

# TAX TREATMENT OF PRIVATE PENSION SAVINGS IN OCDE COUNTRIES

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Kwang-Yeol Yoo and Alain de Serres are senior economists with the Ministry of Finance and Economy, Korea and the OECD Economics Department, respectively. The paper was written when both authors were at the OECD. The authors would like to thank Pablo Antolín, Jørgen Elmeskov, Michael Feiner, Chris Heady and Giuseppe Nicoletti for their valuable comments as well as Christine de la Maisonneuve for technical assistance. This paper also benefited from comments by members of the Working Party No. 1 of the OECD Economic Policy Committee and the Working Party No. 2 on Tax Policy Analysis and Tax Statistics of the Committee on Fiscal Affairs.

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## INTRODUCTION

Most OECD governments use tax incentives to encourage the development of private retirement saving plans. In many cases, for instance, private pension savings are deductible from the income tax base, and accrued return on investment is exempt from taxation, but pension benefits arising from these savings are taxed. In other cases, accrued return on pension investment is taxed, but at a preferential rate relative to other forms of savings. While several aspects of these arrangements have been studied extensively, there has been little direct cross-country comparison of the *ex-ante* tax cost of these incentives.

The primary purpose of this paper is to provide such comparison by estimating the net tax cost per unit (say, dollar or euro) of contribution to tax-favoured private pension plans, based a present-value methodology. The latter takes into account the future flows of revenues foregone on accrued income and of revenues collected on benefit withdrawals corresponding to a unit contribution made in a given year. Put differently, it compares the amount of taxes paid over the entire length of the investment when a dollar is saved in a tax-favoured pension plans with that when the saving is invested in a benchmark non-retirement saving vehicle. In this respect, the net tax cost is not influenced by the history of past contributions (accumulated assets) or by demographic changes. It can thus be interpreted as an indicator of the size of the tax incentive to invest in a private pension scheme faced by savers of different age and income categories. Using the comprehensive income tax regime as a benchmark, a formula is developed to estimate the net tax cost in terms of revenues foregone associated with five different types of tax-favoured private pension regimes. The net tax cost is first calculated for nine (five-year) age groups, which have different relative income levels and investment time horizons, and is then averaged across age groups.

In preparing such estimates, the paper provides an updated overview of the (income) tax treatment of private pension schemes as well as of alternative savings vehicles, building on earlier work in this area.<sup>1</sup> It also produces, as a by-product, estimates of average effective tax rates on private pension and non-pension portfolios, which fully reflect the differences in the tax treatment of shares and fixed-income assets.

The paper is organised as follows. The next section provides a brief discussion of the key concepts underlying the taxation of private pensions as well as an

overview of actual pension systems and tax treatment of private pension across OECD countries. We then present the framework used for calculation, which includes the set of assumptions and the relevant formulas and subsequently report the main results, both as regards the average overall net tax cost for each country and broken down by components and by age-groups. It shows that the size of the subsidy varies significantly across countries, ranging from nearly 40 cents per dollar or euro of contribution (Czech Republic) to around zero (Mexico, New Zealand). While slightly over half of the OECD countries incur a tax cost of more than 20 cents, it exceeds 10 cents in most OECD countries, underscoring the importance that government attributes to the promotion of retirement saving. The penultimate section examines the sensitivity of these results to a change in a number of assumptions, including to the rate used to discount future revenues and to the tax rate used to calculate revenues collected on withdrawals. This is followed by conclusions.

## THE THEORY AND PRACTICES OF TAXING PRIVATE PENSIONS

This section examines the tax treatment of the main private pension scheme in each OECD country. While several forms of long-term saving commitments could be viewed as pension plans, only pension plans that are privately-managed and, in principle, fully-funded are included in the analysis.<sup>2</sup> Among the latter, the study focuses in each country on those that offer an equally favourable tax treatment, independent of whether they are mandatory or voluntary, occupational or personal.<sup>3</sup>

### *A brief theoretical background*

In principle, most savings vehicles, including pension funds, involve three transactions that can be subject to taxation. That is:

- When a contribution is made to the savings instrument.
- When investment income and capital gains accrue to the savings vehicle.
- When funds are withdrawn.

A savings scheme is usually considered as being taxed favourably when its tax treatment deviates from a regime that treats all sources of income equally from a fiscal standpoint (the so-called *comprehensive income tax regime*). In a pure comprehensive income tax system, savings are made out of taxed earnings and the accrual return on funds accumulated is also subject to an income tax. In return, the withdrawal of assets from such saving vehicles is fully exempted from taxation. Such arrangements are known as “taxed-taxed-exempt” (TTE) schemes.

Using this as a benchmark, there are several ways in which tax incentives can be provided. One is a regime which taxes the portion of income that is consumed, but that exempts the portion that is saved for future consumption (the so-called

*expenditure tax* regime). In a pure expenditure tax regime, both the funds contributed and the accrual return on accumulated funds are thus exempted from taxation.<sup>4</sup> In return, the benefits are treated as taxable income upon withdrawals. The pure *expenditure tax* system thus achieves fiscal neutrality between current and future consumption, since all savings are tax-exempt. Such arrangements are commonly referred to as “exempt-exempt-taxed” (EET) schemes. However, tax favour does not necessarily always entail tax deferral. Indeed, for a given tax rate, an equivalent incentive can be provided under a “taxed-exempt-exempt” (TEE) regime, commonly referred to as a “pre-paid” expenditure tax.<sup>5</sup> In the case where the discount rate is equal to the rate of return, and contributions and withdrawals are subject to the same marginal income tax rate, these two regimes deliver the same net present value of revenues to the government (Box 1).

Conversely, tax-deferral is not necessarily synonymous with tax preference given that under similar conditions, an ETT regime is identical to the TTE regime in terms of the net present value of revenues to the government (Box 1). In addition, some tax support can be given also within the spirit of a comprehensive income tax regime. This is the case, for example, when the return on saving is taxed at flat rate that is lower than the marginal rate faced by most wage earners. Hence, a whole range of possible tax combinations going from EEE to TTT can be applied on specific savings vehicles and rates can be varied within each to alter the incentive.

### ***Practices of taxing private pensions in the OECD countries***

As regards the practice of taxation of private pension plans, a vast majority of countries apply a variant of the EET regime. Ten countries (Austria, Canada, Finland, Greece, Iceland, Netherlands, Norway, Poland, Switzerland, and the United States) come close to the pure EET regime in which withdrawals are subject to the progressive income tax rates (Table 1). Another twelve countries (Belgium, France, Germany, Ireland, Japan, Korea, Mexico, Portugal, Slovak Republic, Spain, Turkey and the United Kingdom) also apply an EET regime, but one where withdrawals are generally taxed more leniently than in the first group of countries or where contributions are granted a tax credit rather than a full deduction. For instance, the United Kingdom, Ireland, Spain, France, Mexico and Turkey allow a partial tax-free withdrawal of benefits in the form of a lump sum, while France, Germany and Turkey allow a similar tax privilege to annuity pension income (Table 2). In Mexico, Turkey and the Slovak Republic, pension income above a specified tax-free limit is taxed at a relatively low rate.

The practice in other OECD countries differs from the EET regime to the extent that contributions and/or accrued income are taxed (Tables 1 and 2). In Italy, Denmark, and Sweden, the tax treatment of private pensions is closer to the

### Box 1. Illustration of tax revenues collected from four benchmark regimes

Assume that a taxpayer contributes \$100 to the private pension scheme in the first period and withdraws three periods later. Assume that he is subject to a 25 per cent of the marginal income tax rate and that investment earns a 10 per cent of pre-tax nominal return.

- Under the EET regime, a taxpayer pays at retirement a tax of \$33.3 from his accumulated assets of \$133.1 – initial contribution (\$100) plus accrued income (\$33.1) – and receives a disposable income of \$99.8 (table below). If he did not save in the form of pension, he (the government) should have consumed (collected) \$75 (\$25) in the first period. A \$99.8 that he receives at retirement has the same net present value as \$75 in the first period, *i.e.*  $\$99.8 = \$75 * (1 + 10 \text{ per cent})$ . The EET regime simply allows the deferral of tax payments until retirement, and he is left with the same present value of post-tax income to consume in the first period or consume later at retirement.
- Under the TEE regime, a taxpayer is forced to pre-pay income tax on pension savings in the first period. A taxpayer pays \$25 out of his pre-tax contribution (\$100) and receives \$99.8 – initial post-tax contribution (\$75) plus accrued income (\$24.8) at retirement (table below). If he decided to consume in the first period, he would have been able to spend \$75, which is equal to \$99.8 at retirement in the net present value term. He is again neutral between consuming in the first period and consuming at retirement. The EET and TEE regime deliver the same value of the post-tax retirement income (tax revenues) for the taxpayer (the government), and the post-tax rate of return on pension savings – implicit in the equation  $\$99.8 = \$75 * (1 + 10 \text{ per cent})$  – is equal to the pre-tax rate of return (10 per cent) in both cases.

Alternative pension tax regimes, current dollars<sup>1</sup>

	EET	TEE	TTE	ETT
Pre-tax contribution (A)	100.0	100.0	100.0	100.0
Tax (B)	–	25.0	25.0	–
Post-tax initial asset (C = A – B)	100.0	75.0	75.0	100.0
Net accrued income (D)	33.1	24.8	18.2	24.2
Asset at retirement (E = C + D)	133.1	99.8	93.2	124.2
Tax on withdrawal (F)	33.3	–	–	31.1
Net pension income (G = E – F)	99.8	99.8	93.2	93.2
<i>Memorandum item:</i>				
Net present value of total tax <sup>2</sup>	25.0	25.0	30.0	30.0

1. Assumes a 10 per cent pre-tax rate of return, 25 per cent marginal tax rate and three years of investment.

2. Assumes the discount rate is equal to the rate of return.

**Box 1. Illustration of tax revenues collected  
from four benchmark regimes (cont.)**

- The TTE regime is common to interest-bearing assets in most OECD countries. A taxpayer pays \$25 in the first period and receives \$93.2 at retirement (table below). A reduction in the post-tax income at retirement reflects that investment earnings were taxed during investment periods. The TTE regime results in a 7.5 per cent post-tax rate of return – implicit in the equation  $\$93.2 = \$75 * (1 + 7.5 \text{ per cent})$ . Since the post-tax rate of return is lower than the pre-tax rate of return, the TTE regime creates a disincentive to save, and a taxpayer ends up with less money when he decides to save and consume later at retirement.
- Under the ETT regime, a taxpayer receives \$24.2 of post-tax accrued income, and his pre-tax accumulated assets at retirement amount to \$124.2. He then receives a post-tax amount of \$93.2 at retirement, so the TTE and ETT regime deliver the same value of the post-tax retirement income (table below). Again, the post-tax rate of return is lower than the pre-tax rate of return, distorting an incentive to save. Under the TTE and ETT regime, a taxpayer is neutral between consuming and saving in the first period, because savings is treated in the same way as consumption.

comprehensive income tax system. While they allow for the deferral of taxation on contributions, they tax accrued income from fund investment – albeit at preferential rates – and pension benefits at withdrawal (ETT).

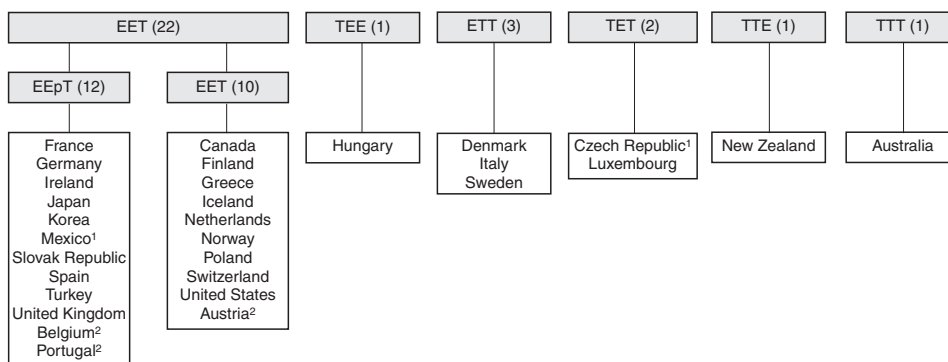
On the other hand, Australia, New Zealand, Czech Republic, Hungary and Luxembourg tax contributions to private pension schemes.<sup>6</sup> In the latter three cases, either employee's or employer's contributions are exempt from taxation, but not both (Table 1, Panel B).<sup>7</sup> Although the treatment in Australia is uniquely characterised as a TTT regime, contributions can be partly exempted (especially for low-income participants) and investment earnings and pension benefits are both taxed at a preferential rate.

## MEASURING THE NET TAX COST OF PRIVATE PENSION ARRANGEMENTS

This section first presents alternative approaches to measuring tax expenditures and motivates the method chosen. It then lays out the framework for calculation by discussing the assumptions used and introducing the formulas suited for each of the main pension tax regimes in place in OECD countries.

Table 1. Country groupings according to the tax treatment of private pensions

## Panel A. General overview



Note: E = exempt; pT = partially taxed, only in the EET system; T = taxed.

1. Mexico and the Czech Republic provide a state subsidy to contributions.

2. The employee's contributions are partially exempt or receive tax credits in Austria, Belgium and Portugal.

 Panel B. Pension taxation for countries whose tax treatment differs  
across the source of contribution

Contributions	Accrued income	Withdrawal	Countries
<b>Employers:</b>			
Exemption	Exemption	Exemption	Hungary
Exemption/Subsidy	Exemption	Partial tax	Czech Republic
Tax	Exemption	Exemption	Luxembourg
<b>Employees:</b>			
Exemption	Exemption	Tax	Luxembourg
Tax or partial tax <sup>1</sup>	Exemption	Exemption	Hungary
Partial tax	Exemption	Partial tax	Czech Republic <sup>2</sup>

1. Mandatory contributions are fully subject to tax while voluntary contributions receive tax credits.

2. A state subsidy to contributions is made in the Czech Republic.

Source: OECD tax database (various years); country responses to the Secretariat's questionnaires; ISSA-INPRS (2003); *European Tax Handbook* (2003).

## Various approaches to measuring tax expenditures

The evaluation of the budgetary costs and benefits of a particular tax policy measure is generally coined in the literature as *tax expenditure*. While the actual definition and practice can vary across countries, there are three common approaches

Table 2. Tax treatment of private pensions in 2003<sup>1</sup>

	Contributions <sup>2</sup>	Fund		Pension payments	
		Income	Value	Annuities	Lump sums
Australia <sup>3</sup>					
Individuals	T	7.1% <sup>4</sup>	E	T/PC	PE/16.5%
Employers <sup>5</sup>	15%	7.1% <sup>4</sup>	E	T/PC	PE/16.5%
Austria <sup>3</sup>					
Individuals	T/PE	E	E	T/PE	T/PE
Employers	E	E	E	T	T
Belgium <sup>3</sup>					
Individuals	T/PC	E	0.17%	T/PC	10%
Employers	E	E	0.17%	T/PC	16.5%
Canada	E	E	E	T	T
Czech Republic <sup>3</sup>					
Individuals	T/PE/S	E	E	15%/PE	15%/PE
Employers	E/S	E	E	15%/PE	15%/PE
Denmark	E	15%	E	T	40%
Finland	E	E	E	T	T
France	E	E	E	T/PE	T/PE
Germany	E	E	E	T/PE	T
Greece	E	E	E	T	T
Hungary <sup>3</sup>					
Individuals	T <sup>5</sup>	E	E	E	E
Employers	E	E	E	E	E
Iceland	E	E	E	T	T
Ireland	E	E	E	T/PE	T/PE
Italy	E	12.5%	E	T/PE	T/PE
Japan	E	E	E	T/PE	T/PE
Korea	E	E	E	T/PE	T/PE
Luxembourg <sup>3</sup>					
Individuals	E	E	E	T	T/PE
Employers	20%	E	E	E	E
Mexico	E/S	E	E	T/PE	T/PE
Netherlands	E	E	E	T	T
New Zealand <sup>3</sup>					
Individuals	T	33%	E	E	E
Employers	21%	33%	E	E	E
Norway	E	E	E	T	Not allowed
Poland	E	E	E	T	T
Portugal <sup>3</sup>					
Individuals	T/PC	E	E	20%/PE	T/PE
Employers	E	E	E	20%/PE	T/PE
Slovak Republic	E	E	E	15%	15%
Spain	E	E	E	T	T/PE
Sweden	E	15%	E	T	T
Switzerland	E	E	E	T	T
Turkey	E	E	E	E	5%/PE
United Kingdom	E	E	E	T	T/PE
United States	E	E	E	T	T

Note: E = exempt; T = taxed under personal income tax; OC = partial credit; PE = partial exemption or deduction from taxation; S = state subsidy.

1. Private pension refers to mandatory or voluntary funded privately managed pension schemes.

2. Tax-deductible contributions are subject to a certain limit in most countries.

3. The tax treatment of the employer's contribution is different from that of the employee's.

4. The effective tax rate assuming a portfolio with 60% interest-bearing assets and 40% equities.

5. Mandatory contributions are fully taxed, but voluntary contributions receive tax credits.

Source: OECD Tax database (various years); National sources; ISSA-INPRS (2003) and *European Tax Handbook* (2003).



to estimating tax expenditures.<sup>8</sup> First, the *revenue-foregone* method measures the amount by which tax revenues are reduced by a particular tax concession, usually under the assumption of unchanged behaviour. Second, the *outlay-equivalent* method measures the cost of providing the same monetary benefit through direct spending, assuming also that behaviour is unchanged as a result of the tax concession. Contrasting with the latter two approaches, the *revenue-gain* method takes potential behavioural responses into account and provides an *ex ante* measure of the expected increase in revenues if the concessions were repealed.

The estimates of the net tax cost associated with tax-favoured private pension arrangements presented in this paper are based on the *revenue-foregone* method to measuring tax expenditures. However, within this method, a number of approaches can be used, in particular the *present-value* approach and the *cash-flow* approach.<sup>9</sup> This paper uses the present-value approach which considers the future flows of revenues foregone on accrued income and of revenues collected on withdrawals corresponding to contributions made in a given year. In this respect, it is not influenced by the history of past contributions or by demographic changes. Given that the present-value method directly takes into account the inter-temporal shift in tax revenues, it may provide a more accurate picture of the underlying budgetary cost associated with participation in tax-favoured schemes, in particular during the first few years after a plan has been introduced.

The more commonly-used cash-flow approach differs from the present-value method in that the budgetary cost in a given year is measured as the net amount of revenues foregone on contributions, revenues foregone on accrued investment income and revenues collected on withdrawals which are all *realised* during that same year. In such a case, the revenues foregone on accrued investment and the revenues collected on withdrawals correspond to contributions made in previous years.<sup>10</sup> The latter approach is better suited to capture the influence of demographic changes on the profile of net fiscal revenues from tax-favoured retirement plans at different points in time. Indeed, the approach has been used recent studies to estimate the current and future profile of tax costs and benefits related to tax-favoured pension regimes in OECD countries (Antolín *et al.* 2005, CBO, 2004, Boskin, 2003 and Mérette 2002).

### ***A present-value estimate of the net tax cost of private pensions: the framework for calculation***

#### *Detailed assumptions*

The net tax cost is obtained by taking the difference over the entire length of the investment between the amount of taxes collected in the case where money is saved in a private pension plan and the amount collected when funds are invested in a benchmark non-retirement saving vehicle, under the following set of assumptions.

First, the current tax treatment of standard savings vehicles in each country is taken as the benchmark tax system. In all cases, this is some version of the comprehensive income tax regime (TTE). Second, marginal tax rates corresponding to different levels of income and family status are derived from a tax model reflecting the current tax code in each country (see Annex).<sup>11</sup> In all countries where contributions to private pension plans can be used to lower taxable income, these effective marginal tax rates measure the fiscal revenue foregone on a currency unit of contribution.<sup>12</sup> Because the marginal income tax rate varies with the level of gross income, reflecting the progressivity of the personal income tax system in most OECD countries, the estimation of the net tax cost requires an assumption about the age-income profile of a participant to the private pension scheme. For this exercise, participants are broken down into ten five-year aged-groups (from 20-24 to 65+, with the first nine groups being contributors and the oldest one being recipients). The income level of each group is assumed to evolve with age according to a hump-shaped age-income profile allowing marginal income tax rates also to vary across ages.<sup>13</sup> Furthermore, since the age-income profile is measured as a proportion of the income of the average production worker (APW), it is implicitly assumed that the income tax brackets are fully indexed to inflation throughout the life cycle.

Third, as concerns taxation of investment income, detailed information on the tax treatment of specific non-pension savings vehicles included in the benchmark portfolio (*i.e.* a mix of interest-bearing instruments and shares, see below) is used to derive implicit tax rates on the return to investment. The tax treatment of investment income varies significantly across both instruments and countries (Yoo and de Serres, 2004).<sup>14</sup> Even so, savings income is generally taxed more lightly than labour income, reflecting in most cases the desire to reduce the effect of double taxation on earnings from shareholding. Considering the difficulties in collecting country-specific information about portfolio composition, the following assumptions concerning the allocation of assets in either private pension or benchmark saving and the corresponding rates of return are applied to all countries:

- The portfolio is composed of 60 per cent interest-bearing assets (bank deposits or bonds) and 40 per cent equities. Hence, the benchmark considers only financial assets and excludes real estate or housing.
- For tax purposes, the return on equity is assumed to be one-third dividends and two-thirds capital gains. Shares are assumed to be held 6.7 years on average and to be subject to capital gains tax.<sup>15</sup> The time horizon assumed for the investment is discussed below.
- Each asset is assumed to earn a 6.5 per cent pre-tax nominal rate of return (including 2 per cent inflation).<sup>16</sup> The discount rate is assumed to be equal to the nominal rate of return.<sup>17</sup>

Fourth, pension income is assumed to be taxed at a rate equal to the mid-point between the average and marginal tax rates corresponding to the average production worker's (APW) salary, provided the mid-point is no more than 5 percentage points below the marginal income tax rate (MITR).<sup>18</sup> A proper calculation would require adequate information about the level and the various sources of *taxable* income of pensioners who have participated in a tax-favoured scheme. And these can be quite different from the average level and sources of taxable income of all pensioners. On the one hand, if benefits from tax-favoured schemes were the sole source of taxable income, then the appropriate rate applied to measure revenues collected on withdrawal would be the average income tax rate corresponding to the value of the annual benefit withdrawn. In practice, however, most recipients of tax-favoured pension benefits usually receive income from various other taxable sources, in which case applying the average tax rate corresponding to the level of private pension benefits would most certainly *underestimate* the amount of tax revenues recovered. On the other hand, applying the corresponding marginal tax rate would most likely lead to *overestimate* tax revenues, if only because pensioners generally benefit from special tax rebates and other benefits. The sensitivity of the net tax cost to a different assumption regarding the marginal tax rate on withdrawals is examined below.

Fifth, as regards the time horizon, it is allowed to vary from one year to over 40 years, depending the age of the investor at the time the contribution is made. In order to take this into consideration, the cost per unit of contribution is first calculated for each five-year age group between the ages of 20 and 65 and then averaged across age groups, using a simple arithmetic averaging formula. Representative contributors from each age group are assumed to make a one-time contribution to a private scheme at a given age and then to withdraw the initial contribution plus accrued investment return in the form of either a lump-sum payment or annuity (depending on the country) starting at the age of 65.

Finally, as mentioned above the tax cost per unit of contribution to a tax-favoured private pension plans is estimated under the assumption of unchanged behaviour, as is common practice in the calculation of tax expenditures based on the revenue-foregone methodology. However, the absence of behavioural change assumption can be interpreted in different ways. In the application below, it is assumed that the contributions to private pension plans do not affect the overall level of national savings. In other words, private consumption is assumed to remain unchanged following the introduction of a tax-favoured scheme. Hence, while contributors are assumed to save the amount corresponding to the value of the tax break, they do not provide new saving, *i.e.* that would be financed by a reduction in current consumption.<sup>19</sup>

*Formulas used for the present-value calculations*

For each of the main tax regimes discussed here, the relevant formula to estimate the net tax cost is shown below. In each case the aim is to estimate the difference in lifetime tax payments between investments in a private pension plan and the benchmark portfolio.

- EET regime

The present-value net tax cost per dollar of pre-tax contribution (TE) is the discounted sum of revenue losses from contributions and accrued investment income plus revenue gains from benefit withdrawal. The net tax cost of a dollar of pre-tax contribution made at age  $m$  (that is withdrawn as a lump-sum at age 65) has the following three components, modelled in equation [1].<sup>20</sup>

$TE_{EET}$  = Revenue foregone on contributions (RFC) + Revenue foregone on accrued income (RFAI) – Revenue collected on withdrawals (RCW)

$$\begin{aligned}
 &= C \cdot t_{c,m} + C[1-t_{c,m}] \left\{ \frac{i \cdot t_{a,m+1}}{(1+\rho)} + \frac{[1+i(1-t_{a,m+1})]i \cdot t_{a,m+2}}{(1+\rho)^2} + \frac{[1+i(1-t_{a,m+1})][1+i(1-t_{a,m+2})]i \cdot t_{a,m+3}}{(1+\rho)^3} + \dots \right\} \\
 &- \frac{C(1+i)^{65-m} t_{b,65}}{(1+\rho)^{65-m}} = C \cdot t_{c,m} + C[1-t_{c,m}] \sum_{j=m+1}^{65} \frac{\left\{ \prod_{k=m+1}^{j-1} [1+i(1-t_{a,k})] \right\} i \cdot t_{a,j}}{(1+\rho)^{j-m}} - \frac{C(1+i)^{65-m} t_{b,65}}{(1+\rho)^{65-m}}
 \end{aligned} \tag{1}$$

where  $TE_{EET}$  and  $C$  represent the present-value net tax cost and amount contributed to the pension plan, respectively;  $t_c$ ,  $t_a$  and  $t_b$  denote the relevant tax rates on contributions, accrued income and benefit withdrawals;  $i$  is the nominal pre-tax rate of return;  $\rho$  is the discount rate; and  $j$  and  $k$  are periods during which contributions earn investment income. The first and second terms in (1) measure revenues foregone on contributions (RFC), and revenues that would have been received on investment income (RFAI) respectively, while the third term captures revenues collected on withdrawals (RCW). The relevant tax rate  $t_a$  in the second term reflects different tax treatment of savings instruments across countries, and it varies across age-groups in countries where investment income is subject to the progressive income tax schedule.

To allow for pension payments in the form of annuity income, the third term of equation [1] can be modified and replaced by the present-value of

taxes on annuity income from the age 65 to 80 (the assumed age of death in the calculation below):

$$RCW = \sum_{v=66}^{80} \frac{C(1+i)^{65-m} \times 1 / \left[ \sum_{n=1}^{15} 1/(1+i)^n \right] \times t_b}{(1+\rho)^{v-m}} \quad [2]$$

Equation [2] implies that a retiree is entitled to annuity pension for 15 years after retirement at age 65. The relevant income tax rate  $t_b$  on benefit withdrawals (which may be different from the tax rate on benefits that applies in the case of a lump sum) is assumed to be constant over the retirement periods.<sup>21</sup>

A variant of the EET regime is one where contributors are entitled to tax credits on their contributions. Revenues foregone on contributions (RFC) are again reduced by the *net* amount that the government receives from contributions. A tax credit set at a constant flat rate for all contributors increases the size of tax relief for lower-income contributors while lowering it for higher-income investors. If the rate of tax credit were sufficiently high, revenues foregone on contributions (RFC) would be as large as revenues foregone under the EET regime. Revenues foregone on accrued income (RFAI) remain the same as in [1]. Compared with the base model (equation [1]), revenues collected on withdrawals (RCW) are reduced in proportion to a fall in taxable pension assets that stem from *de facto* partial taxation of contributions associated with tax credits. The net tax cost per dollar of pre-tax contribution (in the case of lump-sum withdrawals) is then expressed as:

$$TE_{EET2} = C \cdot t_{cred} + C[1-t_{c,m}] \sum_{j=m+1}^{65} \frac{\left\{ \prod_{k=m+1}^{j-1} [1+i(1-t_{a,k})] \right\} i \cdot t_{a,j}}{(1+\rho)^{j-m}} - C[1-t_{c,m} + t_{cred}] \frac{(1+i)^{65-m} t_{b,65}}{(1+\rho)^{65-m}} \quad [3]$$

where  $t_{cred}$  denotes the rate of tax credit.

- ETT regime

In this case, the second term in equation [1] is modified to take into account that revenues foregone on accrued income (RFAI) are reduced by the extent to which accrued investment income from pension savings is now taxed, albeit at a lower rate than accrued income from alternative savings instruments. For example, Denmark and Sweden tax pension fund income at 15 per cent, so revenue losses are lower than under the EET regime. However, revenue losses are reduced by more than the flat tax rate because taxes are collected on invest-

ment income that accrues from the total amount contributed to the pension plan (C), *i.e.* including the portion corresponding to the tax subsidy, rather than on the post-tax contribution  $[C \cdot (i - t_c)]$  as in the EET case.<sup>22</sup> An additional term in the bracket of revenues foregone on accrued income (RFAI) in equation [4] reflects these two effects.

$$\begin{aligned}
 TE_{ETT} = & C \cdot t_{c,m} + \{C[1 - t_{c,m}] \sum_{j=m+1}^{65} \frac{\{\prod_{k=m+1}^{j-1} [1 + i(1 - t_{a,k})]\} i \cdot t_{a,j}}{(1 + \rho)^{j-m}} - C \sum_{j=m+1}^{65} \frac{\{\prod_{k=m+1}^{j-1} [1 + i(1 - t_{k,p})]\} i \cdot t_{p,j}}{(1 + \rho)^{j-m}} \\
 & - C \frac{[1 + i(1 - t_{p,65})]^{65-m} t_{y,65}}{(1 + \rho)^{65-m}} \quad [4]
 \end{aligned}$$

where  $t_p$  represents the relevant flat tax rate for accrued income on pension fund investment.

On the other hand, accumulated pension assets at withdrawal under the ETT regime are smaller than corresponding assets under the EET regime, because accrued income from the pension fund was taxed in the previous stage. Revenues collected on withdrawals (RCW) are reduced in proportion to a fall in taxable pension wealth, and the third (last) term in equation [3] reflects that decline.

- TET regime

The next formula applies to regimes that provide no or only very partial tax exemption on contributions and withdrawals from private pension while completely exempting accrued return on investment. This would apply for instance to employee's contributions to the employer-sponsored pension schemes in Austria, Czech Republic, and Portugal, which account for a relatively small portion of total contributions. These countries tend to tax contributions and withdrawals at a relatively low rate or with the allowance of partial exemption/tax credit so as to minimise double taxation. The following model assumes that only a certain fraction of contributions (1-v) and withdrawals (1-w) are subject to income tax (*e.g.* employee's contributions in Austria). Relative to the EET case, revenues foregone on contributions (RFC) are reduced by the amount of income taxes that the government collects from contributions, whereas revenues collected on withdrawals (RCW) are reduced in proportion to a fall in taxable pension assets that stem from (partial) taxation on contributions. Revenues foregone on accrued income

(RFAI) remain broadly the same. The net tax cost per unit of pre-tax contribution under a TET regime (in the case of lump-sum withdrawal) is expressed as:

$$TE_{TET} = C \cdot v \cdot t_{c,m} + C[1 - t_{c,m}] \sum_{j=m+1}^{65} \frac{\{ \prod_{k=m+1}^{j-1} [1 + i(1 - t_{a,k})] \} i \cdot t_{a,j}}{(1 + \rho)^{j-m}} - [C - C(1 - v)t_{c,m}] \frac{(1 + i)^{65-m} (1 - w)t_{b,65}}{(1 + \rho)^{65-m}} \quad [5]$$

where  $v$  and  $w$  stand for tax-exempt proportions when contributions are made and accumulated assets are withdrawn, respectively.

- TTT regime

One country, Australia, collects some taxes from private pension at each of the three transaction points. Not only contributions to superannuation accounts are made out of taxed income (except for certain low-income participants), but investment earnings and benefits are also taxed, albeit at relatively low rates (Tables 1 and 2). If contributions were subject to the marginal income tax, there would be no revenues foregone on contributions (RFC). However, the employer's contributions are subject to 15 per cent contribution tax, so revenues foregone on contributions are broadly measured as the difference between the marginal income tax rate and the flat tax rate for the employer's portion of total contributions. Revenues foregone on accrued income (RFAI) are reduced by the extent to which accrued income from pension fund investment is taxed at a lower rate relative to accrued income from alternative savings instruments, with the ETT formula (second term of equation [4]).<sup>23</sup> Finally, accumulated pension wealth on which revenues are collected is reduced by the extent to which contributions and accrued income were previously taxed. The net tax cost per dollar of pre-tax contribution (in the case of employer's contributions on behalf of the employee) under the TTT regime (in the case of lump-sum withdrawal) is summarised as follows:

$$TE_{TTT} = C(t_{c,m} - 0.15) + \{ C[1 - t_{c,m}] \sum_{j=m+1}^{65} \frac{\{ \prod_{k=m+1}^{j-1} [1 + i(1 - t_{a,k})] \} i \cdot t_{a,j}}{(1 + \rho)^{j-m}} - C(1 - 0.15) \} \\ \times \sum_{j=m+1}^{65} \frac{\{ \prod_{k=M+1}^{j-1} [1 + i(1 - t_{p,k})] \} i t_{p,j}}{(1 + \rho)^{j-m}} \} - C(1 - 0.15) \frac{[1 + i(1 - t_p)]^{65-m} (1 - w)t_{ls}}{(1 + \rho)^{65-m}} \quad [6]$$

where  $w$  and  $t_{ls}$  stand for the fraction of tax-exempt withdrawals and the tax rate on lump-sum withdrawals respectively.<sup>24</sup>

- TEE regime

The employer's contributions in Luxembourg and the employee's mandatory contributions in Hungary are subject to the TEE schemes (Table 1). In the case of Luxembourg, revenues foregone on contributions (RFC) are now reduced by the *net* revenues that the government collects by imposing a 20 per cent flat tax on contributions. Revenues foregone on accrued income (RFAI) remain broadly the same as the EET model (equation [1]). Since no taxes are recovered on withdrawals, the net tax cost per dollar of pre-tax contribution has only two components:

$$TE_{TEE} = C[t_{c,m} - t_f] + C[1 - t_{c,m}] \sum_{j=m+1}^{65} \frac{\left\{ \prod_{k=m+1}^{j-1} [1 + i(1 - t_{a,k})] \right\} i \cdot t_{a,j}}{(1 + \rho)^{j-m}} \quad [7]$$

where  $t_f$  denotes the flat-rate tax on the employer's contributions. In Hungary where the employee's contributions are fully subject to the income tax, the net tax cost per one dollar of pre-tax contribution is simply reduced to the second term in equation (7).

To summarise, ten age categories are constructed, assuming a hump-shaped age-income profile over the life cycle. Representative contributors from the first nine categories are assumed to make a *once-and-for-all* pre-tax contributions of one dollar to a private pension scheme at the age  $m$  and to withdraw initial contributions plus accrued investment income associated with the one-dollar contribution in the form of lump-sum payments at age 65 or annuity income from age 65 until death at the age of 80. Since the relevant marginal tax rates vary across age-groups and evolve differently over time, revenues foregone from one dollar of pre-tax contribution differs across contributing groups. The construction of age-groups is intended to illustrate how sensitive estimates of the net tax cost are in relation to the level of age-income and the periods when investment income accrues and address the distributional implication of tax-favoured pension saving schemes.<sup>25</sup>

The approach is illustrated in Box 2 with the use of two examples corresponding to EET and ETT cases, respectively. In both examples, the differences in the amount of taxes paid between a tax-favoured scheme and a TTE benchmark are calculated using, for simplicity, an artificially short time horizon.

## MAIN FINDINGS

This section first presents the overall net tax cost per unit of contribution in each country and then provides a breakdown of the overall net cost by components and by age-groups. These base case results are grounded on the key two



### Box 2. How much do different tax-favoured retirement saving plans cost? An illustration based on a short time horizon

Suppose that an individual contributes \$100 to the EET-type private pension schemes in the first period and withdraws three periods later. Assume, for simplicity, that he is subject to a 25 per cent marginal income tax and that investment earns a 10 per cent annual return. Table A displays annual income flows related to a \$100 of pre-tax pension savings and ordinary savings, respectively. Note that post-tax amount invested in ordinary savings is \$75, \$100 \* (1-25 per cent).

The difference in taxes paid between the private pension and ordinary savings (row 5 – row 2) corresponds to the cost to the government in current price (row 7). Using the discount factor (row 8), the net tax cost to government per dollar of pension savings in the present value term (row 9) is measured at 5 cents.

Table A. Net tax cost of EET-type pension savings<sup>1</sup>

	Row	Contribution (year 0)	Accumulated asset			Withdrawal (year 3)	Net tax cost (present value)	
			1	2	3			
Private pension (EET)	Gross balance	1	100.0	110.0	121.0	133.1	133.1	
	Tax paid	2	0.0	0.0	0.0	0.0	33.2	
	Net balance	3	100.0	110.0	121.0	133.1	99.8	
Ordinary savings (TTE)	Post-tax balance	4	75.0	82.5	88.7	95.3	93.2	
	Tax paid	5	25.0	1.9	2.0	2.2	0.0	
	Net balance	6	75.0	80.6	86.7	93.2	93.2	
Difference in taxes paid (TTE-EET)	Revenue loss	7 + 5 – 2	25.0	1.9	2.0	2.2	-33.2	
	Discount factor	8	1.0	0.91	0.83	0.75	0.75	
	NPV revenue loss	9 = 8*7	25.0	1.7	1.7	1.6	-25.0	5.0

1. Assumes a 10 per cent pre-tax rate of return (discount rate), 25 per cent marginal tax rate and three years of investment.

Assume alternatively that an individual contributes \$100 to the ETT-type private pension schemes. Table B illustrates annual income flow from both pension and ordinary savings. Since the government can recover a part of revenue loss from levying a 10 per cent tax on accrued income from pension savings, the overall net tax cost to the government is lower at 3 cents per dollar of pension savings in the net present value terms.

**Box 2. How much do different tax-favoured retirement saving plans cost? An illustration based on a short time horizon (cont.)**

**Table B. Net tax cost of EET-type pension savings<sup>1</sup>**

		Row	Contri- bution (year 0)	Accumulated asset			With- drawal (year 3)	Net tax cost (present value)
				1	2	3		
Private pension (EET) <sup>2</sup>	Gross balance	1	100.0	110.0	119.9	130.7	129.5	
	Tax paid (A)	2	0.0	1.0	1.1	1.2	32.4	
	Net balance	3	100.0	109.0	118.8	129.5	97.1	
Ordinary savings (TTE)	Post-tax balance	4	75.0	82.5	88.7	95.3	93.2	
	Tax paid (B)	5	25.0	1.9	2.0	2.2	0.0	
	Net balance	6	75.0	80.6	86.7	93.2	93.2	
Difference in taxes paid (TTE-EET)	Revenue loss	7 = 5 - 2	25.0	0.9	0.9	1.0	-32.4	
	Discount factor	8	1.0	0.91	0.83	0.75	0.75	
	NPV revenue loss	9 = 7*8	25.0	0.8	0.8	0.7	-24.3	3.0

1. Assumes a 10 per cent pre-tax rate of return (discount rate), 25 per cent marginal tax rate and three years of investment.

2. Assumes a 10 per cent tax on pension fund income.

assumptions that the effective tax rate on withdrawals is set at 5 percentage points (or less, see above) below the marginal income tax rate corresponding to the average production worker and that the discount rate is equal to the rate of return. The sensitivity of the baseline results to a change in these fundamental assumptions is examined below.

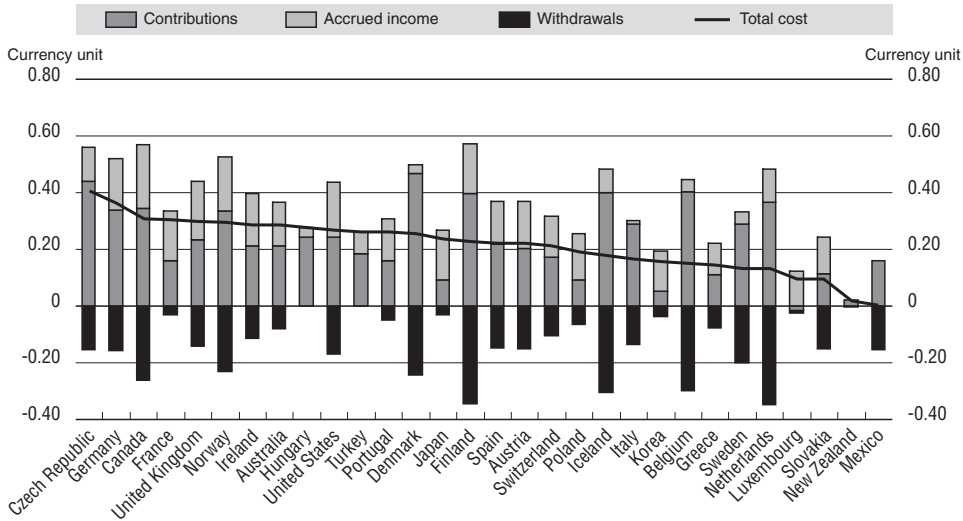
### **Net tax cost by country**

The size of the subsidy, measured as the average net tax cost across age groups per unit of pre-tax contribution in a tax-favoured retirement saving plan, appears in Figure 1, which shows both the overall cost (solid line) and the three components: revenues foregone on contributions, revenue foregone on accrued investment income and revenue collected on withdrawals. The key points to highlight are the following:

- The size of the subsidy varies significantly across countries, ranging from nearly 40 cents per dollar of contribution (Czech Republic) to around zero (Mexico, New Zealand).<sup>26</sup>

Figure 1. Net tax cost per unit of contribution, age-group average<sup>1,2</sup>

Currency unit



1. Based on the employer-sponsored schemes (except Italy and Korea) and annuity pension income. However, for countries in which tax treatment between the employer's and employee's contributions is the same, the distinction between employer-sponsored and individual pension schemes is meaningless.
2. The outcomes in New Zealand and Mexico are driven by the following factors. In New Zealand, employers' contributions are subject to a flat rate of 21 per cent, the rate lower than the marginal income tax rate. Mexico exempts income accruing to regular investment from taxation.

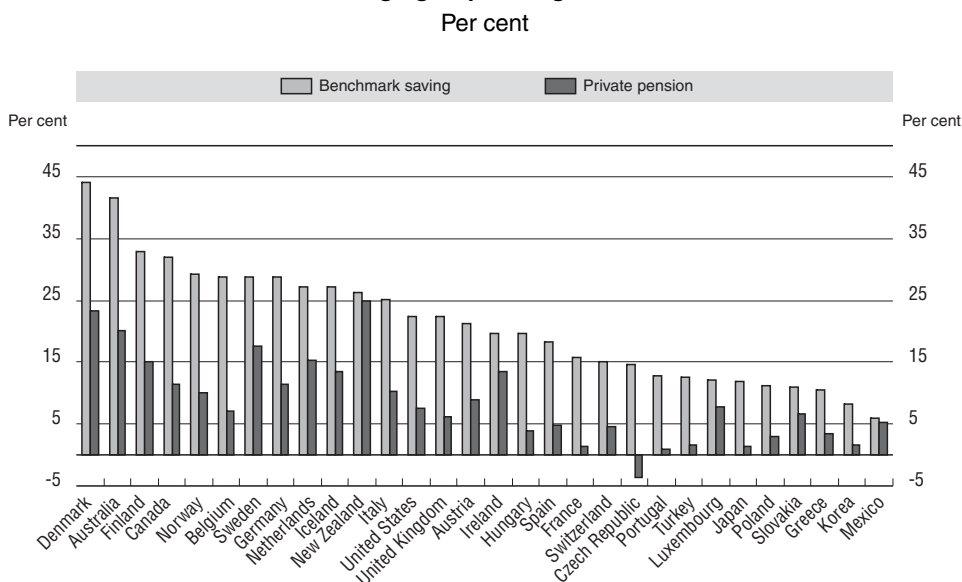
- It is also important to note that, despite the differences in taxing private pension savings, most OECD countries incur a sizeable positive net tax cost, amounting to at least 10 cents per dollar of pre-tax contribution.
- Not surprisingly, the size of the subsidy is generally higher in countries having an EET scheme. Over half of the OECD countries incur a tax cost of more than 20 cents and in nearly all of them the main private pension scheme benefits from an EET treatment. A number of countries tax pension benefits at a relatively low rate despite having an EET regime, with a significant impact on the overall cost.
- Conversely, countries whose pension tax treatment deviates from the EET model generally face a lower net tax cost. For example, Italy and Sweden – applying an ETT-type treatment – incur a net tax cost in the range of 13 to 17 cents per dollar of contribution. As expected, the difference with respect to EET countries comes essentially from lower revenues foregone on accrued income, even though in most ETT cases, the tax rate on accrued investment income on pension savings is substantially lower than that applied to the benchmark saving

portfolio. The high net tax cost in Denmark, another ETT-system country, however, mainly stems from bigger revenues foregone on contributions due to a high marginal income tax rate for relatively high-income workers.<sup>27</sup>

- New Zealand and Mexico are the only countries with zero net revenues foregone associated with pension savings. In the case of New Zealand this owes to the neutral tax treatment of pension savings relative to other forms of savings – the TTE regime applies in both cases.<sup>28</sup> As for Mexico, it provides an illustration of the equivalence between EET (private pension) and TEE regimes (benchmark) under the assumption of equality between the discount rate and the rate of return.<sup>29</sup>

In order to put the size of the tax incentive in perspective, Figure 2 shows the levels of effective tax rates on private pensions and the benchmark saving portfolio.<sup>30</sup> Broadly speaking, the tax incentive corresponds to the difference between the two tax rates. It can be seen that while the majority of countries effectively tax pension savings at 10 per cent or less, only two (Korea and Mexico) tax non-pension

Figure 2. **Effective tax rates on private pension and benchmark saving, age-group average<sup>1,2</sup>**



1. Based on the employer-sponsored schemes (except Italy and Korea) and lump-sum pensions. However, for countries in which tax treatment between the employer's and employee's contributions is the same, the distinction between employer-sponsored and individual pension schemes is meaningless.
2. The effective tax rate is measured as the difference between the net present value of the pre-tax assets and the post-tax assets in proportion to the net present value of the pre-tax assets, for 6.5 per cent of return (and discount rate).

savings at such low rates. Also, the fact that a number of countries with EET regimes (*e.g.* Poland, Korea, Greece, Slovak Republic and Mexico) have nevertheless low tax cost reflects in most cases the low taxation of benchmark saving vehicles. The only exceptions in this regard are Iceland and the Netherlands, where the effective tax rates on both pension and portfolio savings are high, partly due to a high marginal income tax rate relative to the other low-tax-cost EET-system countries. Not surprisingly, countries that do not apply EET regimes are generally the ones with the highest effective tax rates on pension savings, although there are some exceptions (Italy, Belgium and Luxembourg).

### ***Size of tax expenditure based on a present-value approach***

Using estimates of the (average) net tax cost per unit of contributions to a tax-favoured retirement saving scheme, a rough estimate of the overall budgetary cost associated with total contributions in such schemes can be produced, for countries where data on total amounts contributed are available. On the basis of contributions made in 2000, the overall budgetary cost is estimated to vary from over 1.7 per cent of GDP (Australia, Ireland, Switzerland, United Kingdom) to less than 0.2 per cent of GDP (Japan, Slovak Republic) (Figure 3). As mentioned above, this measure based on a *present-value* approach can be interpreted as tax expenditure, but it is not directly comparable to common estimates of tax expenditures regularly published by fiscal authorities, as the latter are typically based on a *cash-flow* methodology.

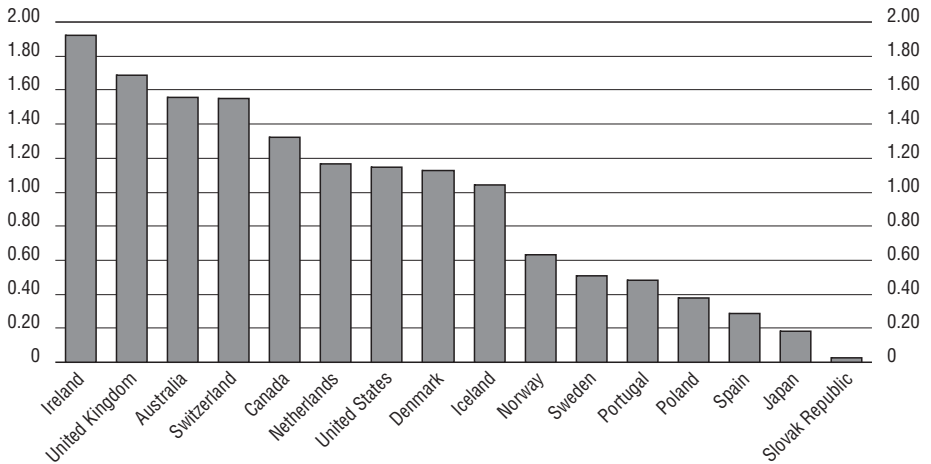
Aside from the net cost per unit of contribution and participation rates, variations across countries in the overall budgetary cost reflect differences in contribution rates. Indeed, the average contribution per participant as a ratio of the average wage is relatively high in countries where participation is voluntary and where both the tax incentive and contribution limits are fairly generous (Ireland, United Kingdom, Canada and the United States) (Figure 4). Among countries where participation is quasi-universal (the Netherlands, Switzerland, Iceland, Denmark and Sweden) the contribution rate is fixed at a higher rate in the Netherlands and Switzerland where the tax-favoured pension plan represents the main pension pillar and therefore aims for higher replacement rates.

### ***Net tax cost by component***

Figure 5 decomposes the net tax cost into its three components: revenues foregone on contributions (RFC), revenues foregone on accrued income (RFAI) and revenues collected on withdrawals (RCW).

- RFC are high in Denmark, Czech Republic, Belgium, Iceland, Finland and Netherlands (Figure 5, Panel A) reflecting high the marginal income tax rate

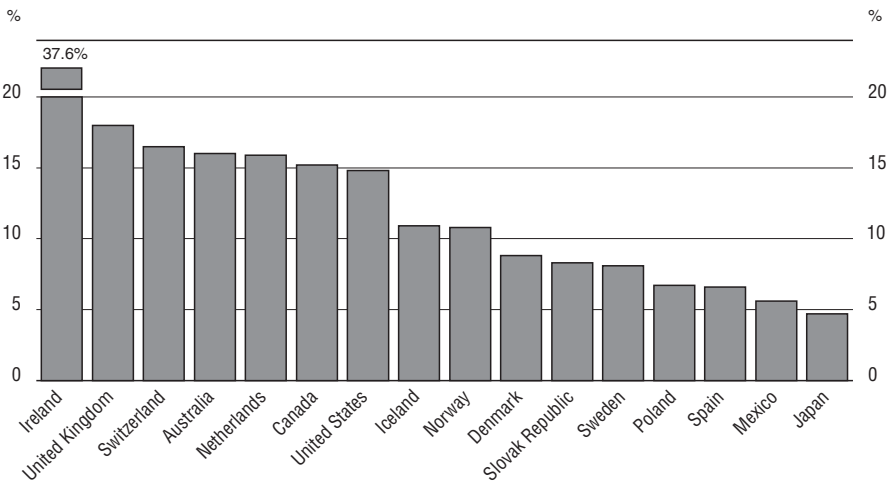
Figure 3. Overall budgetary cost arising from contributions made in 2000<sup>1</sup>



1. The figures are obtained by first calculating the product of the age-group specific net fiscal cost per unit of contributions times contributions in each group in 2000 and then by aggregating the products across age groups. Given that the net fiscal cost per unit of contributions is estimated on the basis of the tax treatment prevailing in 2003, these estimates should be interpreted with caution.

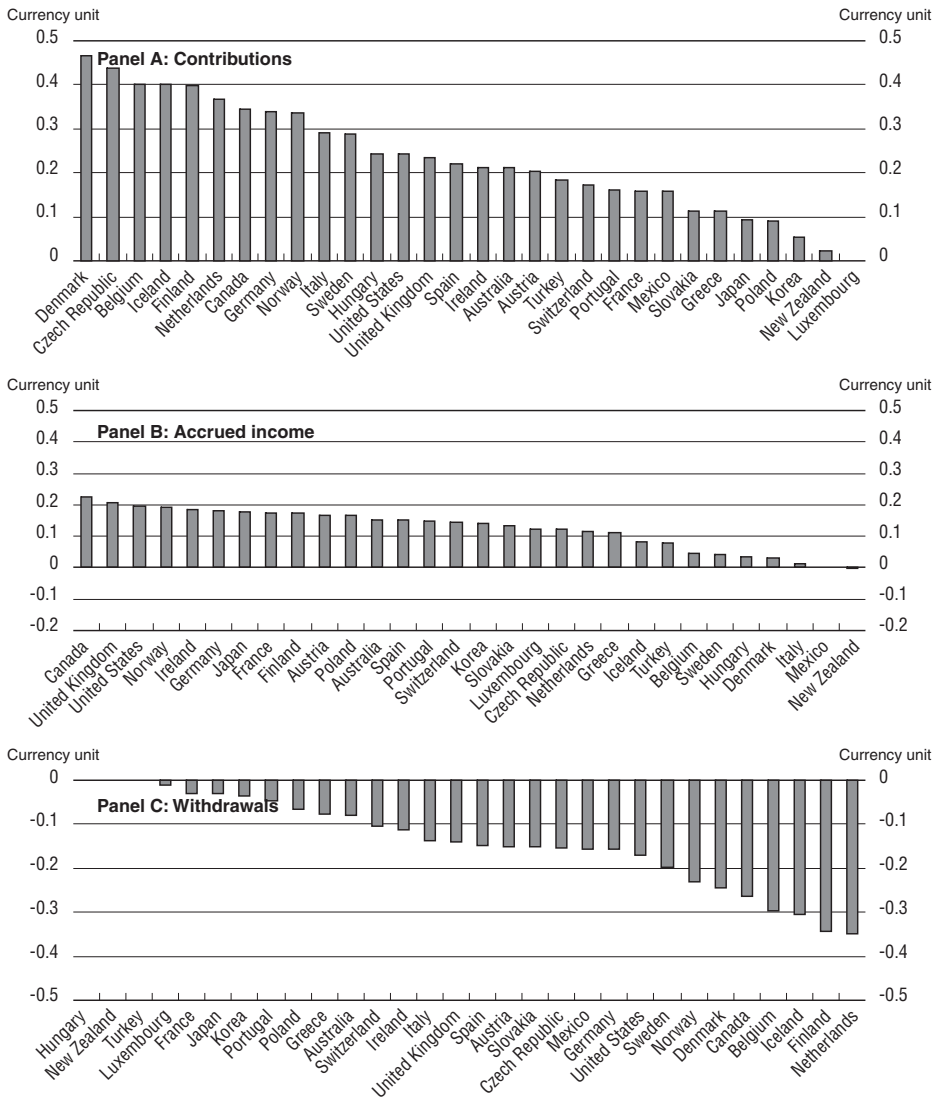
Source: National sources and OECD.

Figure 4. Average contribution per participant  
As a percentage of the average wage of employees



Source: National sources and OECD.

Figure 5. Net tax cost per unit contribution in tax-favoured schemes by component<sup>1,2</sup>



1. Based on the employer-sponsored schemes (except Italy and Korea) and annuity pensions. However, for countries in which tax treatment between the employer's and employee's contributions is the same, the distinction between employer-sponsored and individual pension schemes is meaningless.
2. The outcomes in New Zealand and Mexico are driven by the following factors. In New Zealand, employers' contributions are taxed at 21 per cent, the rate lower than the marginal tax rate. Mexico exempts income accruing to regular investment from taxation.

(except Czech Republic) (Figure 1). Conversely, the small size of RFC in other EET-system countries such as Poland, Korea, Japan, Slovak Republic and Greece (to some extent) mainly reflects a low marginal income tax rate for the assumed range of wage-income. In the case of Luxembourg, the small RFC stems from partial taxation of contributions to pension schemes.

- RFAI are large at above 18 cents in Canada, the United Kingdom, the United States, Norway, Ireland, Germany, Japan, France and Finland (Figure 5, Panel B). The large size of RFAI in Canada, the United Kingdom and the United States is partly due to their tax systems that subject the income from interest-bearing assets to the progressive income tax rate. In the case of Norway (and Finland) this reflects a high flat-rate tax applies to interest income and capital gains (but dividend income avoids taxation through imputation tax credits).<sup>31</sup> In contrast, the large size of RFAI in Ireland and Japan owes to the similar tax treatment of equity and interest-bearing assets (non-imputation). Germany incurs a large size of RFAI because investment income is subject to a high marginal tax rate, despite favourable tax treatment of equity investment relative to fixed income investment. France foregoes relatively big revenues from non-taxation of accrued income, because income from alternative investment is subject to 9 per cent social contribution rate.<sup>32</sup>

### ***Net tax cost by age group***<sup>33</sup>

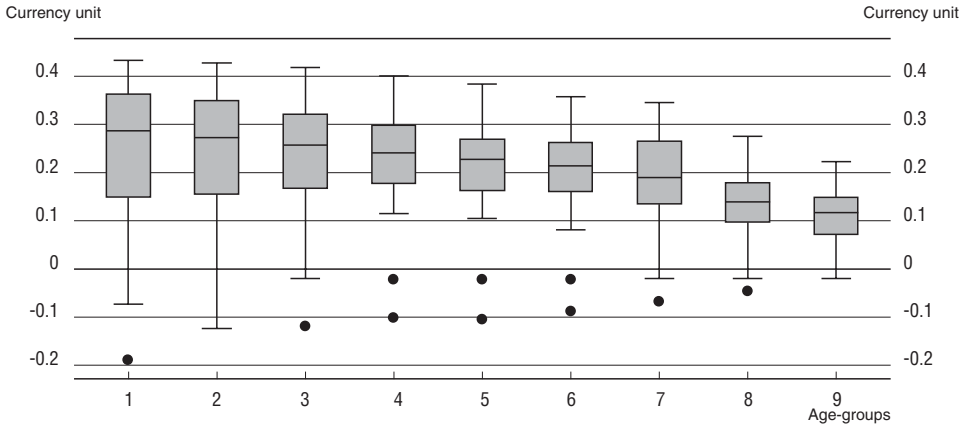
To illustrate how the net tax cost per dollar of contribution changes with age groups, Figure 6 depicts the median value and the cross-country dispersion of the net tax cost in each age group.<sup>34</sup>

- Unsurprisingly, the net tax cost (or tax incentive) is on average higher for pension savings made by younger age-groups as the cumulated cost related to the non-taxation of accrued investment income over a longer time horizon outweighs the generally lower cost related to the tax break on contribution.
- However, the higher median tax cost for younger age-groups masks a wider cross-country variation. The cross-country variation in the net tax cost narrows for middle-aged groups.

## **SENSITIVITY ANALYSIS**

Two of the assumptions used to make the calculations can have a particularly significant impact on the results: the choice of a discount rate and the assumed tax rates on withdrawals. This section examines the sensitivity of the net tax cost to these particular assumptions as well as to a number of less critical ones.



Figure 6. Net tax cost per unit of contribution in tax-favoured schemes by age group<sup>1</sup>

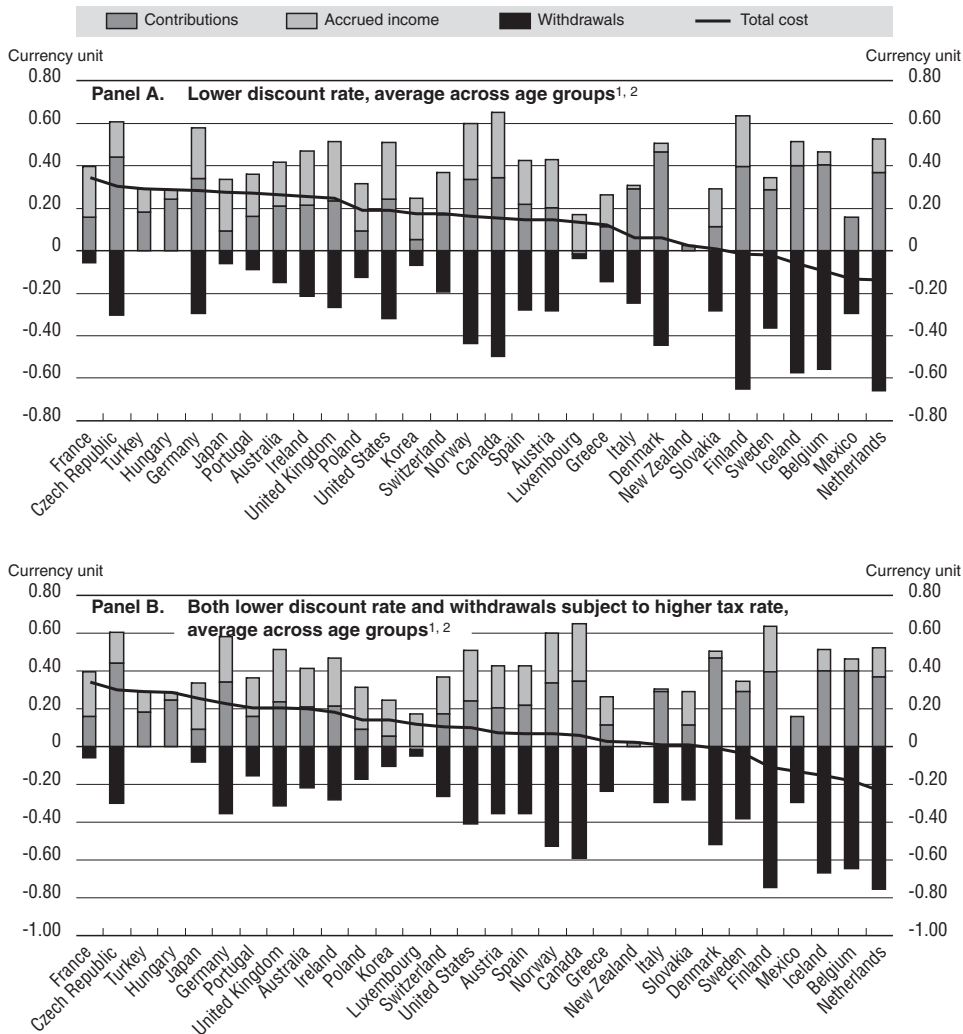
1. The box plot shows the median OECD value of the net tax cost per dollar of contribution, second and third quartiles of the cross-country distribution (the edges of each box) and the extreme values (the two whiskers extending from the box) for each age group (1-9). Dots identify outlier observations.

### ***Assuming a lower discount rate and a higher tax rate on withdrawal***

That the results may be sensitive to the rate at which the government chooses to discount future revenues (relative to the market rate of return) should come as no surprise in the context of a present-value methodology. As mentioned earlier, the fact that the government can generally borrow at a lower rate than the market return does not necessarily imply that a lower discount rate is the natural choice especially considering that in many countries the governments assumes part of the risks.<sup>35</sup> In any case, the impact of using a lower discount rate (4.5 per cent instead of 6.5 per cent) is shown on Figure 7 (Panel A) for the average across age-groups.

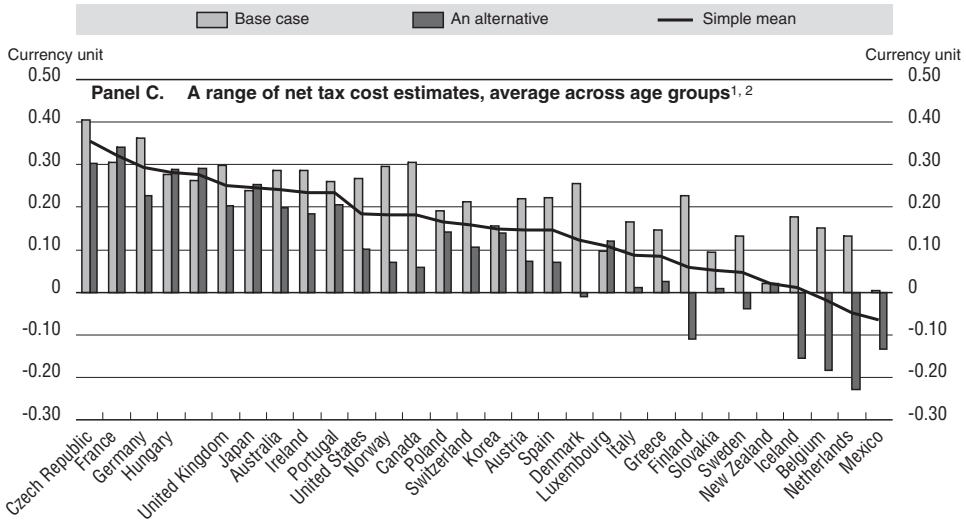
As expected, with future tax revenues given a bigger weight relative to the base case calculation, the overall net cost is diminished in nearly all countries with tax-deferred pension schemes, albeit with large cross-country variations in the size of the declines.<sup>36</sup> Indeed, a lower discount rate reduces the net tax cost by 8 cents per dollar of contribution on average across countries (Table 3, case 2).<sup>37</sup> Furthermore, in a number of countries, the taxes collected on withdrawals become sufficiently large to exceed (in present-value terms) the benefits. In fact, based on a similar calculation and using a low discount rate relative to the rate of return, some have claimed that far from being a cost to the government, tax-favoured

Figure 7. Net tax cost per unit of contribution under alternative assumptions



1. Based on the employer-sponsored schemes (except Italy and Korea) and lump-sum withdrawal at 65. However, for countries in which tax treatment between the employer's and employee's contributions is the same, the distinction between employer-sponsored and individual pension schemes is meaningless.
2. The outcomes in New Zealand and Mexico are driven by the following factors. In New Zealand, employers' contributions are taxed at 21 per cent, the rate lower than the marginal tax rate. Mexico exempts income accruing to regular investment from taxation.

Figure 7. Net tax cost per unit of contribution under alternative assumptions



1. The base case assumes a 6.5 per cent discount rate and the mid point between the marginal and average tax rate corresponding to 100 per cent APW income as the tax rate on withdrawals.
2. An alternative case assumes a 4.5 per cent discount rate and the marginal tax rate corresponding to 100 per cent APW income as the tax rate on withdrawals.

individual retirement saving plans in the United States (IRAs) were actually generating positive net tax revenues.<sup>38</sup>

In order to examine the sensitivity of the results to the assumption regarding the tax rate on withdrawals, the net tax cost has been calculated assuming a withdrawal rate corresponding to the marginal income tax rate relevant for pensioners receiving 100 per cent of APW income (Table 3, case 3). Relative to the baseline calculation, this amounts to raising the tax rate on withdrawals by around 0.2 to 5 percentage points depending on the country. A higher tax rate on pension benefits leads to a reduction of the net tax cost per dollar of contributions by 3 cents on average across countries. Combining this with a lower discount rate (4.5 per cent) generates a cumulated decline in the net tax cost of 13 cents on average (Table 3, case 4 and Figure 7, panel B). The net tax cost becomes positive for Belgium, Finland, Iceland, Netherlands and Sweden where tax payments on pension savings are deferred and the marginal tax rate on withdrawals is relatively high.

The difference between the base case estimates and the estimates based on a lower discount rate and higher withdrawal rate provides a range of plausible net tax costs per unit contribution (Figure 7, panel C). The simple mean between

Table 3. **Sensitivity of the net tax cost per dollar of contribution to different assumptions**  
 Difference in net cost relative to the base case (cents per dollar)<sup>1</sup>

	1. Base case <sup>2</sup>	2. Lower discount rate <sup>3</sup>	3. Higher tax rate on withdrawal <sup>4</sup>	4. Lower discount and higher tax rate	5. More equities <sup>5</sup>	6. Higher inflation <sup>6</sup>
Australia	28.5	-2.1	-3.5	-8.6	-2.3	0.5
Austria	22.1	-7.6	-3.8	-14.8	-3.1	1.9
Belgium	15.0	-24.6	-4.7	-33.4	-1.6	1.1
Canada	30.6	-15.3	-5.0	-24.8	-2.2	2.3
Czech Republic	40.6	-10.4	0.0	-10.4	-2.2	1.5
Denmark	25.5	-19.5	-3.8	-26.5	-2.2	-0.5
Finland	22.8	-24.3	-5.0	-33.7	-1.8	1.8
France	30.5	3.7	-0.1	3.5	-3.7	1.7
Germany	36.2	-7.9	-3.0	-13.6	-4.3	1.8
Greece	14.6	-2.7	-5.0	-12.1	-3.7	1.4
Hungary	27.7	1.1	0.0	1.1	1.7	0.3
Iceland	17.7	-23.9	-5.0	-33.3	-0.2	1.0
Ireland	28.6	-3.1	-3.7	-10.2	-0.9	1.8
Italy	16.5	-10.5	-2.8	-15.4	-2.5	-0.2
Japan	23.8	3.7	-1.1	1.6	-2.9	2.1
Korea	15.7	1.9	-1.9	-1.7	-2.6	1.8
Luxembourg	9.7	3.8	-0.8	2.4	-3.0	1.5
Mexico	0.4	-13.8	0.0	-13.8	0.0	0.0
Netherlands	13.2	-26.8	-5.0	-36.2	-2.1	-0.1
New Zealand	2.0	0.3	-10.8	0.3	0.3	0.3
Norway	29.7	-13.4	-4.9	-22.7	-2.0	2.0
Poland	19.1	0.0	-2.6	-4.9	-3.5	2.0
Portugal	26.0	1.0	-3.4	-5.5	-3.9	1.8
Slovakia	9.5	-8.5	0.0	-8.5	-2.4	1.6
Spain	22.3	-7.6	-4.1	-15.3	-3.4	1.6
Sweden	13.2	-15.2	-1.0	-17.0	-0.5	0.0
Switzerland	21.2	-3.9	-3.6	-10.6	-2.6	1.8
Turkey	26.2	3.0	0.0	3.0	-2.3	1.0
United Kingdom	29.9	-5.1	-2.4	-9.6	-0.8	2.3
United States	26.8	-7.9	-4.6	-16.6	-2.0	2.2
OECD average	21.5	-7.8	-3.1	-12.9	-2.1	1.3

1. A negative figure implies a reduction in the net tax cost per dollar of contribution.

2. Base case assumes a portfolio of 60 per cent interest-bearing assets and 40 per cent equities, 6.5 per cent rate of return (of which inflation rate is 2 per cent), the discount rate equaling the rate of return. The net tax cost is based on the employer-sponsored schemes (except Italy and Korea) and the case of annuity pension. However, for countries in which tax treatment between the employer's and employee's contributions is the same, the distinction between employer-sponsored and individual pension schemes is meaningless

3. Assumes a 4.5 per cent discount rate.

4. Withdrawal rate set at marginal rate on pension earnings equivalent to 100% of APW. Implies higher tax rate of between 0.2 to 5 percentage points depending on the country

5. Assumes 60 per cent equities and 40 per cent interest-bearing assets

6. Assumes 3 per cent inflation.

these two estimates is below 20 cents for the majority of countries and negative for few, including Belgium and the Netherlands.

### ***Sensitivity of results to other assumptions***

The sensitivity of the results to changes in the portfolio composition and the rate of inflation have also been examined (Table 3). In both cases, the changes are having an impact only on one component – revenues foregone from the non- (or partial) taxation of accrued income (RFAI) – and this impact is generally limited. First, having a larger proportion of equities (60 per cent instead of 40 per cent in the base case) in the pension and benchmark portfolios reduces revenues foregone and the net tax cost by 2 cents on average, reflecting the more favourable tax treatment of dividends and capital gains compared with interest-bearing assets (Table 3, case 5). The reduction in the tax cost ranges from essentially zero (Iceland that does not favour equity investment in terms of taxation, and Mexico that does not tax regular investment income) to around 4 cents (France, Germany, Greece and Portugal).

Second, a 1 percentage point increase in inflation (higher nominal return but unchanged real return) increases the net tax cost per dollar of contribution by one cent on average (Table 3, case 6).<sup>39</sup> The non-neutrality of inflation stems from the common practice of taxing nominal rather than real gains from investment. In such a case, higher inflation – hence a higher nominal rate of return – tends to increase the net tax cost associated with non- or partial taxation of accrued income.

## **CONCLUSIONS**

This paper provides estimates of the net tax cost per unit (*e.g.* one dollar or euro) of contribution to tax-favoured retirement savings plans in OECD countries. More specifically, it is a measure, in present-value terms, of the net fiscal revenue foregone associated with a one unit invested over a given time horizon in a tax-favoured retirement saving plan. It is measured on a net basis in the sense that while it considers the revenue foregone arising from deductible contributions and from the non-taxation of accrued income (in the cases where this applies), it also takes into account the revenues collected when assets are withdrawn. For each country, it is measured as an average of the cost calculated over nine age groups, each with different characteristics in terms of income levels and investment horizons. For countries where data are available, the net tax cost per unit is then multiplied by total contributions in 2000 to provide a present-value estimate of the overall budgetary cost (in a given) year arising from participation in such schemes.

The results indicate that the size of the tax incentive for investing in private pensions varies significantly across countries, ranging from nearly 40 cents per unit

of contribution (Czech Republic) to around zero (Mexico, New Zealand). However, despite the variations in the tax treatment of private pension savings, most OECD governments incur a sizeable positive net tax cost, amounting to at least 10 cents per unit of pre-tax contribution, underscoring the importance that governments give to the promotion of private savings. In general, the tax cost (or incentive) is higher for younger age groups, reflecting the non-taxation of accrued investment income over a longer time horizon.

Not surprisingly, the net tax cost is generally higher in countries having an EET scheme and lower in countries, such as Sweden and Italy, who partly tax accrued return on investment. However, given that the net tax cost reflects the generosity of tax treatment of private pension savings *relative* to alternative non-pension savings vehicles, there is no systematic pattern. In fact, several countries (Poland, Iceland, Korea, Greece, Netherlands, Slovak Republic and Mexico) with EET-type private pension arrangements also provide generous tax breaks on alternative savings vehicles, and hence incur a low net tax cost.

These calculation can be interpreted as providing an estimate of the size of the tax incentive for investing in private pension, and hence of the potential cost for government. The overall actual budgetary cost, however, depends on participation tax-favoured schemes and the magnitude of total contributions. On the basis of contributions made in 2000, the present-value estimates of overall budgetary cost vary from over 1.7 per cent of GDP (Australia, Ireland, United Kingdom) to less than 0.2 per cent of GDP (Japan, Slovak Republic).

In most countries, the estimated net tax cost is significantly reduced if one assumes that the rate at which future revenue flows are discounted at a rate that is lower than the assumed rate of return on investment and/or if the tax rate on benefit withdrawals is assumed to be as high as the rate used to calculate revenue losses on contributions (Figure 7, Panels A to C). In such a case, the net cost would even turn into a net gain for a number of countries.

## Notes

1. See *inter alia*, Whitehouse (2002, 1999), Franco (1996), OECD (1994) and Dilnot and Johnson (1992).
2. For the purpose of this study, fully-funded plans are loosely defined as those where the benefits are entirely financed by previously accumulated pension assets, without any implication or requirement in terms of degrees of actuarial fairness. Hence, the study includes plans that operate either on a defined-contribution or defined-benefit basis or any combination of the two.
3. Occupational pension plans are defined as those where access is linked to an employment relationship between the plan member and the sponsor. In contrast, access to personal plans is not linked to an employment relationship. In the latter case, individuals independently purchase and select material aspects of the arrangements without intervention of their employers (INRS-ISSA, 2003). In both cases, the plans can take the form of individual accounts. An overview of the private plans covered in each country is provided in Annex 3 of Yoo and de Serres (2004).
4. This is as long as the accrual return is re-invested.
5. In both cases, investors earn the same (tax-free) rate of return and the revenues foregone by the government are also equivalent in present value terms as long as the discount rate is the same as the rate of return and provided that tax rates on contributions and withdrawals are also the same. In contrast, investors earn the post-tax rate of return in the cases of ETT or TTE plans.
6. It should be noted that in Belgium, Austria and Portugal, the tax break on contributions is granted as a less generous tax credit or partial exemption rather than a full deduction.
7. In the case of Hungary, mandatory employee's contributions are taxed under the TEE *pre-paid* expenditure tax system, while employer's contributions to private pension plans are completely exempted from taxation (EEE). In Luxembourg, employer's contributions are subject to a withholding tax. In the Czech Republic, a state subsidy amounting to 30 to 50 per cent of total contributions is granted in addition to the partial tax deduction of contributions from personal income taxation.
8. See OECD (1996) for a description of country practices regarding tax expenditure reporting and a discussion of underlying issues.
9. For a detailed exposition of the distinctions between these two approaches, see Finance Canada (2001) and Analytical Perspectives (2003).
10. Although the cash-flow approach remains by far the one most widely used in the estimation of tax expenditures regularly published by fiscal authorities, some countries, including Canada and the United States, often report in addition the present-value estimates of tax expenditure on selective programmes as a part of official budget documents.

11. Details on the methodology and information used to calculate these marginal tax rates in OECD countries can be found in OECD (2002).
12. Note that employer contributions to employees' plans are treated as deductible from the personal taxable income rather than from corporate profits. While the main reason for this is to avoid the complications of dealing with corporate taxation, this is consistent with the notion that at least over a long enough horizon, the cost of employers' contributions is ultimately absorbed by employees in the form of lower wages.
13. The same age-income profile is assumed for all countries. The calculation of marginal tax rates also takes into account differences in family situations across ages. For each age group, the marginal tax rate is calculated as a weighted average of the marginal rates over three different family situations (single, two earners with no kids, one earner with two kids and two earners with two kids). Income tax brackets are implicitly assumed to be fully indexed to inflation.
14. The net wealth tax levied in a number of countries (Switzerland, Sweden, Norway, Luxembourg, Iceland, France and Finland) is not taken into account in the calculation of the implicit tax rate on accrued investment income. Such tax is generally levied on assets valued above a threshold set at a high level.
15. This is equivalent to assuming that 15 per cent of the shares held in the portfolio are sold every year. Admittedly, this is based exclusively on US observations (Burman and Ricoy, 1997).
16. Several of these assumptions are similar to those used the calculation of marginal effective tax rates on alternative saving vehicles in OECD countries (OECD, 1994). While it is the case that a relatively higher rate of return on shares would have been closer to reality, the focus here is on the differences in the tax treatment of the different assets included in the benchmark.
17. This may seem high considering that the government can usually borrow at the risk-free interest rate. On the other hand, a higher discount rate than the risk-free rate could be justified on the basis that in many cases, governments partly bear the risks of private pension arrangements. In any case, results based on a lower discount rate are reported below under the heading "Sensitivity analysis".
18. There are 16 countries where the difference between the marginal and average tax rates on the average production worker's (APW) salary is substantial (over 10 percentage points), reflecting the presence of zero brackets for low income. In such cases, the tax rate on benefit withdrawal is set at 5 percentage points below the marginal rate on APW.
19. An alternative interpretation would have been to assume that the value of the tax break is not saved but consumed, leading to an equivalent reduction in national saving. While this may be viewed as an extreme case, it is often implicitly assumed in the calculation of tax expenditures based on the cash-flow approach.
20. See Finance, Canada (2001) for the detailed illustration of measuring the cost related to the EET pension schemes.
21. Note that equation [2] can also be easily adapted to the cases where pension income is subject to a flat-rate tax.
22. Remember that consistent with the assumption of unchanged national savings, contributions to tax-favoured retirement savings plans comprise the tax subsidy ( $C \cdot t_c$ ) and personal (diverted) saving [ $C \cdot (1 - t_c)$ ]. Since the tax subsidy component would not



- have generated investment income in absence of the scheme, it is excluded from the calculation of revenue losses from accrued income.
23. The only difference with equation [3] is that, in the TTT regime, taxes are collected from the pension fund's investment income that accrues to "taxed" contributions –  $C(1 - 0.15)$  – rather than tax-free contributions ( $C$ ).
  24. In practice, without taking into account the tax-free threshold (partly due to the immature nature of the superannuation), the effective tax rate estimated at 12 per cent is used in estimating the RCW. The effective tax rate is measured by predicting the average tax payments that workers will pay on lump-sum pension after they contribute to the scheme for 35 years at the current contribution rate.
  25. For the purpose of presentation, a representative contributor is assumed to be at the youngest age in each age-group. For example, a contributor from the age-group 20-24 years old is assumed to be 20 years old, so his (her) contribution stays in the pension scheme for the next 45 years.
  26. In the case of Mexico, the estimated net cost would be higher if the flat rate subsidy per working day paid by the government to each contributor was taken into account, something which can not be easily done under the methodology followed.
  27. In Denmark, "real" capital gains from equity investment are taxed. As a result, the revenue foregone on accrued income is reduced as the inflation component of investment return is tax exempt. Australia and Ireland are other countries that taxes only "real" capital gains.
  28. In New Zealand, the tax treatment of pension plans and other forms of savings is essentially the same except that accrued income is taxed at a flat 33 per cent in the case of pension, whereas it is taxed at the relevant marginal tax rate in the case of non-pension savings. However, in both cases, dividend imputation credits are applicable, hence differences in taxation are likely to be minimal.
  29. Also the calculation for Mexico ignores the fixed government contributions (2.44 peso per day of work) to individual accounts, partly owing to the technical difficulty in quantifying its impact. In any case, considering that private pension savings are mandatory in Mexico and that the government guarantees the minimum pension benefit, it is not clear that this fixed contribution should be included in the calculation of revenues foregone from individuals' contributions.
  30. The details of the calculation of these effective tax rates are exposed in Annex I of Yoo and de Serres (2004).
  31. The RFAI in Norway (which levies a tax rate of 28 per cent on investment income) is larger than that in Finland (which levies a tax rate of 29 per cent on investment income). This is because the marginal income tax rate faced by each age-group tends to be higher in Finland than in Norway, and therefore post-tax savings (to which income accrues) and the accrued income are smaller in Finland.
  32. The generalised social contribution (CSG, 7.5 per cent), the social security deficit contribution (CRDS, 0.5 per cent) and social levy (2 per cent) are levied on all types of capital income.
  33. Detailed results on the net tax cost by age group and components are reported in Yoo and de Serres (2004).
  34. The box plot shows the median OECD value of the net tax cost per dollar of contribution, the second and third quartiles of the cross-country distribution (the edges of each

box), and the extreme values (the two whiskers extending from the box) for each age-group. Dots identify outlier observations.

35. For instance, governments risk losing tax revenues in the case of under-funded pension plans. Also, in some countries, employment-based pension plans are guaranteed by government-backed agencies.
36. Exceptions are France, Japan and Luxembourg. While Luxembourg is a TET, the rise of the net tax cost in France and Japan comes essentially from higher revenues foregone on accrued income, compared with revenues collected on withdrawals (Table 3).
37. However, the relationship between the difference between the discount rate and the rate of return and the reduction in the net tax cost is not linear.
38. See Dusseault and Skinner (2000). The authors argued that with asset invested in IRAs accumulating at a rate of return higher than the discount rate used by the government, the present value of future tax withdrawals exceed revenues foregone on contribution by a large amount. The assumption of a lower discount rate in the case of personal plans (such as IRAs) can be more easily justified given that the risks involved for the government are in principle much lower. However, revenues foregone from the non-taxation of accrued investment income were not taken into account.
39. This also implies that a rise in the real rate of return would raise the RFAI by 1 cent, as the tax system does not distinguish between the components of the nominal return.

*Annex*

**Marginal Income Tax Rates by Family Status**

The marginal tax rates faced by contributors depend on their family status, as workers with dependents tend to receive tax relief in terms of allowance or tax credits. In order to derive the marginal tax rates adjusted for family status, it is assumed that the family status of participants in private pension schemes in the US is broadly the same as that of participants in other countries except the UK in which information is available. This is because the family status of participants in private pension schemes is not available in most of OECD countries. The final weight in all OECD countries except the US and the UK is then measured by taking into account both the country-specific family status of workers and the US family status of participants. Table A1 reports the family status of participants in private pension schemes in the US and UK.

**Table A1. Family status of participants in private pension schemes**  
I. United States

A. Share of workers in each family status				
Age groups	Single earner (A1)	Married/sole earner (A2)	Married/2 earners (A3)	All earners (A = A1 + A2 + A3)
19-24	72.7	4.9	22.3	100.0
25-29	72.7	4.9	22.3	100.0
30-34	40.4	13.9	45.7	100.0
35-39	40.4	13.9	45.7	100.0
40-44	40.4	13.9	45.7	100.0
45-49	33.5	18.3	48.2	100.0
50-54	33.5	18.3	48.2	100.0
55-59	33.5	18.3	48.2	100.0
60-64	35.8	38.9	25.3	

B. Percentage of workers participating in any tax-deferred plan, 1977				
Age groups	Single earner (B1)	Married/sole earner (B2)	Married/2 earners (B3)	All earners (C)
19-24	28.1	44.8		34.8
25-29	28.1	44.8		34.8
30-34	52.0	56.4		57.9
35-39	52.0	56.4		57.9
40-44	52.0	56.4		57.9
45-49	58.5	61.4		64.0
50-54	58.5	61.4		64.0
55-59	58.5	61.4		64.0
60-64	35.3	39.8		41.5

C. Weight across family status of participants in pension savings				
Age groups	Single earner (D1 = A1*B1/C)	Married/sole earner (D2 = A2*B2/C)	Married/2 earners (D3 = A3*B3/C)	All earners (D = D1 + D2 + D3)
19-24	58.7	6.3	35.0	100.0
25-29	33.5	3.6	62.9	100.0
30-34	34.5	12.9	52.7	100.0
35-39	34.5	12.9	52.7	100.0
40-44	34.5	12.9	52.7	100.0
45-49	32.2	18.4	49.4	100.0
50-54	32.2	18.4	49.4	100.0
55-59	47.2	27.1	25.7	100.0
60-64	30.5	37.3	32.2	100.0

Table A1. Family status of participants in private pension schemes (cont.)

2. United Kingdom

A. Share of workers in each family status				
Age groups	Single earner (A1)	Married/sole earner (A2)	Married/2 earners (A3)	All earners (A = A1 + A2 + A3)
19-24	78.1	2.2	19.7	100.0
25-29	34.5	9.0	56.5	100.0
30-34	34.5	9.0	56.5	100.0
35-39	34.5	9.0	56.5	100.0
40-44	34.5	9.0	56.5	100.0
45-49	34.5	9.0	56.5	100.0
50-54	34.5	9.0	56.5	100.0
55-59	30.6	19.5	49.9	100.0
60-64	30.6	19.5	49.9	100.0
B. Percentage of workers participating in any tax-deferred plan, 1977				
Age groups	Single earner (B1)	Married/sole earner (B2)	Married/2 earners (B3)	All earners (C)
19-24	28.1	44.8		34.8
25-29	55.3	58.9		61.0
30-34	55.3	58.9		61.0
35-39	55.3	58.9		61.0
40-44	55.3	58.9		61.0
45-49	55.3	58.9		61.0
50-54	55.3	58.9		61.0
55-59	35.5	39.8		41.5
60-64	35.5	39.8		41.5
C. Weight across family status of participants in pension savings				
Age groups	Single earner (D1 = A1*B1/C)	Married/sole earner (D2 = A2*B2/C)	Married/2 earners (D3 = A3*B3/C)	All earners (D = D1 + D2 + D3)
19-24	63.1	2.8	34.1	100.0
25-29	31.3	8.7	60.0	100.0
30-34	31.3	8.7	60.0	100.0
35-39	31.3	8.7	60.0	100.0
40-44	31.3	8.7	60.0	100.0
45-49	31.3	8.7	60.0	100.0
50-54	31.3	8.7	60.0	100.0
55-59	26.2	18.7	55.1	100.0
60-64	26.2	18.7	55.1	100.0

Source: British Household Panel Survey (1998).

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