# 10 Political economy of pension reform in Turkey

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## Introduction

Making sure that retired workers will be able to maintain at least some minimum standard of living during later parts of their lifetime is an important social policy goal for all governments. For this reason, many countries legally require workers to have some old-age insurance coverage provided through publicly managed pension schemes that are typically run on a Pay-As-You-Go (PAYG) basis.

Public PAYG schemes finance pensions and other old-age benefits to retired workers by using contributions collected from currently active workers and their employers in the form of payroll taxes. This makes revenue–expenditure balances of publicly managed pension funds sensitive to reductions in the relative sizes of retirees collecting benefits and active workers continuing to pay contributions. If such reductions are not matched with increases in contributions and/or reductions in old-age benefits over extended periods of time, the resulting deterioration in revenue–expenditure balances will eventually lead to sizable deficits that need to be funded by the Treasury.[1]

Certainly, different political economy issues shape up policy makers' attitude towards growing pension deficits and the timing of policy responses. First of all, even though a gradual decline in the number of workers per retiree is certain to occur over time, incumbent governments tend to delay taking action to curb the growth in pension deficits as long as possible, since increasing contributions and/or lowering pension benefits are not likely to prove popular among voters. While not as commonly observed, a second and more extreme form of myopic policy action involves interventions that change the incentive structure driving individuals' work/retirement decisions or the eligibility criteria for retirement in such a way to speed up the deterioration in pension balances for political rent-seeking purposes. In either case, avoiding timely action on account of the lack of electoral support often causes pension deficits to eventually reach alarming magnitudes, requiring a major overhaul of the pension system without further delay at some point.

Such an overhaul typically involves a parametric pension reform (Chand and Jaeger, 1996) to change the existing values of public pension program parameters (contribution and replacement rates and statutory entitlement ages for pension benefits[2]) markedly so as to restore balances or shrink deficits to tolerable levels by

increasing contributions collected and/or reducing benefits paid out. In general, previous delays in parametric reform require adjusting values of pension program parameters more dramatically than it would have been necessary in the absence of such delays. Since increasing the contribution rate and entitlement age are likely to face opposition from younger voters, whereas reducing the replacement rate is likely to displease older voters, the implementation of reform itself is a process driven by political economy considerations: New values of parameters must be set in such a way to minimize the harm to re-election chances of the incumbent government (i.e. left no choice but) to introduce the reform.[3]

In addition to adjustments to pension parameters, the reform process may also call for a restructuring of the existing institutional setup of the system or establishment of new institutions, possibly giving rise to power struggles between supporters and opponents of institutional reform and hence creating additional political economy concerns.

The purpose of this chapter is to discuss some of these political economy issues in the context of recent efforts to rehabilitate the Turkish pension system, and to investigate alternative parametric reform scenarios that could be adopted for that purpose. Discussion in the remainder of the chapter is organized as follows. The next section describes the structure and problems of the pension system in Turkey while the section on Pension reform process provides a brief account of the recent pension reform process. The section on Alternatives of the reform of 1999, looks into alternative reform options and discusses advantages and limitations of these alternatives. The final section concludes the chapter and summarizes likely developments ahead.

## Structure and problems of the Turkish pension system

The publicly managed social security system in Turkey was set up and began to provide old-age insurance coverage and other social security benefits in the 1940s. Notwithstanding the work under way to create a single public pension fund administration, the system is currently made up of three different agencies, each with its own PAYG pension operations to provide retirement benefits to different groups within the working population, and a number of pension funds that commercial banks have set up for their own employees. SSK, the largest of the three public agencies, provides social security coverage to blue-collar workers employed in both private and public sectors and white-collar workers in the private sector, whereas ES serves as the pension fund administration for white-collar workers employed by local and central governments. The third one, BK, covers farmers, artisans, and other self-employed people. Participation in retirement plans offered is compulsory for all wage and salary earners as well as self-employed individuals in principle but actual coverage is far less comprehensive due to serious compliance problems. Voluntary participation is possible for people who are active outside compulsory coverage categories.[4]

Prior to 2003, additional pension benefits beyond coverage provided by these three public agencies were only available through a number of pension funds

privately set up by some companies, universities etc. to provide optional coverage to their own employees. After the legal and regulatory framework was drawn up to allow working individuals to voluntarily purchase additional coverage from private companies, many insurance companies began to offer individual retirement plans in 2003, essentially transforming the single-pillar pension system in Turkey into a two-pillar system.

The introduction of individual retirement accounts to be managed by private companies was in fact part of a larger process for social security reform, started in 1999 following serious financial difficulties that social security agencies run by the state began to experience due to the imbalance between contributions collected and benefits paid out. The primary culprit behind the deficits that became persistent after the 1980s was pension/old-age insurance operations that generated significant losses primarily due to generosity of pension benefits to retirees and their survivors relative to the amount and duration of contributions. This relative generosity resulted from pension parameters introduced and maintained by different governments purely for the purposes of reaping political benefits or avoiding political risks. Among the three agencies, pension (and health) benefits provided by ES have traditionally been even more generous than the other two, making public service a particularly attractive choice of employment for many people.

When the pension crisis hit Turkey, PAYG-based pension funds run by the state in several other countries were also encountering financial difficulties of their own due to declining worker-to-retiree (or active-passive) ratios. Differently than those countries where decreasing worker-to-retiree ratios resulted from aging of respective populations, however, the fall in this ratio in Turkey was mainly due to various reductions in pension benefit entitlement ages (Table 10.1).

Pension regulations in effect until 1999 allowed female/male workers to begin collecting retirement benefits as early as 38/43 years of age. Although relatively few people actually retired before 40 years of age, about one-third of people who applied to SSK to get their retirement benefits started during 1996–1999 were younger than 45 years of age.[5] Despite some variation across social security agencies, the median retirement age has been significantly lower than OECD averages (Gillion and Cichon, 1996). The reductions in entitlement ages financially squeezed public pension funds by lowering both average contributions net of benefits per worker[6] and worker–retiree ratios (Table 10.2).

*Table 10.1* Statutory entitlement ages in Turkey before 1999

| Years | Female workers | Male workers |
| --- | --- | --- |
| 1950 | 60 | 60 |
| 1965 | 55 | 60 |
| 1969 | 38 | 43 |
| 1986 | 55 | 60 |
| 1992 | 38 | 43 |

Source: Kenar *et al.* (1996).

The decline in worker-to-retiree ratios resulting from the tendency of workers to take advantage of regulations allowing for low retirement ages has indeed been the major contributor to the growth in pension deficits which, by the end of the 1990s, had reached unsustainable proportions. Interestingly, the entitlement ages were not pulled down to such preposterously low levels as 38 and 43 as a result of the demands by trade unions and other pressure groups. Instead, entitlement age cuts were initiatives of ruling parties aiming to increase their chances of getting re-elected by achieving quick reductions in unemployment through positions opened up by young retirees (Işıklı, 1998).

It soon became obvious, however, that cuts to minimum retirement ages were rather short-sighted and uncalculated moves by politicians, since most workers who opted to retire at such early ages were taking up employment elsewhere, thereby adding pension receipts to wage/salary income from their new jobs. Finding employment was relatively easy for these young retirees as they were usually more experienced and skilled than younger people seeking first time employment. Furthermore, they were willing to accept, often unregistered, employment at lower wages/salaries since they already had a pension income. Some did not even have to really quit their job: they would apply to get their retirement benefits started as soon as they become eligible, and would get "re-hired" for the very same position and continue working in a business-as-usual fashion. Many employers allowed and even encouraged their employees to go through retirement procedures without effectively quitting their jobs, since they had nothing to lose. On the contrary, they would at least save the employers' share of contributions by re-hiring these workers after they started collecting their pensions.[7] As such, Turkey's experience has been a clear example to how badly designed schemes can encourage premature retirement (Barr, 2002).

The lack of labor market regulation with respect to re-employment of young retirees, coupled with already low compliance rates with the existing regulations and the large size of unregistered workers, not only limited the job creation effect hoped of lower entitlement ages, but also contributed to the growth in pension losses and hence public sector borrowing requirements (PSBR) that were already running high (Table 10.3). Given the way high and growing PSBR had been driving interest rates up, the most probable net result of reductions in statutory entitlement ages was a hike in unemployment rates due to crowding out of private investment – effectively suppressing employment creation capacity of the economy below what would have been in the absence of such attempts at quick fixes for the unemployment problem.

Even though not carefully contemplated reductions in entitlement ages for short-term political benefits were the primary reason underlying the untimely experience of Turkey with pension crisis, when the country still had a predominantly young population,[8] it was by no means the only populist intervention of politicians to disturb actuarial balances of the pension system. Such interventions started back when the policy-induced decline in worker-to-retiree ratios had not reached critical levels. As publicly managed pension funds were still running surpluses thanks to the advantageous age composition of masses they covered,

*Table 10.2* Pension coverage by status and agency: 1990–2002 (in thousands)

| Active insured/employment (%) | 1990 | 2000 | 2002 | % Change 1990–2002 |
|---|---|---|---|---|
| *SSK (Sosyal Sigortalar Kurumu) total* | 18,977 | 34,139 | 35,261 | 86 |
| 1 Insured (active contributors) | 3,446 | 5,283 | 5,257 | 52 |
| 2 Voluntarily covered contributors | 300 | 844 | 942 | 214 |
| 3 Active contributors in agriculture | 74 | 185 | 149 | 101 |
| 4 Pension recipients (passive users) | 1,596 | 3,339 | 3,748 | 134 |
| 5 Dependents | 13,560 | 24,488 | 25,166 | 85 |
| 6 Active/passive ratio [(1 + 2 + 3)/4] | 2.39 | 1.89 | 1.69 | −29 |
| 7 Dependency ratio [(5 + 4)/(3 + 2 + 1)] | 3.97 | 4.41 | 4.55 | 15 |
| *BK (Bağ-Kur) total* | 13,361 | 15,036 | 15,548 | 16 |
| 1 Insured (active contributors) | 1,967 | 2,182 | 2,193 | 12 |
| 2 Voluntarily covered contributors | 106 | 255 | 238 | 124 |
| 3 Active contributors in agriculture | 752 | 876 | 891 | 18 |
| 4 Pension recipients (passive users) | 595 | 1,277 | 1,394 | 134 |
| 5 Dependents | 9,940 | 10,446 | 10,833 | 9 |
| 6 Active/passive ratio [(1 + 2 + 3)/4] | 4.75 | 2.59 | 2.38 | ↓ |
| 7 Dependency ratio [(5 + 4)/(3 + 2 + 1)] | 3.73 | 3.54 | 3.68 | ↓ |
| *ES (T.C. Emekli Sandiği) total* | 8,586 | 9,766 | 10,699 | 24 |
| 1 Insured (active contributors) | 1,560 | 2,164 | 2,373 | 52 |
| 2 Pension recipients (passive users) | 843 | 1,297 | 1,409 | 67 |
| 3 Dependents | 6,182 | 6,305 | 6,917 | 11 |
| 4 Active/passive ratio [1/2] | 1.85 | 1.67 | 1.68 | ↓ |
| 5 Dependency ratio [(3 + 2)/1] | 4.50 | 3.51 | 3.51 | ↓ |
| *Private pension funds total* | 312 | 324 | 324 | −10 |
| 1 Insured (active contributors) | 84 | 78 | 72 | −14 |
| 2 Pension recipients (passive users) | 32 | 71 | 78 | 143 |
| 3 Dependents | 195 | 174 | 175 | −10 |
| 4 Active/passive ratio [1/2] | 2.63 | 1.10 | 0.92 | ↓ |
| 5 Dependency ratio [(3 + 2)/1] | 2.70 | 3.12 | 3.53 | ↑ |
| *Overall total* | 41,236 | 59,265 | 61,832 | 50 |
| 1 Insured (active contributors) | 7,058 | 9,707 | 9,894 | 40 |
| 2 Voluntarily covered contributors | 406 | 1,099 | 1,180 | 190 |
| 3 Active contributors in agriculture | 826 | 1,061 | 1,040 | 26 |

*Table 10.2* Continued

|  | | 1990 | 2000 | 2002 | % Change 1990–2002 |
|---|---|---|---|---|---|
| 4 | Pension recipients (passive users) | 3,068 | 5,985 | 6,628 | 116 |
| 5 | Dependents | 29,878 | 41,413 | 43,090 | 44 |
| 6 | Active/passive ratio [(1 + 2 + 3)/4] | 2.70 | 1.98 | 1.83 | ↓ |
| 7 | Dependency ratio [(5 + 4)/(3 + 2 + 1)] | 3.97 | 3.99 | 4.10 | ↑ |
| Total population | | 58,754 | 68,036 | 70,171 | 19 |
| Share of insured population (%) | | 72.7 | 87.1 | 88.1 | 21 |
| Active insured/employment (%) | | 39.1 | 46.3 | 46.3 | 18 |

Source: State Planning Organization, *The Eighth Five Year Development Plan: 2001–2005*, and *Annual Program Documents* 2003 and 2004 (all in Turkish).

*Table 10.3* Pre-1999 growth of social security deficit in Turkey

| Year | Share of total transfers (treasury funding) to social security agencies in total budget deficit ( %) | Share of total transfers (treasury funding) to social security agencies in GNP (%) |
|---|---|---|
| 1993 | 17 | 1.20 |
| 1994 | 20 | 1.13 |
| 1995 | 36 | 1.44 |
| 1996 | 26 | 2.16 |
| 1997 | 34 | 2.55 |
| 1998 | 35 | 2.85 |

Source: Ayas (1998).

governments began to tap these surpluses to finance overspending in other budget items, thereby diverting investable resources of pension funds to unrelated areas such as agricultural support purchases (Kılıçdaroğlu, 1998; Sayan, 2001). This diversion, coupled with the mismanagement of assets that had been acquired by pension funds, helped pull back the crisis in time.

Over the years, politicians continued to meddle with the pension system by enacting several laws to make previously uncovered voters eligible to receive pension benefits that are incomparably higher than the amounts they were expected to pay in back contributions, and by handing out pre-election bonuses to retirees in the form of arbitrary raises to pension incomes across the board and "one time" lump sums called social assistance payments. Kılıçdaroğlu (1998) calculated that these social assistance payments handed out without a matching increase in contributions amounted to US\$ 13.8 billion over the 1977–1996 period. In addition to the burden they placed on pension balances, these payments and arbitrary

additions to pension incomes have created uncertainties for all retirees, making it difficult for them to plan ahead (TUSIAD, 2004).

These pre-election bonuses have broken the link between contributions and benefits which was already rather weak, particularly in the case of ES, the pension fund administration for civil servants employed by local and central governments. Due to the historically privileged status of this group with its roots in the strong and long-lasting bureaucratic tradition in Turkey, ES has always had a special place among the three agencies in terms of the generosity of pension (and health) benefits it provided relative to contributions collected.

In summary, the introduction of imprudent legislation for short-term political gains – as in the case of entitlement age reductions and payments to retirees of pre-election bonuses not tied to contributions – and mismanagement of pension funds under political pressure – as in the case of the use of excess contributions in financing other public expenditures – have all contributed to the financial crisis of the pension system that Turkey prematurely experienced in the 1990s.

While some governments were directly responsible for starting or speeding the deterioration in pension balances through politically motivated steps, others are to be blamed for their failure to take action to stop or even reverse this process in fear of voter reaction. In other words, the losses generated by the Turkish pension system proved unsustainable by the end of the 1990s as a result of the actions or the lack thereof by different governments despite the advantageous age profile of Turkish population. This end could still have been delayed, if the large number of unregistered workers could be reduced through appropriate labor market policies so as to generate additional contribution revenue.

The number of unregistered workers in the private sector and self-employed individuals is very high indeed (currently estimated by the Ministry of Labor and Social Security to be around 11 million) due, to a large extent, to the high rates of payroll taxes – that are supposed to be collected from self-employed individuals themselves, or private sector workers and their employers as contributions. High payroll taxes have not only encouraged employers to employ unregistered workers but also reduced competitiveness of businesses that hire only registered workers, creating additional compliance problems and collection difficulties.

Even for registered workers and the self-employed, compliance problems cause actual contribution receipts to fall significantly below potential levels (Topal, 1999; TUSIAD, 2004). Low compliance manifests itself particularly in the form of a widespread tendency among employers to underreport payments to workers or to withhold contributions collected rather than transferring them to pension fund administrations, as there exists economic incentives for such violations (such as low late transfer penalties relative to market interest rates). These violations often go unpunished due, in part, to the inability of governments to enforce full compliance with pension laws, and in part to the lack of their willingness to pursue small businesses run by a few employees for political and sometimes economic (as during the times of economic crises) reasons. Regardless of the reasons, governments' tendency to look the other way causes large amounts of potential

contribution revenue to be lost. Prior to 1999, data published by BK itself indicated that only 2.8 percent out of 3 million registered individuals owed no back contributions, whereas 27 percent made almost no contribution after getting registered with the remaining 70 percent making irregular payments (Sayan, 1999).

## Pension reform process

### *Implementation of the reform of 1999*

Growing share of budget deficits in GNP and the rapidly increasing contribution of funding needs of the social security system to this share had begun to threaten future solvency of the system by the second half of the 1990s. Furthermore, total deficit of the whole system was projected to increase to 16.8 percent of GNP by the year 2050 in the case of non-intervention. The divergence between expenditures and revenues in pension operations was largely responsible for the bleak outlook and the GNP share of pension losses alone was projected to exceed 5 percent by 2010, should the pre-1999 values of pension parameters be retained (Ayas, 1998; see also Gillion and Cichon, 1996 for similar projections). Having realized that there was almost no room left for delaying action any further any more, the coalition government that was in power prepared a proposal for a major pension reform in 1999.

The obvious need to extend average contribution period (and shorten average benefit collection period) made the entitlement age the most critical parameter of reform. In the early drafts of the reform bill, the entitlement ages were set at the substantially higher levels of 63 and 65 respectively for female and male workers who would start working for the first time after the new law has gone into effect. For the existing workers, the bill called for gradual increases over time that were to be progressively higher for more junior workers. Even though past reductions in entitlement ages were not directly demanded by workers, the bill's provisions to increase them faced a very strong resistance, with "say no to retirement in the grave" becoming the slogan of opposing groups. Under intensive pressure from trade unions and other interest groups as well as opposition parties in the parliament, the government had to modify the proposal to limit the entitlement age hike to 58 and 60 for female and male workers, respectively (Sayan and Kiraci, 2001a).

After heated debates between the government and the opposition groups inside and outside the Parliament, the bill was legislated into law no. 4447 in September 1999. While it raised entitlement ages to 58/60 for first time employees and set a transition period of 8 years for gradual increases for existing employees, the values of average contribution and replacement rates were maintained.[9] Besides the age increase, major modifications introduced included the extension of the indexation period for calculation of pension benefits to the entire duration of employment and the linking of increases in pension incomes to consumer inflation (TUSIAD, 2004) to curb the tendency of governments to make arbitrary adjustments to pensions received by retirees for political benefit.

The parametric reform was a crucial step to control the rapid growth in pension and hence social security deficits. Yet, significant and lasting reductions in deficits would have required more radical measures that were not necessarily feasible politically. One of the major shortcomings of law no. 4447 was its failure to restore the missing link between contributions and pension benefits for ES on account of the government's reluctance to deal with the reaction that civil servants including higher ranking bureaucrats, and the members of the judiciary, police forces, and the military – particularly outspoken pressure groups that most governments would rather not have a confrontation with for political reasons. So, the only significant provision of the reform act for personnel covered by ES has been the increase in entitlement ages. Even then, the effectiveness of this most notable provision of law no. 4447 was reduced by a decision that the Turkish Constitutional Court (the supreme court in the country) took in response to an appeal by some members of the Parliament.

As an act of political solidarity with trade unions and other groups opposing the hike in entitlement ages, a number of deputies from the main opposition party challenged the conformity of age adjustment with the constitution by filing an appeal with the supreme court. Following its examination of the appeal, the Constitutional Court ruled in February 2001 that the law's (non-linear) scheme for gradual increases in the entitlement age during the transition period violated the equality principle and hence constitutional rights of workers in certain age groups and ordered that this provision be reconsidered. The Constitutional Court required that the government make legal arrangements within six months to make sure that the transition to new entitlement ages will be smoother (Sayan, 2002). Consequently, the transition period was extended until 2020 to increase entitlement age roughly by one every year, seriously reducing the effectiveness of the initially planned age increase scheme as a tool for reducing pension deficits (Table 10.4).

Notwithstanding the modifications to age adjustments, law no. 4447 had been intended to be just the first stage of a larger reform to overhaul the system. The additional steps envisaged for the completion of reform process included the introduction of individual retirement accounts managed by the private sector as an optional second pillar; improvement of information technology infrastructure for more accurate record keeping with less paperwork and red tape in such a way to increase compliance and improve efficiency of operations, and the initiation of a work program to merge different rules and regulations of coverage under each of the three pension institutions into a unified framework.

Such merging of different rules and regulations to create a similar cost and benefit structure of coverage across social security agencies was rather significant since it would essentially put an end to the privileged status of ES. This required major institutional restructuring to achieve and hence was set as a goal that needs to be pursued during the later stages of reform. Despite serious political risks of such a move, the incumbent government in 1999 facing strong pressure from the IMF saw the inevitability of such an institutional reform. It soon began to take the initial steps in that direction but adopted a public relations strategy based on

*Table 10.4* Minimum entitlement ages for female workers (who were already employed at the time of the passage of new regulations)

| Years | Prior to 1999 | Law no. 4447 (1999–2002)[a] | Revision of law no. 4447 (after 2002) |
|---|---|---|---|
| 2000 | 38 | 38 | 38 |
| 2001 | 38 | 41 | 38 |
| 2002 | 38 | 43 | 38 |
| 2003 | 38 | 45 | 39 |
| 2004 | 38 | 47 | 40 |
| 2005 | 38 | 48 | 41 |
| 2006 | 38 | 49 | 42 |
| 2007 | 38 | 50 | 43 |
| 2008 | 38 | 51 | 44 |
| 2009 | 38 | 58 | 45 |
| 2010 | 38 | 58 | 46 |
| 2011 | 38 | 58 | 47 |
| 2012 | 38 | 58 | 48 |
| 2013 | 38 | 58 | 49 |
| 2014 | 38 | 58 | 50 |
| 2015 | 38 | 58 | 51 |
| 2016 | 38 | 58 | 52 |
| 2017 | 38 | 58 | 53 |
| 2018 | 38 | 58 | 54 |
| 2019 | 38 | 58 | 55 |
| 2020 | 38 | 58 | 56 |
| 2021–2060 | 38 | 58 | 58 |

Note
a Minimum entitlement ages that could not be put into effect due to the Constitutional Court's ruling.

the avoidance of emphasizing the ultimate goal of bringing costs and benefits of coverage under ES in line with the other two agencies. The first step for the elimination of differences between the way contributions are linked to benefits across agencies and establishment of common standards was the creation of a social security administration to coordinate the harmonization of rules and regulations and to serve as an umbrella organization for the existing agencies. The government issued decree no. 618 for this purpose in October 2000 but legal complications arising later dictated that a law be approved by the Parliament delaying the establishment of this administration until the enactment of law no. 4947 in July 2003 (TUSIAD, 2004).

There has also been some progress in the achievement of other targets set for successive waves of pension reform after 1999. The most significant of these has been the creation of an optional second pillar through the entry of private companies into the pension insurance business (Teksöz and Sayan, 2002). Private insurance companies in Turkey had long been offering pension benefits to

individuals who want additional coverage through life insurance policies even before, but the purchase of defined-contribution plans specifically designed for the purposes of providing additional pension income to individuals covered by one of the public pension schemes became possible only in 2003. The bill allowing for the opening of individual retirement accounts with private companies was enacted into law in 2001, and following the completion of the regulatory framework, a number of private companies began to operate in 2003, selling pension plans to individuals who would like to take advantage of market determined rates of return on their long-term savings and the tax incentives provided.[10] Yet reduced disposable incomes of workers due to high contribution rates charged by public pension schemes and the recent economic crises have so far limited the growth in the demand for individual retirement plans.

## *Evaluation of the reform of 1999*

Despite a series of initiatives including the enactment of the Pension Reform Act of September 1999, the reform process had only limited success in curbing social security deficits. In fact, the passage of law turned out to be largely ineffective in stopping the growth in social security deficits except for a temporary improvement in the balances of SSK and to some extent BK. The balances of ES, on the other hand, continued to deteriorate since law no. 4447 largely kept conditions for ES coverage intact except for the entitlement age hike whose effectiveness was mitigated by the ruling of the Constitutional Court. As a result, the ratio of deficits to GNP even exceeded its pre-reform values (Table 10.5).

While there is no doubt that the Constitutional Court decision requiring the gradual increases to entitlement age be slowed down has been a major contributor to the failure of reform, it was not the only factor. The costs of timidity of the incumbent government in extending the coverage of parametric reform to ES on account of political risks have also become evident by now, as ES, the lowest-ranking agency in terms of the size of membership, became the highest-ranking contributor to overall social security deficits. In addition, the growth in lump-sum social assistance payments not tied to contributions also continued especially during severe economic crises that Turkey experienced between 1999 and 2002. Perhaps more importantly, the size of unregistered worker population could not be

*Table 10.5* Transfers to publicly managed social security agencies funded by the treasury (as percentage of GNP)

| Total | 1999 (%) | 2000 (%) | 2001 (%) | 2002 (%) | 2003 (%) | 2004[a] (%) |
|-------|----------|----------|----------|----------|----------|-------------|
| SSK   | 1.41     | 0.32     | 0.69     | 0.87     | 1.35     | 1.39        |
| BK    | 1.02     | 0.84     | 0.99     | 0.96     | 1.38     | 1.27        |
| ES    | 1.32     | 1.41     | 1.49     | 1.71     | 1.72     | 1.86        |
| Total | 3.75     | 2.57     | 3.17     | 3.54     | 4.45     | 4.52        |

Source: Turkish Social Security Administration.

Note
a Provisional.

reduced. The reform of 1999 has not served this purpose at all indeed, since the cost of employing registered workers remained high due to the the maintenance of high contribution rates at their pre-1999 values.

The evolution of GNP shares of transfers in Table 10.5 clearly indicates the need for a more radical and comprehensive reform which would not leave any of the existing agencies out of its scope, including new adjustments to pension parameters. It is interesting to note that in the absence of such a reform, Turkey's aspirations to become a full member of the European Union could be killed by the deficits of its publicly managed social security system alone, since the upper limit of public deficits to GNP ratio allowable for members has been set at 3 percent by the Maastricht criteria. Furthermore, the upcoming demographic pressure increases the urgency of such a comprehensive reform. Even though Turkey still has a young population relative to the most of its OECD partners, population aging gradually sets in (Kenc and Sayan, 2001). The country is projected to get out of the demographic window of opportunity characterized by the increasing share of working age people in total population during the next two decades, signalling the need to take additional measures to avoid even larger deficits (TUSIAD, 1999). The next section discusses some alternatives that could be considered to face the challenges ahead of the Turkish pension system.

## Alternatives of the reform of 1999

As Table 10.5 indicated, law no. 4447 has achieved little in curbing the deficits of the publicly managed social security system in Turkey. Facing even larger deficits to be funded than before and under intense pressure from the IMF which tied the renewal of the Stand-By Agreement under negotiation with Turkey to the condition of a major social security reform, the governments that came to power after the November 2002 elections prepared a new draft for a social security reform bill in July 2004. The bill focused on another parametric reform ruling out the possibility of major restructuring such as the introduction of a third pillar through compulsory individual retirement accounts. Despite concrete suggestions spelled out in a report commissioned by the Turkish Association of Industrialists and Businessmen (TUSIAD, 2004) and some lobbying, the government insisted on parametric reform on account of the lack of initial financing to meet the costs to be incurred during transition from a two-pillar system to a three-pillar one – made up of public pension schemes and one compulsory and one optional pillar for pension plans to be provided by privately managed but regulated insurance companies. So, the rest of the discussion in this section focuses on parametric reform alternatives alone, and as such, contributes to the literature on identification of parameters for rehabilitating a PAYG-based pension system as briefly surveyed by Chand and Jaeger (1996) and Sayan and Kiraci (2001b). Especially relevant studies focusing on the Turkish case include ILO (1996), Akmaz (1999) and Sayan and Kiraci (2001a,b).

The investigation of alternative reform parameters here is carried out in reference to old-age insurance operations of SSK, the largest of three publicly managed social security agencies in Turkey. The results are obtained by solving an actuarial model through a genetic algorithm (GA) developed for this purpose

(Sayan and Turhan-Sayan, 2001).[11] The GA determines optimal values of pension program parameters by realistically allowing for transitional and long-term changes in entitlement ages over time and it significantly improves computational efficiency over other studies dealing with the same problem (see, for example, Sayan and Kiraci, 2001a). Despite partial equilibrium nature of the actuarial model used, the investigation here also links up well with the literature studying social security reform issues using overlapping generations general equilibrium models – see Joines *et al.* (1999) for a survey, and Miles (1999) or Huang *et al.* (1997) for examples to studies on other countries, and Sayan and Kenc (1999) and TUSIAD (2004) for examples to studies on the Turkish social security system.

### *Formulation of the problem*

The search for new pension parameters that intertemporally balance expenditures and revenues of SSK begins by defining the difference between total inflation-adjusted present discounted value (PDV) of future pension payments that need to be made to retirees and future contribution receipts from active workers who pay their dues. Letting $D$ represent this difference for the period under consideration, we can write

$$D = \sum_{t=t_0}^{\tau} \frac{1}{(1 + \delta)^{t'}} \left( RR \sum_{a=A_t}^{le} \overline{rw}_{a,t} r_{a,t} - CR \sum_{a=a_0}^{mwa} rw_{a,t} w_{a,t} \right), \qquad (10.1)$$

where

CR : Average contribution rate – including the supplementary contributions that the employers are legally required to make $(0 < CR < 1)$,

RR : Average replacement rate showing the percentage of pension income to replace the average wage/salary income earned prior to retirement $(0 < RR < 1)$,

$A_t$ : Statutory entitlement age (minimum retirement age for female workers) at time $t$ $(A_t < mwa$, where mwa is maximum working age),

$\delta$ : Discount rate,

$w_{a,t}$ : Projected number of contributing workers at the age of $a$ at time $t$,

$\overline{rw}_{a,t}$: Average real wage income projected to be earned by active workers at the age of $a$ at time $t$ – adjusted for the earnings cap or wage ceiling that determines the maximum amount out of which contributions are collected,

$r_{a,t}$ : Projected number of pensioners who are aged $a$ at time $t$,

$rw_{a,t}$: Average real work time income of pensioners aged $a$ at time $t$,

$a$ : Age index running from the beginning of working life, $a_0$, to le, life expectancy in years (le > mwa),

$t$ : Time index running from the initial period, $t_0$, to $\tau$, the end of model horizon, and $t' = t - t_0$.

The values of all variables other than $A_t$, CR and RR in (10.1) are determined by demographic or labor market conditions and, hence, cannot be controlled by

pension authorities. By this notation, total pension payments to be made by the pension fund at any year $t$ are calculated by multiplying the number of retirees, distinguished by their ages, with the applicable pension for the corresponding age group. The applicable pensions at time $t$, in turn, are calculated through an indexation scheme requiring each retiree to be paid a certain proportion, RR, of the average of real wages earned prior to retirement.[12] Each active worker aged $a$ at time $t$, on the other hand, is paid $rw_{a,t}$ and a fraction, CR, of this income adjusted for the wage ceiling (i.e. the maximum level of wages/salaries by which contributions and pension payments are calculated) is collected as contributions. $D$ in (10.1) therefore shows the inflation-adjusted PDV of the difference between pension payments (projected) to be made and total contributions (projected) to be collected by the end of time horizon considered.

Equation (10.1) may be taken as the objective function in a constrained minimization problem requiring to find CR and RR values and minimum retirement ages to be introduced at different points in time, $A_t$, so as to keep $D$ as low as possible under exogenously given, projected values of real wages, retiree, and active worker populations and other relevant constraints. Given that publicly managed pension systems do not typically aim to run surpluses (with $D < 0$),[13] a more realistic and relevant problem to consider would be to identify CR, RR, and $A_t$ values without allowing $D$ to be negative over the period under consideration. Since expenditures exceed receipts when $D > 0$, the choice of a positive target value for $D$ implies that the pension system is allowed to run a deficit.

To consider this more realistic version of the pension reform problem for Turkey, the time horizon for the runs with the GA was chosen to be the period from 2000 to 2060, and the target level of pension deficit over this period was set equal to zero. Since the losses generated by SSK (and by the social security system at large) had already reached alarming proportions prior to the reform act of 1999, the target level of pension deficit was chosen to keep the existing debt from growing. In fact, getting $|D|$ as close to zero as possible is equivalent to the maintenance of the real deficit of SSK at its initial level. As the Turkish economy would continue to grow, this must be expected to lower the real GDP share of SSK's pension deficit to a negligible level by the year 2060. Furthermore, since Turkish population is projected to remain stable beyond 2060 (TUSIAD, 1999), the program parameter configurations suggested to minimize deficits over 2000–2060 would not need to be modified afterwards. Given this target, the problem for the relevant time horizon could formally be defined as[14]

$$\text{Minimize}_{A_t, \text{CR, RR}} |D| = \left| \sum_{t=2000}^{2060} \frac{1}{(1+\delta)^{t'}} \left( \text{RR} \sum_{a=A_a}^{\text{le}} \overline{\text{rw}}_{a,t} r_{a,t} - \text{CR} \sum_{a=a_0}^{\text{mwa}} \text{rw}_{a,t} w_{a,t} \right) \right|$$

$$\text{subject to} \quad p_{a,t} = \begin{cases} w_{a,t} & \text{for } a_0 \leq a < A_t, \forall t \\ w_{a,t} + r_{a,t} & \text{for } A_t \leq a \leq a \leq \text{mwa}, \forall t \\ r_{a,t} & \text{for mwa} < a \leq \text{le}, \forall t \end{cases} \quad (10.2)$$

$$0 < \underline{\text{CR}} \leq \text{CR} \leq \overline{\text{CR}} < 1, \quad 0 < \underline{\text{RR}} \leq \text{RR} \leq \overline{\text{RR}} < 1,$$

where $\underline{CR}$ ($\underline{RR}$) and $\overline{CR}$ ($\overline{RR}$), respectively, denote the lower and upper bounds defining the range within which policy makers would like to adjust the contribution rate (replacement rate), and $p_{a,t}$ represents the projected year $t$ population of the people in age group $a$ ($a \geq a_0$) and covered by SSK. Hence, the equality constraint in (10.2) states that anyone who is between the minimum retirement age $A_t$ and maximum working age, mwa, at time $t$ must either be a worker or a retiree, whereas any member of this group who, at time $t$, is younger (older) than $A_t$ (mwa) will necessarily be a worker (retiree). Given the way minimum retirement age, $A_t$, defines the limits for relevant age brackets in the equality constraint, however, any increase in $A_t$ introduced as part of a pension reform would increase the future size of working population at the expense of the retiree population. In other words, even though the policy makers/pension authorities cannot control $p_{a,t}$ itself, they may affect its composition by increasing minimum retirement age in such a way to reduce the number of retirees to collect benefits – while simultaneously increasing the number of workers to pay contributions. Since $A_t$ marks the lower limit for the summation sign in the objective function, each alternative value of $A_t$ considered within the context of a parametric reform implies a different value for $|D|$, even when CR and RR are held constant. This is, in fact, what raises the complexity of identifying the [CR, RR, $A_t$] configurations minimizing $|D|$ (Sayan and Kiraci, 2001b). Yet, the GA used in this chapter overcomes the associated computational difficulties quite efficiently (Sayan and Turhan-Sayan, 2001).

## Description of the data and implementation

Since the time horizon for the computational exercises was chosen to be the 61-year period between 2000 and 2060, projections on active worker/retiree populations by ages (aggregated over genders) were used to construct a (mwa$-a_0+1$) $\times$ 61 matrix for the working population, and a (le$-A_0+1$) $\times$ 61 matrix for the retiree population over 2000–2060, where $A_0$ is the initial value of minimum retirement age. Based on data on SSK membership in ILO (1996), maximum working age, mwa, was taken to be 75 and the earliest working age, $a_0$, to be 15. Likewise, following ILO (1996), the life expectancy, le, was set equal to 80+ allowing retirees to continue to collect benefits by the age of 80 or more. Since ILO (1996) projections on working and retiree populations assumed the maintenance of the actual (pre-1999) minimum retirement age, $A_0$, was taken to be 38. These values yielded two demographic projection matrices for 2000–2060: WAT $= [w_{a,t}]_{61 \times 61}$ for the active (contributing) worker population by age, and RAT $= [r_{a,t}]_{43 \times 61}$ for the retiree population by age. Other data available in ILO (1996) included real wage and pension incomes of actively working and retired members of SSK by ages, all in terms of Turkish Liras (TL) at constant 1995 prices. Whenever necessary, the available series were extended into the year 2060 by taking into account the likely growth in economy wide labor productivities as well as productivity differentials due to seniority, and by using the average replacement rates given in the same source. The resulting work and pension income matrices, WPAY $= [\mathrm{rw}_{a,t}]_{61 \times 61}$ and RPAY $= [\overline{\mathrm{rw}}_{a,t}]_{43 \times 61}$, were then constructed and

used together with the corresponding demographic projection matrices, WAT $= [w_{a,t}]_{61\times61}$ and RAT $= [r_{a,t}]_{43\times61}$, to calculate the initial (pre-reform) value of $|D|$ by taking CR $= 0.20$, RR $= 0.65$ and $A_0 = 38$ (i.e. average contribution and replacement rates, and minimum retirement age prior to the reform of 1999) and $\delta = 0.05$.

Figure 10.1 generates the paths SSK's pension balances would follow over time under three different policy scenarios by employing the projections used in solving the problem described earlier: Continuation of pre-1999 policy without any changes to pension program parameters; the actual reform of 1999 with no changes to CR and RR but transitional and permanent increases introduced to entitlement ages, and under revisions to the entitlement age increase scheme as required by the relevant ruling of the Turkish Constitutional Court (see also Table 10.4).

The area between each plot and zero line at the top of the figure corresponds to total deficit over 2000–2060 as captured by objective function variable $|D|$ in the problem described earlier. Since plots in Figure 10.1 assume away compliance problems, however, the path plotted for each policy scenario should actually be expected to lie below the corresponding plot in Figure 10.1 due to the leakages in the form of underreported payments to workers or contributions not transferred to SSK by employers. Table 10.6 reports total deficit values implied by plots in Figure 10.1, as well as by considering a 10 percent leakage rate assumed to be maintained throughout the time horizon considered so as to highlight direct costs of low compliance.

The numbers in Table 10.6 indicate that the pension reform act of 1999 could have achieved considerable success in reducing the real PDV of the pension deficit likely to be incurred by SSK over the 2000–2060 period, if it had been implemented without modifications. Deficit over the whole period would have
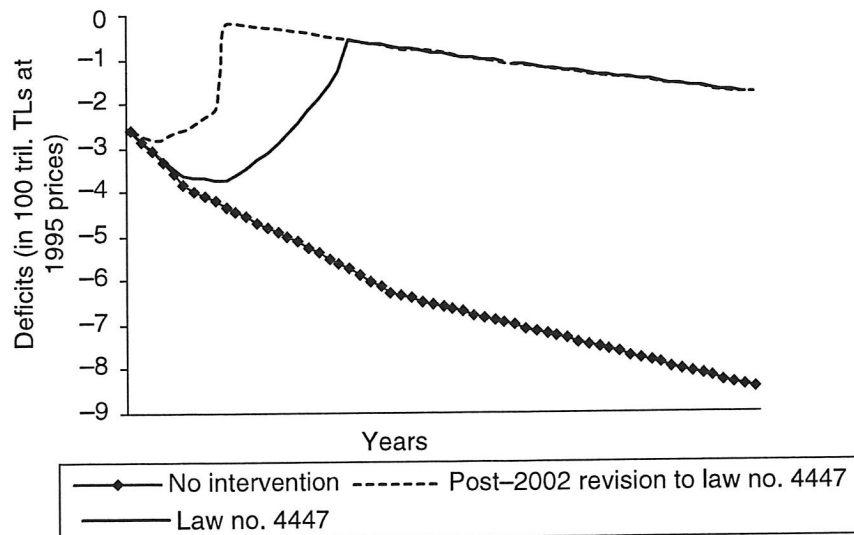


*Figure 10.1* SSK's pension balances under different policy scenarios.

*Table 10.6* Pension deficits of SSK under different policy scenarios: 2000–2060 (in trillions of 1995 TLs)

| Compliance scenarios | Policy scenarios | | | |
|---|---|---|---|---|
| | No. reform | Law no. 4447 (original formulation) | Revision of law no. 4447 (present situation) | Cost of the revision |
| | | I | II | II−I |
| Full compliance | 38,013 | 7,561 | 11,060 | 3,499 |
| Low compliance (10% leakage) | 39,050 | 9,180 | 12,610 | 3,430 |
| Cost of low compliance | 1,037 | 1,619 | 1,550 | 69 |

been declined from 38,013 to 7,561 billion TLs at 1995 prices, representing an 80 percent reduction in real terms. The actual savings, however, remained more modest because of the modifications to the way entitlement age was raised due to the Constitutional Court's decision on the appeal by the main opposition party. Furthermore, low compliance assumed to be represented by a conservative 10 percent leakage rate accounts for more than 10 percent of deficit implying considerable direct costs to SSK and hence to public deficits.

### Simulation experiments and results

The search for optimal pension program parameters was carried out through the GA-based optimization program developed in MATLAB which updated WAT and RAT matrices continuously for each increase introduced to the entitlement ages, generating a new projection for supply of labor to be covered by SSK until 2060 as described in Sayan (2002). Since GAs are designed to search for the global optimum without requiring a good initial guess, the GA approach was particularly useful for the problem at hand.

This section reports results from simulation experiments carried out by solving the problem in the previous section under alternative ranges imposed on the values that parameters of interest are allowed to take. In the case of CR and RR, a single range is defined for the entire model horizon whereas the minimum retirement age, $A$, was assumed to be increased at different points in time between 2000 and 2060 for each simulation experiment. This treatment is generally compatible with pension reform practices in different countries (Kohl and O'Brien, 1998) including the parametric pension reform of 1999 in Turkey.

The simulation scenarios described later seek an answer to what would have happened to SSK's pension balances if alternative parameter configurations had been introduced instead:

*Scenario 1*   The transition period in the original formulation of law no. 4447 is maintained under this scenario but the entitlement ages for each year during the

transition period are allowed to take values within given age ranges. The upper limits of ranges are set in equal to the ages fixed by law no. 4447 so as not to allow for age increases higher than in the actual reform during the transition period. To take the upward trend of life expectancies into account, the period from the end of the original transition period (2009) to the end of model horizon (2060) is divided into two sub-periods, 2010–2023 and 2024–2060, with higher entitlement ages being allowed in the last sub-period. The year 2024 is taken as the beginning of this last period so as not to require anyone who is in the workforce and covered by SSK at the time of legislation to postpone retirement any longer than required by the actual reform act. Given that the reform act forced the youngest workers who began to work at the age of 15 in 2000 to postpone collection of pension benefits until the age of 58 (instead of 38) or by the year 2043 (instead of 2023), entitlement ages exceeding 58 are allowed to be applicable only to those who are to begin working after 2024, that is, those who are 14 or younger in the year 2000. Furthermore, this year also marks the closing of the demographic window of opportunity for Turkey (TUSIAD, 1999): Since the share of working age population is expected to start going down afterwards, the need for higher entitlement ages would be stronger in the second sub-period.

Unlike the actual reform act that maintained average contribution and replacement rates, $a \pm 25$ percent band around initial values of CR and RR is considered. In terms of the notation of the problem defined above, values assigned to $\underline{CR}$ and $\underline{RR}$, and $\overline{CR}$ and $\overline{RR}$ define the ranges within which CR and RR may be adjusted.[15] The relevant ranges and the resulting [CR, RR, $A_i$] configurations obtained with the GA are given in Table 10.7.

The results in Table 10.7 reveal that even more impressive savings could have been achieved by using different configurations of pension program parameters. The optimal configurations in the table indicate that it would have been possible to accomplish an even higher reduction in $|D|$ by

(i) slightly increasing CR by one percentage point and decreasing RR by about 1.1 points (Column 4); or
(ii) decreasing both CR and RR by about 2.3 and 3.3 percentage points, respectively (Column 5),

with minor adjustments in the gradual increases in the entitlement age during the transition period, and a higher jump after 2024. Both sets of optimal configurations point to huge cuts in $|D|$ reducing it to negligible levels over the period from 2000 to 2060. Yet, it would be impossible to define some objective criteria to choose one of the optimal configurations for implementation, since neither is strictly better than (or Pareto superior to) the other.

Entitlement age increases under configuration (ii) are smaller than or equal to those under configuration (i) during all years of the transition period except 2008, but this configuration requires a higher age increase after 2024. Still, at least as far as entitlement age increases alone are concerned, one may argue that it would be easier to implement (ii) politically, as people who would be directly affected

*Table 10.7* Results under scenario 1 with the Genetic Algorithm

| Pension parameters | No. reform | Law no. 4447 | Possible parameter configurations | | Ranges allowed for variables under scenario1 |
| --- | --- | --- | --- | --- | --- |
| | | | (i) | (ii) | |
| Average RR (%) | 65 | 65 | 63.92 | 61.75 | 48.8–81.3 |
| Average CR (%) | 20 | 20 | 21.00 | 17.67 | 15.0–25.0 |
| A for 2000 | 38 | 38 | 38 | 38 | 38 |
| A for 2001 | 38 | 41 | 41 | 40 | 38–41 |
| A for 2002 | 38 | 43 | 42 | 42 | 42–43 |
| A for 2003 | 38 | 45 | 45 | 44 | 44–45 |
| A for 2004 | 38 | 47 | 47 | 46 | 46–47 |
| A for 2005 | 38 | 48 | 48 | 48 | 47–48 |
| A for 2006 | 38 | 49 | 49 | 48 | 48–49 |
| A for 2007 | 38 | 50 | 50 | 50 | 49–50 |
| A for 2008 | 38 | 51 | 50 | 51 | 50–51 |
| A for 2009–2023 | 38 | 58 | 58 | 57 | 51–58 |
| A for 2024–2060 | 38 | 58 | 62 | 64 | 59–64 |
| $|D|$[a] | 38,013.0 | 7,561.7 | nil | nil | |
| RR/CR | 3.25 | 3.25 | 3.04 | 3.49 | |

Note
a  In billions of TLs at constant 1995 prices.

sooner would presumably react more strongly to age increases than people who would be affected later – including those who are yet to begin working and yet to become voters. However, the differences between configurations (i) and (ii) are not limited to age increases. Of the two configurations, (i) would be more (less) favorable to current retirees (workers) since it requires a smaller cut (rise) in RR (CR). Thus, even if the entitlement age increase schemes are assumed to be similar enough to leave them out of consideration in making a choice between the two configurations, law makers would still have to weigh potential reaction from retired voters against that from voters who are in the workforce. Certainly, the age composition of voters would be a major factor to consider in this comparison, but how well-organized the lobbying groups are would also affect the outcome. Alternatively, the ratio of RR to CR under each configuration can serve as a rule of thumb since an incumbent government considering a number of parametric reform alternatives will be likely to prefer the configuration with the highest RR/CR ratio for any given entitlement age vector over time and a comparable level of pension deficits. In the light of this discussion, configuration (ii) would probably have been a better choice for a parametric reform in Turkey politically.

Given that both solutions yield 2- or 3-year increases in the entitlement ages at first and one year increases later during the transition period, however, these schemes too would have been subject to the same criticism raised by the Turkish Constitutional Court that the law's scheme for gradual entitlement age increases

during the transition period violated the equality principle. To meet this criticism, the next scenario considers an alternative reform configuration.

*Scenario 2* In this scenario, a transition period allowing for equally-spaced but faster increases in the entitlement ages is considered. By the scenario, entitlement age increases were to be speeded up through 3-year age increases after every 2 years during the transition period, and would be increased by 1 year for every 10 years thereafter to account for increasing life expectancies. The ranges within which program parameters are allowed to vary are given in Table 10.8 along with the results.

Once again, the results indicate that SSK's 2000–2060 deficit could have been practically eliminated, if accelerated increases in the entitlement age could be matched with reductions in CR (1 percentage point) and RR (5 percentage points). Figure 10.2 shows how overall deficit would have been eliminated over time as improvements to SSK balances at later periods following reform compensate for losses incurred during earlier periods. Admittedly, this configuration would have been more difficult (but not impossible) to sell to the retired voters than the actual reform.

*Table 10.8* Results under scenario 2 with the Genetic Algorithm

| Pension parameters | No. reform | Law no. 4447 | Revision of law no. 4447[a] | Alternative parameter configurations | Ranges allowed for variables under scenario 2 |
|---|---|---|---|---|---|
| Average RR (%) | 65 | 65 | 65 | 60 | 48.8–81.3 |
| Average CR (%) | 20 | 20 | 20 | 19 | 15.0–25.0 |
| $A$ for 2000 | 38 | 38 | 38 | 38 | 38 |
| $A$ for 2001–2002 | 38 | 41–43 | 38 | 41 | 41 |
| $A$ for 2003–2004 | 38 | 43–47 | 39–40 | 44 | 44 |
| $A$ for 2005–2006 | 38 | 48–49 | 41–42 | 47 | 47 |
| $A$ for 2007–2008 | 38 | 50–51 | 43–44 | 50 | 50 |
| $A$ for 2009–2010 | 38 | 58 | 45–46 | 53 | 53 |
| $A$ for 2011–2012 | 38 | 58 | 47–48 | 56 | 56 |
| $A$ for 2013–2014 | 38 | 58 | 49–50 | 59 | 59 |
| $A$ for 2015–2016 | 38 | 58 | 51–52 | 60 | 60 |
| $A$ for 2017–2018 | 38 | 58 | 53–54 | 60 | 60 |
| $A$ for 2019–2020 | 38 | 58 | 55–56 | 60 | 60 |
| $A$ for 2021–2024 | 38 | 58 | 58 | 60 | 60 |
| $A$ for 2025–2034 | 38 | 58 | 58 | 61 | 61 |
| $A$ for 2035–2044 | 38 | 58 | 58 | 62 | 62 |
| $A$ for 2045–2054 | 38 | 58 | 58 | 63 | 63 |
| $A$ for 2055–2060 | 38 | 58 | 58 | 64 | 64 |
| $|D|$[b] | 38,013.0 | 7,561.7 | 11,060.0 | 0.0 | |
| RR/CR | 3.25 | 3.25 | 3.25 | 3.16 | |

Notes
a As required by the Constitutional Court.
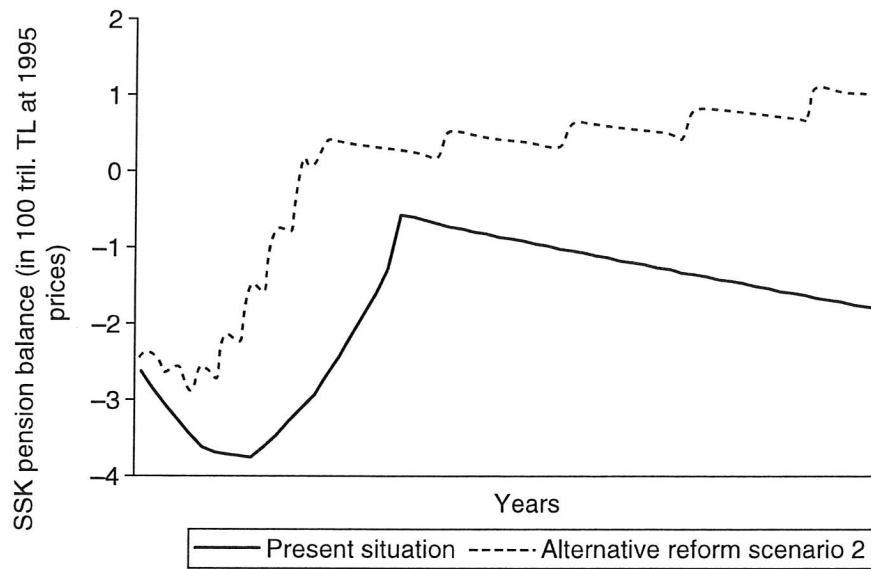b In billions of TLs at constant 1995 prices.

*Figure 10.2* SSK's pension balances under reform scenario 2.

## Conclusions

This chapter describes the recent pension reform process in Turkey and discussed the nature and magnitude of financial difficulties facing the publicly managed pension system in the country by highlighting the role that politically motivated interventions to the system have played in generating pension losses underlying the reform efforts.

Pre-election entitlement age cuts introduced by different governments on the pretext of creating vacant positions for the younger generation seeking employment were identified as the primary culprit behind the pension crisis that Turkey experienced prematurely. Another factor cited as contributing to the crisis was arbitrary pre-election bonuses paid to retirees by almost every government despite the absence of matching contributions, adding to the generosity of retirement benefits that are linked only weakly to contributions made by civil servants covered by ES, the pension fund administration of white-collar workers employed by local and central governments. Coupled with the misuses of surplus funds once generated by the pension system for political rent seeking, these practices were argued to facilitate the growth in pension deficits which eventually reached alarming proportions during the 1990s. Finally, inability and political unwillingness of governments to deal with the problem of low compliance with pension laws and regulations, particularly the lack of action to reduce the substantial population of unregistered workers were noted as a significant contributor not only to the growth in pension deficits but also to serious economic and social problems in other areas.

The chapter also investigated parametric alternatives that can be employed to control deficits that are likely to be incurred in the decades ahead by SSK, the

agency that run the largest pension fund in Turkey. The issue of identification of parametric policy options before SSK was tackled by solving an actuarial model with the help of a GA developed for this purpose. The resulting parameter configurations were shown to have the potential to eliminate pension deficits of SSK and political feasibility of implementing them was discussed.

The contribution rate-replacement rate pair found by the GA under second reform scenario involving no change in the entitlement age increase scheme currently in effect pointed to a five points reduction in the replacement rate and a one-point reduction in the contribution rate. This is largely compatible with the draft reform bill that is currently under discussion for legislation to go into effect in 2006. The replacement rate of 60 percent found through the genetic algorithm is exactly the same as the rate the draft bill proposes to implement starting from 2016, following an immediate 2.5 point reduction from 65 to 62.5 percent. Different from the optimal solution found here, however, the bill foresees no reduction in the contribution rate, suggesting instead to raise entitlement ages after 2036, and raising doubts about the effectiveness of upcoming pension legislation to overcome compliance problems of the past. Still, the new bill reflects (an IMF-supported) determination to put an end to privileged status of civil servants by harmonizing conditions for coverage across social security agencies. Whether the current government will be able to achieve this politically risky goal remains to be seen.

## Acknowledgment

## Notes

1  A PAYG-based pension fund starts out with many contributors and very few, if any, retirees collecting benefits. That's why benefits are typically very generous relative to contributions at the initial stages following establishment of the fund. As time passes, the ratio of contributing workers to retirees begins to fall gradually as covered workers start retiring. The decline in this critical ratio continues at an accelerating pace as populations age due to declining fertility and increasing life expectancies in the course of demographic transition of nations.

2  The CR determines the amounts to be collected from earnings of workers as old-age insurance premiums, whereas the RR determines the share of average work time earnings to be replaced by pension income after retirement. The entitlement age (EA) sets the minimum age when individuals may begin collecting pensions and other retirement benefits.

3  In addition to immediate effects on the living standards of working and retired members of the society, the parameter configuration to be introduced will also have implications for intergenerational distribution of the reform's burden on presently living and future generations (see, for example, Boll *et al.*, 1994).

4  For more detailed information about the structure of Turkish social security system, see Topal (1999) or Akmaz (1999).

5 See table 44 at http://www.ssk.gov.tr/wps/sskroot/istatistik/2000/t43–60.htm, accessed on October 25, 2004.

6 Low entitlement ages shortened average contribution period and hence lowered contributions per worker, while at the same time extending the average retirement period and hence raising total benefits paid per retiree.

7 In many cases, young employees would retire by a certain weekend and come back to their workplace and resume their responsibilities the next Monday without violating any laws or regulations.

8 As of 1990, the average age of Turkish population was 26.4 whereas the median age was 22.2 (http://www.frekans.com.tr/html/4tr_istatistikler.asp, accessed on October 25, 2004). Despite its tendency to age gradually, the UN data show that Turkish population is still young with 29 percent of the population between 0 and 14 years of age, 64 percent between 15 and 64 and only 7 percent older than 64 as of 2000.

9 So, the government opted to cut the number of pensioners rather than average pensions which might have led to increased poverty among retirees (Barr, 2002).

10 For more detailed information on the structure of the market for private pension plans and the underlying legal and regulatory framework, see Elveren (2003) that is available at http://www.bireyselemeklilik.gov.tr/seminer_konferans/SK_PerYon.ppt, accessed on April 2, 2005.

11 GAs are adaptive parallel search techniques that are of probabilistic nature. The reader may consult to a wide selection of books and papers for more information on GAs. A formal description of genetic methods is given in Judd (1998). For implementation details, Goldberg (1989) and Banzhaf *et al.* (1998) are particularly good references.

12 To be more precise, $rw_{a,t} \equiv (1/n)\Sigma_{i=1}^{n} rw_{a-i,t-(a-ra)-i}$ where *ra* is the actual retirement age ($ra \geq A$) and *n* is the number of years in the applicable averaging period.

13 Because many governments view pension systems as a channel to make income transfers to working and/or retiree populations, they would often be willing, in fact, to allow public pension systems to run "reasonable" deficits – with the definition of reasonable varying across governments and macroeconomic conditions.

14 With the absolute value operator, the global minimum for $|D|$ would be zero. Hence, the formulation of the objective function rules out the possibility that SSK would run a significant surplus while providing pension coverage over the 2000–2060 period.

15 Admittedly, the selected ranges for CR and RR in the simulation experiment here are somewhat arbitrary and may actually be outside the ranges that policy makers deem politically feasible or desirable. But our GA-based approach is flexible enough to allow for a rather quick computation of parametric reform alternatives under alternative ranges.

# References

Akmaz, M. (1999). *Systemic Analysis of and Policy Generation for the SSK Pension Scheme in Turkey*, Unpublished Thesis, Ankara: Middle East Technical University.

Ayas, E. (1998). "Türkiye'de sosyal güvenlik sisteminin sorunları ve çözüm önerileri," *Isletme ve Finans* 13(150): 41–50.

Banzhaf, W., P. Nordin, R.E. Keller, and F.D. Francone (1998). *Genetic Programming: An Introduction*, San Fransisco, CA: Morgan Kaufman Publishers.

Barr, N. (2002). *The Pension Puzzle: Prerequisites and Policy Choices in Pension Design*, Washington, DC: IMF.

Boll, S., B. Raffelhüschen, and J. Walliser (1994). "Social security and intergenerational redistribution: a generational accounting perspective," *Public Choice* 81: 79–100.

Chand, S.K. and A. Jaeger (1996). "Aging Populations and Public Pension Schemes" (Occasional Paper 147), Washington, DC: IMF.

Elveren, A.H. (2003). "Bireysel emeklilik sistemi: İşleyişi ve gelişmeler," paper presented at the 11th Congress of the Turkish Association of Human Resource Management, October 3–4, Istanbul.

Gillion, C. and M. Cichon (1996). "Pension reform in Turkey," *Hazine Dergisi* (Special Issue on Social Security and Health Insurance Reform): 40–56.

Goldberg, D.E. (1989). *Genetic Algorithms in Search, Optimization and Machine Learning*, Reading: Addison Wesley.

Huang, H., S. Imrohoroglu, and T. Sargent (1997). "Two computations to fund social security," *Macroeconomic Dynamics* 1: 7–44.

ILO (1996). *Social Security and Health Insurance Reform Project: Final Report*, Geneva: ILO.

Işıklı, A. (1998). "Türkiye'de işgücü piyasası ve sosyal güvenlik," in A. Şahinöz (ed.), *Türkiye Ekonomisi Sektörel Analiz*, Ankara: Turkiye Ekonomi Kurumu.

Joines, D.H., A. Imrohoroğlu, and S. Imrohoroğlu (1999). "Computing models of social security," in R. Marimon and A. Scott (eds), *Computational Methods for the Study of Dynamic Economies*, London: Oxford University Press.

Judd, K.L. (1998). *Numerical Methods in Economics*, Cambridge: MIT Press.

Kenar, N., T. Teksöz, and A.H. Çoşkun (1996). "Sosyal guvenlik sistemimiz ve reform," *Hazine Dergisi* (Special Issue on Social Security and Health Insurance Reform): 5–25.

Kenc, T. and S. Sayan (2001). "Demographic shock transmission from large to small countries: an overlapping generations CGE analysis," *Journal of Policy Modeling* 23(6): 677–702.

Kılıçdaroğlu, K. (1998). "Türkiye'de Sosyal Güvenlik Sisteminin Sorunlari ve Çözüm Önerileri," *İşletme ve Finans* 13(150): 35–40.

Kohl, R. and P. O'Brien (1998). "The Macroeconomics of Ageing, Pensions and Savings: A Survey" (Economics Department Working Paper 200), Paris: OECD.

Miles, D. (1999). "Modelling the impact of demographic change upon the economy," *Economic Journal* 109: 1–36.

Sayan, S. (1999). "Türkiye'deki yaşlılık (emeklilik) sigorta prim kaçaklarının toplumsal ve bireysel maliyetleri," *ASO Medya* (Eylul): 40–54.

Sayan, S. (2002). "Turning Potential Retirees into Workers: Pension Reform Act of 1999 and Beyond in Turkey," *Middle East Business and Economic Review*, 14(2): 54–70.

Sayan, S. and T. Kenc (1999). "Long-term consequences of rehabilitating a financially troubled pension system: an overlapping generations, general equilibrium analysis for Turkey" (Economic Research Forum Working Paper No. 9914), Cairo: ERF.

Sayan, S. and A. Kiraci (2001a). "Parametric pension reform with higher retirement ages: A computational investigation of alternatives for a Pay-As-You-Go based pension system," *Journal of Economic Dynamics and Control* 25(6–7): 951–966.

Sayan, S. and A. Kiraci (2001b). "Identification of parametric policy options for rehabilitating a Pay-As-You-Go based pension system: an optimisation analysis for Turkey," *Applied Economics Letters* 8(2): 89–93.

Sayan, S. and G. Turhan-Sayan (2001). "In search of parametric reform alternatives for a pay-as-you-go pension system: a genetic algorithm approach," Unpublished Manuscript.

Teksöz, T. and S. Sayan (2002). "Simulation of benefits and risks after the planned privatisation of pension system in Turkey: is the expected boost to financial markets feasible?," *Emerging Markets Finance and Trade* 38(5): 23–45.

Topal, N. (1999). "Is the Turkish social security system in need of reform?" (ESDS Employment Studies Working Paper No. 22), Hertfordshire: University of Hertfordshire.

TUSIAD (1999). *Türkiye'nin Fırsat Penceresi: Demografik Dönüşüm ve Izdüşümleri*, Istanbul: TUSIAD.

TUSIAD (2004). *Türk Emeklilik Sisteminde Reform: Mevcut Durum ve Alternatif Stratejiler*, Istanbul: TUSIAD.