Private Benefits, Fiscal Costs, and Economic Resource Costs of the Private Defined Contribution Pension Systems in Turkey

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ABSTRACT

This study addresses economic issues associated with the private defined benefit pension system in Turkey. The institutional arrangements in Turkey for administering the government securities held in such pensions are compared with two private defined contribution pension schemes in Canada. In Canada, pension participants can hold the insured securities of banks instead of government securities. In turn banks charge no management fees on pension accounts that hold such securities. In the Turkish private pension system, more than 20% of the total value of the pension investments in government bonds are lost through administration costs. In addition, there is a net fiscal cost to the Treasury of Turkey. Although the net return received by pension holders is approximately the same as in the Turkish system, taxes are fully collected in Canada on either the proceeds of the pensions or on the taxable income used to finance the private pension assets.

Jel Classification: H20, J26, J32

Keywords: Private pensions, Turkey, pension administration costs, economic resource cost, Canada

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Introduction

The objective of this study is three-fold. First, it assesses whether the reform of the Turkish private pension system (the introduction and modification of private defined-contribution pension systems) has improved the financial wellbeing of individual contributors in terms of income replacement capability. Second, it quantifies how the reforms of the private defined-contribution system have affected the fiscal cost of such pension policies. Third, it quantifies the economic resource costs imposed on the economy by the cost of the administrative system designed by the regulations that created the private pension system.

The net fiscal impact includes the net benefits derived by government from the taxation of the income streams that are used to finance the contributions to the pension system, the taxation of the income produced by the pension system and the fiscal cost of any government support given to these defined-contribution pension schemes. A major source of fiscal costs is the tax incentives often used by governments to encourage people to save more in pension schemes (Yoo & De Serres, 2004). The fiscal treatment of pension plans therefore has an impact through the creation of tax expenditures and potentially the rate of capital formation through the required level of government borrowing.

Economic resource costs are the administrative costs associated with the specific institutional design for the management of a pension scheme. Such costs include those incurred for collecting funds, organizing records, investing funds, deciding eligibility and paying benefits (Mitchell, 1998; Tuesta, 2014). According to James and Palacios (1995), the efficiency of any pension scheme is substantially influenced by the associated administrative costs. This is due to the eroding effect such costs have on pensions and consumer welfare. Bateman, Kingston and Piggott (2001) and Creighton and Piggott (2006) also show that these costs reduce pension returns significantly. *Ceteris paribus*, higher administrative costs lead either to higher rates of

contribution being required during working years to achieve a target level of consumption during retirement or to less income and, hence, less consumption during retirement. The financial and economic cost of providing for a secure retirement can be significantly affected by the administrative costs of the pension plans (Bateman & Mitchell, 2004).

Furthermore, the potential economic benefit of additional domestic saving that is used to finance real investment in the economy can be completely or more than completely offset by the intermediation costs associated with the stimulation of this additional saving. The economic implication of real costs incurred through management fees in the Turkish pension system therefore requires special attention. According to Peker (2016), in 2014, Turkish pension administrators earned an average fee of 2.34% for generating just 0.19% average net return to the saver. This suggests that the economic resource costs associated with the Turkish pension system at that time were very high.

Pension systems have several policy objectives. To the individual contributor, the goal is to achieve consumption smoothening over his or her lifetime. To governments, the goals may include increased domestic saving, increased tax revenue, improved income redistribution and poverty alleviation in old age (Barr & Diamond, 2009). It is therefore not uncommon for governments to reform their pension systems from time to time in accordance with their current policy objectives. For example, over the years the Turkish government has introduced reforms to its pension system for three major reasons.

The first was the need to reduce the deficits of the Turkish social security institutions that had drastically added to the debt burden of the government (Teksoz & Sayan, 2002). The publicly managed pay-as-you-go (PAYG) pension system previously used in Turkey became financially unsustainable after 1990. To reduce this burden over time, the government undertook major reforms in its public social security sector and, in addition, introduced privately managed defined-contribution pension schemes (Topal, 1999; Sayan & Kiraci, 2001).

The second reason was the need to deepen the capital markets and bolster economic growth by providing long-term savings to finance investment (Ozel & Yalcin, 2013). According to the IMF (2012), Turkey's low domestic savings make it highly reliant on capital inflows from abroad. This amplifies business cycles and increases instability within the country. Privately managed defined-contribution pension schemes have the potential to provide long-term savings which, in turn, drive economic growth and stability (Mackenzie, Gerson & Cuevas, 1997).

The third reason was to protect the welfare of pensioners. The financially unsustainable PAYG pension system puts the old age pension entitlement of Turkish citizens at great risk as it may not be able to pay the promised benefits to future retirees. The only way to ensure that pensioners are able to access their entitlements upon retirement was to reform the pension system.

Although the introduction of reforms by the Turkish government seems to be a step in the right direction, the reform process required the government to make choices between alternative pension systems and the types of institutions that would administer and manage such systems. There are various costs and benefits associated with each type of pension institution. It is thus important to examine whether the best possible set of reforms have been introduced and the most suitable pension system adopted.

If the private pension system is to achieve its three objectives of providing income support for retirement, stimulating incremental savings to finance real investment in the country and reducing the fiscal burden of the public pension system, it must have certain properties. First, it must provide better private returns than other financial instruments of a similar risk class. Second, the tax cost to the fiscal system required to produce this favourable return through private schemes must be small relative to other ways of achieving the same level of returns. Third, the economic resource costs of administering the system must be negligible, otherwise it will be impossible to achieve the first two objectives simultaneously. These administrative

costs reduce the net real returns from the investment; this effect can only be offset in a given class of investment by incurring tax expenditures through favourable tax treatment. If the pension system is to deliver favourable private returns, higher administration costs will necessitate higher fiscal costs. The resource cost created by financial intermediation will result in economic waste and will lower the rate of economic growth.

The evolution of pension policies in Turkey

Three social security institutions were originally established in Turkey: (i) the Social Insurance Institution (SSK) was created in 1946 for public and private sector workers; (ii) the Retirement Fund (Emekli Sandiği) was created in 1950 for civil servants; and (iii) the Social Security Institution for Craftsmen, Tradesmen and other Self-employed People (Bağ-Kur) was created in 1971 for self-employed workers. The pension benefits from these social security systems are based on a PAYG system. It is a defined-benefit system in which pension payments to retirees are drawn from contributions made by the current workers and any deficit is guaranteed by the government.

Starting from the early 1990s, all three of the Turkish social security institutions were running deficits. The social security system deficit was projected to reach as high as 10.1% of gross domestic product (GDP) by 2050 if no changes were made to its structure (ILO, 1995). This triggered the first major reform, which was carried out in 1999. This reform introduced a two-pillar system in which the three social security institutions, after being restructured, made up the first pillar and newly introduced private pension schemes made up the second pillar. The focus of this reform was (i) setting up the Individual Pension System (IPS), a voluntary private pension system, and (ii) setting up administrative reforms to control the deficit of the three social security institutions.

Although the reform succeeded in lowering the deficits of the social security institutions for a while, the deficits began to rise once again. As of 2004, the present value of the future deficits,

inclusive of debt-servicing costs, was 475 billion Turkish Lira. This equated to about 110% of Turkish GDP (Brook & Whitehouse, 2006).

In 2006 a new set of reforms were implemented and two new social security laws were introduced. The first, the social security administrative reform law, was designed to unify the three social security institutions under a single umbrella. It was introduced to ease the monitoring of the number of insured people, revenues, expenses and the quality of customer service, and to accommodate mobility in the workforce. The second, the social insurance and health reform law, introduced a uniform pension formula based on sustainable parameters in the three social security institutions.

In 2012, the government of Turkey, having witnessed major improvements in the Turkish social security system, made further reforms to the existing private pensions law through the introduction of the 'Regulation on the Private Pensions System Law no. 6327', which created a reformed defined-contribution pension system (KPMG Turkey, 2013). The changes introduced in this new law were designed to encourage more savings that would, among other things, help to finance government infrastructure projects while generating a bigger asset pool for the financial sector. The ultimate objective was to establish Turkey as a regional financial hub. Key changes introduced included the introduction of government co-funding of private pensions and at the same time a reduction of the tax rate on the distributions at retirement, from a minimum tax rate of 3.75% of the total cumulative value (contribution plus investment income) to 3.75% of the accumulated value of investment income only.

The most recent set of reforms were introduced in August 2016. The most prominent feature of these reforms is that voluntary participation in the scheme was converted to auto-participation. Every newly hired individual and every employee who changes jobs is automatically enrolled in the private pension system. The reform also compels any contributor who was automatically enrolled in the private pension system to remain a contributor for at

least six to eight months. The new law ensures that participants who stay in the pension system and make regular contributions also receive a one-time subsidy of 1000 Turkish Lira. The 2016 reforms became effective as at January 2017 (Baker & McKenzie International, 2016; CMS Law-Now, 2016; Zhu, 2016).

In the Turkish private pension system, in order to ensure that pension contributions are invested in very low-risk assets, a significant portion of pension mutual funds are invested in government securities. For example, in terms of portfolio ceilings on pension fund investments according to asset classes, whereas there are no limits on how much can be invested in relatively secure bonds and equity, a cap of 20% is placed on retail investment funds and private investment funds. Bank deposits have a cap of 25%, 50% cap is placed on loans, while no investment is allowed in real estate (OECD, 2018).

When the contributor to the Turkish private pension scheme holds government bonds, there are certain management costs associated with the administration of the pension fund. As this study shows, these management costs significantly reduce the final value of the accumulated retirement savings available to the pension scheme participant.

The designers of the Canadian private defined contribution pension system, when faced with a similar problem, devised a rather innovative institutional system for the provision of nearly risk free securities that have eliminated these management costs.

Like Turkey, the defined-contribution pension schemes in Canada are voluntary and personal. Canadian policy makers provided two options, a Tax Free Savings Accounts (TFSAs) and a tax-free contribution account called the Registered Retirement Saving Plan (RRSP). The RRSP is a tax-deferred and tax-sheltered capital-accumulation pension account created to promote retirement saving by employees and self-employed people. Up to a limit, contributions to RRSPs are tax-deductible. The deduction limit is calculated as the lesser of 18% of previous

year's earned income and the RRSP annual limit. Income earned within the account is not taxed. All withdrawals from the account are, however, taxed as income. This type of institutional arrangement for the taxation of pension savings is referred to as a Tax Free Contribution Account (TFCA) (Canada Revenue Agency, 2017).

In terms of tax treatment, the recently introduced TFSA (2009) is the opposite of the RRSP. Contributions to the TFSA are made using after-tax income and, as the name implies, investment income and withdrawals are tax-free under this scheme (Canada Revenue Agency, 2017).

Generally, when the TFSA and RRSP are held by banks or other financial institutions, it is common for contributions to be invested in fixed-income securities issued by the same financial institutions. The reason why such securities are attractive as pension assets is because these Guaranteed Investment Certificates (GICs) when purchased from banks are guaranteed up to a limit by the Canada Deposit Insurance Corporation (CDIC). The regulatory policy of allowing banks to administer pension fund accounts has two advantages for the economy and the plan participants. First, these funds are available for lending by the banks to both private and public sectors of the economy. This will generally result in the financing of real investments that yield higher economic rates of return than if these funds were used to finance general government expenditure. Second, allowing the banks to source funds via these pension schemes helps them to reduce their risk of default. There is an implicit, though not legal, lock-in effect that is associated with such private pension holdings of the securities issued by the banks. To a great extent, funds obtained from securities that mature are reinvested in the securities of the same financial institution.

The management fees charged by the banks to administer these pension accounts are usually negligible or non-existent under the TFSA and RRSP. Even though interest income grows tax-free, the interest rates on contributions to the TFSAs and RRSPs are generally identical to those

on direct investments in the institutions' securities of the same maturity that are subject to normal taxation. For example, in September 2018, the Canadian Imperial Bank of Commerce (CIBC) paid the same five-year interest rate of 1.25% both on GICs of five years' duration that are held by individuals outside their pension plan and on GICs held as a fixed-income investment that are either part of their RRSPs or part of their TFSAs (https://www.cibc.com/en/interest-rates/gic-rates.html). The Bank of Montreal offers an interest rate of 2% on GICs, irrespective of whether they are held within their RRSPs or TFSAs or held outside of both (https://www.bmo.com/home/personal/banking/rates/gic-term-deposits). This similarity is not a new phenomenon. Mucaj (2006) compared interest rates offered on GICs within and outside RRSPs by 13 different Canadian banks for 2005 and found that the rates were exactly the same in most cases. This is as a result of the competition for TFSA and RRSP market share among service providers. Service providers offer various incentives, such as administrative fee waivers, in order to attract a larger share of the TFSA and RRSP markets. There is a benefit to the banks arising from the reduction in the overall risk of the institution as a result of their access to this source of financing. At the same time, the reduction in the level of financial intermediation costs is a benefit to the economy.

This risk-mitigating property of private pension funds being able to invest in risk-free bank securities is lost if the private pension funds are required to hold government bonds. If they are required to hold government bonds then the pension fund management will need to charge fees in order to cover for the economic resource costs of administration. Hence, the potential economic benefits of instituting such defined-contribution private pension plans are greatly reduced or lost.

The focus of the remainder of this study is to quantitatively evaluate the implications of the institutional designs that Turkey has implemented for the management of private defined contribution schemes. The comparison is made from the point of view of the pension

participant, the government fiscal position, and the economic resource allocation in the economy. These schemes are compared with the situation where the investor simply purchased Turkish government bonds, and with hypothetical alternatives structured like those operated in Canada where the pension fund investors could hold government guaranteed bank securities in bank administered pension accounts.

Modelling alternative investment systems

It is noteworthy that in Turkey, contributions made to defined-contribution pension plans can be held in a wide variety of financial instruments. For example, according to Capital Markets Board of Turkey data, in 2015, 57% of private pension assets were invested in government bonds, 12.5% were invested in equities, 7.5% in reverse repurchase agreements, 1.3% in foreign securities, 1% in money markets and the remaining 21% in other savings vehicles (Paakkinen, 2015). These figures show that Turkish private pension savings are heavily invested in government bonds.

In Turkey, the purchase of TGBs, outside of any pension scheme, is an alternative low-risk savings vehicle in which to invest one's savings. Investments in TGBs are used in the current study as a benchmark against which all other pension facilities are compared.

To make this comparison, a model is constructed to show how investments in TGBs are treated by the tax system to determine the net benefit to the contributor and the net fiscal impact on the government budget. A set of models are then constructed to show how the contributions to four other types of pension facilities (TFSA, TFCA, the initial Turkish defined-contribution private pension system that existed between 1999 and 2012 (OTPS), and the new Turkish defined-contribution pension system (NTPS)) are treated. Estimates are made of the eventual net benefit to the contributor, the net fiscal impact on the government budget and the associated economic resource costs arising from the administration of each of the pension arrangements.

The same personal income tax rates (t_j) are assumed across all cases in order to make the different institutional arrangements comparable. We also assume that the same amount of pre-tax income (C_j) is contributed yearly in each of these five alternative savings vehicles. In this way, we guard against the potential impact of pension size differences. Each of the models can be simulated for a number of different parameter values.

In the absence of fiscal adjustments and management costs, this baseline gross of tax yearly contribution may be accumulated and computed in year 1's price level. Equation 1 is a representation of how the accumulated annual contributions gross of tax are compounded over the time period when the investments are being made. The accumulation is made using a nominal interest rate and then deflating the result with the price index to arrive at the real accumulated portfolio.

$$A_y^r = \frac{\left\| \sum_{j=0}^{y} \left(C_j \sum_{j=1}^{y-1} \left[\prod_{u=j+1}^{y} (1+i) \right] \right) \right\|}{p_y} \quad (1)$$

where A_y^r is defined as the real accumulated portfolio gross of tax after *y* years of contributing to the pension scheme, *y* represents the number of years over which contributions are made, C_j is the annual nominal contribution gross of tax yearly income that is used to make the contribution to the investment scheme, *i* refers to the annual nominal rate of return earned from the stock of investment, and p_y stands for the price index in year *y*.

The simulation model that has been built to carry out this comparative analysis is flexible to accommodate different rates of inflation, real interest rates and contribution levels.

Analysis of an individual savings programme in Turkish government bonds (TGBs)

To calculate the value of the accumulated portfolio over *y* years, we assume that the baseline before-tax real income of C_j in year 1's price level is set aside annually for the purchase of TGBs as a savings instrument over *y* periods. First, an amount is deducted from this gross of

tax income as income tax and the remainder (disposable income) is used to purchase the government bonds. The tax rate can be varied with the scenario under consideration. It is assumed that the amount invested in TGBs yields a rate of return equal to a real rate (*r*). The real bond rate is converted into a market (nominal) bond rate in order to account for the influence of inflation. The market bond rate is calculated using the formula (Fisher, 1977):

$$i = r + R + (1 + r + R)\, gPe \tag{2}$$

where i = nominal market bond rate, r = real bond rate, R = risk factor (TGBs are assumed to have zero risk premium) and gPe = the expected inflation rate.

No tax relief is given for the amounts invested in bonds; therefore, savings investments are made from disposable income. The investment income obtained in the form of interest on the government bonds is taxed annually according to Turkey's investment income tax legislation (The Republic of Turkey Ministry of Finance Revenue Administration, 2016).

At the end of the *y* periods, we calculate the value of the accumulated investment (principal + interest) and indicate the net benefit to the investor by estimating the net present value (NPV) and internal rate of return (IRR) of the investment programme. We also determine the net fiscal impact on the government budget and measure the economic resource costs associated with the administration of the government bonds. In equation 3, the accumulation of yearly contributions net of income tax is compounded over the *y* periods with a nominal interest rate. In addition, an investment income tax on the interest is deducted in each period. The real accumulated portfolio net of tax (A_y^{net}) is then obtained by deflating the value obtained with a price index p_y.

$$A_y^{net} = \frac{\left\| \sum_{j=0}^{y} \left(c_j (1 - t_j) \sum_{j=1}^{y-1} \left[\prod_{u=j+1}^{y} (1 + i - i.t_R) \right] \right) \right\|}{p_y} \tag{3}$$

Where A_y^{net} = accumulated portfolio net of tax after *y* years of contributing to the pension scheme, t_j = rate of income tax on the income used to make the contribution, and t_R = effective tax rate on investment income.

In equation 4, the real accumulated portfolio net of tax is discounted to the first year ($j = 0$) at a discount rate equal to the assumed real rate of return, to arrive at the NPV of the accumulated portfolio.

$$A_0^{NPV} = \frac{A_y^{net}}{(1+\delta)^y} \quad (4)$$

Where: A_0^{NPV} = NPV of the accumulated portfolio net of tax at time $j = 0$, and δ = discount rate.

Equation 5 shows how the accumulation of the addition of income tax ($t.C_j$) paid in each period and investment income tax collected from interests on annual contributions net of income tax ($C(1-t).i.t_R$) is deflated with a price index to arrive at the NPV of the net fiscal impact of bond investment at time $j = 0$.

$$NFI_0^{NPV} = \sum_{j=0}^{y} \left[\frac{[t.C + C(1-t).i.t_R]_j / p_j}{(1+\delta)^y)} \right] \quad (5)$$

Where NFI_0^{NPV} = NPV of the net fiscal impact at time $j = 0$.

Calculating Tax Free Savings Account (TFSA) contributions

The tax structure of the TFSA is quite similar to that of TGBs, the only difference being that interest is not taxed under the TFSA and there are no management fees charged to cover the administration costs because we are considering the part of the pension portfolio held in government guaranteed securities issued by banks. The TFSA tax structure is, in fact, identical to that of TGBs held by residents of jurisdictions such as North Cyprus and many Middle Eastern countries, where the interest income of TGBs is also not taxed. Investments held in a TFSA are modelled assuming that the contributions to the TFSA are made from after-tax

income, that there is no tax paid when the funds are withdrawn at a later date, and that the interest earned on the accumulated investments in the TFSA is also not taxed, even when withdrawn.

We again begin with a baseline annual gross of tax contribution of C_j. A particular amount of income tax, depending on the scenario under consideration, is paid on this contribution and the remainder is committed to the pension system. While in the pension system, the contributions generate some investment income at a nominal interest rate equivalent to the Turkish government bond rate of *i*%.

At the end of the *y* periods, the value of the accumulated portfolio (contribution + investment income) is calculated, the net benefit to the contributor (measured through NPV and IRR) is determined and the net fiscal impact on government budget is estimated. We also examine whether there are any associated economic resource costs. Equation 6 is a mathematical representation of how the accumulated annual contributions net of income tax are compounded over the time period when the investments are being made. The accumulation is made using a nominal interest rate and then deflating with the price index to arrive at the real accumulated portfolio.

$$A_y^{net} = \frac{\left\| \Sigma_{j=0}^{y} \left(C_j (1-t_j) \Sigma_{j=1}^{y-1} \left[\Pi_{u=j+1}^{y} (1+i) \right] \right) \right\|}{p_y} \tag{6}$$

Equation 7 shows how the real accumulated portfolio net of tax is discounted to the first year ($j = 0$) with a discount rate of δ to arrive at the NPV of the accumulated portfolio.

$$A_0^{NPV} = \frac{A_y^{net}}{(1+\delta)^y} \tag{7}$$

In equation 8, the accumulated value of income tax paid on annual contributions ($t.c$) is deflated annually with price index and discounted to the first year ($j = 0$).

$$NFI_0^{NPV} = \sum_{j=0}^{y} \left[\frac{(t.C)_j/p_j}{(1+\delta)^y}\right] \quad (8)$$

Calculating Tax Free Contribution Account (TFCA) contributions

A unique feature of the TFCA is that although it gives a tax deduction when contributions are made, it leaves the contributor with a future tax obligation. We model the TFCA contributions based on this understanding.

We likewise begin with a baseline annual gross of tax contribution (C_j) which is tax-deductible. Thus, the entire contribution goes into the pension system, where it yields some investment income in each period at a Turkish government bond rate of *i*%. The accumulated portfolio (contribution + investment income) is also not taxed while in the pension system and no management fees are charged by the banks on holdings of the banks' GICs. Tax is, however, paid on the accumulated portfolio when withdrawals are made. We then calculate the value of the accumulated portfolio after taxation, estimate the net benefit to the contributor by its NPV and IRR, and determine the net fiscal impact and examine whether there are associated economic resource costs. Equation 10 shows how the accumulated annual contributions gross of tax are compounded over the time period when the investments are being made. The accumulation is made using a nominal interest rate. Equation 9 shows how a pension tax is deducted from this nominal accumulated portfolio ($A_y(1 - t_p)$) and the result deflated in y^{th} period by price index to obtain the real accumulated portfolio net of tax (A_y^{net}).

$$A_y^{net} = (A_y(1 - t_p))/p_y \quad (9)$$

$$A_y = \sum_{j=0}^{y}(C_j \sum_{j=1}^{y-1}\left[\prod_{u=j+1}^{y}\langle 1 + i\rangle\right] \quad (10)$$

Where A_y = accumulated portfolio and t_p = pension tax rate.

As shown in equation 11, the NPV of the accumulated portfolio net of tax at time $j = 0$ is again obtained by discounting the real accumulated portfolio to the first year ($j = 0$) with a discount rate of δ.

$$A_0^{NPV} = A_0^{NPV} = \frac{A_y^{net}}{(1+\delta)^y} \quad (11)$$

In equation 12, the value of the pension tax on nominal accumulated portfolio $(t_p.A_y)$ is deflated with a price index in the y^{th} year and discounted to the first year ($j = 0$) to arrive at the net fiscal impact.

$$NFI_0^{NPV} = \frac{(t_p.A_y)/p_y}{(1+\delta)^y} \quad (12)$$

Evaluation of the original defined Turkish Private Pension System (OTPS) contributions

The Turkish defined-contribution pension system (OTPS), legislated in 1999 and reformed in 2013, was also a tax-free contribution account in structure, like the TFCA but with administrative costs. It is interesting to evaluate this system to observe its outcomes and the incentives it created, which resulted in the reforms that followed.

The OTPS calculations start with the same baseline annual gross of tax contribution of C_j. The tax treatment of the initial contributions is the same as in the case of TFCA, which exempts income paid into such a pension scheme from tax. Thus, the entire contribution is invested in the pension system. The contributor, however, pays to the pension fund administrator an entrance fee (f_e) of 470 Turkish Lira. A contribution fee (f_c) of 3.3% from each period's contribution is also earned by the pension fund administrator. Finally, a pension fund management fee (f_m) of 2.3% of the accumulated portfolio in each period (present contribution net of charges + previous contributions + interest on investment) is also charged by the pension

fund administrator. At the end of the y^{th} year, the accumulated portfolio is again taxed at a rate (t_p) of 3.75%.

The accumulated portfolio is calculated, the net benefit to the contributor is estimated, the net fiscal impact is determined and the associated economic resource costs are estimated. Equation 13 shows how the nominal accumulation of yearly contributions net of contribution fee ($f_c c_j$) is compounded over y years. A management fee (f_m) is charged on the compounded amount yearly. In equation 14, a pension tax (t_p) is subtracted from the nominal accumulated portfolio ($A_y(1-t_p)$). The result is further deflated with a price index in y^{th} year to obtain the real accumulated portfolio net of tax(A_y^{net}),

Where $A_y = \sum_{j=0}^{y}[(C_j\,[1-f_c]\sum_{j=1}^{y-1}\left[\prod_{u=j+1}^{y}\langle 1+i\rangle\right]).(1-f_m)]$ (13)

$A_y^{net} = (A_y(1-t_p))/p_y$ (14)

Where f_c = contribution fee rate in the particular year and f_m = management fee in the particular year.

The NPV of the accumulated portfolio net of tax at time $j = 0$ is once again given as:

$A_0^{NPV} = \frac{A_y^{net}}{(1+\delta)^y}$ (15)

The net fiscal impact for the initial Turkish pension system at time $j = 0$ is also given as:

$NFI_0^{NPV} = \frac{(t_p.A_y)/p_y}{(1+\delta)^y}$ (16)

In equation 17, the economic resource cost is shown as the sum of three components: (i) lump sum entrance fee; (ii) contribution fee deflated annually with price indices; and (iii) management fee on the accumulation of yearly contribution net of contribution fee compounded with interest rate i and deflated annually with corresponding price indices.

Overall, these fees are set at a level to cover administrative costs associated with the management of the pension funds.

$$\text{EC}= f_e + \sum_{j=0}^{y}((f_c C)_j/p_j) + \sum_{j=0}^{y}[((1-f_c)C_j \sum_{j=1}^{y-1}\lfloor\prod_{u=j+1}^{y}\langle 1+i\rangle\rfloor).f_m]/p_j \quad (17)$$

Where EC = economic resource cost and f_e = entrance fee.

Equation 18 represents how the economic resource cost is discounted to arrive at its NPV.

$$EC_0^{NPV} = \frac{EC}{(1+\delta)^y} \quad (18)$$

Calculating the New Turkish Pension System (NTPS) contributions

The NTPS is a modification of the OTPS. The key distinguishing features are: (i) in place of the tax exemption given under the OTPS, the government provides the contributor with a cash subsidy equal to g_c% (25% in 2018) of the amount of his or her after-income-tax contribution; (ii) a one-time lump sum subsidy of 1000 Turkish Lira is given to the contributor; and (iii) lower administrative fees (entrance fee, contribution fee and management fee) are paid to the administrators of the NTPS.

The modelling proceeds as follows. An amount of income tax is deducted from the baseline contribution (C_j), a government cash contribution is received at a rate of g_c% of the baseline contribution net of tax, and a one-time lump sum subsidy of 1000 Turkish Lira is added. The sum of these three contributions (individual's contribution + one-time lump sum subsidy + government contribution) is transferred into the pension system.

In the pension system, a one-time entry fee of 102 Turkish Lira is deducted. Subsequently, a contribution fee equal to 1.5% of each contribution made over the accumulation period is also deducted and a tax subsidy equal to 25% of the contribution fee paid in each period is given. A fund management fee of 1.09% is also levied annually on the accumulated portfolio arising only from the individual's contribution. While in the system, the pension contributions generate

investment income in the form of interest at the government bond coupon rate, and the accumulated investment income is taxed at a rate of 3.75% at the end of the y^{th} year.

The part of the total contribution provided by the government also generates investment income at the government bond coupon rate. A tax of 3.75% is likewise levied on the accumulated investment income at the end of the y^{th} year. A fund management fee of 0.37% is also charged annually on the accumulated portfolio arising from the government contribution.

At the end of the y^{th} year, we again measure the net benefit to the contributor and the net fiscal impact, and determine whether there are any associated economic resource costs. In equation 19, a one-time lump sum subsidy is given and a lump sum entrance fee is charged. Furthermore, the accumulation of yearly contributions $[C_j(1-t_j)]$, minus the annual contribution fee $[f_c C_j(1-t_j)]$ plus tax subsidy $[t_s f_c C_j(1-t_j)]$, plus government contribution $[g_c C_j(1-t_j)]$ minus tax levied on government contribution $[\, g_t g_c[C_j(1-t_j)]]$ is compounded with an interest rate, the fund management fee rate (f_m) is levied on the accumulated fund annually and a one-time investment income tax is paid on the accumulated fund at the end of the y^{th} year. The remaining amount is then deflated with a price index to arrive at the net accumulated portfolio A_y^{net}.

$$A_y^{net} = S - f_e + \frac{\sum_{j=0}^{y}[C_j(1-t_j)](1-f_c+t_s f_c+g_c) - g_t g_c[C_j(1-t_j)]\sum_{j=1}^{y-1}\left|\prod_{u=j+1}^{y}(1+i)(1-f_m)\right|(1-\sigma)}{p_y} \quad (19)$$

Where S = one-time lump sum subsidy, t_s = subsidy rate, g_c = government contribution rate and σ = one-time tax rate on investment income.

To obtain the NPV of the accumulated portfolio net of tax, equation 19 is once again discounted thus:

$$A_{yNPV}^{net} = \frac{A_y^{net}}{(1+\delta)^y} \quad (20)$$

Equation 21 shows how the NPV of the net fiscal impact is calculated. The NPV of the net fiscal impact is made up of three components. In the first component, the accumulation of the income tax (t_jc_j) and the tax paid on the government contribution are added together to obtain the total taxes paid. The addition of the tax subsidy on annual contributions is calculated as a share of the contribution fee $[t_s f_c[C_j(1-t_j)]]$, and the total government subsidy in the form of the contribution is obtained to arrive at the total volume of subsidy received by contributors. The difference between total tax and total subsidy is calculated and discounted to year zero with a discount rate. In the second part, a one-time tax on investment income is levied and the tax amount is then deflated with a price index and discounted to year zero with a discount rate. The third part is the one-time lump sum subsidy *S*.

The NPV of the net fiscal impact in this case is:

$$NFI_0^{NPV} = \sum_{j=0}^{y} \frac{[t_j C_j/p_j]+[\, g_t g_c[C_j(1-t_j)]/p_j]-[t_s f_c[C_j(1-t_j)]/p_j]-[[g_c[C_j(1-t_j)]/p_j]}{(1+\delta)^j} +$$

$$\sum_{j=0}^{y} \frac{\left\| [\Sigma_{j=1}^{y-1} i]\, \sigma \right\| / p_y}{(1+\delta)^j} - S \quad (21)$$

The economic resource cost is:

$$\text{EC}= f_e \; + \sum_{j=0}^{y} (f_c C_j(1-t_j)/p_j) + \frac{\left\| \left(\sum_{j=0}^{y} [C_j(1-t_j)](1-f_c+t_s f_c+g_c) \sum_{j=1}^{y-1} \left[\prod_{u=j+1}^{y} (1+i) \right] \right) \cdot f_m \right\|}{p_y} \quad (22)$$

As specified in equation 22, the economic resource cost is made up of the sum of three components: (i) entrance fee; (ii) accumulation of contribution fees deflated by price index; and (iii) sum of management fees levied in each pension accumulation of yearly contributions.

We again obtain the NPV of the economic resource cost using the formula:

$$EC_0^{NPV} = \frac{EC}{(1+\delta)^y} \quad (23)$$

Results

This section begins by presenting the evaluation results obtained from the simulation experiments described by equations 1 to 23 using the base case data. Table 1 presents the parameters used in the simulations.

Table 1. Parameter Values

Govt. bond rates		TFSA rates		TFCA rates	
Marginal income tax rate (t_j)	20.00%	Marginal income tax rate (t_j)	20.00%	Marginal income tax rate (t_j)	20.00%
Real rate of return (r)	3.00%	Real rate of return (r)	3.00%	Real rate of return (r)	3.00%
Inflation rate (gpe)	8.12%	Inflation rate (gpe)	8.12%	Inflation rate (gpe)	8.12%
Govt. bond coupon rate (i)	11.36%	Govt. bond coupon rate (i)	11.36%	Govt. bond coupon rate (i)	11.36%
Govt. bond tax rate on annual interest earnings ($t_{R)}$	10.00%	Withdrawal tax rate on final accumulation balance (t_p)	0.00%	Withdrawal tax rate on final accumulation balance (t_p)	20.00%
OTPS rates		**NTPS rates**		**Common Parameters**	
Real rate of return (r)	3.00%	Marginal income tax rate (t_j)	20.00%	Duration of contributory period (y)	40 years
Inflation rate (gpe)	8.12%	Real rate of return (r)	3.00%	Frequency of contribution	Annual
Govt. bond coupon rate (i)	11.36%	Inflation rate (gpe)	8.12%		
Entrance fee (f_e)	470TL	Govt. bond coupon rate (i)	11.36%		
Contribution fee rate (f_c)	3.30%	Govt. contribution (g_c)	25.00%		
Fund management rate (f_m)	2.30%	Entrance fee (f_e)	102TL		
Pension tax on the final balance (t_p)	3.75%	Contribution fee rate (f_c)	2.00%		
		Fund management rate (f_m)	1.09%		
		Govt. fund mgt. fee rate (f_m)	0.37%		
		One-time-only subsidy (s)	1000TL		
		Tax subsidy (t_s)	25.00%		
		Pension tax on the final balance (t_p)	3.75%		

Source: Authors' calculations

Note: Annual contributions of a real value of 1000 Turkish Lira over a 40 year period is assumed for all cases in our simulations. The results are not significantly changed for any constant profile of contribution over the contributory period of the pension.

The estimations are made in four steps. First, the IRR for each pension scheme is computed from the point of view of the pension contributor. The IRR is obtained by calculating the real discount rate which equates the final accumulated value of the pension asset at the time of retirement to the value of all the gross of tax contributions used to purchase the investment. Second, we estimate the accumulated portfolio (net of tax) for each pension scheme. This refers to the amount of contributions accumulated over the forty-year period after all taxes have been paid. The accumulated portfolio is calculated as present value and expressed as a percentage of the present value of before-tax contributions made to the pension scheme. This ratio measures the proportion of the present value of the contributions that is retained by the pension participant. If this ratio is equal to 1 then it means that the pension participant will have paid no tax on the income contributed nor any tax at any point on the returns or the cumulated value of the investment. In such a circumstance, the IRR will be equal to the gross rate of returns or yield of assets held in the pension fund.

Third, an estimation of the net fiscal impact of each pension scheme is made. The net fiscal impact is simply the difference between the taxes received and subsidies given by the government. This is again expressed as a proportion of the present value of all the gross of tax contributions made into the pension system. Fourth, an estimation of the management costs associated with each pension scheme is carried out. The management cost refers to the cost associated with the operation and maintenance of a pension scheme. The management fees and other administrative costs are, in the main, used to employ labour and pay for all the economic resource costs of these financial intermediation efforts. These resource costs are a direct cost to the economy and represent the deadweight loss or economic cost created by the particular pension scheme. This economic cost is very different in nature to the net fiscal burden, which is a transfer of income between the pension participant and the government treasury. All the

figures in step four are again converted into their present values and measured as a percentage of the real value of the accumulated gross of tax contribution (equation 1).

Results when marginal income tax rates are the same during the contribution period as at the time of pension pay-out

Considering a situation where the marginal income tax rate does not change over time, the following results (summarized in Table 2) are obtained from our analysis. For the case of TGBs, we find that investors who use gross of tax income to buy these will ultimately be able to retain approximately 62.7% of the value of the gross of tax income they used to purchase these bonds. Expressed in terms of the rate of return, the investor earns an IRR that is estimated to be 1.8% (Table 2, row 1).

Both the TFSA and TFCA types of institutional set-up yield to the pension participant 80% of the initial gross of tax income that they invest in the pension scheme (Table 2, columns 2 and 3). These two institutional arrangements, in which bank securities guaranteed by a deposit insurance system are purchase, do not have any associated intermediation costs that are passed on to investors. Hence, the difference between the yield of these two schemes and that of investment in government bonds arises entirely due to the greater tax burden on investments in government bonds, 37.35% versus 20% in the TFSA and TFCA schemes.

The value of the accumulated contributions net of tax under the OTPS is equivalent to just 56% of the accumulated gross of tax contribution and the IRR yield is 1.53% (Table 2, column 4). It is easy to see why the OTPS was a failure. It did not yield as high a return as simply holding the same government bonds without any preferential tax treatment.

Table 2 Scenario 1. Present values of savings plan components to the first year (j=0) of savings program($t_j^0 = t_j^{40} = 20\%$)

#	Variables	TGB	TFSA	TFCA	OTPS	NTPS
1	Gross of tax contribution	100.000%	100.000%	100.000%	100.000%	100.000%
2	IRR	1.805%	2.427%	2.427%	1.528%	2.449%
3	Net fiscal impact	37.265%	20.000%	20.000%	2.191%	-4.287%
4	Economic efficiency cost	0.000%	0.000%	0.000%	41.584%	23.583%
5	Value of accumulated portfolio net of tax	62.735%	80.000%	80.000%	56.225%	80.705%

Accumulated portfolio net of tax ranking: NTPS> TFSA= TFCA > TGB>OTPS

IRR ranking: NTPS> TFSA= TFCA > TGB> OTPS

Welfare cost ranking: OTPS>NTPS>TFSA= TFCA =TGB

Net fiscal impact ranking: TGB > TFSA = TFCA > OTPS > NTPS

Source: Authors' calculations

Under the NTPS, the final value amounts to 81% of the accumulated gross of tax contribution with an IRR of 2.45%. Based on the accumulated portfolio net of tax and IRR figures, the NTPS comes first in terms of benefit to the contributor, the TFSA and TFCA jointly come second, the TGBs come in fourth and the OTPS comes last.

With regard to the net fiscal impacts, the amount of tax collected under TGBs is equivalent to 37% of the accumulated gross of tax contribution. A further breakdown of the 37% tax shows that the first 20% is taken at the beginning from the application of the normal income tax to income that is represented by the gross of tax contribution. The remaining 17% arises from the tax paid on the interest received on the cumulated investment. TGBs do not receive any subsidies; therefore, the present value of the net fiscal impact is positive and equal to 37% of the present value of the gross of tax contributions.

Under the TFSA, the value of the taxes collected is equivalent to 20% of the accumulated gross of tax contribution. This entire amount is due to the income tax paid on the income represented by the gross of tax contribution to the savings scheme. No form of subsidy is received by the pensioner from the government. The net fiscal impact is thus exactly equal to the amount of tax paid. This amounts to 20% of the accumulated gross of tax contribution.

Under the TFCA, the total amount of tax collected also equals 20% of the accumulated gross of tax contribution. The total amount is paid when withdrawals are made from the pension scheme. Again, no subsidies are given by the government under this scheme; therefore, the net fiscal impact is equal to 20% of the accumulated gross of tax contribution.

As for the OTPS, the total tax collected amounts to only around 2% of the accumulated gross of tax contribution. All contributions of income to this pension system were not subject to income tax. When withdrawals were made from the pension scheme, 15% of the cumulated amount was exempt from this income tax and a tax rate of 3.75% was then levied on the

remaining 85%. This scheme does not involve subsidies being given to contributors; therefore, the net fiscal impact also amounts to approximately 2% of the accumulated gross of tax contribution.

Under the NTPS, while the amount of tax collected is 20.3% of accumulated gross of tax contribution, the amount of subsidy given is 25% of accumulated gross of tax contribution. This results in a negative net fiscal impact equal to a net subsidy of 4.29% of the present value of the gross of tax contributions. Under this scheme, out of the total tax collected, approximately 20% is collected from the gross of tax income used for the contribution at the beginning, 0.24% of the gross of tax contribution is collected from the interest received on the pensioner's contribution, and 0.071% of the gross of tax contribution is collected from interest received on the government's contribution. A breakdown of the total subsidy given under the NTPS is as follows: an amount equal to 20% of the accumulated gross of tax contribution is given as the government's contribution to the pension scheme, an amount equal to 4.2% of the accumulated gross of tax contribution is given as a one-time-only subsidy to the contributor by the government, and a total accumulated value of tax subsidy equal to 0.4% of the accumulated gross of tax contribution is also given by the government.

In summary, TGBs make the most contribution to government coffers, followed by the TFSA and TFCA, which contribute equal amounts. They are followed by the OTPS. Meanwhile, the NTPS, on balance, depletes government finances as a result of the large subsidies received by contributors under this scheme.

A critical aspect determining the economic impact of any pension scheme is the level of economic resource costs required to manage the system. These costs are reflected in the level of management fees and other charges that are levied on components of the pension. No such costs are incurred under the TGB, TFSA and TFCA schemes because there is empirical evidence that they do not need to involve institutional management arrangements that impose

net intermediation costs. However, substantial economic resource costs are created in the form of pension management costs under both the OTPS and NTPS. Under the OTPS, the value of the management cost incurred is equivalent to 41.58% of the present value of the total contributions. Under the NTPS, although the economic resource costs are lower than for the OTPS, they are still quite substantial, at 23.58% of the total contributions to the system.

The government of Turkey wisely closed down the OTPS and replaced it with the NTPS. Under the old system, the private participants, the government and the economy all lost, relative to just investing in government bonds. The only individuals attracted to this system were private investors in very high income tax rate brackets, who could use this scheme as a tax-avoidance strategy. They could contribute to the pension and obtain a tax deduction for the amount of their contribution and then, as soon as possible, they would cancel their pension plan and end up paying a much lower 3.75% exit tax. As a result, they could make a net financial gain even after paying the applicable pension fund fees.

The NTPS has rectified the problem of the OTPS by providing private investors with a better return than just buying government bonds. However, this is achieved at a tremendous fiscal and economic resource cost. Although the total intermediation cost has been reduced from 41.58% under the OTPS to 23.58% under the NTPS, it is still very substantial. The attractive yield of the NTPS of 80.71% of total contributions and an IRR of 2.45% is only achieved by the provision of a government subsidy. This yield to the investor is achieved by starting with total gross of tax contributions of 100%, subtracting the economic resource cost of 23.58%, and then adding the net fiscal transfer of 4.29%. This results in a net yield of 80.71% of the gross of tax contributions to the private pension participant.

Sensitivity analysis

Income tax rate during contribution period is greater than the tax rate during pension pay-out

Different private pension systems will be attractive to different types of investors, depending on their tax situation. The four tax schemes are now considered in the case where the marginal income tax rate of the individual investor is higher during the period in which they are contributing to the scheme as compared to the rate of tax at the time of pension pay-out. This is a typical retirement scenario for middle-aged contributors where the income tax rate on their wage or business income at the time of making contributions is expected to be higher than the marginal rate of income tax that is expected to be paid on pension income upon retirement. In this case, it is assumed that the marginal income tax rate of the individuals at the time they make pension contributions is 25%, while the marginal income tax rate at the time the pensions are paid out is 15%. All other parameters of the simulation are kept the same as in the base case. The results are summarized in Table 3.

Starting with the IRR (Table 3, row 2), this higher income tax rate on ordinary income clearly has a greater negative impact on the returns on investment in TGB, TFSA and NTPS than those in TFCA and OTPS. The TFCA ranks first with an IRR of 2.58%, the NTPS ranks second with an IRR of 2.29%, the TFSA ranks third with an IRR of 2.26%, the TGB is fourth with an IRR of 1.64%, while the OTPS is still last with an IRR of 1.53%. Consistent with these results, the accumulated contributions are highest under the TFCA, where the contributor is able to retain 85% of the accumulated gross of tax contributions. The NTPS provides the next best outcome, allowing the pensioner to reclaim 76% of their total contributions. Following very closely is the TFSA, under which the pensioner is able to reclaim 75% of their accumulated gross of tax contributions. The TGB is ranked next, as it allows the retention of 59% of the pensioner's

total accumulated gross of tax contributions. The contributor retains the least amount of only 56% under the OTPS.

Table 3. Scenario 2. Present values of savings plan components to the first year (j=0) of savings program ($t_j^0 = 25\%,\ t_j^{40} = 15\%$)

#	Variables	TGB	TFSA	TFCA	OTPS	NTPS
1	Gross of tax contribution	100.000%	100.000%	100.000%	100.000%	100.000%
2	IRR	1.642%	2.262%	2.582%	1.528%	2.289%
3	Net fiscal impact	41.186%	25.000%	15.000%	2.191%	1.969%
4	Economic efficiency cost	0.000%	0.000%	0.000%	41.584%	22.221%
5	Value of accumulated portfolio net of tax	58.814%	75.000%	85.000%	56.225%	75.810%

Accumulated portfolio net of tax ranking: TFCA > NTPS> TFSA> TGB>OTPS

IRR ranking: TFCA > NTPS> TFSA > TGB> OTPS

welfare cost ranking: OTPS>NTPS>TFSA= TFCA =TGB

net fiscal impact ranking: TGB > TFSA > TFCA > OTPS > NTPS

Source: Authors' calculations

It is worth noting that when the marginal tax rate is higher in the contributing phase than in the pay-out phase, the TFCA benefits the contributor more than the TFSA and NTPS. The benefit to the contributor under the TFCA was previously lower than that of the NTPS and equal to that of TFSA under scenario 1.

With regard to the fiscal impacts, as reported in Table 3, rows 3 and 4, under the TGB, the total tax collected is 41% of the accumulated before-tax contributions and the net fiscal impact is likewise equal to 41% of the gross of tax contribution. Under the TFSA, the total tax received is equal to 25% of the accumulated gross of tax contribution, no subsidy is given to contributors and hence, the net fiscal impact is exactly equal to the entire 25%. Meanwhile, under the TFCA, the total tax collected is equal to the tax rate on the final payment of the pension, which in this case is assumed to be 15%.

Finally, with regard to economic resource costs, the TFSA, TFCA and TGB do not create such costs. The OTPS generates the highest management costs, equivalent to 42% of the accumulated gross of tax contribution. The management costs incurred under the NTPS amount to 22% of the accumulated gross of tax contributions; this is a 2% decline in management costs when compared with scenario 1, as a smaller amount of net of tax contributions are made. The NTPS still results in a very substantial waste of economic resources. This inefficiency in intermediation is only overcome by a fiscal subsidy equal to 23.3% of the before-tax value of the contributions.

Income tax rate during contribution period is lower than the tax rate during retirement

We now consider the situation in which the marginal income tax rate is lower in the present than in the future. This may happen if the contributions start when the individual is young and earning a level of income that is normally expected to rise in real terms, so that by the time of retirement the individual will be taxed at a higher marginal income tax rate than during the period of contributions. In these simulations we are assuming that the marginal income tax rate

during the period of accumulation is 15% and then rises to 25% during retirement. Table 4 presents a summary of our findings.

Considering the IRR (Table 4, row 2), the NTPS ranks first (2.60%), the TFSA ranks second (2.58%), the TFCA ranks third (2.26%), the TGB ranks fourth (1.96%) and the OTPS is last (1.53%). Compared with the previous evaluation, the rankings of the NTPS, TFSA and TFCA are reversed. Accordingly, the accumulated net of tax contributions (Table 4, row 5) are highest under the NTPS (86%), followed by TFSA (85%), TFCA (75%) and TGB (67%). Finally, the OTPS provides the lowest figure when only 56% is retained.

The net fiscal impact is a positive 33% for TGB and a positive 15% for TFSA. Net fiscal impacts for the TFCA, OTPS and NTPS are 25%, 2% and negative 11%, respectively.

When the marginal tax rate is lower in the present than in the future, the TFSA raises more revenue for government than the TFCA does. Furthermore, the size of the net negative fiscal impact incurred by government because of subsidies under the NTPS increases by 7% (from 4% to 11%) as compared with scenario 1.

The economic resource cost associated with the management of the schemes is equal to 42% of the accumulated gross of tax contributions under the OTPS but reduces to 25% under the NTPS.

Table 4 Scenario 3. Present values of savings plan components to the first year (j=0) of savings program ($t_j^0 = 15\%,\ t_j^{40} = 25\%$)

#	Variables	TGB	TFSA	TFCA	OTPS	NTPS
1	Gross of tax contribution	100.000%	100.000%	100.000%	100.000%	100.000%
2	IRR	1.960%	2.582%	2.262%	1.528%	2.600%
3	Net fiscal impact	33.336%	15.000%	25.000%	2.191%	-10.543%
4	Economic efficiency cost	0.000%	0.000%	0.000%	41.584%	24.945%
5	Value of accumulated portfolio net of tax	66.629%	85.000%	75.000%	56.225%	85.599%

Accumulated portfolio net of tax ranking: NTPS> TFSA > TFCA > TGB>OTPS

IRR ranking: NTPS > TFSA> TFCA > TGB> OTPS

Welfare cost ranking: OTPS>NTPS>TFSA= TFCA =TGB

Net fiscal impact ranking: TGB > TFCA > TFSA > OTPS > NTPS

Source: Authors' calculations

Different rates of inflation

One of the important features to be judged when evaluating any private pension scheme is how well it accommodates different rates of inflation without reducing the net after-tax real yield of the pension assets received by the individual owning the assets. We evaluate each of the three currently operational pension alternatives—TFSA, TFCA and NTPS—along with government bonds. The results of this analysis are presented in Table 5 for inflation rates of 5%, 10% and 15%. In each case it is assumed that the nominal interest fully adjusts for the rate of inflation.

The impact of inflation and the tax treatment of government bonds (Table 5, row 2) clearly shows the tremendous inflation risk that is imposed on such investments because of the taxation of their nominal interest earnings. As inflation increases from 5% to 15%, the real returns on government bonds falls from 1.97% to 1.49% and the ratio of the accumulated portfolio to the gross of tax contribution falls from 66.8% to 55.4%.

Table 5. Sensitivity analysis for different inflation rates

	Inflation rate	TGB	TFSA & TFCA	NTPS
IRR	5.000%	1.970%	2.430%	2.451%
	10.000%	1.720%	2.430%	2.449%
	15.000%	1.493%	2.430%	2.447%
Accumulated portfolio	5.000%	66.782%	80.000%	80.743%
	10.000%	60.541%	80.000%	80.683%
	15.000%	55.447%	80.000%	80.627%
Net fiscal impact	5.000%	33.218%	20.000%	-4.369%
	10.000%	39.459%	20.000%	-4.240%
	15.000%	44.553%	20.000%	-4.122%
Resource cost	5.000%	0.000%	0.000%	23.626%
	10.000%	0.000%	0.000%	23.558%
	15.000%	0.000%	0.000%	23.495%

Source: Authors' calculations

On the other hand, the net positive fiscal impact increases from 33.2% to 44.55%. To avoid this increase in the taxation of fixed-income securities, investors usually choose to place them in pension plans illustrated by the TFSA, TFCA and NTPS. Under the same base case assumptions, there is no impact of inflation on the real rate of return of fixed-income securities held in TFSA and TFCA (Table 5, column 3).

In the case of the NTPS, the interaction of inflation, taxation and the various administrative changes and government subsidies has only a very mild negative impact on the return received by the investor.

As in the other cases, the Turkish government through its NTPS pension system is able to give the private investor holding fixed-income securities a favourable private rate of return, but only at a high cost to the national treasury and an economic resource cost of over 23% of the contributions made to this private pension system.

Conclusion

The newly introduced privately managed defined-contribution pension scheme (NTPS) in Turkey has been implemented to serve as a complement to the nation's social security system. This study has addressed some of the economic issues created by this defined-benefit pension system by comparing the outcomes of the new pension system with the previous one and also with the two Canadian inspired defined-contribution pension schemes (TFSA and TFCA) that would be administered by banks. Estimates are made of the IRR, accumulated portfolio, net fiscal impact and economic resource cost (administration costs) associated with each of the retirement savings schemes.

Our findings show that the three existing pension schemes for individual investors are more beneficial as savings vehicles than direct investment in TGBs. However, the improved performance by the NTPS, from the point of view of the individual investor, is being produced by a loss in tax revenue by the government and an economic resource cost to the country.

In contrast, the institutional arrangements in Canada for such defined-contribution private pension plans do not induce individuals to invest in government bonds. Instead, individuals are allowed to purchase riskless GICs of the commercial banks and trust companies. Because this source of funds is long term and stable for these financial institutions, these institutions have, in exchange, lowered the management fees for holding such investments in a pension account to zero. As a consequence, these plans yield almost the same return as the NTPS, and at the same time allow the government to collect substantial tax revenues, thus creating no economic resource costs.

We conclude that the institutional structure of pension schemes plays a vital role in determining their level of success. If the bank-administered TFSA and/or TFCA were adopted in Turkey and the requirement of holding government securities were lifted, such schemes would provide contributors with benefits similar to those they currently enjoy under the new Turkish scheme, while eliminating the economic resource costs of administration and improving their net fiscal impact.

However, the adoption of pension schemes structured like these two Canadian systems would require some caution, since the distribution of their benefits changes with variations in the marginal income tax rate. Our results show that the TFCA is superior to the TFSA in terms of the private returns in cases where the marginal income tax rate is higher in the present than in the future. Hence, it would appear prudent to introduce schemes similar to both the TFSA and TFCA

simultaneously. Contributors should be able to choose the option that best suits their individual situation. Alternatively, contributors may choose to operate both schemes in order to manage the uncertainty of their future tax position and hence be able to take advantage of the unique characteristics of each scheme.

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