributions to achieve a target replacement rate. People need to contribute around 11.7% over a 40 year period when assuming future average annual returns on investment of around 7% in order to achieve a target replacement rate of 30% of final salary. However, if returns were to remain lower, say at 5%, contributions to achieve the same target retirement income of 30% of final salary need to increase to 18% over a 40-year period.[13]

Increasing contributions or increasing the contribution period increases the probability of reaching the target retirement income and the associated replacement rate. Contribution rates and contribution periods are variables the levels of which need to be assessed in the context of a generalised stochastic model where all risks (labour, financial and demographic) are considered. Table 6.2 shows the probability distribution of replacement rates for a contribution rate of 5% and a contribution rate of 10% for two contribution periods, 20 and 40 years, based on a stochastic model with uncertainty about returns, interest rates, inflation, life expectancy, employment prospects and career real wage growth paths (see Antolín and Payet, 2010). The table shows that for a target retirement income of 30% and a 40-year contribution period, doubling the contribution

Figure 6.2. **Combinations of contribution rates and returns on investment to achieve a target retirement income**



Source: OECD calculations.

StatLink http://dx.doi.org/10.1787/888932598797

rates from 5% to 10% increases the probability of achieving the target retirement income (*i.e.* getting a replacement rate at equal or greater) from 62% to 92%. However, if the contribution rate remains at 10% but the contribution period is halved to 20 years, the probability of achieving a target replacement rate of 30% falls from 92% to 33%. In short, the longer is the contribution period and the higher the contribution rate the more likely is the individual to achieve the target retirement income, which could only have been offset it by increasing contributions and the contribution period.

Table 6.2. **Distribution of retirement income relative to final wages**

	Percentile of distribution (%) for 40-year contribution period									Probability RR ≥ 30%	Probability RR ≥ 70%
	1	5	10	25	50	75	90	95	99		
5% contribution rate	9.0	12.7	15.9	23.4	36.3	55.0	78.4	95.8	143.5	61.6	13.9
10% contribution rate	17.7	25.5	32.0	47.1	73.3	111.0	159.2	194.8	293.4	91.7	52.8
	Percentile of distribution (%) for 20-year contribution period									Probability RR ≥ 30%	Probability RR ≥ 70%
	1	5	10	25	50	75	90	95	99		
5% contribution rate	3.4	4.6	5.3	7.3	11.4	17.0	22.7	26.7	36.2	2.8	0.1
10% contribution rate	6.9	9.2	10.7	14.7	22.8	34.1	45.6	53.7	72.8	33.0	1.3

Note: OECD calculations, which result from assuming uncertain investment returns, inflation, discount rates, life expectancy and labour market conditions. People contribute either 5% or 10% over a 20 or a 40-year period, and assets are invested in a portfolio comprising 60% in equities and 40% in long-term government bonds.

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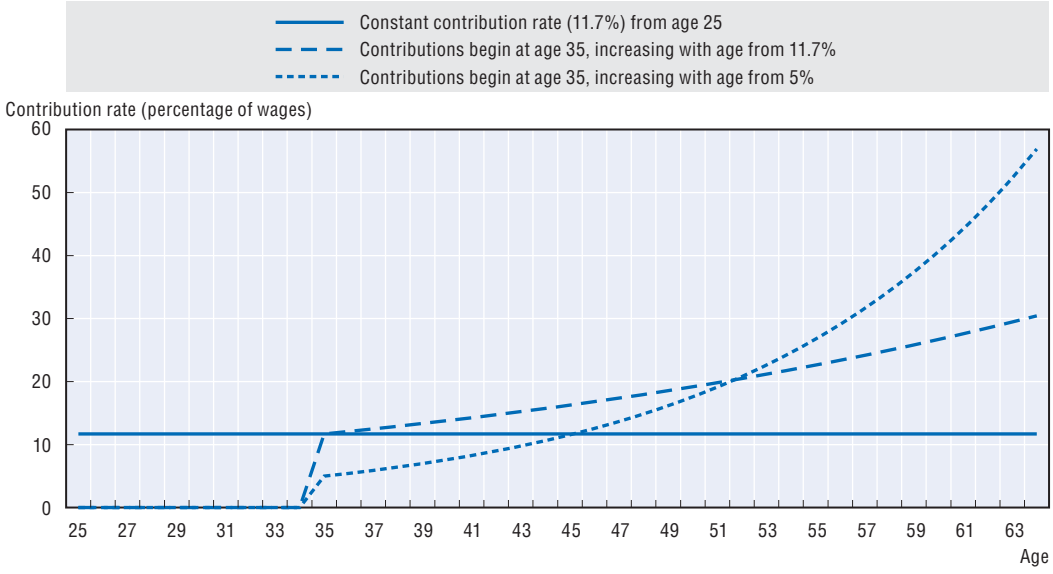
While it is critical to ensure that the contribution rate and period are sufficiently high to meet the target retirement income, there is no *a priori* justification to maintain a constant contribution rate over the whole accumulation period. In fact, there are good reasons to argue that contribution rates should increase with age.[14]

People at early stages of their working life have generally less income and greater consumption needs (*e.g.*, housing, kids) than later in their careers, making it harder to divert part of their income into retirement saving plans. In this context, it may be optimal to start saving for retirement later in one's career and have contribution rates increasing as people age (Blake at al. 2011a,b). However, this means that contribution rates may have to reach a high level at the end of one's career in order to attain the same target retirement income.

Figure 6.3 below shows three possible profiles of contribution rates that can (on average) deliver a target retirement income of 70% of final wages. The target income can be achieved with a constant contribution rate of 11.7% starting at age 25 (the straight line in the chart). If one begins contributing at 35 instead with an initial contribution rate of 11.7%, contribution rates would have to reach 25-30% of wages in the last years before retirement. Beginning with lower contribution rates at age 35 makes the increase in contribution rates at the end of the working life even higher. The steeper line in Figure 6.3 assumes that people begin contributing at age 35 at 5% and contribution rates increase steadily throughout their working career. In order to reach the target retirement income, contribution rates would have to reach 50% of wages at the end of the worker's career. However, such steep contribution rate schedules may lead to time inconsistency as people may lack the will power to raise their contributions rate to very high levels towards the end of their working lives. Shocks can also be experienced in later life which may force people to lower their retirement savings.[15]

Figure 6.3. **Contribution rates linked to age**



Note: OECD calculations, which result from assuming a 40-year contribution period, a target retirement income of 70% of final salary, and a constant nominal rate of return on investment of 7% (see Table 6.1).

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Summing up, in order to deliver adequate retirement income for people retiring mainly with income from DC plans, there is a need for comprehensive measures that encourage or ensure high enough contributions for long enough periods. Such measures include labour market policies that promote job-creation at all ages, allowing people to have long contribution periods. Policymakers should also provide incentives to lengthen

the contribution period by raising the maximum age at which tax-deductible contributions can be made to DC plans. Such a maximum age should be well-beyond the official retirement age. Authorities may also consider rising the age at which benefits from DC plans can first be drawn in line with increases in life expectancy.

6.3.4. Improve the design of incentives to save for retirement to increase contributions and coverage

Contributions could be increased through mandates or with the help of "nudge" measures. The previous section has argued that it is essential to contribute large enough amounts for long enough periods to have meaningful retirement income in DC pension plans. In countries where DC pension plans are compulsory, increasing contribution rates, although complicated by the political process, could be easier than in countries where saving in DC pension plans is voluntary. Contribution rates in voluntary DC pension plans can nonetheless be increased with the help of "nudge" measures, such as matching contributions from either employers or the State and auto-escalation.[16] Research shows that people tend to contribute up to the maximum contribution rate of the match. Programs like the Save More Tomorrow Program (SMTP) in the United States use auto-escalation, whereby people sign up today to increase contributions tomorrow in line with wage increases, seem to be quite successful in bringing in higher contributions rates as people improve through their careers.

It is also important to increase the number of people saving in DC pensions plans. One of the main OECD recommendations as regards pensions is to diversify the sources to finance retirement and to encourage the complementary role of defined contribution pension plans. In this context, it becomes important to have large levels of coverage in DC pension plans (*i.e.* working age people with retirement savings accumulated in these plans). Evidence reported in Chapter 4 suggests that coverage is around 50-60% in countries where DC pension plans are an important complement to finance retirement and these plans are voluntary. Even in countries where these plans are mandatory and are one of the main sources to finance retirement, coverage is below 90% because it is not compulsory for some groups of the population (*e.g.* self-employed) or there are problems related to informality.

Governments throughout the OECD are highly active in designing and implementing policies to encourage private pension savings.[17] The most obvious route is through compulsion, by mandating contributions to private pensions. Several countries have achieved both high and uniformly distributed levels of coverage across age and income levels through compulsion.[18] However, compulsion may not be an available policy option for some countries, not least because saving for retirement beyond a certain threshold is considered an individual choice. Unfortunately, when people are left by themselves to provide for retirement, empirical evidence suggests that some of them will not save enough for retirement. Consequently, if compulsion is not viable, authorities may wish to consider other policies to encourage voluntary private pension savings.

Soft compulsion is one example. Experience shows that high levels of coverage could be achieved through such measures of soft-compulsion as automatic enrolment. In fact, it has been suggested that automatic enrolment in pension plans with appropriate default options with respect to contribution rates and investment allocation may achieve the dual goal of preserving individual choice and ensuring an adequate level of saving for retirement, even if individuals do nothing on their own. Recent findings from the behavioural finance literature

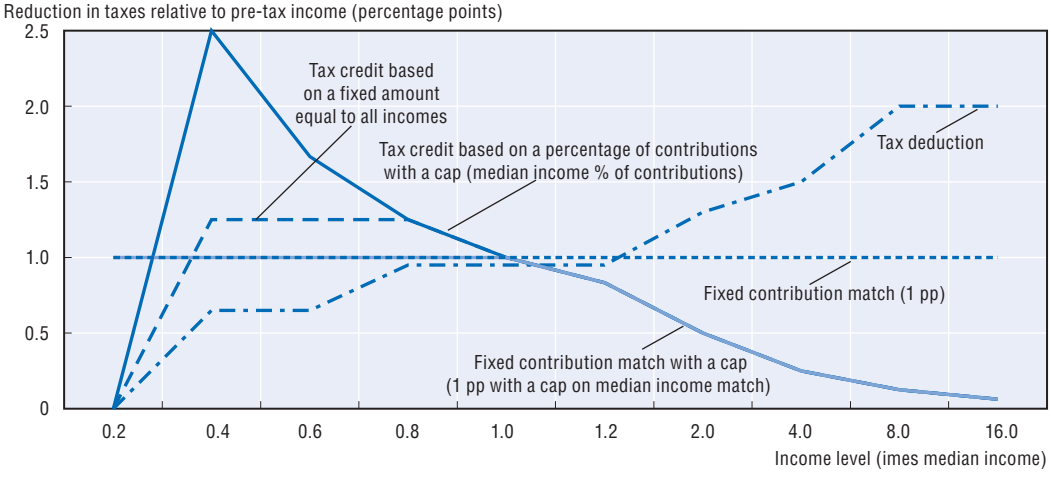
highlighting the importance role that "inertia" or "passive decision" plays in the decision to participate in retirement saving plans (Choi *et al.*, 2002; Mitchell and Utkus, 2003; and Beshears *et al.*, 2006) suggest that by changing the design of pension plans (*e.g.* 401(k) plans) and making enrolment the default option, enrolment in voluntary funded plans can be boosted substantially as few employees ever take explicit action to unenroll.[19] However, despite growing enthusiasm for automatic enrolment, actual experience with its use and evidence of its impact is fairly limited and comes mainly from the United States. Automatic enrolment with an opt-out clause has recently been introduced in New Zealand with positive effects, but the same approach is not working as expected in Italy.[20] The United Kingdom will start its NEST programme with automatic enrolment in 2012.

Another option is to strengthen the value of tax incentives embodied in DC pension plans for low and middle-income individuals, which should help boost the enrolment rate for these population sub-groups.[21] Contributions to voluntary DC pension plans enjoy tax advantages in most OECD countries in order to promote savings for retirement.[22] However, in most countries these tax advantages take the form of a deduction on the income tax base (*i.e.* the amount of income subject to income tax that it is used to determine the tax rate), *tax deduction*.[23]

Tax deductions provide incentives that increase with income as it reduces marginal tax rates. Measuring tax incentives as the change in tax payments relative to pre-tax income stemming from each of the different forms of introducing tax incentives, a tax deduction provides higher incentives to save to higher income earners and it may be of little or no value for workers with low income (Figure 6.4).[24] In addition, given that enrolment and retirement savings increase with income, an incentive structure skewed toward higher income may be far from the best way to increase participation and contributions to DC pension plans.[25]

An alternative way of introducing tax incentives that change inversely with income is to use *tax credits*. Tax credits entail that after calculating taxable income and applying the tax rates relative to the income brackets to determine the tax due, one can apply a

Figure 6.4. **Incentives of tax deductions, tax credits and matching contributions by income**



Note: The tax incentives are designed such that, given the tax brackets, the reduction in taxes relative to pre-tax income is the same for the person with the median income.

Source: OECD calculations.

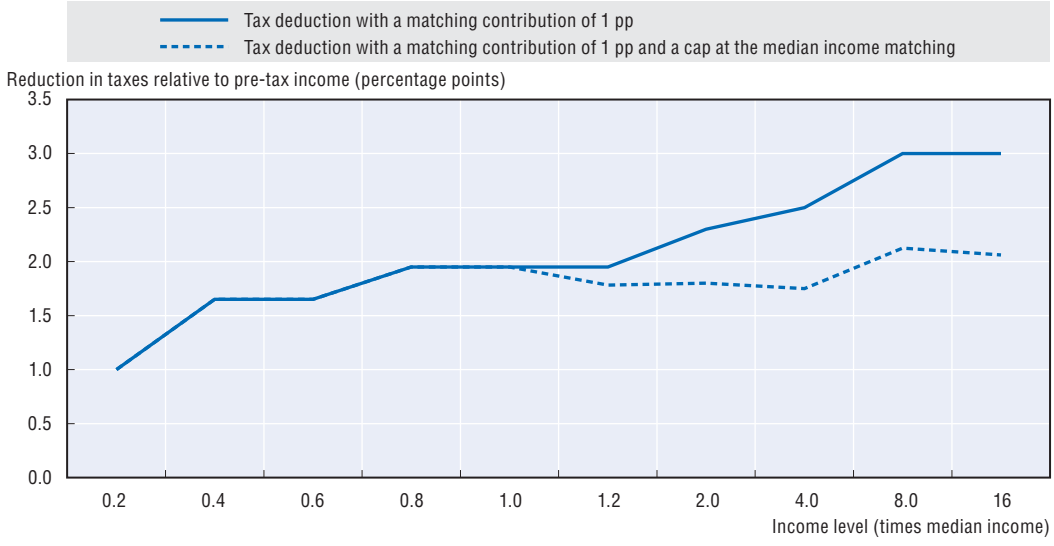
StatLink http://dx.doi.org/10.1787/888932598835

deduction to the tax due. This deduction can be a fixed amount equal for all income levels or a percentage of contributions with a cap. Figure 6.4 shows that in both cases the incentive of tax credits is lower for higher income individuals. Replacing tax deductions with tax credits may therefore help increase coverage among middle-to-low income individuals. However, as shown in Figure 6.4, the low paid, who pay little or no income taxes, hardly benefit from tax credits.

Targeting the low paid requires a third type of incentive, in the form of a *government subsidy* or *matching contribution* into the individual's retirement savings account.[26] For example, for every 5 percentage points of one's wage that is saved in a DC pension plan governments or employers will pay the equivalent of a percentage point of wages. The match can be capped so it is less valuable as income increases. Figure 6.4 shows that the tax incentive of matching contributions is income neutral (*i.e.* the incentives are the same for all income levels), but it could fall with income after reaching a cap when one (*e.g.* a cap equal to the match for the median income) is introduced.[27]

Tax deductions combined with capped matching contributions can make tax incentives more neutral with respect to income. Most countries have tax incentives in the form of tax deduction and are considering adding matching contribution to encourage saving for retirement further, in particular for mid to low income individuals. Figure 6.5 shows the overall incentive in terms of reduction in tax payments as a share of pre-tax income of having tax deductions of contribution to DC pension plans and adding a matching contribution of 1 percentage point, given a contribution rate of 5%. The tax deduction increases incentives with income, adding the incentive of a 1 percentage point match just shifts the curve upwards, increasing the incentive but without changing the income structure of the incentive. However, adding a matching contribution of 1 percentage point with a cap on the match (*e.g.* a cap equal to the match for the median income as in Figure 6.5) changes the tax incentive relationship with income by making it more flat.

Figure 6.5. **Incentives of adding matching contributions to tax deductions by income**



Source: OECD calculations.

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Additionally, better communication for plan members and improving financial education can also be a means of improving coverage and increasing contribution rates in voluntary funded pensions, as discussed above.

Summing up, tax subsidies provide incentives that increase with income, while tax credits provide incentives that are greater for middle than higher income workers, but provide few benefits for low income households. Matching contributions provide incentives that are constant across income classes. Matching contribution with a cap provide incentives that are inversely related to income, with the highest tax benefits going to low income individuals. As most countries currently provide incentives via tax deductions, adding matching contributions with a cap makes the overall tax incentive to save in DC pension plans more income neutral.

6.3.5. Promote low-cost retirement savings instruments

There are also steps that can be taken on the supply side to improve retirement income. The amount of fees that pension providers charge can have an important adverse impact on retirement income. Pension providers charge management fees for the services they offer, such as account administration and investment management. Such fees may be charged on contributions or assets under management or paid separately by the plan member. Ultimately, the level of charges affects the benefits that plan members receive: the higher the charge, the lower will be the benefits that members receive for a given contribution, or the higher will be the total contribution required to achieve the same level of benefits. Table 6.3 below shows the impact of different levels of asset management charges in terms of reductions in benefits, assuming a 40-year contribution period. Halving the management fees from a level of 1% of assets under management to 0.5% can raise pension benefits by 10%. High fees may sometimes be worth paying for a better quality service or for higher risk-adjusted returns. However, more often, they are symptomatic of a seller-dominated pension industry, in which individual plan members have a clear informational and financial disadvantage compared to the pension providers.

Table 6.3. **Comparison of fee levels and impact on benefits**

Fee as % assets	Reduction of pension (%)
0.05	1.2
0.15	3.6
0.25	5.9
0.50	11.4
0.75	16.5
1.00	21.3
1.50	29.9

Note: The impact of fees on pensions is calculated assuming an individual that contributes 10% of wages, wages growth at an annual rate of 3.8% (resulting from 2% inflation and 1.8% growth in productivity). The individual contributes for 40 years since age 25 until age 65 when he retires. The assumed return on portfolio investment is 7%. Lower returns decrease the impact of fees on pensions. For example, the impact of a fee of 1.5% on pensions falls by almost 3 percentage points when returns to portfolio investment fall from 7% to 5%

Source: OECD calculations.

StatLink http://dx.doi.org/10.1787/888932599310

Policymakers therefore need to ensure that there are incentives in place to improve efficiency and reduce costs in the pensions industry, especially in cases where they are clearly beyond reasonable levels.[28] They also need to consider ways to protect lower income

households, who have smaller account balances and are proportionately more costly for providers. These objectives are particularly important in mandatory DC systems and in general in any country where policymakers aim to broaden DC pension plan coverage.

Various policy solutions have been considered, which can be divided into three main groups, disclosure-based initiatives, pricing regulations, and structural solutions. Disclosure-based solutions include ensuring that members receive timely information on the fees they pay, including comparisons between providers. Such disclosures may need to include standardised fee tables in countries where the charge structure may differ across providers. The main limitation of such initiatives, especially in countries that target lower income employees, is the general apathy among individuals towards retirement savings and a much greater response among individuals to providers' marketing strategies than to fee levels.

Pricing regulations include allowing a single charge structure (only contribution-based or only asset-management charges) and setting ceilings on the fees that pension providers can apply. Such solutions can be effective in avoiding high fees, but they are not necessarily conducive to cost-reductions and efficiency improvements in the industry. They can also intensify incentives among providers to promote their products among wealthier households as they can obtain a better cost recovery.

The third type of policy solutions is structural in the sense that it involves a specific industrial organisation set-up. Occupational pension plans, for instance, involve the employer and trustees (or equivalent pension fund directors) acting as intermediaries between plan members and pension providers. The employer or trustee can negotiate contracts for DC plan administration and investment management on behalf of all plan members, ensuring greater negotiating power.

In personal plans, a structural solution may involve the establishment of a centralised institution that is in charge of either delivering the various pension services, directly or via an outsourcing arrangement, or of negotiating better terms (lower fees) on behalf of individual plan members (*e.g.* the Swedish PPM system or NEST in the United Kingdom). This policy solution can be very effective in achieving low fees as it ensures economies of scale and can avoid the marketing expenses of the retail model. However, it may be difficult to implement once a DC industry of competing providers is established, at least in a mandatory system. A centralised institution can also raise governance challenges that call for effective and independent oversight.

There are other structural solutions which can also be conducive to lower fees that may work better when a DC industry of competing providers is already established. This includes establishing a tender process, for example by the regulator, for assigning new or undecided workers to a low-cost pension provider (*e.g.* Chile, Mexico and New Zealand). Again, such a solution calls for strong public sector governance and institutional capability.

6.3.6. Consider the pros and cons of investment guarantees

The financial and economic crisis brought into sharp contrast the volatility resulting from financial market risk (see Antolín, 2009). Moreover, the analysis above (Table 6.2) also shows how important the impact of labour, financial, and demographic risks on retirement income in DC plans can be, in particular, in extreme negative situations in which retirement income can turn out to be quite low. This risk has led regulators, policy makers and market participants to discuss several measures to address this volatility in retirement

income, especially the possibility of low retirement income as a consequence of extreme negative outcomes for the risk variables. The main measures being discussed include introducing guarantees in DC pension plans, in particular, minimum return guarantees like capital guarantees; and establishing appropriate default investment strategies.

The effects of market risk on DC pensions can be alleviated by introducing minimum return guarantees. Minimum return guarantees only ensure that the amount of the accumulated savings at retirement does not fall below a certain value, but the actual pension benefit received after retirement will vary above that ceiling depending on the type of pay-out product chosen and market conditions at that time of retirement. Minimum return guarantees thus protect retirement income in DC plans against major investment losses. They could also enhance people's appreciation of and confidence in DC pension plans and in turn boost the coverage of and contributions to these plans. However, as guarantees have to be paid for, they reduce the expected value of retirement income from DC plans.

The cost of minimum return guarantees can be relatively high depending on risk aversion and the trade-off protection and reduce expected value of retirement income. In this context, Chapter 5 shows that capital guarantees that protect the nominal value of contributions in DC pension plans can be relatively cheap to provide, offer an attractive cost-benefit trade-off for DC pension plan members, and are valued highly by plan members as they address one of the main concerns about DC plans among the general population: people are often disinclined to save in DC plans because they feel they can lose even part of the money they put in. However, such capital guarantees are relatively cheap and easy to implement in the very specific context considered in Chapter 5: a DC pension plan with a fixed and long contribution period (40 years), a pre-set life cycle investment strategy and "normal" capital market conditions. Relaxing any of these features would raise the cost of the capital guarantees. For example, the annual cost of the capital guarantee for a 40-year contribution period rises from 0.06 percent of assets, as shown in Table 6.4, to 0.24 percent of assets with a 20-year contribution period. Whether capital guarantees without those constraints are necessary or affordable would depend on risk aversion and the trade-off between the willingness to pay for certainty and the reduction in retirement income that paying for the guarantee entails.

Table 6.4. **Cost of minimum return guarantees for a 40-year contribution period**

	Capital guarantee	2% guarantee	Inflation-indexed capital guarantee	Ongoing capital guarantee	4% guarantee with annual fees	Floating guarantee
% of net asset value	0.06	0.22	0.24	0.39	0.89	1.22
% of contributions	1.24	4.94	5.58	18.36	18.71	26.09

Source: Antolín *et al.* (2011)

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Guarantees in DC pension plans are less necessary in countries where the PAYG-financed public pension already provides a high level of retirement income and where there are public safety nets that compensate workers – especially low income ones – from a low investment return on their funded pension contributions. On the other hand, guarantees are most useful where DC pension plans provide a large part of the overall retirement income and when membership of such plans is mandatory.

Establishing minimum return guarantees requires addressing additional concerns. Guarantees in DC systems can hamper members' mobility across providers or fund managers, a key feature of DC systems, as providers will charge a fee on the switcher's account to compensate them for the lower contribution period over which they have to meet the guarantee. The investment choice inherent to a DC system also makes the design of guarantees cumbersome, as the price of the guarantee varies with the riskiness of the investment portfolio. Indeed, in countries where there are minimum return guarantees in DC plans, individuals often do not have investment choice.[29] In fact, in some cases, the introduction of guarantees has led providers to move to very conservative investment portfolios, reducing expected long-term returns. Therefore, although guarantees can limit the impact of investment risk, their use to achieve this objective may be inherently inconsistent with DC pension plans. Finally, guarantees raise the need to ensure adequate protection from the insolvency of the guarantor.

6.3.7. Establish default investment strategies with appropriate risk exposure

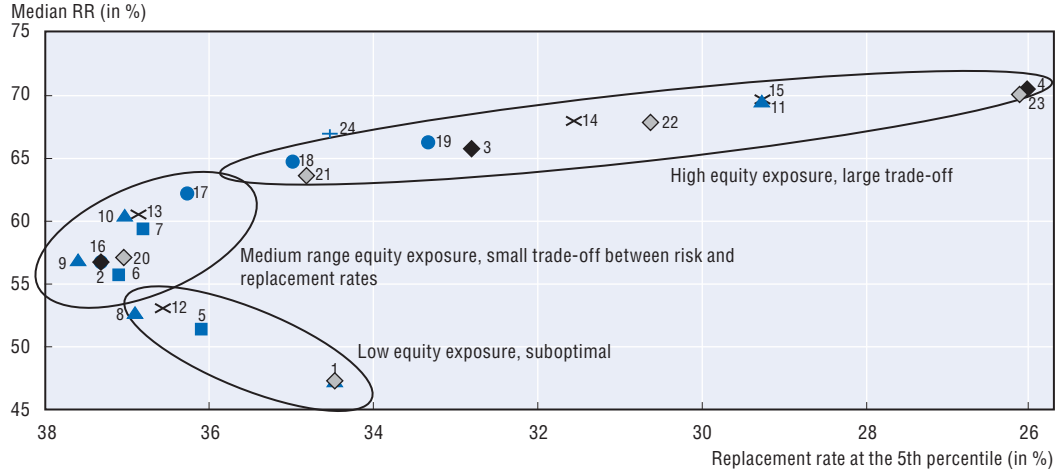
It is possible to partially offset the impact of the uncertainty on retirement income by introducing appropriate default investment strategies. One of the main arguments for supporting DC pension plans is that people are able to choose their investment strategy, they provide choice. People would choose the investment strategy best suited for them according to their risk profile and their level of risk tolerance, as well as their different overall pension arrangements.[30] However, behavioural economics and the financial literacy research show that some people are either unwilling or unable to choose, let alone to actively manage their own portfolio investments. Therefore, default investment strategies would be ideal, as they incorporate the lessons learned from behavioural economics on the importance of inertia and passive decision making, to make sure that those people are assigned to appropriate investment strategies.

Default investment strategies should concentrate on reducing the risk of extreme negative outcomes on retirement income. Indeed, default investment strategies can be designed to minimize the impact of market conditions and reduce the risk of sharp falls in retirement income as a result of extreme negative outcomes (*e.g.* a sharp negative shock to equities just before retirement, as happened to some pension holders in 2008). They are useful in protecting pension benefits from market swings, in particular for people close to retirement. Obviously, risk and reward go hand-in-hand, so ensuring protection from negative market outcomes means lower potential gains during market upswings. Although having a default investment strategy for people with different risk profiles may not be ideal (one-size-fits-all type of problem), when the main concern is the impact on retirement income from extreme negative outcomes, such default options may be appropriate, in particular when choice is given. In this regard, default investment strategies may need to come with an opt-out clause for those who are willing and capable of making investment choices.

Finally, the question comes down to choosing the appropriate default option. Choosing among different investment policies requires balancing the trade-off between higher potential retirement income and the associated risks. The analysis of different investment strategies using a stochastic model shows that an all-bond strategy and most strategies with very low equity allocations (less than 20%) are seemingly inferior in the sense that there is always an investment strategy that provides a higher return (median replacement rate) for a lower risk (higher replacement rate at the 5th percentile). Similarly, investment strategies with high equity exposure (*e.g.* more than 80%) can always been

improved upon by other strategies that provide relatively less return at a much lower risk. Therefore, investment strategies with both very low allocations to equities (below 20%) and very high ones (above 80%) look unattractive in terms of the trade-off between replacement rate expectations and risk, measured by the replacement rate at extreme negative outcomes (*i.e.* the 1st and 5th percentiles). In between, however, there is a wide range of options for regulators and supervisors to consider (Figure 6.6).[31]

Figure 6.6. **Trade-off between potential retirement income (median replacement rate) and risk (replacement rate at 5th percentile)**



Source: Antolín *et al.* (2010).

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Which default strategy to choose depends on the probability threshold established to assess risk. For example, risk adverse regulators or individuals might aim at investment policies that reduce the downside risk of extreme negative outcomes from DC plans in 99.5% of the cases, which may lead to very conservative investment policies, where the share of assets allocated to bonds is quite large (higher than 60%). For less risk adverse regulators or individuals, the risk threshold can be reduced, say to 80% and then the range of possible investment strategies increases as well as potential retirement income. It is important to stress that there is not a single correct trade-off; the choice depends on the specific country context and the risk aversion levels deemed acceptable therein. For countries where payments from DC pension plans are the main source of retirement income, the cost to the society of downside risks or unfavourable outcomes is much larger than in countries where they have other sources of retirement income (public pensions).

6.3.8. Establish life-cycle investment strategies as defaults

Investment strategies based on the life-cycle approach may be appropriate default investment strategies. Life-cycle investment strategies state that the amount of assets accumulated to finance retirement allocated to risky assets (*e.g.* equities) should fall as people get closer to retirement. The OECD work using a stochastic model (see Antolín and Payet, 2010) shows that:

- Life-cycle strategies provide protection for those close to retirement in the case of a negative shock to the stock market just before retirement, in particular for individuals who experience unemployment and who have medium to low growth in income.

- Among the life-cycle strategies, the one with a sharp decrease in equities in the last decade just before retirement performs best, at least when the shock occurs within one or two years before retirement.
- The positive impact of life-cycle strategies dwindles as shocks to equity markets occur further from retirement age.
- Life-cycle strategies also provide protection when contribution periods are short.

Indeed, the table below shows that life cycle strategies provide protection against negative equity market shocks. Table 6.5 presents estimates for the probability that life-cycle strategies provide higher retirement income than fixed portfolios (given the same age-weighted equity exposure) when a negative shock to equity markets occurs before retirement when there is uncertainty on investment returns, inflation, interest rates, unemployment, career real wage growth paths and life expectancy. The table also shows that for shorter contribution periods (*e.g.* 20 years as opposed to 40 years) the likelihood that life-cycle strategies provide a higher replacement rate when there is a negative shock to stock markets the year just before retirement is higher.

Table 6.5. **Estimated probability that pension benefits based on life-cycle strategies will be higher than those based on a fixed portfolio strategy for two different contribution periods**

	Entire random sample (10 000 obs.)		Negative stock market shock[1]	
	Contribution period		Contribution period	
Life-cycle investment strategies	20 years	40 years	20 years	40 years
Sharp decrease after age 55[2]	30.2	42.1	71	61.5

Note: Calculations assume a contribution rate of 5% over a 20- and a 40-year period. Results are from the OECD stochastic model with uncertain returns on investment, inflation, interest rates, life expectancy, unemployment and weighted average real wage growth – weighted by the probabilities of having high (42%), medium (55%) and low (3%) real wage growth.

1. The negative shock to equity markets is defined as an annual fall in the return to equities of 10% or more in the year just before retirement. The sample of cases in which a negative shock to equity markets of 10% or more happens is 15%. Antolín and Payet (2010) presents results when the shock to equity markets occurs two years before retirement, or in any of the five years before retirement.
2. The life-cycle portfolio is designed such that the age-weighted average exposure to equities during the accumulation period is equal to that of the fixed-portfolio exposure to equity, 65% in this case. The gliding path with respect to age is such that the initial allocation of 77% or 87% to equities (depending on contributing for 40 or 20 years, respectively), is kept constant during the most of the accumulation period and decreases to zero only in the last 10 years before retirement.

Source: OECD calculations.

StatLink http://dx.doi.org/10.1787/888932599348

Life-cycle strategies differ on their glide paths. OECD work suggests that life-cycle investment strategies with constant exposure to equities during most of the accumulation period that subsequently reduce it rapidly during the last 10 years before retirement seems to offer the best protection (see Antolín *et al.*, 2010). They are one of the more efficient life-cycle strategies in reducing the risk of sharp reductions in retirement income, in particular when a negative shock to equity markets occurs in the years just prior to retirement (as occurred in 2008). This result owes mostly to the *portfolio-size effect*: the biggest impact of negative-market outcomes occurs at the end of the accumulation period because this is when accumulated balances are at their highest level.

However, it essential to stress that life-cycle investment strategies are not a panacea. First, when using the stochastic model without focusing on extreme negative outcomes (Table 6.2) or looking at historical data and calculating hypothetical replacement rates (see below), it is unclear whether a fixed-portfolio or relatively straightforward life-cycle strategies perform better in terms of the probability distribution of replacement rates. Moreover, life-cycle strategies do not address the problem of volatility of retirement income resulting from market fluctuations or the problem of inadequate or low pensions.

Life-cycle strategies can be organised around a single fund or around several funds. The former are target date funds (*e.g.* as in the United States) in which the allocation to risky assets falls with age. In multi-funds or a life-styling funds system (*e.g.* Chile), each fund has different allocations to risky assets, with an upper and a lower limit to equity exposure, with the middle of the bracket as a possible default option. Individuals are shifted from one fund to the next according to their age. Multi-funds provide flexibility as people in each fund can have different exposures to risk depending on their risk tolerance parameter. Additionally, after a negative equity shock the multi-fund system with upper and lower limits allows for the exposure to equities to be increased and thus take advantage of a possible market rebound. Although this flexibility sounds good, the rationale behind a default strategy is exactly to avoid having people make those kinds of active management decisions that they are not prepared or willing to do.

Finally, the relative performance of investment strategies depends on the type of benefit during the payout phase. Using a stochastic model with different payout phases, life cycle strategies do best – measured in a risk-adjusted manner when risk is assessed by replacement rates in extreme situations (1st or 5th percentile) – when benefits are paid as life annuities but are less valuable when benefits are paid as programmed withdrawals. Dynamic strategies, in which rules link asset allocation to the performance of each asset class in each period of time, seem to work better with programmed withdrawals.[32] A mixed of life-cycle and dynamic strategies may be required when benefits are paid combining programmed withdrawals and deferred life annuities bought at the time of retirement. However, dynamic management strategies fail to add much value. Such strategies provide at best a marginal improvement in the trade-off between median replacement rate and replacement rate at the 5th percentile than life-cycle strategies, and they are much more complicated to explain to the public in general.

Life-cycle investment strategies are the safest bet when sharp drops in retirement income as a result of extreme negative outcomes are the main concern. Moreover, life-cycle investment strategies are easier to explain to the public in general and much easier to implement than more sophisticated investment strategies. One of the most challenging aspects of life-cycle strategies is setting an adequate investment glide path, including a starting and end allocation for equity investments. The choice of glide path will be affected by many factors, including the role of the DC plan in the overall retirement income system.

6.3.9. Combine programmed withdrawals with deferred life annuities indexed to inflation as the default option for the pay-out phase

The design of the payout phase needs to strike a balance between flexibility and protection from longevity risk. One of the main objectives of pension provision is to protect people from outliving their own resources – that is, to insure them against longevity risk. Protection from longevity risk is achieved through life-long pension benefits. Public PAYG-financed pensions and funded DB pension plans promise to pay a constant stream of

income through retirement, hence providing protection from longevity risk. In DC pension plans, individuals bear the longevity risk and only by using part or all of the assets accumulated in these plans to buy life annuities can they be insured against longevity risk.

Unfortunately, life annuities are illiquid and inflexible, and do not allow for bequests. They may also involve high intermediation or marketing costs and are generally perceived as low value for money in many countries. There are "psychological" reasons why people dislike annuities. They do not like to "give away" large amounts of money (annuity premiums are large one-off payments) for a small amount (payments are relatively smaller). Moreover, people tend to view annuity providers as institutions taking their money away. There is also the issue of insolvency risk. People wonder whether the institutions taking their money now for promised pension payments 20-30 years hence will be around over that time. They may think that they can manage their own money better.

The main alternative to buying an annuity is to draw down the accumulated funds gradually while leaving the remainder invested in the DC account. These so-called phased or programmed withdrawals (and lump-sum payments) provide full flexibility and liquidity to face contingencies (*e.g.* health care, pay down debt), and permit bequests. Programmed withdrawals also offer access to portfolio investment gains that traditional annuities fail to provide, although variable annuities offer access to returns from capital market investments.

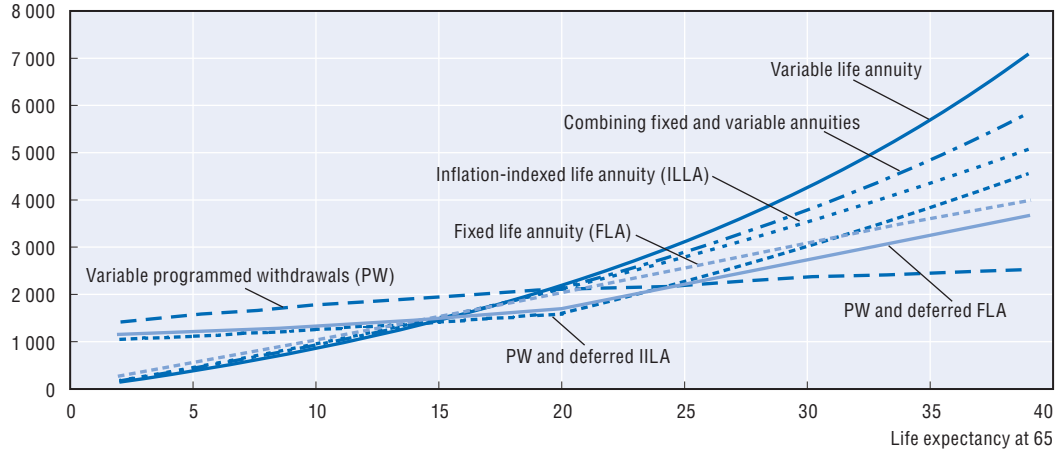
The key policy question to address, therefore, is which arrangement for the payout phase policy makers and regulators may promote or recommend. Despite the clear advantage of life annuities in providing protection from longevity risk, there are also strong arguments for people preferring programmed withdrawals. One key criterion for policymakers to consider is the overall structure of the country's pension system, as well as whether the DC pension plans are mandatory or voluntary.[33] The arguments for mandatory annuitisation are most compelling in mandatory DC systems that provide a large part of retirement income. Some degree of annuitization of balances accumulated in DC pension plans, at least as the default arrangement, may also be appropriate in voluntary DC systems in order to provide some insurance against longevity risk.

From the individual's perspective, the choice of arrangement for the payout phase depends on an age threshold. For example, calculations of total accumulated retirement income under several arrangements for the payout phase (Figure 6.7) show that those individuals who would live below a certain life expectancy at retirement, which determines an age threshold, would have higher accumulated retirement income with programmed withdrawals. Under programmed withdrawals, at the moment of passing away, balances remaining in each person's account go to their heirs. After that age threshold, life annuities become a better value. Therefore, as long as an individual's life expectancy is below the average life expectancy of his or her cohort or socio-economic group (used to calculate pension payments and annuity premiums), said individual would be better off with a programmed withdrawal.

However, individuals do not know whether they will live within or beyond their cohort's life expectancy. If fact, there is widespread evidence that most people underestimate their life expectancy, which is yet another reason why people shy away from buying annuities and instead take programmed withdrawals when offered the choice.

The age threshold depends not only on average life expectancy but also on other financial factors. The average life expectancy is the one corresponding to the individual's

Figure 6.7. **Accumulated retirement income for different payout arrangements according to life expectancy at 65**



Source: OECD calculations.

cohort or socio-economic group, which is used by providers of annuities and variable programmed withdrawals to calculate pension payments and annuity premiums. Accordingly, 50% of people may be better off with variable programmed withdrawals. Yet, other factors can shift the age threshold to the right, making the percentage of people better off with programmed withdrawals higher than 50%. The difference in returns between the equity-bond portfolio of variable programmed withdrawals and the bond-only of life annuities means that as the difference increases the age threshold will shift to the right. Higher inflation would also shift the age threshold to the right. Finally, higher amounts of assets accumulated at retirement also shift the age threshold to the right, thanks to the portfolio size effect of having access to portfolio investment gains in variable programmed withdrawals.

All the above suggests that there are strong incentives against taking up a life annuity at retirement. However, life annuities may need to be part of any default arrangement for the payout phase, depending on the overall pension system, as they provide insurance against longevity risk. Balancing these various risks, the main recommendations are:

Firstly, life annuities are insurance products but are sold as investment products. Life annuities are insurance and, therefore, the entire framework should be changed and focused on insurance for longevity risk. As insurance, one may argue that typical insurance products require small regular payments, while life annuities require a large one-off payment (money illusion). However, there is no particular reason why it should not be possible for individuals to buy life annuities by making small payments throughout the accumulation phase in which the fixed income component of the default life-cycle strategy consists of participations in life annuity products that accumulate over time.

Secondly, standard life annuities are best seen as part of a default arrangement for the payout phase. As life expectancy at retirement is unknown, the age threshold is uncertain. The annuitization of a minimum level of assets accumulated at retirement is advisable to provide protection from longevity risk at least as a default.[34] Among life annuities, variable life annuities look better than standard life annuities, as they provide access to portfolio investment gains (Figure 6.7 above). However, they raise concerns about sharp reductions in retirement income when extreme negative outcomes occur.

Thirdly, the main recommendation for a default arrangement for the payout phase is to combine programmed withdrawals with a deferred life annuity. This combination achieves a balance between protection from longevity risk, flexibility, liquidity, possibility of bequests, and access to portfolio investment gains. An attractive and potentially economical compromise would be to combine variable programmed withdrawals with a deferred life annuity bought at the time of retirement that starts paying at old ages (*e.g.* 85). The programmed withdrawal provides some flexibility and liquidity to face any contingencies, as well as access to potential portfolio investment gains, and the deferred annuity insures against longevity risk at a cost of only a relatively small portion of the assets accumulated in DC plans. Although, standard calculations of its cost suggest that it may be reasonable (15-20% of balances accumulated at retirement), there is a lack of international evidence on the existence of a market for these combined arrangements.[35] The true cost may be higher than standard calculations of premiums may suggest, as the deferred annuity would cover the longevity tail risk and providers may find it difficult to hedge this tail risk, in particular when there is a lack of suitable financial hedging instruments (see discussion below).

Fourthly, lump-sum distributions should be limited to a small part of the accumulated balance at retirement (*e.g.* at most 20%), except perhaps for very small accounts.

Finally, the structure of the payout phase may need to include protection from inflation. In some countries retirement income from DC pension plans may not always be indexed to inflation. The lack of inflation indexation could reduce the purchasing power of retirement income by as much as one third over a 20- year period. To avoid such important losses in purchasing power at old ages, retirement incomes from DC plans need to be indexed to inflation. Unfortunately, indexing retirement income to inflation requires a bigger saving effort. For example, contribution rates need to increase a little over 1 percentage point over a 40-year contribution period to have benefits indexed to inflation given a 20 year life expectancy at age 65. In this context the deferred life annuity in the combined arrangements may need to be indexed to inflation.

Policy proposals mandating partial annuitization of assets accumulated in DC pension plans can only be operational if there are providers and annuity markets function appropriately. However, there are many challenges facing annuitization, which include who the providers could be as well as demand and supply constraints in the market for annuities.

6.3.10. Promote cost-efficient competition in the annuity market

Countries should promote cost-efficient competition in the annuity market. For example, by allowing any financial institution to act as annuity provider, as long as they are sufficiently regulated and fair competition is guaranteed. In particular, solvency ratios should be relatively high to protect retirement income from default on the part of the provider.

In practical terms, life insurance companies are better prepared than other types of intermediaries to offer life annuities, as they have the technical capabilities, the expertise and, in theory, may be naturally hedged as they may operate in both sides of the market (life expectancy and mortality).

However, in some cases, life insurers may face problems in participating in the market for life annuities, which has the effect of reducing competition and increasing costs. One of the main arguments to explain this lack of participation relates to the problems in dealing

with longevity risk, in particular, the lack of financial instruments to hedge against longevity risk and the need to use well defined mortality tables so that provisions and capital put aside can be adequate. However, longevity risk can be managed in house through actuarial valuations and provisioning to withstand fluctuations.

Pension funds could also be providers of annuities in DC plans. This may help in smoothing out the transition between the accumulation and the payout phases and in mitigating the reputational risk to private pensions of insurers going bankrupt.

When pension funds pay benefits in the form of annuities, appropriate prudential funding regulations need to be in place to protect retirement income. These rules need to take into account the risks that pension funds are exposed to as well as the nature of benefit promises and other sources of financing and protection. In particular, pension plan sponsors – and in some cases members – may be ultimately responsible for any pension shortfall, and there may also be collective guarantee arrangements in place in case of sponsor insolvency. Moreover, any agreed "social contract" may allow *ex post* adjustment of benefits.

Alternatively, separate specialised financial institutions dedicated exclusively to the annuity business could operate in the market. Such specialised insurers offer the benefit of protection from solvency problems in other insurance branches, but they may lack the broad-based business needed to ensure sufficient scale and low costs.

Finally, a single entity or state annuity fund could provide annuities. This alternative is attracting interest among policy makers, though the issue of how to combine a state annuity fund and life insurance companies competing in the same market may need to be assessed further. In this sense, a state annuity fund should not crowd out private financial institutions and it should avoid reducing incentives to develop private markets. Countries with small or non-existent annuity markets could institute a centralised annuity provider, but should allow insurance companies and other providers to enter the market, guarantee full equal competition, and the role of the centralised annuity provider should dwindle down as the market develops.

6.3.11. Promote the demand for annuities

Annuity markets are fraught with problems posing a challenge to the recommendation of partial annuitization of assets accumulated in DC plans. Annuity markets face a myriad of demand and supply constraints that need to be addressed in order to promote annuitization.

On the demand side of annuity markets, changing the framing could promote annuitization. Annuities are often viewed as investment instruments and as such they may be quite unattractive. As investments, annuities are far from perfect, in particular when people underestimate their life expectancy and think it is below the average life expectancy of their cohort. The correct view of annuities is of course as insurance products, which are designed to protect people from outliving their resources; annuities also help to smooth out consumption as an individual moves from working life into retirement. Correcting individuals' perception of annuities, by changing the framing of annuities, may help foster increased demand.

Additional factors affecting negatively the demand for annuities include the crowding out from public pensions, tax disincentives to buying annuities; lack of adequate financial literacy and financial awareness of individuals; and the lack of innovative products that address some of the needs that potential annuity buyers may have, as well as bequest

motives and personal circumstances (*e.g.* family support, need to cover medical care expenses) that compel individuals to have precautionary savings. Taxes need to be examined to make sure that there are no incentives against buying annuities.

On financial education, there is a need to implement programs aiming at improving the financial literacy and financial awareness of individuals, as well as improving the qualification of pension and annuity intermediaries using, for example, certification programs

Another serious problem in the demand for annuities is the dichotomy between prospective annuitants' requirements and cost. Surveys always highlight that prospective annuitants want annuity products with several features and guarantees (*e.g.* access to stock market gains, bequests), and they also want annuity products that are not too costly. However, the more features and guarantees involved the more costly annuity products are. Hence, some innovative products combining these features and sharing costs may help in this regard.

Finally, annuity markets and prospective annuitants may benefit from innovative annuity products such as variable annuities that provide access to capital gains at retirement, reverse annuity mortgages that permit tapping into housing wealth, and products that combine pension annuity payments and long-term care coverage. However, design and regulatory issues need to be sorted out. For example, pension payment flows are constant and certain but health disbursements can be unpredictable and quite large. The market for variable annuities has been growing, in particular in the United States, as they allow people access to capital gains, which it is one of the advantages of programmed withdrawals. In theory, access to capital markets gains can also provide a hedge against inflation and potential losses in purchasing power.

6.3.12. Facilitate the supply of annuities by further developing risk-hedging instruments

On the supply side, annuity markets suffer problems of adverse selection affecting pricing, incomplete markets (*e.g.* lack of inflation protection, lack of exposure to equities), concerns with regulatory capital requirement for the risk involved, as well as the exposure to the uncertainty surrounding future mortality and life expectancy (*i.e.*, longevity risk), and the lack of adequate or enough financial instruments to help in hedging longevity risk.

Successful annuitization requires pension funds and providers of annuities to have at their disposal suitable mechanisms to manage longevity risk. This requirement includes the need for a better understanding of what is longevity risk, more appropriate modelling of longevity in actuarial valuations, and instruments to hedge longevity risk.

Longevity risk is the risk that future outcomes in mortality and life expectancy will turn out higher than expected and accounted for. Pension funds and annuity providers determine through actuarial valuations contribution rates or premiums and pension benefits. If the assumptions on mortality and life expectancy incorporated in those actuarial valuations fail to materialise and improvements in mortality and life expectancy turn out to be beyond what has been assumed, the liabilities of pension funds and annuity providers will be much larger than covered by reserves, which could affect their solvency.

Longevity risk affects individuals, pension funds, annuity providers and governments. As a result of the uncertainty about future mortality and life expectancy outcomes, individuals risk outliving their resources (assets accumulated to finance retirement) and

being forced to reduce their standard of living in old age. Pension funds, governments and annuity providers risk having to pay benefits for a longer period than reckoned in their actuarial assumptions, which they may not be able to afford.

Longevity risk comprises idiosyncratic and aggregate longevity risk. Idiosyncratic or individual specific longevity risk refers to the uncertainty or risk that an individual will live longer than expected given the average life expectancy of his/her cohort or socio-economic population subgroup. The aggregate or cohort longevity risk refers to the risk that an entire cohort will live longer than expected as a result, for example, of some medical advances or better dieting. Financial markets can address the idiosyncratic longevity risk by pooling risks, but they may find it more difficult to address aggregate or cohort longevity risk.

Pension funds and annuity providers can manage longevity risk in-house as part of their internal risk management systems. Pension funds and annuity providers can retain the risk and hold enough capital to withstand fluctuations. This arrangement has traditionally been facilitated by the actuarial valuation process. Longevity risk can be reduced by using appropriate models to estimate future improvements in mortality and life expectancy, for example, through stochastic models that allow probabilities to be calculated, which enable risks to be priced accordingly. In this context, the longevity risk will be the difference between the improvements in mortality and life expectancy assumed in the actuarial valuations and the actual improvements that occur in the future. Hence, the first step to manage longevity risk is to recognise its existence and to incorporate it in the actuarial valuations, using stochastic modelling to introduce future improvements in mortality and life expectancy. Furthermore, mortality and life tables should be updated regularly. Moreover, recognition of the long-term nature of longevity risk requires improvements to be incorporated for a long enough period (*e.g.* at least 50 years).[36]

Pension funds and annuity providers can also manage longevity risk using asset-liability management. Asset-liability management or liability driven investment (LDI) has been increasingly adopted by the pension fund industry. This approach tries to link asset allocation strategies to liabilities so that investment returns can match and outperform liability streams. For example, as longevity risk might increase pension liabilities and their duration, investments in long-dated bonds would become more attractive.

Pension funds and annuity providers can also use risk-sharing to manage longevity risk. Innovative products that link payments partially to life expectancy would allow all stakeholders to share longevity risk. Moreover, contributions determined in the actuarial valuations can also be partially linked to changes in mortality and life expectancy. These instruments may be quite useful in sharing, in particular, aggregate or cohort longevity risk.[37] However, risk-sharing may lead to an unequal distribution of costs and benefits between, for example, males and females, the sick and the healthy, or between current and future generations.

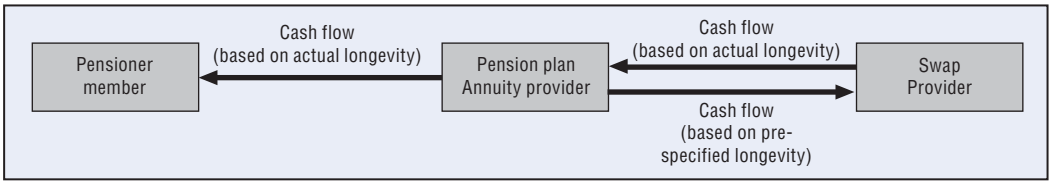
Pension funds and annuity providers can additionally remove some or all the longevity risk by transferring it to a third party. There are several mechanisms at their disposal currently being implemented in the market. These include pension buy-outs, pension buy-ins, longevity hedges and derivatives. Pension buy-outs (passing the entire scheme to a specialist insurer) and pension buy-ins (insuring the liabilities) are generally for defined benefit (DB) pension plans and in termination.[38]

Longevity hedges are contracts that reduce the exposure to longevity risk by transferring some or all of this risk to a third party. A longevity hedge is commonly

executed through a longevity swap. In a longevity swap, the entity buying the hedge (*e.g.* pension fund or annuity provider) pays a series of fixed amounts for the duration of the contract ("fixed leg") based on pre-specified mortality tables (q-forward contracts) or survivor tables (s-forward contracts) in return for receiving from the provider of the hedge a series of variable payments ("floating leg") that are linked to actual mortality (q-forward contracts) or survival rates (s-forward contracts) of pensioners or members.

Longevity hedges (or swaps) carried out so far have some important drawbacks. They are under-the-counter as they tend to use private longevity indices that are not fully publicly available (*e.g.* JP Morgan, Deutsche Bank) based on specific subpopulations of members or pensioners to allow pension funds and annuity providers to transfer all the longevity risk of those specific populations. Moreover, longevity swap contracts may have a duration that does not match to the long-term nature of longevity risk.

Figure 6.8. **Longevity swaps**



Longevity hedges (or swaps) can be constructed so that they transfer all the risk of a specific group of pensioners or members, or transfer only part of the risk. Bespoke longevity hedges allow pension plans or annuity providers to fully transfer all the longevity risk of members covered. The floating payment is linked to the actual lifetime of the specific group of members. These hedges are therefore only viable for large schemes, as a large group of members or pensioners is required to efficiently price the hedge.

Index-based longevity hedges transfer only part of the risk, providing protection against unexpected increases in longevity of a general population, and the scheme or annuity provider is left holding the specific longevity risk of its members. This residual risk of the actual experience of members or pensioners from the index is known as basis' risk.

Bespoke longevity hedges are a better hedge than index-based hedges, because they reflect the pension fund or annuity providers' liabilities more accurately. However, index-based hedges are easy to standardise, which makes them more tradable in the capital markets and, hence, more liquid and perhaps less costly. Index-based contracts could be the basis for derivatives – standardised contracts which exchange realised longevity for pre-specified fixed longevity, which can be traded over-the-counter.

A final instrument involving the transfer of all or part of longevity risk to a third party is a longevity bond. These are bonds whereby the coupons are linked to a longevity index. They provide partial longevity protection for pension funds and annuity providers buying them, but are not a full hedge against all the actual longevity risk. Longevity bonds unfortunately require much heavier funding requirements, making them rather expensive.[39]

All the above options to manage longevity risk, whether through in-house management or different approaches to transferring risks to a third party, are not mutually exclusive. They all should be part of a comprehensive approach to risk management.

However, among the different options to transfer risk to a third party only some have the potential to become a standard approach to managing such risk. For example, buy-outs and buy-ins are quite specific for DB and schemes in termination. Longevity hedges based on specific groups are over-the-counter and cannot be standardised. Index-based swaps by contrast have the potential to become one of the main instruments to partially transfer risk to third parties, once a standard longevity index is available. Longevity bonds also have potential, but unfortunately, longevity indexed bonds issued by private institutions may be too expensive until a market develops further.

Summing up, there are a number of possible policies to facilitate the supply of annuities. First, mortality and life tables should include stochastic forecasts of future improvements in mortality and life expectancy. The attached probabilities would allow for a better assessment of the degree of uncertainty and help to price risks accurately. Moreover, life tables should be updated continuously as new data comes along. Secondly, longevity risk could be managed through a combination of in-house management (*e.g.* through their actuarial valuations and holding reserve capital), some asset-liability matching, risk-sharing products and longevity hedges.

Pension funds and insurance companies need financial instruments in order to better hedge their liability risks (inflation, longevity, interest rates) and expand their roles as providers of pensions and annuities. In this context, index-based longevity hedges have the potential to be come standard capital market solutions to hedging longevity risk.

There is a clear role for governments to play in order to promote capital market solutions to hedging longevity risk and thus facilitate the supply of annuities. Governments could produce standard and reliable longevity indices by different socio-economic subgroups that would help the creation of standard longevity swaps (derivatives), making them more tradable, increasing liquidity and promoting over-the-counter instruments. National statistical institutes are the institutions with the largest wealth of information on mortality and life expectancy by socio-economic variables in each country.

Governments could additionally consider in certain contexts issuing longevity indexed bonds (LIB) and issuing very long-term bonds in sufficient quantities. Governments with low exposure to longevity risk through their social security or public pensions' balance sheets could easily issue longevity indexed bonds to kick start the market. However, governments with exposure to longevity risk in their balance sheets could as well, although some changes in the mandates of government debt management institutions may be required. Alternatively, governments could issue very long-term bonds to help pension funds and annuity providers to hedge longevity risk.[40]

6.4. Conclusion

This chapter has shown that much can be done to improve the design of defined contribution pension plans and to strengthen retirement income adequacy in these plans. Policy options include:

- Ensuring that DC plans are coherent between the accumulation and payout phases, and with the overall pension system.
- Establishing effective communication about pension plans and improving financial literacy.
- Encouraging people to contribute to pensions and for long periods, so that their DC pension plans will provide adequate benefits.

- Improving the design of incentives to save for retirement.
- Promoting low-cost retirement savings instruments.
- Establishing default life-cycle investment strategies to protect people close to retirement against extreme negative outcomes.
- Establishing a minimum level of annuitization as a default for protection against longevity risk, and combine programmed withdrawals with deferred life annuities indexed to inflation.
- Fostering the demand for annuities, facilitating the supply of annuities and encouraging cost-efficient competition in the annuity market. Changing the framing in which annuities are considered from investment instruments to insurance products could foster the demand for annuities, while further developing risk-hedging instruments could facilitate the supply of annuities.

Notes

1. The replacement rate is generally defined as retirement income relative to final salary. Although, sometimes it is calculated relative to career average wages instead of final salary.
2. Antolín (2009) and Antolín and Payet (2010) show situations in which replacement rates may not be appropriate indicators.
3. Antolín (2009) shows that purchasing power can fall as much as one-third in 20 years after retirement if benefits are not indexed to inflation.
4. The (un-weighted) OECD average replacement rate from public pensions is 42% (OECD, 2011). Therefore, for an overall replacement rate of 70%, private pension plans may need to provide a 30% replacement rate.
5. Antolín and Payet (2010) describes the stochastic model used to support the results provided in this chapter. The Chilean Pension Superintendency (see Berstein *et al.*, 2010) also carries out such a modelling exercise.
6. *www.oecd.org/dataoecd/16/33/34018295.pdf*.
7. *www.oecd.org/dataoecd/7/17/35108560.pdf*.
8. *www.oecd.org/dataoecd/4/21/40537843.pdf*.
9. There are other reasons explaining the shift from DB to DC plans such as the need to reduce the burden on employers. In DB pension plans any shortfall due for example to underperformance of investments or longevity changes is the responsibility of plan sponsors, generally employers. In DC pension plans the individual bears all the risks and is responsible for any shortfall. Additionally, the shift from DB to DC has also been implemented to reduce costs to sponsors or employers. In most cases, employers do not contribute to DC plans as much as they had to contribute to DB pension plans.
10. In a perfect world given the promised pension benefits, actuarial calculations will determine the contribution rate. However, in the real world the parameters used in the actuarial calculations change but the promise remains constant, breaking the link between contribution and benefits.
11. The rate of growth of contributions to achieve a certain replacement rate falls as life expectancy increases. For example, in Table 6.1 falls from 1.65 to 1.25.
12. For example, the average annual nominal return for a portfolio invested 60% in equities and 40% in government bonds taking into account continuous annual contributions from 1970 to 2010 (40 years) and using historical returns for the same period in equities (including dividends) and long-term government bonds, would have been 7.3% for France and 7.6% for the United States. This period includes the crisis of 1973-74, 1979-81, 1990-91, 2000-01, and 2008-2010.
13. Assuming potential real GDP growth of 2.5%, inflation of 2% and an equity premium of 4% (the equity premium over the last 110 years has been around 5.5% for countries such as France, Germany, Japan and the United States, according to Credit Suisse Global Investment Returns Yearbook 2011), a portfolio invested 60% on equities and 40% on long-term government bonds

would yield an average annual return of 6.9% (4.5%*40% + 8.5%*60%). Taking the EU GDP growth projections of 1.4% for EU27 over the period 2010 to 2060 (see 2012 EPC Projections of Age Related Expenditure), and assuming a lower equity premium of 3%, average returns on a 60-40 portfolio would be around 5.2% (3.4%*40% + 6.4%*60%).

14. There is also an argument to have contributions falling as people age: the power of compound interest. Thanks to the compound interest formula lower contributions early on in one's working life bring in the same amount of accumulated savings at retirement than higher contributions later on. In this context, some of the communication and financial education programmes aim at making people realise that the earlier they begin contributing to retirement the less they need to contribute annually.

15. The main thrust of the analysis (*i.e.,* large increases in contribution rates at people ages) is validated when using a life-cycle investment strategy with historical US equities and government bonds returns.

16. See Chapter 6 in Thaler and Sunstein (2008).

17. See Chapter 4 in this volume for a detailed description.

18. Membership of funded pension plans is mandatory in Australia, Chile, Estonia, Iceland, Israel, Mexico, Norway, Poland, Slovak Republic, Sweden and Switzerland. However, self-employed as well as employees earning very low income are not subject to the mandatory rule in Australia and Switzerland. In Australia, only employers are obliged to contribute for employees to funded pension plans. In addition, Denmark, Netherlands, and Sweden have quasi-mandatory occupational pension plans, achieved via broad collective agreements between social partners. New Zealand, Italy and the United Kingdom have automatic enrolment.

19. For instance, Madrian and Shea (2001), and Choi *et al.* (2002) have shown that participation is higher at firms where employees are automatically enrolled unless they signal their wish to opt out.

20. See Chapter 4 for details.

21. Most OECD countries use tax incentives to encourage retirement savings in funded pension plans. The most common approach is to deduct contributions from the income tax base, to exempt from taxation or tax at a preferential rate accrued returns on investment, and tax withdrawals or pension benefits arising from assets accumulated in pension plans as income. These tax arrangements are commonly referred to as "exempt-exempt-taxed" or EET schemes. The tax incentive is the exclusion of investment income from income tax as long as benefits are taxed at the same rate that exempt contribution would have been.

22. The analysis focuses on which tax incentives may increase workers' contributions and participation in DC pension plans. The assessment of the tax incentive is done according to different income levels given the bracket structure of income tax, the progressivity of the income tax. The tax incentive is measured as the change in tax payments relative to pre-tax income stemming from each of the different forms of introducing tax incentives.

23. There are different approaches to introduce tax incentives for saving for retirement by exempting contributions from the income tax. Exempting contributions from the income tax can take the form of deductions from the income tax base (tax deductions) or deductions on tax due (tax credits). Alternatively, governments (or employers) could match contributions to private pension plans in order to encourage retirement savings. In a standard income tax form people first report all sources of earned income, to which one can apply certain deductions or exemptions (*e.g.* charity). The result of deducting these exemptions from income is the taxable income. This taxable income is the income to which one has to apply the tax rates of each of the income brackets to determine the tax due. For example, given two tax brackets (EUR 0 to EUR 1 000 taxed at 10%; and EUR 1 000 to EUR 2 000 taxed at 15%), a person with EUR 1 500 taxable income would have to pay EUR 175 ($1\,000 \times 0.1 + 500 \times 0.15$), an effective tax rate of 11.67%. Additionally, there are some tax credits to the amount of tax due (*e.g.* credit per child). Deducting the tax credits from the tax due determines the amount of tax to pay.

24. The interaction between income levels, tax deductions and tax brackets could produce spikes in the tax incentive profile depicted in Figure 6.4 when tax deductions shift tax payers to lower tax brackets.

25. Chapter 4 on coverage shows that coverage is higher for high income people. Hence, policy should focus on increasing coverage for mid- to low income individuals.

26. Matching contributions enable certain groups to be targeted. For example, governments can match contributions only for women, the young or low income individuals (*e.g.* Chile). Matching

contributions are also common in some occupational pension plans (*e.g.* 401(k) plans in the United States), where sponsoring employers match the contribution made by employees up to a certain percentage of the worker's salary.

27. A matching contribution may not be exactly a tax incentive. However, it can be assessed as the percentage change in tax payments (assuming the match is like a tax rebate) relative to pre-tax income.

28. Determining an "adequate" level of fees is country specific, and depends on a variety of factors. However, as a general rule, there is a strong case for investigation and possible government action when total fees surpass 1% of assets under management in an established and broad-based DC pension system.

29. See Chapter 5.

30. Those with DB pension plans would tend to choose different investment strategies, generally more risky, than those with DC pension plans as the main source to finance retirement.

31. Antolín *et al*. (2010) describes in detail the stochastic model and the full analysis.

32. Investment strategies can be *passive*, which are rule based and defined in advance (*i.e.,* rules are established at the onset), or *active*, which are based on the discretion and expertise of asset managers. Within passive investment strategies one could distinguish between *deterministic strategies* (with rules linking asset allocation to external factors such as age) and *dynamic strategies* (with rules linking asset allocation to the performance of each asset class in each period of time).

33. This overall and internal coherence of the payout phase was discussed at the beginning of the chapter.

34. Blake *et al*. (2010) in the context of ending mandatory annuitization in the UK argues that minimum annuitization is difficult to implement in practice when coupled with means-tested arrangements as it will be individual specific. A general or standard minimum level may be easier to implement in practice.

35. Evidence from Chile seems at first glance not to bear well for this recommendation. This combined arrangement exists in Chile as an option for the payout phase, but there is no demand for it. The lack of demand may have more to do with the fact that while there is a requirement for providers to offer quotes for life annuities and programmed withdrawals to people reaching retirement, they are not required to provide a quote for the combined arrangement programmed withdrawals – deferred life annuity. To get a quote people has to request it, but people may not be aware of this option.

36. Longevity risk is a very long-term risk. For example, when buying an annuity at age 60 if an individual were to live 10 years beyond his/her cohort's average life expectancy (say age 85), longevity risk covers 35 years. A member joining a pension fund at the start of his/her career (say age 25-30) will be adding 65 years of longevity risk.

37. The Dutch collective DC pension system is a specific application of this approach of risk-sharing among stakeholders, in particular the risk-sharing between current and future generations (see Steenbeek, and Van Der Lecq, 2007).

38. Annuity providers can also remove all the longevity risk by transferring it to a reinsurer.

39. The only longevity bond issued by a private institution the EIB/BNP bond in 2004 was undersubscribed as it was thought to be expensive, and it was based on a cohort of English and Welsh males aged 65 in 2003, making the basis risk quite large.

40. Current interest costs of issuing long-term government bonds for certain OECD countries are very low.

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Statistical Annex

Sources and definitions

Most of the statistics shown in these tables can also be found in three other (paper or electronic) publications and data depository, as follows:

- The biennial edition of OECD *Pensions at a Glance*.
- The annual edition of *Pension Markets in Focus* (2011 edition available at *www.oecd.org/dataoecd/63/61/48438405.pdf*).
- OECD.Stat, the OECD's central data warehouse (*www.oecd.org/daf/pensions/gps*), which contains derived statistics from the *Global Pension Statistics Database* and the *Public Pension Reserve Funds' Statistics Database*.

Pension replacement rates

Pension replacement rates are calculated using the OECD pension models. The pension entitlements that are presented are those that are currently legislated in OECD countries. Changes in rules that have already been legislated, but are being phased-in gradually, are assumed to be fully in place from the start. Reforms that have been legislated since 2008 are included where sufficient information is available.

The values of all pension-system parameters reflect the situation in the year 2008. Where reforms have taken place more recently, parameters have been re-calculated for 2008 values assuming that the changed rules were already in place.

The calculations show the pension entitlements of a worker who enters the system today and retires after a full career. The main results are shown for a single person. A full career is defined here as entering the labour market at age 20 and working until the standard pension-eligibility age, which, of course, varies between countries.

For a full description of the methodology, please refer to OECD (2011), *Pensions at a Glance 2011: Retirement-Income Systems in OECD and G20 countries*, OECD, Paris.

The OECD Global Pension Statistics project

The OECD Working Party on Private Pensions and its Task Force on Pension Statistics launched the Global Pension Statistics project (GPS) in 2002. The GPS intends to provide a valuable device for measuring and monitoring private pensions, and permit inter-country comparisons of current statistics and indicators on key aspects of retirement systems across OECD and non-OECD countries. The statistics cover an extensive range of indicators and relate to a wide definition of private pension plans (see below the OECD private pension plan classification), themselves subdivided into detailed categories using coherent statistical concepts, definitions and methodologies. More details on the OECD GPS project are available at *www.oecd.org/daf/pensions/gps*.

The OECD private pension plan classification

There is a large variety of pension arrangements across OECD countries. Pension provision through private pension arrangements can take the form of mandatory or voluntary arrangements. They could be linked to an employment relationship, making them occupational pension plans, or they may be based on contracts between individuals and private pension providers, making them personal pension plans. Moreover, occupational pension provision can be achieved through either defined contribution (DC) or defined benefit (DB) arrangements, while personal pension plans can only be of the DC type. DC occupational plans are occupational pension plans under which the plan sponsor pays fixed contributions and has no legal or constructive obligation to pay further contributions to an on-going plan in the event of unfavourable plan experience. DB occupational plans are occupational plans other than defined contribution plans, generally classified into one of three main types, "traditional", "mixed" and "hybrid" plans:

- in a "traditional" DB plan, benefits are linked through a formula to the members' wages or salaries, length of employment, or other factors;
- in a "hybrid" DB plan, benefits depend on a rate of return credited to contributions, where this rate of return is either specified in the plan rules, independently of the actual return on any supporting assets (*e.g.* fixed, indexed to a market benchmark, tied to salary or profit growth, etc.), or is calculated with reference to the actual return of any supporting assets and a minimum return guarantee specified in the plan rule;
- a "mixed" DB plan is a plan that has two separate DB and DC components but which are treated as part of the same plan.

The term private is used throughout this publication to refer to funded and book reserved pension systems. The special, funded regimes for public sector workers that exist in some countries are also classified as private by the OECD. This classification follows the OECD taxonomy* and is in accordance with SNA.

The classification is structured around two key terms (pension plans and pension funds) and two main approaches (functional and institutional). Figure A.1 presents the classifications under a functional approach; Figure A.2 does the same from an institutional perspective.

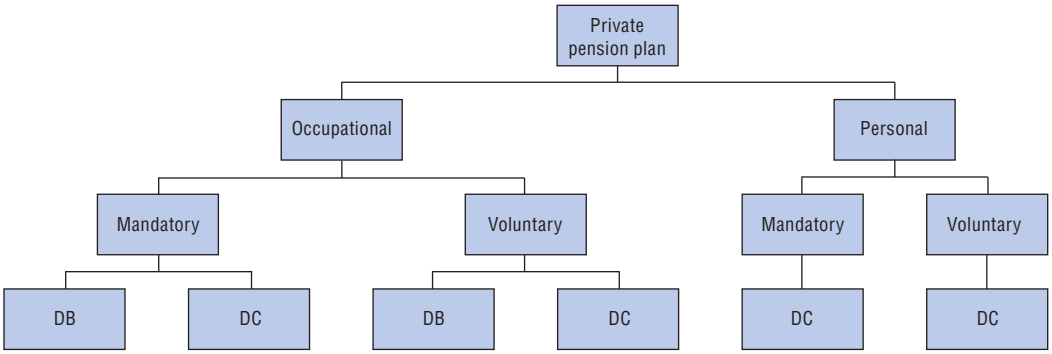
While tables A13 and A14 refer to the overall private pension system (*i.e.* funded plans and book reserved plans), tables A15 to A24 only refer pension funds. Readers interested in knowing the exact coverage of the GPS dataset can refer to the OECD country profiles, available on the OECD website at: *www.oecd.org/document/57/0,3746,en_2649_37411_42315769_1_1_1_37411,00.html*.

Pension funds vs. pension insurance contracts

Pension funds and pension insurance contracts are the two most common financial vehicles of private pension plans in OECD countries. Many countries limit the integration of pension plans only into pension funds, as the financial vehicle of the pension plan (*e.g.* Australia, Chile, Czech Republic, and Mexico). Pension funds are the pool of assets forming an independent legal entity that are bought with the contributions to a pension plan for the exclusive purpose of financing pension plan benefits. The plan/fund members

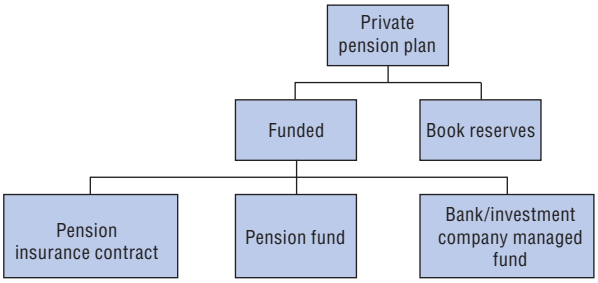
* OECD (2005), *Private Pensions: OECD Classification and Glossary*, OECD, Paris. The OECD classification is available at *www.oecd.org/dataoecd/0/49/38356329.pdf*.

Figure A.1. **Private pension plan: Functional perspective**



Source: OECD (2005), *Private Pensions, OECD Classification and Glossary*, OECD, Paris.

Figure A.2. **Private pension plan: Institutional perspective**



Source: OECD (2005), *Private Pensions, OECD Classification and Glossary*, OECD, Paris.

have a legal or beneficial right or some other contractual claim against the assets of the pension fund. Pension funds take the form of either a special purpose entity with legal personality (such as a trust, foundation, or corporate entity) or a legally separated fund without legal personality managed by a dedicated provider (pension fund management company) or other financial institution on behalf of the plan/fund members.

Other countries also consider the pension insurance contract as the financial vehicle for pension plans (*e.g.* Denmark, Finland, Norway, and Sweden). This is an insurance contract that specifies pension plans contributions to an insurance undertaking in exchange for which the pension plan benefits will be paid when the members reach a specified retirement age or on earlier exit of members from the plan.

Public Pension Reserve Funds

Prefunding is also possible within pay-as-you-go public systems in the form of public pension reserve funds (PPRFs). Such funds are set up by governments or social security institutions with the sole objective of contributing to the financing of pay-as-you-go (PAYG) pension plans. Assets held by PPRFs are owned by the state directly or may be part of the social security system.

Conventional signs

. . Data not available.

n.a. Data not applicable.

Table A1. **Men's pensionable age in OECD countries, 1949-2050**

	1949	1958	1971	1983	1989	1993	1999	2002	2010	2020	2030	2040	2050
Australia	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	66.0	67.0	67.0	67.0
Austria	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0
Belgium[1]	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0
Canada	70.0	69.0	68.0	67.0	66.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0
Chile[2]	. .	. .	. .	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0
Czech Republic[3]	. .	60.0	60.0	60.0	60.0	60.0	60.0	60.5	61.0	62.2	63.5	66.7	68.2
Denmark[4]	65.0	65.0	67.0	67.0	67.0	67.0	67.0	67.0	65.0	65.0	67.0	67.9	68.8
Estonia	. .	. .	. .	. .	. .	. .	. .	63.0	63.0	64.0	65.0	65.0	65.0
Finland[5]	. .	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0
France[6]	. .	65.0	65.0	65.0	60.0	60.0	60.0	60.0	60.5	62.0	62.0	62.0	62.0
Germany[7]	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.5	65.0	66.1	67.0	67.0	67.0
Greece[8]	55.0	57.0	57.0	57.0	57.0	57.0	57.0	57.0	57.0	65.0	65.8	66.5	67.1
Hungary	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	64.5	65.0	65.0	65.0
Iceland	. .	67.0	67.0	67.0	67.0	67.0	67.0	67.0	67.0	67.0	67.0	67.0	67.0
Ireland	70.0	70.0	70.0	70.0	65.0	65.0	65.0	65.0	65.0	66.0	68.0	68.0	68.0
Israel	. .	65.0	65.0	65.0	65.0	65.0	65.0	65.0	67.0	67.0	67.0	67.0	67.0
Italy[9]	60.0	60.0	60.0	55.0	55.0	55.0	55.0	57.0	59.0	61.0	67.3	68.0	68.7
Japan	. .	60.0	60.0	60.0	60.0	60.0	60.0	61.0	64.0	65.0	65.0	65.0	65.0
Korea	. .	. .	. .	. .	. .	60.0	60.0	60.0	60.0	60.0	62.0	64.0	65.0
Luxembourg	65.0	65.0	65.0	65.0	65.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0
Mexico	. .	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0
Netherlands[10]	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0
New Zealand	65.0	60.0	60.0	60.0	60.0	60.0	61.1	64.1	65.0	65.0	65.0	65.0	65.0
Norway	70.0	70.0	70.0	67.0	67.0	67.0	67.0	67.0	67.0	67.0	67.0	67.0	67.0
Poland[11]	60.0	60.0	60.0	60.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0
Portugal	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0
Slovak Republic[3]	. .	60.0	60.0	60.0	60.0	60.0	60.0	60.0	62.0	62.0	62.0	62.0	62.0
Slovenia	. .	. .	. .	. .	. .	. .	. .	63.0	63.0	63.0	63.0	63.0	63.0
Spain[12]	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	66.0	67.0	67.0	67.0
Sweden	67.0	67.0	67.0	67.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0
Switzerland	. .	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0

Table A1. **Men's pensionable age in OECD countries, 1949-2050** *(cont.)*

	1949	1958	1971	1983	1989	1993	1999	2002	2010	2020	2030	2040	2050
Turkey[13]	. .	. .	60.0	45.0	45.0	45.0	45.0	44.0	44.9	48.6	53.1	57.7	65.0
United Kingdom	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	66.0	67.0	67.0	68.0
United States	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	66.0	66.0	67.0	67.0	67.0
OECD34	**64.5**	**64.1**	**64.0**	**63.2**	**63.0**	**62.7**	**62.7**	**62.9**	**63.3**	**64.1**	**64.8**	**65.2**	**65.6**

Note: Where there is more than one value per calendar year, these have been averaged. All data rounded to one decimal place. Data for women are shown in **bold** face where they differ from men's pension age.

1. Early retirement with actuarially unreduced benefits was available with 30 years' contributions up to 2002 increasing to 35 years from 2005.
2. Normal pension ages shown are for the defined-contribution scheme. For the targeted schemes (basic and supplementary pensions) benefits are payable from age 65 for both men and women. It is possible to draw the defined-contribution pension at any age once benefits exceed certain minima.
3. At various times, women's pension age has been lower depending on the number of children they had. The ages shown are the maximum (*i.e.*, for a childless woman). Czechoslovakian data are used in the historical series where appropriate.
4. Pension age increased in with life expectancy of 60-year-olds from every five years after 2027: figures are estimates based on data on mortality rates from the United Nations population division.
5. Pensionable age of targeted, national pension. Pensionable age in earnings related scheme is flexible between ages 63 and 68.
6. Retirement at age 62 on a full pension will be possible if the individual has 41.5 years of contributions from 2012. After 2012, the number of years of contributions required will increase in line with life expectancy.
7. Retirement at age 65 with actuarially unreduced benefits will remain possible at age 65 (when the normal pension age increases to 67) for people with 45 years of actual or credited contributions. Data refer to West Germany for the period 1949-2002.
8. Prior to the most recent reforms, it was possible to retire at any age with a full and actuarially unreduced pension with 37 years' contributions. The indicative pension age shown up to 2010 is based on a full-career worker starting at age 20. From 2020, the pension age will be linked to life expectancy. Figures shown after this are estimates based on data on mortality rates from the United Nations population division.
9. Data up to 2010 reflect the availability of "seniority" pensions for people with a certain number of years' contributions. The pension age is linked to life expectancy from 2026 onwards: estimates are based on data on mortality rates from the United Nations population division. However, it will still be possible to retire at any age with 40 years' contributions.
10. A bill to increase pension age to 66 from 2020 and 67 from 2025 has not yet passed all its parliamentary stages.
11. The government has proposed increasing pension age for women to 65 (to match that of men) and then increase the age for both sexes to 67. This has not yet been legislated.
12. It will still be possible to retire at age 65 with 38.5 years' contributions when normal pension age is increased above 65. A sustainability adjustment will be in place from 2027. However, it is not yet clear which parameters – for example, pension age, contribution rate or benefit level – will be adjusted at each five-yearly review.
13. The early pension ages – below age 60 – reflect the option to retire at any age with 25 years' insurance and a certain number of days of contributions. The ages shown are the point at which a full career worker, starting at age 20, would achieve the contribution condition.

Source: OECD (2011), "*Pensions at a Glance 2011: Retirement-income systems in OECD and G20 countries*", OECD, Paris and national officials.

StatLink http://dx.doi.org/10.1787/888932599367

Table A2. **Women's pensionable age in OECD countries, 1949-2050**

	1949	1958	1971	1983	1989	1993	1999	2002	2010	2020	2030	2040	2050
Australia	**60.0**	**60.0**	**60.0**	**60.0**	**60.0**	**60.0**	**61.0**	**62.0**	**64.0**	66.0	67.0	67.0	67.0
Austria	65.0	**60.0**	**60.0**	**60.0**	**60.0**	**60.0**	**60.0**	**60.0**	**60.0**	**60.0**	**63.0**	65.0	65.0
Belgium[1]	**60.0**	**60.0**	**60.0**	**60.0**	**60.0**	**60.0**	**61.0**	**62.0**	65.0	65.0	65.0	65.0	65.0
Canada	70.0	69.0	68.0	67.0	66.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0
Chile[2]	. .	. .	. .	**60.0**	**60.0**	**60.0**	**60.0**	**60.0**	**60.0**	**60.0**	**60.0**	**60.0**	**60.0**
Czech Republic[3]	. .	60.0	**55.0**	**57.0**	**57.0**	**57.0**	**57.0**	**58.0**	**58.7**	**60.7**	**63.3**	66.7	68.2
Denmark[4]	65.0	**60.0**	**62.0**	**62.0**	**62.0**	67.0	67.0	67.0	65.0	65.0	67.0	67.9	68.8
Estonia	. .	. .	. .	. .	. .	. .	. .	58.0	61.0	64.0	65.0	65.0	65.0
Finland[5]	. .	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0
France[6]	. .	65.0	65.0	65.0	60.0	60.0	60.0	60.0	60.5	62.0	62.0	62.0	62.0
Germany[7]	**60.0**	**60.0**	**60.0**	**60.0**	**60.0**	**60.0**	**60.0**	**60.5**	65.0	66.1	67.0	67.0	67.0
Greece[8]	55.0	57.0	57.0	57.0	57.0	57.0	57.0	57.0	57.0	65.0	65.8	66.5	67.1
Hungary	**55.0**	**55.0**	**55.0**	**55.0**	**55.0**	**55.0**	**55.0**	**55.0**	**59.0**	64.5	65.0	65.0	65.0
Iceland	. .	67.0	67.0	67.0	67.0	67.0	67.0	67.0	67.0	67.0	67.0	67.0	67.0
Ireland	70.0	70.0	70.0	70.0	65.0	65.0	65.0	65.0	65.0	66.0	68.0	68.0	68.0
Israel	. .	60.0	60.0	60.0	60.0	60.0	60.0	60.0	62.0	64.0	64.0	64.0	64.0
Italy[9]	**55.0**	**55.0**	**55.0**	55.0	55.0	55.0	55.0	57.0	59.0	61.0	67.3	68.0	68.7
Japan	. .	**55.0**	**55.0**	**55.0**	**56.0**	**58.0**	60.0	**60.0**	**62.0**	65.0	65.0	65.0	65.0
Korea	. .	. .	. .	. .	. .	60.0	60.0	60.0	60.0	60.0	62.0	64.0	65.0
Luxembourg	65.0	65.0	65.0	65.0	65.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0
Mexico	. .	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0
Netherlands[10]	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0
New Zealand	65.0	60.0	60.0	60.0	60.0	60.0	61.1	64.1	65.0	65.0	65.0	65.0	65.0
Norway	70.0	70.0	70.0	67.0	67.0	67.0	67.0	67.0	67.0	67.0	67.0	67.0	67.0
Poland[11]	60.0	60.0	60.0	60.0	**60.0**	**60.0**	**60.0**	**60.0**	**60.0**	**60.0**	**60.0**	**60.0**	**60.0**
Portugal	65.0	65.0	65.0	65.0	**62.0**	**62.0**	**62.0**	65.0	65.0	65.0	65.0	65.0	65.0
Slovak Republic[3]	. .	60.0	**55.0**	**57.0**	**57.0**	**57.0**	**57.0**	**57.0**	**57.0**	62.0	62.0	62.0	62.0
Slovenia	. .	. .	. .	. .	. .	. .	. .	**57.3**	**61.0**	**61.0**	**61.0**	**61.0**	**61.0**
Spain[12]	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	66.0	67.0	67.0	67.0
Sweden	67.0	67.0	67.0	67.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0
Switzerland	. .	**60.0**	**60.0**	**60.0**	**62.0**	**62.0**	**62.0**	**62.0**	**63.0**	**64.0**	**64.0**	**64.0**	**64.0**

Table A2. **Women's pensionable age in OECD countries, 1949-2050** *(cont.)*

	1949	1958	1971	1983	1989	1993	1999	2002	2010	2020	2030	2040	2050
Turkey[13]	. .	. .	60.0	45.0	45.0	45.0	45.0	**40.0**	**41.0**	**45.2**	**50.4**	**55.6**	65.0
United Kingdom	**60.0**	**60.0**	**60.0**	**60.0**	**60.0**	**60.0**	**60.0**	**60.0**	**60.0**	66.0	67.0	67.0	68.0
United States	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	66.0	66.0	67.0	67.0	67.0
OECD34	**63.1**	**62.2**	**61.9**	**61.3**	**60.9**	**60.9**	**61.1**	**61.1**	**61.9**	**63.2**	**64.1**	**64.5**	**65.0**

Note: Where there is more than one value per calendar year, these have been averaged. All data rounded to one decimal place. Data for women are shown in **bold** face where they differ from men's pension age.

1. Early retirement with actuarially unreduced benefits was available with 30 years' contributions up to 2002 increasing to 35 years from 2005.
2. Normal pension ages shown are for the defined-contribution scheme. For the targeted schemes (basic and supplementary pensions) benefits are payable from age 65 for both men and women. It is possible to draw the defined-contribution pension at any age once benefits exceed certain minima.
3. At various times, women's pension age has been lower depending on the number of children they had. The ages shown are the maximum (*i.e.*, for a childless woman). Czechoslovakian data are used in the historical series where appropriate.
4. Pension age increased in with life expectancy of 60-year-olds from every five years after 2027: figures are estimates based on data on mortality rates from the United Nations population division.
5. Pensionable age of targeted, national pension. Pensionable age in earnings related scheme is flexible between ages 63 and 68.
6. Retirement at age 62 on a full pension will be possible if the individual has 41.5 years of contributions from 2012. After 2012, the number of years of contributions required will increase in line with life expectancy.
7. Retirement at age 65 with actuarially unreduced benefits will remain possible at age 65 (when the normal pension age increases to 67) for people with 45 years of actual or credited contributions. Data refer to West Germany for the period 1949-2002.
8. Prior to the most recent reforms, it was possible to retire at any age with a full and actuarially unreduced pension with 37 years' contributions. The indicative pension age shown up to 2010 is based on a full-career worker starting at age 20. From 2020, the pension age will be linked to life expectancy. Figures shown after this are estimates based on data on mortality rates from the United Nations population division.
9. Data up to 2010 reflect the availability of "seniority" pensions for people with a certain number of years' contributions. The pension age is linked to life expectancy from 2026 onwards: estimates are based on data on mortality rates from the United Nations population division. However, it will still be possible to retire at any age with 40 years' contributions.
10. A bill to increase pension age to 66 from 2020 and 67 from 2025 has not yet passed all its parliamentary stages.
11. The government has proposed increasing pension age for women to 65 (to match that of men) and then increase the age for both sexes to 67. This has not yet been legislated.
12. It will still be possible to retire at age 65 with 38.5 years' contributions when normal pension age is increased above 65. A sustainability adjustment will be in place from 2027. However, it is not yet clear which parameters – for example, pension age, contribution rate or benefit level – will be adjusted at each five-yearly review.
13. The early pension ages – below age 60 – reflect the option to retire at any age with 25 years' insurance and a certain number of days of contributions. The ages shown are the point at which a full career worker, starting at age 20, would achieve the contribution condition.

Source: OECD (2011), "*Pensions at a Glance 2011: Retirement-income systems in OECD and G20 countries*", OECD, Paris and national officials.

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Table A3. **Life expectancy at normal pension age in OECD countries, men, 1958-2050**

	1958	1971	1983	1989	1993	1999	2002	2010	2020	2030	2040	2050
Australia	12.5	12.5	14.2	14.7	15.7	16.6	17.5	18.9	19.1	19.0	19.7	20.4
Austria	12.0	12.0	13.1	14.3	14.7	15.7	16.0	17.5	18.6	19.5	20.2	20.9
Belgium	12.2	12.1	13.1	14.0	14.5	15.5	15.5	17.1	17.7	18.4	19.1	19.8
Canada	. .	10.7	12.8	14.4	15.8	16.3	17.1	18.3	18.9	19.6	20.3	21.0
Chile	. .	. .	. .	. .	. .	. .	. .	17.3	18.0	18.6	19.2	19.7
Czech Republic	15.4	14.2	14.3	14.8	15.7	16.9	16.5	18.0	18.1	17.9	16.3	15.9
Denmark	13.7	11.7	11.9	12.2	12.0	13.0	13.4	16.6	17.5	16.8	16.9	16.9
Estonia	. .	. .	. .	. .	. .	. .	14.6	15.1	15.2	15.2	15.9	16.6
Finland	11.5	11.4	13.0	13.9	14.1	15.2	15.5	17.4	18.6	19.4	20.1	20.8
France	12.5	13.0	14.2	18.8	19.4	20.2	20.5	21.8	21.7	22.5	23.2	23.9
Germany	14.2	14.1	15.2	16.0	16.5	17.6	17.2	17.4	17.6	17.8	18.4	19.1
Greece	19.9	20.7	21.6	22.4	22.7	23.1	22.7	23.9	18.2	18.3	18.4	18.6
Hungary	15.6	15.1	14.5	14.8	14.5	14.9	15.6	16.9	14.8	15.3	16.0	16.7
Iceland	. .	. .	13.5	14.0	14.7	14.9	15.8	16.9	17.8	18.6	19.3	20.0
Ireland	7.6	7.7	7.9	13.1	13.4	14.1	15.2	17.4	17.5	16.6	17.3	18.0
Israel	. .	. .	. .	15.4	16.0	16.7	17.7	16.7	17.8	18.5	19.2	19.9
Italy	. .	16.7	17.1	23.6	24.2	25.4	23.8	23.0	22.1	17.7	17.8	17.9
Japan	14.8	16.6	19.0	20.0	20.2	20.9	20.8	19.7	19.8	20.5	21.2	21.9
Korea	. .	. .	. .	. .	16.2	17.5	18.7	20.8	21.7	20.9	20.0	19.9
Luxembourg	12.5	11.4	12.9	13.8	17.8	19.0	19.2	20.9	22.3	23.4	24.3	25.1
Mexico	14.2	15.3	15.5	16.2	16.1	16.4	16.4	17.1	17.8	18.5	19.1	19.7
Netherlands	13.9	13.3	13.7	14.3	14.4	15.1	15.7	17.3	18.1	18.9	19.7	20.4
New Zealand	. .	15.7	16.8	17.9	18.8	19.0	17.9	18.2	19.2	20.0	20.8	21.5
Norway	9.5	8.9	9.5	12.7	12.8	13.7	14.3	16.3	17.3	18.0	18.8	19.5
Poland	15.9	15.0	15.7	14.3	14.2	15.0	13.9	14.6	15.3	15.9	16.6	17.3
Portugal	12.4	11.8	13.4	14.3	14.2	15.0	15.5	17.0	17.8	18.5	19.1	19.8
Slovak Republic	16.6	15.5	15.3	15.3	16.1	15.9	16.1	15.7	16.7	17.5	18.4	19.2
Slovenia	. .	. .	. .	15.0	15.2	15.8	16.5	17.3	18.2	19.1	19.9	20.7
Spain	13.1	13.7	14.9	15.6	15.9	16.2	16.6	18.0	18.4	18.4	19.1	19.8
Sweden	11.7	12.0	12.7	15.4	15.5	16.4	16.8	18.1	19.2	20.1	20.9	21.6
Switzerland	12.9	13.3	14.6	15.5	15.9	16.9	17.5	18.6	19.6	20.4	21.1	21.8
Turkey	. .	14.6	29.2	29.9	30.5	31.1	31.5	30.1	27.7	24.7	21.7	16.6
United Kingdom	11.9	12.3	13.2	13.8	14.2	15.4	16.0	17.6	17.7	17.6	18.3	18.2
United States	12.8	13.2	14.4	15.0	15.3	16.1	16.7	16.8	17.6	17.5	18.2	18.8
OECD34	**13.3**	**13.4**	**14.7**	**16**	**16.5**	**17.2**	**17.4**	**18.4**	**18.6**	**18.8**	**19.3**	**19.6**

Note: Life-expectancy is calculated using data from 1960 for the pensionable ages applicable in 1958.

Source: Data on pensionable ages over time from Table A.1. Historical data on life expectancy are taken from the *OECD Health Database* 1960-95. Recent data and projections of life expectancy in the future based on the *United Nations Population Division Database*, *World Population Prospects – The 2010 Revision*.

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Table A4. **Life expectancy at normal pension age in OECD countries, women, 1958-2050**

	1958	1971	1983	1989	1993	1999	2002	2010	2020	2030	2040	2050
Australia	19.4	20.0	22.4	22.8	23.7	24.5	24.2	22.7	21.7	21.6	22.4	23.1
Austria	18.6	19.0	20.6	22.1	22.6	23.7	23.8	25.4	26.3	24.5	23.4	24.2
Belgium	18.5	19.3	21.1	22.5	23.1	22.9	21.6	20.8	25.9	22.2	23.0	28.4
Canada	. .	14.5	17.2	18.7	19.9	20.1	20.4	21.3	22.1	22.9	23.6	24.3
Chile	. .	. .	. .	. .	. .	. .	. .	24.7	25.6	26.5	27.2	27.7
Czech Republic	18.5	23.3	21.4	22.1	23.0	24.1	23.1	24.1	23.6	22.3	20.2	19.7
Denmark	19.3	18.6	19.6	19.9	15.6	16.1	16.6	19.4	20.5	19.7	19.8	19.8
Estonia	. .	. .	. .	. .	. .	. .	23.2	22.3	20.7	20.6	21.3	22.0
Finland	13.7	14.4	17.5	17.8	18.0	19.5	19.3	21.1	21.9	22.8	23.6	24.3
France	15.6	16.8	18.4	24.0	24.6	25.3	25.4	26.5	25.9	26.7	27.4	28.1
Germany	18.1	19.0	20.8	21.8	22.5	23.7	23.3	20.6	20.5	20.5	21.3	22.0
Greece	21.5	22.5	23.7	25.2	25.6	26.1	25.3	27.2	20.8	20.9	21.0	21.2
Hungary	22.6	23.2	23.5	24.2	24.2	24.7	25.4	22.6	19.2	19.7	20.6	21.4
Iceland	. .	. .	16.5	17.0	17.0	17.2	18.3	19.2	20.2	21.0	21.8	22.6
Ireland	9.4	10.0	10.6	16.5	17.0	17.6	18.6	20.6	20.7	19.7	20.5	21.2
Israel	. .	. .	. .	21.3	22.0	22.8	24.0	23.7	23.6	24.5	25.2	26.0
Italy	. .	25.2	26.5	28.1	28.8	29.9	28.1	27.1	26.2	21.4	21.5	21.4
Japan	22.8	25.0	27.7	28.3	26.9	24.9	27.6	26.6	24.9	25.6	26.3	27.0
Korea	. .	. .	. .	. .	20.8	22.2	23.2	25.8	26.7	25.7	24.6	24.4
Luxembourg	14.5	14.7	16.8	17.8	22.9	24.2	23.7	24.7	25.7	26.7	27.6	28.4
Mexico	14.6	16.0	17.2	17.9	17.9	18.0	18.2	19.1	20.0	20.8	21.5	22.1
Netherlands	15.3	16.2	18.3	18.9	18.8	19.1	19.1	20.6	21.3	22.1	22.9	23.6
New Zealand	. .	19.8	21.1	22.0	22.7	22.6	20.9	20.8	21.7	22.5	23.3	24.1
Norway	11.1	11.9	13.7	16.7	16.8	17.5	17.7	19.3	20.2	21.0	21.8	22.5
Poland	18.7	18.9	19.9	19.9	20.1	21.0	21.8	23.3	24.2	25.0	25.8	26.6
Portugal	14.5	14.2	16.5	19.8	19.8	20.8	18.8	20.3	21.1	21.8	22.5	23.2
Slovak Republic	18.4	23.7	22.3	22.8	23.7	23.6	23.8	24.6	21.4	22.3	23.2	24.0
Slovenia	. .	. .	. .	. .	. .	. .	25.3	23.9	24.9	25.8	26.6	27.4
Spain	15.3	16.3	18.2	19.2	19.8	20.3	20.6	21.7	21.8	21.6	22.4	23.1
Sweden	13.3	14.9	16.5	19.1	19.1	19.9	20.0	21.0	21.9	22.8	23.6	24.4
Switzerland	19.0	20.5	22.9	22.3	22.6	23.2	23.4	23.8	23.7	24.4	25.2	25.9
Turkey	. .	16.0	30.8	31.9	32.5	33.1	37.2	37.8	35.2	31.5	27.7	20.0
United Kingdom	18.9	19.8	21.0	21.5	21.9	22.7	23.3	24.6	20.4	20.3	21.1	20.9
United States	15.8	17.1	18.6	18.8	18.9	19.1	19.1	19.5	20.4	20.3	21.0	21.7
OECD34	**17.0**	**18.2**	**20.0**	**21.4**	**21.7**	**22.3**	**22.6**	**23.1**	**23.0**	**22.9**	**23.3**	**23.7**

Note: Life-expectancy is calculated using data from 1960 for the pensionable ages applicable in 1958.

Source: Data on pensionable ages over time from Table A.2. Historical data on life expectancy are taken from the *OECD Health Database* 1960-95. Recent data and projections of life expectancy in the future based on the *United Nations Population Division Database*, *World Population Prospects – The 2010 Revision*.

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Table A5. **Gross pension replacement rates from mandatory pensions (public and private) by earnings**

Individual earnings, multiple of mean for men (women where different)

	Median earner	0.5	1	1.5
OECD members				
Australia	52.6 (50.1)	73.3 (70.8)	47.3 (44.8)	38.6 (36.1)
Austria	76.6	76.6	76.6	72.3
Belgium	42.6	60.1	42.0	32.7
Canada	48.5	76.6	44.4	29.6
Chile	48.4 (37.5)	60.0 (49.2)	44.9 (34.0)	41.8 (28.9)
Czech Republic	57.3	80.2	50.2	37.4
Denmark	84.7	120.6	79.7	66.1
Estonia	50.9	60.2	48.0	44.0
Finland	57.8	66.4	57.8	57.8
France	49.1	55.9	49.1	41.3
Germany	42.0	42.0	42.0	42.0
Greece	95.7	95.7	95.7	95.7
Hungary	75.8	75.8	75.8	75.8
Iceland	109.1	144.9	96.9	87.0
Ireland	34.9	57.9	29.0	19.3
Israel	85.3 (75.0)	100.1 (89.9)	69.6 (61.2)	46.4 (40.8)
Italy	64.5 (50.6)	64.5 (50.6)	64.5 (50.6)	64.5 (50.6)
Japan	36.3	47.9	34.5	30.0
Korea	46.9	64.1	42.1	31.9
Luxembourg	90.3	97.9	87.4	83.8
Mexico	46.3 (46.3)	57.5 (57.5)	30.9 (28.7)	29.6 (26.4)
Netherlands	89.1	93.0	88.1	86.5
New Zealand	47.8	77.5	38.7	25.8
Norway	52.9	63.4	53.1	41.7
Poland	59.0 (43.2)	59.0 (45.3)	59.0 (43.2)	59.0 (43.2)
Portugal	54.4	63.3	53.9	53.1
Slovak Republic	57.5	57.5	57.5	57.5
Slovenia	62.4	64.3	62.4	62.4
Spain	81.2	81.2	81.2	81.2
Sweden	58.4	72.9	58.4	72.1
Switzerland	59.3 (58.5)	65.2 (64.7)	57.9 (57.1)	40.9 (40.3)
Turkey	69.5	76.4	64.5	64.5
United Kingdom	37.0	53.8	31.9	22.6
United States	42.3	51.7	39.4	35.3
OECD34	**60.8**	**72.3**	**57.5**	**52.1**
Other major economies				
Argentina	81.1 (73.8)	90.7 (83.4)	78.1 (70.8)	73.9 (66.6)
Brazil	85.9	85.9	85.9	85.9
China	82.5 (52.2)	97.9 (63.7)	77.9 (48.7)	71.2 (43.7)
India	72.4 (68.4)	95.2 (90.9)	65.2 (61.4)	55.0 (51.4)
Indonesia	14.1 (12.4)	14.1 (12.4)	14.1 (12.4)	14.1 (12.4)
Russian Federation	65.1 (57.9)	73.0 (65.9)	62.7 (55.5)	59.2 (52.1)
Saudi Arabia	100.0 (87.5)	100.0 (87.5)	100.0 (87.5)	100.0 (87.5)
South Africa	13.1	21.2	10.6	7.1
EU27	63.1 (61.1)	70.3 (68.3)	61.8 (59.8)	58.4 (56.5)

Source: OECD (2011), "*Pensions at a Glance 2011: Retirement-income systems in OECD and G20 countries*", OECD, Paris.

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Table A6. **Gross pension replacement rates from public, mandatory private and voluntary private pension schemes**

Percentage of individual earnings

	Public			Mandatory private			Voluntary DC			Total mandatory			Total with voluntary		
	0.5	1	1.5	0.5	1	1.5	0.5	1	1.5	0.5	1	1.5	0.5	1	1.5
Australia	37.9	11.8	3.2	35.4	35.4	35.4				73.3	47.3	38.6			
Austria	76.6	76.6	72.3							76.6	76.6	72.3			
Belgium	60.1	42.0	32.7				15.6	15.6	12.3	60.1	42.0	32.7	75.7	57.6	45.0
Canada	61.2	38.9	25.9				30.8	30.8	30.8	61.2	38.9	25.9	92.0	69.7	56.7
Chile	18.8	3.2	0.0	41.3	41.7	41.8				60.0	44.9	41.8			
Czech Republic	80.2	50.2	37.4				11.3	11.3	11.3	80.2	50.2	37.4	91.5	61.5	48.6
Denmark	64.7	28.9	17.0	55.9	50.7	49.0				120.6	79.7	66.1			
Estonia	37.7	25.5	21.5	22.5	22.5	22.5				60.2	48.0	44.0			
Finland	66.4	57.8	57.8							66.4	57.8	57.8			
France	55.9	49.1	41.3							55.9	49.1	41.3			
Germany	42.0	42.0	42.0				16.9	16.9	16.9	42.0	42.0	42.0	59.0	59.0	59.0
Greece	95.7	95.7	95.7							95.7	95.7	95.7			
Hungary	44.4	44.4	44.4	31.4	31.4	31.4				75.8	75.8	75.8			
Iceland	63.0	15.0	5.1	81.9	81.9	81.9				144.9	96.9	87.0			
Ireland	57.9	29.0	19.3				37.6	37.6	37.6	57.9	29.0	19.3	95.5	66.5	56.9
Israel	38.9	19.4	13.0	61.3	50.2	33.4				100.1	69.6	46.4			
Italy	64.5	64.5	64.5							64.5	64.5	64.5			
Japan	47.9	34.5	30.0							47.9	34.5	30.0			
Korea	64.1	42.1	31.9							64.1	42.1	31.9			
Luxembourg	97.9	87.4	83.8							97.9	87.4	83.8			
Mexico	30.5	4.0	2.7	26.9	26.9	26.9				57.5	30.9	29.6			
Netherlands	58.5	29.2	19.5	34.6	58.9	67.0				93.0	88.1	86.5			
New Zealand	77.5	38.7	25.8				14.6	14.6	14.6	77.5	38.7	25.8	92.1	53.4	40.5
Norway	57.7	46.1	34.2	5.7	7.0	7.5	8.6	12.0	17.1	63.4	53.1	41.7	72.0	65.0	58.8
Poland	28.7	28.7	28.7	30.2	30.2	30.2				59.0	59.0	59.0			
Portugal	63.3	53.9	53.1							63.3	53.9	53.1			
Slovak Republic	26.0	26.0	26.0	31.6	31.6	31.6				57.5	57.5	57.5			
Slovenia	64.3	62.4	62.4							64.3	62.4	62.4			
Spain	81.2	81.2	81.2							81.2	81.2	81.2			
Sweden	50.2	35.8	26.2	22.7	22.7	45.9				72.9	58.4	72.1			
Switzerland	52.3	34.5	23.7	12.8	23.4	17.1				65.2	57.9	40.9			
Turkey	76.4	64.5	64.5							76.4	64.5	64.5			
United Kingdom	53.8	31.9	22.6				36.7	36.7	36.7	53.8	31.9	22.6	90.5	68.6	59.3
United States	51.7	39.4	35.3				38.8	38.8	38.8	51.7	39.4	35.3	90.5	78.2	74.1
OECD34	**57.3**	**42.2**	**36.6**							**71.8**	**57.3**	**52.0**	**84.3**	**64.4**	**55.4**
Other major economies															
Argentina	90.7	78.1	73.9							90.7	78.1	73.9			
Brazil	85.9	85.9	85.9							85.9	85.9	85.9			
China	97.9	77.9	71.2							97.9	77.9	71.2			
India	95.2	65.2	55.0							95.2	65.2	55.0	95.2	65.2	55.0
Indonesia	14.1	14.1	14.1							14.1	14.1	14.1			
Russian Federation	35.0	35.0	35.0	17.3	17.3	17.3				52.3	52.3	52.3	35.0	35.0	35.0
Saudi Arabia	100.0	100.0	100.0							100.0	100.0	100.0			
South Africa	15.1	0.0	0.0				33.1	33.1	33.1	15.1	0.0	0.0	48.2	33.1	33.1
EU27	58.4	49.2	44.8							70.3	61.8	58.4			

DC = Defined contribution.

Source: OECD (2011), "*Pensions at a Glance 2011: Retirement-income systems in OECD and G20 countries*", OECD, Paris.

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Table A7. **Net pension replacement rates from mandatory pensions (public and private) by earnings**

Individual earnings, multiple of mean for men (women where different)

	Median earner	0.5	1	1.5
OECD members				
Australia	65.9 (63.2)	82.5 (79.7)	58.9 (56.9)	47.1 (45.3)
Austria	89.9	91.3	89.9	84.6
Belgium	66.0	81.8	64.1	52.0
Canada	61.5	88.7	57.3	39.7
Chile	66.0 (52.4)	74.4 (61.7)	64.3 (49.9)	62.7 (46.3)
Czech Republic	72.5	94.0	64.4	48.9
Denmark	94.5	131.9	89.8	80.8
Estonia	63.1	73.4	58.3	51.4
Finland	64.8	72.0	65.2	64.4
France	60.8	69.4	60.4	53.1
Germany	58.4	55.6	57.9	57.2
Greece	110.3	113.6	111.2	106.8
Hungary	99.5	96.3	106.0	103.2
Iceland	111.7	139.0	101.1	91.7
Ireland	40.8	60.8	35.8	26.8
Israel	92.2 (82.3)	103.0 (93.6)	78.2 (69.8)	56.7 (50.6)
Italy	76.2 (63.0)	78.2 (63.4)	75.3 (62.1)	76.7 (62.1)
Japan	41.4	52.7	39.7	34.9
Korea	51.8	69.8	47.5	37.3
Luxembourg	96.2	103.1	94.0	90.9
Mexico	46.9 (46.9)	58.2 (58.2)	32.2 (29.9)	33.3 (29.7)
Netherlands	103.3	104.5	99.8	96.4
New Zealand	49.6	79.4	41.5	29.4
Norway	62.3	81.7	62.2	51.4
Poland	68.2 (50.7)	68.1 (53.4)	68.2 (50.6)	68.3 (50.4)
Portugal	65.5	73.4	69.2	70.5
Slovak Republic	72.9	68.3	74.5	76.7
Slovenia	90.2	82.5	85.4	86.2
Spain	84.5	82.3	84.9	85.4
Sweden	57.4	71.1	57.7	75.2
Switzerland	66.4 (65.5)	78.6 (78.1)	64.1 (63.2)	46.2 (45.5)
Turkey	98.0	107.3	93.1	96.0
United Kingdom	48.0	67.5	41.5	30.5
United States	53.4	63.8	50.0	46.6
OECD34	**72.1**	**82.9**	**68.9**	**63.5**
Other major economies				
Argentina	94.7 (86.2)	106.0 (97.5)	91.3 (82.8)	87.8 (79.1)
Brazil	96.6	96.6	96.6	98.9
China	90.6 (57.3)	106.4 (69.2)	86.8 (55.2)	80.1 (52.4)
India	82.3 (77.8)	108.2 (103.3)	74.1 (69.8)	63.9 (58.8)
Indonesia	14.8 (13.1)	14.7 (13.0)	14.9 (13.2)	14.9 (13.2)
Russian Federation	74.8 (66.6)	83.9 (75.7)	72.0 (63.8)	68.0 (59.8)
Saudi Arabia	107.4 (95.1)	107.2 (94.8)	107.6 (95.2)	108.0 (95.7)
South Africa	14.4	22.0	11.9	8.3
EU27	75.62 (73.5)	81.8 (79.7)	74.2 (72.1)	70.6 (68.4)

Source: OECD (2011), "*Pensions at a Glance 2011: Retirement-income systems in OECD and G20 countries*", OECD, Paris.

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Table A8. **Net pension replacement rates from public, mandatory private and voluntary private pension schemes**

Percentage of individual earnings

	Public			Mandatory private			Voluntary DC			Total mandatory			Total with voluntary		
	0.5	1	1.5	0.5	1	1.5	0.5	1	1.5	0.5	1	1.5	0.5	1	1.5
Australia	42.6	14.8	3.9	39.9	44.1	43.2				82.5	58.9	47.1			
Austria	91.3	89.9	84.6							91.3	89.9	84.6			
Belgium	74.9	52.1	42.5				19.4	19.3	15.9	74.9	52.1	42.5	94.3	71.4	58.4
Canada	70.9	50.4	35.0				35.7	39.9	41.5	70.9	50.4	35.0	106.6	90.3	76.5
Chile	23.2	4.6	0.0	51.1	59.7	62.7				74.4	64.3	62.7			
Czech Republic	93.5	62.2	47.0				13.1	13.9	14.2	93.5	62.2	47.0	106.7	76.1	61.1
Denmark	70.8	32.6	20.8	61.1	57.2	60.0				131.9	89.8	80.8			
Estonia	46.0	31.0	25.1	27.5	27.3	26.3				73.4	58.3	51.4			
Finland	72.0	65.2	64.4							72.0	65.2	64.4			
France	69.4	60.4	53.1							69.4	60.4	53.1			
Germany	54.8	56.0	55.6				22.1	22.6	22.4	54.8	56.0	55.6	76.9	78.6	78.0
Greece	113.6	111.2	106.8							113.6	111.2	106.8			
Hungary	56.4	62.1	60.5	39.9	43.9	42.8				96.3	106.0	103.2			
Iceland	60.5	15.7	5.3	78.6	85.4	86.3				139.0	101.1	91.7			
Ireland	60.8	31.3	22.5				39.5	40.7	43.8	60.8	31.3	22.5	100.3	72.0	66.4
Israel	40.0	21.9	15.8	63.0	56.4	40.9				103.0	78.2	56.7			
Italy	72.0	71.7	71.8							72.0	71.7	71.8			
Japan	52.7	39.7	34.9							52.7	39.7	34.9			
Korea	69.8	47.5	37.3							69.8	47.5	37.3			
Luxembourg	103.1	94.0	90.9							103.1	94.0	90.9			
Mexico	30.9	4.2	3.0	27.3	28.0	30.3				58.2	32.2	33.3			
Netherlands	65.6	33.1	21.7	38.8	66.7	74.7				104.5	99.8	96.4			
New Zealand	78.9	41.1	29.0				14.9	15.5	16.4	78.9	41.1	29.0	93.9	56.6	45.4
Norway	66.3	52.4	40.4	6.6	8.0	8.8	9.8	13.6	20.2	72.9	60.3	49.2	82.7	74.0	69.5
Poland	33.2	33.2	33.3	34.9	35.0	35.0				68.1	68.2	68.3			
Portugal	73.4	69.2	70.5							73.4	69.2	70.5			
Slovak Republic	30.8	33.6	34.6	37.4	40.9	42.1				68.3	74.5	76.7			
Slovenia	82.5	85.4	86.2							82.5	85.4	86.2			
Spain	82.3	84.9	85.4							82.3	84.9	85.4			
Sweden	49.0	35.4	27.3	22.1	22.4	47.8				71.1	57.7	75.2			
Switzerland	63.2	38.2	26.8	15.5	25.9	19.4				78.6	64.1	46.2			
Turkey	107.3	93.1	96.0							107.3	93.1	96.0			
United Kingdom	62.0	37.4	26.8				42.3	43.1	43.6	62.0	37.4	26.8	104.3	80.5	70.3
United States	61.0	47.3	44.1				45.8	46.6	48.4	61.0	47.3	44.1	106.8	93.9	92.5
OECD34	**65.4**	**50.1**	**44.2**							**81.4**	**67.8**	**62.4**	**96.9**	**77.0**	**68.7**
Other major economies															
Argentina	106.0	91.3	87.8							106.0	91.3	87.8			
Brazil	96.6	96.6	98.9							96.6	96.6	98.9			
China	106.4	86.8	80.1							106.4	86.8	80.1			
India	108.2	74.1	63.9							108.2	74.1	63.9	108.2	74.1	63.9
Indonesia	14.7	14.9	14.9							14.7	14.9	14.9			
Russian Federation	40.2	40.2	40.2	19.9	19.9	19.9				60.1	60.1	60.1	40.2	40.2	40.2
Saudi Arabia	107.2	107.6	108.0							107.2	107.6	108.0			
South Africa	15.7	0.0	0.0				34.3	37.1	39.0	15.7	0.0	0.0	50.0	37.1	39.0
EU27	67.2	58.1	53.2							81.1	73.2	69.6			

DC = Defined contribution.

Source: OECD (2011), "*Pensions at a Glance 2011: Retirement-income systems in OECD and G20 countries*", OECD, Paris.

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Table A9. **Income poverty rates**

Percentage with incomes less than 50% of median household disposable income

	Older people (aged over 65)							Whole population (all ages)
	All 65+	By age		By sex		By household type		
		66-75	75+	Men	Women	Single	Couple	
Australia	26.9	26.1	28.3	24.6	28.9	49.9	17.7	12.4
Austria	7.5	5.3	10.2	3.6	10.1	16.4	3.9	6.6
Belgium	12.8	10.5	16.0	12.7	12.9	16.7	10.0	8.8
Canada	5.9	5.2	6.8	3.1	8.1	16.2	3.9	12.0
Czech Republic	2.3	2.0	2.6	1.4	2.9	5.6	2.0	5.8
Denmark	10.0	6.9	13.7	8.0	11.5	17.5	3.8	5.3
Finland	12.7	8.2	19.5	6.5	16.9	28.0	3.9	7.3
France	8.8	7.2	10.6	6.6	10.4	16.2	4.1	7.1
Germany	8.4	6.5	11.1	5.1	10.8	15.0	4.7	11.0
Greece	22.7	19.2	27.8	20.4	24.5	34.2	17.6	12.6
Hungary	4.6	4.2	5.5	1.8	6.6	11.1	0.8	7.1
Iceland	5.0	5.0	5.0	5.8	4.3	9.8	2.3	7.1
Ireland	30.6	25.8	37.1	24.6	35.3	65.4	9.4	14.8
Italy	12.8	11.2	15.2	8.1	16.1	25.0	9.4	11.4
Japan	22.0	19.4	25.4	18.4	24.8	47.7	16.6	14.9
Korea	45.1	43.3	49.8	41.8	47.2	76.6	40.8	14.6
Luxembourg	3.1	3.4	2.6	4.0	2.4	3.6	2.9	8.1
Mexico	28.0	26.3	31.2	27.6	28.5	44.9	20.9	18.4
Netherlands	2.1	2.2	2.0	1.7	2.4	2.6	2.3	7.7
New Zealand	1.5	1.6	1.4	2.1	0.9	3.2	1.1	10.8
Norway	9.1	3.8	14.6	3.5	13.1	20.0	1.2	6.8
Poland	4.8	5.4	3.8	2.6	6.1	6.0	5.9	14.6
Portugal	16.6	14.4	19.9	16.0	17.0	35.0	15.7	12.9
Slovak Republic	5.9	3.2	10.6	2.0	8.4	10.4	2.9	8.1
Spain	22.8	20.0	26.4	20.1	24.7	38.6	24.2	14.1
Sweden	6.2	3.4	9.8	4.2	7.7	13.0	1.1	5.3
Switzerland	17.6	16.6	19.3	15.2	19.3	24.3	14.6	8.7
Turkey	15.1	14.9	15.6	14.6	15.6	37.8	17.3	17.5
United Kingdom	10.3	8.5	12.6	7.4	12.6	17.5	6.7	8.3
United States	22.4	20.0	27.4	18.5	26.8	41.3	17.3	17.1
OECD30	**13.5**	**11.7**	**16.1**	**11.1**	**15.2**	**25.0**	**9.5**	**10.6**

Source: OECD (2011), "*Pensions at a Glance 2011: Retirement-income systems in OECD and G20 countries*", OECD, Paris.

StatLink http://dx.doi.org/10.1787/888932599519

Table A10. **Income sources, mid-2000s**

As a % of total household disposable income

	Public transfers	Work	Capital
Australia	44.6	19.4	35.9
Austria	79.4	19.1	1.5
Belgium	81.1	11.8	7.1
Canada	46.7	13.4	39.9
Czech Republic	75.9	23.6	0.5
Denmark	56.8	11.5	31.7
Finland	14.9	11.2	73.9
France	86.7	6.4	6.9
Germany	74.9	9.9	15.2
Greece	66.5	25.5	8.0
Hungary	85.6	11.8	2.6
Iceland	61.4	28.5	10.1
Ireland	53.6	20.9	25.4
Italy	72.5	23.6	4.0
Japan	48.3	44.4	7.3
Korea	15.2	58.4	26.4
Luxembourg	79.3	12.0	8.7
Mexico	21.4	54.4	24.3
Netherlands	48.4	9.8	41.8
New Zealand	64.4	15.1	20.5
Norway	61.7	11.2	27.1
Poland	78.4	20.6	1.0
Portugal	66.1	29.0	4.8
Spain	70.8	24.1	5.1
Sweden	70.0	9.0	21.0
Slovak Republic	82.5	17.1	0.4
Switzerland	48.1	11.8	40.1
Turkey	46.3	40.9	12.8
United Kingdom	49.8	11.9	38.3
United States	35.4	34.3	30.3
OECD30	**61.1**	**22.1**	**16.7**

Note: Income from work includes both earnings (employment income) and income from self-employment. Capital income includes private pensions as well as income from the return on non-pension savings.

Source: OECD (2011), "*Pensions at a Glance 2011: Retirement-income systems in OECD and G20 countries*", OECD, Paris.

StatLink http://dx.doi.org/10.1787/888932599538

Table A11. **Projections of public expenditure on pensions, 2010-2060**

As a % of GDP

	2010	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060
OECD members											
Australia	3.6	3.6	3.7	. .	4.3	. .	4.7	. .	4.9	. .	. .
Austria	14.1	14.4	15.1	16.1	16.7	16.7	16.5	16.4	16.4	16.4	16.1
Belgium	11.0	11.9	13.1	14.5	15.5	16.2	16.5	16.7	16.7	16.8	16.6
Canada	5.0	5.4	5.8	6.3	6.6	6.6	6.5	6.4	6.3	6.3	6.2
Chile	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
Czech Republic	9.1	8.6	8.7	8.7	8.9	9.2	9.7	10.3	11.0	11.6	11.8
Denmark	10.1	10.4	10.8	10.6	10.7	10.5	10.3	10.0	9.6	9.5	9.5
Estonia	8.9	7.8	7.7	7.9	8.2	8.1	8.1	8.1	8.0	8.0	7.7
Finland	12.0	12.8	14.0	14.9	15.6	15.5	15.2	14.9	14.9	15.1	15.2
France	14.6	14.4	14.4	14.5	14.9	15.2	15.2	15.2	15.1	15.1	15.1
Germany	10.8	10.5	10.9	11.4	12.0	12.4	12.7	12.8	13.0	13.2	13.4
Greece	13.6	14.1	13.7	13.6	14.1	14.6	14.9	15.3	15.4	15.0	14.6
Hungary	11.9	11.9	11.5	11.4	11.1	11.4	12.1	12.8	13.5	14.2	14.7
Iceland	4.0	. .	. .	. .	. .	. .	. .	. .	6.9	. .	. .
Ireland	7.5	8.3	9.0	9.0	9.0	9.4	10.0	10.6	11.4	11.7	11.7
Israel	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
Italy	15.3	14.9	14.5	14.4	14.5	15.0	15.6	15.9	15.7	15.0	14.4
Japan	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
Korea	0.9	1.1	1.4	2.0	2.5	3.1	3.9	4.8	5.5	6.0	6.5
Luxembourg	9.2	9.9	10.8	12.4	14.0	15.4	16.5	17.6	18.1	18.7	18.6
Mexico	2.4	. .	. .	. .	. .	. .	. .	. .	3.5	. .	. .
Netherlands	6.8	6.8	7.4	8.3	9.1	10.0	10.4	10.5	10.4	10.4	10.4
New Zealand	4.7	4.8	5.3	5.9	6.7	7.3	7.7	7.8	8.0	. .	. .
Norway	9.3	10.9	11.6	12.3	12.9	13.4	13.7	13.8	13.9	14.0	14.2
Poland	11.8	10.7	10.9	11.1	10.9	10.6	10.3	10.1	10.0	9.9	9.6
Portugal	12.5	13.3	13.5	13.4	13.2	13.1	13.1	13.2	13.1	12.9	12.7
Slovak Republic	8.0	8.1	8.6	9.1	9.5	10.0	10.6	11.3	12.2	13.2	13.2
Slovenia	11.2	11.8	12.2	12.5	13.3	14.5	15.8	16.9	17.9	18.3	18.3
Spain	10.1	10.4	10.6	10.5	10.6	11.3	12.3	13.3	14.0	14.0	13.7
Sweden	9.6	9.7	9.6	9.8	10.1	10.2	10.2	9.9	9.9	10.1	10.2
Switzerland	6.3	6.6	6.8	7.5	8.1	8.6	8.6	8.8	8.6	. .	. .
Turkey	7.3	. .	. .	. .	. .	. .	. .	. .	11.4	. .	. .
United Kingdom	7.7	7.4	7.0	7.3	7.7	8.0	8.2	8.0	8.2	8.7	9.2
United States	4.6	4.8	4.9	4.9	4.9	4.9	4.8	4.8	4.8	4.7	4.7
OECD28	**9.3**	**9.5**	**9.8**	**. .**	**10.6**	**. .**	**11.2**	**. .**	**11.7**	**. .**	**. .**
Other major economies		. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
Argentina	5.9	. .	. .		. .	. .	. .	. .	8.6	. .	. .
Brazil	8.5	. .	. .		. .	. .	. .	. .	15.8	. .	. .
China	2.2	. .	. .		. .	. .	. .	. .	2.6	. .	. .
India	1.7	. .	. .		. .	. .	. .	. .	0.9	. .	. .
Indonesia	0.9	. .	. .		. .	. .	. .	. .	2.1	. .	. .
Russian Federation	7.1	8.5	8.9	9.0	9.0	8.7	8.4	8.0	7.5	7.2	6.9
Saudi Arabia	2.2	. .	. .		. .	. .	. .	. .	7.1	. .	. .
South Africa	1.3	1.7	1.8	1.8	1.7	1.6	1.6	1.5	1.5	1.5	1.4
EU27	10.8	10.9	11.1	11.5	11.9	12.3	12.6	12.9	13.1	13.2	13.2

Note: OECD28 figure shows only countries for which complete data between 2010 and 2050 are available. EU27 figure is a simple average of member states (not the weighted average published by the European Commission). Pension schemes for civil servants and other public-sector workers are generally included in the calculations for EU member states: see European Commission, *op cit.* Expenditures on these schemes are not included for Canada, Japan, South Africa and the United States. Projections are not available, in some cases, for separate resource-tested programmes for retirees. This is the case for the United States and some EU member states as set out in European Commission, *op cit.* Similarly, data for Korea cover the earnings-related scheme but not the basic (resource-tested) pension.

Source: European Commission 2012 Ageing Report; Commonwealth of Australia (2010), Australia to 2050: Future Challenges; calculations provided by the Office of the Chief Actuary, Office of the Superintendent of Financial Institutions, Canada; National Pensions Research Institute, Korea; Russia: World Bank staff estimates; South Africa: OECD Secretariat estimates assuming a universalised basic pension; Social Security Administration (2010), Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds, Document 111-137, House of Representatives, United States. Standard and Poor's (2010), Global Aging 2010: An Irreversible Truth for Argentina, Brazil, China, Iceland, India, Indonesia, Mexico, Saudi Arabia, Turkey.

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Table A12. **PAYG and funded (pension funds only) pension contributions and expenditures**

As a % of GDP

	Pension contribution revenues, 2008			Expenditure on old-age and survivors benefits, 2007			Tax breaks for private pensions, 2007[1]
	PAYG	Funded	Total	PAYG	Funded	Total	
Australia	0.0	10.0	10.0	3.4	3.4	6.8	2.7
Austria	8.0	0.4	8.4	12.3	0.3	12.6	0.1
Belgium	4.7	0.4	5.1	8.9	0.3	9.2	0.1
Canada	2.8	2.3	5.1	4.2	2.2	6.4	2.0
Chile	. .	3.5	3.5	5.2	0.9	6.0	. .
Czech Republic	8.3	0.8	9.1	7.4	0.3	7.7	0.1
Denmark	0.0	0.5	0.5	5.1	0.6	5.7	. .
Estonia	. .	. .	. .	5.2	. .	5.2	. .
Finland	6.4	2.7	9.1	5.8	2.5	8.3	0.1
France[2]	. .	. .	. .	12.5	. .	12.5	0.0
Germany	6.6	0.3	6.9	10.7	0.1	10.8	0.8
Greece	7.9	0.0	7.9	11.9	0.0	11.9	. .
Hungary	6.8	1.4	8.2	9.1	0.2	9.3	. .
Iceland	. .	7.2	7.2	1.9	3.6	5.5	1.0
Ireland	. .	. .	. .	3.6	. .	3.6	1.2
Israel	. .	2.0	2.0	4.8	1.7	6.5	. .
Italy	8.6	0.6	9.2	14.1	0.2	14.2	0.0
Japan	5.8	. .	5.8	8.8	. .	8.8	0.7
Korea	2.5	0.3	2.8	1.7	0.6	2.3	. .
Luxembourg	6.0	0.2	6.2	6.5	0.1	6.6	0.5
Mexico	0.0	1.2	1.2	1.4	0.2	1.6	0.2
Netherlands[2]	. .	4.6	4.6	4.7	3.6	8.3	. .
New Zealand	0.0	1.5	1.5	4.3	1.3	5.6	. .
Norway	. .	0.6	0.6	4.7	0.2	4.9	0.6
Poland	7.7	1.7	9.4	10.6	0.0	10.7	0.2
Portugal	. .	1.5	1.5	10.8	0.7	11.4	0.1
Slovak Republic	4.1	4.7	8.8	5.8	. .	5.8	0.2
Slovenia	. .	0.4	0.4	9.6	0.0	9.6	. .
Spain	9.0	0.6	9.6	8.0	0.3	8.3	0.2
Sweden	6.4	. .	6.4	7.2	0.2	7.4	. .
Switzerland	5.9	8.7	14.6	6.4	5.4	11.8	. .
Turkey	2.2	. .	2.2	6.1	0.0	6.2	. .
United Kingdom	. .	2.4	2.4	5.4	2.8	8.2	1.2
United States	4.6	3.8	8.4	6.0	4.5	10.4	0.8
OECD34	**5.0**	**2.3**	**5.8**	**6.9**	**1.2**	**7.9**	**0.6**

Note: In some cases, PAYG pension contribution revenues have been calculated assuming that the revenues are split between different social security programmes in the same proportion as the contribution rates. The total contribution includes payments from people who are not employed (principally the self-employed).

1. Data for Iceland, Norway, Poland and the United Kingdom are from 2005. See Adema, W. and M. Ladaique (2009), "How Expensive is the Welfare State? Gross and Net Indicators in the OECD Social Expenditure Database (SOCX)", Social, Employment and Migration Working Paper No. 92, OECD Publishing, Paris for more details on the data, sources and methodology.
2. It is not possible to separate the contribution revenues into those for PAYG pensions and for other purposes.

Source: OECD (2011), "*Pensions at a Glance 2011: Retirement-income systems in OECD and G20 countries*", OECD, Paris.

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Table A13. **Private pension assets by type of financing vehicle in selected OECD countries, 2001**

	Total assets		Assets by type of financing vehicle (in %)			
	Millions of national currency	Millions of USD	Pension funds	Book reserve	Pension insurance contracts	Other
Australia[1]	519 030	268 181	100.0	0.0	0.0	. .
Austria	6 337	5 673	100.0	. .	. .	0.0
Belgium	14 265	12 771	100.0	0.0	. .	. .
Canada	1 206 976	779 495	48.2	13.8	4.1	34.0
Chile[2]	25 521 621	37 045	100.0	0.0	0.0	0.0
Czech Republic	53 377	1 404	100.0	0.0	0.0	0.0
Denmark	1 282 842	154 173	28.3	0.0	71.7	. .
Estonia	34	2	0.0	0.0	0.0	100.0
Finland	78 373	70 164	88.3	0.0	11.7	0.0
France	. .	. .	. .	. .	. .	. .
Germany	72 745	65 125	100.0	. .	. .	. .
Greece	. .	. .	. .	. .	. .	. .
Hungary	593 448	2 071	100.0	0.0	0.0	. .
Iceland	653 666	6 693	99.2	0.0	. .	0.8
Ireland[3]	51 149	45 791	100.0	0.0	. .	. .
Israel	120 320	28 609	99.9	0.0	0.0	0.1
Italy[4]	33 359	29 865	84.0	15.4	0.6	0.0
Japan[5]	91 843 300	756 013	100.0	0.0	0.0	0.0
Korea[2]	51 214 582	40 937	20.6	0.0	62.8	16.5
Luxembourg	. .	. .	. .	. .	. .	. .
Mexico	248 558	26 600	100.0	0.0	0.0	. .
Netherlands	459 446	411 322	100.0	0.0	. .	0.0
New Zealand[1]	18 308	7 687	100.0	0.0	0.0	0.0
Norway	84 435	9 389	100.0	0.0	. .	0.0
Poland	18 951	4 625	100.0	0.0	. .	0.0
Portugal	14 826	13 273	100.0	0.0	. .	. .
Slovak Republic	0	0	100.0	0.0	0.0	0.0
Slovenia[6]	272	308	43.1	. .	56.9	. .
Spain	39 162	35 060	100.0	. .	. .	0.0
Sweden	752 697	72 806	25.1	5.7	65.7	3.6
Switzerland	440 898	261 357	100.0	0.0	. .	0.0
Turkey[7]	2 195	1 539	100.0	. .	0.0	0.0
United Kingdom	722 391	1 040 472	100.0	0.0	. .	0.0
United States	11 132 389	11 132 389	64.7	0.0	14.0	21.3

1. Data refer to June 2001.
2. Data refer to 2002.
3. *Source:* IAPF Pension Investment Survey.
4. Net technical provisions were considered as proxy for total assets of book reserve schemes.
5. *Source:* Bank of Japan.
6. Data refer to 2003.
7. Data refer to 2004.

Source: OECD Global Pension Statistics.

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Table A14. **Private pension assets by type of financing vehicle in selected OECD countries, 2010**

	Total assets		Assets by type of financing vehicle (in %)			
	Millions of national currency	Millions of USD	Pension funds	Book reserve	Pension insurance contracts	Other
Australia[1]	1 225 325	1 123 966	97.0	0.0	0.0	3.0
Austria	15 348	20 328	97.2	. .	2.8	0.0
Belgium	13 308	17 627	100.0	0.0	. .	. .
Canada	2 079 692	2 018 648	50.4	10.1	3.4	36.1
Chile	69 523 453	136 254	100.0	0.0	0.0	0.0
Czech Republic	232 422	12 182	100.0	0.0	0.0	0.0
Denmark	3 104 432	552 218	28.0	0.0	58.9	13.1
Estonia	16 753	1 419	0.0	0.0	0.0	100.0
Finland	164 091	217 339	90.2	0.0	9.8	0.0
France	165 169	218 767	2.4	0.0	97.6	0.0
Germany	129 371	171 352	100.0	. .	. .	. .
Greece	53	70	100.0	0.0	. .	0.0
Hungary	3 964 528	19 082	100.0	0.0	0.0	. .
Iceland	2 030 314	16 609	94.0	0.0	0.9	5.1
Ireland[2]	75 500	100 000	100.0	0.0	. .	. .
Israel	398 990	106 710	99.7	0.0	0.0	0.3
Italy[3]	84 944	112 508	83.4	3.4	13.2	0.0
Japan[4]	121 840 700	1 388 330	100.0	0.0	0.0	0.0
Korea	183 224 206	158 577	25.3	0.0	66.0	8.7
Luxembourg	799	1 058	100.0	. .	. .	. .
Mexico	1 769 277	140 065	93.1	0.0	0.0	6.9
Netherlands[1]	760 115	1 006 775	100.0	0.0	. .	0.0
New Zealand	27 158	19 572	100.0	0.0	0.0	0.0
Norway	194 170	32 123	100.0	0.0	. .	0.0
Poland	224 816	74 578	99.2	0.0	0.8	0.0
Portugal	21 151	28 014	93.3	0.0	. .	6.7
Slovak Republic	4 882	6 466	100.0	0.0	0.0	0.0
Slovenia	2 117	2 804	51.3	0.0	48.7	0.0
Spain	99 235	131 437	84.6	15.4	. .	0.0
Sweden	1 878 842	260 871	16.8	. .	79.1	4.0
Switzerland	621 234	595 793	100.0	0.0	. .	0.0
Turkey	25 845	17 242	100.0	. .	0.0	0.0
United Kingdom	1 289 071	1 990 935	100.0	0.0	. .	0.0
United States	17 375 347	17 375 347	61.0	0.0	14.4	24.6

1. Data refer to June 2010.
2. *Source:* IAPF Pension Investment Survey.
3. Net technical provisions were considered as proxy for total assets of book reserve schemes.
4. *Source:* Bank of Japan.

Source: OECD Global Pension Statistics.

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Table A15. **Relative shares of DB, DC and hybrid pension fund assets in selected OECD countries, 2001**

As a % of total assets

	Defined contribution		Defined benefit	
	Protected	Unprotected	Traditional	Hybrid / Mixed
Canada[1]	0.0	2.5	92.5	5.0
Chile[2]	0.0	100.0	0.0	0.0
Czech Republic	100.0	0.0	0.0	0.0
Denmark	89.3	0.0	10.7	0.0
Estonia[3]	0.0	100.0	0.0	0.0
Finland	0.0	0.0	100.0	0.0
Hungary	0.0	100.0	0.0	0.0
Iceland[4]	82.8	0.0	17.2	0.0
Israel	0.0	8.9	91.1	0.0
Italy	22.6	48.0	29.4	0.0
Mexico	0.0	100.0	0.0	0.0
New Zealand[5]	0.0	70.0	30.0	0.0
Norway	0.0	0.0	100.0	0.0
Poland	0.0	100.0	0.0	0.0
Portugal[6]	0.0	3.4	96.6	0.0
Slovak Republic	0.0	100.0	0.0	0.0
Spain[7]	0.0	97.7	2.3	0.0
Switzerland	100.0	0.0	0.0	0.0
Turkey[8]	0.0	13.6	86.4	0.0
United States[1]	0.0	32.7	67.3	0.0

1. Data refer to occupational pension plans only.
2. Data refer to 2002.
3. Data refer to investment companies managed funds.
4. Data refer to 2003.
5. Data refer to June 2001.
6. The category "Defined benefit, traditional" includes both traditional DB plans and hybrid/mixed DB plans.
7. The category "Defined contribution, unprotected" includes both DC plans and hybrid/mixed DB plans.
8. Data refer to 2004.

Source: OECD Global Pension Statistics.

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Table A16. **Relative shares of DB, DC and hybrid pension fund assets in selected OECD countries, 2010**

As a % of total assets

	Defined contribution		Defined benefit	
	Protected	Unprotected	Traditional	Hybrid / Mixed
Australia[1]	0.0	89.4	10.6	0.0
Canada[2]	0.0	3.0	92.0	5.0
Chile	0.0	100.0	0.0	0.0
Czech Republic	100.0	0.0	0.0	0.0
Denmark	94.1	0.0	5.9	0.0
Estonia[3]	0.0	100.0	0.0	0.0
Finland	0.0	0.0	100.0	0.0
France[4]	0.0	100.0	0.0	0.0
Greece	0.0	100.0	0.0	0.0
Hungary	0.0	100.0	0.0	0.0
Iceland	64.8	9.9	25.3	0.0
Israel	0.0	22.3	77.7	0.0
Italy	28.0	62.0	10.0	0.0
Korea	17.6	0.0	82.4	0.0
Mexico	0.0	84.1	15.9	0.0
New Zealand[1]	0.0	73.0	27.0	0.0
Norway	0.0	0.0	100.0	0.0
Poland	0.0	100.0	0.0	0.0
Portugal	0.0	6.4	92.2	1.4
Slovak Republic	0.0	100.0	0.0	0.0
Spain	0.0	73.1	0.4	26.4
Switzerland	100.0	0.0	0.0	0.0
Turkey	0.0	45.6	54.4	0.0
United States[2]	0.0	39.0	61.0	0.0

1. Data refer to June 2010.
2. Data refer to occupational pension plans only.
3. Data refer to investment companies managed funds.
4. Data refer to PERCO plans.

Source: OECD Global Pension Statistics.

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Table A17. **Total investment of pension funds in OECD and selected non-OECD countries, 2001-2010**

In millions of USD

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
OECD members										
Australia[1]	268 181	281 376	348 859	443 443	548 928	658 867	964 365	916 789	811 719	1 089 723
Austria	5 673	7 863	10 553	12 882	14 566	15 989	18 014	18 343	19 532	19 751
Belgium	12 771	12 429	12 154	14 353	16 541	16 769	20 262	16 677	19 165	17 627
Canada	375 565	354 647	446 954	534 906	659 935	807 807	888 645	772 383	806 350	1 017 672
Chile	. .	37 045	42 676	55 599	68 444	88 985	105 602	89 482	106 596	136 254
Czech Republic	1 404	2 053	2 852	3 884	5 152	6 462	8 241	11 225	11 332	12 182
Denmark	43 639	45 288	60 646	75 328	87 032	89 569	100 864	161 649	133 980	154 380
Estonia[2]	2	14	81	213	370	602	970	1 076	1 323	1 419
Finland	61 952	66 730	88 814	117 035	134 101	149 497	173 973	164 826	184 821	196 101
France[3]	. .	. .	. .	. .	409	955	1 921	2 718	4 167	5 298
Germany	65 125	70 474	88 903	104 143	112 534	122 764	154 470	172 351	175 501	171 352
Greece	. .	. .	. .	. .	. .	. .	34	49	63	70
Hungary	2 071	2 976	4 397	6 989	9 338	10 978	15 068	14 886	16 886	19 082
Iceland	6 636	7 481	10 781	14 103	19 517	21 672	26 749	18 987	14 351	15 606
Ireland[4]	45 791	42 234	62 656	77 433	96 811	110 093	118 633	92 867	100 278	100 000
Israel	28 573	28 307	30 531	33 037	41 987	45 138	54 394	85 400	90 656	106 376
Italy	25 092	28 234	36 794	44 154	49 496	55 952	68 686	78 498	86 818	93 788
Japan[5]	756 013	999 846	1 208 309	1 186 055	1 261 557	1 150 254	1 122 878	1 120 049	1 351 190	1 388 329
Korea	. .	8 438	9 884	11 516	14 652	26 624	29 786	27 790	29 632	40 146
Luxembourg[6]	. .	. .	. .	116	398	445	512	569	1 172	1 058
Mexico[7]	26 600	33 643	37 213	42 718	76 409	96 469	103 031	110 216	104 254	130 362
Netherlands	411 322	374 898	545 337	659 723	769 627	843 011	1 058 153	979 925	944 244	1 006 775
New Zealand[1]	7 687	7 865	9 094	11 157	12 446	13 123	14 535	13 601	13 755	19 572
Norway	9 389	10 596	14 565	16 939	20 266	22 875	27 385	27 186	27 852	32 123
Poland	4 624	7 623	11 560	17 140	26 513	37 958	51 115	57 927	58 143	73 980
Portugal	13 273	14 658	18 399	18 865	23 580	26 581	30 625	29 653	30 441	26 125
Slovak Republic[8]	0	0	7	. .	298	1 660	3 132	4 640	5 508	6 466
Slovenia	. .	. .	133	304	451	616	860	1 041	1 266	1 437
Spain	35 060	39 064	54 788	69 135	81 513	92 527	118 465	114 230	118 159	111 242

Table A17. **Total investment of pension funds in OECD and selected non-OECD countries, 2001-2010** *(cont.)*

In millions of USD

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Sweden	18 254	18 542	23 457	26 373	33 211	36 395	39 452	35 307	33 435	43 904
Switzerland	261 357	267 554	334 829	389 496	434 746	465 425	504 601	496 957	551 450	595 793
Turkey	. .	. .	. .	1 539	3 245	3 965	7 920	10 934	14 017	17 242
United Kingdom	1 040 472	930 832	1 175 335	1 467 118	1 763 762	2 002 059	2 186 472	1 698 841	1 753 016	1 990 935
United States	7 205 809	6 584 665	7 915 739	8 607 591	9 262 694	10 597 638	10 939 952	8 223 882	9 591 549	10 597 645
OECD34	**10 732 336**	**10 285 376**	**12 606 301**	**14 063 288**	**15 650 532**	**17 619 728**	**18 959 763**	**15 570 956**	**17 212 620**	**19 239 816**
Other major economies										
Argentina[9]	. .	11 650	16 139	18 306	22 565	29 371	30 105	32 881	. .	. .
Brazil	. .	. .	. .	. .	. .	194 810	224 218	224 950	242 909	306 477
China	. .	. .	. .	5 956	8 298	11 413	19 980	. .	37 081	41 492
India[10]	. .	. .	. .	38 021	45 128	50 315	61 970	. .	. .	. .
Indonesia	. .	4 317	5 527	6 194	6 275	8 184	9 617	. .	. .	. .
Russian Federation[11]	1 153	3 145	6 032	9 310	16 309	25 436	34 194	34 228	35 822	51 306
South Africa	. .	. .	. .	. .	201 906	149 539	165 638	. .	. .	. .

1. Data refer to the end of June of each year.
2. Data refer to investment companies managed funds.
3. Data refer to PERCO plans.
4. *Source:* IAPF Pension Investment Survey.
5. *Source:* Bank of Japan
6. The break in series in 2005 is due to the inclusion of pension funds supervised by the CSSF, not included in previous years.
7. The break in series in 2005 is due to the inclusion of occupational pension plans registered by the National Commission for the Retirement Savings System (CONSAR) since 2005, not included in previous years.
8. The break in series in 2006 is due to the inclusion of voluntary pension plans, not included in previous years.
9. *Source:* AIOS. Data for 2008 refer to the end of June.
10. Data refer to all three components in the Employee Provident Fund Organisation – *i.e.* the Employee Provident Fund, Employee Pension Fund, and Deposit Linked Insurance Fund – in march of each year.
11. *Source:* Investfunds (*http://npf.investfunds.ru/indicators/*).

Source: OECD Global Pension Statistics.

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Table A18. **Total investment of pension funds in OECD and selected non-OECD countries, 2001-2010**

As a % of GDP

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
OECD members										
Australia[1]	75.3	70.4	68.9	71.6	80.4	90.4	110.4	93.0	82.6	90.9
Austria	2.9	3.8	4.1	4.4	4.8	4.9	4.8	4.4	5.1	5.3
Belgium	5.5	4.9	3.9	4.0	4.4	4.2	4.5	3.3	4.1	3.8
Canada	52.5	48.3	51.6	53.9	58.2	63.4	62.3	51.4	62.9	64.7
Chile	. .	55.1	58.2	59.1	59.4	61.0	64.4	52.8	65.1	67.0
Czech Republic	2.3	2.7	3.1	3.5	4.1	4.5	4.7	5.2	6.0	6.3
Denmark	27.2	26.0	28.5	30.8	33.7	32.4	32.4	47.5	43.3	49.7
Estonia[2]	0.0	0.2	0.9	1.9	2.8	3.7	4.6	4.6	6.9	7.4
Finland	49.5	49.2	53.9	61.8	68.6	71.3	71.0	60.6	77.8	82.1
France[3]	. .	. .	. .	. .	0.0	0.0	0.1	0.1	0.2	0.2
Germany	3.4	3.5	3.6	3.8	4.0	4.2	4.7	4.7	5.2	5.2
Greece	. .	. .	. .	. .	. .	. .	0.0	0.0	0.0	0.0
Hungary	3.9	4.5	5.2	6.8	8.5	9.7	10.9	9.6	13.1	14.6
Iceland	84.0	83.9	98.3	106.6	119.6	129.7	134.0	114.1	118.3	123.9
Ireland[4]	43.7	34.4	39.8	42.0	48.3	50.2	46.6	34.1	44.1	49.0
Israel	25.1	27.2	27.7	28.3	34.0	32.2	33.2	42.8	46.4	48.9
Italy	2.2	2.3	2.4	2.6	2.8	3.0	3.3	3.4	4.1	4.6
Japan[5]	18.5	25.5	28.6	25.7	27.7	26.3	25.6	22.8	26.7	25.2
Korea	. .	1.5	1.6	1.7	1.9	3.0	3.1	3.0	2.2	4.0
Luxembourg[6]	. .	. .	. .	0.3	1.1	1.0	1.0	1.1	2.2	1.9
Mexico[7]	4.3	5.2	5.8	6.3	10.0	11.5	11.5	10.2	7.3	12.6
Netherlands	102.6	85.5	101.2	108.1	121.7	125.7	138.1	112.7	126.0	134.9
New Zealand[1]	14.7	13.0	11.2	11.3	11.3	12.2	11.1	10.6	11.8	13.8
Norway	5.5	5.5	6.5	6.5	6.7	6.8	7.0	6.0	7.3	7.8
Poland	2.4	3.8	5.3	6.8	8.7	11.1	12.2	11.0	13.5	15.8
Portugal	11.5	11.5	11.8	10.5	12.7	13.6	13.7	12.2	13.4	11.4
Slovak Republic[8]	0.0	0.0	0.0	. .	0.5	2.4	3.7	4.7	6.3	7.4
Slovenia	. .	. .	0.5	0.9	1.3	1.6	1.8	1.9	2.6	2.5

Table A18. **Total investment of pension funds in OECD and selected non-OECD countries, 2001-2010** *(cont.)*

As a % of GDP

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Spain	5.8	5.7	6.2	6.6	7.2	7.5	8.2	7.1	8.1	7.9
Sweden	8.1	7.4	7.5	7.4	9.1	9.3	8.7	7.4	8.4	9.6
Switzerland	102.5	95.9	102.9	107.2	117.0	120.0	119.2	101.2	111.9	113.8
Turkey	. .	. .	. .	0.4	0.7	0.7	1.2	1.5	2.3	2.3
United Kingdom	72.0	58.8	64.4	67.6	78.6	83.4	78.9	64.3	80.5	88.7
United States	71.5	63.2	72.6	74.0	74.8	79.3	79.4	57.9	67.6	72.7
Other major economies										
Argentina[9]	. .	11.4	12.5	12.0	12.3	13.7	11.5	. .	. .	. .
Brazil	. .	. .	. .	. .	. .	18.2	16.8	14.1	15.5	14.7
China	. .	. .	. .	0.3	0.4	0.4	0.7	. .	0.7	0.7
India[10]	. .	. .	. .	5.5	5.6	5.3	5.4	. .	. .	. .
Indonesia	. .	2.2	2.3	2.4	2.2	2.2	2.2	. .	. .	. .
Russian Federation[11]	0.4	0.9	1.4	1.6	2.1	2.6	2.6	2.0	2.9	3.4
South Africa	. .	. .	. .	. .	83.4	60.3	58.4	. .	. .	. .

1. Data refer to the end of June of each year.
2. Data refer to investment companies managed funds.
3. Data refer to PERCO plans.
4. *Source:* IAPF Pension Investment Survey.
5. *Source:* Bank of Japan
6. The break in series in 2005 is due to the inclusion of pension funds supervised by the CSSF, not included in previous years.
7. The break in series in 2005 is due to the inclusion of occupational pension plans registered by the National Commission for the Retirement Savings System (CONSAR) since 2005, not included in previous years.
8. The break in series in 2006 is due to the inclusion of voluntary pension plans, not included in previous years.
9. *Source:* AIOS. Data for 2008 refer to the end of June.
10. Data refer to all three components in the Employee Provident Fund Organisation – *i.e.* the Employee Provident Fund, Employee Pension Fund, and Deposit Linked Insurance Fund – in march of each year.
11. *Source:* Investfunds (*http://npf.investfunds.ru/indicators/*).

Source: OECD Global Pension Statistics.

StatLink http://dx.doi.org/10.1787/888932599690

Table A19. **Pension funds' portfolio allocation in selected OECD countries, 2001**

As a % of total investment

	Cash and deposits	Bills and bonds issued by public and private sector	*Of which:* Bills and bonds issued by public administration	*Of which:* Bonds issue by the private sector	Loans	Equities	Land and Buildings	Mutual funds	Unallocated insurance contracts	Private investment funds	Other investments
Australia[1]	7.7	11.6	*4.3*	*95.7*	3.6	41.9	5.8	0.0	0.0	0.0	29.4
Austria	2.0	76.2	*100.0*	*0.0*	0.4	15.9	0.5	0.0	0.0	0.0	2.7
Belgium	3.8	15.5	*89.7*	*10.3*	0.1	17.7	1.2	55.1	2.8	0.0	3.9
Canada	4.7	26.5	*76.7*	*23.3*	0.8	30.5	3.3	33.0	0.0	0.0	1.2
Chile[2]	0.4	64.3	*46.7*	*53.3*	11.1	10.3	0.0	14.0	0.0	0.0	0.0
Czech Republic	4.0	83.9	*59.4*	*40.6*	0.0	7.3	0.7	0.0	0.0	0.0	4.1
Denmark[3]	0.3	47.1	*21.9*	*78.1*	0.1	39.7	2.7	10.0	0.0	0.0	0.0
Estonia[4]	32.6	46.6	*10.1*	*89.9*	0.0	17.7	0.0	3.1	0.0	0.0	0.0
Finland	0.0	51.6	. .	. .	8.5	28.0	11.8	0.0	0.0	0.0	0.0
Germany[5]	1.6	31.3	*30.6*	*69.4*	20.4	39.1	4.7	0.0	0.0	0.0	2.9
Hungary[2]	4.4	73.1	*93.0*	*7.0*	0.0	9.1	0.3	5.8	0.0	0.0	7.3
Iceland[6]	1.7	53.1	*70.9*	*29.1*	13.8	29.7	0.2	0.0	0.0	0.0	1.5
Ireland[7]	2.8	21.7	. .	. .	0.0	65.0	8.8	0.0	0.0	0.0	1.7
Israel	1.8	92.5	*99.2*	*0.8*	0.3	1.3	0.0	0.0	0.0	0.0	4.0
Italy	9.8	36.5	. .	. .	0.0	7.5	13.8	6.4	22.7	0.0	3.4
Japan[8]	4.6	39.3	. .	. .	2.6	27.2	0.0	0.0	0.0	0.0	26.4
Korea[2]	7.0	83.5	*15.4*	*84.6*	7.0	0.0	0.0	0.7	0.0	0.0	1.7
Mexico	0.2	99.8	*89.8*	*10.2*	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Netherlands	0.0	36.2	*70.0*	*30.0*	8.1	47.8	4.8	0.0	0.0	0.0	3.1
Norway	5.8	56.8	*44.1*	*55.9*	4.4	25.9	4.4	0.0	0.0	0.0	2.7
Poland	3.5	68.0	*98.0*	*2.0*	0.0	28.4	0.0	0.0	0.0	0.0	0.0
Portugal	10.2	49.8	*54.4*	*45.6*	0.0	19.9	5.9	13.0	0.0	0.0	1.2
Slovenia[9]	23.7	69.5	*69.2*	*30.8*	0.0	6.6	0.0	0.1	0.0	0.0	0.1

Table A19. **Pension funds' portfolio allocation in selected OECD countries, 2001** *(cont.)*

As a % of total investment

	Cash and deposits	Bills and bonds issued by public and private sector	*Of which:* Bills and bonds issued by public administration	*Of which:* Bonds issue by the private sector	Loans	Equities	Land and Buildings	Mutual funds	Unallocated insurance contracts	Private investment funds	Other investments
Spain[10]	4.7	58.1	*64.1*	*35.9*	0.0	19.6	0.2	4.3	0.0	0.0	13.0
Sweden	1.2	46.0	*100.0*	*0.0*	0.0	35.5	4.6	0.0	0.0	0.0	12.7
Switzerland	8.5	28.0	. .	. .	11.2	23.6	11.4	16.3	0.0	0.0	1.1
United Kingdom[11]	2.6	19.2	*75.6*	*24.4*	0.5	53.8	4.3	11.4	6.2	0.0	2.0
United States	1.2	17.9	*53.3*	*46.7*	1.1	45.9	1.2	15.9	3.8	0.0	12.9

1. *Source:* Australian Bureau of Statistics. Data refer to June 2001. The high value for the "Other investments" category is mainly driven by net equity of pension funds in life office reserves (26.9%).
2. Data refer to 2002
3. Investments in bonds cannot be separated into the two types of bonds in company pension funds. Total company pension fund investment in bonds has been broken down using the same relative shares as in general pension funds.
4. Data refer to investment companies managed funds.
5. The category "Equities" includes both equity investments and investments in mutual funds.
6. Loans consist solely of collateral loans fulfilling requirements stipulated in Act No. 129/1997 for collateral ratios and may therefore include corporate bonds. Mutual funds include private investment funds in accordance with the classification in Act No. 129/1997. A pension fund is forbidden from investing in real estate or chattels except insofar as it may be necessary for the activities of the fund in accordance with Act No. 129/1997.
7. *Source:* IAPF Pension Investment Survey.
8. *Source:* Bank of Japan. The high value for the "Other investments" category is mainly driven by outward investments in securities (23.5%).
9. Data refer to 2003.
10. "Loans" include credits granted to participants. "Other investments" include repurchase agreements (REPOS).
11. Equity share holdings are at market value and all other holdings at book value. Private equity and venture capital are included in the equity shares category. "Other investments" include security repurchase agreements, commercial papers and contributions receivable.

Source: OECD Global Pension Statistics.

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Table A20. **Pension funds' portfolio allocation in selected OECD countries, 2010**

As a % of total investment

	Cash and deposits	Bills and bonds issued by public and private sector	*Of which:* Bills and bonds issued by public administration	*Of which:* Bonds issued by the private sector	Loans	Shares	Land and Buildings	Mutual funds	Unallocated insurance contracts	Private investment funds	Other investments
Australia[1]	14.8	11.0	*24.7*	*75.3*	1.0	46.5	7.4	0.0	0.0	0.0	19.3
Austria	2.8	2.0	*88.5*	*11.5*	0.9	0.2	0.3	93.5	0.0	0.2	0.0
Belgium	3.0	10.2	*54.6*	*45.4*	0.8	8.8	0.7	72.1	1.4	0.0	3.0
Canada	2.6	25.5	*80.3*	*19.7*	0.3	26.9	5.5	33.6	0.0	0.0	5.6
Chile	0.3	34.0	*34.4*	*65.6*	1.8	15.9	0.0	42.7	0.0	0.0	5.3
Czech Republic	6.8	84.5	*81.1*	*18.9*	0.0	0.8	0.9	3.7	0.0	0.0	3.4
Denmark[2]	0.5	68.6	*71.4*	*28.6*	0.1	15.2	1.1	2.0	0.0	0.0	12.5
Estonia[3]	9.4	17.8	. .	. .	0.0	3.8	0.1	0.0	0.0	64.8	4.0
Finland	0.7	30.5	. .	. .	6.5	47.6	8.8	0.0	0.0	0.0	5.9
Germany	2.1	27.2	*8.8*	*91.2*	28.8	0.6	2.5	36.8	0.0	0.8	1.1
Greece	37.0	48.2	*100.0*	*0.0*	0.0	3.0	0.0	9.7	0.0	0.0	2.1
Hungary	1.6	54.5	*92.7*	*7.3*	0.0	9.2	0.0	31.5	0.0	0.0	3.2
Iceland[4]	7.9	51.5	*75.7*	*24.3*	9.9	6.7	0.0	16.0	0.0	8.0	0.0
Israel	7.0	75.0	*85.8*	*14.2*	1.3	5.8	0.5	3.5	0.0	1.2	5.6
Italy	5.1	42.4	*83.0*	*17.0*	0.0	10.3	4.5	9.8	21.8	1.3	4.8
Japan[5]	4.5	37.5	. .	. .	2.0	10.6	0.0	0.0	0.0	0.0	45.3
Korea	47.1	18.6	*68.9*	*31.1*	0.7	0.1	0.0	7.7	20.3	0.0	5.6
Luxembourg	9.4	55.6	. .	. .	0.0	0.3	0.0	32.6	0.0	0.0	2.1
Mexico	0.5	79.9	*79.1*	*20.9*	0.0	16.8	0.0	2.4	0.0	0.0	0.4
Netherlands	0.1	22.8	*63.0*	*37.0*	5.2	13.2	1.3	47.6	0.0	0.5	9.4
Norway	2.5	48.6	*31.3*	*68.7*	1.0	15.7	3.4	26.7	0.0	0.4	1.6
Poland	3.5	59.4	*94.1*	*5.9*	0.0	36.3	0.0	0.6	0.0	0.0	0.3
Portugal	10.9	43.0	*46.2*	*53.8*	0.0	14.2	9.6	22.8	0.0	0.0	–0.4
Slovak Republic	26.5	68.4	*66.1*	*33.9*	0.0	1.4	0.0	3.4	0.0	0.0	0.2
Slovenia	23.1	57.5	*42.3*	*57.7*	3.3	1.9	0.0	14.1	0.0	0.0	0.1

Table A20. **Pension funds' portfolio allocation in selected OECD countries, 2010** *(cont.)*

As a % of total investment

	Cash and deposits	Bills and bonds issued by public and private sector	*Of which:* Bills and bonds issued by public administration	*Of which:* Bonds issued by the private sector	Loans	Shares	Land and Buildings	Mutual funds	Unallocated insurance contracts	Private investment funds	Other investments
Spain[6]	17.8	53.3	*49.1*	*50.9*	0.0	11.2	0.2	7.4	9.3	0.5	0.1
Sweden	2.4	50.9	. .	. .	0.0	13.0	3.5	28.8	0.0	0.0	1.3
Switzerland	7.0	21.4	. .	. .	4.1	13.2	9.5	40.9	0.0	3.5	0.4
Turkey	31.0	26.9	. .	. .	0.0	25.8	0.4	0.0	0.0	0.0	15.5
United Kingdom[7]	2.6	20.3	*54.1*	*45.9*	1.1	22.0	2.3	28.7	6.3	0.0	16.7
United States	1.2	19.8	*60.2*	*39.8*	0.8	38.2	1.2	22.5	4.3	0.0	11.9

1. *Source:* Australian Bureau of Statistics. Data refer to June 2010. The high value for the "Other investments" category is mainly driven by net equity of pension funds in life office reserves (15.8%).
2. Investments in bonds cannot be separated into the two types of bonds in company pension funds. Total company pension fund investment in bonds has been broken down using the same relative shares as in general pension funds.
3. Data refer to investment companies managed funds.
4. Loans consist solely of collateral loans fulfilling requirements stipulated in Act No. 129/1997 for collateral ratios and may therefore include corporate bonds. Mutual funds include private investment funds in accordance with the classification in Act No. 129/1997. A pension fund is forbidden from investing in real estate or chattels except insofar as it may be necessary for the activities of the fund in accordance with Act No. 129/1997.
5. *Source:* Bank of Japan. The high value for the "Other investments" category is mainly driven by payable and receivable accounts (24.3%) and outward investments in securities (18.7%).
6. "Loans" include credits granted to participants. "Other investments" include repurchase agreements (REPOS).
7. Equity share holdings are at market value and all other holdings at book value. Private equity and venture capital are included in the equity shares category. "Other investments" include security repurchase agreements, commercial papers and contributions receivable.

Source: OECD Global Pension Statistics.

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Table A21. **Pension funds' real net investment return in selected OECD countries, 2002-2010**

In percent

	2002	2003	2004	2005	2006	2007	2008	2009	2010
Australia[1]	. .	–2.1	8.8	9.9	9.4	12.5	–11.3	–10.5	6.2
Austria	–6.9	5.6	4.4	8.1	3.9	–0.4	–16.1	7.9	4.5
Belgium	–11.8	6.1	6.2	10.4	10.2	9.1	–23.7	13.8	5.3
Canada	–7.2	10.5	9.4	10.5	10.4	1.2	–17.9	11.4	8.5
Chile	. .	8.3	9.6	5.6	13.5	7.9	–25.3	19.9	10.0
Czech Republic	1.9	3.1	0.7	3.1	0.5	0.4	–4.0	–0.7	–0.4
Denmark	–6.5	5.6	11.6	15.2	1.2	–2.7	4.0	1.3	7.7
Estonia[2]	1.4	8.9	8.8	7.4	. .	. .	–25.5	11.4	5.2
Finland	–2.0	0.1	7.6	12.1	6.8	2.6	–20.2	13.4	9.0
Germany	1.3	3.5	3.2	3.5	3.1	2.0	–0.9	4.5	6.4
Greece	. .	. .	. .	. .	. .	3.6	0.2	1.7	–7.5
Hungary	1.1	–1.7	8.2	7.5	3.7	–4.4	–23.6	14.3	4.0
Iceland	–5.8	11.1	10.3	12.0	9.1	1.1	–19.4	–3.1	–1.4
Ireland	. .	. .	. .	. .	. .	–7.6	–37.5	. .	. .
Italy	. .	. .	. .	. .	. .	. .	–6.3	5.5	1.6
Japan[3]	30.1	26.8	–17.8	6.1	–8.5	–4.4	–12.5	25.2	–10.3
Korea	8.2	1.8	0.7	0.4	5.9	1.6	–3.2	–2.2	2.2
Luxembourg	. .	. .	. .	29.0	4.5	–1.4	–13.4	8.0	1.2
Mexico[4]	. .	. .	. .	4.2	6.0	–0.3	–6.6	5.8	6.9
Netherlands	–11.0	8.2	8.3	11.4	6.6	0.9	–17.8	11.5	9.5
New Zealand[1]	–4.8	–3.3	7.8	4.1	8.7	5.2	–6.0	–8.7	10.2
Norway	–3.8	9.5	8.0	9.6	7.3	5.2	–12.0	9.6	5.9
Poland	10.6	9.7	9.5	–2.1	13.6	2.9	–18.5	8.9	7.7
Portugal	–6.3	6.4	6.7	7.4	6.5	5.8	–14.7	12.5	–1.9
Slovak Republic	. .	. .	. .	. .	. .	0.5	–9.1	–0.1	0.4
Slovenia	. .	. .	. .	. .	. .	0.9	–8.6	5.2	2.9
Spain	–7.0	2.3	0.6	2.1	1.8	1.4	–12.2	2.8	–1.1
Switzerland	–7.0	4.8	3.4	9.0	4.8	1.5	–15.3	10.7	2.6
Turkey	. .	. .	. .	23.1	13.2	32.3	10.2	11.5	1.2
United Kingdom	1.4	1.1	0.9	0.1	–0.3	–0.4	–1.4	–0.2	–1.7
United States	–3.7	2.0	–0.8	–1.8	–0.6	–1.6	–10.0	4.4	1.0

Note: Data have been calculated using a common formula for the average nominal net investment returns (ratio between the net investment income at the end of the year and the average level of assets during the year) for all countries, except Austria (2010), Estonia (2009), Germany (2010), Ireland (all years), Korea (2010) and the United States (all years), for which values have been provided by the countries. The average real net investment returns have been calculated using the nominal return (as described above) and the variation of the consumer price index for the relevant years.

1. Data refer to annual investment rates of return at the end of June of each year.
2. Data refer to investment companies managed funds.
3. *Source:* Bank of Japan.
4. Data refer to personal pension plans only.

Source: OECD Global Pension Statistics.

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Table A22. **Pension funds' total contributions in selected OECD countries, 2002-2010**

Percent annual change

	2002	2003	2004	2005	2006	2007	2008	2009	2010
Australia[1]	3.0	3.6	13.8	15.0	21.5	96.2	–29.5	–9.7	1.4
Austria	–13.7	1.1	8.9	–9.4	33.1	9.5	6.8	–5.3	. .
Belgium	38.5	–37.6	19.7	–25.3	9.9	15.9	41.8	–6.3	–1.3
Canada	17.2	34.9	13.3	4.0	20.3	–8.2	7.4	29.6	–3.8
Chile	. .	4.4	15.4	15.5	11.4	14.7	5.1	15.4	13.6
Czech Republic	11.8	8.8	11.9	. .	. .	. .	–9.8	–0.5	–0.7
Denmark[2]	3.1	2.6	–50.9	4.0	5.4	4.6	10.4	–0.9	4.3
Estonia[3]	. .	. .	. .	. .	. .	. .	. .	9.6	4.3
Finland	6.1	1.5	4.1	3.0	14.1	5.2	–10.7	–1.4	5.1
Germany[4]	20.4	46.7	31.2	31.8	12.2	178.1	–55.1	31.0	11.5
Greece	. .	. .	. .	. .	. .	. .	18.7	2.6	–5.6
Hungary	12.9	27.9	23.6	13.3	11.8	–24.6	32.5	16.2	–19.1
Iceland	2.6	14.4	–1.8	20.2	10.4	51.8	–27.8	–6.0	9.6
Israel	9.3	1.4	–18.2	50.4	3.7	4.6	15.8	7.9	15.0
Italy	7.5	7.4	3.4	10.3	6.4	43.8	30.6	–0.1	1.9
Luxembourg[5]	. .	. .	. .	. .	–18.2	–2.5	109.1	482.6	–19.9
Mexico[6]	–9.4	4.3	8.8	7.8	42.0	–7.7	58.3	–21.8	16.1
Netherlands	35.1	22.3	9.6	11.0	–6.1	0.5	14.0	11.3	–5.3
New Zealand	–20.6	–7.9	1.8	7.1	11.6	18.5	9.2	23.8	27.3
Norway	11.3	–10.7	14.0	22.3	3.2	15.7	19.0	–17.5	–11.9
Poland	10.8	7.6	11.0	22.6	11.6	9.9	21.5	2.4	7.3
Portugal[7]	90.5	–65.9	18.9	102.3	–51.1	–39.0	141.1	–60.6	–15.0
Slovak Republic	. .	. .	. .	. .	610.4	636.6	39.4	24.7	–73.2
Slovenia	. .	. .	. .	. .	. .	. .	11.6	5.0	5.4
Spain	11.4	–22.6	6.1	10.0	7.0	–12.3	–14.1	–3.3	–8.0
Switzerland	5.2	7.0	6.5	7.3	6.0	14.8	5.3	–3.7	4.5
Turkey[8]	. .	. .	. .	276.8	132.0	51.1	39.6	25.6	38.5
United Kingdom	19.7	33.8	17.7	20.4	9.7	–4.5	–11.2	9.6	20.8
United States	14.7	10.8	2.3	4.4	7.1	2.4	13.3	0.2	. .

1. The increase in 2007 is due to a change in the legislation, which introduced simplified superannuation from 1 July 2007.
2. The drop in contributions between 2003 and 2004 is due to the suspension of the "special pension contribution" (a mandatory tax on all labour) from 2004 onwards.
3. Data refer to investment companies managed funds.
4. The increase in 2007 is due to a shift from a few large industrial companies to IORP schemes. In subsequent years similar shifts turned out to be smaller.
5. The increase in 2009 is due to the fact that a new pension fund has been authorized by the CSSF.
6. The break in series in 2006 is due to the inclusion of occupational pension plans registered by CONSAR since 2005, not included in previous years. Total contributions include mandatory contributions for retirement from employees, employers, and government, and voluntary contributions and transfers from the previous pension system (valid until 1997).
7. The transfert of the total value of a closed pension fund to another, due to a merger between sponsors, explains the sharp rise in 2002. The value transferred was EUR 1 450.382 million. Total contributions grew substantially in 2005 (made mainly to closed and other pension funds), particularly due to extra contributions made in order to match pension liabilities, which were increased by the new method of calculation introduced to comply with International Accounting Standards (IAS). The increase in 2008 is mainly due to additional contributions made by plans sponsors, largely to minimize the effects of the financial crisis (mainly in funds that finance defined benefit plans).
8. Data refer to personal pension plans only.

Source: OECD Global Pension Statistics.

StatLink http://dx.doi.org/10.1787/888932599766

Table A23. **Pension funds' total benefits in selected OECD countries, 2002-2010**

Percent annual change

	2002	2003	2004	2005	2006	2007	2008	2009	2010
Australia[1]	6.4	1.9	–7.6	7.7	14.0	–6.1	84.8	–10.6	3.3
Austria[2]	–5.8	–2.8	13.2	13.9	8.1	60.8	–26.2	–0.4	. .
Belgium	11.3	–13.4	6.0	–1.2	0.5	3.9	–1.8	–0.6	–25.5
Canada	5.0	4.3	10.7	–1.7	12.7	7.5	6.0	7.8	4.2
Chile	. .	10.2	20.2	4.7	21.6	20.2	8.6	–4.1	29.3
Czech Republic	15.2	14.3	–9.3	. .	. .	. .	34.0	32.5	5.4
Denmark	15.8	1.6	8.3	–18.0	13.3	7.3	7.7	8.7	9.0
Estonia[3]	. .	. .	. .	. .	. .	. .	. .	. .	–13.0
Finland	6.9	4.5	4.6	5.8	0.7	7.0	–15.1	33.0	5.4
Germany	6.3	4.8	6.8	2.9	6.3	20.5	18.1	49.6	–26.7
Greece	. .	. .	. .	. .	. .	. .	200.2	–33.0	86.7
Hungary	30.6	4.8	73.9	16.1	0.2	38.0	24.9	–7.5	–18.5
Iceland	15.4	11.1	8.8	11.8	14.9	14.9	18.6	38.6	–7.2
Israel	–9.8	11.3	1.5	4.1	20.5	2.0	5.7	7.3	6.2
Italy	–11.0	56.6	–6.6	–17.3	24.5	–4.4	41.4	–20.4	6.5
Luxembourg	. .	. .	. .	. .	–9.8	42.2	–33.0	62.4	51.5
Mexico[4]	37.5	339.0	–19.6	22.1	258.2	9.3	12.8	35.9	23.3
Netherlands	7.6	6.5	8.5	7.7	6.5	6.0	4.7	5.5	6.0
New Zealand	–2.5	–5.4	–18.1	–0.9	22.8	–8.1	13.0	39.3	–27.6
Norway	3.7	8.5	6.2	5.3	2.5	7.4	52.9	28.9	–38.1
Poland	1 435.2	247.9	88.6	29.8	10.2	89.0	113.8	–23.8	8.0
Portugal	5.9	–8.8	7.0	–2.6	9.3	0.5	8.9	–1.1	–14.0
Slovenia	. .	. .	. .	. .	. .	. .	126.8	126.6	662.3
Spain	–44.9	18.7	30.5	23.1	10.3	–1.7	17.3	–2.0	1.1
Switzerland	3.1	6.7	6.3	2.3	6.2	5.7	3.4	3.8	–5.5
Turkey	. .	. .	. .	33.5	14.5	13.8	69.2	18.8	–3.4
United Kingdom	7.4	3.4	2.7	11.3	8.3	–2.0	5.1	8.1	8.6
United States	3.1	–0.3	9.9	6.5	13.4	9.2	–1.3	–1.7	. .

1. The increase in 2007 is due to a change in the legislation, which introduced simplified superannuation from 1 July 2007.
2. The increase in 2007 is due to cash flows between two investment and risk sharing groups within one pension company in connection with a restructuring.
3. Data refer to investment companies managed funds.
4. The break in series in 2006 is due to the inclusion of occupational pension plans registered by CONSAR since 2005, not included in previous years.

Source: OECD Global Pension Statistics.

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Table A24. **Number of pension funds in selected OECD countries, 2001-2010**

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Australia	222 971	238 753	264 614	290 917	306 553	324 789	363 687	389 813	406 781	432 596
Austria	19	20	20	21	20	21	20	19	19	17
Belgium	. .	. .	268	267	. .	258	258	251	232	172
Canada	3 193	3 045	3 193	3 816	3 816	5 036	5 036	7 192	7 192	7 192
Chile	. .	30	30	30	30	30	30	25	25	30
Czech Republic	14	13	12	11	11	11	10	10	10	10
Estonia[1]	4	19	21	22	15	15	15	19	22	23
Finland	144	144	144	153	174	129	122	119	117	. .
Germany	136	165	177	182	178	175	178	180	182	183
Greece	. .	. .	. .	. .	. .	. .	3	3	3	8
Hungary	. .	108	100	93	90	88	87	86	82	78
Iceland	54	51	50	48	46	41	38	37	52	49
Israel	36	40	42	43	30	32	32	34	33	32
Italy	517	507	484	431	432	431	418	393	370	353
Korea	. .	116	116	116	138	. .	. .	. .	. .	. .
Luxembourg	. .	. .	. .	. .	16	18	17	18	19	22
Mexico[2]	16	14	12	26	1 331	1 342	1 062	1 091	1 050	1 045
Netherlands	965	928	877	841	802	769	714	531	484	455
Norway	149	140	135	125	119	122	109	108	105	100
Poland	. .	. .	. .	. .	. .	20	20	19	. .	19
Portugal	241	241	240	221	223	227	224	230	280	274
Slovak Republic	4	4	5	. .	8	12	11	11	11	11
Slovenia	. .	. .	5	7	7	7	7	7	7	7
Spain	699	804	919	1 163	1 255	1 340	1 353	1 374	1 420	1 504
Switzerland	3 290	3 170	3 050	2 934	2 770	2 667	2 543	2 435	2 351	2 265
Turkey[3]	. .	. .	. .	. .	. .	. .	. .	14	15	15
United Kingdom	. .	. .	. .	94 535	91 674	. .	78 932	63 523	. .	. .

1. Data refer to investment companies managed funds.
2. The break in series in 2005 is due to the inclusion of occupational pension plans registered by CONSAR since 2005, not included in previous years.
3. For personal plans, the value indicates the number of pension companies. In 2010, there were 130 pension mutual funds founded by these companies.

Source: OECD Global Pension Statistics.

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Table A25. **Assets in public pension reserve funds in OECD and selected non-OECD countries, 2001-2010**

In millions of USD

	Name of the fund or institution	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
OECD members											
Australia	Future Fund	. .	. .	. .	. .	. .	13 686	44 395	49 790	51 629	65 825
Belgium	Zilverfonds	. .	. .	. .	. .	. .	. .	. .	23 660	23 474	23 348
Canada	Canadian Pension Plan	31 710	34 139	39 704	54 185	67 095	86 396	108 542	102 024	108 627	136 033
Chile	Pension Reserve Fund	. .	. .	. .	. .	. .	. .	. .	. .	3 421	3 837
France	AGIRC-ARRCO	. .	. .	. .	. .	. .	. .	. .	72 386	71 653	. .
France	Pension Reserve Fund	. .	10 181	18 598	25 117	33 528	39 147	47 671	40 383	46 271	49 034
Ireland	National Pensions Reserve Fund	6 907	6 999	10 803	14 520	19 155	23 714	28 977	23 600	31 040	32 348
Japan	Government Pension Investment Fund	1 212 856	1 178 502	1 270 285	1 381 094	1 285 714	1 174 058	1 110 916	1 137 737	1 312 818	. .
Korea	National Pension Fund	58 826	74 382	94 519	116 379	152 586	191 438	228 096	213 855	217 768	280 407
Mexico	IMSS Reserve	. .	. .	. .	. .	. .	. .	4 560	4 224	3 605	3 594
New Zealand	New Zealand Superannuation Fund	. .	. .	1 093	2 622	4 613	6 668	9 662	9 946	8 265	11 162
Norway	Government Pension Fund – Norway	14 866	17 048	22 372	26 038	29 706	17 010	20 068	15 894	18 963	23 075
Poland	Demographic Reserve Fund	. .	57	123	. .	. .	787	1 255	1 844	2 343	3 372
Portugal	Social Security Financial Stabilisation Fund	3 401	4 446	6 134	7 179	7 687	8 332	. .	12 192	13 065	12 765
Spain	Social Security Reserve Fund	1 321	5 516	11 299	23 767	33 258	44 883	62 471	83 663	83 364	85 265
Sweden	National Pension Funds (AP1-AP4 and AP6)	53 567	49 989	71 180	88 377	103 830	117 546	137 144	111 443	108 505	124 655
United States	Social Security Trust Fund	1 212 742	1 378 081	1 530 364	1 686 985	1 859 441	2 048 112	2 238 500	2 418 658	2 540 348	2 608 950
Other major economies											
Argentina	Sustainability Guarantee Fund	. .	. .	. .	. .	. .	. .	. .	. .	37 965	45 688
China	National Social Security Fund	12 143	15 181	16 008	20 678	25 846	35 464	57 798	. .	113 702	126 542
Saudi Arabia	General Organisation for Social Insurance	. .	. .	. .	. .	. .	. .	. .	. .	. .	400 000

Source: OECD Global Pension Statistics.

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Table A26. **Assets in public pension reserve funds in OECD and selected non-OECD countries, 2001-2010**

As a % of GDP

		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
OECD members											
Australia	Future Fund	. .	. .	. .	. .	. .	1.9	5.1	5.1	5.3	5.5
Belgium	Zilverfonds	. .	. .	. .	. .	. .	. .	. .	4.7	5.0	5.0
Canada	Canadian Pension Plan	4.4	4.6	4.6	5.5	5.9	6.8	7.6	6.8	8.5	8.6
Chile	Pension Reserve Fund	. .	. .	. .	. .	. .	. .	. .	. .	2.1	1.9
France	AGIRC-ARRCO	. .	. .	. .	. .	. .	. .	. .	2.5	2.7	. .
France	Pension Reserve Fund	. .	0.7	1.0	1.2	1.6	1.7	1.8	1.4	1.7	1.9
Ireland	National Pensions Reserve Fund	6.6	5.7	6.9	7.9	9.5	10.8	11.4	8.7	13.7	15.9
Japan	Government Pension Investment Fund	29.6	30.0	30.0	30.0	28.2	26.8	25.4	23.2	25.9	. .
Korea	National Pension Fund	12.2	13.6	15.5	17.1	19.3	21.5	23.5	23.0	15.9	27.6
Mexico	IMSS Reserve	. .	. .	. .	. .	. .	. .	0.5	0.4	0.3	0.3
New Zealand	New Zealand Superannuation Fund	. .	. .	1.3	2.7	4.2	6.2	7.4	7.7	7.1	7.9
Norway	Government Pension Fund – Norway	8.7	8.9	9.9	10.1	9.8	5.0	5.2	3.5	5.0	5.6
Poland	Demographic Reserve Fund	. .	0.0	0.1	. .	. .	0.2	0.3	0.3	0.5	0.7
Portugal	Social Security Financial Stabilisation Fund	2.9	3.5	3.9	4.0	4.1	4.3	. .	5.0	5.7	5.6
Spain	Social Security Reserve Fund	0.2	0.8	1.3	2.3	2.9	3.6	4.3	5.2	5.7	6.1
Sweden	National Pension Funds (AP1-AP4 and AP6)	23.8	20.1	22.9	24.7	28.4	29.9	30.2	23.3	27.2	27.2
United States	Social Security Trust Fund	12.0	13.2	14.0	14.5	15.0	15.6	16.2	17.0	17.9	17.9
Other major economies											
Argentina	Sustainability Guarantee Fund	. .	. .	. .	. .	. .	. .	. .	. .	12.3	12.3
China	National Social Security Fund	1.0	1.2	1.1	1.2	1.2	1.4	1.9	. .	2.3	2.2
Saudi Arabia	General Organisation for Social Insurance	. .	. .	. .	. .	. .	. .	. .	. .	. .	106.4

Source: OECD Global Pension Statistics.

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Table A27. **Public pension reserve funds' portfolio allocation in selected OECD countries, 2010**

As a % of total investments

	Cash and deposits	Fixed income	Shares and other equities	Structured products	Land and buildings	Private equity and hedge funds	Other investments
Australia[1]	15.2	18.1	39.6	0.0	5.3	17.7	4.1
Belgium	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Canada[1]	1.5	27.2	38.6	0.0	6.6	15.1	11.0
Chile	21.2	78.8	0.0	0.0	0.0	0.0	0.0
France – FRR[2]	15.6	40.7	33.0	0.0	0.0	1.1	9.6
Japan[3]	1.4	75.8	22.8	0.0	0.0	0.0	0.0
Mexico	19.5	63.6	0.0	16.9	0.0	0.0	0.0
New Zealand[4]	14.7	26.0	37.2	0.5	0.0	13.9	7.6
Norway[5]	4.4	30.1	63.0	2.1	0.0	0.0	0.4
Spain	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Poland	3.3	82.4	14.3	0.0	0.0	0.0	0.0
Portugal[6]	0.8	64.5	21.7	0.0	2.2	0.0	10.8
Sweden – AP1[7]	0.0	32.3	57.4	0.0	5.0	2.2	3.1
Sweden – AP3[8]	0.0	34.8	51.0	0.6	4.1	7.5	2.0
Sweden – AP4	0.2	34.0	59.9	0.0	3.9	2.0	0.0
United States	0.0	100.0	0.0	0.0	0.0	0.0	0.0

1. Other investments include infrastructure investments.
2. Other investments include accounts receivables and derivatives.
3. Data refer to 2009.
4. Data refer to June 2010. Other investments include derivatives and timber.
5. Other investments include foreign exchange hedging and interest rate swaps.
6. Other investments include derivatives. Land and buildings include real estate funds.
7. Other investments include opportunity investments and foreign exchange portfolios.
8. Other investments include derivatives, long/short portfolios, convertibles, opportunity investments, foreign exchange portfolios, insurance-linked securities.

Source: OECD Global Pension Statistics.

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