

# Funding in Public Sector Pension Plans - International Evidence<sup>1</sup>

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## Abstract

Most countries have separate pension plan for public sector employees. The future fiscal burden of these plans can be substantial as the government usually is the largest employer, pension promises in the public sector tend to be relatively generous, and future payments have to be paid out directly of government revenues (pay-as-you-go) or by funded plans (pension funds) which currently tend to be seriously underfunded. The valuation and disclosure of these promises is all too often less than transparent, which may be hiding potentially huge fiscal liabilities that are being passed on to future generations of workers.

In order to arrive at a fair comparison between countries regarding the fiscal burden of their DB public sector pension plans. This paper gathers more evidence on public sector pension plans regarding the type of pension promise and quantifies the future tax burden related to these pension promises. We have estimated for a number of plans from a sample of OECD countries the size of the *net unfunded liabilities in fair value terms end of 2008*. This fiscal burden can also be interpreted as the implicit pension debt. We find that Finland, UK, France and Germany rank the highest as to the *net unfunded liabilities* as percentage of GDP. The *net unfunded liabilities* in the Netherlands (ABP and PfZW together), Canada (only public servants) and Sweden are low due to the relatively high funding levels in their funded plans. The United States (all state and local plans) and Norway show up in an in-between position.

## Section 1. Introduction

In many countries the sustainability of fiscal policies is being questioned. A major driving force of this growing concern is age-related expenditure, such as health care and social security spending (public pensions). A sometimes overlooked reason for the sustainability problems, however, involves the pensions for government employees. In most countries there are separate pension plans for public sector employees. Traditionally, these specific arrangements are justified because they guarantee the security, integrity and independence of the employees and because they contribute to the attractiveness of a career in the civil service<sup>2</sup>. General findings from research indicate that compared to pensions in the private sector, public sector pensions tend to offer more generous terms and feature lower funding levels (Palacios and Whitehouse 2006).

Reforms have been undertaken in many countries. These reforms have been oriented at bringing remuneration practices in the public sector more in line with those found in the private sector. Such reforms have generally involved lowering the generosity of public-sector pension scheme (e.g. Finland, France, Germany, Italy, Portugal, and Sweden). In some countries public sector workers have been transferred to the main public pension system (e.g. Austria, Chile, Czech Republic, Greece, Hungary, Mexico, Poland, Spain, and the United States), which in some cases include a fully-funded, defined contribution component (e.g. Chile, Denmark, Hungary, Mexico, and Poland). In addition, initiatives have been taken in a number of countries to introduce some degree of prefunding of public sector pensions via the establishment of reserve funds (e.g. Australia, Belgium, Finland, Germany, Ireland, Italy, and Sweden).

Pre-funding implies that, in principle, the costs of pension promises are borne when those pension promises are accrued. In some countries, public sector DB schemes are pre-funded, but in other countries, public sector DB schemes are financed on a pay-as-you-go basis or deeply underfunded. On the liability side, sometimes benefits are not provisioned for at all in the public sector balance sheets. Those benefits that are accounted for in public sector balance sheets are not necessarily comparable to those provisioned for in the private sector as the assumptions employed may not use market-level discount rates, comparable longevity estimates or do not take into account the effect of future salary increases on benefits that have already been accrued. On the asset side, contribution levels are not necessarily sufficient. Finally, underfunding may persist for a long time in view of lax solvency regulations.

The funding practice of public sector plans has received increased attention in the United States, where US state governments offer their employees defined benefit pension plans. These pensions are generally pre-funded to a high extent. A recent study (Novy-Marx and Rauh 2009), however, reports that the market-valued underfunding of the pension liabilities of the state pension funds amounts on average to 24% of gross state product at the end of 2008.

This study provides a survey of public sector pension plans outside the United States. In particular we are interested in public sector pension funds and their funding status. The

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<sup>2</sup> Pensions are an important component of total remuneration. Pensions may therefore help to explain that generally spoken gross wage pay in public sector is lower than in the market as the higher pension entitlements in the public sector compensate for gross wages differences (Disney *et al.* 2009).

calculations show that public sector funded DB plans outside the United States also tend to be underfunded..

The set up is as follows. Section 2 provides an overview of public sector pension plans in OECD countries. Section 3 examines specific public sector pension schemes in detail, describing the plan rules and financing mechanisms.

In Section 4 which deals with the funding position of public sector pension funds, the valuation method for liabilities is a key issue for this topic. We report the funding positions of different plans using two alternative valuation methods, the actuarial and the economic approach. The plans generally tend to be underfunded. In order to put the underfunding in perspective, we compare in sections 5 and 6 the size of underfunding with the present value of future payments of unfunded plans.

The study stays away from the debate on whether and to what extent pension plans for public sector workers should be funded. There are various justifications for underfunding such public pension commitments. First, to the extent that funding risks can be smoothed over time as they can be shared with future generations of tax payers, underfunding in market value terms may be an optimal strategy (see e.g. Cui *et al.* 2010 and Munnell *et al.* 2010). Secondly, a funding surplus might also mobilize pressure to increase benefits which in turn leads on longer term to higher funding costs and so underfunding. So for taxpayers it is rational to aim at underfunding rather than full funding or overfunding. Moreover a funding surplus will enforce contribution cuts and once contributions are reduced, it is difficult to get them increased. The accountability horizon of pension fund management and politicians is much shorter than the horizon over which pension promises have to be met by adequate funding. This horizon gap may lead to forces to underestimate costs and risks and to overestimate the earning capacity of assets. Thirdly, to the extent that prefunding leads to investment in domestic government bonds, a circularity in government funding is creating, with little added value relative to a PAYG system.

At the same time, prefunding can be justified on various grounds, such as intergenerational tax smoothing and the benefits of diversification of pension fund investment, in particular into foreign markets. Furthermore, increases in life expectancy lead to a growing wealth transfer from private sector tax-payers towards public sector pensioners. The government's contribution rate to the special DB arrangements of public sector workers has to grow in line with life expectancy, although this increased cost may be partly shared with public sector workers. Ultimately, therefore, there is no clear answer on what the optimal level of funding should be for such special DB arrangements.

One key policy message from the study is that better disclosure and transparency is needed over the commitments made by governments to such arrangements. While general social security systems are under increased scrutiny, information on public sector arrangements is often partial or not readily available. An international debate should also be opened on how to compare these commitments internally, in order to assist the understanding of their fiscal impact. This paper is a first step in providing internally comparable data on such arrangements for a sample of OECD countries.

## **Section 2. Experience with Pension Plans for Government Workers in OECD Countries**

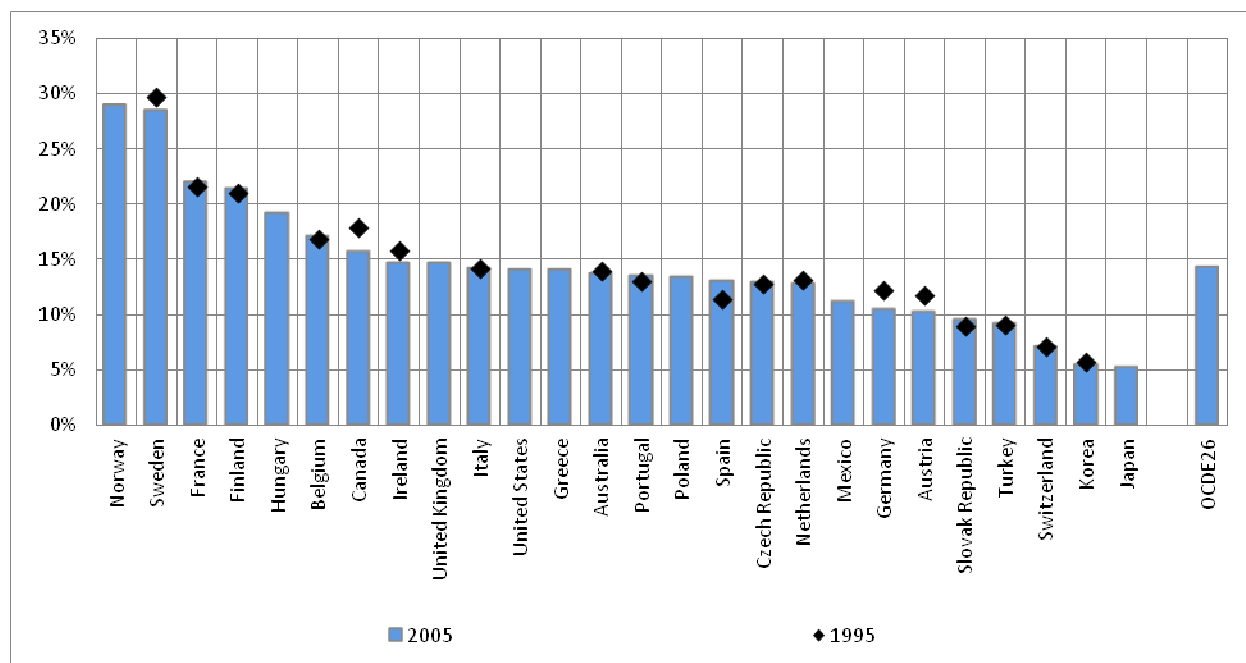
Pension promises for government workers are a major policy challenge for four main reasons. Firstly, the state is usually the largest employer in the country and hence it usually faces large commitments to provide pensions for its employees. Secondly, these pension promises, often in the form of defined benefit plans, tend to be relatively generous, especially when compared to private sector arrangements. In some cases higher pension promises have been made to make up for lower cash pay in the public sector, relatively to the private sector. Thirdly, these pension plans are in some countries underfunded or paid out directly of government revenues (pay-as-you-go financing mechanism). Fourthly, there is as yet no internationally standardised method of reporting public sector pension liabilities, as there is for exchange-listed private sector companies in most countries. The valuation and disclosure of these promises is all too often less than transparent, which may be hiding potentially huge fiscal liabilities that are being passed on to future generations of workers. This section and the next section discuss in turn of each of these issues.

### **2.1 Share of of government workers in total labour force**

As can be seen in Figure 2.1, government workers make up a substantial section of the labour force of many OECD countries, with the OECD average at close to 15% of the total. In Norway and Sweden, government employees accounted for nearly 30% of the labour force. In contrast, in Korea and Japan employees in the state sector accounted for about 5% of the total employees in each country.

If employees of state-owned enterprises are included, the level of labour force coverage increases by a few percentage points in most countries, compare figure 2.2. This figure also shows the change in the level of employment in general government and public corporations as a percent of the labour force in some countries between 1995 and 2005. This percentage remained relatively stable over this ten-year period, with the exception of Slovakia where the percentage dropped steeply.

**Figure 2.1 Employment in general government as a percentage of the labour force (1995 and 2005)**



Source: Government at a Glance 2009

Data revised for Germany (2005 instead of 2004) - Governmental source

Greece: data refers to 2006 - Governmental Source - Staff under private law has been taken into account

Ireland: Governmental Source

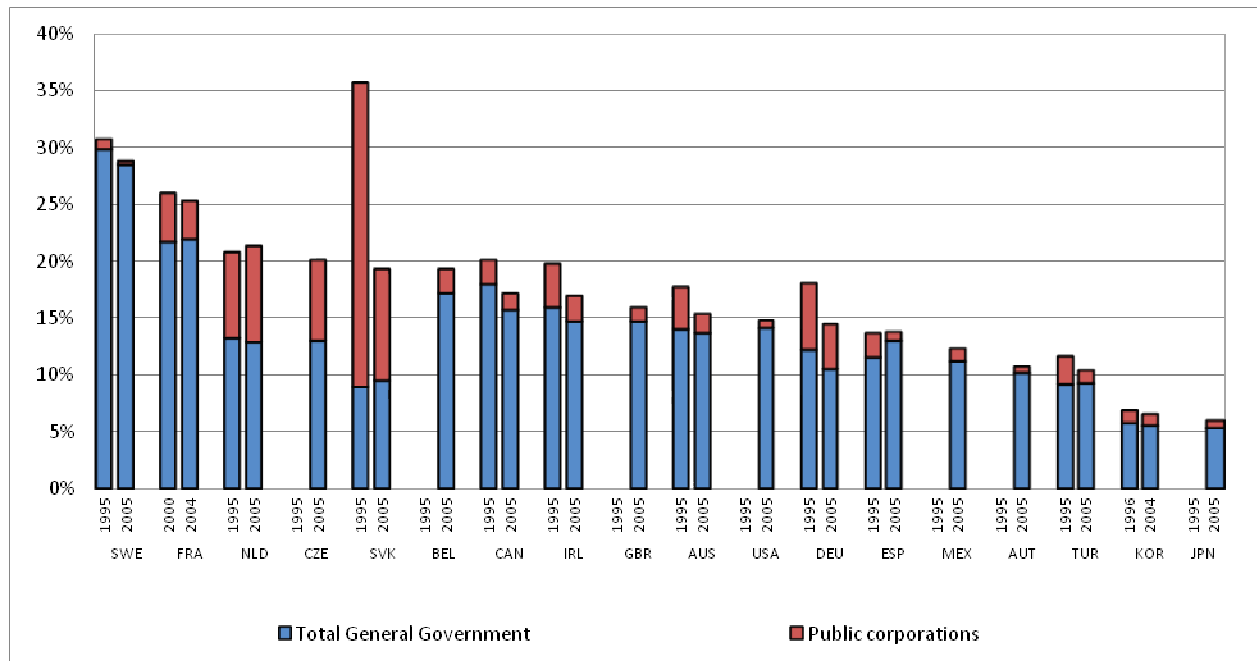
Source of the data for UK: National Statistics Office (FTE)

Data for Slovak Republic: ILO and OECD

Last data available for Korea: 2004

Portugal: data refers to 1996 instead of 1995. Data in 1996 not including Madeira Autonomous Region in Subcentral Government

**Figure 2.2 Changes in employment in general government and public corporations as a percentage of the labor force (1995 and 2005)**



Source: Government at a Glance 2009

Data revised for Germany (2005 instead of 2004) - Governmental source

Data for Slovak Republic: ILO and OECD

Ireland: Governmental Source

Last data available for Korea: 2004

## 2.2 Types of pension plans for government workers in OECD countries

Government workers' pension plans can be classified according to three key criteria. Financially speaking, the main distinction in the administration of government workers' pension arrangements is between funded and unfunded arrangements. Funded arrangements are those where an independent legal entity is established to hold pension plan assets on behalf of the plan members. Unfunded arrangements are financed directly out of the government's coffers, though there may be reserves set up which are the legal property of the employer (government). A third category may be considered, book reserved arrangements, where the sponsoring government recognizes a liability (debt) on its balance sheet which reflects the accrued pensions of its members.

A second classification is whether the pension plan is specific to government workers' or part of a broader arrangement, such as a national pension system. In the former case, it is also

important to know whether the plan substitutes for or complements the nationwide pension system.

Finally, pension plans may be classified into defined benefit (DB), defined contribution (DC) or hybrid pension arrangements. DB plans provide benefits that are ultimately guaranteed by the state as sponsor. In DC plans, by contrast, the government's cost is limited to a prespecified contribution rate and hence do not create any future fiscal liabilities.<sup>3</sup>

Following Pinheiro (2004), Palacios and Whitehouse (2006) and further research, we describe in Table 2.1 the main features of pension arrangements for public sector workers in OECD countries. The table states whether such workers are covered by the main, national social security arrangement and whether they have a special arrangement (substitute or complementary to the general social security system). It also describes the main features of these special pension arrangements. In particular, it describes the financing mechanisms (funded with legal entities set up to hold the assets on behalf of beneficiaries, unfunded schemes - though reserves may be built up – and book reserved plans) and the pension formula (DB or DC)..

**Table 2.1 Main features of pension arrangements for public sector workers in OECD countries**

Country	Are public sector workers covered by the general social security system?	Is the substitute or complementary plan for public sector workers DB or DC? Is it funded, unfunded or book reserved?
Australia	No, they are excluded from the mandatory DC system	The Australian Public Sector Superannuation Scheme (PSS), a book-reserved DB plan for employees of the central government, was closed in 2005 and replaced with a DC plan (PSSap) for new workers. Each State has its own plan for its employees, most of which are funded and based on either DB or hybrid pension formulas.
Austria	Yes	DB, unfunded
Belgium	No	DB, unfunded
Canada	Yes	There is an unfunded, DB pension plan for federal government workers. Provincial governments tend to offer specific, DB plans to their personnel. These plans are usually funded, though some are run under the book reserve system.
Chile	Yes, except military personnel. The mandatory pension system includes a fully-funded DC pillar.	There is no specific arrangement for public sector workers, except military personnel (unfunded, DB)

<sup>3</sup> Some DC systems, however, may involve contingent liabilities for governments if for example, the state provides or underwrites minimum return or pension guarantees.



Denmark	Yes	DC, funded
Finland	No, but the rules are the same as for private sector workers	There is an unfunded DB pension plan for central government workers (VaEL) and for local government workers (KuEL). Reserve funds have been established.
France	No	DB, unfunded, plus a complementary (voluntary) full-funded DC plan (Prefon)
Germany	No, although some employees are covered by the general system	Both substitute and complementary plans are unfunded, DB arrangements. A few states (e.g. Rhineland-Palatinate in 1996, Brandenburg in 2010) have set up reserve funds.
Greece	Yes	DB, unfunded
Hungary	Yes. The mandatory pension system includes a fully-funded DC pillar.	There is no specific arrangement for public sector workers.
Iceland	Yes	DC, funded
Italy	Yes	DB, unfunded
Japan	Yes	DB, unfunded
Mexico	Yes, for new public sector employees since 2007. Mandatory pension system includes a fully-funded DC pillar.	There is no specific arrangement for new public sector workers since 2007. Older workers are covered by an unfunded, DB plan.
Netherlands	Yes	There is a funded DB pension plan for government workers at all levels and education (ABP) and a funded DB plan for health care sector (PfZW).
Norway	Yes	DB, unfunded arrangements for central and local government workers.
Poland	Yes. The mandatory pension system includes a fully-funded DC pillar.	There is no specific arrangement for public sector workers.
Spain	Yes	Central government workers have both an unfunded DB and a funded, DC plan. Some regional governments (e.g. Basque Country and Catalonia) sponsor funded DB plans for their personnel
Slovak	Yes	There is no specific arrangement for

Republic		public sector workers.
Sweden	Yes	DB, unfunded arrangements for central and local government workers.
Switzerland	Yes	DB, funded arrangements for central and local government workers.
Turkey	Yes, except military personnel	There is no specific arrangement for public sector workers, except military personnel who are covered by a DB, funded plan (Oyak).
United Kingdom	Yes	There is an unfunded, DB plan for civil servants of the central government and a funded, DB plan for employees of local authorities (Local Government Pension Scheme).
United States	Yes, for most states and central government workers hired after 1983. Some states maintain arrangements that substitute for social security.	New U.S. federal civilian employees, first hired after 1983, are automatically covered by FERS, a three tiered system that consists of social security, a specific, unfunded DB plan and the Thrift Savings Plan which is a funded, DC plan. States and local governments offer mainly DB plans, which are often funded.

Most OECD governments, with few exceptions, offer special DB arrangements for public sector workers, which in most instances are complementary to the general social security system. These special DB plans create a pension liability for governments beyond that already reported in social security arrangements. Table 2.1 also shows that there are twice as many OECD countries with unfunded DB plans for public sector workers (14) than with funded DB arrangements (7).

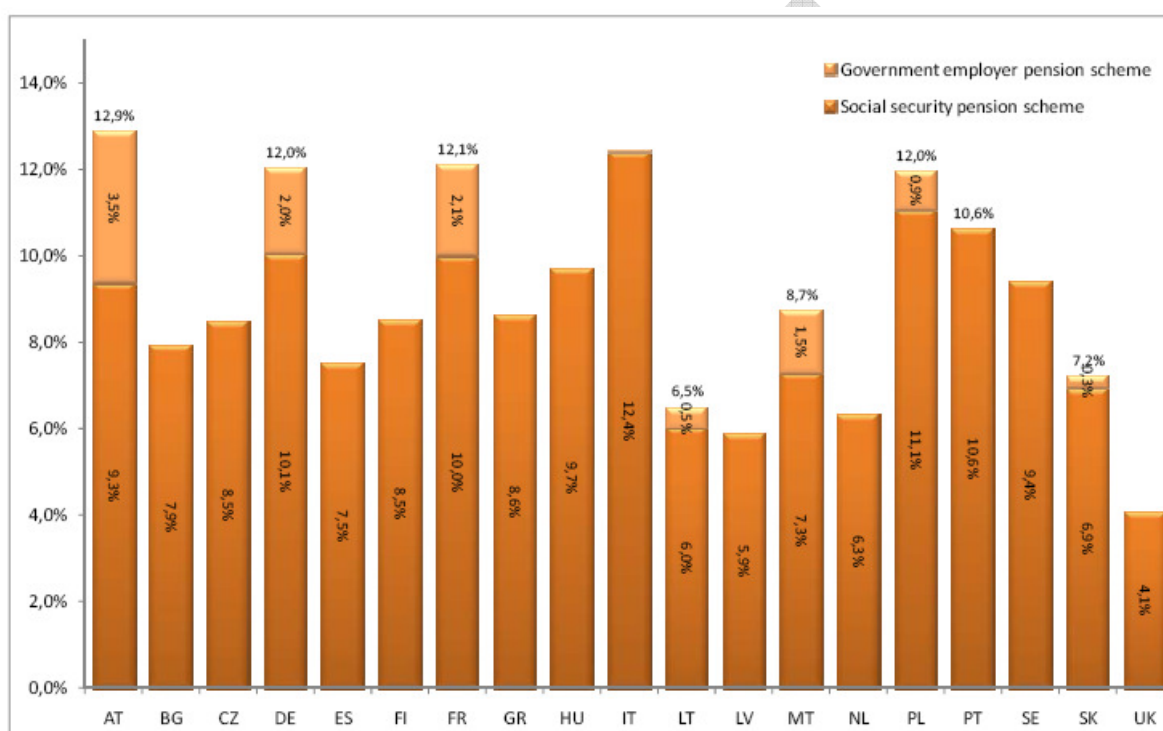
### 2.3 Pension expenditure and pension liabilities

Information regarding public expenditure on government workers' pensions is readily available for most OECD countries. However, international comparability is problematic because of the way the information is reported. The OECD's SOCX database, for example, reports pensions paid to former civil servants through autonomous funds as a private spending item (Australia (partially), Canada, Denmark, the Netherlands, Sweden and the

United Kingdom). All social benefits not provided by general government are considered ‘private’.<sup>4</sup>

A recent study by Müller *et al.* (2009) has collected information for selected European countries. In France and Germany, spending on pensions for public sector workers accounts for 17% of total public spending on pensions while in Austria it is 27%. The highest ratio of government workers’ pension expenditure to GDP is also found in these countries, as plans provide benefits that replace those of the standard social security system.

**Figure 2.3 Pension expenditure for government workers and social security compared (as % of GDP, 2006)**



Source: Müller *et al.* (2009)

Unlike that for private sector pension schemes (if sponsored by publicly-traded corporations), the reporting of government workers’ pension liabilities is not yet standardized internationally, although there is an ongoing initiative to do so by the OECD and the IMF via the so-called system on national accounts (SNA). Some countries, like Australia and Canada, already require their governments (at all levels) to report their unfunded pension liabilities for their employees as a liability on the government’s balance sheet (turning them into book

<sup>4</sup> This is in line with SNA (1993), para 8.63 states: “... Social insurance schemes organized by government units for their own employees, as opposed to the working population at large, are classified as private funded schemes or unfunded schemes as appropriate and are not classified as social security schemes. ...” In practical terms, for pension payments to former civil servants to be classified as private, these payments have to go through autonomous private funds (*e.g.* separate pension and/or insurance companies), for which the government does not make up the deficit on a regular basis (*e.g.* in practice benefit schemes which are defined contribution plans). Non-autonomous pension schemes (including pension benefits paid directly from the government budget) remain institutionally in the government sector.

reserve arrangements). By making these debts explicit, these governments formally quantify and acknowledge the future commitments that they are responsible for.

The next section of this paper examines some specific public sector pension plans in several countries in attempt to highlight in more detail some of the broad concerns identified above.

## **Section 3. Examination of Individual Public Sector Pension Schemes**

### **3.1 Introduction**

The prior section of this paper highlighted some high-level policy challenges that are facing public sector pension schemes, namely the large size of the government as an employer in most countries, the relative generosity of pension promises in public sector schemes relative to private sector schemes, and the funding and disclosure of public sector pension obligations.

This section looks in detail at specific pension schemes for public sector workers in a number of countries in order to identify how the broad-level issues discussed above impact individual schemes. Table 3.1 provides comparative data obtained from a number of public sources, mainly web-sites, annual reports (either 2008 or 2009 depending on availability) and official statistics. We primarily selected OECD countries where there are special DB arrangements for public sector workers, both funded and unfunded.

Some countries such as Australia, Canada and the United Kingdom are characterised by a large number of individual schemes from various employers in the public sector, whereas other countries such as the Netherlands, the Nordic countries and France are characterised by large and harmonised centrally administered schemes. In most of the countries we examined, countries have pension schemes for their federal employees that are separate and distinct from the pension schemes of other public sector employees, although in the Netherlands this is not the case.

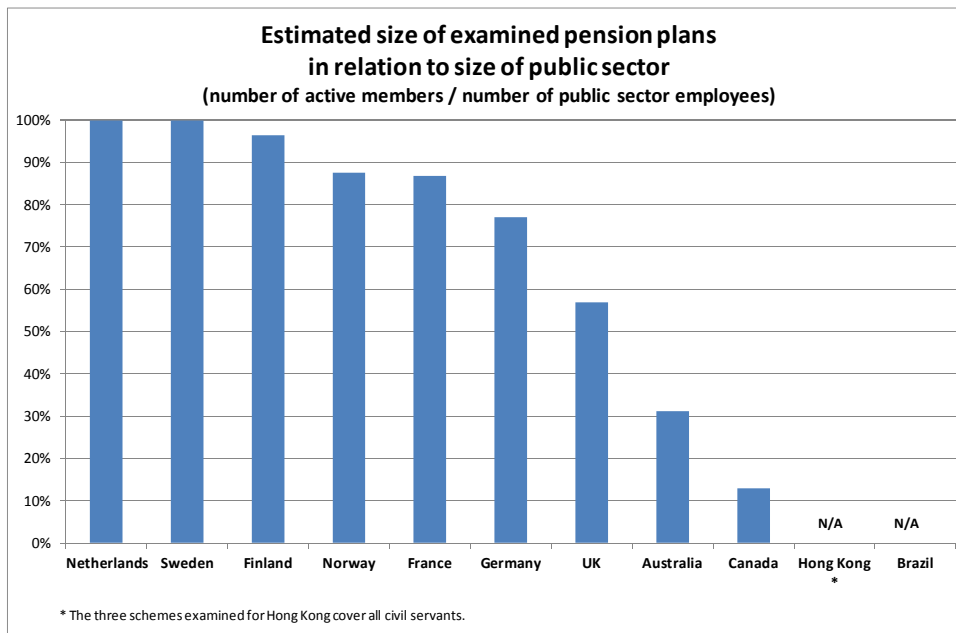
This report examines only a few public sector pension schemes in each country. In the countries with the large centralised public schemes (for example, the Netherlands, the Nordic countries and France), this means that a large portion of the public sector has been covered. In the countries with many individual plans (such as Australia, Canada and the United Kingdom), the report covers a smaller portion of the public sector. Figure 3.1 below shows the portion of the public sector covered by the individual pension schemes examined. This has been measured as the total number of active members in the individual pension schemes examined in each country over the total number of each respective country's public sector employees.

**Table 3.1: Plans in consideration**

The pension schemes examined in detail in this report are shown below; the examined schemes covering federal pensions have been highlighted in the chart. (The pension schemes covering federal employees are the dark-shaded schemes.)

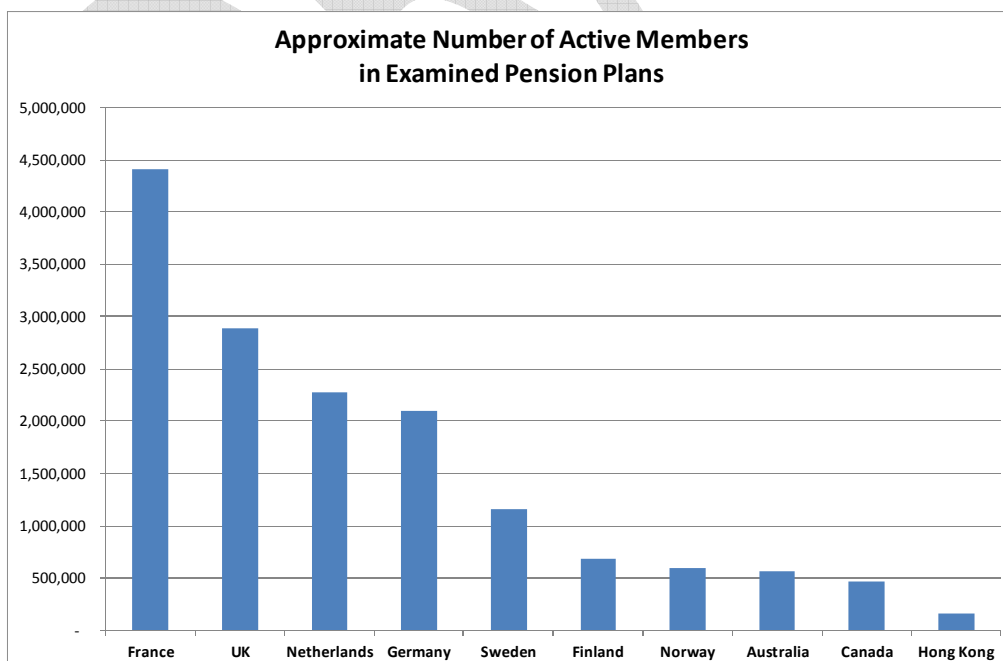
	Australia	Brazil	Canada	Finland	France	Germany	Hong Kong	Netherlands	Norway	Sweden	UK
<b>Number of plans examined</b>	5	0	2	2	3	1	3	2	3	2	7
<b>1</b>	Australia - Public Sector Superannuation Scheme (PSS) - for federal employees	#N/A	Canada OTP	Finland KuEL / KompPL (local govt employees)	France - CNRACL Caisse nationale de retraites des agents des collectivités locales	Germany Civil Servants Pension Plan	Hong Kong (China) Civil Service Provident Fund Scheme	Netherlands ABP	Norway - SPK - for federal employees	Sweden - SPV (federal employees)	UK Principle Civil Service Pension Scheme ("Nuvos")
<b>2</b>	Australia - Public Sector Superannuation Accumulation Plan (PSSAP) - for federal employees		Canada - Pension Plan for the Public Service of Canada	Finland VaEL / StaPL (federal employees)	France - Le Regime des fonctionnaires de l'Etat, de magistrats et des militaires Notes		Hong Kong (China) New Pension Scheme	Netherlands PGGM	Norway - Public Sector Pensjonskasser - for local govt ee's	Sweden - local government employees	UK NHS
<b>3</b>	Australia - The Commonwealth Superannuation Scheme (CSS) - for federal employees				France - Retraite Additionelle de la Fonction Publique		Hong Kong (China) Old Pension Scheme		Norway - KLP - for local govt ee's		UK Teachers' Pension
<b>4</b>	Australia - State Super SAS Trustee Corporation										UK Local Government Merseyside pension fund (1 of 99)
<b>5</b>	Australia - ESSSuper										UK Local Government West Yorkshire pension fund (1 of 99)
<b>6</b>											UK Local Government Greater Manchester pension fund (1 of 99)
<b>7</b>											UK Local Government West Midlands pension fund (1 of 99)
<b>Estimated size of pension plan in relation to size of public sector</b>	31%	Not available	13%	96%	87%	77%	100%	100%	88%	100%	57%
<b>Estimated size of pension plan in relation to size of public and private sectors</b>	Not available	Not available	3%	21%	18%	Not available	4%	31%	55%	30%	11%

**Table 3.1: Size examined pension plans**



The total number of active members varies greatly for the plans examined. The greatest number of active employees is in the French schemes examined at approximately 4.4 million members. The smallest number of active members is in the Hong Kong schemes examined at approximately 157,000 active members. The total approximate active membership of the schemes examined, grouped by country, is shown below:

**Figure 3.2: Active members in examined pension plans**



### **3.2 What is the Pension Promise?**

One of the policy challenges faced by public sector pension schemes is that they tend to offer relatively generous DB pension promises, when compared to private sector arrangements. Often higher pension promises have been made to make up for lower cash pay in the public sector, relative to the private sector.

The first question is what types of benefits are offered by the individual pension plans that have been examined. The individual pension schemes that we examined are mainly DB. The plans in Canada, France, Germany and Norway are final pay DB schemes, whereas the schemes examined in Finland, the Netherlands, and the UK are career average schemes. The plans examined in Australia, and Sweden are a combination of DB and DC. There are three Hong Kong scheme for federal employees: Those members that joined after 1 June 2000 are covered by a DC scheme, whereas members who joined before then are covered by highest pay DB schemes.

Public sector employees in the French pension schemes for public sector employees are not eligible for the state social security pension scheme, so the public sector pension scheme must therefore cover any resulting shortfall. Most German civil servants are also covered by schemes that replace the general social security system. The pension schemes examined in Canada, Finland, and Norway are integrated with the state social security pension scheme. The pension schemes examined in Hong Kong - China, the Netherlands, Sweden and the United Kingdom are distinct and complementary to the state social security pension scheme.

The second question is how do the individual schemes examined compare to pension schemes offered in the private sector in the various countries. In Australia, Canada, France, Germany, Hong Kong - China, Netherlands, and the United Kingdom, the schemes examined offer more generous pension benefits than what is typical practice in the private sector. In Finland, the schemes give similar benefits to those found in the private sector. In Norway, the level of benefits is similar to that typically offered by large and mid-size employers. Small Norwegian employers, however, tend to offer significantly less generous DC schemes due to the government-mandated minimum pension level that was introduced in 2006. In Sweden, the scheme examined gives slightly less generous DB benefits than the scheme that covers most private white-collar workers; although the public sector scheme is more generous than the DC scheme offered to most private sector blue collar workers.

The question as to how the relative more generous level of benefits in the public sector is offset by lower levels of cash compensation has not been explored in this paper, but could be the subject of further research (compare Disney et al. 2010 for a recent study for the UK).

**Table 3.2: Overview public sector pension plans across countries**

	Description of plans	Is the pension promise complementary to the (PAYG) social security benefit or standalone?	How different is the pension promise from that of private sector workers in the country?
<b>Australia</b>	The schemes are a combination of DB and DC.		Private sector employees in Australia typically have DC schemes.
<b>Brazil</b>	#N/A	#N/A	#N/A
<b>Canada</b>	final average pay	Partially integrated with CPP.	This plan provides typical benefits for the public sector, but is more generous than what would typically be found in the private sector.
<b>Finland</b>	career average pay	Integrated	This plan provides typical market practice benefits.
<b>France</b>	final salary plan	This plan replaces the state pension which targets 50% of average pay over 25 years.	This pension is more generous than the private sector.
<b>Germany</b>	final salary plan	Standalone	This pension is more generous than the private sector.
<b>Hong Kong</b>	There is a DC plan for members joining in 2000 and after. Members that joined before 2000 are in separate highest pay DB schemes.	Complementary benefit to the first pillar but standalone	This pension is more generous than the private sector.
<b>Netherlands</b>	career average pay	Mainly standalone	The ABP plan is on the more generous side of what is typical market practice in the Netherlands.  Most employees are covered by DB plans that are final average or career average. In most career-earning plans, the accrual rate is 1.75% to 2.00%.



<b>Norway</b>	typically 66% to 70% of final pay after 30 years of service, including state pension	fully integrated with the state pension	Similar to private sector DB plans in Norway. Private medium and large established companies in Norway will have DB plans of this level. Smaller private sector companies are likely to have the mandatory minimum level DC which is significantly less generous.
<b>Sweden</b>	The main plan is both DB and DC. The DB component is a final average pay plan.	complementary	This scheme is similar, but gives somewhat less generous DB retirement benefits than the DB scheme for most white-collar workers in Sweden. Blue-collar and younger white collar workers have a DC scheme.
<b>UK</b>	career average pay for new scheme final pay for the closed premium and classic schemes	complementary to the state basic pension	This pension is much more generous than the private sector.

### 3.3 Disclosure

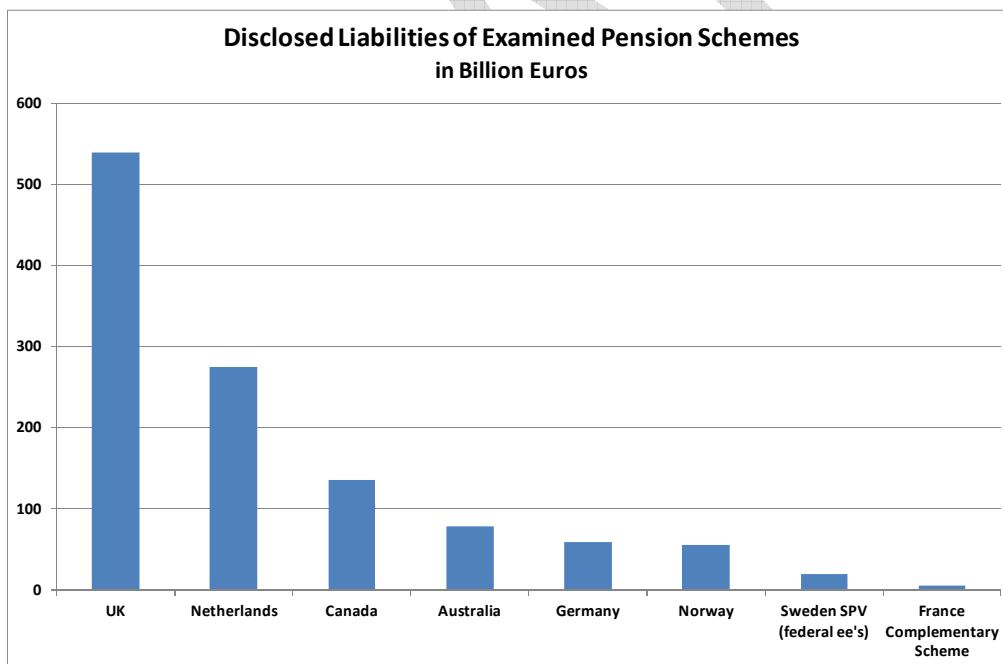
Most of the plans examined appear to have disclosed their full liabilities, either in the financial statements of the employer or the state (for the plans covering federal employees). Full disclosure seems to be provided for by the pension schemes examined in Australia, Canada, Germany, the Netherlands, Norway and the United Kingdom as does the complementary pension scheme for public sector workers in France and the Swedish plan for federal employees. The total disclosed liabilities of the pension schemes examined in these countries, and in Finland and Sweden where partial disclosure is practiced, is shown in the chart below. It should be noted that these pension liabilities have been determined using the regulatory requirements in each respective country, and are therefore not directly comparable. Therefore, the chart below is only intended to give a very general and relative order of magnitude of the size of the liabilities for these schemes.

The main schemes for French public sector workers and the public sector DB schemes are financed on a pay-as-you-go basis and no liabilities are publicly disclosed.

In Sweden, the liabilities for the SPV plan for federal employees appear to be fully disclosed in the Swedish State's financial statements<sup>6</sup>. For the plans covering Swedish local government employees, the story is a bit more complicated. Pension obligations that relate to pension promises accrued by employees after 1997 are accounted for on the balance sheet, unless they have been insured away. According to Statistics Sweden, total pension obligations for the Swedish local government pension schemes amount to 60.6 BSEK as of 31 December 2009 (xxx BEUR). However, the local governments can choose whether or not to disclose pension obligations related to pension promises accrued until 1997 and most local governments do not provision for these pre-1997 liabilities in their balance sheets. As of 31 December 2009, the value of undisclosed pension liabilities for the local governments amounted to 344.1 BSEK (xxx BEUR).<sup>7</sup>

The Finnish plans, KuEL for local government employees and the VaEL for federal employees are partly financed on a pay-as-you-go basis. The KuEL plan for local government employees is financed on a pay-as-you-go basis, although a fund was set up in 1988 to cover annual costs on a short-term basis. The VaEL plan for federal employees established a buffer fund in 1990. Annual expenditures are paid for out of the national budget, and then 40% of those expenditures are reimbursed by the buffer fund. Assets will continue to be accumulated in the buffer fund until 25% of the total liabilities of the VaEL plan is pre-funded.

**Figure 3.3**



<sup>6</sup> The liabilities that are financed on a pay-as-you-go basis in the Swedish local government pension plan are not disclosed in the local government financial statements, but Statistics Sweden publishes the associated liability figure each year.

<sup>7</sup> Statistics Sweden, "Statement of accounts for the municipalities and county councils 2009. Preliminary data from profit/loss statements and balance sheets", 26 April 2010.

## **Section 4. Funded public sector pension plans**

### **4.1 Introduction**

This section presents evidence on financial aspects of funded defined benefit (DB) plans in the public sector for a number of countries. It is clear from the previous sections that unfunded plans are dominant in the government sector in certain countries, however discussion on plan reforms may stimulate the transition to funded plans (compare for example Maurer *et al.* 2009 for Germany and for the United Kingdom the Public Sector Pensions Commission 2010).

This section starts with a comparison of a number of funded DB plans for three different methods of valuation of liabilities. We find that funded plans generally tend to be underfunded and we discuss a number of arguments why this may be the case. To put underfunding in perspective, we compare the size of underfunding in funded plans with the financial obligations captured in unfunded plans of a number of countries.

### **4.2 Funding and methods of valuation of liabilities**

Participants in a DB plan typically accrue pension rights based on years of service, annual accrual rate and wage income over the career. The accrued rights give prospect on a stream of annual pension payments as of retirement age. These payments may be indexed for some reference variable, for example price inflation or wage growth. A pension fund accounts for the future pension payments by reporting the size of the pension liabilities. The liability of a pension plan essentially is the discounted value of this stream of future pension cash flows to the present. There has been a debate on which method of discounting is appropriate in valuing pension liabilities (Exley *et al.* 1997, Bader and Gold 2003, Kortleve *et al.* 2006, Waring 2009). For a long time the actuarial method has been dominant, but since the nineties of the previous century the economic approach based on fair valuation principles increasingly substitutes for the actuarial method. The private sector for the most part no longer utilizes the actuarial method for disclosure purposes as internationally recognized accounting standards prescribe that companies have to report their pension obligations in fair value terms based on economic principles.

For public sector pension plans, there is a large variety in discounting practice. Both the actuarial and the economic method are in use. We discuss these methods in the following. We would like to stress that a valuation method for liabilities does not imply anything regarding the level of funding in funded plans.

## **Actuarial approach**

The actuarial method typically is grounded on conventions (“rules of thumb”) with respect to valuation and accounting issues. The valuation of pension liabilities usually is based on a fixed discount rate. This may be related to the assumed rate of return on assets as for example in the US. For the UK the discount rate is set equal to the sum of assumed inflation rate and some surcharge for the real rate of interest. The Netherlands used for long time a fixed discount rate of 4% for the purpose of both valuation and contribution rate setting. In the pension fund sector this fixed 4% has been interpreted as the assumed long term difference between the rate of return on assets (7%) and the wage growth rate (3%).

The main goal of the actuarial method is to arrive at stability in the reported funding ratio and the contribution rate. Risk may be recognized in the actuarial method, however prudence usually is taken into account by an upward adjustment of the assumed discount rate. The actuarial method has been criticized for an assumed representation of the solvency position of a pension fund, which may hinder a clear view on the funding obligations of the sponsoring stakeholders of the pension fund plan and that costs and risks related to pension promises tend to be underestimated.

## **Economic Approach**

The economic approach explicitly is oriented at transparency through market-based reporting on fair valuation principles. The main goal of the method is to make an objective analysis of the financial position of the pension fund and the implied risks in meeting the promised benefits.

Fair value implies that a pension fund’s liability has to be seen as a financial contract and has to be valued as a bond. Standard financial theory puts forward that future streams of payments have to be discounted at a rate that reflects their risk. As defined benefit plans generally aims to meet the promised pension payments in full, pension liabilities should be discounted at the risk-free rate corresponding with their term of payments. The risk-free rates for example may be derived from the yield curve for government bonds.

Compared to the actuarial method, pension liabilities will become much more volatile in the economic method as the actuarial fixed rate of discount is replaced by the actual yield curve prevailing in the market for government bonds. A main advantage of a market-consistent measure of the funding position is that plans would be deterred from offering additional benefits in response to supposed excess assets.

The scheme below highlights the main differences of the two methods on key aspects.

**Table 4.1: Comparison actuarial and economic approach on key aspects**

<b>Aspect</b>	<b>Actuarial Approach</b>	<b>Economic Approach</b>
<b>Valuation</b>	Assumed	Market consistent
<b>Risk</b>	Assumed, Smoothing	Actual, Explicit
<b>Aim</b>	Stability funding ratio and contribution rate over time	Transparency
<b>Main disadvantage</b>	Possible underestimation of costs and risks	Volatility Focus on short-term swings in the financial position of long-term DB promises.

### **Risk adjustment**

As stated before, financial economics puts forward that future cash flows should be discounted at a rate that reflects their risk. In contrast to the private sector, the government as entity has an infinite lifetime and moreover the power to tax. The risk free rate looks the appropriate discount rate for public sector pension benefits as one may assume that the government as sponsor always will fulfill all pension promises. Recently the public finance distress in Greece and other Southern European countries puts doubts regarding the creditworthiness of their governments. The fulfillment of public sector pension promises no longer can be taken for granted. The riskiness of future pension benefits can be taken into account by adding a risk premium above the risk free rate of interest, where the risk premium reflects the assessed default risk of countries and local governments to meet their public sector pension fund obligations (compare Novy-Marx&Rauh 2008 for a discussion of a number of methods). As the current high debt levels of governments have no precedent in the past, it might be a point of discussion how to translate government's default risk regarding public sector pensions into an appropriate risk premium.

An alternative approach is first to assess the overall – downside – risk in the funding process and subsequently to recognize that one or more of the stakeholders in the pension fund has to bear that risk, i.e. accumulated wealth ultimately falls short versus the promised pension payments. The risk bearing parties are either the plan participants or

the tax payers. Plan participants must absorb underfunding burden by a downward adjustments of their pension entitlements, for example by benefit cuts or increases in retirement age. When current and future tax payers are the risk bearing party, then tax increases are required to make up any shortfall in the funding process.

Effectively a pension fund can be interpreted as an institutional arrangement of embedded options. The balance sheet of a pension fund reads as follows: assets = present value pension liabilities plus residue. This can be rewritten in terms of the well-known put-call parity (Sharpe 1976)<sup>9</sup>:

$$\text{Assets} = \text{PV}[\text{Liabilities}] - \text{PV}[\text{Put}] + \text{PV}[\text{Call}]$$

where PV[Liabilities] reflects the present value of accrued pension benefits evaluated with the risk free rate of return, PV[Put] reflects the present value of underfunding at the end of the horizon into consideration (i.e. assets fall short of value liabilities), and PV[Call] the present value of overfunding (i.e. assets are in excess of value liabilities).

The value of the put, also known in the context of a pension fund as the ‘pension put’, can be interpreted as the present value of the maximal downside adjustment of pension liabilities. This maximum reduction will only be the outcome when the plan participants bear all downside risks, for example by cuts in their benefits proportional to underfunding. Downside risk may also be borne by current and future taxpayers. Then the put gives an indication of the present value of maximal future tax increases to close the shortfall in case of underfunding of the public sector pension fund.

### **Comparing public sector pension funds: which valuation method?**

Rather than opting for one specific method of valuation, we estimate the funding position of public sector pension funds for a number of specific methods of valuation. For sure each plan has its own good reasons for the choices made, however these differences in valuation hinder a comparison of the funding positions of public sector pension plans on equal terms. Government-sponsored pension funds may warrant valuation and funding methods oriented at long-term solvency considerations as the government has an infinite horizon and taxation power. This may motivate to opt for the actuarial method. However it also needs to be admitted that in a number of countries one may witness or expect serious cuts in pension promises to public sector workers. Fair valuation then gives an insightful view on the solvency position of public sector pension funds whereas the determination of the pension put provides an indication of the potential loss in accrued pensions.

The next section provides evidence on the funding positions of public sector pension funds as reported by the funds themselves as well as for two alternative valuation methods.

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<sup>9</sup> Compare Chapman *et al.* 2001 and Hoevenaars & Ponds 2008 for recent applications of embedded options approach for real existing pension funds.

### 4.3 Reported evidence on funding positions

Table 4.2 informs about the financial position of a number of pension plans of different countries end 2008 as reported by these schemes themselves. The appendix provides more detailed information. We also have added information about the relative size of the plan(s) in relation to the public sector in that specific country. All monetary terms are in euros. Assets are reported in market value. The value of the liabilities is determined by the discounting method. The information about the used discount method in the table shows up a large variety as to this aspect.

*The Netherlands* have two public sector plans, APB for the sectors government and education, and PFZW for the health care sector. Like all other pension funds in the Netherlands, the public sector pension plans in the Netherlands have to report the fair value of their nominal liabilities. The nominal liabilities are the accrued pension rights without taking into account future indexation. The supervision prescribes that the discount rates for the various terms have to be derived from the nominal swap rates curve<sup>10</sup>. End 2008 the swap rate corresponding with the duration of the liabilities for the two plans is 3.56%.

The *United States* is present in the table with the aggregate information on the value of assets and liabilities of all public sector plans (derived from Novy-Marx and Rauh 2009). The plans in the *United States* need to exploit the actuarial method as prescribed by the Government Accounting Standards Board (GASB). GASB 25 states that the discount rate should be based on “an estimated long-term yield for the plan, with consideration given to the nature and mix of current and planned investments...” (citation adapted from Munnell *et al.* 2010). For most plans this expected yield turns out to be equal to 8% or close to 8% (Novy-Marx and Rauh 2008).

The *Australian* plan also employs the actuarial method and applies a discount rate of 8%.

The public pension plan of *Sweden* uses a very low discount rate of 1.90% as the valuation method takes into account future indexation of the liabilities.

The *United Kingdom* public sector pension plans are partly unfunded and partly funded of nature. Unfunded plans cover civil servants, national health sector and teachers. The 99 plans of the local communities all are based on funding. The reported evidence in the table therefore only concerns these local funded plans. The evidence is twofold. The first row for the UK plans is information for one specific plan, the West Yorkshire. The second row is an *approximation* of the size of assets and liabilities for all 99 plans. The reported value of liabilities is based on a discount rate of around 3% (= 6% denominator discount rate minus 3% inflation rate). Cash flows are projected with an expected rate of inflation/indexation of 3% (approached by taking the between yield on long term gilts and the yield on inflation linked bonds). The denominator discount rate turns out to be equal to around 6%, determined as the sum of the long term gilt return plus assumed

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<sup>10</sup> The reason for the use of the swap curve instead of the yield curve of Dutch government bonds as proxy for the riskfree rates interest is that the swap market is more developed (more trade terms and many more participants) and so much less sensible for incidental market disturbances.

outperformance of assets over the gilt return, being 2% for assets relating to preretirement service and 1% for postretirement. On average this corresponds with a denominator discount rate equal to around 6%.

**Table 4.2: Reported evidence by plans in consideration**

Country	Plan	Assets	Liabilities	Funding Residue	Funding Ratio	Discount Rate	Discount Method
		<b>in bln euros end of 2008</b>					
Canada	Public Service (31 March 2008)	70.0	66.8	3.2	104.9%	6.00%	Actuarial approach
	OTTPF (2008)	62.1	68.6	-6.5	90.5%	4.00%	Quasi fair value
Netherlands	ABP (2008)	175.6	195.7	-20.1	89.8%	3.57%	Fair value
	PfZW (2008)	71.3	78.7	-7.3	90.7%	3.55%	Fair value
Sweden	federal (2008)	20.0	19.0	0.9	104.8%	1.90%	Fair value ??
UK [1]	WestYorkshire	4.4	5.5	-1.1	79.6%	6.00%	Quasi fair value
	Approx. all local government plans	317.8	542.1	-224.2	58.6%	6.00%	Quasi fair value
US [2]	All state and local plans	1374.3	2110.8	-736.5	65.1%	8.00%	Actuarial approach
Australia	CSS Super (31 June 2008)	3.0	32.0	-29.0	9.3%	7.54%	Actuarial approach
	ESS Super (31 Dec 2008)	8.5	13.8	-5.3	61.5%	8.00%	Actuarial approach

[1] UK has 99 local plans and approximation is based on the three biggest plans

[2] Data US derived from Novy-Marx and Rauh (2009)

#### 4.4 Funding positions for different methods of valuation

The previous section has clarified that funded public sector plans use different methods and assumptions for valuing future pension benefit cash flows. Differences could include discount rates, mortality tables, actuarial methods and disclosure practices. Such differences stem from historical reasons and regulatory practices, but unfortunately, these differences in valuation and disclosure hinder a comparison of the funding positions of public sector pension plans on comparable terms. In order to arrive at an approximation of more comparable funding levels, we revalue the reported pension liabilities for the pension schemes that we have examined in the different countries using the same valuation method. We have however, made no adjustment for differences in other assumptions such as mortality tables, whether or not future salary increases are included in the liabilities and the more, so our revaluation can only be considered as a very rough approximation of a more “comparable” set of funding levels.

The revaluation of the liabilities makes use of the following formula (compare Biggs 2010 and Novy-Marx&Rauh 2008 who also employ this revaluation trick):

$$L_{\text{variant}} = L_{\text{reported}} \left( \frac{1 + r_{\text{reported}}}{1 + r_{\text{variant}}} \right)^{\text{Duration}}$$

where  $r_{\text{reported}}$  stands for the discount rate as reported by the plans and  $r_{\text{alternative}}$  reflects the discount rate of the alternative valuation method.



The term duration in the expression measures the money-weighted average maturity of the benefit cash flows. The duration also roughly corresponds to the elasticity of value of the liabilities with respect to the rate of interest<sup>11</sup>.

The actual duration of the liabilities of a specific plan is determined by the composition of the terms of plan liabilities, however we assume for all plans that the duration of the liabilities is 15 years. Generally speaking this assumed duration of 15 years is a quite good approximation of the duration for most funded DB plans, but indeed a duration of 15 year is too high for a very mature fund and too low for a very young plan.

Table 4.3 displays four panels where each panel is subdivided into four different methods of valuation. We also price the put option for each plan. Additionally the panels A and B give information on the pension put.

The four panels are:

Panel A: Pension liabilities and pension put in billion Euros

Panel B: Pension liabilities and pension put as % GDP

Panel C: Funding ratios

Panel D: Pension fund residual as % of GDP

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<sup>11</sup> The change in the value of the liabilities  $\Delta L$  because of a change in the value or rate of interest  $\Delta r$  can be approximated with the following expression, with D as duration:  $\Delta L \approx -D\Delta r$   
Mismatch risk is the standard deviation of the growth rate of the funding ratio. The number of 10% reflects the thumb-of-rule knowledge of ALM professionals that a pension fund with a mix of 50% bonds and 50% equities, a duration of the liabilities of 15 years and a duration gap of 10 to 12 years has a mismatch risk of around 10%.

Each panel is subdivided to four different methods of valuation:

1. Reported:

Liabilities as reported by the individual schemes, based on local regulatory practice.

2. Fair value:

The “fair value” liabilities are our very rough approximation as to the liabilities of the individual schemes, determined using a market discount rate. This valuation method is inspired by the Netherlands<sup>12</sup>. As the market for government bonds in the Netherlands is quite limited in size and trading rates, the supervisor prescribes fair valuation has to be based on the nominal swap curve. We use the 30-years nominal swap rate as the market discount rate for nominal liabilities as the duration of a 30-years swap rate is about 15 years.

Table 4.4 informs on the 30-years nominal swap rates end 2008 for the different countries.

3. ER 8%:

The valuing of the liabilities is based on an assumed discount rate of 8% as proxy for the assumed rate of return on assets. This valuation method is inspired by the US case.

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<sup>12</sup> Pension funds in the Netherlands aim at indexation of accrued nominal benefits, however the granting of indexation depends on whether there is overfunding above the nominal value of pension liabilities. As indexation is uncertain and dependent on the funding position, Dutch pension funds need not to account for the indexation ambition explicitly.

**Table 4.3: Funding position of funded public sector pension plans evaluated for different methods of valuation liabilities**

panel A		Liabilities in Bln EUROS			
Country	Plan	Reported	Fair value	ER 8%	Pension Put
Canada	Public Servi	66.8	97.6	50.4	34.8
	OTTPF	68.6	75.4	38.9	21.1
Netherlands	ABP	195.7	195.7	104.4	50.7
	PfZW	78.7	78.4	41.8	19.7
Sweden	federal	19.0	16.4	8.0	1.2
UK	WestYorksh	5.5	8.1	4.2	5.5
	Approx. all l	542.1	795.9	409.5	230.3
US	All plans	2110.8	4444.3	2110.8	3070.0
Australia	CSS Super	32.0	60.7	30.0	57.7
	ESS Super	13.8	27.9	13.8	19.2

panel C		Funding ratios		
Country	Plan	Reported	Fair value	ER 8%
Canada	Public Servi	104.9%	71.7%	138.8%
	OTTPF	90.5%	82.4%	159.5%
Netherlands	ABP	89.8%	89.8%	168.2%
	PfZW	90.7%	91.0%	170.5%
Sweden	federal	104.8%	121.5%	250.7%
UK	WestYorksh	79.6%	54.2%	105.4%
	Approx. all l	58.6%	39.9%	77.6%
US	All plans	65.1%	30.9%	65.1%
Australia	CSS Super	9.3%	4.9%	10.0%
	ESS Super	61.5%	30.4%	61.5%

panel B		Liabilities as %GDP			
Country	Plan	Reported	Fair value	ER 8%	Pension Put
Canada	Public Servi	6.7%	9.8%	5.1%	3.5%
	OTTPF	16.4%	18.1%	9.3%	5.1%
Netherlands	ABP	32.1%	32.1%	17.1%	8.3%
	PfZW	12.9%	12.8%	6.9%	3.2%
Sweden	federal	5.6%	4.8%	2.3%	0.4%
UK	WestYorksh	0.3%	0.4%	0.2%	0.3%
	Approx. all l	28.9%	42.4%	21.8%	12.3%
US	All plans	20.9%	44.1%	20.9%	30.5%
Australia	CSS Super	4.4%	8.4%	4.2%	8.0%
	ESS Super	1.9%	3.9%	1.9%	2.7%

panel D		Pension fund residu as %GDP		
Country	Plan	Reported	Fair value	ER 8%
Canada	Public Servi	0.3%	-2.8%	2.0%
	OTTPF	-1.6%	-3.2%	5.6%
Netherlands	ABP	-3.3%	-3.3%	11.7%
	PfZW	-1.2%	-1.2%	4.8%
Sweden	federal	0.3%	1.0%	3.5%
UK	WestYorksh	-0.1%	-0.2%	0.0%
	Approx. all l	-11.9%	-25.5%	-4.9%
US	All plans	-7.3%	-30.5%	-7.3%
Australia	CSS Super	-4.0%	-8.0%	-3.8%
	ESS Super	-0.7%	-2.7%	-0.7%

**Table 4.4: 30-years swap rates**

Country	swap rate end 2008
Canada	3.35%
Finland	3.57%
Netherlands	3.57%
Sweden	2.91%
UK	3.32%
US [1]	2.77%
Australia	3.05%

[1] Swap rate US reached low at end 2008.

Swap rate US end 2009 was 4.56% and end June 2010 3.71%

Panel A of table 4.3 reports the absolute value of liabilities in euros which is strongly related to the size of the country.

Panel B expresses the liabilities as percentage of GDP. The highest values can be found in the Netherlands with fair value liabilities around 45% of GDP (sum of ABP and PfZW), the US with 44% and the UK 42%.

Panel C informs on the funding ratios for the three different valuation models<sup>13</sup>. For the valuation method based on an expected rate of return of 8%, the plans in Canada, the Netherlands, Sweden show up high funding ratios far above 100%. Even with this favorable discounting method, plans in the UK and the US are severely underfunded. The level of funding is much lower for the alternative, fair value valuation method. Most plans turn up in severe underfunding. The best funded plan is in Sweden with a funding ratio of 121%, whereas Australia and US have funding ratios with indexed liabilities around 30%.

Panel D finally expresses the pension fund residue (the difference between assets and liabilities) as percentage of GDP. These results can be interpreted as the implicit government debt comparable with the implicit debt position of unfunded plans. Underfunding implies that accrued pension rights are not matched full by adequate funding so that future tax payers have to step in by additional tax payments to fund the part of pension promises that are yet unfunded.

We also price the put option for each plan. The panels A and B give information on the pension put. We use the Black-Scholes formula. What is calculated is the pension put at the end of the 15-years period representing the present value of nominal underfunding at the end of this period. For all plans we apply the same assumptions: mismatch risk =

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<sup>13</sup> Funding ratio is defined as assets over liabilities: funding ratio = assets/liabilities. Funding residue is the balance between assets and liabilities; funding residue = assets -/ - liabilities.

10%<sup>14</sup>, risk free rate =3.5%, the ‘exercise price’ is the fair value of the nominal liabilities at the end of the horizon, the ‘spot price’ is the value of the assets at the beginning of the period. We apply also the important assumption that over the period of consideration of 15 years the following equality holds: contributions + paid benefits = new accrual + written-off liabilities.

The pension put has a strong relationship with the funding status. The lower the underfunding, the higher the put will be as the probability to end up in underfunding at the end of the evaluation period of 15 years will be larger. For the UK the pension put equals 12.3% of GDP. The US put is much larger as the degree of underfunding end 2008 is larger in the US than in the UK.

The panels C and D of table 4.3 make clear that generally spoken underfunding in public sector pension funds is rather the rule than overfunding, irrespective of the method used to value the pension liabilities. Note the pension put for the US as reported in panel B equals the pension put in panel D, implying the fair value underfunding of US plans is so deep that the probability that at the end of the horizon the US funds will end up with a positive residue is zero.

## **Section 5. Unfunded public sector pension plans**

The liabilities of unfunded public sector plans (either pay-as-you-go or book reserve) can be perceived as a kind of implicit government debt (Holzmann *et al.* 2004). The costs of pension promises are not borne by the generation that has granted them but have to be paid by later generations of taxpayers when they lead to actual pension payments. This section provides an estimation of the size of this implicit debt position for the plans in consideration in this paper.

### **Pay-as-you-go plans**

Some public sector pension schemes are financed on a pay-as-you-go basis. For these plans, no provision is made in the plan sponsors financial statements for any liability and benefits that come due are payable out of the plan sponsor’s general budget.

The implicit debt position in pay-as-you-go financed plans actually is equal to the present value of future benefits based on the pension rights acquired in the past service years of plan participants, so the debt position may be perceived as the Accrued Benefit Obligation (ABO) of an pay-as-you-go financed plan when this plan would be interpreted as a fictitious funded DB plan. In the following table, we have very roughly estimated the

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<sup>14</sup> Mismatch risk is the standard deviation of the growth rate of the funding ratio. The number of 10% reflects the thumb-of-rule knowledge of ALM professionals that a pension fund with a mix of 50% bonds and 50% equities, a duration of the liabilities of 15 years and a duration gap of 10 to 12 years has a mismatch risk of around 10%.

fictitious ABO of the pay-as-you-go financed plans<sup>15</sup>. For reason of comparing with the funded and book-reserved plans, the value of liabilities is calculated on a fair value basis (swap rate) and using a discount rate of 8%.

**Table 5.1 Liabilities in pay-as-you-go plans**

Pay-as-you go plans (predominantly)	Benefits 2008	Reported liabilities	Fair value liabilities		Liabilities ER 8%	
			bln euros	as % GDP	bln euros	as % GDP
<b>France</b> l'Etat, Magistrats. et Militaries	48	n.a.	1456	72%	775	38%
<b>Sweden</b> All except civil servants	n.a.	31	26.8	7%	14	4%
<b>Finland</b> Local (KuEL) and Federal (VaEL) (a) net of funded part	6	n.a	148	77%	79	41%

### Book-Reserved Public Sector Pension Schemes

Some public sector pension schemes finance their obligations using the book-reserve method. This means that the plan sponsor holds a provision in their balance sheet for the liabilities of the plan, but there are no assets that have been set aside in a pension fund to cover these obligations. Rather, as benefits become due, payments are made out of the plan sponsors general budget. Of the plans that we examined, those in Germany, Norway, the Swedish SPV scheme for Federal employees, and the UK schemes for civil servants, the NHS and teachers are financed via the book reserve method.

As was done for the plans with pension fund assets in the previous section, following are the liabilities of the book-reserved plans on the reported basis, the fair value basis (using a market discount rate), and using a discount rate of 8%:

<sup>15</sup> This estimation has been done using the annual benefit payments of the plans in recent years as reported by the plans themselves. For an accurate determination of the ABO, we also need to have knowledge first of the future cash flows based on accrued rights from past years of service, and secondly knowledge of the actuarial principles (e.g. mortality tables, career parameters) and the current composition of the scheme members regarding age and gender<sup>15</sup> as these aspects determine the present value factors needed to “translate” benefit cash flows into the Benefit Obligations. As we have no knowledge of future benefit cash flows nor of present value factors, we have to fall back on rules of thumb that can be derived from the practice of real-life public sector pension funds offering benefits of the same kind.

**Table 5.2 Liabilities in book-reserved plans**

Book-reserved plans (predominantly)	Benefits 2008	Reported liabilities	Fair value liabilities		Liabilities ER 8%	
			bln euros	as % GDP	bln euros	as % GDP
<b>Germany</b> All	48	n.a.	1504	58%	800	31%
Civil Servants	29	n.a.	918	35%	488	19%
<b>Norway</b> All	3	55	103	32%	55	17%
Federal (SPK)	2		62	19%	33	10%
<b>Sweden</b> Federal (SPV)	6	6	5	2%	2	1%
<b>UK</b> Civil Servants	4	119	157	8%	79	4%
National Health Service	5	218	262	14%	132	7%
Teachers	4	172	270	14%	137	7%
Sum	13	508	689	37%	351	18%

## Section 6 Net unfunded liabilities across countries

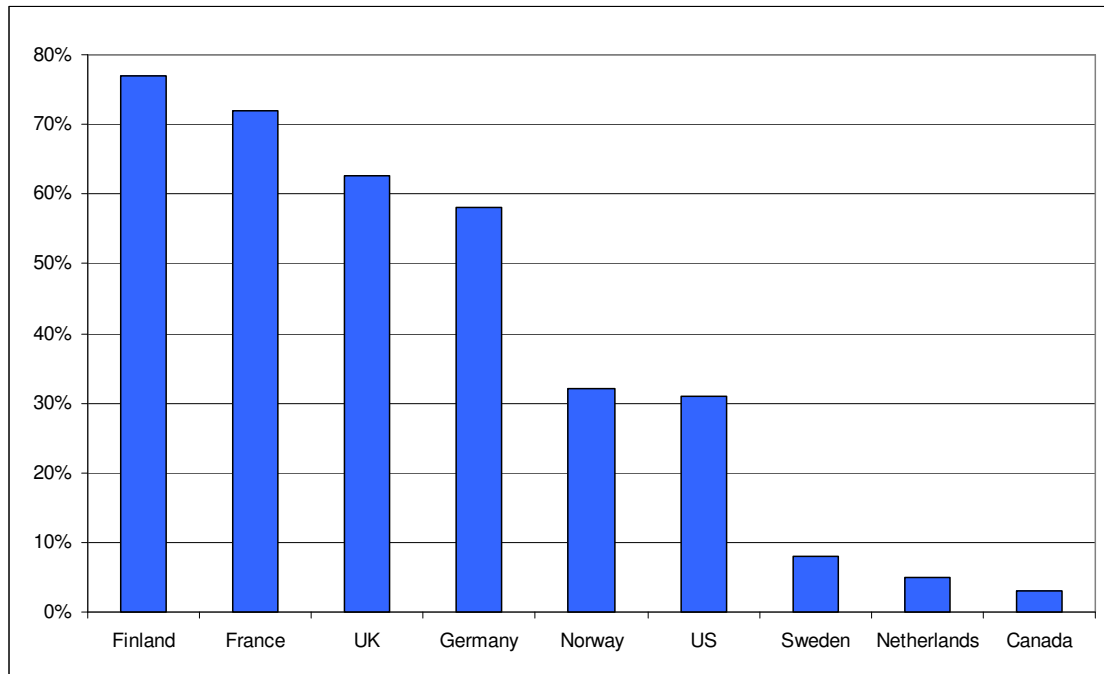
Funded pension schemes in principle reserve means to cover the future payments of promises when those promises are accrued. However, underfunding in funded plans could also be interpreted as implicit debt for future generations of tax payers. Underfunding implies that accrued pension rights are not matched in full by adequate funding now so future tax payers may have to step in to cover financial shortfalls. The residue position as percentage of GDP as reported in table 4.3, panel D can be interpreted as the implicit debt of future tax payers in funded plans. Table 4.5 in principle is the implicit debt position of the book-reserved scheme.

Figure 6.1 ties all information together of all plans we have considered per country in order to get perspective on the net unfunded liabilities on fair value base. Now we can compare the different countries as to the fiscal burden for future tax payers in one dimension. In principle this fiscal burden, this implicit pension debt, can be replaced by explicit government debt, when the governments would turn to the capital market and borrow the money to back all unfunded pension promises made in the past up to now to public sector workers.

Finland, the United Kingdom, France and Germany rank the highest. The *net* unfunded liabilities in the Netherlands (ABP and PfZW together), Canada (only public servants) and Sweden are low due to the relatively high funding levels in their funded plans. The United States (all state and local plans) and Norway show up in between.

The results are quite in line with other reports in this type of country comparisons (compare Muller et al. 2009, report of the Public Pension Sector Commission 2010, and report of the The British North-American Committee 2009).

**Figure 6.1: Net unfunded liabilities public sector plans on fair value base as % GDP (end of 2008)**



## Section 7 Concluding Remarks

Pension promises for government workers are a major policy challenge for four main reasons. Firstly, the state is usually the largest employer in the country and hence it usually faces large commitments to provide pensions for its employees. Secondly, these pension promises, often in the form of defined benefit plans, tend to be relatively generous, especially when compared to private sector arrangements. In some cases higher pension promises have been made to make up for lower cash pay in the public sector, relatively to the private sector. Thirdly, these pension plans are in some countries underfunded or paid out directly of government revenues (pay-as-you-go financing mechanism). Fourthly, there is as yet no internationally standardised method of reporting public sector pension liabilities, as there is for exchange-listed private sector companies in most countries. The valuation and disclosure of these promises is all too often less than transparent, which may be hiding potentially huge fiscal liabilities that are being passed on to future generations of workers.

The aim of this paper is to gather more evidence on public sector pension plans regarding the type of pension promise as well as a quantification of the future tax burden related to these pension promises. Most OECD countries have special pension arrangements for public sector employees. On average 15% of the labour force in OECD countries is covered by government sector pension plans. The plans differ as to their finance base (funding or pay-as-you-go or some kind of book reserving), the nature of the promise



(predominantly defined benefit plans, although some defined contribution plans also exist in some countries), and whether the plans are a complement to or a substitute for the country-wide public pension plans (the former is most common). We also find that government workers plans tend to be more generous than private sector plans, however Scandinavian plans offer similar benefits (and Swedish plans are actually less generous than private sector ones).

A fair comparison between countries regarding the fiscal burden of their DB public sector pension plans is hindered by the country-specific use of valuation and reporting methods. In order to arrive at such a fair comparison, we have estimated for a number of plans the size of the *net unfunded liabilities in fair value terms end of 2008*. This fiscal burden can also be interpreted as the implicit pension debt. We find that Finland, UK, France and Germany rank the highest as to the *net unfunded liabilities as percentage of GDP*. The *net unfunded liabilities in the Netherlands (ABP and PfZW together), Canada (only public servants) and Sweden* are low due to the relatively high funding levels in their funded plans. The United States (all state and local plans) and Norway show up in an in-between position.

The limitations of the study should be considered. In particular, we made a series of assumptions to calculate the fair value of liabilities (such as their duration) as detailed actuarial information on the plans surveyed is not available. Irrespective of the valuation method used (actuarial or fair value), calculations of funding ratios, the pension put, and net unfunded liabilities are also subject to the criticism that they are based on a given set of assumptions that may not represent accurately the long-term financial challenge faced by governments in meeting their pension commitments on an ongoing basis. For instance, the use of market discount rates, as in the fair value approach, incorporates the erratic and not always rational behavior of capital markets in the calculation of long-term pension commitments.

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