

Problems of PAYG Pension Scheme and Pension Reform

- A note on overseas experience and international guidelines

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Executive Summary

This note aims to provide a review on the disadvantages of a pay-as-you-go (PAYG) pension scheme, and key features of recent overseas pension reforms. It consists of five major sections. Firstly, it introduces different types of pension scheme and definitions of the key terms. Secondly it examines the disadvantages of a PAYG scheme including its sustainability problem of an economy with an ageing population, distortion on working incentives, increasing burden on next generation and accumulating implicit pension debt. Thirdly, it reviews the evolution of World Bank's multi-pillar pension framework. Fourthly, it summarises main features of pension reforms of overseas economies on their national pension as well as civil service pension schemes, such as deferring the pension age, downsizing pension benefits, and conducting a partial or entire shift from a defined benefit (DB) scheme to a defined contribution (DC) scheme. Lastly, it discusses the advantages of establishing a DC scheme as well as a pension fund.

The views and analysis expressed in the paper are those of the author and do not necessarily represent the views of the Economic Analysis and Business Facilitation Unit.

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1. Introduction

1.1 Germany was the first one to set up a mandatory pay-as-you-go (PAYG) pension scheme in 1889 (Lui, 1998). A PAYG scheme refers to a plan in which the current pension welfare of the elderly is financed by contribution from the current working population. A lot of economies followed to launch a PAYG pension scheme. Usually, pension benefits are calculated according to a formula based on the worker's wage, years of service and so forth. With a young population, this PAYG arrangement is politically attractive as the contribution rate is low and the current retired people could enjoy benefits immediately. However, such PAYG financing method brings many problems when the population is ageing. As such, these economies have carried out different reforms so as to enhance the whole pension system, especially its sustainability. Along with strong recommendation from an important World Bank report in 1994, defined contribution (DC) scheme has become more popular. At present, over 30 economies have established their mandatory DC scheme since 1980.

1.2 The objectives of this note are:

- i. to introduce different types of pension scheme and definitions of the key terms on this subject;
 - ii. to examine the main disadvantages of the PAYG scheme including sustainability problem, unfairness to future generation, distortion in the labour market, and accumulation of large implicit pension debt;
 - iii. to introduce the multi-pillar pension framework raised by World Bank and the policy recommendations on pension reforms;
- ◆ In response to the population ageing and the sustainability concern of the PAYG scheme, World Bank (1994) studied the framework of the World's existing pension systems in the mid-1990s and opposed the operation of a single PAYG pension pillar. World Bank strongly recommends that the whole pension system should be multi-pillar based (Holzmann, R. and Hinz, R., 2005; World Bank, 1994).

- iv. to summarise the main features of pension reforms implemented by selected economies since 1990 on public pension system as well as civil servants or public sector pension scheme; and
- v. to discuss the advantages of establishing a DC scheme as well as building up a reserve fund.
 - ◆ Among the reform options, many economies focused on modifying the financing method. Some economies established a DC scheme as the main scheme or as a supplement while some economies set up a fund such that pension benefits could be financed partially by the PAYG method and partially by this fund.

1.3 The rest of this study is organised as follows:

- Section 2 introduces key concepts on pension.
- Section 3 discusses the disadvantages of a PAYG scheme.
- Section 4 reviews the World Bank's multi-pillar framework and policy recommendations.
- Section 5 reviews international experience on pension reforms.
- Section 6 explores the benefits of setting up a DC scheme and a reserve fund.
- Section 7 presents the conclusion.

2. Types of Pension Scheme

2.1 One common classification of pension system is in terms of financing method, including unfunded and funded types.¹

- **Unfunded or PAYG plan²** refers to those schemes that are paid on a

1 See OECD (2005d).

2 The definition of PAYG here follows World Bank's glossary (1994, p.xxii) "*in its strictest sense, a method of financing in which current expenditure on pension benefits are paid out of current revenues from an earmarked tax, often a payroll tax.*"

current disbursement method. In the case of an unfunded state pension scheme, the government imposes a tax on the income of the working population and then using the tax revenue to provide retirement benefits for the retirees. When the current working population retires in the future, their retirement welfare will be supported by the next-generation's working group through taxation by the government.

- **Funded plan** refers to those plans in which dedicated assets are cumulated to cover the scheme's liabilities. These assets are assigned by law or contract to the pension scheme and hence they must be used for financing the payment of pension benefit obligations.
- In a **fully funded scheme**, assets are accumulated to pay the future obligations such that the total contributions plus investment returns are enough at any time to cover the present value of the entire flow of future pension responsibility (World Bank, 1994).
- A pension scheme may be partially funded. **Partially funded plan** refers to a plan in which the plan sponsor determines a funding level that is less than 100%. The remainder is unfunded (PAYG) or book reserved³ (Ponds, et al., 2011).

2.2 Another major classification concerns how the benefits / contributions are determined or calculated: defined benefit (DB), defined contribution (DC) and notional defined contribution (NDC).⁴

- **Defined benefit (DB) pension plan** refers to those plans that the sponsor promises a specified benefit on retirement that is linked through a formula to the members' earnings, length of employment, age or other factors.

3 For book-reserved arrangement, the sponsor (e.g. the government) recognises a liability on its balance sheet which reflects the accrued benefits of its pension scheme members, but there are no legally separated pension plan assets on the balance sheet.

4 According to OECD (2011), there are four kinds of pension scheme: DB, points, DC and NDC. Points schemes are used in four countries (France, Estonia, Germany and Slovak) only. In points schemes, workers obtain pension points based on their earnings each year. At retirement, the sum of pension points is multiplied by a pension-point value and then the product is converted into a stream of regular pension payments. As the benefits are based on points which are linked to workers' earnings, for simplicity, points schemes are counted as DB in this note.

- **Defined contribution (DC) pension plan** are those plans in which the amount of contribution paid by the plan sponsor (e.g. the government) is fixed by a pre-specified contribution rate. Individual accounts are set up for members and benefits depend on the amounts credited to these pension accounts (through contributions from sponsor and member) and any investment return on the money in the account.
- **Notional defined contribution (NDC) pension plan** are schemes which record each worker's contributions in an individual account but a rate of return set by the government to the accounts. The scheme is said to be notional in that both the contributions and the interest earned exist only on the books of the managing institution. When retired, the accumulated notional capital in each account is converted into a stream of pension payments using a formula linked to life expectancy (OECD, 2007b).
- DC plans are by definition always fully funded, since people are entitled only to the proceeds of their individual accounts.
- In NDC plans, the pension benefit depends on contributions. However, unlike DC plans, no assets are available in each individual account while the contribution is used to finance current retired people. Thus, the NDC schemes remain unfunded.
- For DB plans, it is possible to be fully funded. But the concept of "fully-funded" is not so certain in DB plans because the future return of investments and the future benefits to be paid are uncertain. Hence, for a DB plan, due to the uncertainty of future returns on the investments and the future benefits to be paid, there is no guarantee that a given level of contributions will be enough to meet the benefits (World Bank, 1994). In practice, accumulated assets from contributions, and investment returns and liabilities of the plan are regularly checked by an actuary.

2.3 Some other useful terms related to pension scheme are explained as follows (OECD, 2011; Holzmann and Hinz, 2005; World Bank, 1994):

- **Accrual rate:** the rate at which pension benefits build up relative to earnings per year of service in a DB scheme.

- **Universal flat benefit:** the pension benefit is based only on age, the length of residence, etc, regardless of the amount and years of contribution.
- **Indexation:** a method to adjust pension benefits so as to take into account of changes in the cost of living, e.g., wage indexation and price indexation.
- **Valorization of earnings:** a method to revalue past earnings by factors such as wage growth, price inflation so as to take into account of changes in average earnings level, prices or economic growth.
- **Replacement ratio:** the ratio of a person's pension in a given time period and the income in a given time period.

3. Disadvantages of a PAYG Pension Scheme

3.1 As noted earlier, PAYG financing method means that the money contributed by today's workers is used to pay the pensions of the current retired people. The public PAYG pension system was the most common pension system, mandatory for covered workers in many countries including high-income economies and middle income economies in the 1980s (World Bank, 1994).

3.2 OECD (1997) indicates that in most OECD member countries, civil servants had separate and specially designed pension schemes. These are either totally separated from the national pension schemes or complementary to them. The reasons for having a specific pension scheme to government employees include: to secure the independence of civil servants, to make a public sector career more attractive, and to shift the costs of current remuneration into the future. A more recent study (Palacios and Whitehouse, 2006) finds that over half of the 158 reviewed economies had a separate retirement-earnings arrangement for civil servants. Their study also finds that civil service schemes were generally financed on a pure PAYG basis. Less than 25% of the civil service pension plans had accumulated any reserves while about 50% of the national schemes had built up some reserves for financing.

3.3 Generally speaking, the PAYG financing arrangement is attractive to political parties as the current aged people can benefit from it immediately even though they may have contributed nothing or little to this system. For the current working population, they need to pay the contribution through taxes. As long as the current workers believe that this system will continue and they would get what they have been promised when they retire in the future, they would still be willing to contribute and regard this as part of saving for future retirement. Thus, politicians can get support from the public, especially the elderly, by carrying out the PAYG system. The second advantage of this scheme is income redistribution within the same generation. For example, every citizen could receive uniform monthly benefit regardless of how much to be taxed and whether the recipient has paid before. Low-income people and those who did not work, like housewives, could enjoy the benefits and hence are more inclined to support these schemes (Lui, 1998).

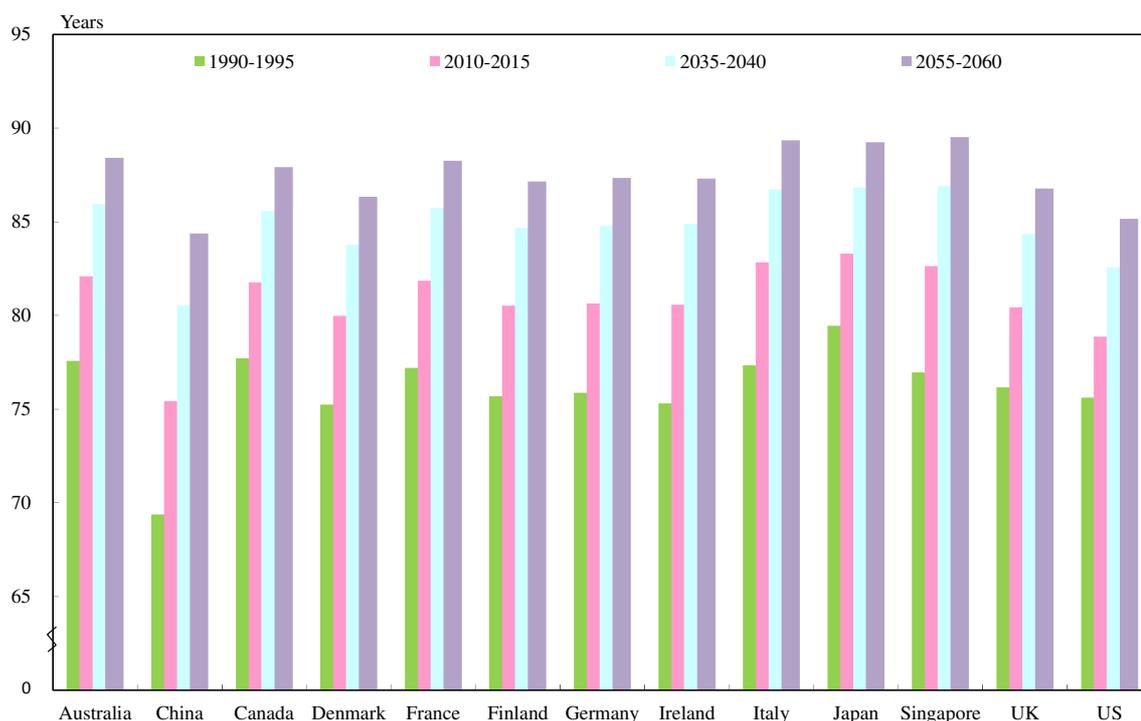
3.4 However, this financing method has disadvantages on the following aspects: sustainability, incentive for early retirement, burden on future generation and implicit burden obligation based on international experience. Such issues are not serious when the pension system operates at the beginning, but will become more problematic over time especially when the population begins to age.

(i) Sustainability Problem of PAYG Financing

3.5 The world's elderly population is increasing rapidly due to increasing life expectancy and falling fertility rates, especially in developed economies. **Figure 1** below displays (projected) life expectancies of several selected economies. It is obvious that life expectancy in all economies will increase steadily over time during 1990-2060. Moreover, the total fertility rates⁵ of all selected economies have been below the replacement level of 2.1 and such trend would persist in the future (**Figure 2**).

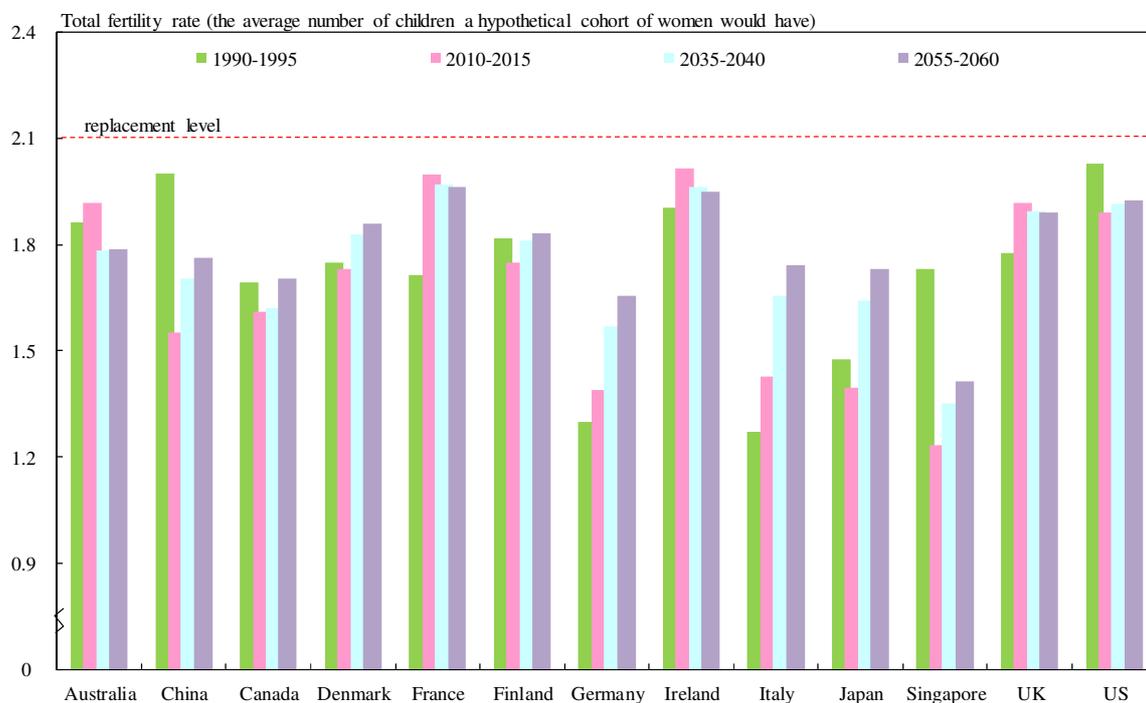
⁵ It refers to the average number of children a hypothetical cohort of women would have at the end of their reproductive period.

Figure 1. Life Expectancies at Birth (Both Sexes Combined) of Selected Economies



Source: World Population Prospects, the 2015 Revision.

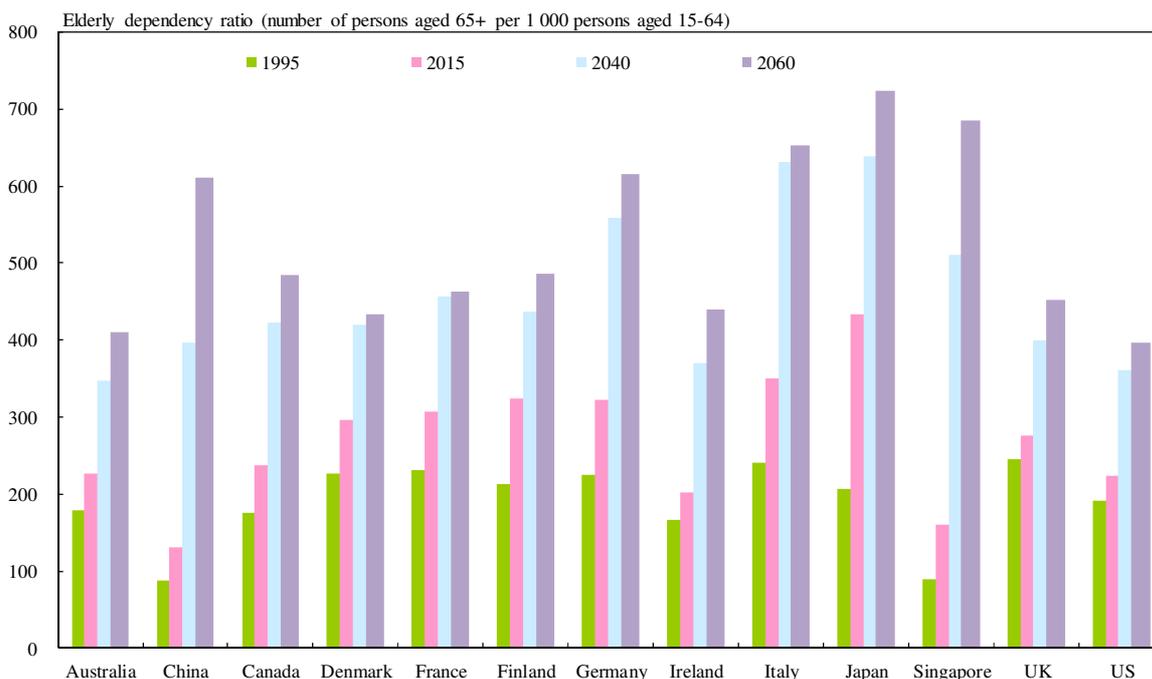
Figure 2. Total Fertility Rate of Selected Economies



Source: World Population Prospects, the 2015 Revision.

3.6 As a consequence, it is not surprising that the proportion of the world's population aged 65 or above will almost triple, from 6.5% to 18.1% during 1995-2060 (United Nations, 2015). According to the projection by United Nations, 27.4% of the population in more developed regions (consisting of Europe, Northern America, Australia and Japan) will be elderly persons (aged 65 or above) by 2060. At that time, on average, one out of every four persons would be an elder. The elderly dependency ratio (the number of elders aged 65 or above per 1 000 persons aged between 15 and 64) for the world will increase from 105 to 295 during 1995-2060. The ratio is even higher for more developed regions, from 203 to 481 over the same period. **Figure 3** displays the elderly dependency ratio of several economies in 1995, 2015, 2040 and 2060. The ratio of Japan will be the highest in 2060, projected to be 724. In other words, the number of working-age persons (aged 15 to 64) to support one elderly person would decrease visibly from 4.8 in 1995 to 1.4 in 2060.

Figure 3. Elderly Dependency Ratio of Selected Economies



Source: World Population Prospects, the 2015 Revision.

3.7 To illustrate the sustainability problem, imagine an economy where every generation lives for two periods – the young and the old – of equal length. It does not have any population growth and productivity growth. In other words, this economy is always inhabited by overlapping generations of young and old people of equal proportion. In each period, the amount of

total contribution from the working population and the amount contributed per working person are fixed while the total retirement benefit and the benefit received per retired person are also fixed. Under this extreme situation, there is no sustainability problem. However, when the population is ageing and the rate of ageing is higher than that of productivity growth, the amount of total contribution cannot catch up with the expenditure required to maintain the promised retirement benefit. Unless the amount of benefits for the retired people decreases or the contribution of the working population increases (e.g. increasing tax rate), this public PAYG pension scheme is not sustainable (Lui, 1998).

3.8 The above condition can be expressed in terms of a simple mathematical equation. In a balanced PAYG system, expenditure in each period equals revenue such that

$$bR = cwL, \quad (1)$$

where b refers to the average pension benefit, R denotes the number of retirees, c refers to the contribution rate, w refers to the average wage/income of working people and L refers to the number of working persons.

3.9 Thus, expenditure on pension (bR) is financed by the revenue from contribution (cwL). Equation (1) can be rewritten as

$$c = \frac{b}{w} \cdot \frac{R}{lA}, \quad (2)$$

where A refers to the number of young persons and l refers to the labour force participation rate ($lA = L$).

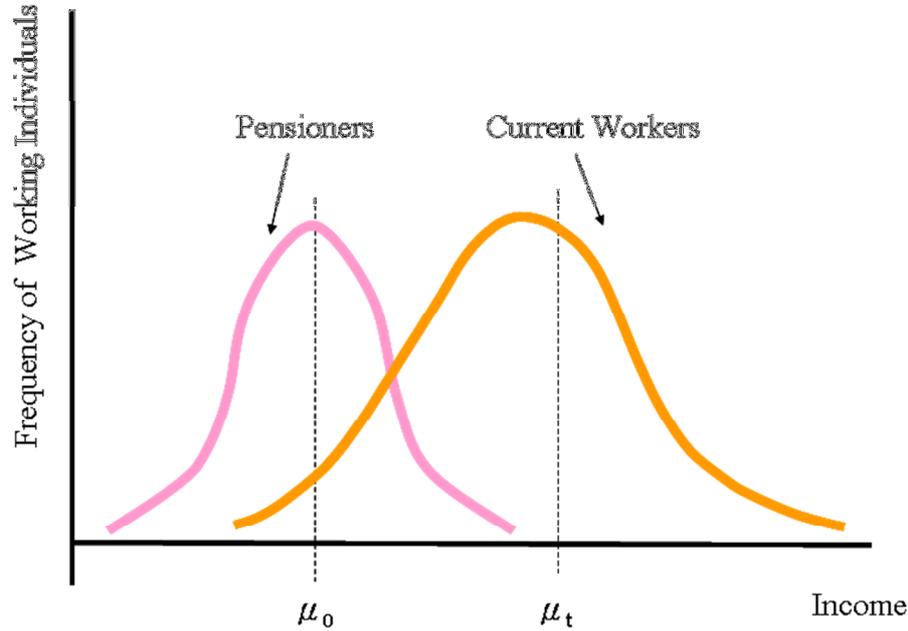
3.10 From Equation (2), the contribution rate (c) equals the product of the replacement ratio ($\frac{b}{w}$), the elderly dependency ratio ($\frac{R}{A}$) and the inverse of labour force participation rate (l). Holding the replacement ratio, the old-age dependency ratio, and the labour force participation rate constant, the contribution rate is also constant. But when the population is ageing continuously, the old-age dependency ratio increases and the revenues are eventually insufficient to cover the promised benefits. Then either the contribution rate (c) needs to go up or the replacement ratio (b/w) must go down so as to maintain the sustainability of the system, given that the labour

force participation rate could only change gradually. In both cases, the PAYG scheme can continue as long as the parameters of the system are adjusted as said. These adjustments are known as parametric reforms (Willmore, 2004). However, the contribution (tax) rate cannot be raised too much because very high tax rate will discourage working incentive and the labour supply may fall. On the other hand, reduction in benefit usually triggers public discontent especially among the current retired people.

3.11 It should be noted that the above formula oversimplifies the actual situation and unique circumstances in different countries with different institutional set-up on pension system. In particular, the formula assumes that the pension benefit level is linked to the prevailing income of an average worker in the working population. In real life, the calculation of individual pension payment in a DB scheme is far more complicated. Each retiree's pension benefit is affected by his/her pre-retirement earnings and other factors related to the career profile. Pension benefits are also adjusted to take into account changes in wages or changes in price in order to ensure that retirees have a similar living standard throughout their retirement period.

3.12 Consider a situation in which the pension benefits are linked to the past income of pensioners before they retired (t_0). The wage distribution is constantly changing, moving to the right when there are real income and productivity growth over time, especially in the moves towards a knowledge-based economy. As such, over time, the current working population generally earns a higher average income at time t [$t > t_0$] than before. The wage distribution of retirees and the current working people are depicted in **Figure 4**.

Figure 4. Conjectured Income Distribution of Pensioners before Retirement and that of the Current Working Population



Notes:

- Pre-retirement income distribution of pensioners
- Income distribution of current working people

μ_0 denotes the average pre-retirement income of pensioners at t_0 .

μ_t denotes the average current income at t .

3.13 An average pension benefit (\bar{b}) is equal to a percentage of average pre-retirement income (μ_0) at t_0 before pensioners retired. At time t , an

average workers' contribution rate is $\frac{\bar{b}}{\mu_t} \cdot \left(\frac{R}{A}\right)_t \cdot \frac{1}{l_t}$, where μ_t refers to the

average income at time t , $\left(\frac{R}{A}\right)_t$ refers to the elderly dependency ratio at time

t , and l_t refers to the labour force participation rate at time t . So when the

labour force participation rate only changes gradually, the contribution rate will increase as long as the elderly dependency ratio increases at a rate greater than that of income over time and vice versa.

3.14 The above example indicates that the upward pressure on the contribution rate due to rising elderly dependency ratio can be somewhat mitigated by an increase in real wage growth rate given the pension benefits are not indexed to the prevailing wage level. To illustrate the sustainability problems of a PAYG system for an economy with population ageing, Equation (2) simplifies the actual conditions through a de facto indexation of pension benefits to the current wage of an average employee.

3.15 In brief, the insolvency problem arises when population is ageing fast and when the rate of ageing is higher than the economy's productivity growth. If the government cannot reduce the benefit or increase the contribution, it will have to raise money via borrowing to sustain pension system. As a result, debt will accumulate and once it exceeds a certain critical point, the system will go bankrupt. In the mid-1990s, World Bank (1994) pointed out this risk and urged governments to reform their existing pension system so as to maintain sustainability in the long run.

(ii) *Burden on Future Generation*

3.16 Another disadvantage is that a PAYG scheme favours the first generation of retirees but places increasing burden on future generations without their consent. At the beginning, the contribution rate tends to be low because there are few eligible pensioners. The burden on young working people is not so heavy. But when the system matures, more retirees are eligible for pension benefits. As illustrated earlier, the next generation will pay higher contributions unless retirement benefits are reduced. The accumulated internal debt will eventually be paid by future generations. Hence, the PAYG pension scheme usually favours the first generation who retires at the expense of future generations.

(iii) *Distortion in the Labour Market*

3.17 In the case of the PAYG plan, poor system design features such as early retirement provisions and generous replacement make distortion in the labour market and hence economic growth. As retirement benefits are not totally linked to the contribution paid (which is related to the wage level) but are also dependent on the contributions paid by the current working group, people have less incentive to work when the PAYG tax-rates increases in an ageing economy. On the contrary, they have incentive to retire earlier (often

below the age of 60). In this case, the supply of experienced labour falls. World Bank (1994) finds that the fall in the supply of experienced workers had reduced the countries labour force by about 1% to 2% in developing countries and by 3% to 6% in developed countries. This would reduce the total production of an economy.⁶

(iv) *Implicit Pension Debt (IPD)*

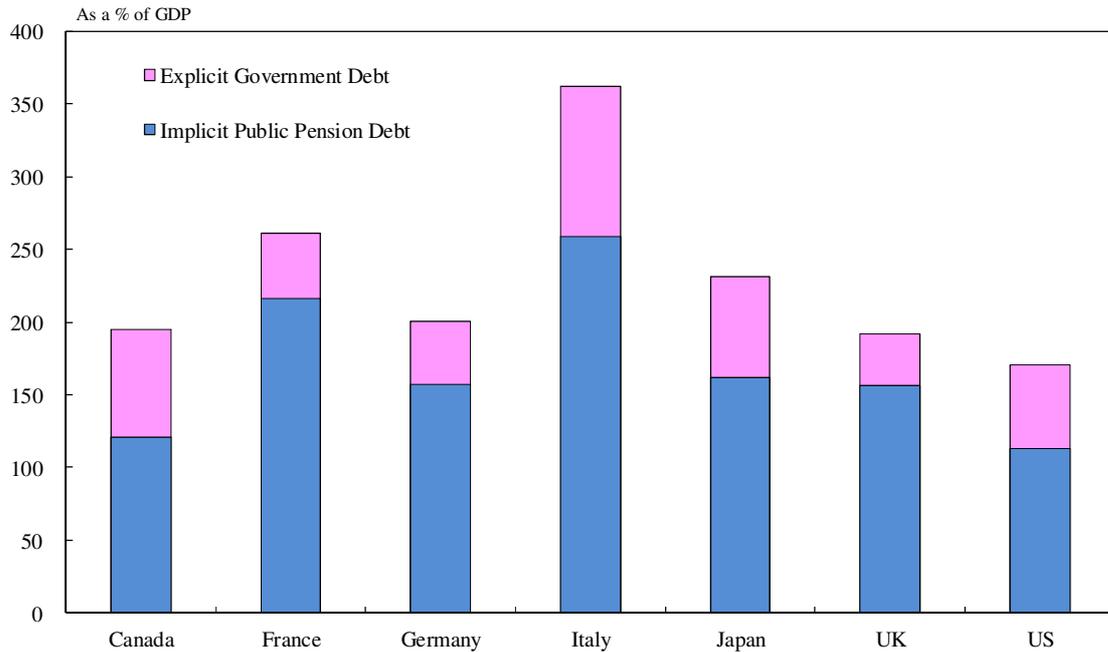
3.18 PAYG financing often masks the long-run cost of promised pension obligations. When workers pay their payroll taxes, they expect to receive a specified benefit in return. The present value of this future stream of expected benefits is known as the “implicit public pension debt.” This implicit debt is a complicated function of the number of workers and retirees, their age distribution and expected life spans, the size of the average benefit, the retirement age, and the discount rate used to calculate the present value. Partly due to the complicated calculation and partly due to the prospective nature of the payment, many citizens and policymakers tend to overlook the hidden liability of these implicit debts. In the early years of a PAYG pension plan, costs seem to be low but as time lapses, the implicit pension debt builds up rapidly and requires much higher tax rates to support when the system matures and population is ageing.

3.19 **Figure 5** compares the explicit government debt of seven selected economies with their implicit public pension debt as a % of GDP in 1990 (van den Noord and Herb, 1993). It is noteworthy that the implicit debt for all these economies was much higher than the explicit government debt⁷. In particular, the implicit pension debt varied from 113% to more than 200% of GDP. Summing up both explicit and implicit debts would triple the total national debt in these selected countries.

6 The PAYG scheme may reduce national saving but the evidence from empirical studies does not yield definite conclusion to support this claim.

7 Except the US, the (explicit) government debt of other selected countries was not related to public pension liabilities. Excluding the debt related to public pension, the US’s government debt fell from 57% to 34% (World Bank, 1994).

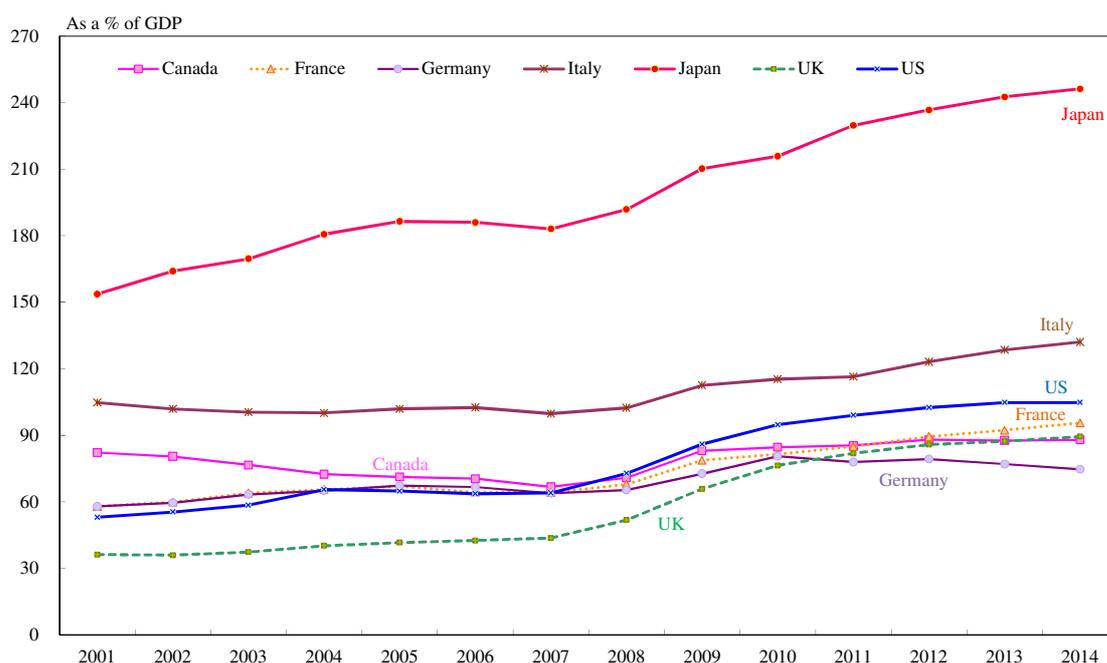
Figure 5. Explicit Government Debt and Implicit Public Pension Debt as a % of GDP in Seven Economies, 1990



Source: van den Noord and Herd (1993).

3.20 The government debt relative to GDP of many countries increased over time. **Figure 6** below plots the government debt as a % of current GDP of seven selected economies from 2001 to 2014. The debt ratio of other selected economics displayed an upward trend in general. In particular, Japan's government debt to GDP ratio increased from 154% to 246%.

Figure 6. Explicit Government Debt as a % of GDP in Seven Economies from 2001 to 2014



Source: World Economic Outlook Database, International Monetary Fund.

3.21 Population ageing is a global phenomenon especially for developed economies. The elderly dependency ratio for developed region was 203 in 1995 and increased to 267 in 2015. But this ratio will jump to 402 in 2035 among these developed economies. Despite no official international statistics for implicit pension debt are published annually, on top of population ageing, it is reasonable to expect that the implicit public pension debt is going up.

3.22 With expanding implicit public pension burden complied with population ageing, it is not likely that one country can afford its future pension obligation through the PAYG financing method. As population ageing not only raises the public pension expenditure but also reduces the working population in an economy, increasing tax rate on future working generation is not a possible solution to meet the future pension liabilities.

3.23 The above underlies World Bank's warning that PAYG schemes are illusory. When the population is young and the system is in an infant stage, it induces the government to offer generous benefits as the costs are low. But the costs will increase when the system becomes mature and the population is ageing. The implicit pension debt will accumulate rapidly and the same benefit levels may become increasingly unaffordable.

3.24 In sum, PAYG national (and civil service) pension schemes were common in developed economies in the past. However, the cost of such pension schemes becomes a burden on the budget and leads to a heavy long-term liabilities eventually. To lessen the fiscal problem of PAYG pension scheme, many economies carried out reforms. Before going to the reform options, the next section will introduce the multi-pillar pension model and policy recommendations proposed by the World Bank.

4. World Bank’s Multi-Pillar Pension Model and Recommendations on Pension Reforms

4.1 The preceding section discusses the problems of PAYG pension system. Acknowledging these shortcomings, international research institutions have worked on ways to improve national pension design.

4.2 Retirement protection schemes are diverse and there are a number of different types of schemes within an economy. As a result, it is difficult to classify the type of a pension system. Based on the role and objective of each part of the pension system, OECD proposes a multi-pillar pension framework (OECD, 2005b)⁸ for the taxonomy of pensions. Moreover, OECD recommends that “*Occupational pension plans should be funded*” and “*Occupational defined benefit plans should in general be funded through the establishment of a pension fund or through an insurance arrangement*” (OECD, 2007a).

4.3 World Bank made similar comments that the public PAYG pension scheme should be reformed as elderly people live much longer than previously anticipated when the scheme was first designed. World Bank (1994) pointed out that an economy’s old age security program should satisfy three functions:

- Saving: helping people to smooth their consumption over their lifetime;

8 The framework has three tiers where the first two tiers are mandatory and the third is voluntary. The first-tier (mandatory, adequacy) aims to ensure pensioners with certain absolute and minimum standard of living. The second-tier (mandatory, saving) aims to enable pensioners to enjoy some target standard of living in retirement compared with that when they were working. The third-tier (voluntary, saving) is a voluntary provision from either the individual or the employer. Within these tiers, schemes are further classified by their forms (public or private, DB or DC).

- Redistribution: shifting lifetime income from one person to another; and
- Insurance involving protection against the probability of unexpected outcomes such as low or even negative return of investment, living longer than expected and so forth.

4.4 World Bank (1994) recommends an economy to build up multiple pillars of old age support so as to separate the saving function from the redistributive function and placing them under different financing and managerial arrangements in two different mandatory pillars since a dominant public pension scheme which pays an earnings-related DB and is financed out of payroll taxes on a PAYG basis is not enough for these three functions, similarly for other type of single pillar system:

- First pillar (redistributive plus insurance): mandatory publicly managed and tax-financed.
- Second pillar (savings plus insurance): mandatory privately managed and fully funded.
- Third pillar (savings plus insurance): voluntary full funded retirement savings.

4.5 According to the demographic and economic conditions, World Bank (1994) further gives some suggestions on the pension system according to three broad categories of economies.

- For countries with a young population, a low per capita income and only a small public pillar like some countries in Africa and South Asia, these countries should:
 - ◆ Provide assistance to the poor;
 - ◆ Keep the existing public pension pillar small, flat and limited;
 - ◆ Build up institutional framework protected by law for personal saving and occupational pension plan which should be fully funded; and
 - ◆ Avoid crowding out informal support systems and induce personal old age family caring
- For young but rapidly ageing economies such as some East Asian economies, these regions should
 - ◆ Accelerate all the actions mentioned above;
 - ◆ Design and introduce a mandatory decentralized funded pillar; and
 - ◆ Expand the coverage of public pillar (for basic support) gradually

but keep the pillar small and redistributive.

- For economies comprising with a lot of middle-aged persons, ageing rapidly and having large public pension programs, including OECD and some eastern European and Latin American economies, they should
 - ◆ Reform the existing public pillar; and
 - ◆ Set up the second mandatory funded occupational pillar through downsizing the public pillar gradually while reallocating contributions to a second mandatory pillar; and allowing old participants in the old public system and promising its continuity while introducing a new funded second pillar.

4.6 In particular, World Bank (1994) gives suggestions on how to modify the existing public PAYG plans:

- Raising the retirement age;
- Reducing opportunities and incentives for early retirement;
- Reducing the benefit levels in case they were too generous; and
- Storing pension reserves separately from general government funds.

4.7 From then on, World Bank continued to be involved in pension reform and provided financial support for reform to many countries in the face of fiscally unsustainable public pension scheme and population ageing. Such experience stimulated an ongoing process of refinement on the multi-pillar pension framework. A decade later, to enhance the existing three pillars and to add in other forms of old-age support not directly mentioned within the original scope, the extended pension conceptual framework was first presented in 2005 (Holzmann and Hinz, 2005) and then updated in 2008 (Holzmann, Hinz and Dorfman, 2008). The refined multi-pillar pension design consists of 5 pillars:

- A non-contributory zero pillar:
 - ◆ In the form of a social pension or general social assistance;
 - ◆ Enable all elderly with minimal level of protection; and
 - ◆ Typically financed by the government.
- A mandatory first-pillar with contributions linked to earnings:
 - ◆ Contributions linked to earnings to replace some portion of lifetime pre-retirement income;
 - ◆ To address the risks of individual myopia, inappropriate planning horizons due to unexpected longer life expectancies and risks of financial market; and

- ◆ Typically financed through PAYG, suffering from demographic and political risks.
- A mandatory second-pillar:
 - ◆ An individual saving account (i.e. DC plan) with different design options such as freedom in selecting investments.
- A voluntary third-pillar:
 - ◆ Take many forms, e.g. individual savings, DB or DC; and
 - ◆ Flexible and discretionary.
- A non-financial fourth-pillar:
 - ◆ Access to informal support such as intra-family support;
 - ◆ Other social programs such as health care and housing; and
 - ◆ Other individual assets (e.g., owner-occupied residential properties, reverse mortgages)

4.8 In order to make a feasible extended framework, World Bank took into account different initial conditions of developed and less developed economies, including inherited mandatory and voluntary pension systems, reform needs like changing existing schemes in response to population ageing, and enabling environment such as fiscal capacity, demographic profile, etc. World Bank then applied the proposed multi-pillar pension reform design and assessed the feasibility based on several predetermined evaluation criteria including adequacy, affordability, sustainability, equitability, predictability, robustness, and contribution to output and growth. World Bank (2008) emphasises several key principles to follow when considering pension reform design, as discussed below.

4.9 The first one is called “*prefunding commitments.*” Prefunding of future pension commitments is generally desirable. Politically, prefunding may better guarantee the capacity of society to fulfil pension commitments because it ensures that pension liabilities are backed by assets protected by legal property rights.

- *Pre-funding means that provision is made for future pension payments.* The funds allocated together with the interest earned on them make up the pension capital which will be drawn on when pensions are paid out.
- It is possible for a DB plan to be partially funded and partially PAYG. It means that benefits for the current retired members are paid by a

mix of accumulated assets⁹ and taxes/contributions paid by current workers.

4.10 The second principle is “second pillar benchmark.” It suggests that a mandatory and fully-funded second pillar is a useful benchmark. The third principle is “*small, simple and universal.*” This principle is related to the first pillar. To enable the first pillar to be affordable and sustainable, such scheme should be relatively small, simple and universal. Small means that the mandated replacement rate should be low to ensure sustainable financing. Simple refers to the calculation of benefits. Universal refers to the application to all sectors of an economy. The fourth principle is “*broader assessment of risk, vulnerability and poverty.*” This principle alerts the government to have a cautious assessment on the pension system towards poverty of all age group.

4.11 World Bank expects that every economy should respond to its uniqueness when designing own multi-pillar pension system. Some economies have already established a dominant PAYG mandatory public pension pillar for long time. Despite transforming PAYG publicly managed DB pension scheme to a privately managed DC scheme would bring many advantages, the process must be faced with many obstacles. In cognizance of the political obstacles, it would be very difficult, if not impossible, to remove the whole public pension pillar from the pension system and as such, here is some advocate for diversification of other approaches or pillars (Holzmann and Hinz, 2005). Notwithstanding, World Bank (2008) underlines clearly the first pillar should be relatively small, simple and universal while a mandatory and fully-funded second pillar can be used as a means to assess the potential welfare improvement for a reform design.

4.12 More specific application of the extended conceptual framework and reform options on countries with different features are demonstrated in Holzmann and Hinz (2005). In general, in economies where coverage and administrative capacity are high, the zero or first pillar can serve as a safety net and should be means-tested. Those with full institutional capacity but only basic income provisions will move toward mandatory funded provisions. In particular, for economies with existing fully funded DC scheme with limited basic income support, they are advised to focus on the enhancement of the

⁹ The advantages of setting up a fund for financing future pension obligations will be discussed in **Section 6**.

existing pillars such as dealing with low rate of return of DC scheme, encouraging more voluntary saving, etc.

5. International Experience on Pension Reform

5.1 This section discusses the major pension reforms undertaken in selected economies since 1990. First, we start with an overview of the types of measures taken in national pension scheme. Second, we review the major reforms on civil service pension¹⁰.

(i) Reforms on National Pension Scheme

5.2 The types of reform include lifting pension eligibility age, raising incentive for continuing to work, changing the benefit formula, changing valorization of past earnings or indexation of pension benefits, funding a reserve for DB plan, and transforming the PAYG scheme to a DC or notional DC scheme. **Table 1** below summarises the major reforms on national pension schemes for selected ten economies.

- **Lifting pension eligibility age**
 - ◆ Most economies now have a standard retirement age of 65 years. Some economies have extended or will raise their retirement age to 67, like Australia, Denmark and Germany. This change would make people retire later and hence improve financial sustainability.

- **Raising incentive for continuing to work**
 - ◆ Reducing benefits for early retirement and increasing the number of years of contributions required to receive a full pension are commonly used to deter people from retiring early. Moreover, increasing the increments or bonuses paid to people retiring after the normal pension age can encourage people to work longer voluntarily. For example, Italy increased the number of contribution years for full pensions from 35 to 36 years while the UK raised benefit increments for late retirement.

¹⁰ “National scheme” refers to a pension scheme guaranteed by the state to all eligible residents. The laws determine the governance arrangements and key parameters for state pension schemes (Palacios and Whitehouse, 2006).

- **Changes in the benefits formula**
 - ◆ Some economies adjust the calculation method of benefits so as to reduce the benefits given to retired people. For instance, many earnings-related schemes used to calculate benefits with respect to only a few years of final or best earnings. Some economies have extended the period over which earnings are measured. For example, France moves from the best 10 years to the best 25 years in the public pension scheme. Extending the period over which earnings are measured will tend to cut pension benefits. The average of the best years or final earnings is usually higher than the average over the lifetime because the latter also takes earlier years with lower earnings into account.

- **Valorization of past earnings and indexation of pension benefits**
 - ◆ Past earnings are revalued between the time pension rights accrued and the time they are paid out. With earnings-related public pension systems, several economies have switched from earnings valorization to price valorization in recent years, e.g. France. It is because price indexation results in lower pension benefits. Similarly, pension benefits are adjusted to take into account changes in the cost of living (e.g. prices and/or earnings). This is called indexation. Again, in recent years, some countries have shifted from indexation of pension benefits to earnings towards full or partial indexation to prices. This keeps the purchasing power of pension benefits, but pensioners do not enjoy the general growth in real wage. A shift to a less generous valorization and indexation can improve the financial sustainability.

Table 1. Reforms on National Pension System in Selected Economies since 1990

| | Lift Pension Eligibility Age | Raise Incentive for Continuing to Work | Change the Benefit Formula / Valorization of Past Earnings / Indexation of Pension Benefits | Link Pensions to Life Expectancy | Set up a Fund for Defined Benefit (DB) Scheme | Introduce a Defined Contribution (DC) / Notional DC Scheme |
|------------------|--|--|---|--|--|--|
| Australia | <ul style="list-style-type: none"> - Pension age for women has increased to 65 since July 2013. - Pension age for both males and females will further increase from 65 to 67 during 2017-2023. | <ul style="list-style-type: none"> - New and more generous work bonus to Age Pension recipients has been introduced since July 2011 for later retirement. | | | | <ul style="list-style-type: none"> - Mandatory DC scheme was introduced in 1992. - Contribution rate will increase from 9% to 12% between 2013 and 2025. |
| Canada | | <ul style="list-style-type: none"> - For the Canada Pension Plan (CPP) / Quebec Pension Plan, accrual rate is raised from 0.5% to 0.7% per month if delay retirement. - For early retirement (age 60-65), pensions are reduced at a rate of 0.6% per month rather than 0.5%. | | | <ul style="list-style-type: none"> - The CPP Investment Board, which was created in 1997, established the CPP Reserve Fund. | |
| Denmark | <ul style="list-style-type: none"> - Early pension age is increasing from 60 to 64 during 2014-2023. - Normal pension age will increase from 65 to 67 between 2019 and 2022. | | | <ul style="list-style-type: none"> - Pension age will link to life expectancy from 2025 onwards. | | |
| France | | <ul style="list-style-type: none"> - Minimum pension age will increase from 60 to 62 by 2017. | <ul style="list-style-type: none"> - Earnings considered in calculating pension benefits increased from the best 10 to the best 25 years. - Valorization of past earnings is linked to price. | <ul style="list-style-type: none"> - Minimum contribution period increases with changes in life expectancy. | | |
| Germany | <ul style="list-style-type: none"> - Normal pension age is increasing from 65 to 67 between 2012 and 2029. | | <ul style="list-style-type: none"> - Benefits will cut back through changing valorization and indexation when dependency ratio of the pension system worsens. | | | <ul style="list-style-type: none"> - Voluntary DC pensions were introduced with tax privileges. |

Table 1. Reforms on National Pension System in Selected Economies since 1990 (Con't)

| | Lift Pension Eligibility Age | Raise Incentive for Continuing to Work | Change the Benefit Formula / Valorization of Past Earnings / Indexation of Pension Benefits | Link Pensions to Life Expectancy | Set up a Fund for Defined Benefit (DB) Scheme | Introduce a Defined Contribution (DC) / Notional DC Scheme |
|--------------------|--|---|---|--|---|--|
| Ireland | - Pension age will increase from 66 in 2014 to 67 in 2021 and to 68 in 2028. | | | | - A fund was set up for financing public pensions. | - Young employees whose income above certain threshold join DC plan automatically from 2014 onwards. |
| Italy | - Normal pension age increased for men from 60 to 65 and for women from 55 to 60. - Pension age for women will increase to 66, to match with men by 2018. | - Contribution years for full pension increased from 35 to 36 years. | | - Notional annuity calculation is used and the amount of annuity is linked to life expectancy. | | - NDC system has extended to all workers from 2012 onwards. |
| Japan | | | - Accrual rate decreased. - Benefits are adjusted with respect to any expected change in dependency ratio. | | | |
| New Zealand | - Pension age increased from 60 to 65. | | | | - New Zealand Superannuation Fund was set up in 2001. | - KiwiSaver has been implemented since July 2007 |
| UK | - Women's pension age increased from 60 to 65. | - Increment for deferring pension claim increased. - The default retirement age of 65 was removed. | | | - Pension protection fund to insure DB plans was created in 2004. | - Employers are required to provide access to DC pension. |

Sources: Heller (2006), Kings et al. (2007), Martin & Whitehouse (2008), OECD (2011), OECD (2013), Whiteford & Whitehouse (2006), and Pension Funds on Line.

- **Linking pensions to higher life expectancy**
 - ◆ For some pension schemes, pension capital is accumulated in an individual account and will be converted into a regular pension payment, an annuity, at retirement. Thus, annuity will be lower with an increase in life expectancy at the time of retirement because the fixed amount of total pension needs be paid for a longer time. Among DB schemes, France linked the required number of years of contributions to get a full pension with life expectancy in the 2003 pension reform.

- **Funding public pensions**
 - ◆ Instead of fully relying on PAYG financing method, some countries have established public pension reserves. In addition to the long-standing reserves in Japan, new reserves have been introduced in Canada, Ireland, New Zealand and the UK.

- **Introducing defined contribution plans**
 - ◆ Some economies introduce mandatory or voluntary DC or shift away from the PAYG DB scheme to DC scheme. For example, Australia introduced a mandatory occupational DC scheme in 1992.

(ii) Reforms on Civil Service Scheme

5.3 As noted earlier, several countries have specific civil service scheme in which most of them were financed on PAYG basis. In response to the population ageing, apart from the national pension system, the civil service pension schemes have been adjusted to lessen the government's fiscal burden. In comparison to national pension systems, the reforms on civil service pension schemes share similar common options (**Table 2**):

- Increasing pension eligibility age: e.g., Germany and Italy;
- Raising incentive for continuing to work: e.g., France and Ireland;
- Changing the benefit formula: e.g., Germany;
- Indexation of pension benefits to price: e.g., France;
- Establishing a fund in DB schemes: e.g., Australia and Canada; and
- Introducing a DC scheme: e.g. Australia.

Table 2. Reforms on Civil Service Pension System in Selected Economies since 1990

| | Lift Pension Eligibility Age | Raise Incentive for Continuing to Work | Change the Benefit Formula / Valorization of Past Earnings / Indexation of Pension Benefits | Set up a Fund for Defined Benefit (DB) Scheme | Introduce a Defined Contribution (DC) / Notional DC Scheme |
|-----------|---|---|--|---|--|
| Australia | | | | - Public Sector Superannuation Scheme (PSS) Fund was established. | - The Australian Government has introduced a DC scheme for most new Australian Government employees since July 2005. |
| Canada | | | | - A fund for Federal Public Service Pension Plan was set up. | |
| France | | - Benefits were reduced for early retirement. - The number of quarters needed to obtain a full pension increased from 150 to 160 since 2003. | - Public sector's pension benefits is linked to prices rather than wages. | | |
| Germany | - The normal retirement age increased to 67 since mid-2007. | | - In 2003, a new pension benefit formula was introduced that made retirement benefit less generous. - The replacement rate of the German civil service scheme will fall from 75% to 71.75% by 2030. | | |
| Ireland | | - Benefits reduced for early retirement. | | | |
| Italy | - The minimum retirement age for entitlement to full pension increased from 57 to 65 by 2004. | | | | |

Sources: Maurer et al. (2008), OECD (1997), OECD (2005c), OECD (2007c), O'Leary (2006), Palacios (2002), Palacios & Whitehouse (2006), Ponds, et al. (2011), and Pension Funds on Line.

5.4 In brief, this section reviews the main pension reform options on national and civil service pension schemes in selected economies since 1990. The main directions include deferring retirement age, reducing the pension benefit, and changing financing method to improve the sustainability. Some economies maintain the existing structure of the pension system but change the parameters or some of the rules in which earnings are measured, benefits are calculated or cost of living is adjusted. Some countries decide to introduce a mandatory / voluntary DC scheme while some establish a fund to partially finance the pension payment.

6. Advantages of Establishing DC Scheme and Pension Fund

6.1 **Tables 3** and **4** below display the main features of the mandatory occupational pension schemes of selected economies on national and civil service pension systems respectively. We can observe that more economies introduce a DC scheme and establish a fund in DB schemes for their national as well as civil service pension. Among selected economies, three economies have a mandatory DC pension scheme (Australia, Denmark and Singapore); Italy adopts a notional DC scheme; Canada operates a partially funded DB scheme; and only France and Germany still mainly rely on a PAYG DB scheme. Similarly among civil service pension plans of selected economies, except France and Germany, other economies either introduce a DC component or build up a fund to finance the pension payments.

Table 3. Main Features of the Mandatory Occupational Pension Scheme of Selected Economies

| Economies | Name of the Scheme | Type of the Scheme | | |
|------------------|---|---|--|--|
| | | Defined Contribution (DC) / Notional DC | PAYG / Partially Funded Defined Benefit (DB) | Remarks |
| Australia | Superannuation | It is a DC plan. | | |
| Canada | Canada Pension Plan (CPP) | | It is a partially funded DB plan. | CPP reserve fund has been set up. Pension benefits are financed partially by PAYG and partially by the fund. |
| Denmark | Danish Labour Market Supplementary Pension (ATP) | It is a DC plan. | | |
| France | Compulsory occupational pension schemes: AGIRC (for executives) and ARRCO (for non-executives) | | They are PAYG DB plans. | |
| Germany | Germany - Statutory Public Pension System | | It is a PAYG DB plan. | |
| Italy | Italy - Public Pension System | It is a notional DC plan. | | |
| Singapore | Central Provident Fund | It is a DC plan. | | |

Sources: OECD (2011), OECD (2013), and Pension Funds on Line.

Table 4. Main Features of Mandatory Pension Scheme to Public Sector Employees of Selected Economies

| Economies | Name of the Scheme | Type of the Scheme | | |
|-----------|---|--|--|---|
| | | Defined Contribution (DC) | PAYG / Partially Funded Defined Benefit (DB) | Remarks |
| Australia | Australia - Public Sector Superannuation Scheme | | Employees who joined the government in or before June 2005 participate a partially funded DB plan. | The fund under the DB plan is managed by Commonwealth Superannuation Corporation which is a legal corporate entity. |
| | Australia - Public Sector Superannuation Accumulation Plan | Employees who join the government after June 2005 participate a DC plan. | | |
| Canada | Canada - Federal Public Service Pension Plan | | Employees participate a partially funded DB plan. The employer (Government of Canada) contribute funds to finance the plan. | The fund is managed by the Public Sector Pension Investment Board whose capital is transferred by the federal government since April 2000. It is a Canadian crown corporation. |
| Finland | Finland - State pension provision (VaEL) | | It is a partially funded DB plan. A buffer fund called Valtion Elakerahaston (VER) has been set up and the target funding level is 25% of the VaEl plan's liabilities. | The Finnish state pension fund Valtion - Elakerahaston (VER) is an off-budget State fund. VER has a Board of Directors appointed by the Ministry of Finance. |
| France | France - Le Regime des fonctionnaires de l'Etat, demagistrats et des militaires | | It is a PAYG DB plan. | |
| Germany | Germany - Civil Servant Pension Plan | | It is a PAYG DB plan. | |
| Ireland | Ireland - Public Service Pension | | It is a partially funded DB plan. | National Pensions Reserve fund has been set up in 1999. The fund will be used for financing public service pensions from 2025 onwards. |
| Japan | The Mutual Aid Association for employees working in the central and local governments | | It is a partially funded DB plan. Accumulated reserves form Government Pension Investment Fund. | Since 2006, the Government Pension Investment Fund has become an independent administrative institution to manage the reserves entrusted by the Minister of Health, Labour and Welfare. |
| Singapore | Central Provident Fund for most government employees | It is a DC plan. | | |
| Taiwan | Taiwan - Public Service Pension Fund | | It is a partially funded DB plan. | Since 1995, the Public Service Pension Fund Management Board under the Ministry of Civil Service of the Examination Yuan has set up to manage the Pension Fund. |

Sources: Maurer et al. (2008), OECD (2005c), OECD (2007c), O'Leary (2006), Palacios & Whitehouse (2006), Ponds, et al. (2011), Yermo (2008), Pension Funds Online, and website of respective pension schemes.

6.2 The following will first explain the advantages of operating a DC scheme and then the benefits of funding a reserve for pension benefits.

(i) Advantages of Using a Defined Contribution Scheme

6.3 In 1990, only 25 million workers had their personal retirement accounts in 20 economies but the number jumped to more than 80 million workers in these economies in 2000. These economies include Chile, Denmark, Colombia, Peru, Mexico, Uruguay, Australia, Poland, Latvia, Hong Kong, etc. (James, 2002). At present, over 30 economies have setup mandatory DC plans. Why has the DC scheme become so popular?

6.4 Firstly, contrary to PAYG DB schemes, DC plans are by definition fully funded and are financially sustainable. In a DC plan, a fund must be established to store and invest the contribution made by each member. Recall that under a DC plan, a stock of capital is accumulated to pay future pension benefit with a view to ensure total contributions plus investment returns are enough at any time to meet the present value of the future obligations. That is, the current generation of workers support themselves after retirement.

6.5 Secondly, its design has fewer labour disincentives especially on early retirement. In a DC plan, employees contribute according to a fixed schedule (e.g., 5 percent of wages per year) and these contributions plus the investment returns earned will accumulate to form retirement benefits. This creates a direct linkage between contributions and benefits. For those who retire early, the accumulated retirement capital will become smaller automatically, and the opposite is true otherwise. As a result, each individual can make his or her own choice on the income-leisure tradeoff and a collective decision on a mandatory retirement age is thus unnecessary.

6.6 Thirdly, DC plans give individuals flexibility and control to adjust their pensions in line with their needs and preferences. For instance, members have the options to manage investment risk according to their preferences and expectation on retirement living standard. DC pension scheme tends to leave the responsibility to individuals to plan their retirement.

(ii) Advantages of Setting up a Pension Reserve Fund

6.7 Apart from shifting to / introducing a DC scheme, another usual reform is to set up a fund such that the original PAYG scheme could be partially funded. The following discusses two major benefits of building a reserve to finance the obligations of pension schemes operated by the government¹¹.

6.8 Firstly, setting up a fund can help to smooth taxation across different generations. It can help the working population contribute a relatively stable percentage of taxable income over time. Of course, whether this advantage could be realised depends on a good management of the reserved fund and an appropriate return of the fund in each period. But without this reserve, all pension liabilities would be financed through PAYG taxation. To maintain the promised welfare for retired employees with an ageing population, the government needs to increase taxation so as to meet these obligations as long as the benefits are not reduced. In this case, the tax burden of next generation will be larger.

6.9 Secondly, it can increase the transparency of fiscal budget. At present, there is no standard practice to report public pension liabilities, and certain accounting practices may allow these fiscal liabilities to be hidden inside the fiscal budget. Instead, funding a reserve means that the government has to set up a fund to meet these promised pension obligations. When determining the size of the fund, the government needs to disclose more details of these implicit pension obligations.

7. Concluding Remarks

7.1 An unfunded PAYG pension scheme has a long history and was once popular. However, when the pension scheme becomes mature and the population begins to age, its disadvantages become unsettling and trigger public concern. These shortcomings include sustainability problem, distortion on working incentives, increasing burden on the next generation and accumulating huge implicit pension debt.

7.2 In the 1990s, World Bank (1994) pointed out the problems of an unfunded PAYG pension scheme in response to the global population ageing

11 See James (2002), Palacios (2002) and Ponds, et al. (2011).

especially in developed economies. In particular, World Bank proposes a multi-pillar pension framework which is considered superior to a single pillar public pension scheme.

7.3 Many economies have undertaken or will phase in reforms on its PAYG pension system. Some modified their existing public DB pension schemes through tightening the eligibility for receiving pensions, increasing the incentives for later retirement, changing benefit formula, switching the valorization of past earnings or indexation of pension benefits, and linking pensions to life expectancy. Others have made or are poised to implement fundamental changes of their pension structure, like converting the PAYG DB scheme to a DC scheme partially or wholly.

7.4 In spite of these adjustments and phased in reforms, according to OECD projections (OECD, 2005a), old-age pension spending as a percentage of GDP could increase by a further 3 to 4 percentage points during 2000-2050 among OECD economies as a result of population ageing. There is, thus, a pressing need for each economy to consider options like increasing the retirement age, expanding the role of individual DC accounts, establishing pension reserve fund, in order to maintain a sustainable pension system in the long term.

References

- Heller, P. S. (2006). *Is Asia prepared for an aging population?* (IMF Working Paper 06/272). Washington, DC: IMF. Retrieved from <https://www.imf.org/external/pubs/ft/wp/2006/wp06272.pdf>
- Holzmann, R. & Hinz, R. (2005). *Old-Age Income Support in the 21st Century An International Perspective on Pension Systems and Reform*. Washington, D.C.: World Bank. Retrieved from http://siteresources.worldbank.org/INTPENSIONS/Resources/Old_Age_Inc_Supp_Full_En.pdf
- Holzmann, R., Hinz, R., & Dorfman, M. (2008, June). *Pension systems and reform conceptual framework* (Social Protection Discussion Paper Series 0824). Washington, D.C.: World Bank. Retrieved from <http://www-wds.worldbank.org/servlet/WDSContentServer/IW3P/IB/2008/>

10/25/000333038_20081025020404/Rendered/PDF/461750NWP0Box334081B01PUBLIC10SP00824.pdf

Iglesias, A., & Palacios, R. (2000). *Managing public pension reserves part I: Evidence from the international experience* (Social Protection Discussion Paper Series 0003). Washington, D.C.: World Bank. Retrieved from http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2000/12/15/000094946_00111805312189/Rendered/PDF/multi_page.pdf

James, E. (1996, November). *New systems for old age security--theory, practice and empirical evidence*. Paper presented at EDI Conference on Pension Reform. Retrieved from http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2001/04/27/000094946_0104140853175/Rendered/PDF/multi0page.pdf

James, E. (2002). *Social security reform around the World: Lessons from other countries* (NCPA Policy Report 253). Texas: National Center for Policy Analysis. Retrieved from <http://unpan1.un.org/intradoc/groups/public/documents/APCITY/UNPAN007122.pdf>

Kings, J., Turkisch, E., & Manning, N. (2007). *Public sector pensions and the challenge of an ageing public service* (OECD Working Papers on Public Governance, 2). OECD Publishing. Retrieved from <http://www.oecd.org/gov/pem/38199046.pdf>

Lui, F. T. (1998). *Retirement protection: A plan for Hong Kong*. (1st Edition). City University of Hong Kong Press.

Martin, J. P., & Whitehouse, E. R. (2008). *Reforming retirement-income systems: Lessons from the recent experiences of OECD countries* (OECD Social, Employment and Migration Working Papers 66). OECD Publishing. Retrieved from <http://www.oecd.org/els/public-pensions/40962388.pdf>

Maurer, R., Mitchell, O. S., & Rogalla, R. (2008). *Reforming German civil servant pensions: Funding policy, investment strategy, and intertemporal risk budgeting* (Pension Research Council Working Paper WP2008-09). The Wharton School of the University of Pennsylvania. Retrieved from http://papers.ssrn.com/sol3/Delivery.cfm/SSRN_ID1157450_code683932.pdf?abstractid=1157450&mirid=1

- OECD. (1997). *Civil service pension schemes* (Sigma Papers 10). OECD Publishing. <http://dx.doi.org/10.1787/5kml6g6c4rvl-en>
- OECD. (2005a). *Extending opportunities: How active social policy can benefit us all*. OECD Publishing.
- OECD. (2005b). *Pensions at a glance 2005: Public policies across OECD countries*. OECD Publishing. Retrieved from <http://www.oecd.org/els/soc/34816545.pdf>
- OECD (2005c). Pension funds for government workers in OECD countries. *Financial Market Trends*, 2,153-179. Retrieved from <http://www.oecd.org/finance/private-pensions/35802785.pdf>
- OECD. (2005d). *Private pensions: OECD classification and glossary*. OECD Publishing. Retrieved from <http://www.oecd.org/finance/private-pensions/38356329.pdf>
- OECD. (2007a). *OECD guidelines on funding and benefit security in occupational pension plans: Recommendation of the Council*. OECD Publishing. Retrieved from <http://www.oecd.org/finance/private-pensions/38547978.pdf>
- OECD. (2007b). *Pensions at a glance 2007: Public policies across OECD countries*. OECD Publishing. http://dx.doi.org/10.1787/pension_glance-2007-en
- OECD. (2007c). *Public sector pensions and the challenge of an ageing public service*. OECD Publishing. <http://dx.doi.org/10.1787/285530706017>
- OECD. (2011). *Pensions at a glance 2011: Retirement-income systems in OECD and G20 countries*. OECD Publishing. http://dx.doi.org/10.1787/pension_glance-2011-en
- OECD. (2013). *Pensions at a glance 2013: Retirement-income systems in OECD and G20 countries*. OECD Publishing. Retrieved from <http://www.oecd.org/pensions/public-pensions/OECDPensionsAtAGlance2013.pdf>

- O’Leary D. (2006). Public service pensions in Ireland. Retrieved from <http://www.oecd.org/countries/lithuania/38700828.pdf>
- Oxera Consulting Limited. (2008). *Defined-contribution pension schemes: Risks and advantages for occupational retirement provision*. European Fund and Asset Management Association (EFAMA). Retrieved from http://www.efama.org/Publications/Public/Long-Term_Savings_and_Pension_Steering_Committee/oxera_report.pdf
- Palacios, R. (2002). *Managing public pension reserves part II: Lessons from five recent OECD initiatives* (Social Protection Discussion Paper Series 0219). Washington, D.C.: World Bank. Retrieved from http://www-wds.worldbank.org/external/default/WDSContentServer/WDS/PIB/2005/08/23/000160016_20050823154600/Rendered/PDF/334070SP021901see0also0213111.pdf
- Palacios, R., & Whitehouse, E. (2006). *Civil-service pension schemes around the world* (Social Protection Discussion Paper Series 0602). Washington, D.C.: World Bank. Retrieved from <http://www.oecd.org/countries/lithuania/38701206.pdf>
- Pension Funds Online. (n.d.). Retrieved from <http://www.pensionfundsonline.co.uk/content/country-profiles>
- Ponds, E., Severinson, C., & Yermo, J. (2011). *Funding in public sector pension plans: International evidence* (OECD Working Papers on Finance, Insurance and Private Pensions 8). OECD Publishing. <http://dx.doi.org/10.1787/5kgcfnm8rgmp-en>
- PSP Investment. (n.d.) Retrieved from <http://www.investpsp.ca/en/index.html>
- United Nations. (2015). *World population prospects, the 2015 revision*. Retrieved from <http://esa.un.org/unpd/wpp/>.
- Van den Noord, P., & Herd, R. (1993). *Pension liabilities in the seven major economies* (Economics Department Working Paper, 142). OECD Publishing. <http://dx.doi.org/10.1787/083510523416>
- Whiteford, P., & Whitehouse, E. (2006). Pension challenges and pension reforms in OECD countries. *Oxford Review of Economic Policy*, 22(1),

78-94.

Willmore, L. (2004). Population ageing and pay-as-you-go pensions. *Ageing Horizons - Oxford Institute of Ageing*, 1, 1-11. Retrieved from <http://larrywillmore.net/PAYG.pdf>

World Bank. (1994). *Averting the old age crisis policies to protect the old and promote growth*. Oxford University Press. Retrieved from http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/1994/09/01/000009265_3970311123336/Rendered/PDF/multi_page.pdf

World Bank. (2008). *The World Bank pension conceptual framework*. Washington, D.C.: World Bank. Retrieved from http://siteresources.worldbank.org/INTPENSIONS/Resources/395443-1121194657824/PRPNoteConcept_Sept2008.pdf

World Bank (2012, October 31). Pensions: Data. Retrieved from <http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTSOCIALPROTECTION/EXTPENSIONS/0,,contentMDK:23231994~pagePK:148956~piPK:216618~theSitePK:396253,00.html>

Yermo, J. (2008). *Governance and investment of public pension reserve funds in selected OECD countries* (OECD Working Papers on Insurance and Private Pensions 15). OECD Publishing. Retrieved from <http://www.oecd.org/finance/private-pensions/40194872.pdf>