Tax-Deferred Retirement Saving Plans:
A Review of Budgetary Implications and Policy Issues

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Abstract:

The fiscal implications of tax-deferred pension saving programs is at the core of numerous analytical, empirical and policy issues in macroeconomics and public finance. It includes such issues as the efficiency of the saving incentives; the wealth effect on private consumption; the effect on the national debt; forecasts of future income tax revenue, and the state of the government's balance sheet.

This paper provides a general overview of the academic debate of the tax-deferred pension programs, and uses a simulation model developed by Fougère and Mérette (2000b) to project tax expenditure associated with these programs. In particular, we build a numerical experiment with reasonable parameter values to investigate the characteristics of the funding, maintenance and depletion phases that describe these programs. Also, we conduct a series of simulation experiments that show to what extent the calculation of tax expenditure is sensitive to parameters such as the tax rate, the interest rate, the productivity rate, and the demographic shift toward an older population. The simulation results suggest:

1) Withdrawals form tax-deferred accounts will increase so dramatically relative to contributions with population ageing that a lower tax expenditure can be expected in the future.
2) With the demographic ageing, the simulation results are mostly sensitive to changes in the productivity growth and interest rates. Higher productivity growth leads to a higher fiscal revenue, whereas higher interest rates cause lower fiscal income.

Key word: tax-deferred pension programs; tax expenditure; population ageing

1. Introduction

A number of countries, especially industrialized countries, are facing a rapid increase in the proportion of elderly component in their populations. The baby boom generation (those born between 1946 and 1966) heading for retirement is one of the most important reasons for this change, though lower birth rates and increased longevity are also contributing factors. As a consequence, the elderly dependency ratio, which defined as the number of individuals aged 65 and over divided by those aged 15-64, is expected to rise substantially.

It is projected[1] that the proportion of elderly people in OECD (Organisation for Economic Co-operation and Development) countries will double from 11.3 percent in 1990, whereas the population growth rate will decrease from the current rate of 1.25 percent to 0.5 percent by 2050. These elements of the demographic changes may have dramatic fiscal consequences and pose important public policy challenges for the countries involved. The upward pressures on government's tax and spending systems in nearly all OECD countries require major changes to existing social retirement pension systems.

In most OECD countries, governments promote the development of private pensions by means of tax incentive. Usually, private pension contribution can be deducted from the income tax base, and accrued return on investment is exempt from taxation, but pension benefits arising from these savings are taxed. As the large cohorts begin to retire, the amount of withdrawals from private pension plans is expected to exceed the amount of contributions-this has already begun to happen in some countries. Whether or not this will be sufficient to eventually bring about a positive flow of net tax revenues depends on several factors, including the difference between the effective tax rates on contributions and withdrawals as well as the cost related to the non-taxation (in most countries) of

[1] United Nations' medium variant population projections

accrued income on accumulated assets, and more importantly, the effectiveness of tax incentives to boost private saving across income groups.

The central purpose of this paper is to assess how the tax-deferred pension programs help to change the negative effects of the ageing process on economic growth and fiscal balance. The paper is organized as follows: Section 2 presents the mechanic and evolution of tax-deferred pension programs. This is followed in Section 3 by an overview of the debate about the fiscal implication of tax-favored private pension. Section 4, however, we focus on the debate on the effectiveness of tax-deferred pension programs in stimulating new saving in major OECD countries. In section 5, we further describe an overlapping generation model to numerically project the net fiscal revenues arising from tax-favored schemes over the 1930-2160 period, based on projections of contributions, asset accumulation and withdrawals, taking into account demographic trends. We also examine the extent to which the results reported are affected by alternative assumptions. This should help to better assess how private pension schemes affect fiscal sustainability in the following decades.

2. Tax-Deferred Pension Programs in US and Canada

2.1 Tax-Deferred Retirement Plans and Their Fiscal Significance

2.1.1 The mechanics of tax-deferred pension plans

A *comprehensive income tax regime* treats all sources of income equally. In a pure comprehensive income tax regime, savings are made out of tax earnings, and the accrual interest on accumulated assets is also treated as taxable income. However, the withdrawal of funds accumulated from such saving vehicles is fully exempted from taxation. Such arrangements are known as "taxed-taxed-exempted" (TTE) schemes. Based on this benchmark, the tax treatment which deviates from the so-called comprehensive income tax regime (TTE) is usually considered as being tax favorably.

Tax deferral is an example of tax favorable plans. *Expenditure tax regime*[2] is one of the several ways that governments provide tax incentives through tax-deferred retirement schemes. In this regime, the contributions to an employer-sponsored retirement plans are not included in the employee's taxable income, investment income accrues within those plans are tax free but taxes will be posed upon the funds when they are withdrawn, this is the so-called exemption-exemption-tax regime (EET). Because the exemption in tax liability given mostly as contributions is made, which is at the front end of the process, this type of tax incentive is also known as a "front-loaded" plan.

Additionally, deferred-liability incentive is another available tax-deferred retirement plan, which allows interest to be tax free until withdrawn, but not provide tax exemption on the contributions; we can call this kind of tax-deferral as TET.

However, tax favor does not necessarily always entail tax deferral. Given the tax rate, *taxed-exempt-exempt regime* (TEE) is another equivalent incentive provided. It provides tax exemption of investment income and withdrawal, but treats contribution as taxable. It is commonly referred to as Back-loaded tax regime. Since 1998, Roth IRAs in USA is an example of back-loaded benefits available to certain taxpayers.

In addition, some tax support can be given also within the spirit of a *comprehensive income tax regime*. This is the case, for example, when the return on saving is taxed at flat rate that is lower than the marginal rate by most wage earners. Hence, a whole range of possible tax combinations going from EEE to TTT can be applied on specific savings vehicles and within each, rates can be varied to give a different incentive.

Front-loaded retirement plan (EET) and deferred-liability incentive (TET) are two types of pension schemes which have attracted substantial interests recently. As the first type is more common in Canada and in the US, we will describe it in more detail.

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[2] This is a regime which taxes the portion of income that is consumed, but exempt the portion that is saved for future consumption, thus, and thus is called expenditure tax regime.

2.1.2 Types of tax-deferred pension plans (EET)

As Congressional Budget Office (CBO) classified, the tax code recognizes a variety of retirement plans that offering either front-loaded or deferred-liability benefits as we described above. And employment-based plans offering front-loaded benefits are of two types: defined-benefit and defined-contribution plans.

Defined-benefit plans promise specific benefits in retirement phase. Workers receive fixed benefits regardless of the returns on invested funds in the retirement plans and the employers have the responsibility to make the funds sufficient to cover the outlay benefits.

Under defined-contribution plans, by contrast, the employees are committed to contribute to a fixed percentage of their earnings, a fixed dollar amount, or a specified number of cents per year of service/participation or per hour worked. Pension benefits are not predetermined but depend on the contributions accumulated for each individual and the return on the investment of these monies.

According to the Statistic Canada (2003), defined benefit plans may be further subdivided into two types: unit benefit and flat benefit plans. Flat benefit plans provide a fixed benefit under a formula that is usually regardless of the level of participants' earnings. Under unitbenefit plans, however, members earn a unit of earnings, usually expressed as a fixed percentage of earnings, for each year of credited service/participation. Unit benefit plans are by far the largest category of plans in terms of membership.

2.1.3 The phases of the Retirement Saving System

A tax-deferred retirement plan typically has three phases in its "life-cycle." The first phase, corresponding to the contributors' working and contributing years, is called funding phase. The second and third phases, corresponding to the participant's retirement as well as withdrawing years, are called maintenance phase and depletion phase. Applied

to the full system, the funding phase is defined as the period during which aggregate contributions exceed aggregate withdrawals. Whereas when aggregate withdrawals exceed aggregate contributions, the system enters a maintenance phase during which the assets typically continue to accumulate because investment income more than fills the gap between contributions and withdrawals. If withdrawals continue growing fast and become so large that investment income is not enough to cover the gap between contributions and withdrawals, the system enters a depletion phase.

2.1.4 Accounting for tax deferral of the tax-deferred pension plans

The fiscal implications of tax-deferral can be thought of the difference each year between the cost from foregone taxes revenues on contributions and investment income from the plans' assets and the gain in revenues from the taxation of withdrawals. Generally, the pattern of tax expenditure[3] (defined as tax cost minus tax revenue) corresponding to the three phases of tax-deferred pension plans are different: the funding phase and maintenance phase, during which contributions and investment income exceed withdrawals, will be associated with a cost for the government, in other words, a positive tax expenditure. However, during the depletion phase, the tax revenue from withdrawal is greater than the cost of tax exemption for the contribution and investment income, which implies a negative tax expenditure.

Three issues related to the phases of the retirement pension plans should be paid attentions, as emphasized by the CBO. First, the system may never enter the depletion phase and stay in the maintenance forever. Second, shifting age structure may alter the progress of the phases. Third, the tax treatment outside of retirement pension plans may also affect the sequence of phases and revenue flows. A series of examples can be used to explain those three key points.

In the example that follows, we assume that each cohort live three periods, potentially

[3] Some others use *tax difference* which defined as tax revenue minus tax cost, thus has the opposite sign of tax expenditure.

contributing to tax-deferred plans the first two and withdraw all contributions and investment income in the last period. Each cohort earns income the first two periods to retire in the last one, so in any period in the economy, we have a young age group, a middle age group and an old age group.

In the base case, only the young age group is allowed to participate during period 1 and the program ceases after period 2. This base case permits to follow the evolution of the program from the funding to the depletion phase. Also, it is worth notice that only one cohort gets the full benefit of the tax deferral in this base case.

In this example, pensioners contribute 4 percent of income to the retirement plans for their first two periods, and then withdraw all of their deposits and investment income in the third period. Total income is assumed to grow at 10 percent per period. Hence, the $10,000 of total income in period 1 represents $5,000 income from the young age group and $5,000 from the middle age group. The investment return on the assets is assumed to be 30 percent, whereas the tax rate for withdrawals is put at 20 percent. All cohorts of workers have the same size. In period 5, the program has disappeared completely, so we have zeros everywhere.

From Table 1, we notice that periods 1 and 2 are in funding phase, as contributions exceed withdrawals and tax expenditure is positive. Specifically, in period 1, only one cohort is making contributions with the amount of $200, which is 4 percent of its income of $5,000. Then the contributions earn $60 investment income at 30 percent interest rate, thus the accumulated asset of program reaches $260 without withdrawal during the period 1. Tax expenditure of the first period is 20 percent of accumulated asset in period 1, as much as $52. In period 2, however, two cohorts are contributing. With the grown total income $11,000 half from young and half from middle age group, both groups contribute 4 percent of their total income, calculated as $440. Investment income equals $210 based on the contributions of $440 and 30 percent interest rate. With no withdrawal in period 2, the total accumulated asset is the sum of total inflow of period 2 and accumulated asset of

Table 1 Base Case

		Period 1	Period2	Period3	Period4	Period 5
Total Income	Young	5,000	5,500	6,050	6,655	7,321
	Middle	5,000	5,500	6,050	6,655	7,321
	Old	0	0	0	0	0
	Total	**10,000**	**11,000**	**12,100**	**13,310**	**14,641**
Contributions	Young	200	220	0	0	0
	Middle	0	220	0	0	0
	Old	0	0	0	0	0
	Total	**200**	**440**	**0**	**0**	**0**
Investment Income	Young	60	66	0	0	0
	Middle	0	144	86	0	0
	Old	0	0	0	0	0
	Total	**60**	**210**	**86**	**0**	**0**
Withdrawals	Young	0	0	0	0	0
	Middle	0	0	0	0	0
	Old	0	0	624	372	0
	Total	**0**	**0**	**624**	**372**	**0**
End-of-Year Assets	Young	260	286	372	0	0
	Middle	0	624	0	0	0
	Old	0	0	0	0	0
	Total	**260**	**910**	**372**	**0**	**0**
Tax Expenditure	Young	52	57	0	0	0
	Middle	0	73	17	0	0
	Old	0	0	-125	-74	0
	Total	**52**	**130**	**-108**	**-74**	**0**

period 1, which is \$910. As a result, tax expenditure reaches the amount \$130 calculated as (\$440+\$210-\$0)*0.2.

Periods 3 and 4 represent the depletion phase, where withdrawals exceed the sum of contributions and investment income and causes negative tax expenditure in both periods. In period 3, nobody contributes to the program, but the first cohort of the program withdraws its accumulated asset equals to \$624 (\$200*1.3^2+\$220*1.3) in a lump sum manner. However, the accumulated assets of the second cohort still bear interest income of \$86 ((\$220+\$220*0.3)*0.3). Thus the asset accumulated in period 3 is \$372, but the

tax expenditure decreases to -$108. In period 4, with the 10 percent growth rate, the total income rises to $13,310. The second cohort withdraws all its accumulated funds equals to $372 (calculated as ($220*1. 3^2) from the program and there is zero contribution and investment income. Because period 3 includes the withdrawals of assets accumulated over two periods, whereas period 4 includes the withdrawals of a cohort that contributed in only one period, the tax revenue (negative of the tax expenditure) is lower in period 4.

Permanent tax deferral If deferral is an ongoing process of the tax code, new cohorts begin to contribute as the old ones withdraw funds from the pension plans. This leads to a rising tax cost from the tax exemption which offsets the revenue gains generated by withdrawals of the old cohort. Table 2 shows the prospect of an indefinite maintenance phase in which depletion—for the system as a whole—never occurs. In this example, the participation does not cease in period 2 as was the case in Table 1.

Periods 1 and 2 still represent the funding phase. The numbers in the first two columns are the same as in Table 1. From period 3, however, the system moves into a maintenance phase, as contributions drop below withdrawals but investment income more than makes up the difference. This is why tax expenditure remains positive. It is notable that with a steady growth in income and stable patterns of saving for retirement, the depletion phase may never occur unless the tax deferral program is ceased. Observe that in the table, we find that the size of the end-up year assets from period 3 follows the growing trend of income. The ongoing deferral causes a relative improvement in the fiscal position over time though it results in positive tax expenditure in all years.

Table 2 Effects of Ongoing Tax Deferral on the Retirement Plans

		Period 1	Period 2	Period 3	Period 4	Period 5
Total Income	Young	5,000	5,500	6,050	6,655	7,321
	Middle	5,000	5,500	6,050	6,655	7,321
	Old	0	0	0	0	0
	Total	**10,000**	**11,000**	**12,100**	**13,310**	**14,641**
Contributions	Young	200	220	242	266	293
	Middle	0	220	242	266	293
	Old	0	0	0	0	0
	Total	**200**	**440**	**484**	**532**	**586**
Investment Income	Young	60	66	73	80	88
	Middle	0	144	158	174	192
	Old	0	0	0	0	0
	Total	**60**	**210**	**231**	**254**	**280**
Withdrawals	Young	0	0	0	0	0
	Middle	0	0	0	0	0
	Old	0	0	624	687	755
	Total	**0**	**0**	**624**	**687**	**755**
End-of-Year Assets	Young	260	286	315	346	381
	Middle	0	624	686	754	831
	Old	0	0	0	0	0
	Total	**260**	**910**	**1,001**	**1,100**	**1,212**
Tax Expenditure	Young	52	57	63	69	76
	Middle	0	73	80	88	97
	Old	0	0	-125	-137	-151
	Total	**52**	**130**	**18**	**20**	**22**

Demographic effects In contrast to Table 2, the process of large cohort of baby boomers moving through the age structure raises the possibility that tax deferral may result in negative tax expenditure for a period of years. This would occur especially when this large cohort reaches retirement age and if it is followed by a much smaller cohort of contributors.

Table 3 shows the effect a baby-boomers cohort, assumed to be 10 percent larger than other cohorts and entering the age structure at period 4. In period 4, the total income comes from two sources, one is from middle age group with the amount as $6,655 ($6,050 * 1.1), and another is from the young age group with a 10 percent larger size,

Table 3 Effect of the Baby-Boomers on the Tax-Deferred Retirement Plans

		Period1	Period2	Period3	Period4	Period5	Period6	Period7
Total Income	Young	5,000	5,500	6,050	7,321	7,321	8,053	8,858
	Middle	5,000	5,500	6,050	6,655	7,321	8,053	8,858
	Old	0	0	0	0	0	0	0
	Total	**10,000**	**11,000**	**12,100**	**13,976**	**15,374**	**16,106**	**17,712**
Contributions	Young	200	220	242	293	288	322	354
	Middle	0	220	242	266	322	322	354
	Old	0	0	0	0	0	0	0
	Total	**200**	**440**	**484**	**559**	**610**	**644**	**744**
Investment Income	Young	60	66	73	88	86	97	106
	Middle	0	144	156	174	211	209	232
	Old	0	0	0	0	0	0	0
	Total	**60**	**210**	**231**	**262**	**7**	**306**	**338**
Withdrawals	Young	0	0	0	0	0	0	0
	Middle	0	0	0	0	0	0	0
	Old	0	0	624	687	755	914	905
	Total	**0**	**0**	**624**	**687**	**755**	**914**	**905**
End-of-Year Assets	Young	260	286	315	381	374	419	460
	Middle	0	624	686	755	914	905	1,005
	Old	0	0	0	0	0	0	0
	Total	**260**	**910**	**1,001**	**1,136**	**1,288**	**1,324**	**1,465**
Tax Expenditure	Young	52	57	63	76	75	84	92
	Middle	0	73	80	88	107	106	117
	Old	0	0	-125	-137	-151	-183	-181
	Total	**52**	**130**	**18**	**27**	**31**	**7**	**28**

they possess as much as \$7,321 (\$6,050*1.1*1.1) income. Altogether, the total income level of \$13,976 is greater than that of the normal case such as in Table 2. After period 4, the new cohorts evolve with the 10 percent smaller size than the baby-boomers cohort. In the example, greater contributions in periods 4 and 5 generate greater tax expenditure than from period 3. And with the higher income level, more contribution and investment income are generated compared to the case in Table 2. So, in period 4, with the same amount of withdrawal by the second cohort, the accumulated asset increases and tax expenditure increases to \$27, rather than \$20 as in the previous case. In period 6, however,

as the baby boomers cohort retires and withdraw all their funds $914, the tax expenditure declines from $31 in period 5 to $7 in period 6. In period 7, the system returns to equilibrium after the large cohort leaves the scene. In this example, the government can expect an increase in revenues when the economy moves from period 5 to period 6 where a greater amount of withdrawals occurs.

The outside tax treatment on investment income Another important factor affecting the fiscal budget is the taxation upon investment income. In many tax structures, capital gains and dividends earned outside tax-deferred pension systems are taxed at a lower tax rate than the regular income. However, in most cases, the tax upon the withdrawal is the same as the regular rate.

The tax rate differential has two critical implications as shown in the Table 4. First, a lower tax rate for investment income outside the pension plans will mitigate the tax expenditure during the funding phase. In periods 1 and 2, the revenues foregone are less than they would be if the tax rate was also 20 percent in this example. Second, the same effect exists during the maintenance phase from period 3 to period 5. Tax expenditure in the plans continue to grow, but because the tax exemption is based on a lower tax rate, the tax expenditure is not as great as it would be if the tax rates were the same as for the regular income.

Table 4 Effect of Lower Tax Rate for Investment Income on Retirement Plans

	Period 1	Period2	Period3	Period4	Period5
Uniform 20 Percent Tax Rate (From Table 1)					
Tax Expenditures	52	130	18	20	22
Percentage of income	0.5	1.1	0.1	0.2	0.2
Lower 15 Percent Tax Rate on Investment Income					
Tax Expenditures	31	78	11	12	13
Percentage of income	0.3	0.7	*	*	*

Note: *= between zero and 0.05 percent.

Accounting for the tax rate differential is critical to projecting the effects of deferral over time because its effect on the tax expenditure tends to change even within the maintenance phase, that is, even when the net flow into the plans (contributions plus earnings minus withdrawals) remains a stable fraction of GDP, the tax expenditure can change.

2.2 Empirical Practice of Tax-Deferred Pension Plans in OECD countries

As regard to the practice of tax-deferred pension plans, most of the governments of OECD countries offer EET as tax incentives. Specifically, eleven countries come close to the pure EET regime. Another ten countries also apply an EET regime, but one where withdrawals are taxed more modest than in the first group of countries. In this section, we will focus on the pension plan systems in the United States and Canada.

2.2.1 Tax-deferred retirement savings plans in the United States

The past two decades have witnessed the introduction of a number of public policies designed to provide incentives for household saving. In the United States, the two most important are: Individual Retirement Accounts (IRAs) and 401(k)s. Both are EET type.

Individual Retirement Accounts (IRAs) were first permitted in 1974 to self employed individuals. It supplies a tax defer on contributions and investment income until the assets are withdrawn. The contribution limit is $2000 for each employee annually and $250 for a nonworking spouse. In 1981, The Economic Recovery Tax Act expanded IRA eligibility to allow all working taxpayers to contribute. The IRA limits were increased dramatically. IRA contributions rose from $5 billion to $28 billion in one year, approximately 30 percent of total personal saving. Over the 1982-1986 periods, households contributed more than $170 billion to IRA accounts; by 1986, IRA contributions were about one-fifth of aggregate personal saving. However, contributions declined precipitously after the Tax Reform Act of 1986, because the Tax Reform Act excluded higher-income taxpayers with employer-sponsored pensions from making tax-deductible contributions. Those who are

not covered by an employer-sponsored plan are eligible to claim an exemption for their IRAs contributions, thus receive front-loaded benefits. However, others can not claim the deduction, thus receive deferred-liability benefits only on the investment income. Total contributions of IRAs fell by 62 percent in 1987 and have remained low since then.

The 401(k) plan has grown fast in recent years. Though 401(k) plans have been available since 1978, it has attracted interests after the Department of the Treasury clarified the rules for their use in 1981. The contribution amount of 401(k) increased from almost zero at the beginning of the 1980s to over $63 billion by 1992. Similar to the traditional IRAs, 401(k) plans involve tax-deferred contributions, no taxes paid on accumulated interest until the funds are withdrawn, and limits on annual contributions and restrictions on early withdrawals. There are differences with IRAs, however, a 401(k) plan is available only to employees of organizations that elect to sponsor such plans. Employee contributions to a 401(k) occur through regular payroll deductions, whereas IRAs contributions may be made at the employee's discretion. Additionally, employers can supplement employee contribution rates to a 401(k), whereas for IRAs, they are not allowed to. Prior to 1987, the employee contribution limit was $30,000, but the Tax Reform Act of 1986 reduced the limit to $7,000 and indexed this limit for inflation in subsequent years. The contribution limit was $9,235 for both 1994 and 1995 tax years.

It is reported by the Congress Budget Office (CBO) that by the end of 2003, there were $11.9 trillion in the tax-deferred pension plans[4] of which about 90 percent[5] was taxable upon withdrawal[6]. Most of those funds were in defined-benefit plans: around $3 trillion in private plans and $ 3.29 trillion in government plans[7]. The remaining was in

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[4] Federal Reserve Board, "Flow of Funds Accounts of the United States," March 4, 2004 Release, Tables L225 and L225i, available at www.federalreserve.gov/releases/Z1/20040304/.

[5] This is an approximation taken from the 2002 numbers.

[6] The $1.1 trillion that CBO estimates was not taxable upon withdrawal represents amounts contributed on an after-tax basis that will not be taxed again, including purchases of nonqualified annuities, nondeductible IRA contributions, employee contributions to certain defined-contribution plans before they became 401(k) plans, and most employee contributions to defined-benefit plans.

[7] The "Flow of Funds" does not break down government plans between defined-benefit and defined-contribution plans.

private-sector defined-contribution plans and IRAs.

2.2.2 Tax-deferred retirement savings plans in Canada

Canada's retirement income system has been developing gradually over more than 100 years. At the end of the 19th century, employer pension plans were only offered to certain employees of the federal public service, the railways and some commercial banks. With the amendment to the Income War Tax Act in 1919, pension plans by individuals or by employers were encouraged and employee contributions to employer pension plans could be claimed as a tax deduction.

As for the development of tax-deferred pension programs, there have been 7,010 defined benefit plans with 4.6 million members at the end of 2000, and 8,055 defined contribution plans with 768,781 memberships. Despite the rise in the number of participants in defined contribution plans from 1991 to 2000, defined benefit plans continue to be the most common as around 84 percent of all pension plan members belonged to defined benefit plans.

Despite the variety of the tax-deferred pension plans, the most popular ones in Canada are retirement pension plans (RPPs) and registered retirement savings plans (RRSPs), both of which provide a tax exemption on contributions and on the accrued interest to the plans, but tax on withdrawals (EET).

a) **RPPs**

Registered pension plans (RPPs) are retirement benefit programs provided voluntarily by employers or by unions in both public and private sectors of the economy. Private sector plans are sponsored by individual companies, groups of employers, unions, religions and charitable organizations, and other private sector employers. Public sector plans are

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CBO estimates the portion in defined-contribution plans to be between 15 percent and 20 percent of the total.

designed for employees of the three levels of government. They include plans for employees of federal, provincial and municipal governments and enterprises.

RPP is the first private pension plans in Canada which was permitted soon after Confederation. Since the 1940s and 1950s, RPPs expanded rapidly and have become the most important tax-deferred pension program in Canada. However, with the economic recession from 1991 to 1997, labor force participation rates fell significantly and almost all net employment growth was in the form of self-employment or part-time paid work. As the self-employed with unincorporated businesses are not eligible for RPP members, the membership of RPPs decreases from 5.3 million to 5.1 million of contributors. After experiencing a decline through the period of 1991 to 1997, the number of plan members increased by 7 percent by the end of 2000, increasing from 5.1 million to 5.4 million and the coverage rate (the percentage of paid workers belonging to RPPs) for RPP members has remained relatively unchanged since 1998 at 41 percent.

The participation figures of the private and public sectors are very different. During the period 1991 to 2000, the number of RPP members in the private sector grew 7 percent, compared with a 3 percent decline in the public sector. After 1994, with the workforce downsizing in the public sector, the gap between the number of RPP members in the public and private sectors widened. At the end of 2000, 92 percent of the total plans were in the private sector, with 2.9 million members belonged to these plans. The public sector with only 8 percent of all RPPs plans accounted for close to half (46 percent) of all RPP members with 2.5 million.

The total value of assets held in registered pension pans (RPPs) in 2000 was approximately $817.6 billion, nearly 71 percent of the total value of the three major retirement income programs (C/QPP[8], RPPs, and RRSPs). The assets of RPPs can be managed or funded in several different ways. According to the provisions of the Income

[8] C/QPP: Canada and Quebec Pension Plans, these plans are directed at the employed. They cover almost all workers in Canada and are compulsory for those 18 over.

Tax Act, a RPP must be funded according to the terms of a trust agreement, an insurance company contract, or an arrangement administered by the federal or a provincial government.

As reported by Statistics Canada, from 1991 to 1992, contributions to public sector plans rose from $12.5 billion to $14.1 billion. After that, annual contributions remained below the 1992 peak, amounting to $11.6 billion in 2000. Annual contributions to private sector plans also fluctuated, but rose in the latter years of the decade, peaking in 2000 at $7.7 billion. Specifically, contribution by employers and employees to RRPs totaled $19.4 billion at the end of 2000, an increase of 13 percent from 1991. Almost 64 percent of this amount, or $12.3 billion, was made by employer. Over the decade, given that virtually all members of public sector plans are required to make contributions, employee contributions accounted for 40 percent of total contributions to public sector pension plans in 2000.

Calculating pension plan benefits is associated with various methods. In 2000, the most common formula continued to be computing benefits as a percentage of earnings. Indeed, in 2000, 65 percent of members belonged to RPPs that calculated benefits on the basis of earnings. 80 percent of these plan members were entitled to retirement benefits of 2 percent of their earnings for each year of service.

b) RRSPs

RRSP program was introduced in 1957 with the amendment to the Income Tax Act to allow non-participants in employer-sponsored RPPs, such as self-employed and other paid workers, to receive tax advantages on savings for future retirement. RPP participants were also allowed to contribute to RRSPs, but at a lower maximum level. Contributions to these plans are entirely voluntary.

From 1957, several modifications have been made to the RRSP program to enhance its

accessibility. Over the years, the maximum annual RRSP contribution permitted under the Income Tax Act has been increased several times.

In order to equalize the tax assistance, new and comprehensive ceilings were set for annual savings in 1991, RRSP ceilings were limited to either a dollar amount or 18 percent of earned income, whichever was lower. The annual dollar limit dollar was initially set at $11,500 for RRSPs in 1991 and scheduled to increase each year by $1,000 until reaching 15,500.

In addition to adjustments contribution ceilings, changes in legislation periodically also bring out other contribution possibilities. For example, since 1974, tax filers have been permitted to contribute to their spouses' RRSPs and take the advantage to deduct the contributions from their own personal income tax. Moreover, taxfilers were permitted to transfer or roll over certain types of income to their RRSPs tax-free, however, since 1999; most opportunities to roll over income from pension sources into personal RRSPs were eliminated. Still eligible were retiring allowances, up to certain limits: $2,000 for each year or part year of employment with the employer providing the allowance.

The evolving of RRSPs' contributions has followed a different path compared with the RPPs over the past 30 years. During the 1960s, annual contributions of RRSP remained modest. By 1970, they reached about 0.5 percent of total wages and salaries, equivalent to 0.4 percent of personal disposable income; they growed at a faster pace during the 1970s and 1980s. However, in 1981 and 1990 respectively, there were two short declines in the RRSP contribution rate, each associated with an economic recession. The decrease in the RRSP contribution rate in 1990 also coincided with the removal of most opportunities to roll over income from pension sources into tax filers' personal RRSPs. After 1990, the number of contributors to RRSPs increased significantly, as it has become more popular. From 1991 to 1999, the percentage of taxfilers who contributed increased from 24 percent to 29 percent and the average contribution grew from $3,200 to $4,540. By 1999, RRSP contributions reached $28.6 billion representing 6.4 percent of wages and salaries and 4.9

percent of personal disposable income. An exception to this growing trend was observed in 1998 as both the number of contributors and the amount of contributions declined.

RRSP investments are a significant share of the total assets held under the various portions of Canada's retirement income system. At the end of 2000, RRSP assets were almost $285 billion. From 1991 to 2000, these assets increased by 120 percent and now represent 25 percent of all reserves held under the different programs. At the end of 2000, almost half the assets were invested in mutual funds, 23 percent were held by the charted banks, and 8 percent were deposited with credit unions.

Not all RRSP savings are held until retirement. Contributors may use these deposits for other purposes besides retirement income. They may use them to meet unexpected financial expenditures or to fund themselves during a job loss period. This early withdrawal can partly account for the slower accumulation pace of RRSP assets than RPP. Though contributions of RRSPs have grown faster than for RPPs, RPP assets have grown much faster than for RRSP assets. This is because the change in asset levels not only depends on annual contributions of the pension plans but also on withdrawals and investment income. Looking at withdrawals, it is easy to find a higher level of early RRSP withdrawals, almost half of the total withdrawals of RRSP in 1995, compared with only 6 percent withdrawals of RPPs at that year. Furthermore, RPP assets base is much greater than RRSP assets, thus RPP interest accumulates at a faster pace.

c) Deferred profit-sharing plans (DPSPs)

Registered pension plans (RPPs) and Registered Private Saving Plans (RRSPs) are not the only retirement income program supplying tax deferral. Other program, such as deferred profit-sharing plans (DPSPs), having limited members, may result in considerable retirement savings for some employees.

In 1995, about 5,000 deferred profit-sharing plans (DPSPs) were registered with the

Canada Customs and Revenue Agency, and it was estimated that they were covering approximately 350,000 workers. The number of profit-sharing plans was much smaller; they numbered only 18 and had just over 9,000 members at the end of 2000.

2.2.3. Tax-deferred retirement savings plans in other OECD countries

As we mentioned before, eleven governments (Austria, Canada, Finland, Greece, Iceland, Netherlands, Norway, Poland, Portugal, Switzerland, and the United States) in OECD countries have put in place EET regimes and another ten (France, Germany, Ireland, Japan, Korea, Mexico, Slovak Republic, Spain, Turkey and the United Kingdom) also have implemented an EET regime, but with withdrawals taxed more leniently than in the first group of countries. For instance, the United Kingdom, Ireland, Span, France, Mexico and Turkey allow a partial tax-free withdrawal of benefits in the form of lump sum, while France, Germany and Turkey allow a similar tax privilege to annuity pension income. In Mexico, Turkey and the Slovak Republic, pension income above a specified tax-free limit is taxed at a relatively low rate.

The practice in other OECD countries differs from the EET regime to the extent that contributions and/or investment income are taxed. In Italy, Denmark, Belgium and Sweden, the tax treatment of private pensions is closer to comprehensive income tax system. While they allow for the deferral of taxation on contributions, they tax investment income, although at preferential rates.

Australia, New Zealand, Czech Republic, Hungary and Luxembourg tax contributions to private pension schemes[9]. In the latter three cases, either employee's or employer's contributions are exempt from taxation, but not both[10]. Although the treatment in Australia is uniquely characterized as a TTT regime, contributions can be partly exempted

[9] It should be noted that in Belgium, Austria and Portugal, the tax break on contributions is granted as a less generous tax credit or partial exemption rather than a full deduction.

[10] In the case of Hungary, mandatory employee's contributions are taxed under the TEE back-loaded tax system, while employer's contribution to private pension plans is completely exempted from taxation (EEE). In Luxembourg, employer's contributions are subject to a withholding tax. In the Czech Republic, a state subsidy amounting to 30 to 50 percent of total contributions is granted in addition to the partial tax deduction of contributions from personal income taxation.

(especially for low-income participants) and investment income and pension benefits are both taxed at a preferential rate.

3. Fiscal Current Debate

An important part of the debate regarding tax-deferred pension plans refers to the fiscal gap[11] between the tax cost and benefits. Measuring tax incentives and overall budgetary costs of the tax-deferred retirement plans in OECD countries, OECD finds that the size of the tax cost varies significantly across countries, ranging from nearly 40 cents per unit of contribution to around zero. Additionally, the size of the tax cost is generally higher in countries having an EET scheme than in others. A number of countries tax pension benefits at a relatively low rate despite having an EET regime, with a significant impact on the overall cost. Conversely, countries whose pension tax treatment deviates from the EET model generally face a lower net tax cost. As expected, the difference with respect to EET countries comes essentially from higher revenues foregone on accrued income.

Measuring the net fiscal revenues and costs implied by tax-deferred pension schemes, economists take into account current and future contributions, asset accumulation and withdrawals, all of which will be strongly influenced by future demographic developments. As expected, each currency unit invested in an EET pension scheme entails a net fiscal cost owing mainly to the exemption of contributions and investment income. For the aggregate cost to turn into a net benefit, total withdrawals would have to exceed total contributions by a sufficient margin to recoup the fiscal cost. However, OECD (2004) baseline simulations which are in the absence of new savings indicate that this is generally not the case, even if as a result of demographics. Assumed that the tax rates on contributions and withdrawals are the same, the revenue collected on future withdrawals would, in present value terms, just offset the revenues lost from contributions

[11] As developed by Auerbach (1994) and used in many analyses, the "fiscal gap" measures the size of the immediate and permanent increase in taxes and/or reductions in non-interest expenditures that would be required to set the present value of all future primary surpluses equal to the current value of the national debt, where the primary surplus is the difference between revenues and non-interest expenditures11. The fiscal gap has important implications for current policy choices.

that will reach the peak in two or three decades. However, this result partly depends on the assumption that tax incentives essentially lead to saving diversion rather than creation. In this part, we will generally review these tangled debates though still focus on the case of the United States and Canada.

3.1. Fiscal Debate of Tax-Deferred Pension Plans in the United States

It is by now conventional wisdom that the United States faces a sizeable long-term fiscal gap. The fiscal gap has important implications for future generations and should inform current policy choices. Under a wide range of studies and research, controversial evaluations about tax-deferred pension plans are suggested by economists, here we will review some of the most important opinions in the debate.

1) Boskin

One of the most important economists in this fiscal debate is Boskin. According to Boskin (2003), the value of tax deferred saving vehicles such as IRAs and 401(k)s is at the core of numerous analytical, empirical and policy issues in macroeconomics and public finance. But, in marked contrast to data on government liabilities, little information on deferred taxes beyond historical short-run flows is available anywhere.

Boskin acclaims that estimates of the long-term fiscal status have largely or entirely omitted the revenue from tax-deferred retirement plans, and those omissions are almost as large as the projected budget shortfalls over these periods. To prove this point, Boskin builds a simple model of the various revenue effects of deferred taxes, together with data from numerous sources, develops estimates of the deferred taxes already accrued and likely to accrue in the future.

The results of Boskin's study show that, various tax-deferred pension plans attract roughly $400 billion contribution and the amount is likely to grow with nominal income growth and the increased ceilings on tax-deferred contributions. On the other hand, there

will be large revenue losses from the tax-deductible contributions and investment income that is shifted to tax-deferred accounts, as well as interest on any additional debt. Boskin suggests that the present value of taxes net of the foregone revenue may well be positive, especially if account is taken of corporate tax revenue taxes on interest paid on additional debt, as well as by business taxes on the income from additional capital generated from the change in national saving.

As estimated by Boskin, the deferred tax vehicles have already recouped the foregone revenue, and the deferred taxes already accrued in tax-deferred saving vehicles had reached $3 trillion at the beginning of 2003, almost equivalent to the national debt held privately; the real present value of the net budgetary impact of future deferred taxes is likely to amount to $12 trillion through 2040 and $17 trillion through 2050. And the total size may rival the 75-year actuarial deficits in Social Security and Medicare, plus the national debt.

Specifically, several channels through which tax-deferred accounts affect the budget used in Boskin's study are as follows:

- The tax-deductible contribution to traditional retirement accounts causes the fiscal cost at the time the contribution is about -$7.1 trillion;
- Taxable Withdrawals raises revenue when the withdrawal is made by the amount of +$9.1 trillion;
- To the extent that contributions are financed by diverted saving, revenue on the taxable saving that would have occurred is reduced by the amount of -$1.2 trillion;
- To the extent that contributions generate net additions to national saving, the capital stock increases and the associated increase in future income raises revenue by +$6.7 trillion;
- All of these factors affect the debt held by the public, which in turn affects federal interest payments by+$5.5 trillion; and the change in debt payments affects income taxes on the interest by-$1.2 trillion.

The estimated overall net present value of revenues from all these effects is about $12 trillion. These effects can be divided roughly into direct effects and feedback effects. The direct revenue effects are the lost taxes on contributions and diverted saving, and the taxes collected on withdrawals, holding the overall rate of capital accumulation fixed. The feedback effects include changes in the size of the economy and the resultant effect of increases in the capital stock on revenues, changes in public debt on federal interest payments, and changes in taxes paid on those federal interest payments. Notably, almost all of Boskin's revenue projections comes from feedback effects: The purported increase in the capital stock and the effect on reducing debt held by the public (net of the income taxes paid on debt payments) amounts to at least $11 trillion of the roughly $12 trillion total effect.

2) Auerbach and Gale

Auerbach and Gale (2003) reassess the long-term fiscal outlook in light of Boskin's findings, and acclaim that even given the assumptions underlying Boskin's analysis, his projections of revenue due to tax-deferred accounts have only a modest effect on the long-term fiscal outlook.

Auerbach and Gale find a permanent fiscal gap under current policies of 7.55 percent of long term GDP. This result implies that tax increases and/or spending cuts that amount to more than $750 billion per year is needed to achieve long-term fiscal balance. They explain that almost all of the direct revenue effects that Boskin projects are already implicitly contained in the fiscal gap calculations. That is, Boskin's assertion that existing estimates of the long-term fiscal outlook do not include future taxes from retirement accounts is inaccurate. Specifically, the fiscal gap in Boskin's baseline estimation already contains all of the contributions and about 85 percent of the withdrawals for tax-deferred accounts projected. Thus taking into account Boskin's projected growth in retirement accounts has only a modest effect on the nation's long-term fiscal gap— reducing it from

7.55 percent of GDP to 7.38 percent of GDP. Between now and 2040, the adjustment reduces the fiscal gap from 2.25 percent of GDP to 2.07 percent of GDP.

To calculate the net impact of Boskin's correction on the overall fiscal gap and to emphasize this net impact is small, Auerbach and Gale provide an unbalanced comparison in which they add the feedback effects from the additional revenue from withdrawals in Boskin's projections (compared to the taxes previous fiscal gap estimates). The results show that this change has little effect on the fiscal outlook. The fiscal gap through 2040, for example, falls to 2.03 percent of GDP, rather than to 2.07 percent. Focusing on the overall projected budgetary effect from retirement accounts, Auerbach and Gale claim that almost all of Boskin's revenue projections come from feedback effects which make the overall budgetary effect from tax-deferred accounts immensely overstated.

They also recalculate net present value of revenues used by Boskin because the parameters specified in Boskin's calculations may substantially overstate the feedback effect. The results of the recalculation and adjustments suggest an enormous difference to the purported overall budgetary effect. For example, assuming that 30 percent of contributions to tax-deferred accounts represent net national saving, the adjusted parameters imply a present value of just $1.2 trillion in revenues through 2040 — one tenth of Boskin's base case estimate. Even assuming that 40 percent of contributions are net national saving, along with the other adjustments to the parameters, implies the net present value of revenues from retirement plans will be $3.3 trillion through 2040, less than 30 percent of Boskin's estimate. In either case, the results are far smaller than the $12 trillion figure that Boskin obtains. The results of recalculation suggest that the net present values of revenues from tax-deferred saving plans are close to zero and could well be negative. Auerbach and Gale claims that the present value of revenue on withdrawals is projected to amount to almost $4 trillion between now and 2040. Almost all of the reduction in this adjustment comes from changes in the perceived feedback effects. In their estimates, feedback effects account for $3 trillion, far lower than the $11 trillion feedback effect contained in Boskin's $12 trillion revenue estimate. Based on these

projections, Auerbach and Gale suggest that over the next 40 years, adjusting the fiscal gap to account for retirement plans also alters the fiscal gap by only a small amount.

3) OECD Opinion

Contrast with Boskin (2003), who project that there are $1.7 trillion implicit net assets in tax-deferred pension plans in the US even ignoring the indirect effects; OECD (2004) finds that implicit net assets may instead be negative at -$4.2 trillion. The gap between these two sets of results stems essentially from the different assumptions underlying the two exercises. In fact, using Boksin's assumptions, the Secretariat's estimates of implicit net fiscal assets would rise to $1.2 trillion.

The differences are mostly from Boksin's assumptions that nearly 50 percent of total contributions are funded by new private savings and that there is no spread between the effective tax rate on pension income and the marginal tax rate on contributions. However, the assumption regarding the share of new saving has been disputed by some, including Auerbach et al. (2003) who have argued that a proportion of 25 percent of total contributions would seem more reasonable. Furthermore, there is no clear evidence that the tax rate on withdrawals should be as high as the one on contribution, as tax-deferral may provide opportunities for some tax smoothing. Another source of difference comes from withdrawals function in Boskin's projections. He assumes that accumulated assets in tax-favored plans are entirely withdrawn as a lump-sum at the age of 65. OECD claims that although such a front-loading of withdrawals does not change the net present value of tax revenues over the whole period 2000-2040, it contributes to bring about positive fiscal revenues earlier in the projection period, preventing thereby the build-up of net fiscal liabilities. Given that the future is discounted at a lower rate than the rate of return on assets in Boskin's model, the future net fiscal revenues will translate into higher fiscal assets in present-value terms.

In order to assess the sensitivity of the overall results to changes in initial conditions and some assumptions, a number of variants of the baseline projection have been

implemented by OECD (although not include the effect of new saving created). Overall, the results indicate that the estimates of net fiscal revenues and their discounted sum over time (net fiscal assets) can be quite sensitive to some of the initial conditions, assumptions or tax parameters. First, an increase in the contribution rate unambiguously lowers net fiscal assets for every country examined and indeed countries with relatively high contributions as a share of a wages. Second, the overall impact of a change in the amount of initial assets is ambiguous as lower initial assets accumulated from diverted savings reduce foregone revenues from accrued income but also potential withdrawals. Which of these effects dominates depends largely on accrued income. In countries with high tax rate on accrued investment income from alternative saving vehicles (eg. Canada) would raise net fiscal assets, as the reduction in foregone revenues is larger than the decline in taxes on withdrawals. In general, however, the impact on withdrawals tends to dominate in other countries with large assets built-in (Netherlands, United Kingdom, and United States).

The results are more sensitive to changes in some of the basic assumptions regarding productivity growth and rates of returns even though in both cases the effects are also ambiguous a priori. In addition, reducing the spread between the marginal tax rate on contributions and the effective tax rate on withdrawals by one percentage point brings net fiscal liabilities down by a non-negligible margin.

The baseline projection of OECD revealed that the budgetary cost of tax-deferred schemes in terms of revenues foregone is likely to remain significantly larger than revenues collected despite the sharp rise in the latter resulting from population ageing. As we mentioned earlier, however, this result partly depends on the assumption that the tax incentives essentially lead to saving diversion rather than creation.

4) Congressional Budget Office (CBO)

Using projections of flows into and out of retirement plans for the next 75 years, the CBO

(2004) estimates the flows of contributions to, earnings on, and withdrawals from tax-deferred retirement savings. CBO also applied the relevant tax rates to derive the annual tax expenditures expressed as a percentage of GDP.

Investigating the fiscal effect of tax-deferred pension programs, CBO measures how the receipts-to-GDP ratio will change over the next 75 years as a result of the tax-deferred pension plans, the result shows that receipt-to-GDP ratio does grow but not much affected in the long run. It is estimated that by 2078, receipts are projected to be about 0.5 percentage points higher than in 2003 in terms of GDP under the effect of deferred taxes.

Combining all types of plans, CBO (2004) yields a net flow of funds into all tax-deferred retirement plans that fluctuates between 7.7 percent and 9.6 percent of GDP over the 75-year period. From 2015 on, the percentage will be around 8.0 by 0.3 percentage points. In contrast to the flow of funds, the tax expenditure shows a clear trend towards zero over time. Between 2003 and 2078, tax expenditure changes from 0.8 percent to 0.3 percent of GDP. In other words, CBO projects that the fiscal improvement resulting from tax-deferred retirement plans will be 0.5 percent of GDP over the next 75 years.

3.2. Fiscal Debate of Tax-Deferred Pension Plans in Canada

In Canada, the current population growth is estimated at 0.8 percent per year. However, growth is expected to stop by 2040. Statistics Canada (2003) projects that population growth will turn negative around 2050[12]. The impact of demographic change on fiscal revenue and cost has received increasing attention over the past several years in Canada,

1) Canadian Academics

Mérette (2002) expresses the view that the ageing transition may not cause a worrisome problem in Canada. Revenues from the tax-deferred private pension plans in Canada will

[12] During the same period, the average age of the population will rise from 37.8 years in 2000 to 45.8 years in 2040. By 2040, the elderly share will rise rapidly, reaching 25% while the share of young people is expected to fall to 14%.

have a great smoothing impact on the fiscal status facing the population ageing.

With the increase of the contribution ceilings on RRSPs and RPPs in 1999, the assets accumulated in these programs reached the huge size of over 100 percent of GDP. According to Department of Finance, in 1998, the foregone revenue reached $13.9 billion about 1.5 percent of GDP. In other words, the estimated net revenue loss for Canadian governments associated with tax-deferred retirement plans amounted to as much as 2.3 percent of GDP in 1998. However, the tax expenditures of the programs greatly depend on the age structure, and the change of population structure has been pushing up fiscal cost of the government. The baby boomer cohorts are now in their 40s and 50s and will be soon inclined to withdraw the funds for retirement. It is projected that the government will regain the lost revenue as the retirees gradually run down their retirement assets. It raises the possibility that tax expenditure will be recouped as the baby-boomers moving through the demographic structure.

As Mérette (2002) claimed, the role of net tax expenditures associated with tax-deferred pension plans has been too often neglected in debates regarding medium and long term fiscal schemes. For instance, Robson and Scarth (1997) recommend an up-front debt reduction as the long-run fiscal plan for Canadian governments in order to cushion the future expenditure pressures arising from population aging. However, they ignore the potential offset effect of tax-deferred pension plans, which means that both sides of the government's balance sheet are not fully examined in their evaluation. Similarly, Oreopoulos and Vaillancourt (1998) execute generational accounting calculations to evaluate the intergenerational equity of the fiscal status in Canada. They also do not take the compensating effect of tax-deferred pension plans into consideration. The outcome of their analysis is that current and future generations shared the fiscal burden equally as a result of the fiscal consolidation by Canadian governments in the second half of the 1990s. This implies that the inclusion of tax-deferred pension plans would result in a fiscal balance in favor of future generations. Murphy and Wolfson (1997) are the first to recognize the role of tax-deferred pension plans in the fiscal balance. Fougère and

Mérette (2000a) were the first to simulate the fiscal balance effect of these programs in a general equilibrium framework. Since they focus on more general issues related to ageing populations, Fougère and Mérette describe the role of net tax expenditures in a simple fashion. The contributions and investment income are combined into one element, and the RPPs and RRSPs integrated into a single program. In a more recent paper, Mérette (2002) builds a partial equilibrium but detailed life-cycle model to further investigate the numerical projections of government tax expenditures associated with population aging. This model has the advantage of separating the two programs and of taking into account the three components of each program, that is, exemption for contributions, deduction for investment income and taxation upon withdrawals.

Notably, Mérette (2002) claims the difference in terms of GDP between 2000 and 2050 is enough to pay the implicit health-care liability calculated for the same period by Robson (2001). Moreover, the increase in the implicit tax base is concentrated on those who will have contributed to the private pension plans. The rise in tax payments will thus be greater for individuals contributing larger amounts into RRSPs. Assuming that the tax revenue paid on the withdrawals made by these large contributors is recycled into healthcare expenditures and public pension benefits, Mérette suggests that we will witness an implicit redistribution of income between high-income individuals with lower-income individuals and Canadian governments will have the fiscal room to meet the new expenditure requirements in health care and public pensions that go together with population ageing.

2) OECD Opinion

The base case projections in OECD's (2004) study for Canada rely on series of important assumptions: employment grows at a constant annual rate of 4.1 percent, and 8.9 percent of total wage is contributed to the pension programs for each individual. Effective tax rate on contributions and benefit withdrawals are 34.3 and 29.3 percent respectively, while effective tax rate on accrued investment income is 27.7 percent. In addition, 60 percent of

the employment participate these programs.

The study of OECD, based on the employer-sponsored schemes and annuity pension income, suggests that about 33 cents net tax cost is associated with one dollar of contribution. The overall budgetary cost arising from contributions made in 2000 is 1.39 percent of GDP, and this figure is calculated as the product of the net fiscal cost per unit of contributions and total contributions to tax-favored private pension plans in 2000. As OECD emphasized, given the net fiscal cost per unit of contributions estimated on the basis of the tax treatment prevailing in 2003, these estimates should be interpreted with caution[13].

The simulation results of OECD also show that the forgone revenues on contributions in Canada follows a flat trend around 1.6 percent of GDP from year 2000 to 2050, however, forgone revenues on accrued investment income is 1.8 percent of GDP in 2050. On the other hand, the revenues collected on withdrawals are projected to be 2.3 percent of GDP in year 2045 and the net fiscal revenues are negative at -1.1 percent of GDP.

Compared to the base case without new savings, the alternative scenario with moderate and high proportion of new saving has similar growth pattern, but with higher level of net fiscal revenues. Simulation indicates that, for moderate proportion of new saving, net fiscal revenues are about 0.5 percent of GDP higher than in the base case and for a high proportion of new saving, 1.0 percent.

4. Effects on Private and National Savings

4.1. Effects of Tax-Deferred Pension Plans on Savings in the United States

Whether the tax-deferred pension plans increase net saving can be of crucial importance to future generation and to the health of the economy in general. There has been great number of papers analyzing the effectiveness of IRAs and 401(k) plans in stimulating

[13] Source: National Sources and OECD.

saving. Some researchers have found large and significant positive effects of IRAs and 401(k)s on saving behavior; the evidence favoring this view can be found in the paper by Poterba, Venti and Wise (1996). Others use the same data but find little or no saving effects of IRAs and 401(k)s, as Engen, Gale and Scholz (1996) explain in their contribution to this controversial debate. In this section, we will revisit the controversial debate over the effectiveness of saving incentives.

Venti and Wise (1996) acclaim that based on a series of papers using very different methods of analysis, contributions to these accounts represent new saving in large part. In their view, the critical difficulty to determine the saving effect of IRA plans is savers heterogeneity: some people save and some others don't, and the savers tend to save more in all forms. Thus, a continuing feature of their analyses has been the use of different methods to control for heterogeneity.

When Venti and Wise began to work on the saving effect of IRAs in the mid-1980s, they used the available data to control for individual demographic characteristics, and then they used accumulated financial assets to control for "individual specific" saving effects. The studies thus asked whether persons who save more in IRAs in a particular year save less in other financial assets, controlling for heterogeneity in this way. The results suggested that the majority of IRA saving, even at the outset of the program, represented net saving and was not accompanied by large-scale reduction in other financial asset saving.

Glenn and Skinner (1996) argue that even if one agrees the factions on the magnitude of how IRA and 401(k) contributions affect personal saving, we should further know the cost of the program in terms of foregone tax revenue. Glenn and Skinner develop a cost-benefit approach that focuses on the incremental gain in long-term capital accumulation per dollar of foregone government revenue form offering the saving incentive program. Even for quite conservative measures of the saving effects of IRAs or 401(k)s, this approach estimates that the incremental gains in capital accumulation per

dollar of lost revenue are generally large.

a) IRA

Based on 20,000 observations form the survey of income and program participation, it is suggested by Venti and Wise (1991) that the individuals who contribute to IRA accounts are likely to be wealthier, older and have higher incomes than those who do not. And much of the analysis about the individuals' consumption and saving decision is conducted using the life-cycle model which implies that households save during their working ages to finance retirement consumption. Other main determinants of the saving pattern of individuals are: the rate of return to saving, that individual's preference over present and future consumption, and the time profile of earnings.

In the life-cycle model, a saving incentive plan raises the rate of return for saving through the mechanism of that plan. However, economic theory tells us that the incentive raises a household's total saving through the way that higher rate of return affects the household at the margin- that is, for an incremental dollar of saving. Roughly three-fourths of all contributors deposit the full IRA limit in their account in any given year during the period covered by the study (1983-1986). Several commentators have used this fact as prima facie evidence that IRAs could not generate new saving, because they offer no marginal incentive to save after the limit is reached (Burman, Cordes and Ozanne, 1990; Gravelle, 1991).

Glenn and Skinner, however, argue that an analysis of consumption and saving decisions over a lifetime should focus on lifetime limits from a lifetime perspective, not the annual limits. Gale and Scholz (1994) demonstrated that only 30 percent of IRA contributors contribute at the limit for each of years under their study (1983-1986), implying that the remaining 70 percent of IRA contributors faced a marginal incentive in at least one of the years under the study. This evidence suggests that the IRA limits are binding for few households, even in the relatively short term.

Some economists focus instead on psychological issues of self-control and myopic consumption behavior (Thaler, 1994) rather than the life-cycle model. In this view, IRAs motivate saving both because of the immediate reward of the tax deduction (including the pleasure of denying the IRS[14] its due) and the fact that money is placed "off limits" for current consumption. Similarly, the life-cycle model predicts that optimizing agents should contribute early in the year to their IRA to maximize tax benefits. However, roughly 40 percent of IRA contributors during the 1984 tax year filed quite late, actually in calendar year 1985 (Feenberg and Skinner, 1989).

Both the life-cycle and the behavioral saving models suggest that IRAs have at least the potential to promote saving even in the short term. However, assessing how much IRAs affect saving in the short term is more difficult than it might first appear. A complete analysis would require relatively complete information about household: their taxable assets and tax-favored assets, along with earnings, age and demographic characteristics like marital status or number of children that affect consumption and saving decisions. Household are also likely to have different underlying preferences for saving that are not observable.

At the high end of range of effects are the results of Venti and Wise (1986, 1987, 1988, 1990, and 1991). They model the choice among three goods: consumption, tax-deferred saving (IRA) and taxable saving. Their reason is that if IRA saving is a perfect substitute for taxable saving, the individual will immediately shift taxable saving into IRAs, because IRAs offer the higher net-of-tax rate of return. If, however, IRAs are imperfect substitutes for other forms of saving, then some IRA contributions will come not at the expense of taxable saving, but at the expense of current consumption. If this happens, IRA

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[14] The IRS is the United States national tax collection agency, called the Internal Revenue Service. It is a branch of the Department of Treasury, deals directly with more Americans than any other institution, public or private. It also is one of the world's most efficient tax administrators. In 2003, the IRS collected nearly $2 trillion in revenue and processed more than 222 million tax returns. It cost taxpayers 48 cents for each $100 collected by the IRS.

contributions represent new saving.

To sort out the explanation for the observed relationships among IRA contributions and savings, Gale and Scholz (1994) derive the implied saving function for a particular set of household preference, where saving is a function of wealth and age. Their model is also more general than that of Venti and Wise by allowing for a difference in tastes for saving by IRA contributors compared to those by noncontributors. Their estimate shows that IRAs have a negative or at best zero effect on saving for the sample as a whole. These results suggest that IRA contributions come almost entirely form saving that would have been done in the absence of any incentives.

The intuition behind the Venti and Wise result is that if IRAs and taxable saving were perfect substitutes, then everyone should contribute. However, even among high-income households, roughly one-forth do not contribute. Hence, IRAs must be imperfect substitutes for non-IRA saving, which implies that IRA contributions are coming from reducing current consumption and increasing overall savings. However, in the Gale and Scholz approach, the fact that some households do not contribute to IRAs is interpreted as evidence that those households have little or no taste for saving. If so, then the Venti and Wise results may be biased upward. IRA contributors save more not because of the existence of an IRA program, but because they like to save, in both IRA and non-IRA vehicles. However, the Gale and Scholz (1994) estimates that IRAs have no impact on saving are probably biased downward, since in the estimates, they exclude households who reported more than $100,000 in saving.

Because there are so many problems with estimating specific models of IRA contributions, a number of authors have turned to longitudinal studies of saving behavior, using repeated samples over a number of years to assess the extreme to which households "reshuffle" existing saving into IRAs. The basic idea is to use saving and IRA information on the same households over time.

Attanasio and De Leire (1994) compare saving behavior of households just opening an IRA with that of households previously making contributions. They test whether newly contributing households decrease their non-IRA assets or their consumption to fund contribution. They find that new contributors do not have slower consumption growth, but do experience slower growth of non-IRA assets, which they interpret as supporting the claim that IRA contributions largely represent reshuffled, new saving. However, this interpretation evaluates only the reshuffling that takes place in the first year for a "new" contributor. Even if one assumes that nearly all IRA contributions by new contributors are shuffled, one still finds that the old contributors--in the steady state, the vast majority of all contributors--are barely shuffling at all. Reinterpreting Attanasio and De Leire results, Hubbard and Skinner (1995) found as much as 49 cents of new saving per $1 contribution to an IRA account.

Generally speaking, the econometric studies finding very large saving effects are probably biased upward, and the econometric studies finding very small or negative saving effects are probably biased downward. Combined with survey data, and other studies suggesting an intermediate impact of IRAs on saving, Hubbard and Skinner (1996) suggest that a conservative estimate of the effect of IRAs on personal saving would be about 26 per dollar of IRA contribution.

b) 401(k) plans

Enrollees in 401(k) saving plans look much different from IRA contributors. Employees with lower levels of income are far more likely to participate in a 401(k) saving plan than they are to have an IRA. In other words, the participation rate for 401(k) saving plans is far higher, especially among low-income workers and younger workers, than was the participation rate for IRA.

Estimating how 401(k) saving plans affects household saving is easier than it for IRAs, because some firms offer 401(k) plans to employees, and others do not. It is more

appealing to assert that two different groups- those who are eligible for 401(k)s and those who are not eligible-are households that share common characteristics.

Poterba, Venti and Wise (1994) compare the saving behavior of workers eligible with those not eligible for 401(k)s. They find that in their sample, many workers choose not to contribute a 401(k) plan even they are eligible to do so. Under their assumption that the two groups hold similar tastes for saving, and the composition of these workers did not change by much between 1987 and 1991, they reached the conclusion that 401(k)s are entirely new saving.

Although there are some problems in this approach, overall the evidence supports the view that 401(k) balances have not been offset by a decline of financial assets such as stocks, bonds and checking accounts. Whether 401(k) contributions are offset by decreases in home equity is, however, still an open question. Our reading of the evidence is that 401(k)s largely represent new saving, if only because there is so little in the form of other financial assets or home equity among low-income and younger 401(k) contributors. We nonetheless recognize that the precise fraction of 401(k)s representing new saving is still under debate.

4.2. Effects of tax-deferred pension plans on savings in Canada

In the case of Canada, Fougère and Mérette (1999b) provide an empirical examination of the relation between population ageing and personal savings in Canada with time-series data. They estimate an aggregate personal savings rate equation capturing the shifting of age structure. Contrary to the popular view, their results indicate that over the last two decades, the changing age structure of the population has contributed to an increase in personal savings, rather than to a decrease.

According to Fougère and Mérette (1999b), the increase of cost in medical care due to arising in the old dependants can be compensated by the effect of decline in young

dependants. Their results indicate that though the effect of the reduction in the share of young dependants is expected to continue to dominate over the next 10 years, the changing age structure of the population will still encourage an increase in the personal savings rate until 2010. However, as soon as the increasing share of old dependants begins to dominate after 2010, population ageing will eventually contribute to a significant reduction in the personal savings rate. Simulation results from their econometric model suggest that by 2050, the direct effect of population ageing may contribute to reducing the personal savings rate by close to 50 percent. However, according to Meredith (1995), there are two difficulties with the measurement of savings by the elderly in household data. One is that income and wealth are often defined improperly, since no distinction is made between earned income and other source of income. The second one is that household savings is not observed directly and is inferred from hypothetically constructed wealth profiles of retired people.

According to Miles (1999), one can reconcile household survey data with the prediction of the life-cycle model. Savings rates derived from household surveys are generally based on the difference between measured income and measured consumption. Miles shows that income from pensions may dramatically be overestimated in household surveys. Notably, household surveys consider depletion of pension funds as pension income. This erroneously boosts the savings rate. The true savings rate can be defined as the change in the value of wealth as a ratio of income, which excludes the depletion of capital.

To illustrate the situation in Canada, Bosworth et al. (1991) have excluded private pension income from total income in SPSD/M[15] and recalculated personal savings for specific age groups, with and without capital gains and losses. They find that the savings rate then follows a completely different pattern during the period of retirement. The new pattern of savings is similar to the unadjusted rates until age 50-54. However, after age 54, the savings rate declines rapidly, turns negative around age 60-64 and remains negative or

[15] See Bordt *et al.* (1990).

close to zero for senior households. This result is compatible with the predictions of the life-cycle model. However, the simple method of excluding all private pension income in the calculations may underestimate the true savings rate for seniors; because it does not take account the return on the remaining stock of asset, which should be treated as income. However, Meredith (1995) argues that interest income on the remaining principal is small relative to the rate at which the principal is being withdrawn. The analyses of Bosworth et al. (1991) and Miles (1999) also suggest that the true savings rate pattern is closer to the adjusted pattern than to the unadjusted one.

The life-cycle hypothesis relies on the idea that consumption of the representative household reflects the desire to achieve the preferred allocation of its life resources to consumption over the life cycle. However, there are numerous factors that should also be considered. For instance, the household savings rate can also be affected by demographic factors, public sector savings, changes in real after-tax interest rates, public sector pension plans and so on. For example, the results of Fougère and Mérette (1999b) provide evidence for the Ricardian equivalence: an increase in public sector deficits leads to an increase in personal savings. For a savings rate of 10 percent, a 1 percent of GDP reduction in public sector deficits would lead to a 0.6 percentage point reduction in the personal savings rate. The results also show that the dependency ratio is an important variable determining long-run trends in the savings rate. According to their estimates, an increase in dependency ratio of 1 percent leads to a reduction in the savings rate of about 2 percent. Moreover, over the last two decades, because of the reduction in the share of the young population, dependency ratio contributed positively to personal savings. On the other hand, the expected increase in the dependency ratio, associated with population ageing will put significant downward pressures on saving in the future.

Fougère and Mérette (1999b) also present the simulation results of the effect of population ageing on the personal savings rate, for the period 1997 to 2050, using the United Nations demographic projections. The results indicate that the increase in the share of old-age dependants, in the short run, is more than compensated by the reduction

in the share of young dependants. This leads to a reduction in the total dependency ratio between 1997 and 2010, but to a dramatic increase thereafter. As a result, in the short run, the changing age structures of the population result in an increase in the personal savings rate. By 2010, the personal savings rate increases by 12 percent relative to each baseline solution. However, in the long run (by 2050), the impact of population ageing will lead to a 49 percent reduction in the personal savings rate.

It should be noted, however, that this analysis does not take into consideration the possible induced economic effects of population ageing on savings through effects on wealth, real interest rates, the government balance and so on, these results remain a partial analysis.

4.3. Effects on savings in other OECD countries

In OECD (1996), projections of OECD savings rates are made combining estimates of the effect of future dependency rates on private savings and on public savings. The resulting projections, suggest a decline in OECD net national savings from about 7 to 8 percent of GDP currently to between zero and -8 percent of GDP in 2030. This decline, however, appear improbable if we consider possible rates of national investment.

If savings behavior is consistent with the traditional "life-cycle" hypothesis, by which households are assumed to save when they are working and dissave during retirement periods, then ageing populations are likely to lead to a lower private saving ratio. However, empirical evidence supporting the life-cycle model is very mixed similar to the case of the US. Meredith (1995), reviewing the empirical literature, shows that estimates of the sensitivity of the savings ratio to the dependency ratio vary greatly depending on whether they are based on microeconomic or macroeconomic, time series or cross-section data.

On the basis of pooled-time series estimation across major industrial countries, Masson

and Tryon (1990) obtain an estimate suggesting that an increase of 1 percent in the dependency ratio causes a commensurate fall in the savings ratio. This would be consistent with a very high sensitivity of private savings to demographic changes, typically found in calibrated overlapping-generations models (for example, Hviding and Mérette, 1998).

At the other extreme, household survey evidence typically suggests only a weak (or even positive) effect of the dependency ratio on private savings rates. An empirical study using pooled time-series evidence for 21 industrial countries by Masson et al (1995) provides further empirical support for a weak effect of dependency ratios on private savings rates (according to which a 1 percent rise in the dependency ratio reduces the private savings rate by 0.14 percent only.)

The study result of Turner et al (1998), using the version of the Minilink model to generate the long-term reference scenario, lies between these two extremes, but towards the lower end of these estimates, reflecting the weight of most recent evidence. It implies that a 1 percentage point rise in the dependency ratio reduces the private savings rate by 0.3 percent.

5 Numerical Projections of Tax Expenditure Associated With Tax-Deferred Retirement Plans

In this section, we develop a model to project tax expenditures that are associated with EET type of retirement saving plans. To project the effects of tax deferral on fiscal receipts, we need to estimate the flow of contributions, withdrawals, and the earnings on the balances in the retirement plans. Also we need to know the tax rates relevant to those flows. From those figures, we calculate the tax expenditures resulting from deferred taxes: the taxes not collected on contributions and earnings netted against the taxes collected on withdrawals.

5.1 The Structure of the Model

As in the case for Canada and the US, we assume that the tax legislation requires full taxation of the principal and returns in tax-deferred pension plans when either withdrawals or bequests occur. The time period in our study is 1930-2160, and we have seven age groups from age 16 to 85. The model simulates the mechanics of the tax-deferred pension plans; generating different projections for 1930-2160 of the three components of the constructed pension plan. We derive age- and year-specific parameters by examining contributions and withdrawals in a base year 2000. A key assumption behind the model is that the behavior observed for an age group in the base year will be repeated by other workers when they reach that age in later years. The end product of the model is a set of estimates of tax expenditure on tax-deferred contributions, withdrawal, investment income as well as the net tax expenditure for each year between 1930 and 2160.

We assume that contributions to the tax-deferred pension programs start in year 1930. The components of tax expenditures, however, are determined in the model from observations in year 2000. In a first stage, we estimate the initial flow of the contribution and withdrawal across age groups for 2000. Let *disc* be the contribution share corresponding to age-group g in 2000. This distributional parameter is taking from Fougère and Mérette (2000b). Similarly, let $N_{2000,g}$, be the number of individuals in cohort g in 2000, *taxc* the marginal tax rate on contribution, ep_g the income level of contributors in cohort g in 2000, and tec_{2000} the tax expenditures on contributions. Algebraically, contributions are determined by the following set of equations[16]:

$$C_{2000,\,g+1} = \frac{disc_{g+1}}{disc_g} \times C_{2000,\,g}, \tag{1}$$

$$Taxc \times \sum_{g=1}^{7} (N_{2000,\,g} \times ep_g \times C_{2000,\,g}) = tec_{2000}. \tag{2}$$

In equations (1) and (2), the terms *disc*, $N_{2000,g}$, ep_g, *taxc,* and tec_{2000} are given. The set of equations serve to determine $C_{2000,g}$.

[16] Full notations of the various variables used in equation can be found in Appendix A.

The procedure is similar for the determination of withdrawals for 2000. The distribution of withdrawals made in 2000 is also taken from Fougère and Mérette (2000b) and total amounts withdrawn from these programs must equal the estimated tax expenditures. Let *disw* be the withdrawal share of cohort g in 2000, *taxw* the marginal tax rate on withdrawals and *tew* tax expenditures on withdrawals. Withdrawals are thus determined by the following set of equations:

$$W_{2000,\,g+1} = \frac{disw_{g+1}}{disw_g} \times W_{2000,\,g}, \tag{3}$$

$$Taxw \times \sum_{g=1}^{7} (N_{2000,\,g} \times ep_g \times W_{2000,\,g}) = tew_{2000}. \tag{4}$$

Equation (1) and (3) fixes the distribution of contributions and withdrawals across age groups while (2) and (4) ensure that the levels of aggregate contributions and withdrawals generated equals the estimated tax expenditures in 2000 reported in the Department of Finance, Canada[17].

Accordingly, a budget constraint on each cohort in the model is imposed to ensure that all sheltered assets are taxed by the time an individual dies. We impose a budget constraint consisting of two sets of equations. The first set represents each cohort's wealth accumulation associated with participation in private pension scheme. The second set of equation implies that wealth in the plan is zero at the beginning and at the end of adult life, as children do not contribute to these programs and receive bequests of tax-sheltered assets after taxes only. The budget constraint associated with participation in private pension schemes by a cohort that reaches adult life in period t, is:

$$A_{t+g+1,\,g+1} = (1 + r_{t+g,\,g})A_{t+g,\,g} + C_{t+g,\,g} - W_{t+g,\,g} \qquad g=1,\ldots 7, \tag{5}$$

$$A_{t,1} = A_{t+7,8} = 0. \tag{6}$$

the term $A_{t,g}$ is the amount of assets accumulated in private plans at age g and period t, and r is the rate of return on accumulated assets. Equation (5) says that the amount of

[17] Department of Finance, *Government of Canada: Tax Expenditures.*

assets accumulated by a cohort of age $g+1$ at period $t+g+1$, $A_{t+g+1,g+1}$, equals the principal and return on the stock of assets accumulated at the previous period, plus the net of contributions and withdrawals made at age g during period $t+g$. Equation (6) stipulates that the stock of pension programs asset at the beginning and the end of life must equal zero. Typically, a cohort starts contributing to the program with minimal withdrawals. This permits a positive accumulation of assets. At some point in the life cycle, the cohort starts withdrawing more than contributing. The difference between withdrawals and contributions gets smaller over time, and at a certain point assets start to decline. Given the tax legislation's requirement of these types of plans, cohorts must deplete their tax sheltered assets completely at or before dying. Using these two equations combining with the first four equations, we can also calculate the assets across age groups in 2000.

As the program starts in 1930 and we have 7 age groups participating, we can consider that in year 2000, both contributions and withdrawals of the pension programs are mature. This implies that individuals' contributions and withdrawals increase over time at the growth rate of productivity. Therefore, contributions made in 2000 across the seven age groups are considered in "steady state". That is, we assume that the distribution across age groups will remain constant after 2000, whereas the level of contributions and withdrawal will increase in accordance with the growth rate of productivity.

The second step of our simulation is to determine the contributions and withdrawals after 2000. This is done through a set of simple dynamic equations:

$$C_{g,t+1} = (1+\gamma)C_{g,t} \qquad \text{t=2000,...2160,} \qquad (7)$$

$$W_{g,t+1} = (1+\gamma)W_{g,t} \qquad \text{t=2000,...2160.} \qquad (8)$$

where γ is the productivity growth rate. These two equations say that after 2000, contributions and withdrawals are augmented at the productivity growth rate. It is assumed that the rate of productivity growth remains at 1.23 percent per year in our baseline scenario.

To project the evolution of the program in the entire period, we have to determine the information before 2000. This is done in this fictive experiment by discounting the steady state level of contribution by productivity growth with time value:

$$C_{1930,g1} = C_{2000,g1} \times \left(\frac{1}{\gamma}\right)_7 , \tag{9}$$

$$W_{1930,g1} = W_{2000,g1} \times \left(\frac{1}{\gamma}\right)_7 . \tag{10}$$

As in the examples of section 2, only one generation contributes to the program in the first period, 2 generations in the second period, etc. As the program goes on, there will an overlapping generations contributing to and withdrawal from the pension program. We do replicate the same procedure for the withdrawal before 2000.

With these flows of the contributions and withdrawals, we can then, determine the assets before and after 2000 by cohorts' budget constraints. Since this is an accounting exercise, tax rates, interest rate, productivity growth per capita and the demographic structure are exogenous.

In the baseline projection, we used a marginal tax rate of 20 percent for contributions and withdrawals and investment income, as the tax rates used by OECD (2004). We also apply a 4.5 percent per year interest rate[18] to accumulated assets according to the International Financial Statistics (IFS). The productivity growth rate, 1.23 percent per year, is also approximately calculated from the IFS[19]. The model uses the same rates throughout the entire period in our study. We also simulate several alternative scenarios to the baseline. The purpose of the alternative scenarios is to demonstrate how our results about the effects of deferred taxes on federal expenditures vary under different circumstances. We report in Table 5 the various assumptions under the base case and alternative scenarios.

[18] The International Financial Statistics (IFS)_Table_56577.0935625.
[19] The International Financial Statistics (IFS)_Table_56577.0935625.

Table 5 Key Parameter Values in the model

Key Parameter	Base Case	Alternatives	
Population growth rate	0%	Adjust	dynamically[20]
Productivity growth	1.23%	1.35%	---
Nominal interest rate	4.5%	4.95%	4.05%
Marginal tax rate for contribution[21]	20%	22%	18%
Marginal tax rate for withdrawal	20%	22%	18%
Marginal tax rate for investment income	20%	22%	18%

5.2 Simulation Results

5.2.1 Base Case

Table 6 below shows the evolutions of the three components of the tax-deferred pension program. In terms of contributions, the pension program is partially mature in 1970, after which total contributions remains a constant percentage of GDP. In terms of withdrawals, however, the program is mature in 1990, after that it grows at a constant productivity rate.

Specifically, from 1930 to 1960, contributions grow more rapidly than withdrawals and the level of contributions is greater than for withdrawals. Between 1970 and 1990, however, withdrawals increase faster than contributions since contributions are already mature.

It is worth notice that the numbers reported in Table 6 tells us the same story as the example 2 in section 2. Over time, new cohorts begin contributing to retirement plans even as old ones withdrawal funds. Thus, even as revenues are generated by withdrawals from retirement plans, new contributions remove income from the taxable base at the same time, offsetting the revenue gain.

[20] A demographic shift, taken from Fougère and Mérette (2000) is introduced. The demographic shift replicates the old age dependency ratio of Canada (past and projected) for the entire horizon.

[21] I also experiment changes in the tax rate. The results do not change much, so I do not report them here. They are available, however, upon request.

Table 6 Evolution of Components of Tax-Deferred Pension Plan in Base Case
(Percentage of GDP)

	Contribution	Withdrawal	Investment Income
1930	0	0	0
1940	0.73568	0.00776	0
1950	2.35058	0.10644	0.49854
1960	4.54534	0.66113	2.16268
1970	5.925	4.72552	4.77519
1980	5.925	7.00844	5.6159
1990	5.925	9.4096	5.65537
2000	5.925	9.4096	5.65537

From 2000, the values of each component remain constant.

According to those projections, the pension program is in the funding phase before 1990 and remains in the maintenance phase after 1990, when contributions and investment income exceed withdrawals by increasing amount in almost every year. The program is also fully mature in 1990 as both contributions and withdrawals grow at a constant rate after 1990. The tax expenditures on tax-deferred pension program corresponding to each component of the plans are shown in Table 7 and Figure 1.

Table 7 Tax Expenditures of Tax-Deferred Pension Plan in Base Case
(Percentage of GDP)

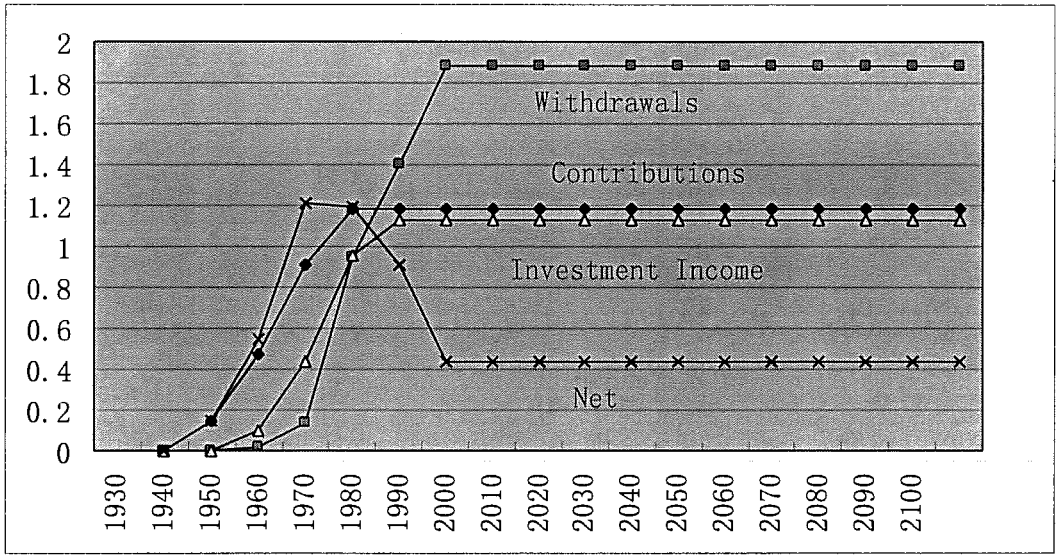
	Contribution Taxation	Withdrawal Taxation	Investment Income Taxation	Net Tax Expenditures
1930	0	0	0	0
1940	0.14714	0.00155	0	0.14558
1950	0.47012	0.02129	0.09971	0.54854
1960	0.90907	0.13223	0.43254	1.20938
1970	1.185	0.9451	0.95504	1.19494
1980	1.185	1.40169	1.12318	0.90649
1990	1.185	1.88192	1.13107	0.43415

From 1990, the tax expenditures become constant

The funding phase before 1990 is associated with a high tax revenue foregone. This is why net tax expenditures increase rapidly after 1930 to reach the highest point in 1970 at

1.2 percent of GDP. Throughout the maintenance phase (after 1990), the tax expenditure on net flow of funds (that is, contributions plus investment income minus withdrawals) declines dramatically to around 0.4 percent of GDP as withdrawals become mature. For governments, this constitutes a total revenue increase of over 0.8 percent of GDP.

Figure 1 Base Case Tax Expenditure (Percentage of GDP)



Notice that in this baseline case, the population size is kept constant during the period covered. Obviously, this is not realistic. As we discussed before, we are concerned mostly about the effect of an ageing population on fiscal expenditures. Table 9 and Figure 2 show the distinct trend of tax expenditures with the demographic shift that implies a substantial increase in the old-age dependency ratio after 2000 as reported in Table 8.

Table 8 Dependency Ratios

1930	0.400000	**1940**	0.366972	**1950**	0.305227	**1960**	0.241378
1970	0.186875	**1980**	0.144905	**1990**	0.145297	**2000**	0.182227
2010	0.227455	**2020**	0.283827	**2030**	0.354545	**2040**	0.423646
2050	0.479204	**2060**	0.498147	**2070**	0.450953	**2080**	0.401642
2090	0.389045	**2100**	0.392157	**2110**	0.398020	**2120**	0.400000
2130	0.400000	**2140**	0.400000	**2150**	0.400000	**2160**	0.400000

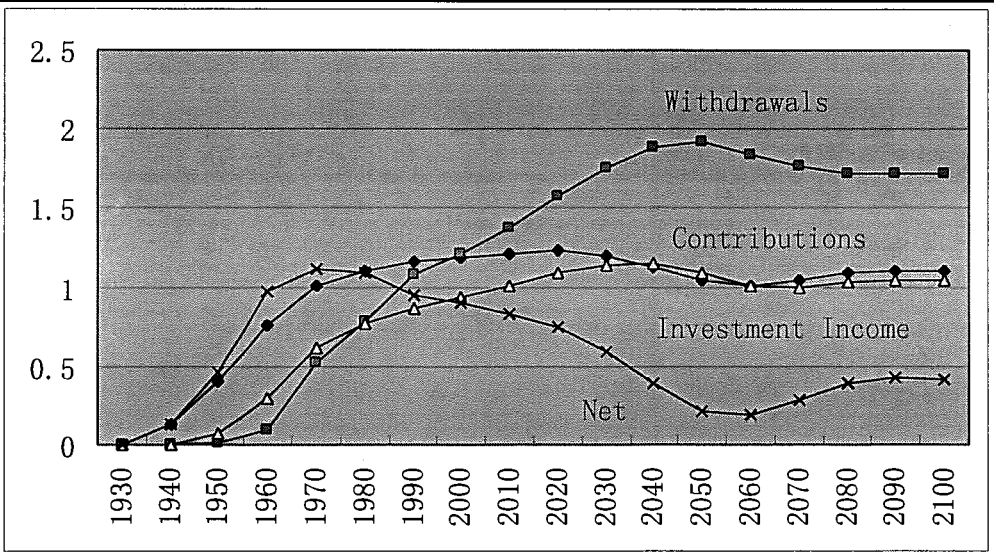
Table 9 Tax Expenditures of Tax-Deferred Pension Plan with Demographic Ageing

(Percentage of GDP)

	Contribution Taxation	Withdrawal Taxation	Investment Income Taxation	Net Tax Expenditures
1930	0	0	0	0
1940	0.12717	0.00134	0	0.12582
1950	0.40378	0.01655	0.07507	0.46229
1960	0.7616	0.0894	0.29885	0.97105
1970	1.01058	0.51677	0.61575	1.10956
1980	1.10361	0.78549	0.7734	1.09152
1990	1.16248	1.07637	0.86707	0.95318
2000	1.185	1.21389	0.93283	0.90394
2010	1.20795	1.37829	1.00559	0.83525
2020	1.2273	1.57537	1.09054	0.74247
2030	1.19701	1.74862	1.14292	0.59132
2040	1.12403	1.88216	1.14464	0.38651
2050	1.04407	1.91468	1.08687	0.21626
2060	1.01278	1.83557	1.01159	0.1888
2070	1.0446	1.7652	0.99909	0.27849
2080	1.08582	1.7169	1.02575	0.39467
2090	1.09824	1.71518	1.04108	0.42415
2100	1.09614	1.7236	1.0445	0.41705
2110	1.09154	1.72912	1.0418	0.40422
2120	1.09	1.73105	1.0404	0.39935

From 2120, the tax expenditures become constant

Figure 2: Tax Expenditures with Demographic Ageing (Percentage of GDP)



Compared with the previous case, the net tax expenditures drop to a lower level. The difference derives largely from the increasing dependency ratios after 2000 with the transition to an older population. Withdrawal increases dramatically and the tax expenditures on withdrawals increase to 1.83 percent of GDP from 2000 to 2060, which contrasts particularly to the decline of contributions from 2020 to 2060, though the change of contribution is relatively small. The reason for the small impact of ageing on contributions is that although the proportion of potential contributors (in effect, those between age 15 and 65) declines with population aging, the proportion of large contributors (those between age 41 and 55) grows substantially relative to the total population.

The tax expenditure associated with investment income is expected to increase and then decrease given the evolutions of contributions and withdrawals. The sum of the three components of the pension program gives the net tax expenditures, which remain positive but decline rapidly from around 1.1 percent of GDP in 1990 towards the lowest point ---0.2 percent of GDP in 2060, which means about 0.9 percent fiscal improvement. After the trough, net tax expenditure then becomes 0.43 percent of GDP and remains constant in terms of percentage of GDP in the following periods.

5.2.2 Sensitivity Analysis

In the base case described above, we made certain assumptions concerning the long-term state of the economy, the policy environment during the forecast period, and the future behavior of the individuals. Here we simulate several alternative scenarios in which we change those assumptions. The purpose of the sensitivity analysis is to demonstrate to what extent the results about the effects of deferred taxes on government revenues vary under different economic conditions.

In this analysis, we test some alternative assumptions about the average values of four key variables: demographic ageing, productivity growth, interest rates, and the tax rates. Each

test involves increasing or decreasing by 10 percent the values of variables used in the base case. The sensitivity test results help to clarify the role of each economic variable in the model and demonstrate the robustness of the model with respect to those variables. One should not, however, extrapolate the robustness of the model to represent the robustness of the retirement system in a changing economy. The model is narrowly focused and cannot reflect all of the interactions between the retirement system and the rest of the economy.

a) Productivity Growth

The base case assumes that productivity grows an average rate of around 1.23 percent per year. Here we assume scenarios in which productivity growth is from year 2000, 10 percent higher (1.35 percent) than in the base case.

Because a change in the productivity growth rate also changes nominal gross domestic product (GDP), one might expect that tax expenditures would not change much. But productivity affects different components of the retirement saving system in different ways. So the net tax expenditures have to be expected different from what it is in the base case. Table 10 and Figure 3 below give us the whole picture of tax expenditures on each component of the pension programs.

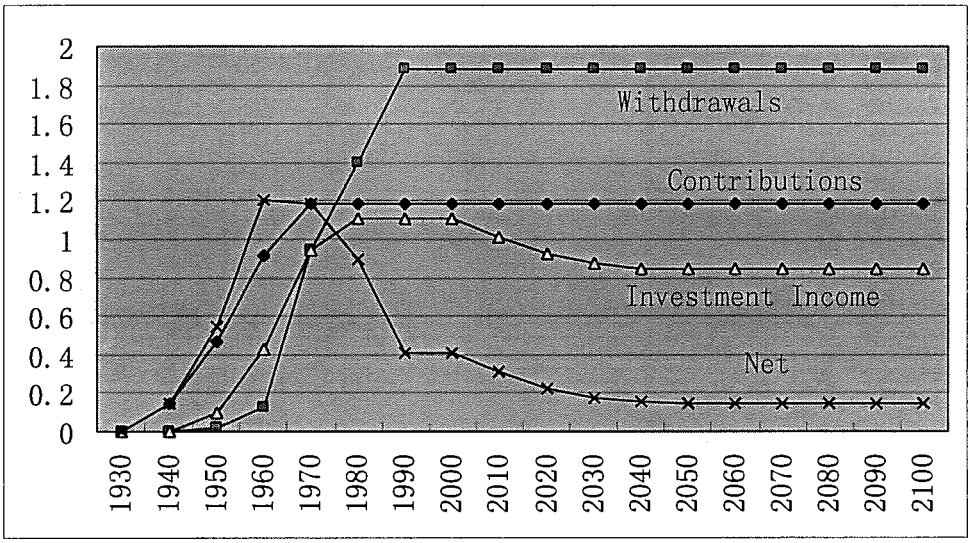
From year 2000, contributions and withdrawals grow at a 10 percent higher rate than before. However, the changes in the absolute values for contributions and withdrawals are different. As withdrawals are greater than contributions in 2000, the change in absolute value of withdrawals exceeds contributions, which leads to a lower level of investment income and thus a lower tax expenditure. The fiscal improvement attributable to tax-deferred plans would be almost 0.8 percent of GDP from 1970 to 2000, and then further improved by 0.3 percent of GDP after 2000 when a higher productivity growth rate is imposed. This constitutes an additional source of revenue for the government in the future.

Table 10 Tax Expenditures of Tax-Deferred Pension Plan with Higher Productivity Growth Rate (Percentage of GDP)

	Contribution Taxation	Withdrawal Taxation	Investment Income Taxation	Net Tax Expenditures
1930	0	0	0	0
1940	0.14714	0.0015	0	0.14563
1950	0.47012	0.02077	0.09887	0.54821
1960	0.90907	0.13005	0.4277	1.20672
1970	1.185	0.93786	0.94169	1.18884
1980	1.185	1.3956	1.10499	0.89439
1990	1.185	1.88132	1.1061	0.40978
2000	1.185	1.88132	1.1061	0.40978
2010	1.185	1.88132	1.00555	0.30923
2020	1.185	1.88132	0.92266	0.22634
2030	1.185	1.88132	0.86998	0.17366
2040	1.185	1.88132	0.84717	0.15084
2050	1.185	1.88132	0.83995	0.14363

From 2050, the tax expenditures become constant.

Figure 3 Sensitivity of Tax Expenditure to Higher Productivity Growth from 2000
(Percentage of GDP)

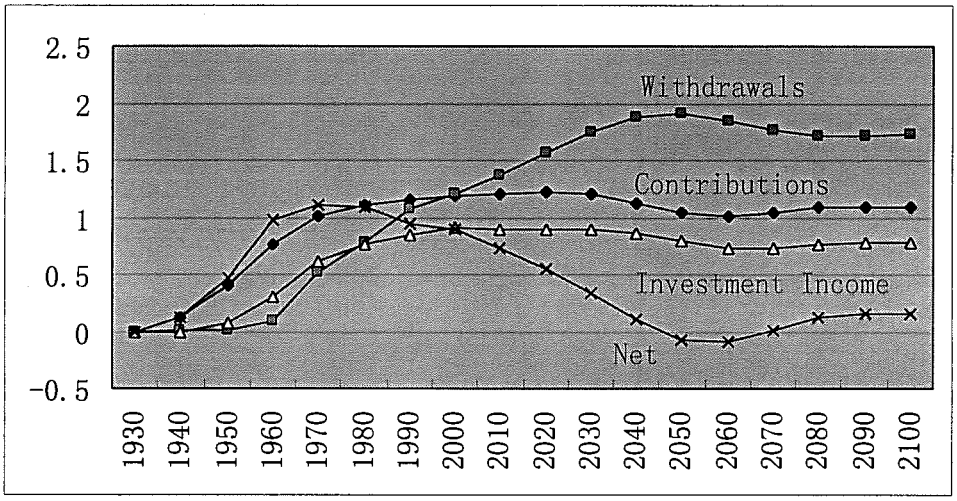


Note: The base case assumes that the productivity grows at 1.23 percent per year. This alternative scenario assumes a 10 percent higher productivity (1.35 percent per year) growth from 2000.

Considering the more realistic situation--with demographic ageing, Table 11 and Figure 4

display a different story:

Figure 4 Sensitivity of Tax Expenditure to Higher Productivity Growth from 2000 with Demographic Ageing (Percentage of GDP)



Note: The base case assumes that the productivity grows at 1.23 percent per year. This alternative scenario assumes a 10 percent higher productivity (1.35 percent per year) growth from 2000.

Table 11 Tax Expenditures with Higher Productivity Growth Rate with Demographic Ageing (Percentage of GDP)

	Contribution Taxation	Withdrawal Taxation	Investment Income Taxation	Net Tax Expenditures
1930	0	0	0	0
1940	0.12717	0.0013	0	0.12587
1950	0.40378	0.01615	0.07443	0.46207
1960	0.7616	0.08788	0.29559	0.96932
1970	1.01058	0.51242	0.60761	1.10577
1980	1.10361	0.78096	0.76204	1.08469
1990	1.16248	1.07309	0.85191	0.94129
2000	1.185	1.21074	0.91596	0.89022
2010	1.20795	1.37539	0.89696	0.72952
2020	1.2273	1.57266	0.90098	0.55562
2030	1.19701	1.74649	0.89363	0.34415
2040	1.12403	1.8809	0.86226	0.1054
2050	1.04407	1.9145	0.79697	-0.07346
2060	1.01278	1.83648	0.73101	-0.09269

2070	1.0446	1.76587	0.72667	0.0054
2080	1.08582	1.71658	0.75952	0.12876
2090	1.09824	1.71449	0.77523	0.15898
2100	1.09614	1.72289	0.77775	0.151
2110	1.09154	1.72852	0.7743	0.13732
2120	1.09	1.7305	0.77261	0.13211
From 2120, the tax expenditures become constant				

With demographic ageing, higher productivity growth leads to a negative net tax expenditures in 2050 and 2060. The difference derives largely from lower tax expenditures for investment income. Keeping pace with the growth rate of GDP, the percentages of contributions and withdrawals over GDP change only slightly. However, the higher productivity growth rate enlarges the gap between their absolute values. Since the level of withdrawals in 2000 is higher than contributions, withdrawals will exceed contributions by an increasing amount, and the consequent investment income is not as high as in the base case. This means a lower tax expenditure (0.9 percent of GDP) on investment income compared to the base case (1 percent of GDP). The fiscal improvement due to the higher productivity growth is 1.2 percent of GDP, larger than the 0.9 in the base case. In other words, higher productivity leads to a larger fiscal improvement. However, we should notice that this result highly depends on the starting point, here year 2000. Specifically, we have in this experiment for year 2000 a larger level of withdrawals than contributions. If contributions were exceeding withdrawals in 2000, the tax expenditure would show an increase trend rather than a decline.

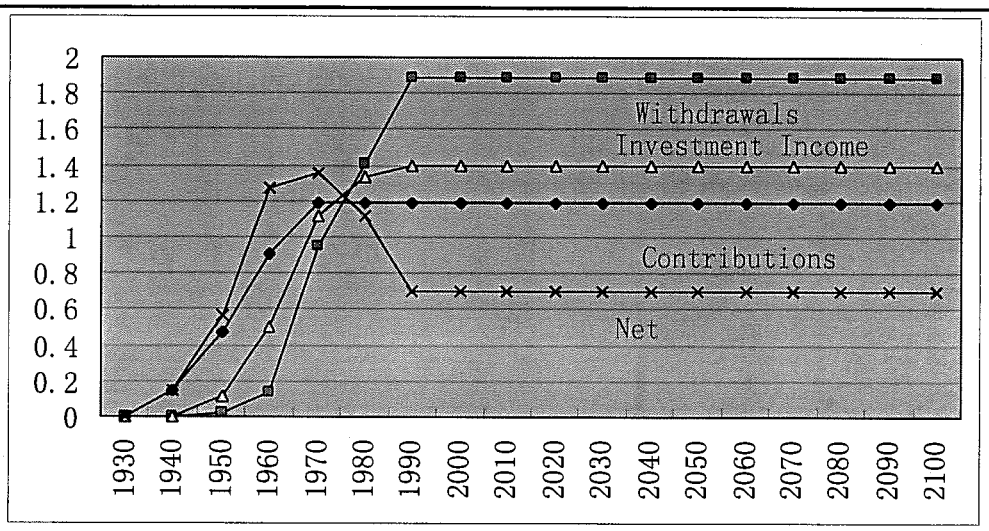
b) Interest Rate

The base case assumes that the interest rate is 4.5 percent per year. We test scenarios using a 10 percent higher or lower than in the base case, which means 4.95 percent and 4.05 percent respectively.

Higher interest rate increases investment income and, therefore, subsequent withdrawals. It has no impact on contributions. Similarly, a lower interest means a lower investment

return on contributions to these plans and hence a subsequent lower tax expenditure on the investment income component. This also means a lower stock of assets accumulated by pensioners which leads to a lower level of withdrawals.

Figure 5 Sensitivity of Tax Expenditures to Higher Interest Rate (Percentage of GDP)

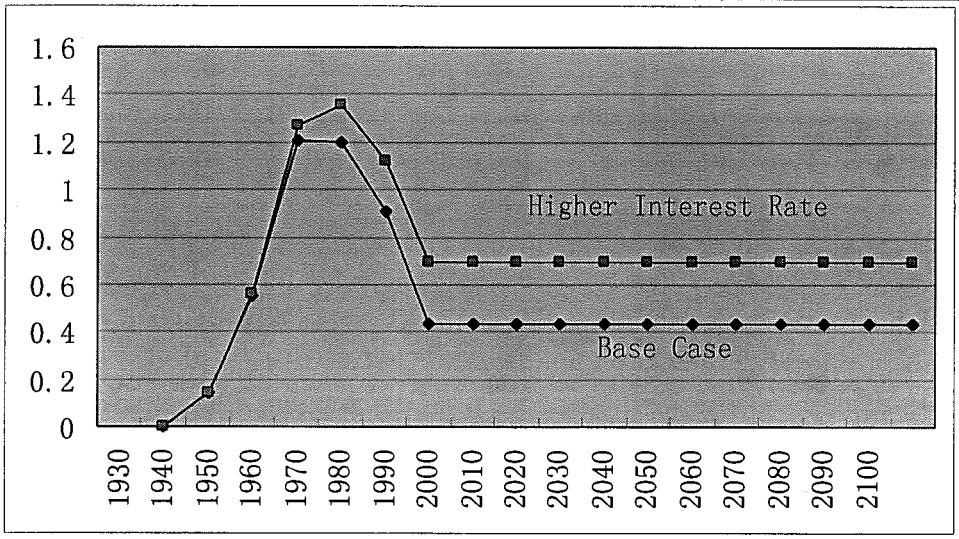


Note: The base case assumes that the interest rate is 4.5 percent per year. This scenario assumes a 10 percent higher interest rate (4.95 percent per year).

Compare with the base case, Figure 5 shows the main difference of this scenario is the higher level of tax expenditures on investment income at 1.4 percent of GDP, caused by the higher interest rate. Figure 6 exhibits a comparison between the base case and the new scenario.

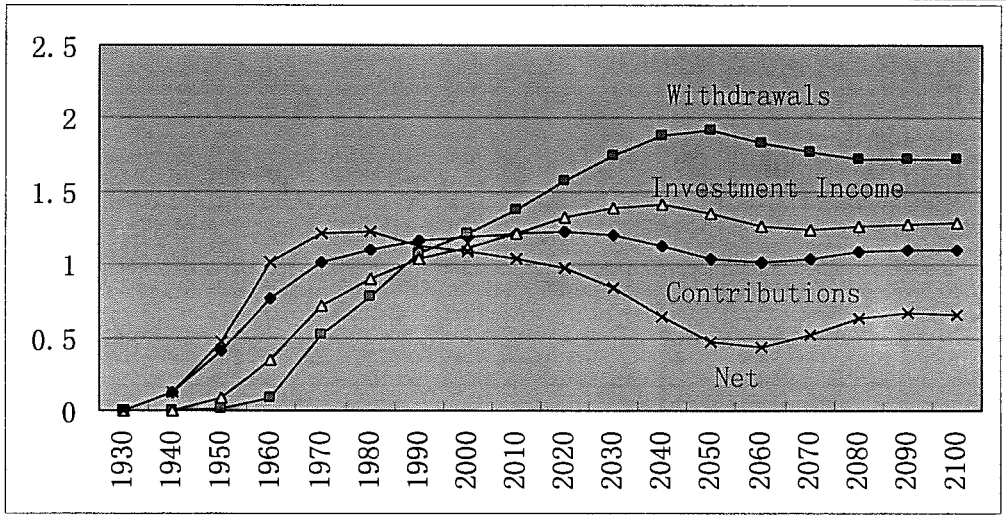
Instead of a fiscal improvement of 0.8 percent of GDP over the entire period, as in the base case, the improvement would be 0.7 percent of GDP. The net expenditures remain at around 0.7 percent of GDP during the maintenance phase, which is 0.3 greater than in the base case.

Figure 6 Comparison of Tax Expenditures between Base Case and Higher Interest Rate Scenario (Percentage of GDP)



Note: The base case assumes that the interest rate is 4.5 percent per year. This scenario assumes a 10 percent higher interest rate (4.95 percent per year).

Figure 7 Sensitivity of Tax Expenditures to Higher Interest Rate with Demographic Ageing (Percentage of GDP)



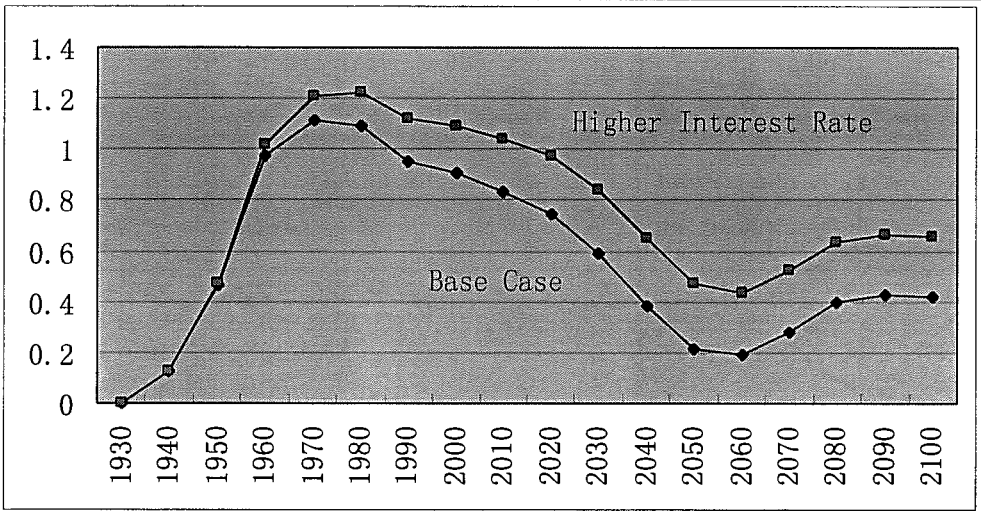
Note: The base case assumes that the interest rate is 4.5 percent per year. This scenario assumes a 10 percent higher interest rate (4.95 percent per year).

Considering the transition of ageing, Figure 7 shows a new story of tax expenditures associated with the higher interest rate and demographic shift. From Figure 7 above, we

find that the investment income taxation is very sensitive to the higher interest rate and increase rapidly to 1.4 percent of GDP, which exceeds contributions by 0.2 percent of GDP after 2030. This is noticeably different from the base case in Figure 2, where they almost have same value. Without big impacts on withdrawals and contributions, higher tax expenditures on investment income lead to a more positive net tax expenditures (0.48 percent of GDP) than in the base case (0.2 percent of GDP).

Figure 8 displays that combined effect of demographic shift and higher interest rate. A smaller fiscal improvement is projected at around 0.8 percent of GDP, instead of 0.9 percent fiscal improvement in the base case.

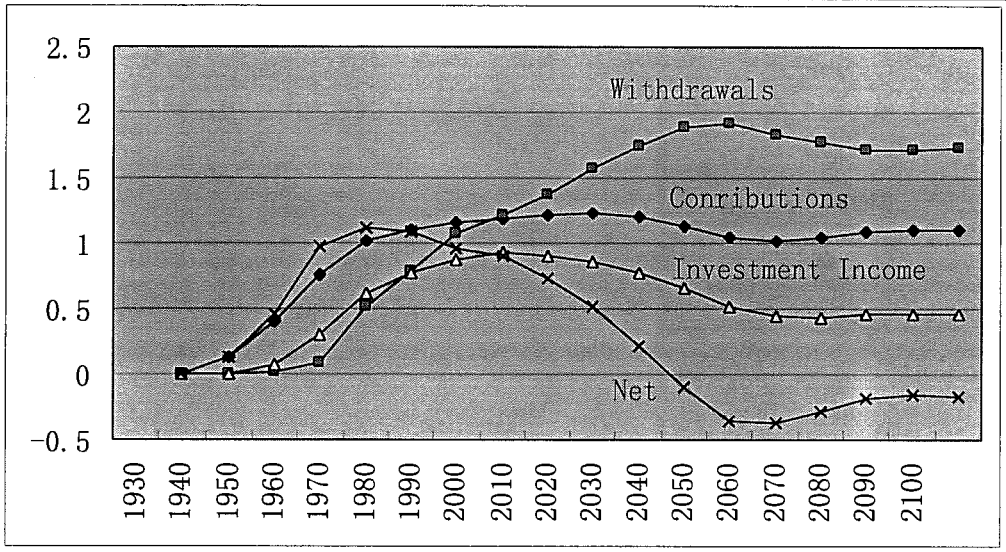
Figure 8 Comparison of Tax Expenditures between Base Case and Higher Interest Rate with Demographic Ageing **(Percentage of GDP)**



Note: The base case assumes that the interest rate is 4.5 percent per year. This scenario assumes a 10 percent higher interest rate (4.95 percent per year).

We also consider the possibility that interest rate declines from some middle point of the horizon and then decreases dynamically. The simulation we experiment assumes that interest rate starts to be 10 percent lower from 2010, that is, at the time when ageing population pressure is taken off. After 2010, interest rate in each period is 10 percent lower than the previous period.

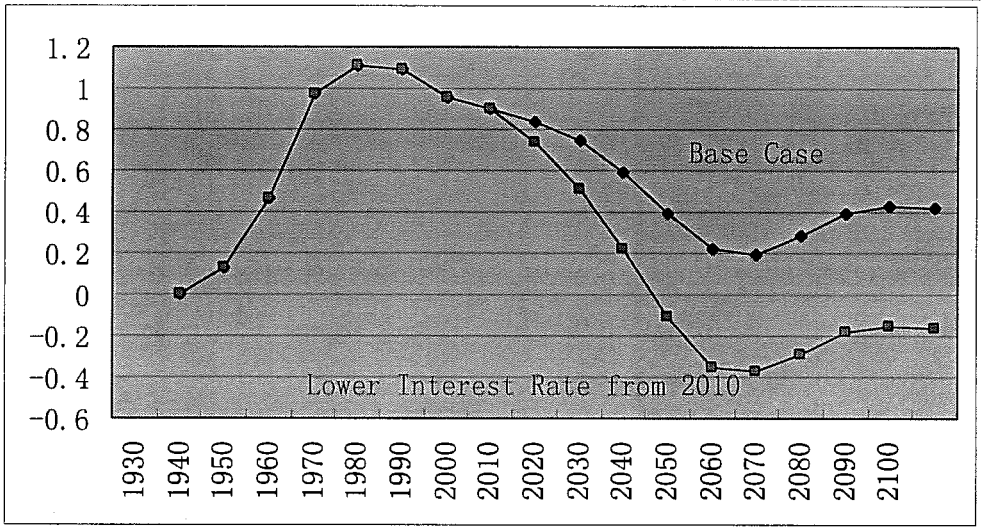
Figure 9 Sensitivity of Tax Expenditures to a Lower Interest Rate from 2010 with Demographic Ageing (Percentage of GDP)



Note: The base case assumes the interest rate is 4.5 percent per year. This scenario assumes that from year 2010 the interest rate in each period is 10 percent lower than the previous period.

From Figure 9, it is easy to see that the main differences come from the change of investment income taxation. With the same principal as the previous case, a lower interest rate leads to a lower investment income, and in turn to a smaller tax expenditure. Compared to the base case with ageing, where investment taxation is as high as 1 percent of GDP, investment taxation in this case, decreases dramatically to 0.5 percent of GDP. With a large downward impact on the investment income, the effects on contributions and withdrawals, however, are not substantial. As a consequence, the net tax expenditures decrease from 1.1 percent of GDP in 1990 to -0.4 percent in 2070. In other words, we project a fiscal improvement to be 1.5 percent of GDP resulting from a lower interest rate and ageing. In the long-run, the trend of net tax expenditure is towards -0.2 percent of GDP, that is, the saving plan generates in the long run net positive tax revenue for the government.

Figure 10 Comparsion of Tax Expenditures between Base Case and Lower Interest Rate Scenario (Percentage of GDP)



Note: The base case assumes the interest rate is 4.5 percent per year. This scenario assumes that from year 2010 the interest rate in each period is 10 percent lower than the previous period.

Figure 10 gives us a clear comparison of the tax improvement between the base case with ageing and the lower interest rate scenario. Instead of 0.9 percent of GDP fiscal improvement, as in the base case, the lower interest rate implies a much higher fiscal improvement at 1.5 percent of GDP. In other words, lower interest rates lead to a net fiscal income associated with the pension plans.

6. Conclusion

Although tax-deferred retirement-saving plans are unlikely to bring sizable windfall gains over the next few decades, they will allow governments to shift important fiscal revenues to a period in the future where the fiscal impact of ageing will peak. Without such a shift, it is not clear that government would have resisted political pressures to spend these revenues rather than suing them to build assets as to meet the future cost of populations ageing. Hence, from a political economy perspective, tax deferral can be viewed as a sound public finance policy in the context of an important demographic shift toward an older population.

The simulations of the different scenarios show that demography is the main factor driving the tax expenditure associated with tax-deferred retirement plans. Interest and tax rates influence the size of the decline of the tax expenditure but not its dynamic pattern. A series of experiments shows that the results are rather insensitive to changes of tax rates. Considering the demographic ageing, the results are mostly sensitive to changes in the productivity growth and interest rates. Specially, a combination of an ageing population shift with a dynamically decline in interest rate can lead to a negative level of tax expenditure.

Appendix A The notations we used in simulations	
notation	**Interpretation**
g	cohort group
disc	contribution share corresponding to age-group g in 2000
disw	withdrawal share corresponding to age-group g in 2000
$N_{2000,g}$	number of individuals in cohort g in 2000
ep_g	income level of contributors in cohort g in 2000
$C_{2000,g}$	contribution per dollar from contributor of cohort g in 2000
$W_{2000,g}$	withdrawal per dollar from contributor of cohort g in 2000
$A_{2000,g}$	asset per dollar for contributor of cohort g in 2000
taxc	marginal tax rate on contribution
taxw	marginal tax rate on withdrawal
taxi	marginal tax rate on investment income
tec	tax expenditures on contributions in 2000 from Department of Finance
tew	tax expenditures on withdrawals in 2000 from Department of Finance
r	10-year compound interest rate

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