PART I

Comparing Pension Policies of OECD Countries

This part starts with an overview of the different schemes that together make up national retirement-income systems. A summary of the key features of pension systems – the parameters and rules – follows. The main empirical results, consisting of eight indicators that are calculated using the OECD pension models, are then presented.

The first two indicators are both replacement rates; that is, the ratio of pension benefits to individual earnings. These are given in gross and net terms, taking account of taxes and contributions paid on earnings and on retirement incomes. There are also two sensitivity analyses of the gross replacement rate: gross pension replacement rates with entry at age 25; and gross pension replacement rates with different rates of return.

The next two indicators are based on pension wealth, again in gross and net terms. Pension wealth, unlike replacement rates, reflects differences in pension ages, indexation of pensions in payment and national life expectancy.

The balance between the two core objectives of pension system – adequacy and insurance – is explored by the next pair of indicators, on the progressivity of the pension benefit formula and the link between pension and earnings.

The final two indicators are: weighted averages – pension levels and pension wealth; and structure of the pension package. They summarise the pension system as it affects individuals across the earnings distribution.

Overview of Retirement-Income Provision

OECD countries' retirement-income regimes are diverse and often involve a number of different programmes. As a result, classifying pension systems and different retirement-income schemes is difficult. The taxonomy used here, building on earlier work (OECD, 2004, 2005a), is based on the role and objective of each part of the pension system. The framework consists of two mandatory "tiers": a redistributive part and an insurance part. Redistributive components of pension systems are designed to ensure that pensioners achieve some absolute, minimum standard of living. Insurance components are designed to achieve some target standard of living in retirement compared with that when working. Voluntary provision, be it individual or employer-provided, makes up a third tier. Within these tiers, schemes are classified further by their provider (public or private) and the way benefits are determined (defined benefit or defined contribution, for example).

Table I.1 shows the diverse structure of pension systems in OECD countries. The table looks at schemes that might affect people who have spent all or most of their careers covered by the national pension system (and so excludes, for example, safety-net programmes that affect only or mainly people with large gaps in their contribution histories).

All OECD countries have safety nets that aim to prevent poverty in old age. All of these programmes, here called "first-tier, redistributive schemes", are provided by the public sector. There are three main types.

With *basic*-pension schemes, the benefit is either flat rate (the same amount is paid to every retiree) or it depends only on years of work, but not on past earnings. Additional income does not change the value of basic pensions. Thirteen countries have a basic pension scheme or other provisions with a similar effect.

The other two kinds of first-tier retirement-income programmes target payments on older people with low incomes. These are distinguished by the way in which benefits are targeted.

Resource-tested plans pay a higher benefit to poorer pensioners and reduced benefits to better-off retirees. The value of benefits depends either on income from other sources or on both income and assets. Some countries provide a safety net for older people through general social-assistance benefits. There are 16 OECD countries with resource-tested programmes likely to affect low earners who spend all or most of their careers in the national pension system.

Minimum pensions, found in 14 countries, are similar to resource-tested plans since they also aim to prevent pensions from falling below a certain level. The difference lies in

Table I.1. **Structure of pension systems in OECD countries**

	First tier			Second tier	
	Universal coverage, redistributive			Mandatory, insurance	
	Public			Public	Private
	Resource tested	Basic	Minimum	Type	Type
Australia	✓				DC
Austria	✓			DB	
Belgium	✓		✓	DB	
Canada	✓	✓		DB	
Czech Republic	✓	✓	✓	DB	
Denmark	✓	✓			DC
Finland			✓	DB	
France	✓		✓	DB + points	
Germany	✓			Points	
Greece	✓		✓	DB	
Hungary				DB	DC
Iceland	✓	✓			DB
Ireland	✓	✓			
Italy	✓			NDC	
Japan		✓		DB	
Korea		✓		DB	
Luxembourg	✓	✓	✓	DB	
Mexico		✓	✓		DC
Netherlands		✓			DB
New Zealand		✓			
Norway		✓	✓	Points	DC
Poland			✓	NDC	DC
Portugal			✓	DB	
Slovak Republic			✓	Points	DC
Spain			✓	DB	
Sweden			✓	NDC	DB + DC
Switzerland	✓		✓	DB	DB
Turkey			✓	DB	
United Kingdom	✓	✓	✓	DB	
United States	✓			DB	

DB = defined benefit.
DC = defined contribution.
NDC = notional accounts.
Source: Information provided by national authorities. See OECD (2004, 2005a) for a more detailed definition of these terms.

the way in which the value of entitlements is determined. Minimum pensions take account only of pension income, often from a single pension scheme, and are not affected by income from other savings or assets. Minimum credits in earnings-related schemes, such as those in Belgium and the United Kingdom, have a similar effect: benefits for workers with very low earnings are calculated as if the worker had earned at a higher level.

The second tier in this typology of pension schemes plays an "insurance" role. It aims to provide retirees with an adequate income relative to their previous earnings, not just a poverty-preventing absolute standard of living. Like the first tier, it is mandatory. Only Ireland and New Zealand do not have mandatory, second-tier provision.

Some 16 OECD countries have public, defined-benefit (DB) plans, making them the most common form of pension-insurance provision. In DB schemes, the amount a pensioner will receive depends on the number of years of contributions made throughout

the working life and on some measure of individual earnings from work. Four countries have "points" schemes: the French occupational plans and the German, Norwegian and Slovak public schemes. Workers earn pension points based on their individual earnings for each year of contributions. At retirement, the sum of pension points is multiplied by a pension-point value to convert them into a regular pension payment.

Four countries have private occupational DB plans. In the Netherlands and Sweden the DB nature is explicit. In Iceland and Switzerland, the government sets the contribution rate, a minimum rate of return and the annuity rate at which the accumulation is converted into a pension, policies that together define the pension benefit.

The next most common form of pension-insurance provision is the defined-contribution (DC) plan. In these schemes, contributions flow into an individual account and the accumulation of contributions and investment returns is usually converted into a pension-income stream at retirement. DC schemes are organised in different ways. In Australia, employers must cover their workers while in Hungary, Mexico and Poland, workers choose a pension provider without employer involvement. In Sweden, only a small contribution goes into the mandatory individual accounts with additional DC provision for most workers under the quasi-mandatory occupational schemes.

There are also notional-accounts (NDC) schemes: the public pension plans of Italy, Poland and Sweden. These are schemes which record each worker's contributions in an individual account and apply a rate of return to the accounts. The accounts are "notional" in that both the incoming contributions and the interest charged to them exist only on the books of the managing institution. At retirement, the accumulated notional capital in each account is converted into a stream of pension payments using a formula based on life expectancy.

Key Features of Pension-System Design

The main features of OECD member countries' pension systems are summarised in Table I.2 below. These follow the typology of the previous section, dividing the pension system into two tiers. The summary necessarily leaves out much of the institutional details. More complete descriptions are provided in the country studies (Part III).

First-tier, redistributive schemes

The level of benefits under first-tier, redistributive schemes is expressed as a percentage of average earnings in each country (see the discussion of average earnings data in the section on methodology above).

In the cases of minimum pensions and basic schemes, the benefit entitlement is shown for a worker who enters at age 20 and works without interruption until he reaches the *standard* pension eligibility age. In most OECD countries, this is age 65 as shown in the last lines of Table I.2. Only full-career workers with very low earnings will be eligible for the resource-tested programmes; the majority of beneficiaries will be those with short and interrupted contribution histories. The final row shows the total, first-tier benefit for a full-career worker. In some cases, workers can receive several different types of first-tier benefits, while in other cases they are only eligible for one programme.

The average minimum retirement benefit across OECD countries is a little under 29% of average earnings.

Second-tier, insurance schemes

The information on the second, insurance tier is shown separately for earnings-related and defined-contribution (DC) plans.

The information on earnings-related schemes begins with the scheme type: defined benefit (DB), points or notional accounts (NDC). The main parameter accounting for differences in the value of these schemes is the accrual rate per year of contribution, that is, the rate at which a worker earns benefit entitlements for each year of coverage. The accrual rate is expressed as a percentage of the earnings that are "covered" by the pension scheme. Most pension schemes cover only part of workers' earnings to calculate pension benefits.

For points systems, the effective accrual rate shown in Table I.2 is the ratio of the cost of a pension point to the pension-point value, expressed as percentage of individual earnings. This, like the accrual rate in DB schemes, gives the benefit earned each year as a proportion of earnings in that year. In notional-accounts schemes, the effective accrual rate is calculated in a similar way to obtain the annual pension entitlement as a proportion of earnings in a given year. The calculations, which depend on the contribution rate, notional interest rate and annuity factors, are described in detail in *Pensions at a Glance* (OECD, 2005a).

In a little under half of the countries with earnings-related plans (of all three types), the accrual rates are linear. In the other countries, the pension benefit earned for each year of coverage varies, either with individual earnings, with the number of years of contributions or with individual age.

In eight cases, the accrual rate varies with earnings (indicated in Table I.2 by [w]). In the public schemes of the Czech Republic, Switzerland, Portugal and the United States, the pattern is progressive, giving higher replacement rates to lower-income workers. In the United Kingdom, the accrual rates are U-shaped, highest for low earners, then smaller, then higher again. In the occupational plans of France and Sweden, the benefits are designed to offset the redistribution in the public scheme; they pay a higher replacement rate to high earners on their pay above the ceiling of the public plan.

In the occupational plans of Finland and Switzerland, pension accrual increases with age (shown as [a]).

Two countries have accrual rates that vary with length of service ([y]). In Luxembourg, the accrual rate increases for people with a longer contribution history. In Spain, there are three accrual rates. The pattern is the reverse of that in Luxembourg: the highest accrual rate is for the first few years of coverage and the lowest for later years in longer contribution histories.

Defined-contribution plans

The key parameter for DC plans is the proportion of earnings that must be paid into the individual account by employees, employers or the government. The average contribution rate in the eight countries with a mandatory DC plan is 7.25%. The largest contribution is in Denmark, made up of 1% to the special pension and an average of 10.8% to quasi-mandatory, occupational schemes. In Australia and the Slovak Republic, the contribution rate is 9%. Norway has recently made coverage of DC occupational schemes mandatory, but the contribution rate is only 2%. In Sweden, employees must contribute 2.5% of earnings to a DC account and white-collar, private sector workers are also covered by a DC scheme with a 2% contribution rate. The contribution rate is 6.5% in Mexico. The additional government contribution of 5.5% of the minimum wage is shown as a basic scheme because it is a flat amount for each year of service.

Measuring earnings to calculate benefits

DB pension entitlements depend on the past earnings of the individual worker but the way in which these are measured differs. Table I.2 shows whether lifetime average or a limited number of best or final years' salaries are used. It is important to remember that the information shown here relates to the long-term rules of the system: the averaging period is being changed in a number of countries (see the special chapter on pension reform).

By far the most common method is to use the full lifetime average of earnings to calculate benefits. This is the approach in 17 countries, with Canada, the Czech Republic and the United States averaging earnings over the great majority of the career (30-35 years). There are five exceptions. Final salaries will be used to calculate benefits in Greece, Spain and in the DB occupational scheme in Sweden. The public pension schemes of France and Norway will be based on the best 25 and 20 years' earnings respectively.

Valorisation

Closely linked with the earnings measure is the policy of valorisation or revaluation, whereby past earnings are adjusted to take account of changes in living standards between the time pension rights accrued and the time they are claimed. (This is sometimes called pre-retirement indexation.) If benefits are based on the final year's salary, there is no need for valorisation. But it is necessary to protect the value of pension entitlements when benefits are based on earnings measured over a longer period. The uprating of the pension-point value and the notional interest rate in points and notional-accounts systems, respectively are the exact corollaries of valorisation in DB plans (see Queisser and Whitehouse, 2006, Box 4 for a detailed explanation).

The effect of valorisation policy on pension entitlements is large due to a "compound-interest" effect. On the baseline economic assumptions used in this report – *i.e.*, real wage growth of 2% and price inflation of 2.5% – prices valorisation for a full career (between age 20 and 65) results in a pension that would be 40% lower than a policy of full adjustment of earlier years' pay in line with economy-wide average earnings.

The most common practice – followed in 15 OECD countries – is to revalue earlier years' pay in line with the growth of average earnings in the economy. Belgium, France and Spain, however, revalue earnings only with price inflation, although the effect in Spain is relatively small because only the final 15 years' salary enters the benefit formula, compared with 25 years in the French public scheme and the lifetime average in Belgium and the French occupational plans. Finland, Portugal and Turkey revalue earlier years' earnings to a mix of price and wage inflation.

Ceilings on pensionable earnings

Most countries do not require high-income workers to contribute to the pension system on their entire earnings. Usually, a limit is set on the earnings used both to calculate contribution liability and pension benefits. This ceiling on the earnings covered by the pension system has an important effect on the structure, size and cost of second-tier schemes. The average ceiling on public pensions for 19 countries is 189% of average economy-wide earnings. (This average excludes eight countries where there is no public pension scheme for which a ceiling is relevant, such as basic or targeted programmes and three countries that have no ceiling on earnings eligible for a public pension.)

Table I.2 also shows ceilings for mandatory private pension systems and for the public, occupational plans in France and Finland. Of the nine countries with this type of programme, three have no ceiling: Finland, Iceland and the Netherlands. The ceilings of the occupational plans in France and Sweden are three and 2.8 times respectively the cap on pensionable earnings in the public programme (equivalent to over 3 times average economy-wide earnings). The ceiling on mandatory contributions to the defined-contribution (DC) plan in Mexico is also relatively high.

Pension eligibility ages

The majority of OECD member countries have a standard retirement age of 65 for men. Pension eligibility ages for women are still lower in several countries but, in most of these, they will be equalised gradually with those of men (in Belgium, Hungary and the United Kingdom, for example). Iceland, Norway and the United States have a standard pension age of 67 and other countries, such as Denmark, Germany and the United Kingdom, are also

proposing increase pension age above 65. France is the only OECD country which allows normal retirement at age 60. More than half of OECD countries, however, allow retirement before the normal pension age, although usually only with reduced benefits.

Indexation of pensions in payment

Indexation refers to the policy for the up-rating of the value of the payment from the point of claim of the pension benefit onwards. Pension benefits are usually adjusted in line with an index of consumer prices. Some countries have mixed uprating of benefits, to a combination of price inflation and wage growth: the Czech Republic, Finland, Hungary, the Slovak Republic and Switzerland.

Austria, Greece, Italy and Portugal have adopted progressive indexation mechanisms, which give higher increases to low pensions than to higher benefits. Italy provides full price adjustment for low pensions and 90% or 75% of price inflation to higher pensions. In Portugal, pensions are adjusted to a mix of price inflation and GDP growth; the exact increases depend both on the level of pensions and on GDP growth rates.

Indexation of pension-system parameters

Indexation affects not only pensions in payment but also the parameters of pension systems. In resource-tested and basic pension schemes, the adjustment of benefit levels to the point when they are first claimed is more important than the adjustment of benefits in payment.

Take the United Kingdom's basic pension scheme as an example. This has been linked to prices since 1981, when it was worth 24% of average earnings. Today, it is worth just 15% of average earnings. The change in indexation procedure reduced the entitlements not only of pensioners but also the benefits of all future workers. If the procedure continues, then the basic pension for new entrants will be worth just 6.4% of average earnings when they retire in 45 years' time, just 40% of its value relative to earnings now. (This calculation uses the baseline real-earnings-growth assumption of 2% per year.)

Canada and Sweden also link their resource-tested schemes to prices (while the United Kingdom now links this to average earnings). The implication, over the long periods involved in pension policy, is that these programmes will all but disappear. For new entrants, the minimum retirement income in 45 years time would be just 12% of average earnings in Canada and 14% in Sweden. It is difficult to believe that it will be politically possible to pay such low incomes to poor, old people. As a result, these policies are unlikely to be sustainable or, indeed, sustained.

Therefore, the modelling in this report explicitly assumes that these benefits and parameters are linked to average earnings, and not prices, even though this is what legislation specifies. Obviously this assumption has a big effect on the results when calculating the value of the pension promise.

Table I.2. **Summary of pension-scheme parameters and rules**

	Australia	Austria	Belgium	Canada	Czech Republic	Denmark	Finland	France	Germany	Greece
First tier										
(% average earnings)										
Resource-tested	25	28	22	17	26	18	19	32	19	11
Basic	–	–	–	14	8	18	–	–	–	–
Minimum	–	–	34[1]	–	12	–	–	23	–	34
Overall entitlement	25	28	34	31	26	36	19	32	19	34
(full-career worker)										
Second tier										
Earnings-related										
Type	None	DB	DB	DB	DB	None	DB	DB/Points	Points	DB
Accrual rate	–	1.78	1.33	0.63	0.45[w][2]	–	1.5[a][4]	1.75 [w][5, 6]	1.00	2.57[5]
(% indiv. earnings)										
Earnings measure	–	40	L	b34	f30	–	L	b25/L	L	f5
Valorisation	–	w[15]	p	w	w	–	80w/20p	p/p	w[16]	[17]
Indexation	–	d	p	p	33w/67p	–	20w/80p	p/p	w[16]	d
Defined contribution										
Contribution rate	9	–	–	–	–	11.8	–	–	–	
(% indiv. earnings)										
Ceilings										
(% average earnings)										
Public	–	147	117	96	None	–	–	101	151	275[7]
Private/occupational	257	–	–	–	–	–	None	302	–	–
Pension age										
Normal	65	65	65	65	63	65	65	60	65	65
(women)					(59-63)[3]					
Early	55		60	60	60		62		63	55
(women)					(56-60)[3]					

Parameters are for 2004 but include all legislated changes that take effect in the future. For example, some countries are increasing pension ages and extending the earnings measure for calculating benefits; pension ages for women are shown only if different from those for men. Early pension ages are shown only where relevant.

– = not relevant; [a] = varies with age; [w] = varies with earnings; [y] = varies with years of service.

b = number of best years; f = number of final years; L = lifetime average.

d = discretionary indexation; fr = valorisation at a statutorily fixed rate; p = valorisation/indexation with prices; w = valorisation/indexation with average earnings; GDP = linked to gross domestic product.

DB = defined benefit; DC = defined contribution; NDC = notional accounts.

1. Belgium, Slovak Republic, United Kingdom: minimum benefit calculated from minimum credit.
2. Czech Republic, Portugal, United States: higher accrual rates on lower earnings, lower accruals on higher earnings.
3. Czech Republic: pension ages for women vary with number of children.
4. Finland: higher accrual rates at older ages.
5. France, Greece, Sweden: data shown combines two different programmes.
6. France, Sweden: higher accrual rate on higher earnings under occupational plans.
7. Greece: effective ceiling calculated from maximum pension.

Table I.2. **Summary of pension-scheme parameters and rules** *(cont.)*

	Hungary	Iceland	Ireland	Italy	Japan	Korea	Luxembourg	Mexico	Netherlands	New Zealand
First tier										
(% average earnings)										
Resource-tested	–	18[8]	27	–	–	–	–	–	–	–
Basic	–	9	30	–	16	30	10	7.0/4.2[10]	31	40
Minimum	22	–	–	–	–	–	39	26	–	–
Overall entitlement	22	27	30	22	16	30	39	26	31	40
(full-career worker)										
Second tier										
Earnings-related										
Type	DB	DB	None	NDC	DB	DB	DB	None	DB	None
Accrual rate	1.22	1.40	–	1.75	0.55	1.5	1.85 [y][9]	–	1.75[11]	–
(% indiv. earnings)										
Earnings measure	L	L	–	L	L	L	L	–	L[14]	–
Valorisation	w	fr	–	GDP	w	w	w	–	w	–
Indexation	50w/50p	p	–	p[18]	p	p	w	–	w	–
Defined contribution										
Contribution rate	8	–	–	–	–	–	–	6.5[10]	–	–
(% indiv. earnings)										
Ceilings										
(% average earnings)										
Public	220	–	–	370	150	160	215	–	–	–
Private/occupational	220	None	–	–	–	–	–	377	None	–
Pension age										
Normal	62	67	66	65	65	65	65	65	65	65
(women)				(60)				60		
Early			65	60	60	60	57		60	
(women)										

8. Iceland: includes two different programmes.
9. Luxembourg: higher accrual rate for longer contribution periods.
10. Mexico: additional contribution of 5.5% of minimum wage is shown as a basic pension. The lower value of the annuity calculated is for women (because women retire earlier than men).
11. Netherlands: accrual rate varies between occupational schemes.
12. Norway: lower accrual rate on higher earnings.
13. Spain: higher accrual rate on early years of service and lower on later years.
14. Netherlands: earnings measure is average salary for around two-thirds of occupational plans and final salary for one-third.
15. Austria: valorisation assumed to move to earnings as the averaging period for the earnings measure is extended.
16. Germany: valorisation can be reduced by any increase in contribution rates and for the potential contribution to private pensions. Indexation can be reduced by any increase in contributions.
17. Greece: valorisation in line with pension increases for public-sector workers.
18. Italy: indexation is fully to prices for low pensions, 90% of prices or 75% of prices for higher pensions.

Table I.2. **Summary of pension-scheme parameters and rules** *(cont.)*

	Norway	Poland	Portugal	Slovak Republic	Spain	Sweden	Switzerland	Turkey	United Kingdom	United States
First tier										
(% average earnings)										
Resource-tested	33	–	20	–	–	34	24	6	20	22
Basic	18	–	–	–	–	–	–	–	15	–
Minimum	–	23	44	22[1]	30	–	18	28	15[1]	–
Overall entitlement	33	23	44	22	30	34	24	28	30	22
(full-career worker)										
Second tier										
Earnings-related										
Type	Points	NDC	DB	Points	DB	NDC/DB	DB	DB	DB	DB
Accrual rate	1.05 [w][12]	0.67	[w][2]	1.16	[y][13]	1.18[w][5, 6]	[w/a]	2.0	[w][21]	[w][2]
(% indiv. earnings)										
Earnings measure	b20	L	L	L	f15	L/f	L	L	L	b35
Valorisation	w	w[19]	25w/75p	w	p	w	w	50w/50p	w	w[22]
Indexation	w	p[19]	p/GDP[20]	50w/50p	p	w-1.6	50w/50p	p	p	p
Defined contribution										
Contribution rate	2	7.3	–	9	–	4.5[5]	–	–	–	–
(% indiv. earnings)										
Ceilings										
(% average earnings)										
Public	219	230	None	300	165	132	108	245	115	290
Private/occupational	–	–	–	–	–	367	108	–	–	–
Pension age										
Normal	67	65	65	62	65	65	65	65	65	67
(women)		(60)					(64)			
Early			55		60	61	63			62
(women)							(62)			

19. Poland: valorisation to real wage bill growth but at least price inflation. Indexation has been 80% prices and 20% wages but moved to prices from 2005.

20. Portugal: indexation will be higher relative to prices for low pensions and *vice versa*. Indexation will be more generous the higher is GDP growth.

21. United Kingdom: accrual rate highest for low earnings, then lower then higher again.

22. United States: earnings valorisation to age 60; no adjustment from 60 to 62; prices valorisation from 62 to 67.

Source: Information provided by national authorities and OECD calculations.

Retirement-Income Indicators

The first two indicators are both replacement rates; that is, the ratio of pension benefits to individual earnings. These are given in gross and net terms, taking account of taxes and contributions paid on earnings and on retirement incomes. There are also two sensitivity analyses of the gross replacement rate: gross pension replacement rates with entry at age 25; and gross pension replacement rates with different rates of return.

The next two indicators are based on pension wealth, again in gross and net terms. Pension wealth, unlike replacement rates, reflects differences in pension ages, indexation of pensions in payment and national life expectancy.

The balance between the two core objectives of pension system – adequacy and insurance – is explored by the next pair of indicators, one on the progressivity of the pension benefit formulae and the other on the link between pension and earnings.

The final two indicators are: weighted averages – pension levels and pension wealth; and structure of the pension package. They summarise the pension system as it affects individuals across the earnings distribution.

Definition and measurement

The gross replacement rate is defined as gross pension entitlement divided by gross pre-retirement earnings. It is shown here at median earnings and at 0.5, 0.75, 1, 1.5 and 2 times average (mean) earnings.

The old-age pension replacement rate is a measure of how effectively a pension system provides income during retirement to replace earnings, the main source of income prior to retirement. Often, the replacement rate is expressed as the ratio of the pension over the final earnings before retirement. However, the indicator used here shows the pension benefit as a share of individual lifetime average earnings (re-valued in line with economy-wide earnings growth). Under the baseline assumptions, workers earn the same percentage of economy-wide average earnings throughout their career. In this case, lifetime average re-valued earnings and individual final earnings are identical. If people move up the earnings distribution as they get older, then their earnings just before retirement will be higher than they were on average over their lifetime and replacement rates calculated on individual final earnings will be lower.

For workers at average earnings, the average for the OECD countries of the gross replacement rate from mandatory pensions is 58.7%. There is substantial variation across countries, with Greece and Luxembourg at the top of the range, offering replacement rates of more than 90%. The lowest replacement rates for average earners are paid in the United Kingdom, Ireland and Japan, while countries such as Norway and Switzerland are in the middle of the range. Replacement rates from mandatory schemes tend to be the lowest in the six mainly English-speaking countries, averaging 38.5% for workers on mean earnings. They are the highest in the five Southern European nations – Greece, Italy, Portugal, Spain and Turkey – averaging 74.3%.

Low earners – workers earning only half the mean – have higher replacement rates than median or mean earners: on average, 73%. This reflects the fact that most countries attempt to protect low-income workers from old-age poverty. The cross-country variation of replacement rates at this earnings level is much lower than it is for pensions of those who earn twice the average. The highest gross replacement rate for low earners is found in Denmark at 120%, which means that full-career workers with permanently low earnings have more money when they retire than when they were working. The lowest rate is observed in Germany where full-career workers on half average earnings receive only a 40% replacement rate.

At high earnings, Greece again offers the highest pensions, reflecting both a high accrual rate and a high ceiling on pensionable earnings. While most other countries have lower ceilings and therefore lower replacement rates for high earners, the Greek system offers the same rate to full-career workers up to 275% of average earnings. In contrast, high earners receive the lowest benefits relative to their previous earnings in Ireland. The variation across countries in replacement rates for high earners is much greater than it is for people on low or average pay.

Finally, the table also presents pension replacement rates for women in the four countries where these differ from those of men (due to a lower pension eligibility age for women than for men). The difference between the sexes in replacement rates is particularly stark in two of the countries with defined-contribution schemes: Mexico and Poland. In both countries, normal pension age for women is 60 while for men it is 65. This means that women accumulate capital in the individual pension accounts over a shorter period. It also means that women spend a longer period in retirement over which pension capital must be spread. As a result, replacement rates at average earnings are around one third smaller for women than they are for men. In Mexico, the differential between men and women's replacement rates is larger than in Poland because annuities are calculated using sex-specific mortality rates rather than unisex life tables.

Gross replacement rates by earnings

	Median earner	Individual earnings, multiple of mean						Median earner	Individual earnings, multiple of mean				
		0.5	0.75	1	1.5	2			0.5	0.75	1	1.5	2
Men							**Men** (cont.)						
Australia	47.9	70.7	52.3	43.1	33.8	29.2	New Zealand	46.8	79.5	53.0	39.7	26.5	19.9
Austria	80.1	80.1	80.1	80.1	78.5	58.8	Norway	60.0	66.4	61.2	59.3	50.2	42.7
Belgium	40.7	57.3	40.9	40.4	31.3	23.5	Poland	61.2	61.2	61.2	61.2	61.2	61.2
Canada	49.5	75.4	54.4	43.9	29.6	22.2	Portugal	54.3	70.4	54.5	54.1	53.4	52.7
Czech Rep.	54.3	78.8	59.0	49.1	36.4	28.9	Slovak Rep.	56.7	56.7	56.7	56.7	56.7	56.7
Denmark	83.6	119.6	90.4	75.8	61.3	57.1	Spain	81.2	81.2	81.2	81.2	81.2	67.1
Finland	63.4	71.3	63.4	63.4	63.4	63.4	Sweden	63.7	79.1	66.6	62.1	64.7	66.3
France	51.2	63.8	51.2	51.2	46.9	44.7	Switzerland	62.0	62.5	62.1	58.4	40.7	30.5
Germany	39.9	39.9	39.9	39.9	39.9	30.0	Turkey	72.5	72.5	72.5	72.5	72.5	72.5
Greece	95.7	95.7	95.7	95.7	95.7	95.7	UK	34.4	53.4	37.8	30.8	22.6	17.0
Hungary	76.9	76.9	76.9	76.9	76.9	76.9	US	43.6	55.2	45.8	41.2	36.5	32.1
Iceland	80.1	109.9	85.8	77.5	74.4	72.9							
Ireland	38.2	65.0	43.3	32.5	21.7	16.2	**OECD**	60.8	73.0	62.7	58.7	53.7	49.2
Italy	67.9	67.9	67.9	67.9	67.9	67.9							
Japan	36.8	47.8	38.9	34.4	29.9	27.2	**Women** (where different)						
Korea	72.7	99.9	77.9	66.8	55.8	45.1	Italy	52.8	52.8	52.8	52.8	52.8	52.8
Luxembourg	90.3	99.8	92.1	88.3	84.5	82.5	Mexico	31.1	52.8	35.2	29.7	28.5	27.9
Mexico	36.6	52.8	37.3	35.8	34.4	33.6	Poland	44.5	46.2	44.5	44.5	44.5	44.5
Netherlands	81.7	80.6	81.5	81.9	82.4	82.6	Switzerland	62.6	62.8	62.6	59.1	41.2	30.9

Source: OECD pension models.

Gross replacement rates by earnings
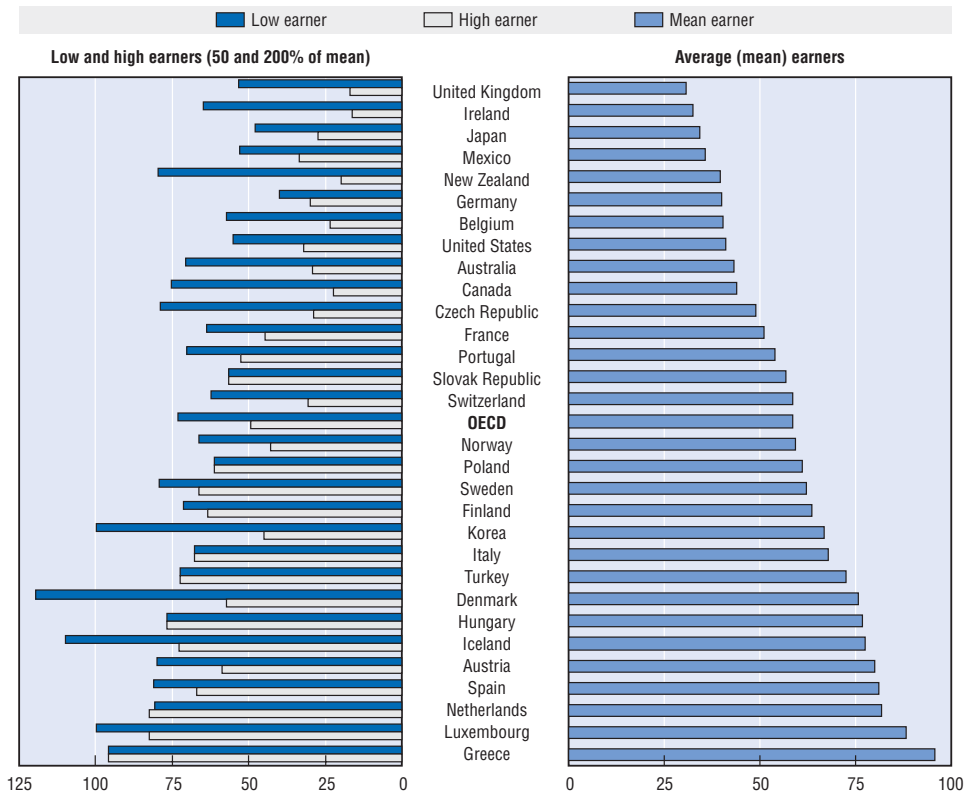
Note: Countries are ranked in order of gross pension replacement rates (GRR) of average earners, *i.e.* mean GRR in the chart.
Source: OECD pension models.

> ## Definition and measurement
>
> The net replacement rate is defined as the individual net pension entitlement divided by net pre-retirement earnings, taking account of personal income taxes and social security contributions paid by workers and pensioners. Otherwise, the definition and measurement of the net replacement rates are the same as for the gross replacement rate (see previous indicator). The results again cover full-career workers with median earnings and with 0.5, 0.75, 1, 1.5 and 2 times average (mean) earnings.

The personal tax system plays an important role in old-age support. Pensioners often do not pay social security contributions and, as personal income taxes are progressive and pension entitlements are usually lower than earnings before retirement, the average tax rate on pension income is typically less than the tax rate on earned income. In addition, most income tax systems give preferential treatment either to pension incomes or to pensioners, by giving additional allowances or credits to older people. Therefore, net replacement rates are usually higher than gross replacement rates.

For average (mean) earners, the net replacement rate across OECD countries is on average 70%, which is some 11 percentage points higher than the gross replacement rate. The pattern of replacement rates across countries is different on a net rather than a gross basis.

For example, Belgium and Germany have considerably higher net replacement rates than gross. This is due, first, to favourable treatment of pension income under social security contributions and, secondly, because replacement rates are relatively low which, with strongly progressive personal income taxes, means that people pay much less in income tax when retired than they did when working. Germany is gradually withdrawing the current, very generous tax treatment of pension income but the differential between gross and net replacement rates will remain large even when this policy is fully in place.

In contrast with Belgium and Germany, New Zealand and Sweden move lower down the rankings measured on a net rather than a gross basis. This is because these countries tax pension income and earnings at very similar rates.

For low earners (with half of mean earnings), the average net replacement rate across OECD countries is 84%. The effect of taxes and contributions on net replacement rates for low earners (at half average earnings) is more muted than for workers higher up the earnings scale. This is because low-income workers typically pay less in taxes and contributions than those on average earnings. In many cases, their retirement incomes are below the level of income-tax standard

reliefs (allowances, credits, etc.). Thus, they are unable to benefit fully from additional concessions granted to pensions or pensioners under the income tax.

The difference for low earners is 11 percentage points, on average. Belgium and the Czech Republic have much higher replacement rates for low earners when measured on a net basis. In Mexico, the net replacement rate of low earners is below the gross rate because low-income workers pay less in tax than low-income pensioners (at the same level of income).

The differential between net and gross replacement rates for high earners is again 11 percentage points. But this implies that personal income taxes and social security contributions play a greater role than for average or low earners because net replacement rates – at 61% for high earners – are lower than for lower-income workers. The tax system therefore reduces the progressivity of retirement-income systems. The net replacement rate for workers earning twice the average is highest in Turkey where high-income workers also have the highest rates across the earnings range. Not surprisingly, the lowest rates are found in the flat-rate pension systems of New Zealand and Ireland. In both countries, workers earning twice the average will receive pensions that amount to less than a quarter of their previous net earnings.
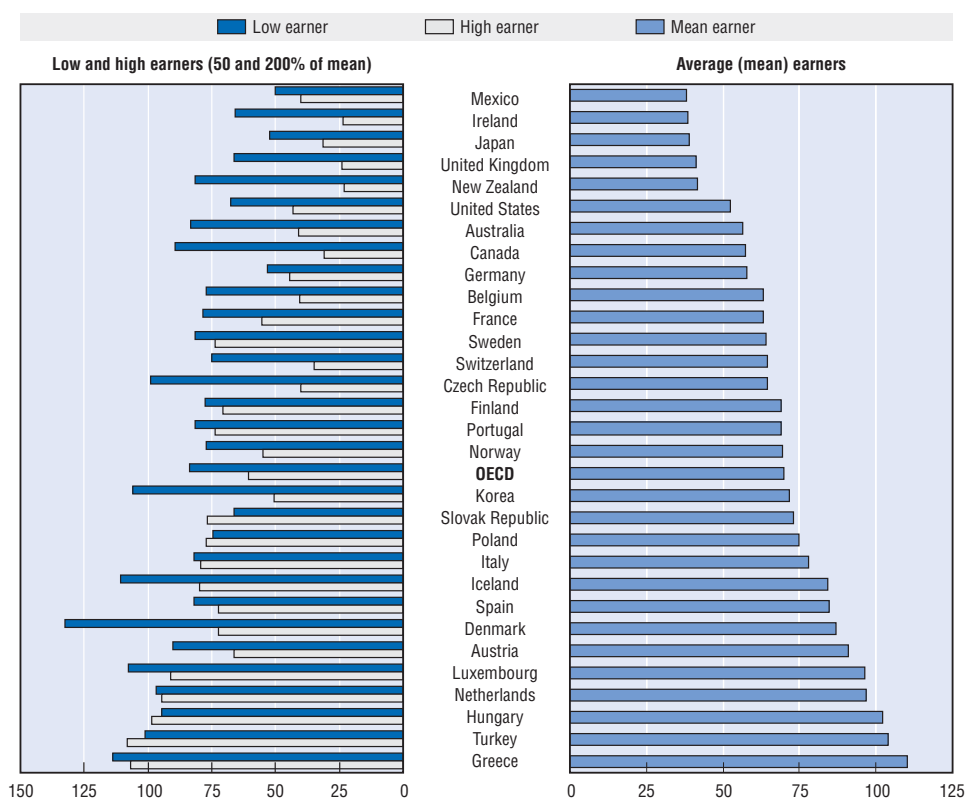
There are regional differences in the gap between gross and net replacement rates. For median earners in the EU-15 countries, net replacement rates are on average 11 percentage points higher than gross rates. In Nordic countries, the difference is smaller: net rates are less than 7 percentage points higher than gross rates. This is due to the fact that income taxes play a more important role in the Nordic countries than elsewhere: workers on mean earnings pay 33% of their wages in taxes and contributions in the Nordic countries compared with 26.5% for the OECD as a whole and still lower – 22.5% – in the English-speaking countries. When it comes to low earners, however, the Nordic countries offer a 96% net replacement rate while the Anglophone OECD countries pay 76% of previous net earnings.

Net replacement rates by earnings

	Median earner	Individual earnings, multiple of mean						Median earner	Individual earnings, multiple of mean				
		0.5	0.75	1	1.5	2			0.5	0.75	1	1.5	2
Men							**Men** (cont.)						
Australia	61.7	83.5	66.2	56.4	46.1	40.8	New Zealand	48.6	81.4	54.9	41.7	29.4	23.2
Austria	90.6	90.4	90.6	90.9	89.2	66.4	Norway	70.0	77.1	71.2	69.3	62.5	55.1
Belgium	64.4	77.3	65.5	63.0	51.1	40.7	Poland	74.8	74.5	74.8	74.9	75.0	77.1
Canada	62.8	89.2	68.3	57.4	40.0	30.8	Portugal	67.4	81.6	66.0	69.2	72.2	73.7
Czech Rep.	70.3	98.8	75.6	64.4	49.3	40.2	Slovak Rep.	71.9	66.4	70.6	72.9	75.4	76.7
Denmark	94.1	132.7	101.6	86.7	77.0	72.2	Spain	84.2	82.0	83.9	84.5	85.2	72.4
Finland	68.0	77.4	68.4	68.8	70.3	70.5	Sweden	66.2	81.4	69.2	64.0	71.9	73.9
France	62.8	78.4	64.9	63.1	58.0	55.4	Switzerland	68.8	75.0	68.2	64.3	45.7	35.1
Germany	57.3	53.4	56.6	58.0	59.2	44.4	Turkey	103.4	101.0	102.9	104.0	106.4	108.3
Greece	111.1	113.6	111.7	110.1	110.3	107.0	UK	45.4	66.1	49.2	41.1	30.6	24.0
Hungary	96.5	94.7	95.1	102.2	98.5	98.5	US	55.3	67.4	58.0	52.4	47.9	43.2
Iceland	86.9	110.9	92.0	84.2	80.3	79.7							
Ireland	44.4	65.8	49.3	38.5	29.3	23.5	**OECD**	72.1	83.8	74.0	70.1	65.4	60.7
Italy	77.9	81.8	78.2	77.9	78.1	79.3							
Japan	41.5	52.5	43.5	39.2	34.3	31.3	**Women**						
Korea	77.8	106.1	83.1	71.8	61.9	50.7	Italy	63.8	63.6	64.4	63.4	63.7	63.5
Luxembourg	98.0	107.6	99.8	96.2	92.9	91.0	Mexico	32.2	50.3	35.7	31.7	32.3	33.2
Mexico	37.9	50.3	37.8	38.3	39.0	40.0	Poland	55.3	57.5	55.3	55.2	55.0	56.4
Netherlands	105.3	97.0	103.8	96.8	96.3	94.8	Switzerland	68.1	75.4	68.9	65.0	46.3	35.5

Source: OECD pension models.

Net replacement rates by earnings

Net replacement rates by earnings

Low earner / High earner / Mean earner

Low and high earners (50 and 200% of mean) — Average (mean) earners

Note: Countries are ranked in order of net pension replacement rates (NRR) of average earners, *i.e.*, mean NRR in the chart.
Source: OECD pension models.

StatLink ᘓᗏ *http://dx.doi.org/10.1787/304061275274*

Definition and measurement

The gross replacement rate is defined as gross pension entitlement divided by gross pre-retirement earnings. It is shown here at median earnings and a 0.5, 0.75, 1, 1.5, and 2 times average earnings levels. The rates are here shown for workers who enter the labour market at age 25 and work until the standard retirement age in the respective country. Until they reach age 25, workers are assumed not to earn any pension entitlements.

Under the baseline assumptions used in this report, workers enter the labour market at age 20 and work until the standard retirement age. For the vast majority of OECD countries – with pension ages of 65 – this assumption results in a career length of 45 years. However, the lower pension age in France results in a full career length of 40 years and the higher ages in Iceland, Norway and the United States imply career lengths of 47 years. In the four countries that intend to retain different pension ages for men and women in the long term (see Table), career lengths are shorter for women than for men by between one and five years.

In reality, careers are currently shorter than the baseline assumption of 40-47 years: some workers start paid work later than age 20 and many spend time out of the labour market for various reasons. In addition, early retirement is still common in many OECD countries. As a sensitivity analysis, therefore, gross replacement rates are presented here for a shorter career. The alternative assumption is that workers enter the labour market at age 25. For the majority of countries, this results in a career length of 40 years. Again, it is shorter in France – 35 years – and longer for Iceland, Norway and the United States – 42 years. The table shows gross replacement rates from old-age pensions relative to earnings under this assumption.

For workers at average earnings, the average gross replacement rate for OECD countries for entry age 25 is 54.1%, compared to 58.7% for labour-market entry at age 20. Workers earning only half the average again receive higher replacement rates: on average 69.2%, compared to 73% for entry at age 20. At median earnings, *i.e.* at the earnings level both below and above which half of all workers are situated, the average OECD gross replacement is 56.3%, compared to 60.8%.

In Ireland, New Zealand, Portugal, Spain and the United States, replacement rates are the same for entry at ages 20 and 25. This is because Ireland and New Zealand have flat-rate pension systems. In Spain and the United States, the maximum replacement rate is reached after 35 years; therefore, contributing five years more does not change the pension benefit level except if these years are among the highest earnings.

The assumed age of labour-market exit is the normal pension age for each country in the analyses with entry at both age 20 and age 25. In France, however, benefits are more tightly tied to years of contributions than they are in most other countries. The first results in the table show the case of an individual working at ages 25-60, giving a replacement rate of 37.4% for an average earner, compared with 51.2% for an average earner with a career spanning ages 20 to 60. Given the size of the penalty for retiring at 60 for workers entering at age 25, the table also shows as a memorandum the results for a French worker contributing from age 25 to age 65.

Are estimates of future pension entitlements based on this shorter career length "better" than those assuming a longer period? The first point that needs to be borne in mind is that the aim of all these estimates is *not* to predict future pensions; it is to describe how pension systems operate. Having said that, the shorter working career is certainly close to the experience of current pensioners. Whether this will be the case in the future is speculation. OECD (2006) suggests that after years or even decades of contracting, the average age of retirement in some countries has started to rise instead. (See also OECD, 2005b, indicator SS8).

More important for the purposes of this exercise is the fact that recent changes in the pension systems of many countries have extended credits for time out of the labour force. Child care, higher education, receipt of sickness, invalidity benefits and unemployment all result in periods being credited to an individual's contribution record in many countries. In the future therefore, it seems likely that if people do not have full careers when they reach retirement age, they nevertheless will have a variety of credits which will need to be taken into account.

Gross replacement rates by earnings: entry at age 25

	Median earner	Individual earnings, multiple of mean				
		0.5	0.75	1	1.5	2
Australia	45.9	68.7	50.3	41.0	31.8	27.2
Austria	71.2	71.2	71.2	71.2	69.7	52.3
Belgium	37.9	50.9	38.1	37.6	29.2	21.9
Canada	49.5	75.4	54.4	43.9	29.6	22.2
Czech Republic	49.1	71.5	53.4	44.3	32.8	26.0
Denmark	78.2	113.9	85.0	70.6	56.2	50.0
Finland	58.2	68.7	58.2	58.2	58.2	58.2
France	37.5	63.8	42.5	37.4	34.0	32.3
Germany	35.5	38.6	35.5	35.5	35.5	26.7
Greece	92.9	92.9	92.9	92.9	92.9	92.9
Hungary	66.8	66.8	66.8	66.8	66.8	66.8
Iceland	74.8	104.6	80.4	68.4	64.6	63.1
Ireland	38.2	65.0	43.3	32.5	21.7	16.2
Italy	61.0	61.0	61.0	61.0	61.0	61.0
Japan	34.4	45.5	36.5	32.1	27.6	24.9
Korea	64.6	88.8	69.2	59.4	49.6	40.1
Luxembourg	79.8	89.1	81.6	77.8	74.0	72.2
Mexico	31.5	52.8	35.2	30.8	29.5	28.8
Netherlands	76.7	78.6	77.1	76.3	75.5	75.1
New Zealand	46.8	79.5	53.0	39.7	26.5	19.9
Norway	59.0	65.6	60.2	58.2	49.1	41.5
Poland	53.3	53.3	53.3	53.3	53.3	53.3
Portugal	54.3	70.4	54.5	54.1	53.4	52.7
Slovak Republic	48.8	48.8	48.8	48.8	48.8	48.8
Spain	81.2	81.2	81.2	81.2	81.2	67.1
Sweden	60.5	75.9	63.5	57.2	60.5	63.1
Switzerland	58.2	57.7	58.1	55.2	38.6	28.9
Turkey	65.9	67.2	65.9	65.9	65.9	65.9
United Kingdom	32.6	51.9	36.2	29.1	21.2	15.9
United States	43.6	55.2	45.8	41.2	36.5	32.1
OECD average	56.3	69.2	58.4	54.1	49.2	44.9
Women						
Italy	45.7	52.8	52.8	52.8	52.8	52.8
Mexico	31.1	52.8	35.2	29.7	28.5	27.9
Poland	38.1	46.2	44.5	44.5	44.5	44.5
Switzerland	57.8	62.8	62.6	59.1	41.2	30.9
Memorandum:						
France						
Career 25-60	37.5	63.8	42.5	37.4	34.0	32.3
Career 25-65	51.9	63.8	51.9	51.9	47.9	45.9

Definition and measurement

Eight OECD member countries have defined-contribution (DC) plans as part of their mandatory retirement-income provision. Pension entitlements in DC schemes depend crucially on the rate of return earned by the contributions when they are invested. The baseline assumption of the pension modelling is that the real return earned by DC pensions is 3.5% per year, net of administrative charges.

Here, replacement rates are also calculated assuming lower or higher rates of return, varying between 1% and 6% a year in real terms. (These returns are deliberately symmetric around the baseline assumption.)

A real rate of return on investments of 3.5% a year is a relatively conservative assumption by historical, empirical standards. Between 1984 and 1996, real rates of return on the investments of pension funds in 8 OECD countries averaged 8% per year (OECD, 1998, Table V.3). Nonetheless, some commentators argue that the risk-adjusted rate of return on defined-contribution pensions cannot exceed the riskless interest rate (for example, Bodie, 1995). This variable, which underlies the actuarial calculations in this report, is assumed to be 2%. Still others point to the very high administrative costs which have affected individual pension entitlements in some countries as a reason why even more conservative rate of return assumptions should be made (see the references in Whitehouse, 2000 and 2001). On the other hand, other analysts argue that there is an "equity premium" that delivers higher returns than the riskless interest rate even allowing for the costs of the risk borne. These issues have generated a substantial literature. (See, *inter alia*, Blanchard, 1993; Constantinides *et al.*, 1998; Jagannathan and Kocherlakota, 1996; and Mehra and Prescott, 1985.)

The replacement rates shown in the charts cover workers at four different levels of earnings. They include all sources of retirement income, not only those from the defined-contribution plan. The charts below show the replacement rate under different assumptions for the real rate of return (on the horizontal axis).

Of all the eight countries, pension entitlements are most sensitive to the rate of return on investments in Mexico. This is because the other seven countries have substantial public pensions (whose value, of course, does not vary with the rate of return) whereas Mexico only has a relatively small minimum pension. A high rate of return (6%) would virtually double the value of Mexican pension entitlements relative to the baseline assumption (of 3.5%) for workers on median earnings or above. Low-income workers, however, would be entitled to the minimum pension at all rates of return below 4.5%. Only above this level would they build up sufficient funds in their individual accounts to see any benefit from higher returns.

In contrast, contribution rates to private DC schemes are the lowest of these eight countries in Norway (2% of earnings) and Sweden (2.5% individual and 2% occupational) and so these schemes provide only a small part of the overall pension package. The total replacement rate therefore varies much less with the rate of return on investments.

Total pensions in Denmark, Poland and the Slovak Republic are more sensitive to returns than in Norway and Sweden because contribution rates are higher: between 9 and 11%. Increasing the rate of return from 3.5% to 6% would increase total pensions by around 50% in all these cases. Australia, too, has a relatively high contribution rate of 9%. However, the means test in the public scheme means that the gains in DC benefits from a higher return are partly offset by a lower public pension.

The sensitivity of the total pension entitlement to rates of return varies significantly with individual earnings in three countries: Australia, Denmark and Mexico. In all three, this is because of the effect of first-tier, public pensions. Low-income workers are much less affected by rates of return than are average and high earners. In Hungary, Poland and the Slovak Republic, in contrast, workers at the earnings levels shown are all equally affected by differences in rates of return.

Gross replacement rates by earnings and rate of return on defined-contribution pensions

Low earner (50% mean earnings)

Median earner

Average (mean) earner

High earner (200% mean earnings)
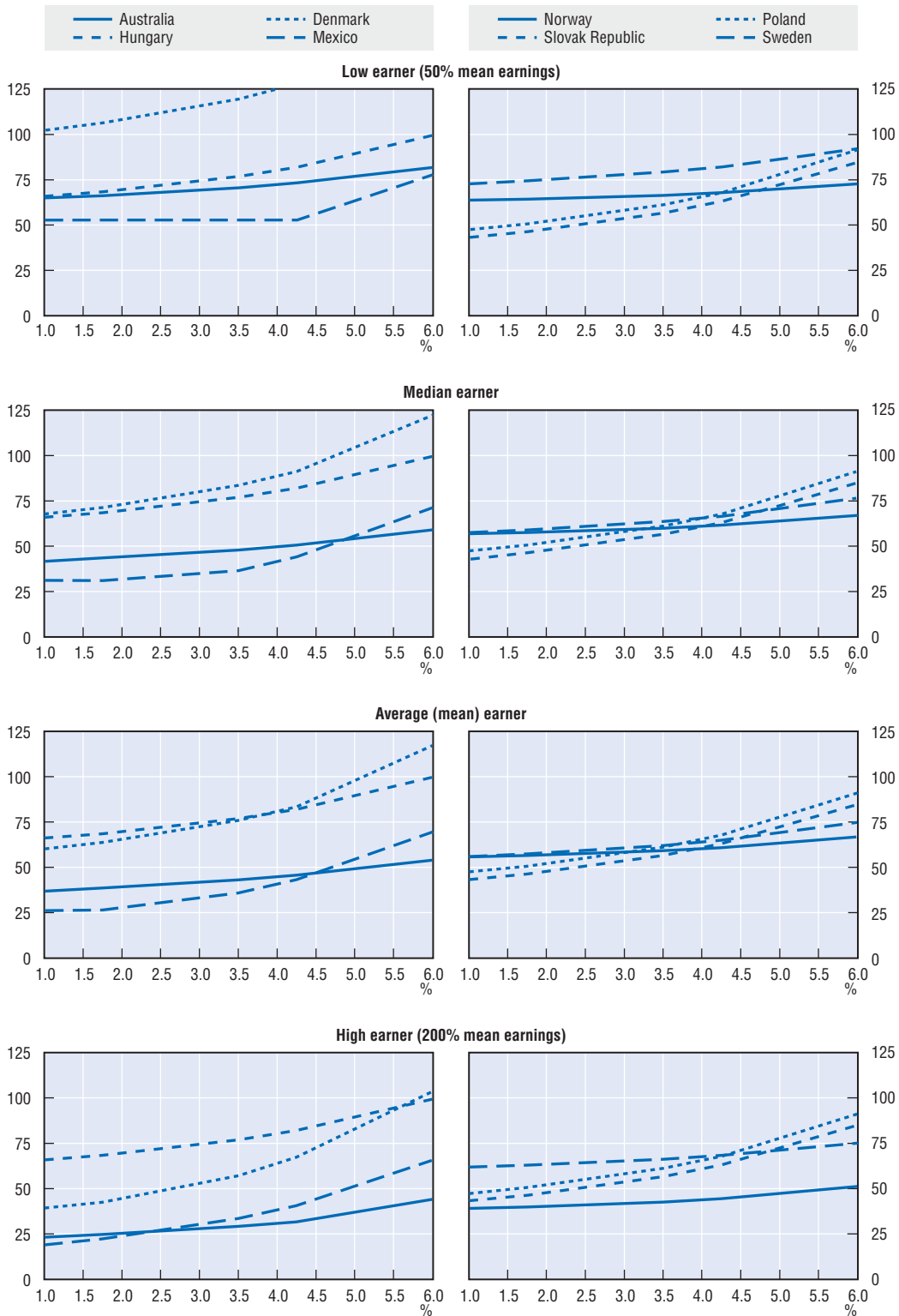
Note: The vertical scale has been capped at 125% replacement rate. For low earners in Denmark, the replacement rate at the highest investment return is 157%.

StatLink ⟨⟩ *http://dx.doi.org/10.1787/857341456784*

Definition and measurement

Replacement rates give a first indication of the magnitude of the pension promise, but they are not comprehensive measures, since they measure only the flow of pension benefits at the time of retirement. For a full picture, it is necessary to take account of life expectancy, retirement ages and the indexation of pension benefits, which together determine for how long the pension benefit must be paid and how its value evolves over time. This is captured by pension wealth, a measure of the stock of future flows of pension benefits.

The calculation of pension wealth uses a uniform discount rate of 2% and country-specific life tables. Since the comparisons refer to prospective pension entitlements, the calculations use mortality projections for the year 2040.

Pension wealth is measured and expressed as a multiple of gross annual individual earnings. It is shown here for workers with earnings of 0.5, 1 and 2 times the average, separately for men and women.

Pension wealth shows the size of the lump sum that would be needed to buy a flow of pension payments equivalent to that promised by the mandatory pension system in each country. Taking Japan as an example, the mandatory pension for a man on average earnings is worth 5.7 times individual earnings at the time of retirement. At half average earnings the mandatory pension is worth 7.9 times individual earnings because replacement rates are higher for low earners.

Luxembourg has the highest pension wealth at every level of earnings. For average earners, it is 19.3 for men and 23.5 for women. This is worth double the average for OECD countries, which amounts to 9.3 for men and 10.9 for women. Pension wealth for average earners is lowest in the United Kingdom, closely followed by Mexico.

Exploring the results on a regional basis, gross pension wealth for average earners is almost identical between the EU-15 countries, the Nordic and the Southern European countries. The regional average ranges between 10.4 and 10.7. In the six Anglophone OECD countries, however, pension wealth of people on mean earnings – at an average of 6.3 times annual pay – is lower by one third than in these other regions.

In countries with shorter life expectancies, such as Hungary, Poland and Turkey, benefits are paid for a shorter retirement period and so, other things equal, the benefit level can be higher. The effect is the reverse in Switzerland and the Nordic countries, where life expectancies are high. Unlike measures of replacement rates, the link between affordability and life expectancy is captured by the pension-wealth indicator.

The chart and the table at the bottom isolate the effect of the different factors that determine pension wealth. The chart on the left-hand side explores the impact of differences in pension age. It shows, separately for men and women, remaining life expectancy from age 55 to age 70 along with the annuity factor, which measures pension wealth. The same annual pension paid to a 60-year-old is worth 17.5% more for a man and 16.1% more for a woman than a benefit drawn at age 65.

Pension wealth also depends on the indexation of pensions in payment. The table shows that, using the baseline assumption of 2% real wage growth, indexation to earnings would result in pension wealth over 20% higher than under price indexation (which is the most common procedure in OECD countries). Mixed indexation – partly to wages, partly to prices – is becoming more common (see "Key features of pension-system design", above). The table shows how much higher pension wealth is with these policies than with price indexation. The effect of more generous indexation procedures is larger for women than for men. This is because of women's longer life expectancy, of over 3½ years on average in OECD countries, resulting in a longer expected retirement over which to benefit from real benefit increases.

Finally, pension wealth also depends on life expectancy. Mortality rates are expected to fall over the coming decades, and so pension wealth measured using today's data would be 14.5% lower for men and 12.1% lower for women than the baseline, which is projected mortality rates for 2040. Cross-country differences are also important. Pension wealth, other things equal would be 12.3% higher for men and 8.3% higher for women in Japan than the average country, because of longer life expectancy. In the opposite direction, pension wealth would be 14% lower in Turkey than the average across OECD countries.

Gross pension wealth by sex and earnings
Multiple of individual annual gross earnings

	Men			Women		
	0.5	1	2	0.5	1	2
Australia	12.5	7.3	4.6	14.6	8.4	5.4
Austria	12.2	11.7	8.1	14.2	13.5	9.4
Belgium	8.8	6.2	3.6	10.2	7.2	4.2
Canada	11.5	6.7	3.4	13.4	7.8	4.0
Czech Republic	13.0	8.1	4.8	15.3	9.5	5.6
Denmark	19.5	11.9	8.7	22.3	13.6	9.9
Finland	11.2	10.0	10.0	13.2	11.8	11.8
France	11.5	9.2	8.0	13.2	10.6	9.3
Germany	7.2	7.2	5.5	8.6	8.6	6.5
Greece	14.3	14.3	14.3	16.6	16.6	16.6
Hungary	12.4	12.4	12.4	15.4	15.4	15.4
Iceland	17.7	11.8	11.0	20.0	13.3	12.3
Ireland	11.5	5.8	2.9	13.7	6.9	3.4
Italy	10.0	10.0	9.9	10.7	10.7	10.6
Japan	7.9	5.7	4.5	8.9	6.4	5.1
Korea	13.9	9.3	6.3	16.6	11.1	7.5
Luxembourg	21.8	19.3	18	26.6	23.5	22.0
Mexico	7.0	4.8	4.5	8.5	4.8	4.5
Netherlands	14.9	15.1	15.2	17.4	17.7	17.8
New Zealand	14.7	7.4	3.7	17.3	8.6	4.3
Norway	11.5	10.2	7.3	13.4	11.3	8.5
Poland	8.4	8.4	8.4	8.9	8.6	8.6
Portugal	10.5	7.9	7.7	12.3	9.2	9.0
Slovak Republic	8.8	8.8	8.8	10.7	10.7	10.7
Spain	12.2	12.2	10.1	14.3	14.3	11.8
Sweden	12.6	10.0	10.5	14.4	11.4	12.0
Switzerland	10.7	9.8	5.1	13.1	12.0	6.3
Turkey	9.2	9.2	9.2	10.7	10.7	10.7
United Kingdom	8.0	4.6	2.5	9.1	5.3	2.9
United States	7.9	5.9	4.6	9.2	6.8	5.3
OECD average	11.8	9.4	7.8	13.7	10.9	9.0

Source: OECD pension models.

Annuity factors and life expectancy by sex and age

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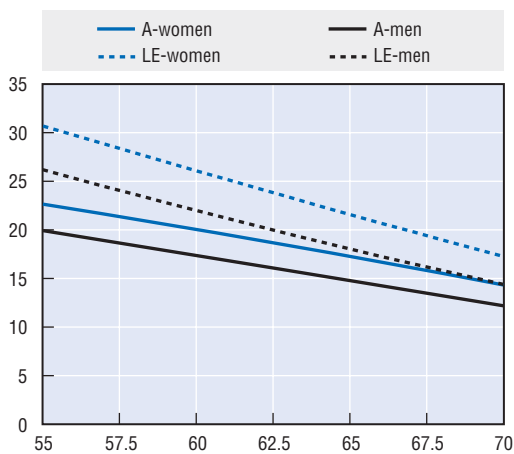
Sensitivity of pension wealth to indexation procedure and life expectancy

Indexation	Prices	Wages	80p/20w	67p/33w	50p/50w
Men	0	+21.7%	+3.9%	+6.5%	+10.1%
Women	0	+24.5%	+4.3%	+7.3%	+11.3%
Mortality rates	2002	2020	2040	Japan	Turkey
Men	−14.5%	−7.2%	0	+12.3%	−14.4%
Women	−12.1%	−5.1%	0	+8.3%	−14.1%

Net pension wealth shows the size of the lump sum that would be needed to buy the flow of pension payments, net of personal income taxes and social security contributions, promised by the mandatory pension system in each country. The charts compare gross and net pension wealth for men and women respectively. In countries that lie on the 45-degree line, gross and net pension wealth are the same because there are no taxes due on pension income.

Beginning with average earners, pension wealth is the same net and gross in eight countries. In the Slovak Republic and Turkey, this is because pensions are not subject to tax. In Australia, Canada, the Czech Republic, Ireland, Mexico and Portugal, this is because mandatory replacement rates are low relative to other OECD countries. Workers on average earnings will not build up sufficient mandatory pension entitlement to be taxed in retirement, due to basic income-tax reliefs and the exemption of pension income from social security contributions. However, high earners in Australia and Portugal will be entitled to some taxable mandatory pension and so net pension wealth is lower than gross for people with double average earnings.

In some cases, countries' rankings of pension wealth changes significantly when measured on a net basis. For example, the Czech Republic has the 12th highest net pension wealth for an average earner compared with the 19th highest measured on a gross basis.

While in eight countries average earners will not be liable for taxes and contributions on their retirement incomes, in others – especially the five Nordic countries, but also Austria – retirees are likely to have a substantial tax burden. In part, this reflects the high level of the gross replacement rate from the mandatory system but also high general levels of taxation in the Nordic countries. Thus, countries that rely heavily on income taxation rank lower in net pension wealth than they do in gross terms. Finland and Sweden, for example, fall from joint 9th in the ranking of gross pension wealth for average earners to positions 18 and 20, respectively, for net pension wealth for men. Measured on a gross basis, pension wealth is 70% higher in the five Nordic countries than in the six Anglophone countries. However, comparing net pension wealth, the difference is just 30%.

At the top and the bottom of the ranking for average earners, however, there are no changes. Luxembourg again has the highest net pension wealth at every level of earnings. For men, net pension wealth for average earners is lowest in the United Kingdom, followed by Mexico, at less than five times annual individual earnings. However, the position of the two countries is reversed for women, with Mexico having the lowest.

Turning to low earners, the OECD average net pension wealth is lower than gross wealth by 0.9 times annual individual earnings. This reflects the fact that low earners will be liable for income tax on their mandatory pensions in ten OECD countries. In Germany and Greece, such workers would only pay social security contributions on their pension income while, in seven countries, low-income pensioners would pay both taxes and contributions. For average earners, the differential between gross and net pension wealth is slightly higher: 1.3 times annual individual earnings and higher still – 1.6 – for men on double average earnings. The average proportion of pension paid in taxes and contributions is 6.6% for low earners (50% of mean) compared with 11.6% for average earners and 16.4% for high earners (200% of mean).

Net pension wealth by sex and earnings

Multiple of individual annual gross earnings

	Men			Women		
	0.5	1	2	0.5	1	2
Australia	12.5	7.3	4.3	14.6	8.4	5
Austria	11	9	5.7	12.8	10.4	6.6
Belgium	8.8	5.6	3.1	10.2	6.5	3.6
Canada	11.5	6.6	3.3	13.4	7.7	4.0
Czech Republic	13	8.1	4.8	15.3	9.5	5.6
Denmark	13.4	8.0	5.3	15.4	9.2	6.1
Finland	9.6	7.4	6.6	11.4	8.8	7.8
France	10.8	8.1	6.6	12.4	9.3	7.6
Germany	6.2	6.3	4.2	7.9	7.0	4.9
Greece	14.3	13.0	11.1	16.5	15.1	12.8
Hungary	12.4	10.8	8.9	15.3	13.4	11.0
Iceland	14.7	9.1	7.6	16.6	10.2	8.6
Ireland	11.5	5.8	2.9	13.7	6.9	3.4
Italy	10.0	8.4	7.4	10.7	9.4	8.2
Japan	7.2	5.3	4.0	8.2	5.9	4.5
Korea	13.7	9.1	6.0	16.3	10.8	7.1
Luxembourg	19.6	15.6	12.7	24	19.1	15.5
Mexico	7.0	4.8	4.5	8.5	4.8	4.5
Netherlands	13.5	12.3	10.5	15.8	14.3	12.3
New Zealand	12.2	6.1	3.0	14.3	7.1	3.6
Norway	10.1	8.3	5.6	11.8	9.7	6.6
Poland	7.2	7.0	6.9	7.9	7.3	7.1
Portugal	10.5	7.9	7.4	12.3	9.2	8.7
Slovak Republic	8.8	8.8	8.8	10.7	10.7	10.7
Spain	11.0	10.1	7.9	12.9	11.9	9.3
Sweden	9.5	7.2	6.8	10.9	8.2	7.8
Switzerland	10.1	8.1	4.2	12.4	9.9	5.2
Turkey	9.2	9.2	9.2	10.7	10.7	10.7
United Kingdom	7.9	4.5	2.5	9.1	5.2	2.8
United States	7.9	5.7	4.3	9.2	6.6	5.0
OECD average	10.9	8.1	6.2	12.7	9.4	7.2

Source: OECD pension models.

Gross *versus* net pension wealth by sex, average earner

Net pension wealth (multiple of individual earnings)

Net pension wealth (multiple of individual earnings)
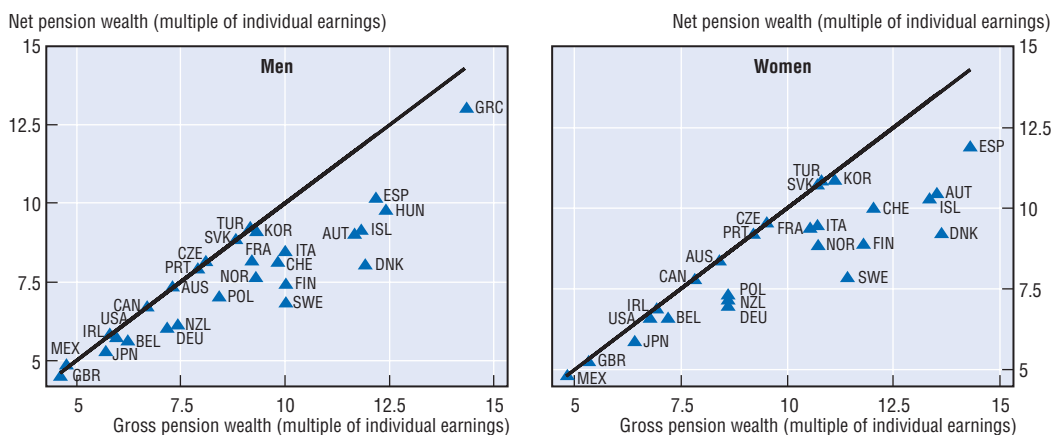
Note: Both scales of both charts have been capped at pension wealth of 15 times individual earnings, which excludes Luxembourg and the Netherlands from both charts and Greece and Hungary from the chart for women.

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Definition and measurement

OECD countries' pension systems have very different philosophies, particularly in their relative emphasis on the insurance and redistributive roles. The strength of the link between pre-retirement earnings and post-retirement pension entitlements is here measured by a summary indicator, the progressivity index. The index is designed so that a pure basic scheme would score 100% and a pure insurance scheme, zero. The calculation is based on the Gini coefficient. The higher the Gini coefficient, the more unequal is a distribution. Formally, the index of progressivity is calculated as 100 minus the ratio of the Gini coefficient of pension entitlements divided by the Gini coefficient of earnings (expressed as percentages). In each case, the Gini coefficients are calculated using the earnings distribution as the weight. Calculations were carried out both with national data (where available) and with the OECD average for the earnings distribution.

"Pure" basic pension systems pay the same flat-rate amount to all pensioners regardless both of their earnings history and their other sources of income. Such a scheme is sometimes also called a "demogrant" or a "citizen's pension". The relative pension value is independent of earnings and the replacement rate declines with earnings. At the other end of the spectrum of benefit design is a "pure insurance" scheme, which aims to pay the same replacement rate to all workers when they retire. Defined-contribution plans conform to this pure-insurance model if the contribution rate is a constant proportion of earnings for all workers. The same applies to earnings-related schemes that offer the same accrual rate regardless of earnings, years of service or age.

These two benchmarks – pure-insurance and pure-basic schemes – underpin an "index of progressivity" constructed for cross-country comparison of pension benefit formulae. The index is designed so that a pure basic scheme would score 100% and a pure insurance scheme zero. (This is based on the measure of effective progression devised by Musgrave and Thin, 1948.) The former is maximally progressive; the latter is not progressive since the replacement rate is constant. A high score is not necessarily "better" than a low score or *vice versa*. Countries with a high score simply have different objectives than countries with a low score.

The first column of the table shows the results for the Gini coefficient of gross pension benefits. The second column shows the index of progressivity of the benefit formula. In pure basic systems – Ireland and New Zealand – the index is, of course, 100%. Other countries with highly progressive pension systems are Australia, Canada, the Czech Republic, and the United Kingdom where the index is above 65%. These countries all have targeted or basic pensions that play a major role in retirement-income provision.

At the other end of the scale, Finland, Hungary, Italy, the Netherlands, Poland, the Slovak Republic and Turkey have almost entirely proportional systems with very limited progressivity. The index is less than 10% in all these cases. This group includes two of the countries with notional accounts, which were deliberately designed to have a close link between contributions and benefits. Other countries lie between these two groups.

The average index across OECD countries is 36.9%. The regional differences, however, are striking. While the Anglophone countries show an average index of 82.7%, meaning that their systems are strongly progressive, Southern European countries present an average index of only 10.2%, indicating a very strong link between earnings and pension benefits.

To explore the extent to which inequality in pension entitlements is explained by differences in the benefit formula or in inequality of earnings in a particular country, the table presents results based on both the national and the OECD average distribution of earnings. (The charts below show the distribution of earnings for selected countries.) Taking the OECD averages for the 18 countries for which data are complete, the index of progressivity is around 37% using both the OECD average earnings distribution and country-specific information. There are only significant differences in countries where the national earnings distribution is very different from the OECD average. For example, the Gini coefficient on earnings in the United States is 32.7% compared with the OECD average of 26.9% so the progressivity index is 10 percentage points higher measured using national data. Belgium has the most equal distribution of earnings of the 18 countries for which the OECD has data. Its pension system is therefore less equalising when measured using national data.

Finally, it is important to note that the index of progressivity of pension benefit formulae measures only the mandatory parts of the pension systems. Some countries have extensive private occupational and personal pension provision. Taking these into account would make the distribution of pensioners' incomes wider.

Gini coefficients on pension entitlements and earnings

OECD average and national earnings-distribution data

	OECD average distribution		National earnings distribution		
	Pension Gini	Progressivity index	Pension Gini	Progressivity index	Gini wage
Australia	7.3	73.1	7.4	72.8	27.1
Austria	18.9	30.4			
Belgium	11.2	58.8	9.9	54.1	20.7
Canada	3.7	86.6			
Czech Republic	8.7	68.0	8.7	66.6	25.5
Denmark	11.1	59.3			
Finland	25.1	7.6	22.4	6.7	23.6
France	20.5	24.6			
Germany	20.0	26.7	19.5	25.7	26.3
Greece	26.5	2.6			
Hungary	26.9	1.3	33.4	0.6	33.5
Iceland	18.0	33.9			
Ireland	0.0	100.0	0.0	100.0	29.2
Italy	26.4	3.1	22.8	3.7	23.1
Japan	14.4	46.9	14.4	45.6	26.4
Korea	12.3	54.8	14.2	51.9	29.3
Luxembourg	22.2	18.6			
Mexico	19.0	30.3			
Netherlands	26.9	0.0	25.9	0.0	25.1
New Zealand	0.0	100.0			27.7
Norway	17.1	37.4	13.9	36.9	21.2
Poland	25.4	6.5	28.8	5.6	30.2
Portugal	22.1	18.8			
Slovak Republic	26.5	2.7			
Spain	22.1	18.8	25.8	16.9	30.8
Sweden	23.7	12.9	20.7	10.2	22.7
Switzerland	12.7	53.3			
Turkey	25.1	7.8			
United Kingdom	5.1	81.1	5.1	82.3	28.9
United States	16.1	40.9	16.1	51.0	32.7
OECD average	17.2	36.9			
OECD 18	17.0	37.5	17.0	37.1	26.9

Note: OECD 18 refers to the 18 countries for which national earnings-distribution data are available.

Source: OECD pension models; OECD earnings-distribution database.

Distribution of earnings: OECD average and selected countries
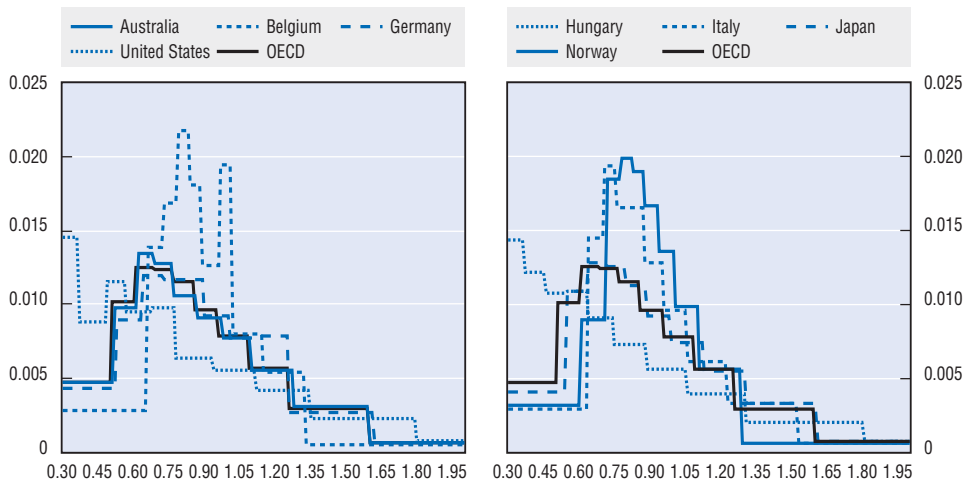
Source: OECD earnings-distribution database.

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Definition and measurement

The strength of the link between pension entitlements and individual earnings is measured using the relative pension level, that is, the gross individual pension divided by gross economy-wide average earnings (rather than by individual earnings as in the replacement-rate results). It is best seen as an indicator of pension *adequacy*, since it shows the benefit level that a pensioner will receive in relation to average earnings in the respective country. Individual replacement rates may be quite high, but the pensioner may still receive only a small fraction of economy-wide average earnings. If, for example, a low-income worker – who earned only 50% of economy-wide average earnings – has a replacement rate of 100%, the benefit will only amount to 50% of economy-wide average earnings. For an average earner, the replacement rate and the relative pension level will be the same.

The relative pension levels are used here to illustrate the link between individual pre-retirement earnings and pension benefits in each country. They are shown for individual earnings from 0.5 to 2 times average (mean) earnings levels.

The chart shows relative pension levels in OECD member countries on the vertical axis and individual pre-retirement earnings on the horizontal. Countries have been grouped by the degree to which pension benefits are related (or not) to individual pre-retirement earnings. The grouping is based on the value of the Gini coefficient of the distribution of pension levels across the earnings range weighted by the OECD average distribution of earnings. The calculation method and results are set out in the previous section on the progressivity of pension benefit formulae.

In the first set of five countries (Panel A), there is little or no link between pension entitlements and pre-retirement earnings. In Ireland and New Zealand, pension benefits are purely flat rate. In Canada, the relative pension level varies little: from 37% for low earners to 44% for those on average earnings and above. Although Canada has an earnings-related pension scheme, its target replacement rate is very low, its ceiling is set at average economy-wide earnings and a resource-tested benefit is withdrawn against additional income from the earnings-related scheme. In the United Kingdom, the earnings-related scheme has a strongly progressive formula and there is also a basic pension. In Australia, the relatively flat curve results mainly from the means-tested public pension programme. There is also a limit to the earnings for which employers must contribute to the DC scheme.

At the other end of the spectrum lie five countries with a very strong link between pension entitlements and pre-retirement earnings (Panel F). In the Netherlands, there is no ceiling to pensionable earnings in the quasi-mandatory occupational schemes. In the Slovak Republic and Italy, ceilings on pensionable earnings are set at three times or more

average economy-wide earnings. For low-paid workers, top-ups from the minimum pensions in are apparent in the charts for all countries except Hungary. But apart from this narrow earnings range, relative pension levels increase with individual earnings in a linear way.
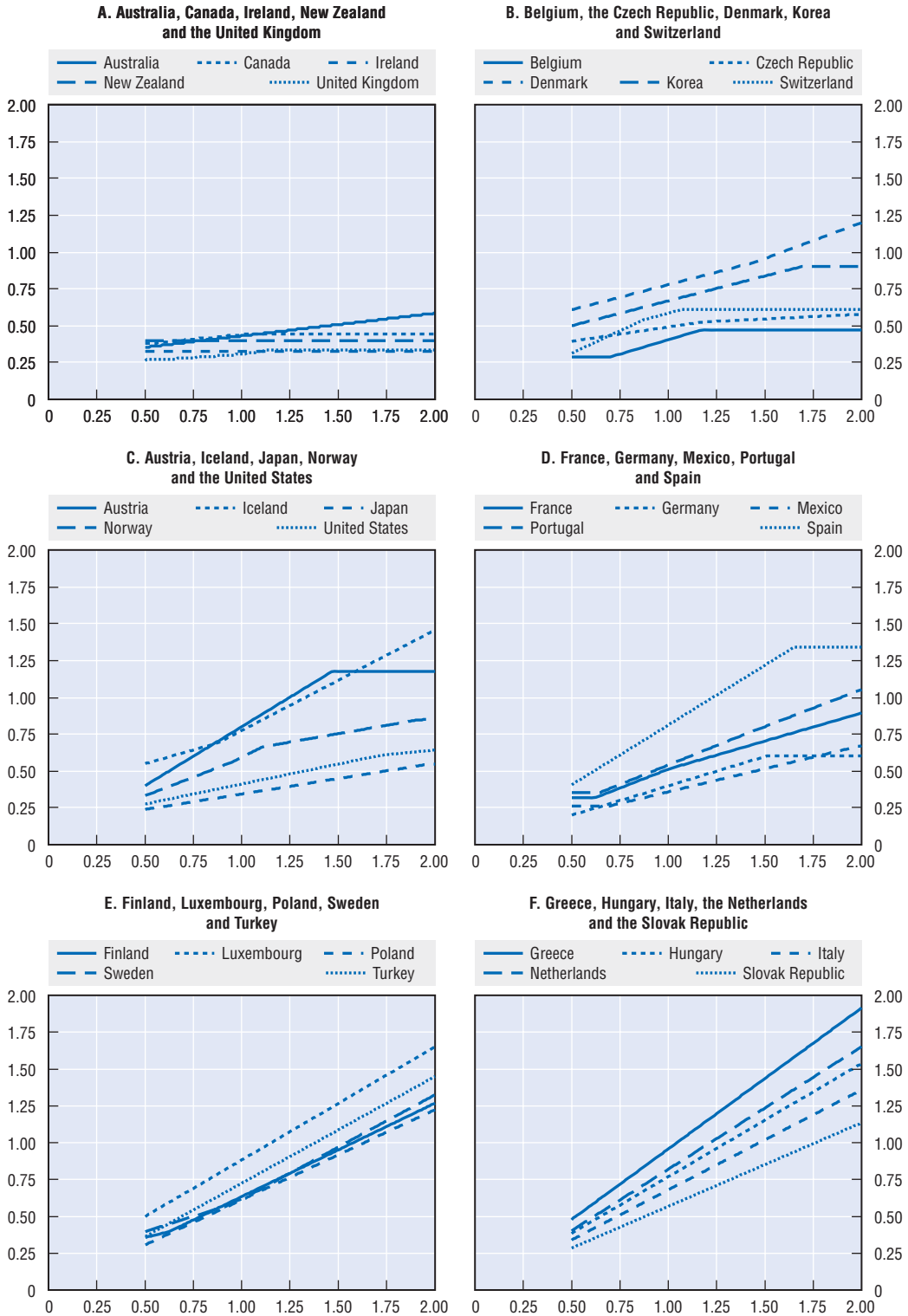
The five countries in Panel E have a slightly weaker link between individual pre-retirement earnings and pensions than those in Panel F. This is due to safety-net benefits for low earners.

The remaining half of OECD countries represents intermediate cases (between those with little or no link between individual earnings and pensions and those with a strong or very strong link). The ten countries in Panels B and C exhibit stronger links between pensions and pre-retirement earnings than the first group of countries, but their pension systems have much more progressive formulae than those of the five countries shown in Panel F. In the Czech Republic, Norway and the United States this redistribution to low earners is primarily the result of a progressive benefit formula that replaces a larger share of pre-retirement income for poorer workers than for average and higher-income earners. In Iceland, this is done through targeted retirement-income programmes. Denmark has significant basic and targeted schemes.

Panel D shows five countries that lie towards the middle of the OECD countries in terms of the link between pension entitlements and pre-retirement earnings. France and Portugal have redistributive pension programmes – minimum and targeted schemes – at lower-income ranges and strong earnings-benefit links at higher income levels. In Germany, there is no minimum pension but poor retirees are eligible for benefits from the general social assistance programme.

The link between pre-retirement earnings and pension entitlements

Gross pension entitlement as a proportion of economy-wide average earnings

A. Australia, Canada, Ireland, New Zealand and the United Kingdom

Australia — Canada ···· Ireland – · –
New Zealand – – United Kingdom ········

B. Belgium, the Czech Republic, Denmark, Korea and Switzerland

Belgium — Czech Republic ····
Denmark – – Korea – · – Switzerland ········

C. Austria, Iceland, Japan, Norway and the United States

Austria — Iceland ···· Japan – · –
Norway – – United States ········

D. France, Germany, Mexico, Portugal and Spain

France — Germany ···· Mexico – · –
Portugal – – Spain ········

E. Finland, Luxembourg, Poland, Sweden and Turkey

Finland — Luxembourg ···· Poland – · –
Sweden – – Turkey ········

F. Greece, Hungary, Italy, the Netherlands and the Slovak Republic

Greece — Hungary ···· Italy – · –
Netherlands – – Slovak Republic ········

Source: OECD pension models.

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Definition and measurement

Building on the results for replacement rates and pension levels across the range of individual earnings, it is possible to develop *composite indicators* of countries' pension systems that aggregate the results for workers at different earnings levels. The indicators are the *weighted average pension level* and the *weighted average pension wealth*. The indicators build on the calculations of pension entitlements for people earning between 0.3 and 3 times the economy-wide average (a larger range than shown in the results tables).

Each level of individual earnings is given a weight based on its importance in the distribution of earnings. The calculations use the average distribution of earnings based on data for 18 OECD countries. The earnings distribution is skewed. The mode (or peak) of the distribution is at around two-thirds of mean earnings. The median (the earnings level both below and above which half of employees are situated) is typically between 80 and 85% of mean earnings. Two-thirds of people earn less than mean earnings. Thus, there are many people with low earnings, and fewer with high earnings, so low earners are given a larger weight in the calculation of the indicator than high earners.

The measure of *weighted average pension level* combines the earnings distribution with the projections of pension entitlements. The relative pension level is averaged over individuals across the earnings range using the earnings-distribution weights (see the charts in the indicator on "Progressivity of pension benefit formulae"). The result is the weighted average of the pension entitlement expressed as a percentage of economy-wide average earnings.

This indicator is presented in the first column of the table. The average level across the OECD countries is 57.5%. Again, there are vast differences between countries. Seven countries' mandatory systems deliver an average pension of less than 40% of average earnings. These are Belgium, Germany, Ireland, Japan, Mexico, New Zealand, and the United Kingdom. Greece and Luxembourg are found at the other end of the spectrum. The weighted average pension levels in these countries are 95% and 87%, respectively. A further five countries have an average pension level above 75%: Denmark, Hungary, Iceland, the Netherlands and Spain. Next, with pension levels in the low seventies, are Austria and Turkey.

The same weighting can also be applied to the pension wealth measure. The second and third columns of the table show the weighted average of pension wealth, separately for men and women. Given that women's life expectancy is higher than men's, women's pension wealth is relatively higher in all countries. The final column of the table also gives the figures for average pension wealth in US dollars, based on average market exchange rates for 2004.

Luxembourg, not surprisingly, has the highest pension wealth, which averages almost 19 times average earnings for men and 23 times for women. This is worth USD 920 000 for men and over USD 1.1 million for women. The averages across OECD countries are 9.2 times average earnings for men and 10.7 for women. The Netherlands and Greece rank second and third. Denmark, Hungary, Iceland and Spain are closely clustered with pension wealth of 11-12 times average earnings.

Average pension wealth is over half a million US dollars in Denmark**,** the Netherlands and Norway. On this comprehensive measure, the most modest pension systems are those of Belgium, Ireland, Japan, Mexico, the United Kingdom and the United States where pension wealth is less than six times average earnings. This is around two-thirds of the average for OECD countries.

The systems of countries with short life expectancies – such as Poland and Turkey – have more modest values for pension wealth at 8.2 and 9.1, respectively. Despite its relatively high weighted average pension level, Turkey has a lower pension promise given that life expectancy is low compared with other OECD countries. Pension wealth is in turn *higher* in countries such as France and Hungary because of earlier retirement ages than is the norm for OECD countries. In France, for example, the weighted average pension *level* is significantly lower than the OECD average while pension *wealth* is around the average; this is the result of a combination of a low pension age and high life expectancy.
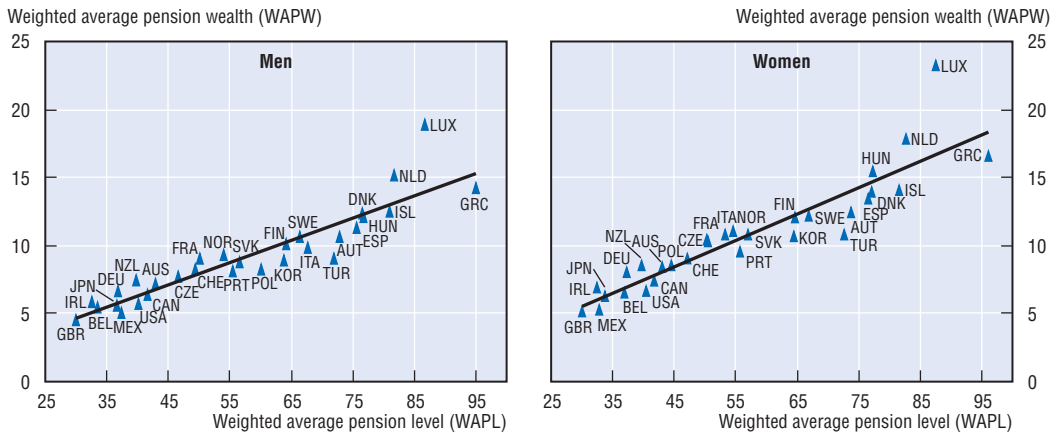
Weighted average pension level and pension wealth

Pension level as a percentage of economy-wide average earnings, pension wealth as a multiple of economy-wide average earnings and in US dollars

	Average pension level	Average pension wealth		Average pension wealth (USD)	
	Men	Men	Women	Men	Women
Australia	42.9	7.2	8.4	259 000	302 000
Austria	72.8	10.6	12.4	433 000	551 000
Belgium	36.7	5.6	6.5	248 000	318 000
Canada	41.6	6.4	7.4	192 000	233 000
Czech Republic	46.7	7.7	9.1	63 000	77 000
Denmark	76.8	12.1	13.9	640 000	719 000
Finland	64.1	10.1	12.0	396 000	462 000
France	50.1	9.0	10.4	330 000	389 000
Germany	36.9	6.7	8.0	342 000	439 000
Greece	95.1	14.2	16.6	306 000	358 000
Hungary	76.5	12.4	15.4	104 000	129 000
Iceland	81.0	12.5	14.1	493 000	525 000
Ireland	32.5	5.8	6.9	217 000	259 000
Italy	67.7	9.9	10.8	271 000	293 000
Japan	33.5	5.5	6.3	251 000	293 000
Korea	63.8	8.9	10.7	213 000	265 000
Luxembourg	86.7	18.9	23.3	920 000	1 144 000
Mexico	37.3	5.0	5.3	34 000	32 000
Netherlands	81.8	15.1	17.8	695 000	814 000
New Zealand	39.7	7.4	8.6	193 000	225 000
Norway	54.0	9.3	11.0	505 000	581 000
Poland	60.1	8.2	8.6	66 000	69 000
Portugal	55.4	8.1	9.5	131 000	148 000
Slovak Republic	56.5	8.8	10.8	55 000	67 000
Spain	75.6	11.3	13.4	278 000	352 000
Sweden	66.3	10.6	12.2	434 000	467 000
Switzerland	49.4	8.3	10.3	472 000	682 000
Turkey	72.0	9.1	10.8	89 080	105 000
United Kingdom	30.0	4.5	5.2	224 000	264 000
United States	40.2	5.7	6.7	173 000	206 000
OECD average	57.5	9.2	10.7	301 000	359 000

Source: OECD pension models; OECD earnings-distribution database.

Weighted averages compared: pension levels *versus* pension wealth by sex

Source: OECD pension models; OECD earnings-distribution database.

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Definition and measurement

The structure of the pension package is illustrated by using the indicator of *weighted average pension wealth* presented immediately above. The weights are based on the distribution of earnings. The contribution that each component of the system makes to the potential resource transfer to pensioners from mandatory programmes is calculated as the weighted average pension wealth from each source.

The contribution of each pension system component to the pension promise as a percentage of the total. Since the weighted average pension wealth in some countries does not include all components (*e.g.* resource-tested programmes often do not enter into this measure as in most countries full-career workers are not eligible for these benefits), the cells for these components remain empty.

Thirteen countries have basic pension schemes, but their importance in terms of the resource transfer to older people varies substantially. In Ireland and New Zealand, there is only a basic pension; thus, its share is 100%. In Korea and in the United Kingdom, the basic pension makes up around one half of the total resource transfer to pensioners. Basic pensions in Japan and in the Netherlands make up around 40% of the transfer, while in Canada, Denmark and Norway, they contribute about one third to the total pension promise.

Resource-tested programmes also vary hugely in importance. Australia stands out as the only country where this type of benefit makes up almost half of the total pension package. The public pension in Australia is means-tested but the parameters of the means test currently result in well over half of older people receiving some public pension. Resource-tested benefits are also significant in Canada, Denmark and Iceland. For the United Kingdom, resource-tested benefits play a very important role in providing today's older people's incomes. In the long term, however, this will diminish because of the shift to a more progressive formula in the public, earnings-related scheme (as shown by the size of the minimum pension, which derives from minimum credits under this plan). Also, the modelling assumes that the basic pension will increase in future in line with earnings. If the basic pension were price-indexed, then much of its role would be taken up by resource-tested benefits instead.

The two countries with the largest role for minimum pensions – Belgium and the United Kingdom – both have minimum credits. Only in Mexico, Portugal and Sweden are minimum pensions expected to provide a significant part of the overall pension package.

It is important to remember that these results are based on the case of full-career workers. All of the first-tier programmes – basic, resource-tested

and minimum pensions – will be much more important for people with incomplete contribution histories. However, it is very difficult to obtain information on the distribution of past contribution histories let alone predict these weights into the future.

The upper chart shows the overall balance between first- and second-tier schemes in the overall retirement-income package. In Ireland and New Zealand, there are no second-tier, mandatory pensions and in the United Kingdom, most of the earnings-related plan goes into providing benefits related to the minimum credit. At the other end of the spectrum, the second tier provides 99% or more of pensions for full-career workers in ten countries. In some of these – such as Austria, Italy, Poland, Spain and Turkey – this reflects the high replacement rate target of the second tier. In others, such as Switzerland and the United States, the pension benefit formula of the public scheme is progressive, meaning that much of the redistributive work done by the first tier in other countries is carried out by second-tier plans.

Within the second tier, there are defined-contribution (DC) plans in eight countries. These predominate in the resource transfer to older people in Mexico and are half or more of the total in Australia, Poland and the Slovak Republic. All other plans are earnings-related, either defined-benefit (DB), notional accounts or points systems.

The lower chart shows the balance between public and private provision of mandatory pensions for full-career workers, including both first and second tiers. In the 11 countries where the private sector is involved in the mandatory pension system, the private sector on average provides 51% of the retirement-income package. This ranges from 11% in Norway to 84% in Mexico. In other countries, of course, voluntary private pensions play an important role (see the special chapter on private pensions in Part II).

Structure of the pension package

Percentage contribution of components of the pension system to weighted average pension wealth

	First tier			Second tier			Total
	Resource-tested	Basic	Minimum	Public	Private DB	Private DC	
Australia	45.8					54.2	100.0
Austria				100.0			100.0
Belgium			5.4[1]	94.6			100.0
Canada	16.5	34.5		49.0			100.0
Czech Republic		17.2		82.8			100.0
Denmark	12.5	31.5				56.0[2]	100.0
Finland			1.5	98.5			100.0
France	1.3		1.9	96.8[3]			100.0
Germany	1.1			98.9			100.0
Greece			0.1	99.9[4]			100.0
Hungary				65.9		34.1	100.0
Iceland	5.7	13.3			81		100.0
Ireland		100					100.0
Italy	0.1			99.9			100.0
Japan		40.2		59.8			100.0
Korea		51.9[5]		48.1			100.0
Luxembourg		13.3[6]	0.1	86.6			100.0
Mexico		11.8[7]	4.3			83.9	100.0
Netherlands		38.2			61.8		100.0
New Zealand		100					100.0
Norway		30.1	0.4	58.5		11.1	100.0
Poland			0.3	48.8		50.9	100.0
Portugal			3.5	96.5			100.0
Slovak Republic			0.2	45.3		54.5	100.0
Spain			0.2	99.8			100.0
Sweden			4.7	49.0	26.4	19.9[8]	100.0
Switzerland	0.1			68.4	31.5		100.0
Turkey			0.8	99.2			100.0
United Kingdom	0.5	50.8	33.8[9]	15.0			100.0
United States				100.0			100.0
OECD	2.8	1.9	17.8	58.7	6.7	12.2	100.0

1. Belgium: includes both minimum pension and minimum credits.
2. Denmark: private DC plans include both quasi-mandatory occupational (51.0%) and the special pension (5.0%).
3. France: public pensions include both the state scheme (59.3%) and the complementary, occupational scheme (37.5%).
4. Greece: public pension is made up of the main (73.0%) and the supplementary components (26.9%).
5. Korea: basic component represents the part of the public pension based on average rather than individual earnings.
6. Luxembourg: basic pension also includes the end-of-the-year allowance.
7. Mexico: basic component calculated from the flat-rate government contribution to DC accounts of 5.5% the real minimum wage from 1997.
8. Sweden: private DC includes both the mandatory premium pension (11.2%) and the occupational DC scheme (8.7%).
9. United Kingdom: minimum pension relates to minimum credits in public, earnings-related scheme.

Source: OECD pension models.

Balance between first-tier, redistributive programmes and second-tier, insurance schemes

Percentage of weighted average pension wealth

StatLink http://dx.doi.org/10.1787/313333516308
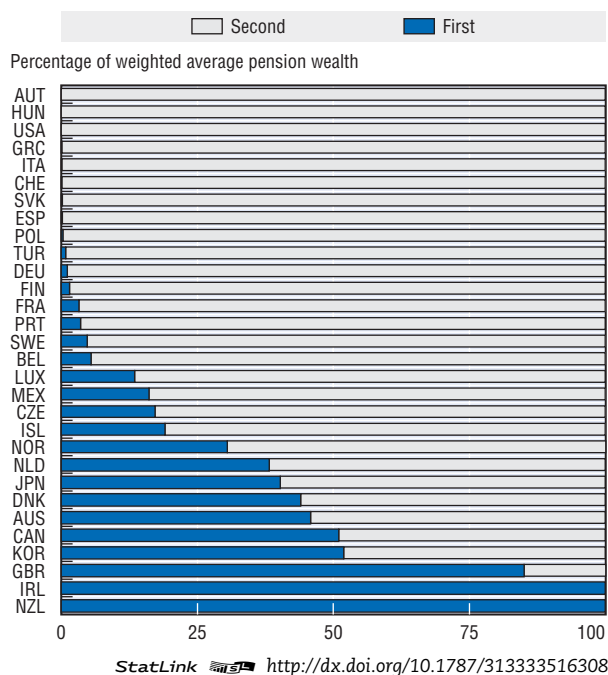
Balance between public and private provision of mandatory pensions

Percentage of weighted average pension wealth

StatLink http://dx.doi.org/10.1787/758801064205
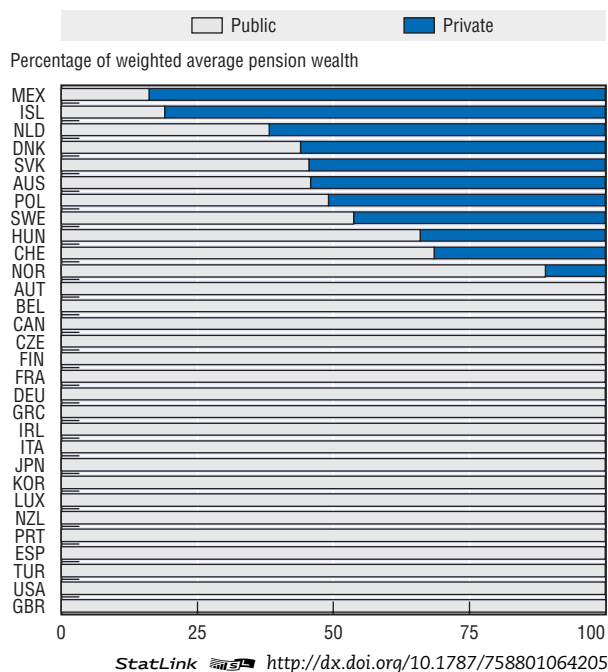
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Foreword

T*his report provides indicators for comparing pension policies across OECD countries. It gives estimates of the level of pension people will receive if they work for a full career and if today's pension rules stay unchanged.*

Monika Queisser and Edward Whitehouse of the Social Policy Division of the OECD's Directorate for Employment, Labour and Social Affairs prepared the report. Rie Fujisawa and Edward Whitehouse were responsible for the pension modelling and the analysis of the tax position of pensioners. Anna Cristina D'Addio and Jongkyun Choi assisted in finalising the report.

National officials provided invaluable, active assistance in collecting information on their countries' pension and tax systems. The results have been confirmed by national authorities with the exception of those for Italy, which are based on the OECD's interpretation of parameters and rules provided by the government.*

Numerous OECD colleagues provided guidance and information, particularly Mark Pearson, Martine Durand and John Martin. The OECD private-pensions team in the Directorate of Financial and Enterprise Affairs – particularly Fiona Stewart and Juan Yermo – provided useful input to the special feature on private pensions. Delegates to the OECD Working Party on Social Policy advised on modelling procedures and development of indicators for cross-country comparisons of pension systems. They also gave constructive comments on earlier drafts.

The report is the product of a joint project co-financed by the European Commission and the OECD; the project also benefited from a financial contribution made by the government of Switzerland.

The OECD pension models use the APEX (Analysis of Pension Entitlements across Countries) infrastructure originally developed by Axia Economics, with the help of funding from the OECD and the World Bank.

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* Italy has expressed serious doubts about the adequacy of data used in the report, and consequently about the comparability of results. In particular, baseline assumptions about labour market entry ages and career length (respectively, 20 and 45 years) are different from those agreed in a comparable exercise undertaken at the EU level, and differ from current Italian labour market norms. Italy thinks interpretations based on these data may be misleading.

Structure of the Report and Methodology

The general approach of *Pensions at a Glance* is a "microeconomic" one, looking at prospective individual entitlements under all 30 of OECD member countries' pension regimes. This method is designed to complement alternative comparisons of retirement-income systems: long-term fiscal and financial projections (for example, Dang *et al.*, 2001; and European Union, 2006) and analysis of income-distribution data (such as Förster and Mira d'Ercole, 2005; and Disney and Whitehouse, 2001).

The report is divided into three main parts. Part I presents the information needed to compare pension policies in a clear, "at a glance" style. It starts by showing the different schemes that together make up national retirement-income provision. Next, there is a summary of the parameters and rules of pension systems.

This is followed by eight main indicators that are calculated using the OECD pension models.

- The first two are the most familiar to pension analysts. Both are replacement rates, *i.e.*, the ratio of pension benefits to individual earnings. These are given in gross and net terms, taking account of taxes and contributions paid on earnings and on retirement incomes. Two analyses of the sensitivity of the gross replacement rate follow. The first looks at individuals who enter the pension system later than the baseline assumption, while the second considers the importance of investment returns in pension systems with defined-contribution (DC) components.

- The next two indicators are pension wealth, again given in gross and net terms. Pension wealth is a more comprehensive measure of pension entitlements than replacement rates because it takes account of pension ages, indexation of pensions to changes in wages or prices and life expectancy.

- Countries differ in the way that their pension systems aim to provide an old-age safety-net or replace a target share of pre-retirement income. The balance between these two is explored by the next pair of indicators: the first on the progressivity of the pension benefit formula and the second on the link between pension and earnings.

- The final two indicators aim to summarise the pension system as it affects individuals across the earnings distribution, showing the average pension level, pension wealth and the contribution of each component of the retirement-income system to overall benefits.

Two special chapters form Part II of this report. They cover pension reforms and private pensions, respectively. Both of these analyses use the OECD pension models to explore more deeply the central issues of pension policy in national debates. The framework of *Pensions at a Glance* is forward-looking, focusing on future pension entitlements of today's

workers. However, the past decade has seen intense reform activity in the world of pensions and retirement. The first special chapter looks at what countries did and how this is likely to affect future benefits. A number of these reforms have increased the role of the private sector in pension provision. The second special chapter identifies the complex range of private retirement arrangements and quantifies the savings effort individuals will have to make to maintain standards of living in retirement.

Finally, Part III provides detailed background information on each of the 30 countries' retirement-income arrangements. These include pension eligibility ages and other qualifying conditions; the rules for calculating benefit entitlements; the treatment of early and late retirees; and more detailed information on the pre-reform scenarios explored in the special chapter on pension reforms. The country studies summarise the national results in standard charts and tables.

The remainder of this section describes the methodology used to calculate pension entitlements. It outlines the details of the structure, coverage and basic economic and financial assumptions underlying the calculation of future pension entitlements on a comparative basis.

Future entitlements under today's parameters and rules

The pension entitlements which are compared 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 2004 are included where sufficient information is available (in Portugal, for example). Some changes (such as the increase in pension age in Germany and the reform package in the United Kingdom) have not been finalised or were finalised too late for inclusion.

The values of all pension system parameters reflect the situation in the year 2004. The calculations show the pension entitlements of a worker who enters the system today and retires after a full career. The results are shown for a single person only.

Career length

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. The implication is that the length of career varies with the statutory retirement age: 40 years for retirement at 60, 45 years for retirement at 65, etc. As the results can be sensitive to the career-length assumption, calculations are also made for situations where workers enter at age 25 and so retire with five years less than a full career.

Coverage

The pension models presented here include all *mandatory* pension schemes for private-sector workers, regardless of whether they are public (*i.e.* they involve payments from government or from social security institutions, as defined in the System of National Accounts) or private. For each country, the main national scheme for private-sector employees is modelled. Schemes for civil servants, public-sector workers and special professional groups are excluded.

Systems with near-universal coverage are also included provided they cover at least 90% of employees. This applies to schemes such as the occupational plans in Denmark, the Netherlands and in Sweden. An increasing number of OECD countries have broad coverage of voluntary, occupational pensions and these play an important role in providing retirement incomes. For these countries, a second set of results is shown with voluntary pension schemes in the special chapter on private pensions.

Resource-tested benefits for which retired people may be eligible are also modelled. These can be means-tested, where both assets and income are taken into account, purely income-tested or withdrawn only against pension income. The calculations assume that all entitled pensioners take up these benefits. Where there are broader means tests, taking account also of assets, the income test is taken as binding. It is assumed that the whole of income during retirement comes from the mandatory pension scheme (or from voluntary pension schemes in those countries where they are modelled).

Pension entitlements are compared for workers with earnings between 0.5 times and twice the economy-wide average. This range permits an analysis of future retirement benefits of both the poorest and richer workers.

Economic variables

The comparisons are based on a single set of economic assumptions for all 30 countries. In practice, the level of pensions will be affected by economic growth, wage growth and inflation, and these will vary across countries. A single set of assumptions, however, ensures that the comparisons of the different pension regimes are not affected by different economic conditions. In this way, differences across countries in pension levels reflect differences in pension systems and policies alone.

The baseline assumptions are:

- real earnings growth: 2% per year (given the assumption for price inflation, this implies nominal wage growth of 4.55%);
- individual earnings: assumed to grow in line with the economy-wide average. This means that the individual is assumed to remain at the same point in the earnings distribution, earning the same percentage of average earnings in every year of the working life;
- price inflation: 2.5% per year;
- real rate of return after administrative charges on funded, defined-contribution pensions: 3.5% per year;
- discount rate (for actuarial calculations): 2% per year (see Queisser and Whitehouse, 2006 for a discussion of the discount rate);
- mortality rates: the baseline modelling uses country-specific projections (made in 2002) from the United Nations/World Bank population database for the year 2040;
- earnings distribution: composite indicators use the OECD average earnings distribution (based on 18 countries), with country-specific data used where available.

Changes in these baseline assumptions will obviously affect the resulting pension entitlements. The indicators are therefore also shown for alternative assumptions regarding the rate of return on funded defined-contribution schemes. The impact of variations in economy-wide earnings growth, and for individual earnings growing faster or slower than the average, was shown in the first edition of *Pensions at a Glance* (OECD, 2005)

The real rate of return on defined-contribution pensions is assumed to be net of administrative charges. In practice, this assumption might disguise genuine differences in administrative fees between countries (see Whitehouse, 2000 and 2001 for an analysis).

The calculations assume the following for the pay-out of pension benefits: when DC benefits are received upon retirement, they are paid in the form of a price-indexed life annuity at an actuarially fair price. This is calculated from mortality data. Similarly, the notional annuity rate in notional accounts schemes is (in most cases) calculated from mortality data using the indexation rules and discounting assumptions employed by the respective country.

Taxes and social security contributions

Information on taxes and social security contributions which were used to calculate the net indicators for 2002 were included in the country chapters in the first edition of *Pensions at a Glance* (OECD, 2005). The tax and social security contribution rules and parameters have been updated to 2004 but are not repeated in this volume for reasons of space (Fujisawa and Whitehouse, forthcoming 2007, provides more information).

The modelling assumes that tax systems and social-security contributions remain unchanged in the future. This implicitly means that "value" parameters, such as tax allowances or contribution ceilings, are adjusted annually in line with average earnings, while "rate" parameters, such as the personal income tax schedule and social security contribution rates, remain unchanged. General provisions and the tax treatment of workers for 2004 can be found in the OECD report *Taxing Wages* (OECD, 2006). The conventions used in that report, such as which payments are considered taxes, are followed here.

Average earnings

Starting with this edition, *Pensions at a Glance* uses a new and more comprehensive measure of average earnings corresponding to an "average worker" (AW). This is broader than the previous benchmark of the "average manual production worker" (APW). This new concept was introduced in the report *Taxing Wages* (OECD, 2006) and also serves as benchmark for *Benefits and Wages* (OECD, 2007).

The reasoning behind the change was that a manual worker in the production sector is not representative of the "typical taxpayer", given the steady decline in manual employment in manufacturing in most OECD countries. The new base for calculating average earnings includes more economic sectors and both manual and non-manual workers. The concept and definition of earnings, however, remains the same: gross wage earnings paid to average workers, measured before deductions of any kind, but including overtime pay and other cash supplements paid to employees.

Table 0.1 reports average earnings levels under the old (APW) and new (AW) definition, for the year 2004. Only three countries (Ireland, Korea and Turkey) are not yet able supply earnings data on the broader basis and so the modelling is based on the old, APW measure of average earnings.

The effect of broadening the types of workers covered has very different effects on measured average earnings in different OECD countries. In 19 of the 27 countries for which new, AW data are available, these are *higher* than average earnings under the previous, APW definition but the size of the difference varies greatly (see Figure 0.1). The change in definition increases measured average earnings by 30% or more in six countries (Austria,

Table 0.1. **OECD measures of average earnings, 2004**

National currency and USD at market price and purchasing-power-parity exchange rates

	OECD measure of average earnings				Exchange rates with USD	
	Old – National currency (APW)	New – National currency (AW)	New – USD, market price	New – USD, PPP	Market price	PPPs
Australia	52 777	48 827	35 922	35 917	1.36	1.36
Austria	24 946	32 872	40 842	37 872	0.80	0.868
Belgium	32 281	35 578	44 205	41 151	0.80	0.865
Canada	40 912	38 945	29 933	31 269	1.30	1.25
Czech Republic	213 573	209 489	8 153	14 936	25.69	14.03
Denmark	323 900	316 500	52 860	37 684	5.99	8.40
Finland	29 152	31 539	39 186	32 372	0.80	0.974
France	23 087	29 549	36 713	32 199	0.80	0.918
Germany	34 088	41 046	50 998	45 898	0.80	0.894
Greece	12 525	17 360	21 569	24 996	0.80	0.695
Hungary	1 262 712	1 697 268	8 377	13 682	202.61	124.05
Iceland	2 849 554	2 770 000	39 463	29 461	70.19	94.02
Ireland	30 170	n.a.	37 485	30 321	0.80	1.00
Italy	23 044	22 053	27 400	25 628	0.80	0.861
Japan	4 223 100	4 943 208	45 708	37 139	108.15	133
Korea	27 356 688	n.a.	23 888	34 974	1 145.20	782
Luxembourg	32 586	39 171	48 668	42 649	0.80	0.918
Mexico	66 432	76 332	6 767	10 446	11.28	7.31
Netherlands	32 457	37 026	46 003	41 300	0.80	0.897
New Zealand	41 778	39 428	26 129	26 793	1.51	1.47
Norway	314 523	366 161	54 332	41 005	6.74	8.93
Poland	26 745	29 263	8 015	15 858	3.65	1.85
Portugal	9 372	12 969	16 113	18 344	0.80	0.707
Slovak Republic	190 000	200 722	6 228	11 679	32.23	17.19
Spain	17 913	19 828	24 635	26 215	0.80	0.756
Sweden	251 282	300 814	40 949	32 773	7.35	9.18
Switzerland	64 419	70 649	56 849	40 900	1.24	1.73
Turkey	13 959	n.a.	9 789	16 788	1.43	0.831
United Kingdom	20 560	27 150	49 747	43 881	0.55	0.619
United States	34 033	30 355	30 355	30 355	1.00	1.00

n.a.: Not available.

AW = average wage.

APW = average production worker.

PPP = purchasing power parity.

Note: Monetary values for Turkey divided by 1 000 000. Average earnings are not available on the AW measure for Ireland, Korea and Turkey.

Source: OECD (2006), p. 13; and *OECD Main Economic Indicators*.

France, Greece, Hungary, Portugal and the United Kingdom). For three additional countries the increase was 20% (Germany, Luxembourg and Sweden). In contrast, a sizeable decrease occurred only in the United States (13%), with more modest declines (of around 5% or less) in seven further countries.*

* Countries have endeavoured to supply data based on the new Average Wage concept. However, as when any new series is introduced, there are teething problems and different interpretations of guidelines need to be reconciled. It appears possible, for example, that the US data excludes some groups that are included in other countries' estimates of the average wage, which may partly explain the surprisingly low US average wage estimate. This issue is subject of ongoing work, and updates to the wage series will be posted on the OECD website as and when they become available.

Figure 0.1. **Percentage difference of average earnings AW levels with regard to previous APW levels, 2004**
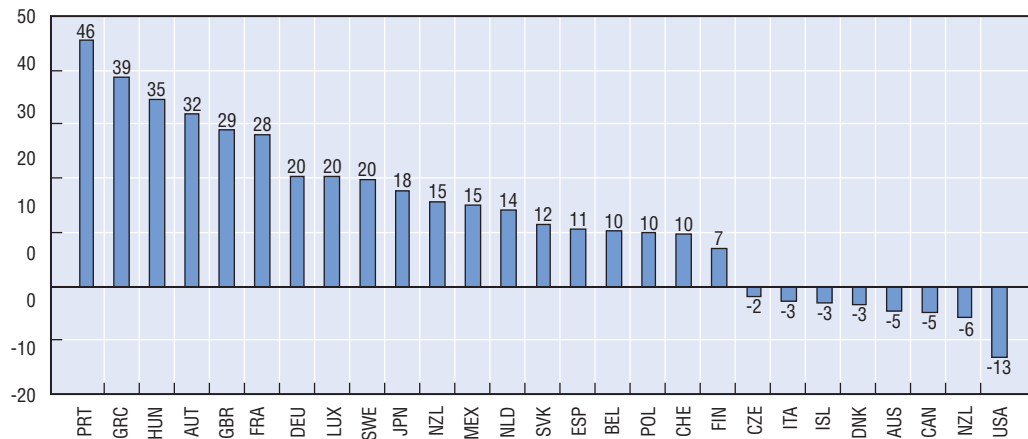
Source: OECD (2006), p. 13.

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Table 0.2. **Total life expectancy at age 65, 2040 projected mortality rates**

	Men	Women
Australia	84.0	87.4
Austria	83.7	87.3
Belgium	83.8	87.3
Canada	83.8	87.4
Czech Republic	82.5	86.0
Denmark	83.1	86.0
Finland	83.6	87.5
France	83.9	87.6
Germany	83.2	86.6
Greece	83.3	86.6
Hungary	80.8	85.0
Iceland	84.8	87.5
Ireland	82.8	86.2
Italy	83.0	87.0
Japan	85.8	88.7
Korea	81.8	85.6
Luxembourg	83.0	87.2
Mexico	80.9	84.8
Netherlands	83.5	86.7
New Zealand	83.6	86.8
Norway	84.2	87.5
Poland	81.5	85.6
Portugal	82.8	86.2
Slovak Republic	81.1	85.1
Spain	83.4	87.0
Sweden	84.3	87.5
Switzerland	84.5	88.2
Turkey	80.0	83.0
United Kingdom	83.3	86.4
United States	83.8	87.3
OECD average	**83.1**	**86.6**

Note: These projections build on recent national census data. The assumptions for future changes in mortality rates vary between countries but nonetheless use a consistent methodology. The resulting mortality rates can differ from national projections because of differences in assumptions.
Source: OECD calculations based on United Nations/World Bank population database.

Demographics and life expectancy

Table 0.2 shows the country-specific total life expectancy, separately for men and women, conditional on surviving until age 65. Given that pension entitlements are projected into the future, the calculations use the projections for 2040 from the United Nations/World Bank population database. Workers who enter the labour market in 2004 will retire between 2044 and 2051. Unfortunately, mortality-rate projections are available only for 2040 and 2075.

Citizens of poorer OECD member states are projected to retain lower life expectancies than their counterparts in richer economies. In Hungary, Mexico, Poland, the Slovak Republic and Turkey, life expectancy at age 65 is 1½-3 years shorter than the OECD average. Japan and Switzerland have significantly longer life expectancy than the OECD mean today and are projected to remain at the top in 2040. Other countries are clustered around the OECD average.

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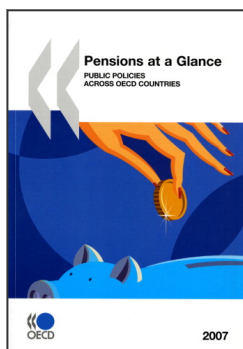
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