

BENEFIT-COST ANALYSIS OF TURKISH SOCIAL  
SECURITY REFORM PROPOSALS

By

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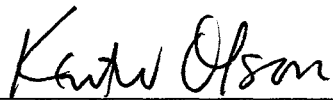
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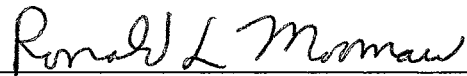
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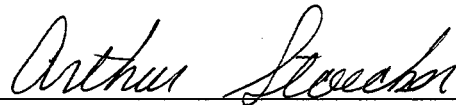
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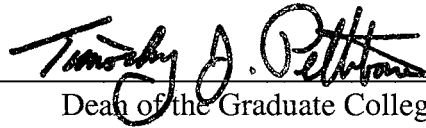


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## NOMENCLATURE

|       |   |
|-------|---|
| BK    | The Social Security Institute for Self-Employed Persons                                   |
| dAC   | Change in administrative cost   |
| dGDPg | Change in GDP due to change in government saving from privatizing                         |
| dGDPp | Change in GDP due to change in private saving from privatizing                            |
| dMWC  | Change in the marginal welfare cost of taxation   |
| ECTR  | Effective current law pay-as-you-go social security contribution (tax) rate               |
| EFTR  | Effective social security contribution (tax) rate for PAYG component of the privatization |
| EPTR  | Total privatization tax rate that is sum of EFTR and ISATR                                |
| ES    | The State Employees' Pension Fund   |
| ILO   | International Labor Office (Organization)   |
| IRA   | Individual Retirement Account   |
| IRR   | Internal rate of return   |
| ISA   | Individual Savings Account  |
| ISATR | Individual savings account tax rate (privatization tax rate)                              |
| MWC   | Marginal welfare cost of taxation   |
| PAYG  | pay-as-you-go   |
| PRA   | Personal Retirement Account   |
| PVCLB | Present value of individual benefit with current law pay-as-you-go system                 |
| PVCLC | Present value of individual cost with current law pay-as-you-go system                    |

|        |  |
|--------|--|
| PVdB   | Present value of change in benefit                               |
| PVdC   | Present value of change in cost                                  |
| PVdMWC | Present value of the change in marginal welfare cost of taxation |
| PVdNB  | Present value of change in net benefit                           |
| PVPB   | Present value of individual benefit with privatization           |
| PVPC   | Present value of individual cost with privatization              |
| ROR    | Rate of return   |
| SSW    | Social security wealth   |
| STR    | Statutory social security contribution (tax) rate                |
| SSK    | Social Insurance Institute                                       |
| TL     | Turkish Lira   |
| TUSIAD | Turkish Industrialists' and Businessmen's Association            |

# CHAPTER I

## INTRODUCTION

Publicly managed social security systems have received great attention from both academic researchers and policymakers in recent years. This is not surprising, given the fact that a social security system affects almost all people, in one way or another, in a country. Social security has significant macroeconomic and microeconomic effects. On the one hand, social security taxes have significant effects on the labor supply, and private and national saving. On the other hand, benefits and other social security services have important impacts on the wealth of working and retired populations.

Publicly managed social security systems mostly operate on the basis of a pay-as-you-go (PAYG) financing method. With pay-as-you-go financing, current contributors pay current benefits and administration expenses of the system. Financing problems of pay-as-you-go systems arise when revenue collected from current contributors is less than the expenditures of the system. In fact, the revenue-expenditure balance may be negative if social security taxes and replacement rates are designed unrealistically in the face of demographic developments.

Demographic developments are difficult, if not impossible, to control in the short to medium run. Hence, social security tax and replacement rates along with minimum retirement age parameters are the prime policy tools to make adjustments and key the social security system in balance if a pay-as-you-go financing method is to be retained.

Due to adverse demographic developments, many countries have searched for alternative financing methods and several have tried privatization as a substitute for, or complement to, the pay-as-you-go method of financing their social security systems.

Privatization has been adopted in Australia, in many South American countries, and it has been considered as an option in many other countries as well.<sup>1</sup>

As one of the most dynamic developing countries, Turkey has been facing social security problems since the early 1990s and recently adopted new measures toward reforming its relatively young defined-benefit pay-as-you-go social security system. A low minimum retirement age, generous benefits relative to contributions, frequent political interventions, low contribution collection rates, and other factors had made the system financially unsustainable.

In order to achieve greater long-run sustainability, Turkey adopted a new social security law in 1999 based mostly on a special report done by the International Labor Office (ILO, 1996a). With this new Law, the Turkish social security system has been restructured, but a pay-as-you-go financing method has been retained. Given that ILO outlined a privatization option for the Turkish social security system in its report and Turkey chose the restructured pay-as-you-go option, one can question whether this was a rational choice from social point of view. Would Turkey be better off with the privatization alternative instead? This dissertation is designed to answer this question. To do so, we estimate and evaluate the social benefits and costs of changing from the current Turkish social security system to a counterfactual privatization reform alternative.

## **1.1 Background**

There are mainly three institutions that constitute the Turkish social security system:<sup>2</sup> Sosyal Sigortalar Kurumu “The Social Insurance Institute,” Emekli Sandığı

---

1 See Feldstein (1997)

2 There are other organizations that provide social security to their members; however, they are not included in this study because they are small in terms of covered population along with lack of data. Among these are the Armed Forces Mutual Assistance Fund (OYAK), Special Institution for Personnel of

“The State Employees’ Pension Fund,” and Bağ-Kur “The Social Security Institute for Self-Employed Persons.”

Sosyal Sigortalar Kurumu (hereafter “SSK”) was established to provide social protection for wage earners in 1945. It was reorganized in 1964 to increase its capacity. Persons covered by this institution are those employed by one or more employers on a contract basis. It covers approximately 38 percent of the total population (Cavusoglu, 1998). A general directorate under the Ministry of Work and Social Security administers this institution.

Emekli Sandığı (hereafter “ES”) was established in 1949 as a part of the Ministry of Finance to provide social security to all civil servants employed by the central government, local governments, state economic enterprises and army members. It covers nearly 15 percent of the total population (Cavusoglu, 1998). A general directorate under the Ministry of Finance administers this institution.

Since SSK covers only contracted workers and excludes those who are self-employed and other professionals, there was a need to establish another social security institution or modify the existing institutions to cover self-employed workers and other professionals who are not covered by other institutions. In 1971, Bağ-Kur (hereafter “BK”) was established as a third retirement institution to cover self-employed workers and other professionals, including workers and farmers in agriculture. This institution covers almost 21 percent of the total population (TUSIAD, 1997; Cavusoglu, 1998). A general directorate under the Ministry of Work and Social Security administers this institution.

---

Banks, Private Insurance Companies and Stock Exchanges, Ereğli Miners’ Pension Fund, and Primary School Teachers’ Sickness and Provident Fund.

These three institutions constitute the Turkish social security system. They operate on a pay-as-you-go basis, and thus have the usual financial problems of such system.

To evaluate the financial strength of these institutions, or all together as a system, one simply has to look at how much income the system generates (payroll taxes or contributions that contributors pay to the system), how much the system spends (in benefits and other expenses), the difference between these two figures, and how these figures change over the years as the number of contributors and/or beneficiaries change. There are some other parameters that need to be taken into account such as the benefit formulas, magnitude of the contribution rates, retirement entitlements, the population structure, and the growth rates of wages and GDP, and future interest rates and price levels. Considering these, it appeared by the mid 1990's that the Turkish social security system was financially insolvent due to a low retirement age (Cavusoglu, 1998; TUSIAD, 1997; ILO, 1996a, 1996b; Sayan and Kiraci 2001, 953), a low contribution collection rate (TUSIAD, 1996; ILO, 1996a), a low contribution base (TUSIAD, 1997), a low number of contributors<sup>3</sup> (TUSIAD, 1997), a high number of retirees (Ercan and Gokce, 1998), and a high level of benefits relative to costs (Fisunoglu, 1998; Sayan and Teksoz, 2001, 2). The structure of the system was so generous that even a 35 year-old person could retire under certain conditions (TUSIAD, 1997). Also, according to the TUSIAD study, it has been calculated that an insuree of SSK, after retiring, could receive his/her total contributions from the system within 2.5 years in the form of benefits (TUSIAD, 1997). All these factors indicated that the system could not survive unless appropriate measures were taken.

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<sup>3</sup> It is about half of the current labor force. See TUSIAD (1997) for details.



Table 1.1 presents information about number of contributors (active persons) and pensioners (passive persons) from 1950 to 1996 by each institution. It shows how the system has changed in terms of its members. As can be seen in the table, the growth rate of the number of pensioners has been greater than the growth of the active members for all three institutions.

TABLE 1.1  
NUMBER OF ACTIVE AND PASSIVE PERSONS BY  
YEAR AND INSTITUTIONS (000)

| Year | Active Persons |      |      | Passive Persons |      |      |
|------|----------------|------|------|-----------------|------|------|
|      | SSK            | ES   | BK   | SSK             | ES   | BK   |
| 1950 |                | 200  |      |                 | 9    |      |
| 1955 |                | 281  |      |                 | 34   |      |
| 1960 |                | 359  |      |                 | 62   |      |
| 1965 | 896            | 548  |      | 55              | 96   |      |
| 1970 | 1314           | 824  |      | 145             | 181  |      |
| 1975 | 1823           | 1092 | 817  | 290             | 341  | 4    |
| 1980 | 2205           | 1250 | 1101 | 636             | 496  | 138  |
| 1985 | 2608           | 1400 | 1927 | 1071            | 680  | 294  |
| 1990 | 3447           | 1560 | 2719 | 1597            | 843  | 596  |
| 1991 | 3598           | 1640 | 2722 | 1717            | 879  | 656  |
| 1992 | 3797           | 1730 | 2791 | 1852            | 940  | 712  |
| 1993 | 3976           | 1812 | 2779 | 1999            | 1000 | 778  |
| 1994 | 4203           | 1896 | 2617 | 2175            | 901  | 826  |
| 1995 | 4411           | 1880 | 2590 | 2338            | 952  | 881  |
| 1996 | 4624           | 1964 | 2564 | 2540            | 1048 | 1110 |

Source: Author's tabulation, based on data provided by the Turkish State Planning Organization.<sup>4</sup>

Thus, the active/passive ratios have been declining over the years, and current ratios are now below 2 for all these institutions, as figure 1.1 shows.

<sup>4</sup> See <<http://www.dpt.gov.tr/dptweb/esg/esg-i.html>. >

The reason for this decline was not due to the demographic changes experienced in most developed countries. It was rather, political choices that obligated the system to pay benefits to individuals who, in actuality, either did not pay contribution or paid very little.

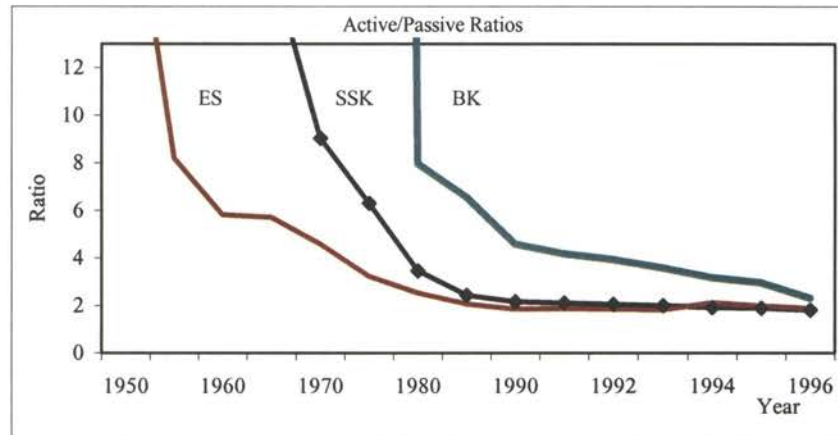


Figure 1.1. Turkish Social Security Active/Passive Ratios.  
Source: Author's diagram, based on Table 1.1.

Turkish social security system reform studies speeded up in second half of 1990s to evaluate the system and develop reform alternatives to save the system. The traditional defined-benefit pay-as-you-go financing method is the most widely used method for financing social security, especially in the western world. Reforms of the Turkish pay-as-you-go system actually started early in the 1970s due largely to demographic changes and higher benefit payments that made the system financially weak and questionable (TUSIAD 1997, 31-33). While ILO (1996a) argues that restructuring the existing Turkish pay-as-you-go system by changing existing parameters in such ways to result in increasing contributions and/or reducing benefits would be enough to restore the long run financial equilibrium of the system, others have argued for replacing the current pay-as-you-go system with a privatization institution. Between these two polar cases numerous alternatives can be proposed. In fact, TUSIAD (1997) offers new mandatory individual

retirement accounts (IRA) along with the pay-as-you-go method, or a “two-tiered” system. Although two components of the Turkish social security system (SSK and BK) were originally designed as fully-funded institutions, they operated as pay-as-you-go institutions in practice, due largely to insufficient income to fully cover the actuarial commitments (Undersecretariat of Treasury, 1999, p. 6). The Treasury transferred general revenue to pay the system’s deficit starting in the early 1990s and continued to support it at an increasing rate as the deficit increased rapidly (Fisunoglu, 1997). The social security deficit was 1.8 percent of GDP in 1995 (TUSIAD, 87). This amount was one-fourth of the budget deficit in that year (Fisunoglu, 1997, 91). The social security deficit was 2.9 percent of GDP in 1999<sup>5</sup> and was projected to be 3.4 percent in year 2005, 4.3 percent in year 2010, 7.0 percent in year 2030, and 10.1 percent in year 2050 if no change in the system was made (ILO, 1996a, 11).

It is obvious that the system was unsustainable with its pre-reform parameters. To reform the Turkish pay-as-you-go social security system, two primary alternatives were developed and proposed<sup>6</sup>. There are still other proposals; however, they are not comprehensive and they only suggest altering some basic parameters.

ILO developed four reform options for the Turkish social security system (1996a). Each of the reform options has been quantified by using long-term actuarial projection models. Among these options, the first and second are restructured pay-as-you-go and mandatory individual saving accounts options, respectively. The former represents continuity of the defined-benefit pay-as-you-go financing method. The latter represents a defined contribution method of privatization. TUSIAD (1997) developed a two-tiered

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<sup>5</sup> State Planning Organization. “Social Security Reform in Turkey.” Unpublished Government Document.

<sup>6</sup> ILO 1996 and TUSIAD 1997.

system similar to ILO' s (1996a) third reform option. There have been a number of studies that have evaluated these and other proposed reform options for the Turkish social security system; however, no study has estimated and analyzed the benefits and costs of the proposed reform options. This study aims to do such an analysis.

## 1.2 The Problem

As previously mentioned, two components of the Turkish social security system (SSK and BK) were originally designated as fully-funded institutions, but they operated pay-as-you-go institutions in practice due largely to insufficient income to fully cover actuarial commitments (Undersecretariat of Treasury, 1999, p. 6). In fact, the system went into deficit in the early 1990s and the size of the deficit increased rapidly throughout the decade.

TABLE 1.2  
SOCIAL SECURITY DEFICIT IN TURKEY

| Year | Budget Deficit<br>(1)<br>(Trillion) | Social Security<br>Deficit<br>(2)<br>(Trillion) | (2)/(1)<br>(%) | Share of Total Transfers<br>to Social Security<br>Institutions In GNP (%) |
|------|-------------------------------------|---|----------------|---|
| 1993 | 134                                 | 23  | 17             | 1.20  |
| 1994 | 152                                 | 30  | 20             | 1.13  |
| 1995 | 316                                 | 113   | 36             | 1.44  |
| 1996 | 1238                                | 326   | 26             | 2.16  |
| 1997 | 2180                                | 740   | 34             | 2.55  |
| 1998 | 3990                                | 1400  | 35             | 2.85  |

Source: Sayan and Kenc (1999), pp. 27.

The Turkish Treasury transferred general revenue to pay a deficit that was 1.8 percent of GDP in 1995 (TUSIAD, 87), and increased to 2.9 percent in 1999.<sup>7</sup> In fact,

<sup>7</sup> State Planning Organization. "Social Security Reform in Turkey." Unpublished Government Document.

table 1.2 makes it clear that social security deficit grew rapidly. While the social security deficit was only 17 percent of the budget deficit in 1993 it continued to grow and more than doubled in just five years to 35 percent. It was obvious that immediate measures were a must to avoid further fiscal crises in the system.

Turkey initiated social security reform in 1999 by restructuring the current pay-as-you-go financing system as recommended by ILO (1996a). One of the interesting but real facts is that the system is projected to remain in deficit until the year 2050 even with the reform alternatives. However, the size of the deficit is projected to be smaller than in the absence of reform. Still, it is clear that the 1999 reforms did not go far enough. This raises the question of whether further reform, such as privatization, is desirable. This depends, from a social perspective, on whether the social net benefits from privatization are positive.

### **1.3 Objectives of the Study**

The objectives of this study are to:

1. Estimate the present values of social costs and social benefits of privatization.
2. Estimate the effect of privatization on individual wealth.
3. Determine which generations will gain/lose from privatization.
4. Determine the effect of privatization on private and national saving.
5. Derive policy implications for future reform of the Turkish social security system.

### **1.4 Significance of the Study**

This study uses benefit-cost analysis to evaluate the Turkish social security system under two financing methods, one (pay-as-you-go) that has long been used in most countries and another (privatization) that has recently been adopted by many Latin

American countries and received much attention worldwide. Little attention has been given so far to the social costs and benefits of both methods. In fact, there has not been even a single benefit-cost study to evaluate privatization as a Turkish social security option. This study aims to fill this gap.

### **1.5 Assumptions of the Study**

In this study, we have developed two alternative social security systems for each of the three Turkish social security institutions. The first alternative is the current restructured Turkish social security system based on a pay-as-you-go underfunded method. The second alternative, the counterfactual, is a two-tier system, combining pay-as-you-go with a defined contribution method based on individual savings accounts. In this alternative, we assume a Feldsteinian-type privatization model that provides for a gradual privatization of the current system. Under the privatization option, benefits will be paid and taxes will be collected out of two systems for the length of the period. Current workers as well as new workers will pay social security plus privatization taxes. While pay-as-you-go based taxes will be completely used to pay pay-as-you-go benefits, privatization taxes will be used to pay benefits and administrative costs under the privatization alternative and any excess taxes will be invested.

To keep a common element between the two alternatives, benefits are held the same under both alternatives. In this way, the change in financing method and tax revenue will be the sole source of benefits and costs. Thus, we assume that the current restructured system benefits will not be different under privatization and that the tax base will be the same regardless of the system for the length of the period, which is from year 2000 to 2050. The length of the period seems short for examining multiple generations;

however, secondary data were not available beyond 2050, and the generation of data beyond 2050 raises difficult estimation problems.<sup>8</sup>

We also increased contribution rates to levels necessary for the system to be in financial balance. The differences between current statutory contribution rates and required contribution rates determine the size of the social security -and budget- deficit. In the privatization alternative, it is assumed that at the end of the period (2050), there will be no surplus in the trust fund.

In this study, ILO' s (1995b) data were used. ILO produced these data by using a long-term actuarial model, and the resulting data essentially rely on a number of assumptions.<sup>9</sup> For this study we retain most of ILO' s assumptions, but change a few of them. One of the assumptions that we change is about actual contribution rates. Actual contribution rates (sum of employer and employee) are assumed to be at their statutory levels (21.5 percent for SSK, 35 percent for ES, and 20 percent for BK) for both reform options. We also use required, or effective, social security tax and privatization tax rates. We will explain each of them where appropriate.

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<sup>8</sup> It is possible to generate data for another 50 years or so but new projections on different variables may not be consistent with the ILO' s secondary data. If longer period beyond year 2050 needs to be extended, the data should be generated by the same method for the whole period. We leave this extension as a subject of further research.

<sup>9</sup> These assumptions include: a 10-year transition period of increasing retirement age to 58 for women and 60 for men, a level of contribution rate for the three institutions of 21.5 percent, and retirement benefits adjusted to reflect the growth in earnings net of workers' social security contributions. The annual rate of growth of GDP in real terms was assumed to be 5.9 percent from 1995 to 2005, 4.0 percent from 2006 to 2025, and 3.0 percent from 2026 to 2050. The annual employment growth rate was assumed to be 1.3 percent from 1996 to 2005. The rate of inflation was assumed to be 5 percent in 2000 and to remain at 5 percent through 2050. The annual rate of increase in real average wages was assumed to be 5.7 percent from 1995 to 2005, taper off to 3 percent from 2006 to 2025, and remain at 2.5 percent from 2026 to 2050. The last assumption is about the real interest rate. It was assumed to be 9.2 percent in 1995, falling to 2.6 percent in 2000. After 2006, it was assumed to be stable at 2.2 percent. See for detail: ILO, "Social Security Final Report," Geneva, March 1996.

We assume that under privatization, contributors will pay both privatization and current system taxes from year 2000 through year 2050. This assumption is made to see how tax rates differ over the whole period under both options.

One vital assumption of the privatization option is the assumed real rate of return on investment. It is assumed that privatization tax revenue will be invested, and that a 9 percent real rate of return will be earned for each year in the length of the period.<sup>10</sup> In sensitivity analysis we alter this rate.

A social security contribution rate in this study reflects the sum of employee and employer portions. However, there is no employer portion of the contribution in case of BK where the insurers pay the whole premium.

Administrative cost is assumed to be one half of 1 percent of the tax base of each institution for the pay-as-you-go system. ILO (1995b) used this rate and we think that it is a close approximation so we follow them. For the privatization option, however, we assume administrative cost to be 1 percent of the gross assets of the institution. This reflects the higher administrative costs expected for managing the privatization fund. All money values are in 1995 Turkish Lira (hereafter TL) values unless they are indicated otherwise.

## **1.6 Scope and Limitations**

This study is based on the data for the three Turkish social security institutions reported by ILO (1995b) and makes a benefit-cost analysis. New data are generated as necessary, but the study relies heavily on the ILO's data. It covers the period years from

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<sup>10</sup> TUSIAD (1997) used 9 percent real rate of return in its study, and we choose this rate as a maximum attainable rate in such a dynamic middle developing country where daily political agenda easily affects the directions of the main economic indicators. Thus, the real return can vary overtime, but on average 9 percent may be a good approximation.



2000 to 2050. The study considers only two alternatives; the restructured current Turkish pay-as-you-go system and a gradual privatization alternative based on individual saving accounts.

### **1.7 Organization of the Study**

There are six chapters that form this study. A review of the relevant literature is presented in chapter 2. Chapter 3 describes the data sources and models a simple actuarial methodology to generate additional data that are necessary to conduct a benefit-cost analysis. The chapter also contains long-run financial projections of the three Turkish social security institutions under the current law pay-as-you-go and privatization cases. Chapter 4 presents the benefit-cost model applicable to this study. It also describes the general sources of social benefits and social costs of changing the financing method of the system. Benefit-cost results for the three Turkish social security institutions are presented in chapter 5. A summary of results is also included in this chapter. Further, the chapter contains the comparisons between the results obtained and the projected GDP. Results of the sensitivity analysis are also given in the chapter. The last chapter hosts the conclusions, policy recommendations and suggestions for future research.

## CHAPTER 2

### REVIEW OF THE LITERATURE

#### 2.1 Definitions and Brief History

Human beings have always faced different kinds of risks in every day life in one form or another. No one is guaranteed that he or she is not going to face such a problem. This fact was true in the past, and will be true for years to come. One of the risks that man faces is economic insecurity. History records many risks and problems that mankind have faced. Given this, humans have developed challenges and efforts against such risks to protect themselves. Individual, and later on family and community protections, must have been formed in the early years even though we have no explicit evidence. Dixon's (1999) definition of social security supports this argument. Dixon argues that social security "can usefully be thought of as the product of centuries of effort to provide people with a means of support in the face of individual, social or economic distress" (1999, p. 2). Thus, the idea of social security probably originated well before known recorded history. In fact, Dixon (1999) quoted Mathew as saying that "its history is probably as old as the history of man. The quest for survival has prompted people, from the beginning of its existence, to devise ways of protecting itself from the hazards of life" (2).

The United Nations recognized social security as a fundamental human right in 1948 (Dixon, 1999, 1). Since then, many countries have developed social security programs consistent with their "traditions, history, level of socioeconomic development and the prevailing political and social philosophies, which come together to determine

who should be the social security winners and losers” (Dixon 1999, 1). According to Dixon (1999) there are 172 countries that have social security programs (2).

Social security programs in different countries are based on different traditions as determined by each country’s value systems. Dixon identifies social security traditions in seven categories (41). These are European poor law tradition, the master-servant tradition, the occupational provident fund tradition, the insurance tradition, the Marxist-Leninist-Stalinist tradition, the state welfare paternalism tradition, and the marketization tradition.<sup>11</sup> Turkey’s system fits the state welfare paternalism category. Systems in this category, like Turkey, generally use a pay-as-you-go method of finance.

## **2.2 The Turkish Perspectives**

The primary purpose of a social security system is to provide reasonable income to its members when they become old. Governments provide social security benefits mostly on a pay-as-you-go basis. If the main principles of the system are negated by myopic political interventions, the system will produce undesirable consequences. Turkey is no exception to this. There are a significant number of studies that investigate the Turkish social security system, explain several reasons why the system has been in financial crisis, and offer ways to reform it. There are studies that evaluate the 1999 reform and offer additional reform avenues (see for example Sayan and Kiraci, 2001a and 2001b; TUSIAD, 1997; ILO, 1996a; Ercan and Gokce, 1998). Akalin (1999) explained immediately after the new Law of 1999 that social security in Turkey is legally structured as a natural government monopoly so that it does not compete with the private sector, and, therefore, that economic inefficiency prevails. The only way that the system may be efficient in providing its services and in using its resources efficiently is to design the

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<sup>11</sup> See Dixon (1999) for more details.

system in such a way that an invisible hand can operate (Akalin, 1999). Centel (1997) studies the issue in the context of a European perspective. His main argument is that in order for the Turkish economy to integrate with the European economy, the Turkish social security system should be restructured in a way similar to European social security systems. He further states that the three Turkish social security institutions should be united under one organization and that it should be given financial and administrative autonomy. Many scholars do not agree with the idea of unifying the three institutions (see for instance Akalin, 1999; Tuncay, 1998).

The emphasis in the Turkish literature is given to the administrative aspect of the institutions. Whether autonomy or privatization would solve the system's long-run funding problem has been the subject of debate (Aydin 1998; Centel 1997). Those who advocate having autonomy argue that daily political interventions are the main cause of the prospective crisis, and preventing political influence on the institutions by granting autonomy to the social security institutions might help solve the problem (Akalin, 1999; Tuncay, 2000; Alper, 1999).

As the number of studies on pay-as-you-go defined benefit social security systems has increased in the last two decades, much more attention has been given to identifying the weaknesses of the Turkish systems so that new policies can be developed accordingly. Sayan and Kiraci (2001b) have in fact studied the Turkish social security system in this context. They have identified Turkish social security system parameters to optimize the system. More specifically, they developed a rather simple optimization model in an intertemporal generational accounting setting. They used contribution rates, replacement rates and minimum retirement ages as their policy options. They found that

if contribution rates and replacement rates are to be held at their current values, the minimum retirement age has to be increased significantly (92).

### **2.3 International Perspectives**

When we look at the international dimension of the social security issue, we see the same problems, namely, that state managed pay-as-you-go systems have started having fiscal problems in other countries as well. The pay-as-you-go financing method has been applied and experienced in many countries, and many of these countries have already begun to search for new methods that might be better than a traditional pay-as-you-go system. As a result, new methods, such as privatization, have already been adopted in different parts of the world. Privatization of social security started in Chile and has spread to other countries such as Argentina, Australia, Bolivia, Mexico, Peru, Columbia, and the United Kingdom (Kotlikoff, 1996).

There are mainly two approaches that have been the subject of the social security reform studies in the literature. These approaches are: (1) to reform or restructure publicly managed defined-benefit pay-as-you-go financing methods, and (2) to privatize, based on defined contributions. Each study on the subject demonstrates different aspects of the issue, and reaches conclusions either in favor of or against privatizing the social security system. Kotlikoff (1996) illustrates the effects of social security privatization by using the Auerbach-Kotlikoff model. He proposes a rather simple privatization model for the United States, and concludes, based on some specific assumptions and simulation results, that privatizing social security would be likely to have a positive effect in the long-run on output and living standards, with a 4.5 percent of GDP welfare gain to future generations (Kotlikoff, 1996).

## **2.4 The Transition Argument**

There are a number of advocates that argue that solution to social security problem may be privatization. However, they claim that switching from current to a privatization social security system would be too costly. This is called a transition problem that requires higher social security tax (or impose double social security tax on current generation). The transition path from a pay-as-you-go financing system to privatization in general would be costly for every economy. Opponents of privatization argue that for the United States, the transition path would be too costly to be politically acceptable given the current benefit and cost structure of the system (Feldstein and Samwick, 1998). Feldstein and Samwick (1998) have examined the basic transition issues and described an alternative transition path for the United States' social security system. In their study, the transition plans were constrained to provide the same amount of benefits in future years as beneficiaries would receive from the current system. They have made a number of reasonable assumptions about the base case and transition path to privatizing the system, and, based on their simulation results, conclude that privatization would generate very substantial long-run benefits which would be more than 5 percent of GDP every year and the transition costs would be relatively modest (Feldstein and Samwick, 1998).

## **2.5 Higher Real Rates of Return**

Another potential problem with privatization of social security is unrealistic expectations of high rate of return. Opponents of privatization often state that the rate of return from privatization would not be much higher than what it is under the pay-as-you-go system, given the risky nature of the private securities. Baker (1998) criticizes

privatization and argues that rates of return from privatization have been overstated and that rates of return from the current pay-as-you-go system have been underestimated. He observes that, for the United States, the current system was a good deal for the past 60 years and that it will be a good deal for the next 60 years (Baker, 1998).

## **2.6 Higher Administration Costs**

Also, under privatization it is widely believed that administration costs will be much higher than under the current system (Schulz, 2000; Mitchell and Zeldes, 1996). This argument has been a powerful tool in policy debates for opponents of privatization. Although the conceptual debate continues, Mitchell (1996) has done empirical work on this particular subject. By using US and other country's private and public retirement system administrative data, she finds that administrative costs of publicly-managed social security systems differ significantly across countries and institutional settings. She states that scale of the institution matters. Even though privately-managed social security systems are likely to have higher administrative costs than their public counterparts, she concludes, quality will be much better under private systems (Mitchell, 1-2).

The quality argument has important implications. People demand not only goods and services but they demand better quality goods and services. Pay-as-you-go public institutions provide only one type of service, whereas private counterparts can provide different services based on demand, and dissatisfied clients (contributor and/or retirees) can find another firm. The additional administrative cost under privatization may be justified on this ground. The quality dimension remains unquantified, however, and does not enter into our estimates of costs and benefits.

## **2.7 Multi-Pillar Systems**

Instead of having only one financing system, pay-as-you-go or privatization, a combination of these two may well be preferred over either one. This is the so called multi-tiered or multi-pillar system. In fact Feldstein and Samwick (1999) considered this combination for the US social security system. Under their two-tiered system, they suggest a personal retirement account (PRA) program funded initially by a 2.3 percent tax on earnings in addition to maintaining the existing social security trust fund at a level high enough to pay promised future benefits. By keeping current system benefit unchanged thorough the length of the projection period, and using their own simulation method, they concluded that a program of PRAs will provide more income in retirement than the current system and that there will be no need to increase the current payroll tax any further to keep the system in balance (11). In fact, their simulation indicates that the payroll tax can eventually be reduced far below its current level.

It is often mentioned in the literature that privatization will have positive impact on national saving and GDP. Feldstein and Samwick (1999) favor this argument based on their research. They indicate that there will be “a substantial increase in national saving and GDP” (11).

## **2.8 Lessons for Research**

In spite of recent reforms, Turkey’s social security system remains a pay-as-you-go institution. Turkish scholars have clearly exposed the long-run funding problems that this will create. Some have suggested that privatization may be a viable solution, but no one has analyzed a privatization alternative.



The overall merit of privatization cannot be determined by appeal to theory, alone –there are both benefits and costs. It must be determined by empirical analysis. Kotlikoff and Feldstein/Samwick have made significant strides in this direction by their examination of the United States social security system. Feldstein and Samwick’s work is especially instructive because it provides a model that can be adapted to the analysis of a privatization plan for any country that has an underfunded pay-as-you-go social security system. We will draw upon this model in our analysis of a privatization plan for Turkey.

## CHAPTER 3

### LONG-RUN PROJECTION OF THE PAY-AS-YOU-GO AND PRIVATIZATION ALTERNATIVES

#### 3.1 Introduction

The objective of this chapter is to develop long-run projection of the tax rates and trust fund between required to fund the current pay-as-you-go reform plan and a two-tiered approach to privatization. These projections provide much of the basic data needed for the cost-benefit analysis of this study.

#### 3.2 Financial Projections of Current Pay-As-You-Go System

The ILO developed the first reform option as a restructured pay-as-you-go institution for Turkey. In its report (ILO, 1996a), the ILO stated that traditional pay-as-you-go principles have been mostly ignored in the case of Turkey, but that restructuring the system to operate with these principles would suffice to solve the Turkish social security problem. Thus, the ILO mainly developed and proposed options that would generate more revenue and reduce expenditures of the system by changing some key parameters. Under this restructured pay-as-you-go scenario, the system would provide a benefit equal to 1.5 percent of average annual lifetime earnings times the number of years of contributory service. The annual lifetime earnings would be revalued periodically to reflect movements in gross national average earnings. The institution was assumed to cover civil servants and all other employees. The insurable maximum and minimum tax bases would be five times and one time the minimum wage, respectively. The minimum

pension would be 25 percent of the national average wage. The pensionable age would be 55 for men and 53 for women, and would be raised to 60 for men and 58 for women over a ten-year period (ILO, 1996a).

### **3.3 Data and Actuarial Model**

Data from ILO (1995b) are not sufficient to conduct our analysis. Additionally, ILO (1995b) reports its data by year up to 2005 and every 5 to 10 years thereafter. Hence, we developed a simple actuarial simulation method to generate additional data needed to make tax rate (and, later, trust fund) projections on yearly basis for the entire period. The actuarial simulation model is based on the following methodology.

#### **3.3.1 Current Pay-As-You-Go System Data Methodology**

Let  $Z$  represent the financial balance of the “Trust Fund” of a social security institution. Then the following equation can be written

$$Z_t = GA_t - TE_t + OY_t \quad (3.1)$$

Where  $GA$  stands for gross assets of an institution at the end of year  $t$ , consisting of the sum of prior year assets ( $PYA$ ) and total social security contribution revenue ( $TR$ ) at the end of year  $t$ . Hence,  $GA$  may be expressed as

$$GA_t = PYA_t + TR_t \quad (3.2)$$

$TE$  in equation 3.1 represents total expenditure of an institution at the end of year  $t$ . It includes benefits ( $B$ ) paid to beneficiaries and administrative costs ( $AC$ ) of an institution. This can be expressed in the following equation

$$TE_t = B_t + AC_t \quad (3.3)$$

Lastly, the term  $OY$  stands for other income of an institution such as interest earnings, and other non-contributory income. Here we assumed that an institution can

earn interest income by investing net assets (NA) which may exist if revenue is greater than spending. If there exists such net assets (NA) in year t, they may be invested at rate g and generate income. Thus,  $OY_t$  can be represented by the following equation

$$OY_t = NA_t * g \quad (3.4)$$

There are two more expressions implicit in equations (3.1) and (3.2) that can be represented in equation form. The first one is

$$TR_t = TB_t * t_t \quad (3.5)$$

This equation is a simple revenue expression, however, it includes two very important variables for this study. TB stands for social security tax base or insurable base as the ILO (1995b) calls it. To estimate the social security tax base for the next fifty – years or so requires a number of assumptions about primary economic variables and other related demographic and socio-economic variables. Fortunately, the ILO (1995b) has done that for Turkey so we rely on its data and we use its data in this study. The second term in equation (3.5) represents the statutory social security tax rate in year t. We use both statutory and effective tax rates. While the former does not change from year to year, the latter is assumed to change every year so as to put the institution in financial balance.

The second implicit equation mentioned above is the following:

$$NA_t = GA_t - TE_t \quad (3.6)$$

This equation gives the expression for net assets of an institution. NA is one of the sources of other income. If  $NA > 0$ , then it will be invested and a positive investment

income will be earned.<sup>12</sup> We assumed the rate of return from investing in government securities (required by law) to be 3 percent for the entire period. If  $NA=0$ , then, revenue and expenditure of the institution in question are equal, and no difference between statutory and effective tax rate exists. If, on the other hand,  $NA<0$ , then, there has to be income sufficient to pay the deficit. It may be obtained by borrowing. If it is, this is considered equivalent to an effective tax rate that will be increased sufficiently to eliminate deficit years in which  $NA<0$ .

Our objective in developing the simple actuarial model is to make  $Z \geq 0$  each year for entire period. Since the ILO reported that the deficit of the three Turkish social security institutions would continue in the entire period no matter which option is adopted, we assumed  $Z$  to be equal to zero.

As we mentioned previously, the ILO reports its data yearly up to year 2005 and either every 5 or 10 years thereafter. We need to determine data for each year from 2006 to 2050 that were not reported by the ILO (1995b). We obtained yearly data by using the following method.

Let  $\delta$  be the annual growth rate of a variable between two periods, and let  $t$  stand for the number of years between two periods. Then, the following expression can be written

$$\Psi = \Phi(1 + \delta)^t \tag{3.7}$$

Where  $\Psi$  is the end year of the period and  $\Phi$  is the beginning year of the period.

Given  $t$ , then  $\delta$  can be found by using the following expression

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<sup>12</sup> Feldstein and Samwick (1998) says that pay-as-you-go based social security earns, on average, a real rate of return equal to the growth rate of the economy. So we assumed this rate to be same growth rate of GDP in this study.

$$\delta = \left( \frac{\Psi}{\Phi} \right)^{\frac{1}{t}} \quad (3.8)$$

Therefore, we used expression (3.8) to convert data reported every 5 or 10 years to a yearly basis. We used this expression mainly on two data series that the ILO produced; namely the promised benefits and the social security tax base series.

### 3.3.1.1 Current Law Financial Outlook for SSK

It is instructive to visualize the financial projection of each of the three Turkish social security institutions under each option so that we can understand each of the institution's financial structure and develop alternative policies. Under the current law pay-as-you-go financing system, SSK will not generate income sufficient to pay its obligation each year, as figure 3.1 clearly shows. There will not even be a single year that

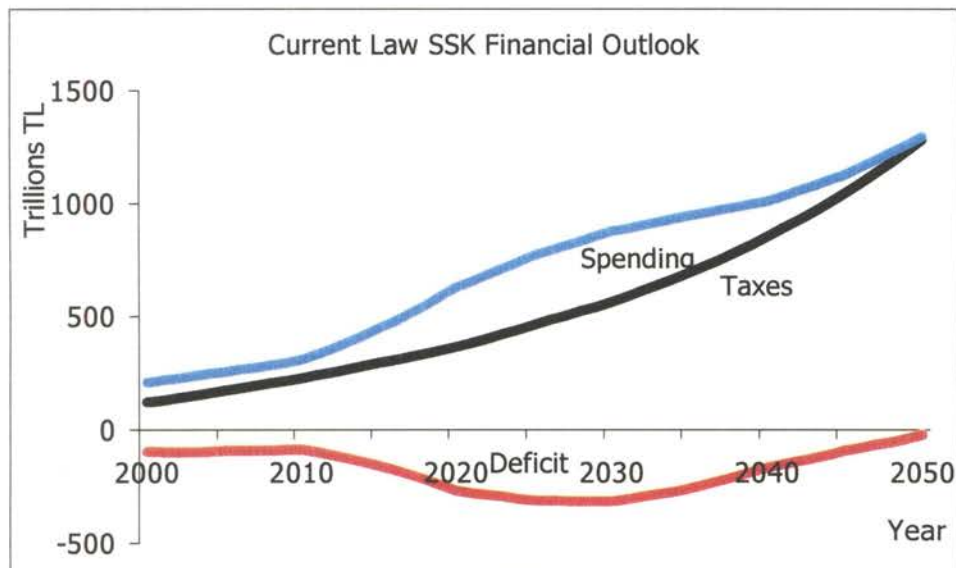


Figure 3.1. Financial outlook under current law for SSK.  
Source: Author's own calculations, based on data in ILO (1995b).

it would generate a surplus. A constant deficit will be maintained for the first ten years, and then the deficit keeps increasing and reaches a maximum point by year 2030. The deficit will be TL 312.8 Trillion in that year. It then gets smaller, but at the end of the projection period financial balance is yet to prevail. Even in year 2050, the deficit will be TL 16.2 Trillion.

The SSK taxes in Figure 3.1 are based on the 21.5 percent rate scheduled in the current law. Taxes required to avoid a deficit would be much higher. Our calculations indicate that the effective SSK contribution rate at which there will be no deficit, starts at 37 percent, or 72 percent higher than the statutory tax rate. These rates are shown in figure 3.2.

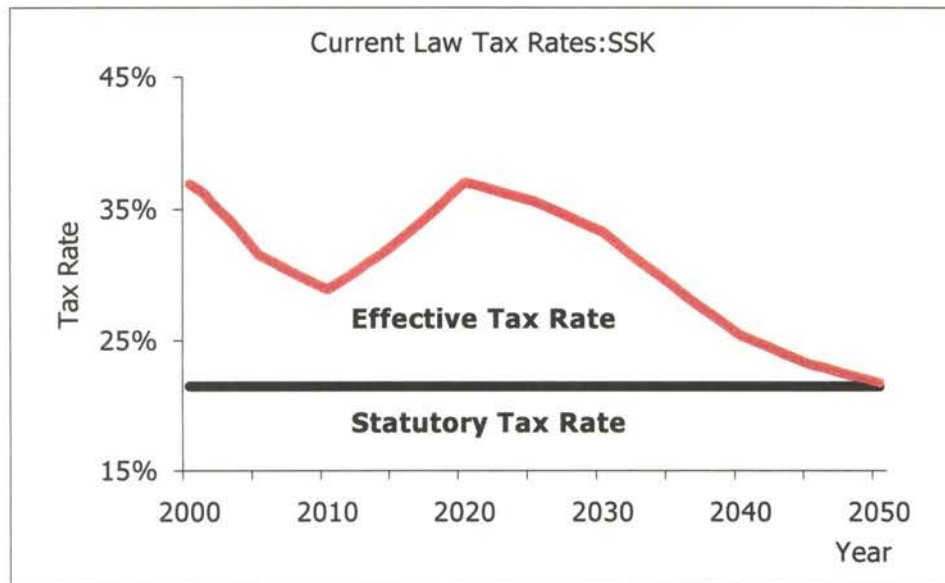


Figure 3.2. Tax rates under current law for SSK.  
Source: Author's own calculations, based partly on data in ILO (1995b).

The effective contribution rate is the rate at which the revenue of the institution is just equal to the outlay of the institution. In other words, the statutory rate is not sufficient to provide promised benefits and the rate has to be increased to generate required

revenue. Hence, the effective contribution rate is one at which current promised benefits can be provided. The 1999 policy changes have a positive effect on the effective SSK contribution rate; it keeps declining for the first ten-year period even though it starts at a high rate. However, this short run positive effect is not enough to achieve “no deficit,” and after a ten-year period the rate starts increasing and in year 2020 it peaks at 37.1 percent. After that year it steadily decreases and in year 2050 it reaches 21.8 percent, which is close to the statutory rate.

### 3.3.1.2 Current Law Financial Outlook for ES

The financial structure of ES under the pay-as-you-go financing method is shown in figure 3.3. There will be deficit for the first 4-years. Starting in year 2005, there will be a surplus for most of the remainder of the projection period. The surplus accumulates due to the assumption that the net assets of this institution will earn a 3 percent rate of return for every year that net assets are positive. It should be noted, also, that the statutory contribution rate for this institution is 35 percent.

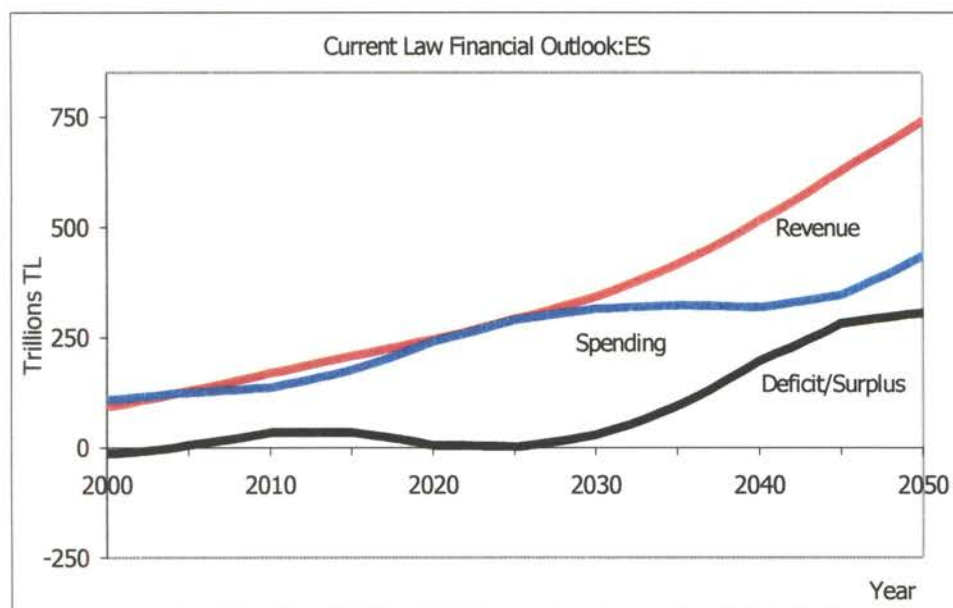


Figure 3.3. Financial outlook under current law for ES.  
Source: Author’s own calculations, based on data in ILO (1995b).



In this institution, the effective contribution rate is higher than the statutory contribution rate for first four years and starts declining. By 2010 it increases and reaches 36 percent in 2020. After 2026, it decreases to as low as 22 percent in 2044 and ends up 40 percent lower than the statutory contribution rate at 25 percent in year 2050. These two rates are shown in figure 3.4.

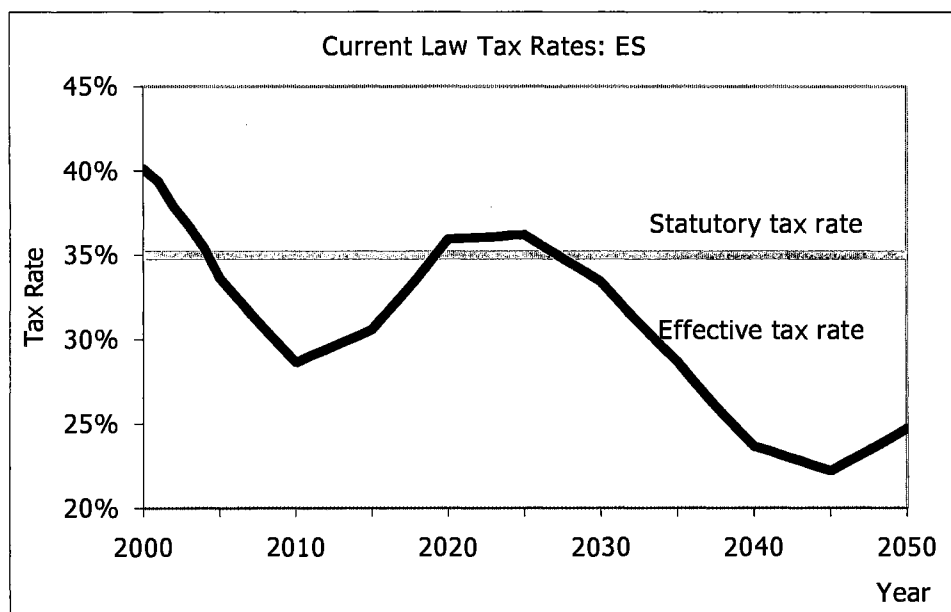


Figure 3.4. Tax rates under current law for ES.  
Source: Author's own calculations, based partly on data in ILO (1995b).

### 3.3.1.3 Current Law BK Financial Outlook

As can be seen in figure 3.5, BK will eventually face a large deficit that is increasing at an increasing rate. Although it will have a surplus for ten years, after year 2010 it will have deficit that gets larger every year. This is not a surprise, given the facts of the institution. Specifically, this institution was designed for self-employed individuals. There is no employer portion of the contribution. An insurer has to pay the

entire statutory contribution rate, which is 20 percent, if he or she wants to participate in this institution. Further, collecting contributions from the insured is even harder. This makes it difficult to have a financially sound institution. Up to year 2026 the deficit is less than revenue of the institution. In year 2027 and thereafter, however, the deficit will be higher than the institution's revenue. While the deficit in year 2026 is TL 129 Trillion (in 1995 TL values), income is TL 130 Trillion. In 2027 however, they are TL 136 and TL 135 Trillion, respectively. It is even worse in year 2050; the deficit constitutes 52.5 percent of the spending in that year.

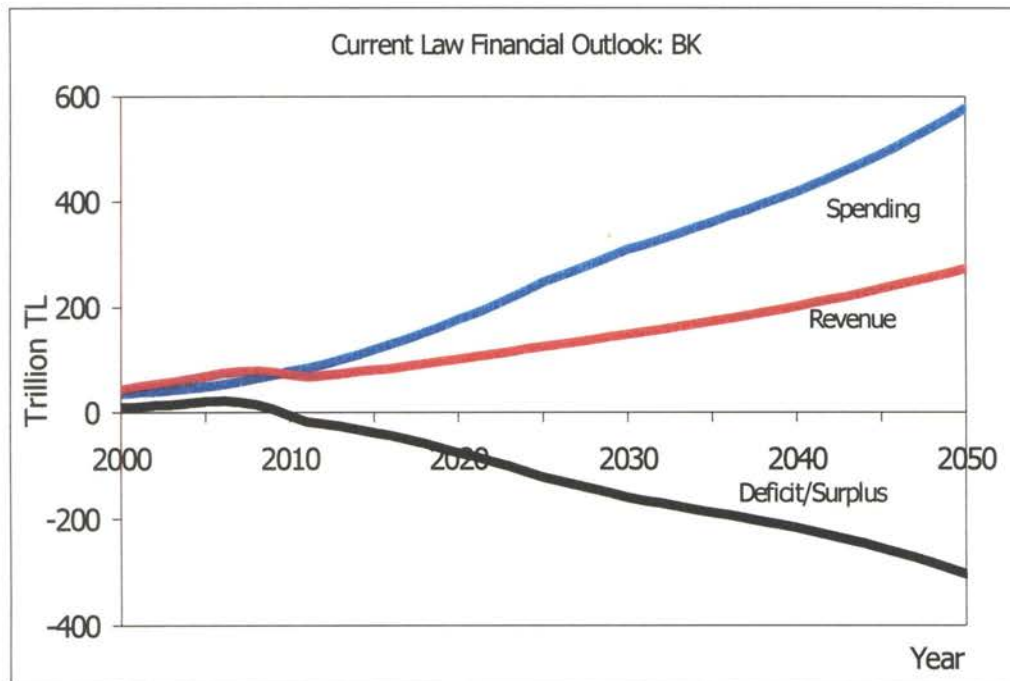


Figure 3.5. Financial outlook under current law for BK.  
 Source: Author's own calculations, based on data in ILO (1995b).

The current statutory BK contribution rate is 20 percent. To maintain the promised benefit for the entire period requires a much higher effective contribution rate. Figure 3.6 shows both rates. Starting in year 2005, the effective contribution rate

increases constantly, reaching 43 percent, or 115 percent higher than the statutory rate. At the end of the period it ends up at 44 percent.

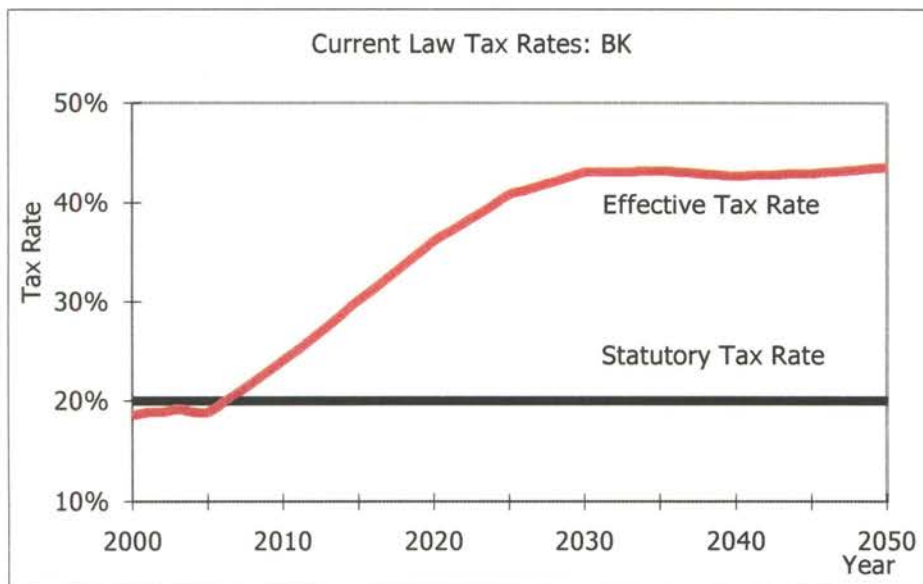


Figure 3.6. Tax rates under current law for BK.  
Source: Author's own calculations, based partly on ILO (1996a).

### 3.3.2 Privatization Alternative

There are two components under privatization alternative. One is a pay-as-you-go component that is maintained until the transition to privatization is completed. The other component is the individual savings accounts that are invested in private securities. We assumed such a gradual privatization that the transition period would last for the entire projection period. These components deserve explanation in terms of developing and using the simple actuarial simulation model.

#### 3.3.2.1 Pay-as-you-go component

The methodology is similar to the one that we just developed in the previous section. We assumed that the pay-as-you-go contribution rate would be paid by current workers as well as new entrants to the system. Benefit payments from this system will be

paid to those who are already retired and to those who are eligible under current law. However, the number of eligible retirees will decline along with benefit expenditures and the opposite will be true for ISAs. Thus, the same procedure developed above will be applied for the pay-as-you-go component of privatization.

### **3.3.2.2 Individual Savings Accounts Component**

The same methodology is also employed here with some modifications. First, there are two administrative cost components that need to be separated. One is the cost of administering the disability and survivorship component. The other is the administration cost of individual savings accounts. Under the privatized part of the system, the disability and survivorship components require separate administration. Thus, the cost for this might be much less than the administrative costs of managing ISA funds. We followed the ILO (1995b) and assumed that one half of 1 percent (0.005) of the social security tax base will be sufficient for paying the administrative costs of the disability and survivorship components.

Since the ISAs are assumed to be administered by private fund managers, much higher costs of administering the ISAs may occur. We assumed that this rate would be one percent of gross assets of individual savings accounts of an institution.

### **3.3.3 Financial Projections of Privatization Alternative**

Since most of the South American countries privatized their retirement systems, other countries have been closely watching the performance of these privatized retirement systems. The privatization experience led the ILO to develop a reform option under Turkish parameters. This option contains the most radical changes among ILO's alternatives. In this option, it is assumed that old-age pensions of new entrants to labor

force would be based on mandatory individual saving accounts (ISA). The amount of benefit would depend on the contributions paid equally by employers and employees and on the rate of return obtained by the private pension fund (ILO, 1996a). This national pension system would be a defined contribution model, with a minimum retirement benefit equal to 40 percent of previous earnings guaranteed by the Government for workers who have contributed for 30 years. The system would cover all private sector employees, civil servants, and the self-employed (ILO, 1996a). Under this privatization scenario, the final balance of an individual's account multiplied by an annuity factor would determine benefits<sup>13</sup>. It would be adjusted in line with consumers' price index (ILO, 1996a).

Results of the actuarial projections under this option show that the deficit would be 1.1 percent of GDP in 2010, 2.8 percent in 2020, and 0.1 percent in 2050 (ILO, 1996a, 24). It is important to mention that these results highly depend upon the assumed 3 percent real rate of return (ILO, 1995a). TUSIAD used a 9 percent real rate of return in its projections (TUSIAD, 1997). Although the ILO used a very low real rate of return in this option, the deficit in year 2050 is much lower than it is under the base case or current law scenario. However, in the first ten years there has to be much higher government subsidy or deficit to cover promised benefits. Because of this transition cost, the privatization scenario imposes a heavy burden on the current generation which has to pay both the existing benefits of previous generations and their own benefits (ILO, 1996a).

The privatization alternative in this study is modified from the ILO's original work in two ways. First, in order to make comparisons among the alternative reform

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13 ILO (1996a, 31) notes "a minimum pension equal to 40 per cent of previous earnings (up to the national average) would be guaranteed by the State for workers who have contributed for 30 years..."

options, ILO kept the contribution rate for the three institutions at 21.5 percent. In this study we keep benefits the same under both alternatives. More explicitly, benefit expenditures for each institution from year 2000 to 2050 will be same under both alternatives. They differ across the institutions, of course. Second, there will be no surplus in any trust funds or ISAs beyond year 2050.

### **3.3.3.1 Financial Projections Under Privatization Alternative for SSK**

The privatization of SSK as developed in this study shows that the effective rates at the beginning of the period will be higher than the statutory contribution rates; however, they will decline as the privatization transition advances. Figure 3.7 shows four-contribution rates under privatization. STR is statutory contribution rate that stays constant at 21.5 percent. EFTR is the effective contribution rate for the pay-as-you-go component of the privatization option. It is the rate that current active insurees and employers will pay to the pay-as-you-go component. It starts at a rate that is 71 percent higher than the statutory tax rate. Another tax rate is the individual savings account rate (ISATR). This tax is a new tax that starts at a very low rate and increases gradually. ISATR plus EFTR is the combined tax that will be collected under privatization. While revenue from the ISAs will be invested in the capital market after paying promised benefits and administrative costs and a trust fund will be accumulated, revenues from the pay-as-you-go component will be used to pay promised benefits. As figure 3.7 shows, the overall privatization tax rate ( $EFTR+ISATR=EPTR$ ) decreases as the transition period gets underway, but then increases, and by year 2022 it reaches the highest rate of 40.45 percent. As privatization proceeds beyond 2022, the effect of built-in fund increase causes the effective rate to decline. Under privatization, in fact, the total contribution rate

will be less than the statutory rate by and beyond the year 2037. By the year 2050, the rate would be 9.5 percent, or 55.8 percent lower than the statutory rate. Therefore, privatizing SSK would eventually require only 44.2 percent of the current statutory tax rate to provide the same amount of benefit.

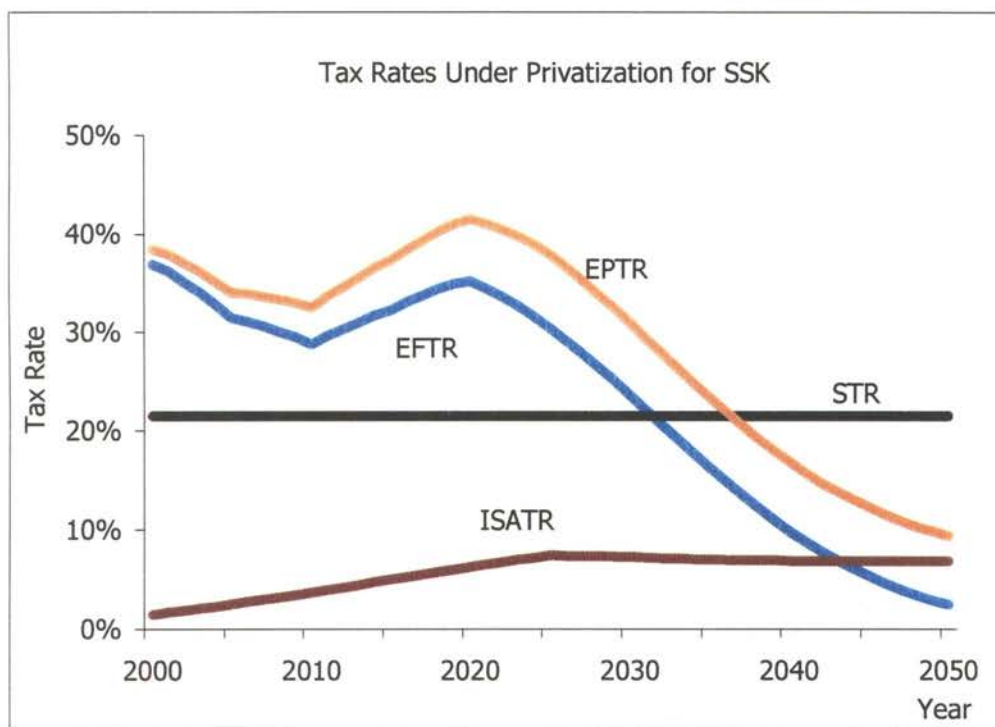


Figure 3.7. Tax rates under privatization alternative for SSK.  
Source: Author's own calculations, based partly on data in ILO (1995b).

The individual savings accounts tax rate is started at 1.5 percent and increased gradually, reaching the maximum level by year 2025 at 7.5 percent. At the end of the period, in year 2050, it will be 6.95 percent. Figure 3.8 shows the individual savings accounts trust fund. It is assumed that each year it receives tax revenue plus prior year assets and pays administrative costs and promised benefits and invests remaining funds at a real rate of 9 percent. As we explained elsewhere in this study, no fund is assumed to



remain at the end of the period. Thus, figure 3.8 shows the growth and eventual depletion of the trust fund for SSK.

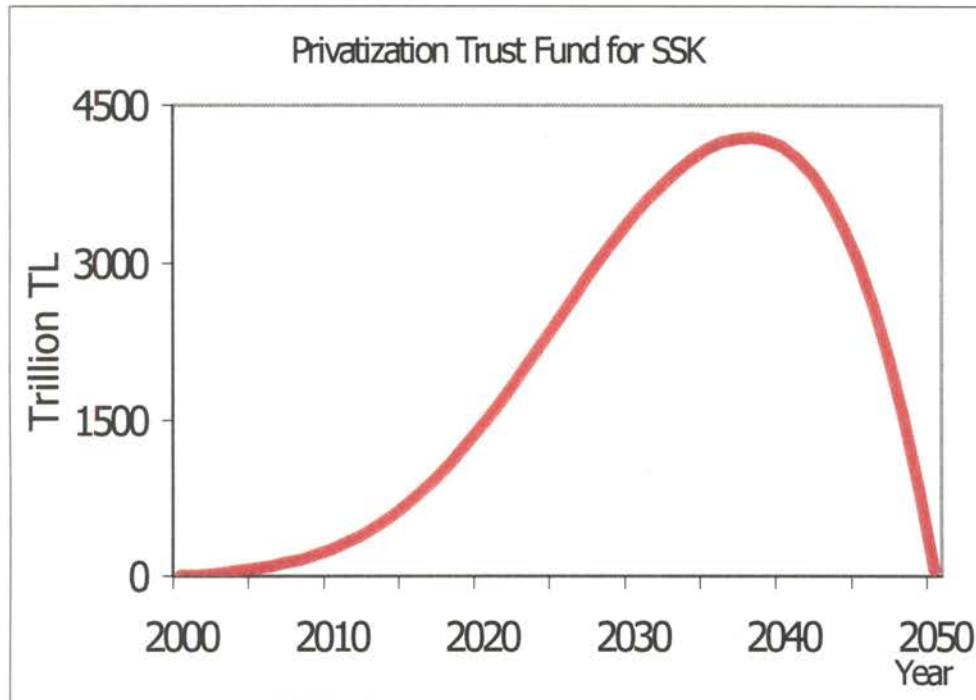


Figure 3.8. Privatization Trust Fund for SSK.  
Source: Author's own calculations, based partly on data in ILO (1995b).

While privatization for SSK seems a better option, it is instructive to compare effective contribution rates between the current law and the privatization alternatives. Figure 3.9 shows both rates. ECTR is the effective current law pay-as-you-go social security tax rate, and EFTR+ISATR is the total effective tax rate that would prevail under the privatization option (EPTR). As figure 3.9 clearly indicates, both tax rates show similar patterns in terms of increase and decrease throughout the period. However, the rate under privatization is higher than it is under the current system at the beginning of the period up to year 2027. This is due to the transition cost of establishing the



privatization trust fund. Beyond year 2027, the effective tax rate with privatization is less than the current law effective tax rate. The difference between the two rates after year 2027 is greater than the difference before the year 2027.

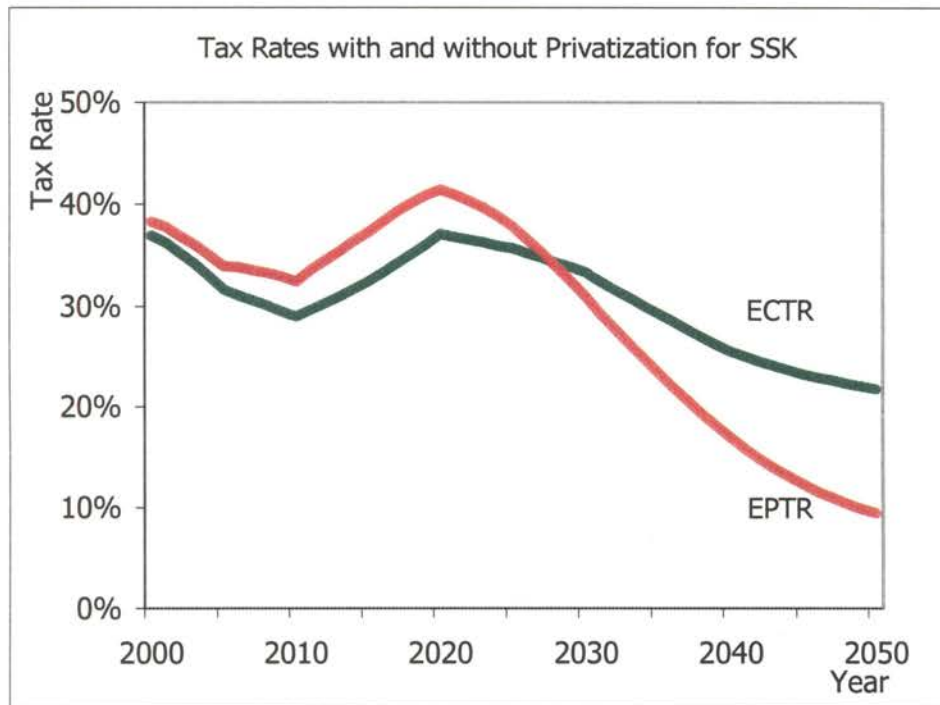


Figure 3.9. Effective tax rates with (EPTR) and without (ECTR) Privatization for SSK  
Source: Author's own calculations, based partly on data in ILO (1995b).

### 3.3.3.2 Financial Projections Under Privatization Alternative for ES

As with privatizing SSK, there are four different tax rates for ES. Figure 3.10 shows these tax rates. STR stands for the statutory contribution rate of 35 percent. EFTR and ISATR are the effective contribution rate and individual savings accounts tax rate for ES, respectively. EFTR is the rate that would be applied to the pay-as-you-go component, ISATR is the rate that would be applied to the privatization component. Since STR is so high, the effective contribution rate would be smaller than STR except for the first couple of years. The total privatization tax rate (EPTR) indicates that under privatization same

amount of benefit can be provided at a low tax rate. After a short transition period the effective tax rate becomes much less than the statutory tax rate. There would be a huge tax saving under this option.

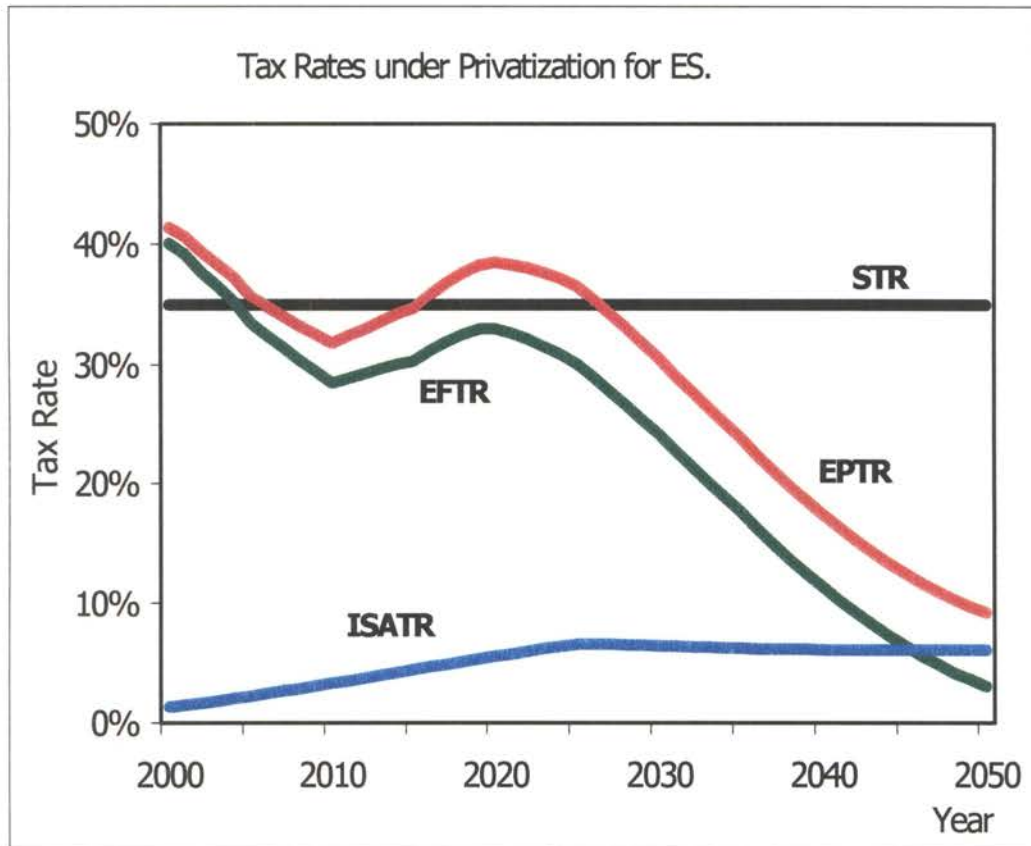


Figure 3.10. Tax rates under privatization alternative for ES.  
Source: Author's own calculations, based partly on data in ILO (1995b).

The individual saving accounts trust fund for ES is shown in the Figure 3.11. Even though the tax rate (ISATR) starts at a very low rate of 1.3 percent the trust fund accumulates funds quickly, given the assumed 9 percent return. In fact, the rate reaches only a high of 6.6 percent in year 2025 and declines to 6.1 percent in year 2050. Thus, the

9 percent real rate of return accumulates sufficient investment income to pay promised benefits and higher administrative costs.

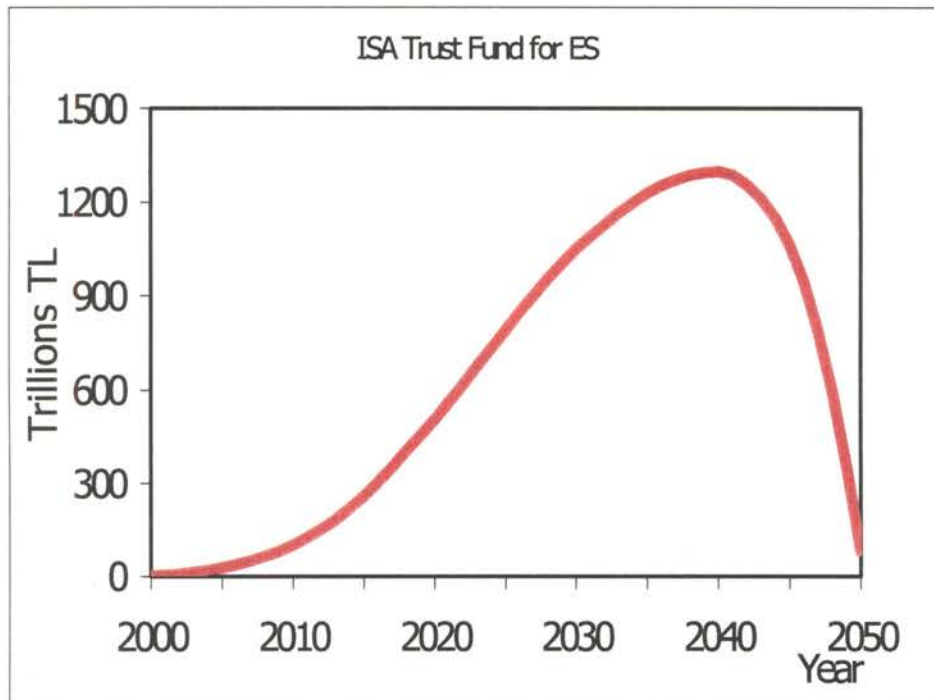


Figure 3.11. ISA trust fund for ES.

Source: Author's own calculations, based partly on data in ILO (1995b).

When we compare the effective tax rates under both options for ES we can see a pattern similar to that under SSK. Figure 3.12 shows the pay-as-you-go effective tax rate and the effective pay-as-you-go plus privatization tax rate. The effective pay-as-you-go plus privatization tax rate is higher for the first 27 years and lower for the rest of the period than the effective pay-as-you-go tax rate. Indeed, in the short run the pay-as-you-go alternative seems superior to the privatization in terms of tax rates; however, this appears to be reversed in the long-run.

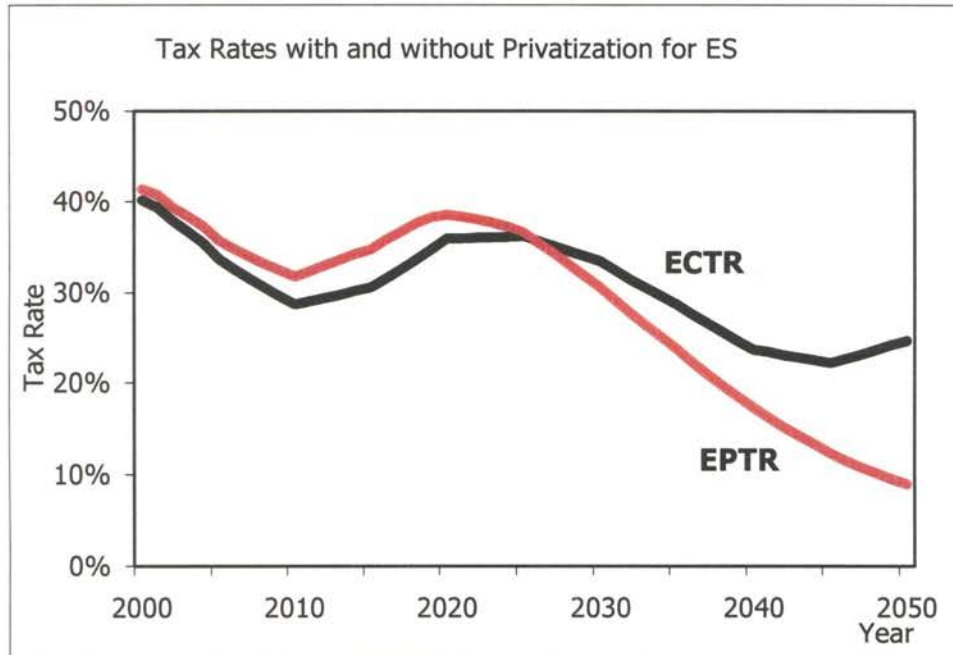


Figure 3.12. Effective tax rates with (EPTR) and without (ECTR) privatization for ES.  
Source: Author's own calculations, based partly on data in ILO (1995b).

### 3.3.3.3 Financial Projections Under Privatization Alternative for BK

The privatization of BK seems very challenging. Figure 3.13 shows the tax rates under privatization for BK. STR shows the statutory contribution rate that is set at 20 percent. EFTR represents the effective contribution rate of the pay-as-you-go component. Although this rate is smaller than the statutory rate for the first 6 years, it would increase as the transition to privatization progresses and reaches 30 percent in year 2016. As the privatization trust fund grows, the effective contribution rate of the pay-as-you-go component declines below the statutory contribution rate by year 2022. It would eventually be zero by the year 2044.

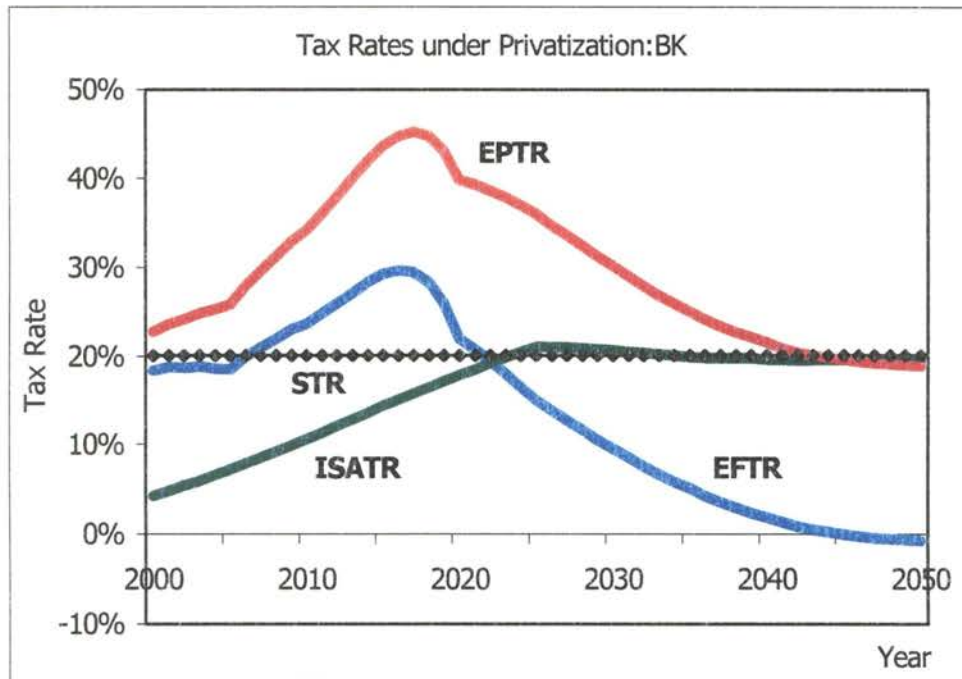


Figure 3.13. Tax rates under privatization for BK.  
 Source: Author's own calculations, based partly on data in ILO (1995b).

ISATR is the contribution rate that would be applied to individual savings accounts. It starts at 4 percent and increases constantly, reaching 21 percent by the year 2025, stays at this rate for a couple of years, then stays roughly equal to the statutory rate until the end of the period in 2050. When we sum up both rates required under privatization, ISATR and EFTR, we see that the total effective privatization tax rate (EPTR) would be higher than statutory tax rate for almost the entire period.

The ISAs Trust Fund for BK can be seen in figure 3.14. While there is no fund at the beginning, it reaches TL 2,132 Trillion (in 1995 TL values) in 2036. Then, it rapidly declines to zero at the end of period.



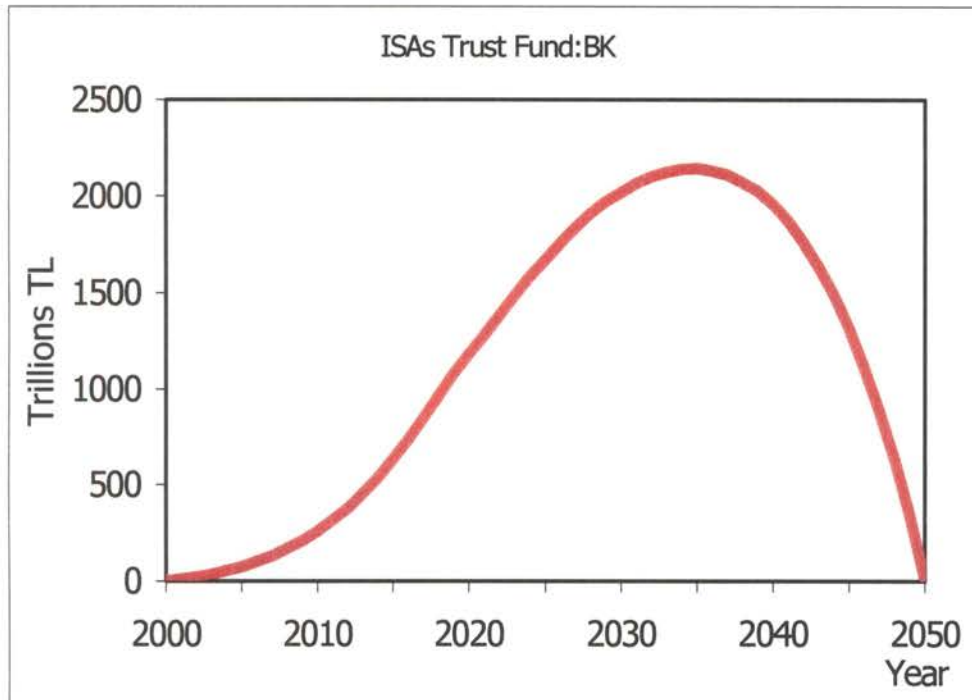


Figure 3.14. ISA trust fund for BK.  
Source: Author's own calculations, based partly on data in ILO (1995b).

This pattern in which the total privatization tax rate would be higher than the statutory contribution rate deserves further explanation. The following figure 3.15 helps. As shown in that figure there are two tax rates that would exist under both alternatives. ECTR is the effective tax rate that would prevail under the current law pay-as-you-go system. EPTR is the effective rate that would prevail under the privatization system. Thus, the effective privatization tax would be higher than effective pay-as-you-go tax for the first 22 years and lower for the rest of the period. Indeed, the comparison between these effective tax rates is the one that matters, for benefit-cost analysis, not the comparison between statutory rates and effective rates. Furthermore, the prevailing effective contribution rates seem too high to be politically acceptable. Our aim here,

however, is to show that if the promised benefits can only be financed by contribution rates what the rate would have to be.

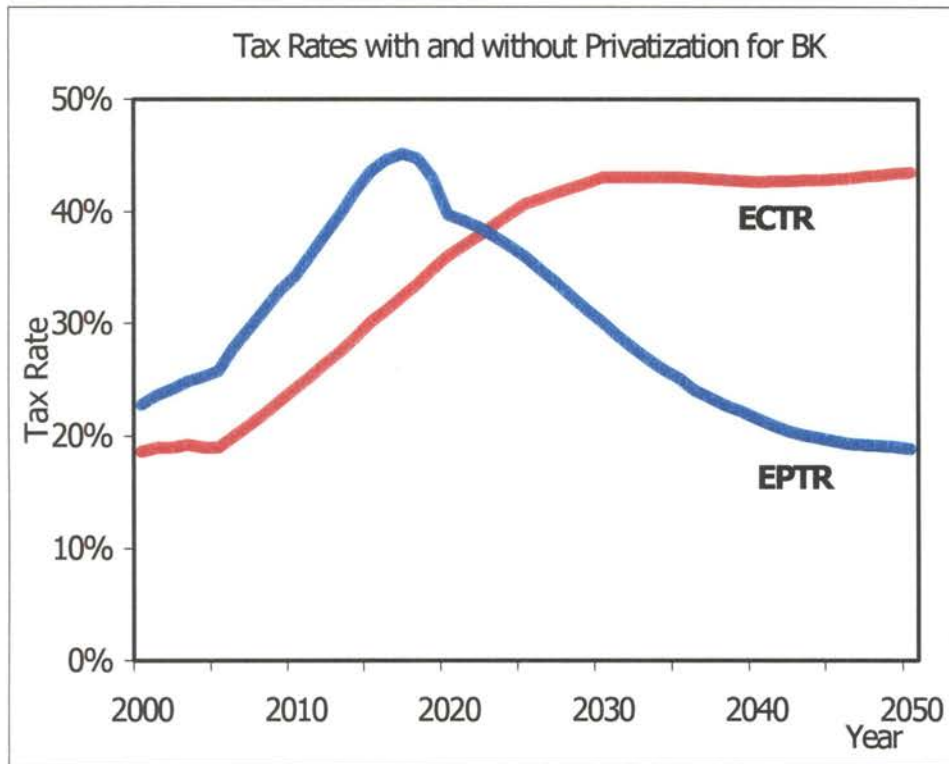


Figure 3.15. Effective tax rates with (EPTR) and without (ECTR) privatization for BK. Source: Author's own calculations, based partly on data in ILO (1995b).

It is also important to remember that under BK, there are no employer contributions. This institution is designed to cover only self-employed individuals, professionals, and farmers. Viewed from this angle, the rates may be too high to sustain. This issue is not a subject of this study, however.

### 3.4 Additional Data and Parameter Values

The cost-benefit analysis in this study requires the use of a number of additional parameter values and data in addition to that generated from our actuarial model and data provided by ILO (1995b). Some of these come from relevant literature, and we have

calculated some of them ourselves. To calculate the marginal welfare cost of taxation, we need the aggregate marginal tax rate,  $m$ , the compensated labor supply elasticity,  $\eta$ , and total labor income,  $wL_2$ . We use 30.5 percent for  $m$ , which is taken from OECD (1998, 156). The value of the labor supply elasticity is taken from Sayan and Kenc's study (1999b). As for the total labor income, there were no data projections available for the period this study covers. In fact, there are two parameters required; one is the level of employment ( $L_2$ ) for each year, the other is the average wage ( $w$ ) for each year. The ILO (1996b) has calculated the national average monthly wage per person. Thus, we needed only to calculate total annual employment to estimate each year's labor income. To estimate total employment, we assumed that agricultural employment should be excluded from the total employment. This is because of the fact that employment in the agricultural sector (especially the farm sector) is not paid in the way their counterparts are paid in other sectors. In order to exclude agricultural employment from the total, we calculated its share of total employment. We observed that the agricultural employment share was 54.2 percent in 1980, but fall to 42 percent in 1999. This 12.2 percent reduction in just 20 years led us to assume that the agricultural employment share will continue to decline each year by the average rate of change over the 20-year period, 1980-1999, or  $-0.01286$ . Incorporating this parameter in our calculation, we estimated the total non-agricultural employment series. Multiplying this by the annualized national wage, we projected total labor income.



## CHAPTER 4

### BENEFIT-COST ANALYSIS OF TURKISH SOCIAL SECURITY SYSTEM

#### 4.1 Introduction

This chapter gives theoretical information on the impact of privatization of social security system. It identifies potential sources of benefits and costs. The chapter also gives the benefit-cost model for this study. Additionally, the last part of this chapter describes the impact of privatizing social security system on representative individual wealth and mentions potential sensitivity analysis for the robustness of the model results.

#### 4.2 Social Benefits and Costs of Social Security Privatization

As Feldstein (1996a) explained in his paper, social security privatization has primarily 3 impacts on the economy. The first impact has to do with the effect of taxes that government collects on the labor supply. Since the projected deficit in the Turkish system will not be reduced to zero under either alternative, it will be financed by other taxes in addition to social security contributions. We treat the social security deficit as additional taxes levied on labor income. Therefore, the privatization alternative will change the taxes collected by the government. The change in the tax rate will affect labor market equilibrium.

The second impact of privatization is on the nation's capital stock. More specifically, privatization will allow some of the taxes used to finance social security to be invested in the stock market. The real rate of return on these investments is expected to be higher than the real rate of return on government securities. Thus, it will help to increase the nation's capital stock. This is especially important for developing economies.

Because of privatization, there would be also a change in government saving. The change in government saving will have an impact on capital accumulation through its effect on crowding-out or crowding-in of private investment.

The last impact would be the change in the costs of administering the system. It is widely believed that the administration cost of social security under privatization would be much higher than it is under the current pay-as-you-go financing method.

These impacts are the sources of the social benefits and social costs of privatization. We think that changes in tax rates and in national saving would generate social benefits that exceed social costs, while changes in administration costs will generate social costs. The net benefit will depend upon the difference between the values of these impacts.

#### **4.2.1 Marginal Welfare Cost of Taxation**

Economic theory suggests that the social security payroll tax distorts the labor supply decision. Feldstein (1995, 1996a) states that the payroll tax distorts occupational choice, location, number of hours individuals work, and work effort. In this study we emphasize the effects of social security on number of hours worked and the subsequent welfare cost of taxation. There are two methods in the literature that measure the welfare cost of taxation; one developed by Feldstein (1995) and the other by Browning (1987). We will estimate the marginal welfare cost of taxation for each year through the year 2050 using Browning's partial equilibrium model of marginal welfare costs. Although Feldstein's method seems theoretically more accurate than Browning's method, we use the latter method given that data needed to employ the former are not available.

Browning's model is illustrated in figure 4.1. Following Browning's (1987) definitions,  $S^*$  is a compensated labor supply curve. The worker's wage rate is  $w$ . The aggregate marginal tax rate is  $m$  and the net marginal wage rate is  $(1-m)w$ . This corresponds to the aggregate marginal tax rate without privatization. An increase in the tax rate would increase the aggregate marginal tax rate to  $m'$  and the net wage rate would be  $(1-m')w$ . The privatization option will necessitate an initially larger subsidy to social security from general revenue than under the current system or an effective increase in taxes required to finance social security. After a transition period the general revenue subsidy will fall relative to the current system and there will be a decrease in the marginal tax rate. The increase (decrease) in the marginal tax rate creates a marginal welfare cost (benefit). When the marginal tax rate increases from  $m$  to  $m'$  (as in Figure 4.1), there will be a reduction in the quantity of labor supplied along the compensated supply curve to  $L_3$ . Therefore, marginal welfare cost resulting from a change in the tax rate is equal to the area of ACDE in figure 1 and represented by WC.

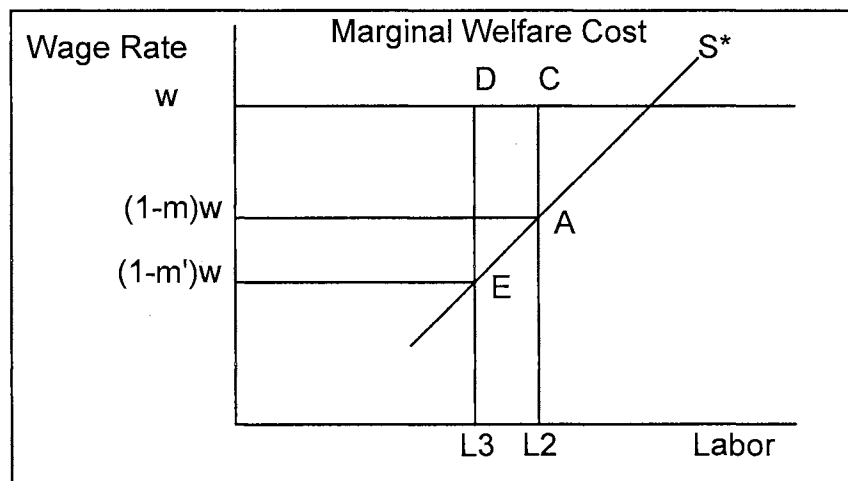


Figure 4.1. Change in marginal welfare cost of taxation.  
Source: Browning (1987, 17).

ACDE is equivalent to

$$WC = \frac{1}{2} [wm + wm'] dL_2 \quad (4.1)$$

Because  $m'$  is equal to  $m + dm$  and  $dL_2$  is equal to  $[\eta L_2 / (1-m)] dm$ , equation (4.1) can be expressed as

$$WC = \left[ \frac{m + 0.5dm}{1 - m} \right] \eta w L_2 dm \quad (4.2)$$

The new parameter,  $\eta$ , is the labor supply elasticity. We will calculate the marginal welfare cost using equation (4.2).

#### 4.2.2 Private Saving

Changes in taxes will also affect the value of the wealth represented by the retirement system and thus potentially affect GDP. Actually, there have been many studies that investigate the relationship between private saving and pay-as-you-go-based social security system both theoretically and empirically. These studies include Barro (1974) and Feldstein (1974). While Barro (1974) argues that there is no significant adverse effects of social security on private saving, Feldstein (1974) argues and found evidence otherwise. They continued their arguments empirically. These studies include Barro (1978) and Feldstein (1978; 1996b). Based on these two influential scholars hypotheses, there have been other empirical studies that employ other countries data. These studies include Gultekin and Logue (1979) for employing U.S. data, Denny and Rea (1979) employing data for Canada, Markowski and Palmer (1979) applying data for Sweden, Barros (1979) employing data for Britain, Oudet (1979) employing data for France, and Hurler and Dennerlein (1979) employing data for Germany. More recently,

Meguire (1998), Attanasio and Paiella (2001), and Alessie and Kapteyn (2001) looked these issues again. They found evidence that supports Feldstein's view. Coronado (1997) for instance, studied the effects of privatization on household saving from Chilean social security privatization experience. He also found evidence that supports Feldstein's view.

In this study we follow Feldstein (1996a) view as he indicates, social security wealth (SSW) will be changed as taxes change. Social security wealth is the net present actuarial value of expected future benefits and costs. An increase in taxes reduces SSW and a reduction in taxes increases SSW. Feldstein (1974, 1996b) studied the relationship between social security and saving and concluded that social security wealth reduces private saving. His results suggest that an increase (decrease) in taxes reduces (increases) SSW and results in an increase (decrease) in private saving. Changes in private saving affect the capital stock and GDP. Specifically, an increase in private saving will have a positive effect on the capital stock and GDP. Therefore, in this study we will also calculate the effect of tax changes on SSW, the capital stock, and GDP.

#### **4.2.3 Government Saving**

There is another potential impact of privatization on the capital stock and GDP. This impact comes from the changes in government saving as a result of privatization. Privatization will change the size of the government's net budget balance-the surplus or deficit. If the budget deficit shrinks (grows), government borrowing will decrease (increase), "crowding in" (out) private investment. If privatization crowds in (out) private investment, the capital stock and potential GDP will increase (decrease). Under both the existing system and privatization scenarios, there will be no social security surplus. There will be a change in the size of the social security deficit, however. We assume that this

deficit will be financed by borrowing rather than by reductions in other government expenditures. Therefore, the costs and benefits from changes in the deficit will come from changes in private investment, rather than from changes in other government programs.

#### **4.2.4 Administrative Costs**

The fourth source of benefits and costs of privatization is from the changes in the cost of administering the system. It is widely believed that the privatization of social security would increase administrative costs (Schulz, 2000; Mitchell, 1996; Mitchell and Zeldes, 1996), given the higher cost of managing portfolios of private securities than the cost of managing government securities. Thus, we will estimate the changes in the cost of administering the system under the privatization alternative.

#### **4.3 The Benefit-Cost Model**

In order to estimate the changes in benefits and costs outlined in the previous section, we will use the traditional benefit-cost model that is widely used in evaluating public programs and projects. A benefit-cost analysis requires a comparison of two scenarios: one “without” the alternative being evaluated, and one “with” the alternative in place. The “without” scenario is a projection of the future with the current Turkish social security system, as recently reformed. The “with” scenario is a projection of the future with the privatization alternative instead of the current system. The ILO has developed the basic elements of both of these scenarios. We will use these scenarios in our analysis, supplemented by additional data, as necessary. We will examine these scenarios carefully, however, for debatable assumptions and parameters and incorporate reasonable alternative assumptions and parameters in the sensitivity analysis.

In its simplest form, net benefit (NB) can be expressed as

$$NB = B - C \quad (4.3)$$

Where B is benefit and C is cost.

Since benefits and costs are often realized at different times they are not comparable unless they are expressed in terms of present values that can be obtained by using appropriate discounting (Gramlich, 1990). The present value of a benefit,  $B_t$ , in any future year  $t$  is  $B_t/(1+r)^t$ , where  $r$  is the discount rate. Similarly, the present value of a cost,  $C_t$ , in any future year  $t$  is  $C_t/(1+r)^t$ . The present value of the net benefit in a future year,  $t$ , can be expressed as

$$PVNB_t = \frac{B_t}{[1+r]^t} - \frac{C_t}{[1+r]^t} \quad (4.4)$$

The present value of a stream of net benefits can be expressed as

$$PVNB_{0, T} = \sum_{t=0}^T \frac{B_t}{[1+r]^t} - \sum_{t=0}^T \frac{C_t}{[1+r]^t} \quad (4.5)$$

Given the benefits and costs described above, the model can be expressed in the following way symbolically;

$$PVdNB = PVdB - PVdC \quad (4.6)$$

Where

$$PVdB = PV(-WC) + PV(GDP_g) + PV(GDP_{ssw}) \quad (4.7)$$

and

$$PVdC = PV(WC) + PV(-GDP_g) + PV(-GDP_{ssw}) + PV(AC) \quad (4.8)$$

Where the symbols can be expressed as:

PVdNB = Present value of change in net benefit

PVdB = Present value of change in benefit

$PVdC$  = Present value of change in cost

$PV(-WC)$  = Present value of decrease in welfare cost of taxation

$PV(GDP_g)$  = Present value of increase in GDP due to increase in government saving

$PV(GDP_{ssw})$  = Present value of increase in GDP due to decrease in social security wealth

$PV(WC)$  = Present value of increase in welfare cost of taxation

$PV(-GDP_g)$  = Present value of decrease in GDP due to decrease in government saving

$PV(-GDP_{ssw})$  = Present value of decrease in GDP due to increase in social security wealth

$PV(AC)$  = Present value of increase in administration cost of the system.

It is necessary to mention that all items except administrative costs are the source of costs for some years and of benefits for other years. Hence, we will express them in “change in net present value” term.

Given the need to pay promised benefits to current retirees while simultaneously building up privatized trust funds for future retirees, an initial increase in taxes, or reduction in other government expenditures, is required. We assume the former. Thus,  $WC_t$  will be positive initially. If the rate of return on private securities exceeds the rate of return on government securities, the required trust funds can be achieved eventually with lower taxes. Thus,  $WC_t$  will eventually turn negative as the privatization alternative matures.

Privatization will initially increase the government budget deficit, or reduce government saving resulting in reduced GDP. Eventually, however, the deficit will fall and GDP will increase as a result.



Privatization will also initially decrease, and then increase, social security wealth (SSW), as a consequence of the required changes in taxes. The effect on SSW is expected to initially increase and then reduce GDP.

The Effect of privatization on administrative cost is expected to have an unambiguous effect on net benefits. That is, privatization should increase administrative costs throughout the entire study period.

In evaluating public programs, choosing the right discount rate is very important. We will use the discount rate,  $r$ , that is known the social discount rate. It differs from the market discount rate. It reflects the social rate of time preference.

The basic question is whether the present value of change in net benefit (PVdNB) is greater than zero. If it is, then privatizing the social security system will produce a potential Pareto improvement.

Given reasonable doubt about the value of certain parameters, sensitivity analysis will be performed. It will include adjustments for (1) the greater variability in returns on private securities in the case of privatization, (2) different discount rates, (3) variation in the average age of capital, (4) different estimates of labor supply elasticity, and (5) alternative assumptions and parameters for the “with” and “without” scenarios of the ILO.

From the individual viewpoint, the change in wealth of representative individuals will also be estimated under both alternatives. This will be done by calculating the present value of benefits and costs with and without privatization. The change in wealth of each representative individual is the difference between the change in present value of benefits and costs.

## CHAPTER 5

### RESULTS AND DISCUSSIONS

#### 5.1 Introduction

In this chapter, the results of the benefit-cost analysis described in the previous chapter will be presented. It should be noted that the results are to be evaluated based on the assumptions of this study.

We organize this chapter in three subsections; each gives the results for one of the three Turkish social security institutions. There are four benefit-cost categories that have been identified and estimated for each institution.

#### 5.2 Benefit-Cost Results from Privatizing SSK

##### 5.2.1 Marginal Welfare Cost of Taxation

The marginal welfare cost of taxation (MWC) in this study essentially tells us that a change in social security tax rates produces costs or benefits to society depending on the direction of the change. In other words, a change in social security tax rates will alter the well-being of the society either negatively or positively.

Figure 5.1 shows the marginal welfare cost of taxation due to the changes in the SSK contribution rate if privatization was undertaken. The area between the curve and horizontal axis should be interpreted in the following way: the area above the horizontal axis, “the positive region,” represents costs to society while the area below the horizontal axis, “the negative region,” represents benefits to the society. This cost is TL 31 Trillion in the first year, 2000, and it increases during the transition period. It reaches a maximum in year 2019 of TL 422 Trillion. Nine years after, by year 2028, SSK starts producing

benefits from lower taxes. Such benefits increase steadily and reach TL 1,396 Trillion by the year 2050. It should be noted that the costs and benefits in figure 5.1 are given as their level values not their present values.

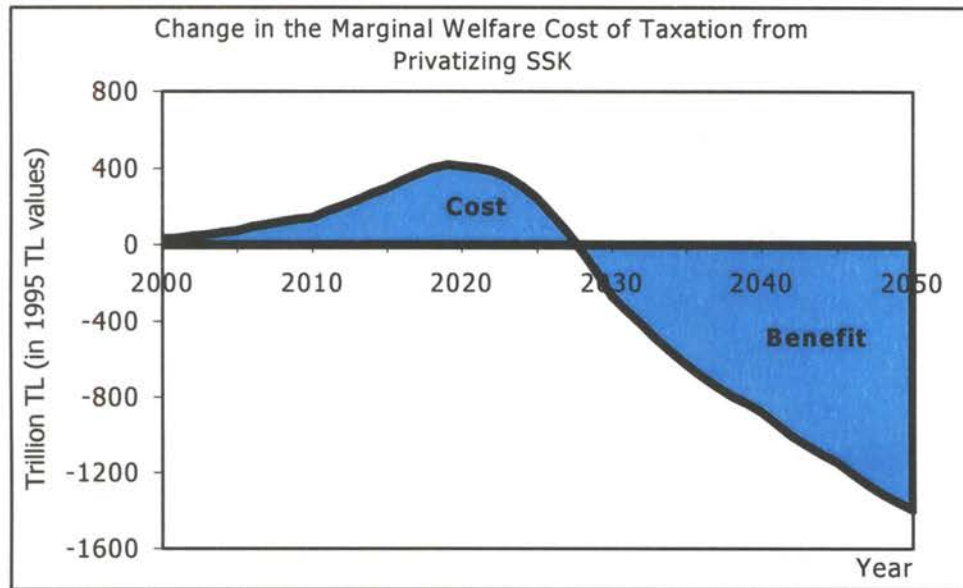


Figure 5.1. Change in the Marginal Welfare Cost of Taxation from Privatizing SSK.  
Source: Author's own calculations.

### 5.2.2 Administrative Costs

The second benefit-cost category is the change in administrative costs between the two alternatives. It is widely believed that under privatization administration costs would be much higher than they are under a pay-as-you-go financing system. Figure 5.2 shows the changes in administrative costs for SSK. All the area under the curve represents additional cost. It starts at TL 2.9 Trillion in 2000 and increases as the privatization transition takes place. It reaches its highest point in year 2041 at TL 64.7 Trillion. Although administrative costs start declining after the year 2041, they will not reach the level that would have been under a pay-as-you-go system.

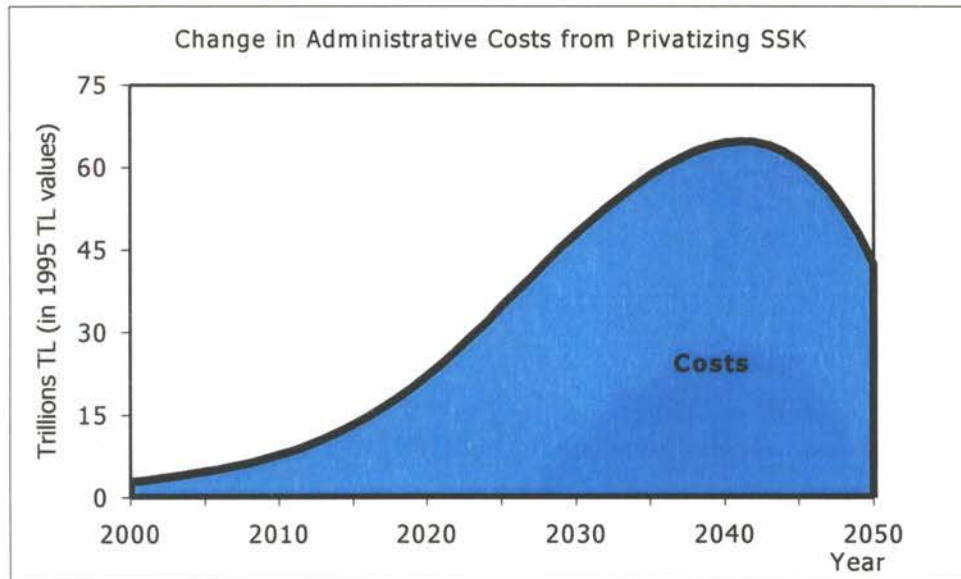


Figure 5.2 Change in administrative costs from privatizing SSK.  
Source: Author's own calculations.

### 5.2.3 Government Saving

The third benefit-cost category for SSK is the change in GDP due to changes in government saving as a result of the change in the way the SSK is financed. The social security budget is generally kept separately in Turkey. However, as in the United States, it is considered part of the government budget (consolidated) and it is, therefore, used for political purposes. While social security surpluses can be used to finance various governmental programs, the social security surpluses can be used to retire government debt; that is, they can be “saved”. Changes in “government saving” would lead to changes in investment that, in turn, change GDP.

Figure 5.3 shows the change in GDP due to the change in government saving, given that privatization reduces SSK deficits or SSK dissaving, and assuming that the smaller SSK deficits do not simply induce the government to increase the consolidated

budget deficit. The area under the curve should be interpreted as benefits. Although in the first few years the generated benefit is quite low, beyond 2010 it increases. It is surprising to note that even under the transition to privatization, there is no single year that has a negative effect due to a change in government saving behavior. The magnitude of the benefit is also important. In fact, the cumulative benefit is TL 17,328 Trillion and it is the largest undiscounted benefit item.

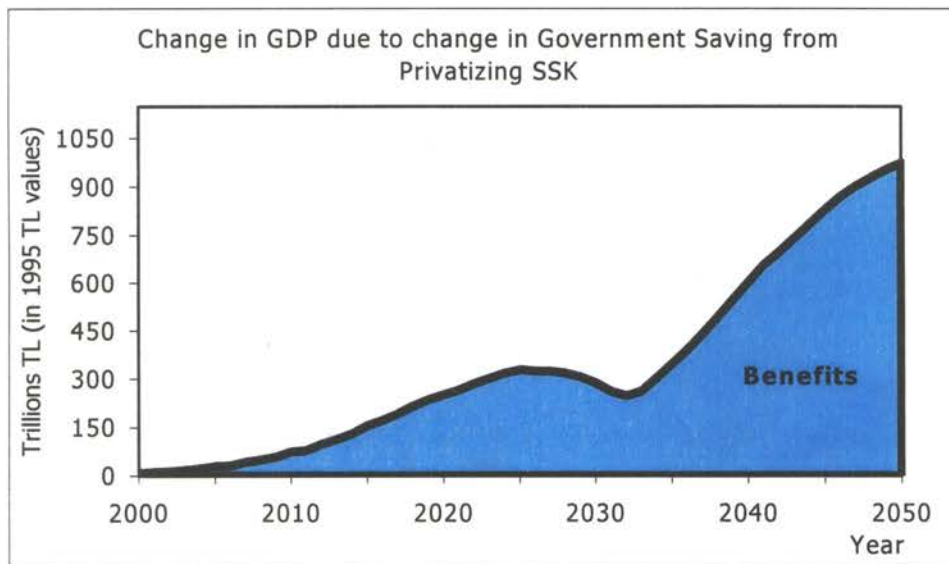


Figure 5.3. Change in GDP due to change in government saving from privatizing SSK.  
Source: Author's own calculations.

#### 5.2.4 Private Saving

The last benefit-cost category is the change in GDP due to the change in private saving. Figure 5.4 presents the changes in GDP due to changes in private saving as a result of changing the SSK financing method. Because of privatization and the increase in the effective SSK tax rates, the change in private saving affects GDP positively during the transition period. As privatization progresses, the positive effect disappears and the change in GDP becomes negative and it decreases rapidly as shown in figure 5.4.

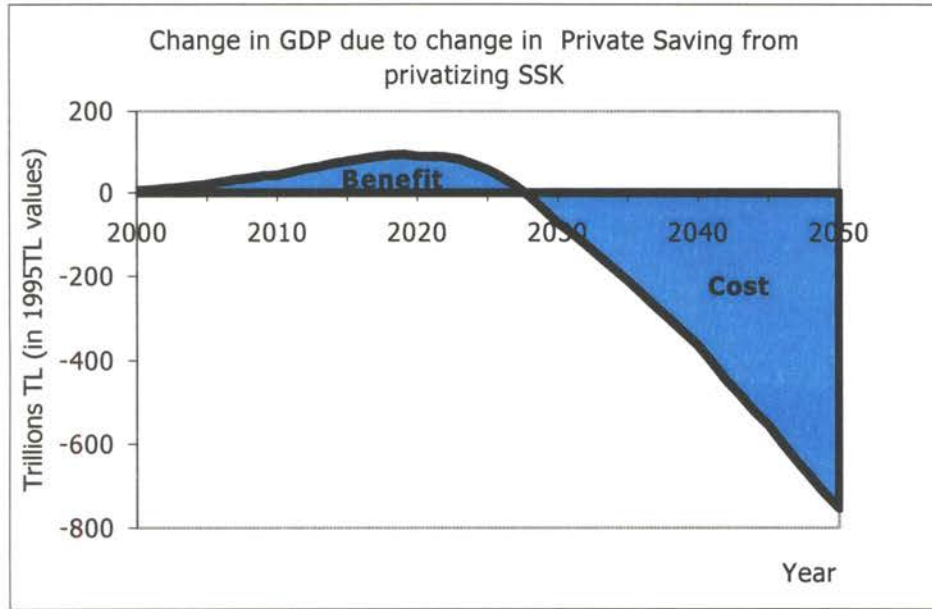


Figure 5.4. Change in GDP due to change in private saving from privatizing SSK.  
Source: Author's own calculations.

### 5.2.5 Net Benefits and Present Values of Net Benefits from Privatizing SSK

We presented the results for the four benefit-cost categories for SSK above. However, for benefit-cost analysis, it is the present values of the change in net benefit that matters. If the present value of change in net benefit is greater than zero, we can conclude that privatizing SSK would be a potential Pareto improvement. Thus, we calculated the change in net benefits and the present values of the change in net benefits for SSK. The result can be seen in figure 5.5. The figure summarizes all of the proceeding benefit-cost categories in terms of the change in net benefits and change in present values of net benefits. While in the first 24 years, both the change in net benefits (dNB) and present values of the change in net benefits (PVdNB) are negative, they are positive in the last 27-year period. Further, total PVdNB for the entire period is greater



than zero for SSK. Thus, for SSK, the social benefits of privatizing SSK would be higher than the social costs privatization brings.

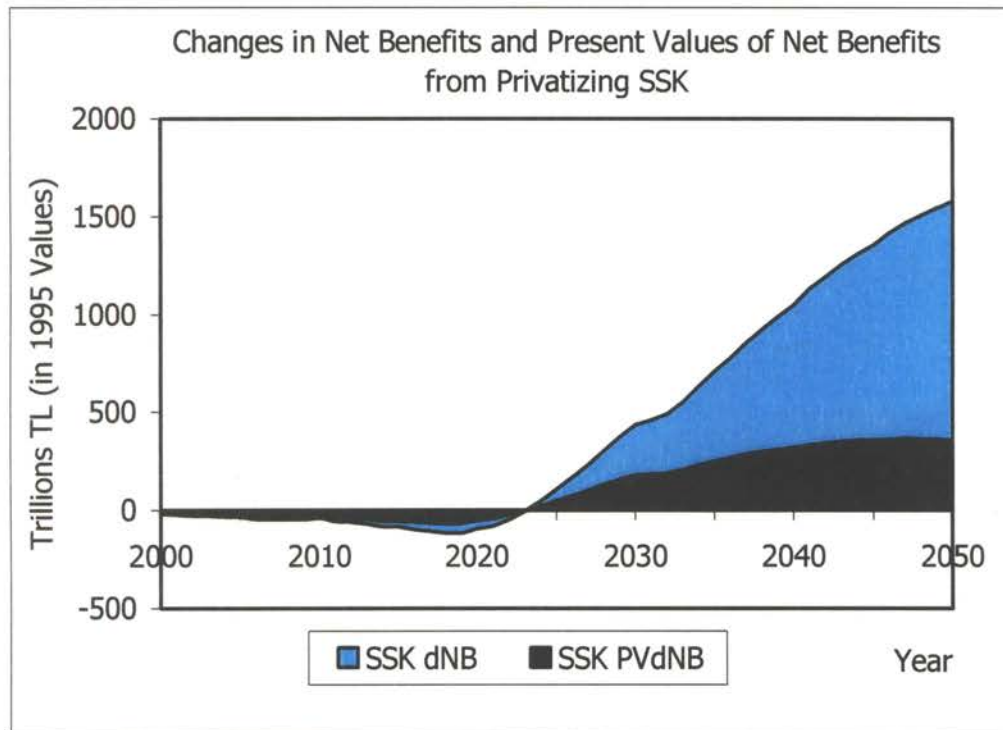


Figure 5.5. Changes in net benefits and present values of net benefits from privatizing SSK.  
Source: Author's own calculations.

### 5.3 Benefit-Cost Results from Privatizing ES

#### 5.3.1 Marginal Welfare Cost of Taxation

Like SSK, the change in the marginal welfare cost of taxation (dMWC) due to privatizing is initially a source of social costs. As figure 5.6 shows, the dMWC at the beginning of privatization is TL 18 Trillion. It gradually increases to the maximum level of TL 166 Trillion in 2018 and then declines to TL 26 Trillion in 2025. Change in MWC becomes negative, or a source of benefits, in 2026, starting at TL 11 Trillion and then increasing rapidly. Within 5 years, in year 2031, the social benefits from declining MWC increases 19 percent more than the maximum level of social cost from increasing MWC.

In fact, the cumulative net benefit from the decrease in the marginal welfare cost of taxation for ES is TL 5,721 Trillion (undiscounted); that is, 2.5 times higher than the total social cost from the increase in MWC.

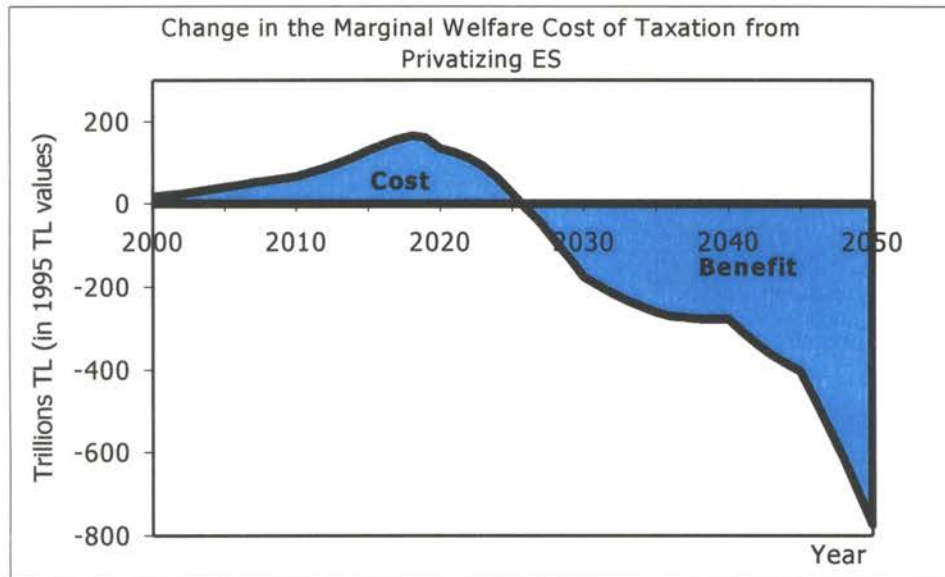


Figure 5.6. Change in the marginal welfare cost of taxation from privatizing ES.  
Source: Author's own calculations.

### 5.3.2 Administrative Costs

The change in administration costs between the two alternatives is shown in figure 5.7. The area under the curve represents social costs. However, it is not a large figure when compared with the other benefit-cost categories. The cumulative administration cost is just TL 578 Trillion. This is less than the social benefit due to change in the marginal welfare cost of taxation in year 2048, alone. Therefore, the change in administration cost does not have a significant impact on the net benefits from privatizing ES.



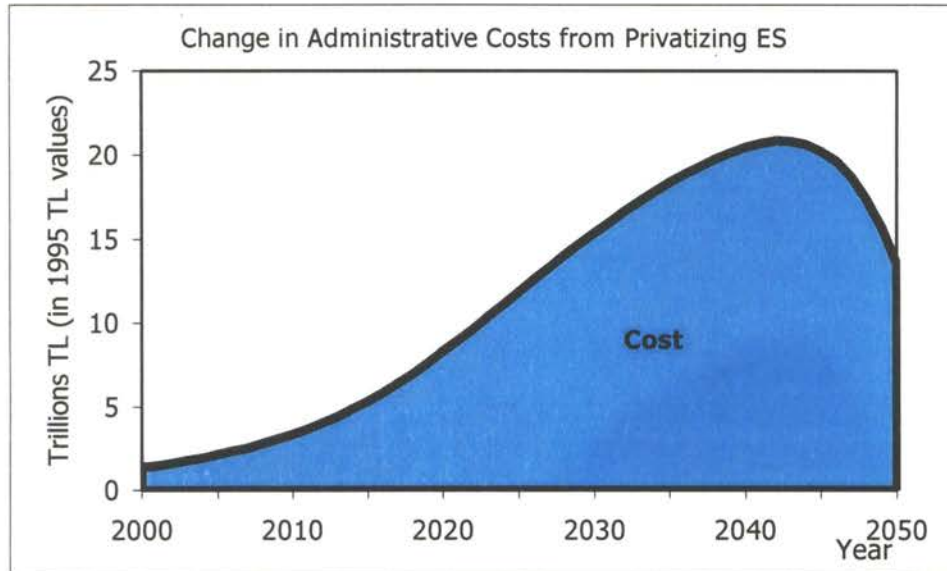
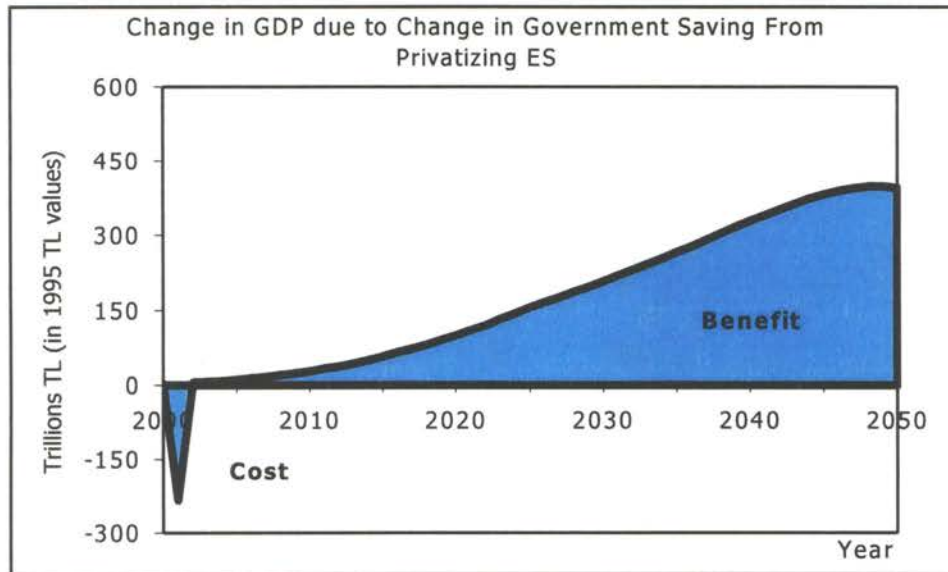


Figure 5.7. Changes in administrative costs from privatizing ES.  
Source: Author's own calculations.

### 5.3.3 Government Saving

The change in GDP due to the change in government saving from privatizing ES can be seen in figure 5.8. The area above the horizontal axis and under the curve represents social benefits while the area below the horizontal axis and the curve represents social costs. In the beginning two year-period, there would be social cost. However, for the remainder of the period, there would be a social benefit from privatizing.



5.8. Changes in GDP due to change in government saving from privatizing ES.  
Source: Author's calculations.

### 5.3.4 Private Saving

The change in GDP due to the change in private saving from privatizing ES can be seen in figure 5.9. During the transition period, the change in ES wealth has a positive impact on the economy. Although the positive impact continues through 2025, a large negative change in GDP would prevail in the second half of the period. While the first 26 year's accumulative benefit is TL 992 Trillion, the last 25 year's cost would be 8 times higher. Overall, the effect of privatizing ES on the private saving would contribute negatively to the nation's GDP.

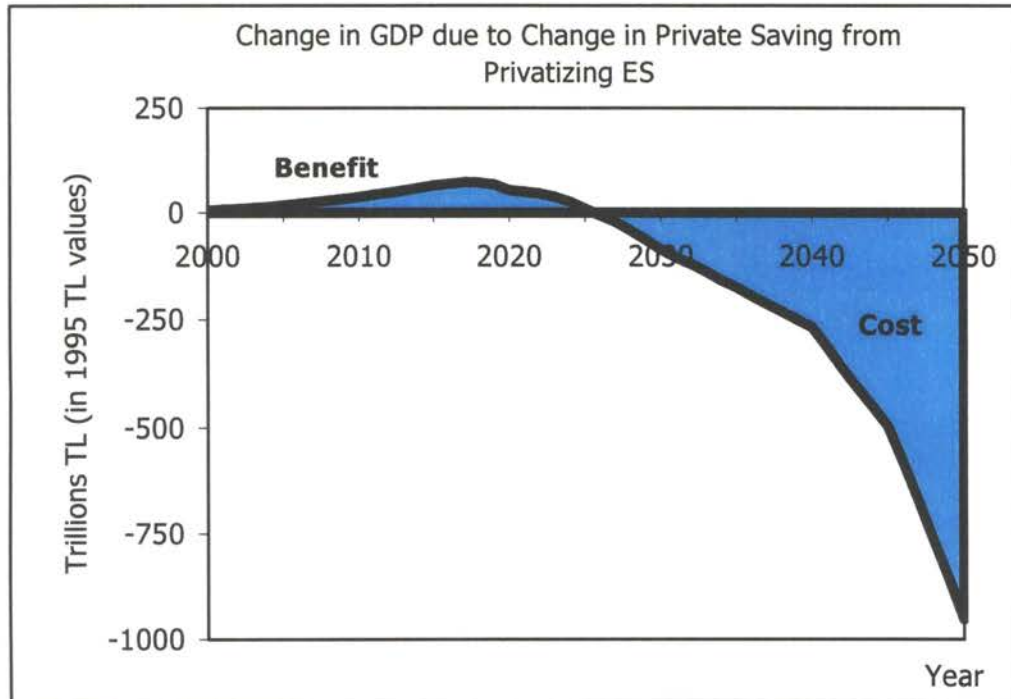


Figure 5.9. Change in GDP due to changes in private saving from privatizing ES.  
Source: Author's own calculations.

### 5.3.5 Net Benefits and Present Values of Net Benefits from Privatizing ES

Figure 5.10 shows the changes in net benefits and present values of net benefits. As can be seen, there are two distinct periods in the figure. From year 2000 through 2019, social costs prevail. During the second period, from 2020 to 2050, social benefits prevail. For the entire period, 2000-2050, PVdNB of ES equals TL 2,092 Trillion (in 1995 TL values). Thus, privatization of ES would generate a potential Pareto improvement.

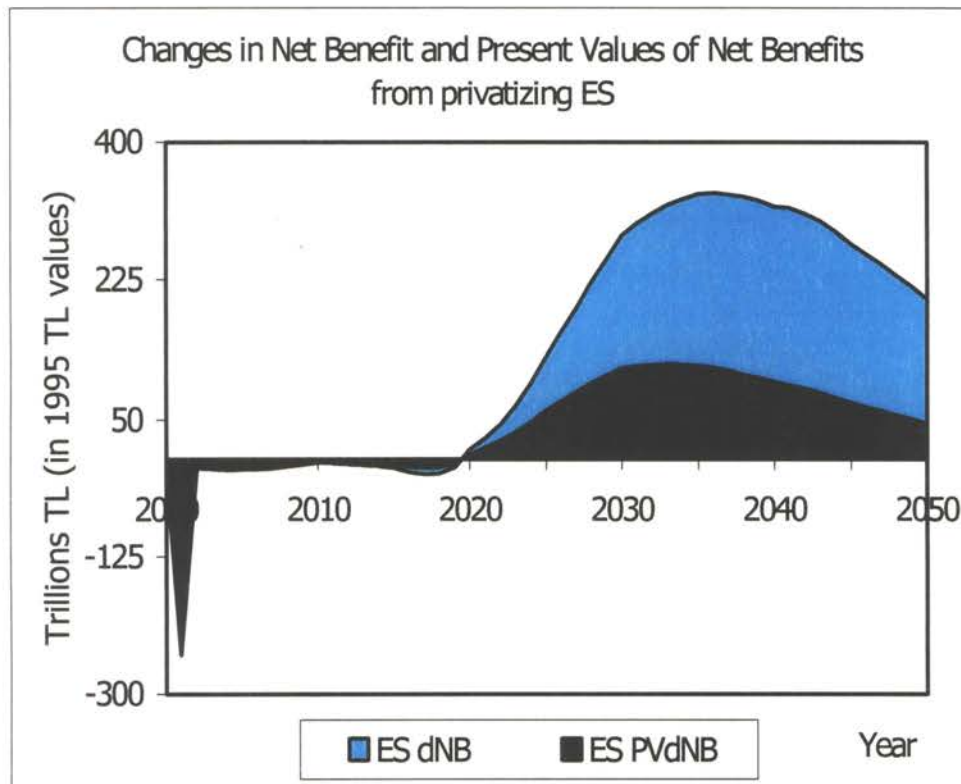


Figure 5.10. Change in net benefit and present values of net benefits from privatizing ES.  
Source: Author's own calculations.

## 5.4 Benefit-Cost Results from Privatizing BK

### 5.4.1 Marginal Welfare Cost of Taxation

Change in contribution rate of BK may have important welfare implications for two primary reasons. First, insurees in this institution pay the whole contribution; there is no employer contribution. Second, the rate of compliance may decrease if the rate of contribution increases rapidly. Figure 5.11 shows the changes in marginal welfare cost of taxation (dMWC) due to change in contribution rate for BK assuming no change in compliance. For the early transition years, the social cost of privatizing this institution increases. By the year 2023, however, the social cost disappears and social benefits begin

(as taxes fall) and increase at an increasing rate. Overall, the change in the contribution rate produces social benefits much larger than social costs.

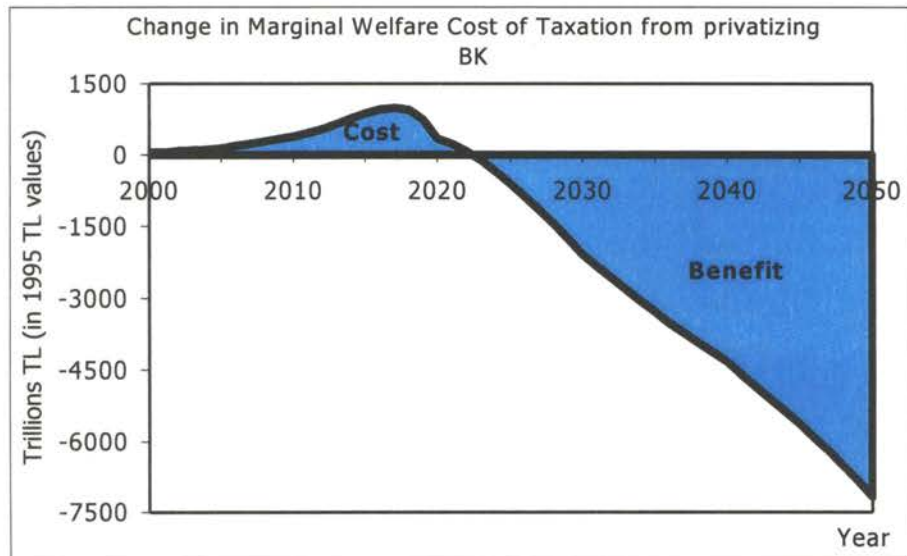


Figure 5.11. Change in marginal cost of taxation from privatizing BK.  
Source: Author's own calculations.

#### 5.4.2 Administrative Costs

Figure 5.12 shows the change in administration costs of BK. The area under the curve should be interpreted as social cost.

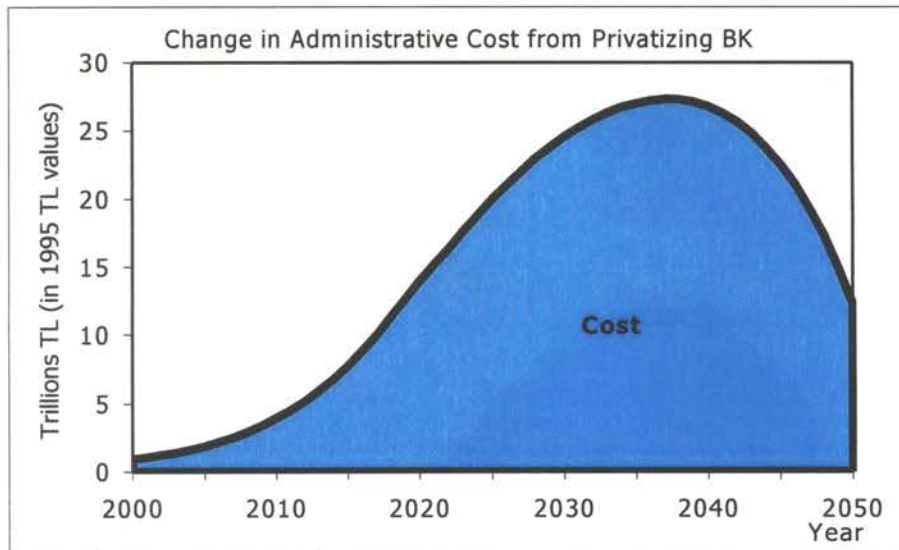


Figure 5.12. Changes in administrative costs from privatizing BK.  
Source: Author's own calculations.



Although it generates only social cost, it is relatively small if we compare this cost, for instance, with the marginal welfare cost of taxation. While the cumulative change in administration cost would be TL 789 Trillion, it only constitutes nearly 89 percent of the social benefit that would be generated in year 2026, alone, from the decline in the contribution rate.

### 5.4.3 Government Saving

As we stated in the previous section, contribution compliance is a real issue for this institution. This stems from the fact that the participants in this institution are self-employed. Thus, contribution compliance along with higher contributions may make it harder to generate enough revenue to pay necessary benefits. As a result, the treasury may have to transfer extra general revenue to this institution to pay benefits. This problem diminishes as privatization progresses. Ignoring compliance problems, the change in GDP due to the change in government saving would be positive as depicted in figure 5.13.

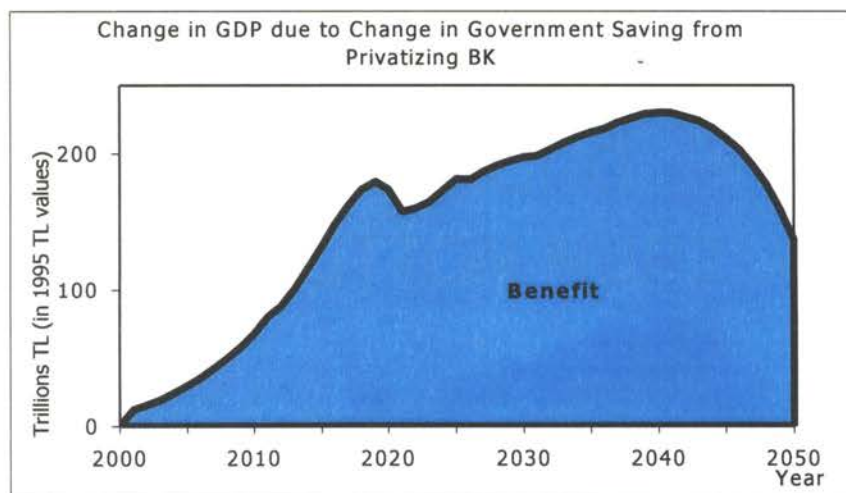


Figure 5.13. Change in GDP due to change in government saving from privatizing BK.  
Source: Author's own calculations.

#### 5.4.4 Private Saving

Figure 5.14 illustrates the change in GDP due to the change in private saving from privatizing BK. As with the other two institutions, the change in GDP due to change in private saving has two periods. The change in GDP during the first period is positive for about 23 years; it is negative, and much larger, for last 28 years. Net benefit for the entire period is negative.

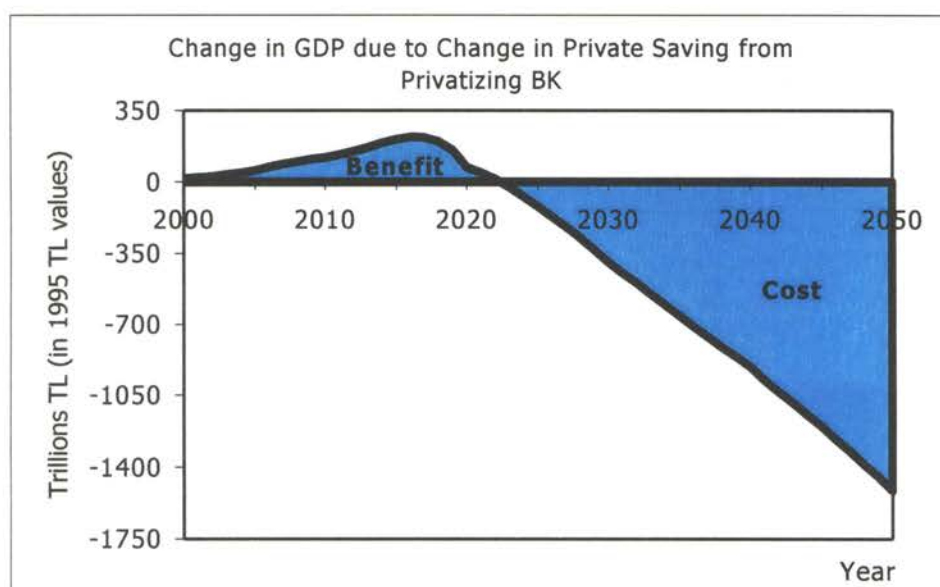


Figure 5.14. Change in GDP due to change in private saving from privatizing BK.  
Source: Author's own calculations.

#### 5.4.5 Net Benefits and Present Values of Net Benefits from Privatizing BK

The changes in net benefit and present value of net benefit are illustrated in figure 5.15. During the first 22-year period both the change in net benefit and present value of net benefit are negative, indicating that social cost is higher than social benefit. For the last 29 year-period, however, the reverse is true. For the whole period, the change in

present value of net benefit for BK is TL 22,448 Trillion (in 1995 TL values). Hence, privatization of BK would be a potential Pareto improvement.

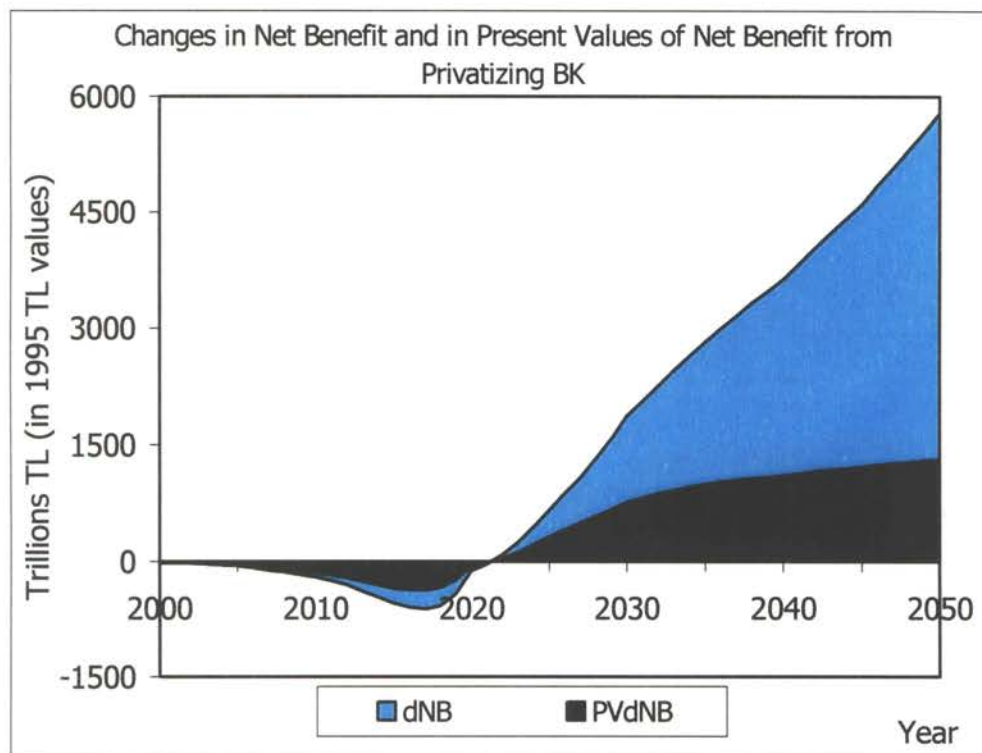


Figure 5.15. Changes in net benefits and in present values of net benefits for BK.  
Source: Author's own calculations.

### 5.5 Summary of Benefit-Cost Results for the Three Turkish Social Security Institutions

We have summarized the changes in present values of social benefits (PVdB), social costs (PVdC), and social net benefits (PVdNB) according to source, for each Turkish social security institution in table 5.1.<sup>14</sup> Changes in the marginal welfare cost of taxation (dMWC) due to the changes in social security contribution rates are reported in the first column. It is apparent in the table that the changes in the social security tax rates

<sup>14</sup> Benefit-cost results are reported in appendix A.1 for SSK, appendix A.2 for ES, and appendix A.3 for BK, in the appendixes.



yield both costs and benefits, in present value equivalents, for all three institutions. The present values of social costs result from additional higher contribution rates due to privatization (first 28 years for SSK, first 26 years for ES, and first 23 years for BK), and the present values of social benefits result from the lower contribution rates that prevail under privatization for the remaining years for each institution. The change in net social benefit ( $PVdNB = PVdB - PVdC$ ) due to  $dMWC$  is positive for each institution. They are TL 1,748 Trillion for SSK, TL 924 Trillion for ES, and TL 24,023 Trillion for BK. In fact, the marginal welfare cost of taxation due to privatization yields positive present values of net social benefit that constitute 29 percent of the total present value of net benefit for SSK, 44 percent for ES, and 107 percent for BK.

Changes in administrative costs have an unambiguous impact for all three institutions, as expected. However, they have small impacts on the present values of net social benefit. They contribute only 10 percent of the present value of the change in social cost for SSK, 6 percent for ES, and 2.5 percent for BK. The changes in administrative costs ( $dAC$ ) are presented in the second column in table 5.1.

The changes in GDP due to the changes in government saving are reported in the third column in table 5.1. The impact on the present value of net social benefits from the changes in GDP due to government saving is significantly larger than the impact of administrative costs. Changes due to government saving constitute the largest part of present value of net benefit for SSK and ES -50 percent, and 52 percent, respectively. These results were expected. As privatization progresses, the deficit or borrowing requirement of government declines. This, in turn, crowds in private investment, resulting in a significant positive impact on GDP.

The net effect of the change in private saving on GDP was negative for each institution. As Feldstein (1996b) states, upon privatization, additional taxes (or higher social security taxes) are necessary in the transition period. This reduces public retirement wealth, leading people to consume less and save more of their income. Hence, an increase in taxes causes a higher level of private saving. After the transition, however, taxes decline, causing public retirement wealth to increase. As a result, private saving declines. By looking at the column for  $dGDPp$  in table 5.1, we see the same pattern for all three institutions. The overall effect, in present value terms, however, is negative for each institution.

Of the four benefit-cost categories,  $dAC$  and  $dGDPp$  have negative net present values. In fact, the latter has greater negative present values of net benefit than the former for all three institutions. The present value of net benefit due to the change in administrative cost ( $dAC$ ) is approximately 47 percent of the  $PVdNB$  due to the change in GDP ( $dGDPp$ ) for SSK, 15 percent for ES, and 7 percent for BK.

In terms of benefits, while the largest source is the change in GDP due to change in government saving ( $dGDPg$ ) for SSK and ES, it is the change in taxes ( $dMWC$ ) that dominates for BK. In particular, 86 percent of the change in present value of benefit for BK comes from  $dMWC$ .

In table 5.1, the last column gives the horizontal summation for each institution. For SSK,  $PVdB$  is TL 12,604 Trillion,  $PVdC$  is 6,675 Trillion, and therefore,  $PVdNB$  is TL 5,929 Trillion, or significantly greater than zero. Similarly, ES' s  $PVdNB$  is TL 2,092 Trillion, and BK' s  $PVdNB$  is TL 22,448 Trillion. Thus, all three institutions have significantly positive  $PVdNB$ s. Therefore, based on these results, alone, privatizing the

three Turkish social security institutions would produce a potential Pareto improvement for Turkey.

TABLE 5.1.  
SUMMARY OF BENEFIT-COST RESULTS FOR THE THREE TURKISH SOCIAL SECURITY INSTITUTIONS (IN TRILLION TL)

| Type         | Benefit-Cost Sources |      |       |        | Total         |
|--------------|----------------------|------|-------|--------|---------------|
|              | dMWC                 | dAC  | dGDPg | dGDPp  |               |
| <b>PVdB</b>  |                      |      |       |        |               |
| SSK          | 5,441                | 0    | 6,254 | 909    | 12,604        |
| ES           | 2,322                | 0    | 3,188 | 648    | 6,158         |
| BK           | 30,393               | 0    | 3,256 | 1,737  | 35,385        |
| <b>PVdC</b>  |                      |      |       |        |               |
| SSK          | -3,693               | -660 | 0     | -2,322 | -6,675        |
| ES           | -1,398               | -228 | -228  | -2,212 | -4,066        |
| BK           | -6,369               | -317 | 0     | -6,251 | -12,937       |
| <b>PVdNB</b> |                      |      |       |        |               |
| SSK          | 1,748                | -660 | 6,254 | -1,413 | <b>5,929</b>  |
| ES           | 924                  | -228 | 2,960 | -1,564 | <b>2,092</b>  |
| BK           | 24,023               | -317 | 3,256 | -4,514 | <b>22,448</b> |

Source: Author's own calculations.

TABLE 5.2.  
IRR FOR THE THREE TURKISH SOCIAL SECURITY INSTITUTIONS

| IRR | %     |
|-----|-------|
| SSK | 10.94 |
| ES  | 9.30  |
| BK  | 11.86 |

Source: Author's own calculations.

Table 5.2 reports calculations of the internal rate of return (IRR) based on the data underlying table 5.1. These estimates are all significantly greater than zero. Whether they are greater than the best alternative rate is unknown.

### **5.6 Comparison between NB and Projected GDP**

Since a positive PVdNB for each institution indicates a potential Pareto improvement, but the reader may lack a relevant reference for determining how large these estimates are, it would be informative to compare the NB results for each institution with the projected GDP<sup>15</sup> for Turkey. A summary of these comparisons is shown in table 5.3. While NB constitutes only 0.18 percent of GDP in year 2000 for SSK, 0.09 percent for ES, and 0.24 percent for BK, the percentage increases over time. In 2025, for instance, it is 0.36 percent for SSK, 0.43 percent for ES, and 2.24 percent for BK. It is apparent that in first 26 years while taxes are high, the percentages are negative. However, for the last 25 years, during which taxes fall each year, the percentages are positive and increase rapidly. By year 2050, the percentages are 2.5 percent for SSK, 0.31 percent for ES and 9 percent for BK.

It should be noted that the NB for BK is by far the largest relative to GDP of the three institutions. This is due to the large contribution rate required to privatize BK. In other words, the privatization of BK increases national savings the most. Overall, the NB for the three institutions together constitutes around 0.5 to 12 percent of GDP from 2000 to 2050.

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15 Projected GDP are taken from ILO (1995b). Projected GDP series is reproduced for each year from 2000 to 2050 based on the method outlined in chapter 3. The results are reported in appendix A.4.

TABLE 5.3

COMPARISON BETWEEN NB AND PROJECTED GDP (IN TRILLION TL, 1995  
TL VALUES)

| Year            | GDP    | SSK    |              | ES    |              | BK     |              |
|-----------------|--------|--------|--------------|-------|--------------|--------|--------------|
|                 |        | NB     | Ratio to GDP | NB    | Ratio to GDP | NB     | Ratio to GDP |
| 2000            | 10,464 | -18.4  | -0.18%       | -9.4  | -0.09%       | -25.5  | -0.24%       |
| 2005            | 13,937 | -31.8  | -0.23%       | -13.4 | -0.10%       | -56.7  | -0.41%       |
| 2010            | 16,956 | -34.3  | -0.20%       | -4.0  | -0.02%       | -201.5 | -1.19%       |
| 2015            | 20,630 | -82.0  | -0.40%       | -12.0 | -0.06%       | -541.6 | -2.63%       |
| 2020            | 25,099 | -93.2  | -0.37%       | 11.8  | 0.05%        | -112.9 | -0.45%       |
| 2025            | 29,808 | 108.3  | 0.36%        | 129.2 | 0.43%        | 666.7  | 2.24%        |
| 2030            | 35,401 | 436.9  | 1.23%        | 281.8 | 0.80%        | 1865.5 | 5.27%        |
| 2035            | 41,040 | 708.8  | 1.73%        | 333.9 | 0.81%        | 2823.6 | 6.88%        |
| 2040            | 47,577 | 1050.9 | 2.21%        | 317.6 | 0.67%        | 3618.0 | 7.60%        |
| 2045            | 55,155 | 1356.8 | 2.46%        | 270.1 | 0.49%        | 4608.3 | 8.36%        |
| 2050            | 63,939 | 1575.8 | 2.46%        | 201.3 | 0.31%        | 5783.3 | 9.05%        |
| 51 year average |        |        | 0.78%        |       | 0.27%        |        | 2.97%        |

Source: Author's own calculations, based partly on data in ILO (1995b).

### 5.7 Sensitivity Analysis

The benefit-cost results are based on a number of assumptions that were stated in chapter 1. In this section, we make changes in key parameters that appear to be most likely to affect PVdNB, and provide estimates of the effects of these changes.

We estimated the sensitivity effects in two different ways: first we changed one parameter value at a time and added each change independent of all other changes to the original level. In the second method, the adjustments were aggregated in the order they were introduced and applied to the original level. This method essentially is a combination of changing all parameter values. Details are given below.

### **5.7.1 Independent Adjustments**

As mentioned above, each adjustment was first made independently and applied to the original level, so the change in the original level reflects only the one adjustment made.

#### **5.7.1.1 Adjustment for Risk**

We have assumed and used a 9 percent real rate of return (ROR) on the balances in the privatization trust funds. Given the dynamic nature of the Turkish economy this rate may be justified. In fact, TUSIAD (1997) used this rate in its privatization study. However, this method does not account for variations in returns.

We use two methods to account for such variation. One reduces the 9 percent ROR by risk premia. The other increases the contribution rate.

Two risk premia are used: 2 percent and 4 percent. The 2 percent premium reduces the ROR to 7 percent, or about half of the 14.06 percent ROR earned on Turkish equities from 1990-1999.<sup>16</sup> The 4 percent premium reduces the ROR to approximately the level considered by Feldstein and Samwick as a certainty equivalent for a U.S. 9 percent ROR.

Table 5.4 summarizes sensitivity results that are obtained by the risk premium adjustments. Using a 7 percent real rate of return yields TL 3,857 Trillion of PVdNB for SSK, a 35 percent reduction. In case of ES, the PVdNB declines 27 percent from TL 2,092 to TL 1,536 Trillion. The decline for BK is also 27 percent. While the substitution of 7 percent for the 9 percent used in the original calculations reduces the PVdNB as we expected, all three institutions still have large positive PVdNBs.

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<sup>16</sup> Real interest rate in the 1990s are as follows (%): 1990, 14.2, 1991, 9.1, 1992, 10.3, 1993, 16.3, 1994, 16.7, 1995, 13.2, 1996, 17.3, 1997, 2.6, 1998, 15.7, and 1999, 25.2. These rates are taken from IMF Staff Country Report No: 00/14, February 2000, page 14. See report for details.

When the 5 percent real rate of return is substituted for 9 percent, the resultant PVdNBs are still positive for all three institutions. They are TL 1,477 Trillion for SSK, TL 798 Trillion for ES, and TL 9,164 Trillion for BK. The reduction from the original PVdNBs is 75 percent for SSK, 62 percent for ES, and 59 percent for BK.

In a recent article, Feldstein (1997) indicates that a 50 percent increase in the contribution rate (from 2 to 3 percent) to a U.S. privatization trust fund (coupled with the continuation of the present system during a phase-in period) would “virtually rule out the possibility –less than one chance in 1,000 – of not being able to fund”<sup>17</sup> benefits.

Assuming that such an increase for Turkey would virtually eliminate risk as well, we increased the contribution rate for all three Turkish institutions.

The results are presented in table 5.5. The original values of PVdNB are reported in the first three rows. The middle three rows show the results of the PVdNB after introducing 50 percent ISA tax increase for each institution. The last three rows show the change in the PVdNB between the original values and values after the increase in the ISA tax rate by 50 percent. For instance, in the column dMWC for SSK, the original PVdMWC is TL 1,748 Trillion. After the ISA tax rate is increased by 50 percent, PVdMWC becomes negative, TL -3,912 Trillion. The total effect of the increase in the tax rate is to reduce PVdMWC by TL 5,660 Trillion. Overall, the increase in the ISA tax rate for BK causes PVdNB to fall from TL 22,448 Trillion to TL 11,420 Trillion, a 49 percent reduction.

Application of higher ISA tax to SSK and ES has surprisingly positive results. The change in PVdNB after the increase in the ISA tax rate for SSK is 78 percent and for ES it is 94 percent. These results are easily explained, however: the higher tax rates force

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<sup>17</sup> Feldstein (1997, p. 38)

an increase in national saving, resulting in larger future GDP. This effect shows up clearly in the columns for both government and private savings.

TABLE 5.5

SENSITIVITY RESULTS: ISA TAX RATE INCREASE BY 50 PERCENT (TRILLION TL, 1995 TL VALUES)

| Values                        | Institution | dMWC    | dAC    | dGDPg  | dGDPp  | Total PVdNB    |
|-------------------------------|-------------|---------|--------|--------|--------|----------------|
| Original                      | SSK         | 1,748   | -660   | 6,254  | -1,413 | <b>5,929</b>   |
|                               | ES          | 924     | -228   | 2,960  | -1,564 | <b>2,092</b>   |
|                               | BK          | 24,023  | -317   | 3,256  | -4,514 | <b>22,448</b>  |
| ISA Tax Rate Increase by 50 % | SSK         | -3,912  | -1,313 | 15,480 | 326    | <b>10,581</b>  |
|                               | ES          | -1,572  | -457   | 6,128  | -40    | <b>4,058</b>   |
|                               | BK          | 1,670   | -816   | 10,196 | 370    | <b>11,420</b>  |
| Change                        | SSK         | -5,660  | -653   | 9,226  | 1,739  | <b>4,652</b>   |
|                               | ES          | -2,496  | -229   | 3,168  | 1,524  | <b>1,966</b>   |
|                               | BK          | -22,353 | -499   | 6,940  | 4,884  | <b>-11,028</b> |

#### 5.7.1.2 Adjustment for Discount Rate

We have used a real discount rate of 3 percent as a proxy for a high-end estimate of the social rate of time preference. For sensitivity analysis, we apply rates of 2 and 4 percent. While we expect an increase in PVdNB when substituting 2 percent for 3 percent, the reverse is expected if 4 percent used instead of 3. Table 5.4 shows the results. It should be noted that even though the rate of decrease and increase in the real discount rate is the same ( $\pm 0.01$  or  $\pm 33.3$  percent), the changes in the results are not same. For instance, there is a 58 percent increase in PVdNB for SSK as a result of the decrease in discount rate to 2 percent. When 4 percent is used instead, the decline in PVdNB is only about 38 percent. This behavior is the same for the other two institutions. Although the



effect of changing the real discount rate to 4 percent causes one of the largest declines in the PVdNB for all three institutions, the resultant PVdNBs are still significantly greater than zero.

This is not a surprising result. In fact, the IRRs reported earlier indicate that PVdNB will remain positive for real rates up to the range of 9-11 percent. These are well out of the range of reasonable adjustment.

#### **5.7.1.3 Adjustment for the Average Age of Capital**

The estimates of the changes in GDP due to both government and private saving depend upon the assumed economic life of additions to capital stock. We assumed for our original calculations that each addition to the capital stock will be used for ten years during which time there will be no productivity decline from these additions. This assumption may be unrealistic, however, it appears to have no central importance for this study. We cut the average age of capital first by a year and then later by two years. For a 9 year average age of capital, as can be seen in table 5.4, there was only TL 114 Trillion reductions in PVdNB for SSK. It was TL 26 Trillion for ES. However, it increased PVdNB of BK by TL 109 Trillion.

Using 8 years as the average age of capital, a similar pattern prevailed: no significant changes in PVdNB occurred. Thus, PVdNB for all three institutions is not sensitive to this parameter.

#### **5.7.1.4 Adjustment for Labor Supply Elasticity**

We followed Browning's (1987) partial equilibrium model of the welfare cost of taxation. In his study, Browning gives the range of labor supply elasticity to be between 0.2 and 0.4. We used a labor supply elasticity of 0.2, from Sayan and Kenc (1999), in

original calculation. We changed it  $\pm 0.1$  to see how results would change, however. Using 0.3 for the labor supply elasticity, the PVdNB increased by TL 874 Trillion for SSK, TL 462 Trillion for ES, and TL 12,011 Trillion for BK as shown in table 5.4. By substituting 0.1 for 0.2, almost exactly the same amount of change in PVdNB occurred in the opposite direction for each institution. The change in the elasticity of labor supply has significant effect on BK, only, about a 53.5 percent change in PVdNB. This may be attributed to the high contribution rate necessitated with this institution. These rates make individuals under this institution highly sensitive to changes in supply elasticity.

#### **5.7.1.5 Adjustment for Administrative Costs**

As mentioned in several places in this study, one of the problems with privatizing social security is the expected additional administrative cost. We assumed administrative costs equal to one percent of gross assets for the privatization trust funds in our original calculations. We increased this rate by 100 percent in the sensitivity analysis. As can be seen in the last row of table 5.4, it reduces the PVdNB by TL 1,327 Trillion or 22 percent for SSK, 17.5 percent for ES, and 16.5 percent for BK.

Overall, the PVdNB is highly dependent upon the real rate of return, the real discount rate, and administration costs. No significant effect on PVdNB occurs from changing either the average age of capital or elasticity of labor supply parameters.

TABLE 5.4. SENSITIVITY RESULTS: CHANGE FROM REFERENCE LEVEL (IN TRILLION TL, 1995 TL VALUES, PERCENT)

| Measure                 | Parameter Value | SSK   |                  |       |                | ES    |                  |       |                | BK     |                  |        |                |
|-------------------------|-----------------|-------|------------------|-------|----------------|-------|------------------|-------|----------------|--------|------------------|--------|----------------|
|                         |                 | PVdNB | $\partial$ PVdNB | IRR   | $\partial$ IRR | PVdNB | $\partial$ PVdNB | IRR   | $\partial$ IRR | PVdNB  | $\partial$ PVdNB | IRR    | $\partial$ IRR |
| Reference               | Original Value  | 5,930 |                  | 10.94 |                | 2,092 |                  | 9.30  |                | 22,449 |                  | 11.86  |                |
| Risk Adj                | 7%              | 3,857 | -2,073           | 7.45  | -3.49          | 1,536 | -556             | 7.36  | -1.94          | 16,377 | -6,072           | 8.84   | -3.02          |
| Risk Adj (2)            | 5%              | 1,477 | -4,453           | 4.48  | -6.46          | 798   | -1,294           | 5.06  | -4.24          | 9,164  | -13,285          | 6.06   | -5.80          |
| Disc. Adjustment        | 2%              | 9,375 | 3,445            | 11.46 | 0.52           | 3,190 | 1,098            | 9.52  | 0.22           | 34,022 | 11,573           | 12.04  | 0.18           |
| Disc. Adjustment        | 4%              | 3,690 | -2,240           | 10.50 | -0.44          | 1,335 | -757             | 9.08  | -0.22          | 14,737 | -7,712           | 11.71  | -0.15          |
| Disc. Adjustment        | 5%              | 2,228 | -3,702           | 10.10 | -0.84          | 814   | -1,278           | 8.88  | -0.42          | 9,577  | -12,872          | 11.58  | -0.28          |
| Capital Age             | 9 Year          | 5,816 | -114             | 10.68 | -0.26          | 2,066 | -26              | 9.20  | -0.10          | 22,558 | 109              | 11.54  | -0.32          |
| Capital Age             | 8 Year          | 5,709 | -221             | 10.43 | -0.51          | 2,019 | -73              | 9.02  | -0.28          | 22,504 | 55               | 11.70  | -0.16          |
| Labor Supply Elasticity | 0.3             | 6,804 | 874              | 8.12  | -2.82          | 2,554 | 462              | 7.71  | -1.59          | 34,460 | 12,011           | 10.83  | -1.03          |
| Labor Supply Elasticity | 0.1             | 5,055 | -875             | 52.75 | 41.81          | 1,630 | -462             | 13.10 | 3.80           | 10,437 | -12,012          | 239.12 | 227.26         |
| Administration Costs    | 2%              | 4,603 | -1,327           | 8.84  | -2.10          | 1,725 | -367             | 8.24  | -1.06          | 18,743 | -3,706           | 10.11  | -1.75          |

### **5.7.2. Combined Adjustment: The Intermediate Case**

Here adjustments were aggregated in the order they were introduced and applied to the original level. This method essentially is a combination of changing all parameter values. Table 5.6 presents these results.

First the combination of 7 percent real rate of return and 4 percent discount rate were used. The decrease in PVdNB is TL 1,794 Trillion for SSK, TL 671 Trillion for ES, and TL 6,283 Trillion for BK. When we introduced first 9 year and then 8-year average age of capital to the same combination, the results did not change significantly, as can be seen in forth and fifth rows of table 5.6. Further, we add elasticity of labor supply of 0.3 and 0.1 in the combination, the results are still positive in either case. It should be noted that adding elasticity of labor supply changes BK' s PVdNB significantly. Lastly, adding administrative cost parameter to the combination, the PVdNB becomes smaller for each institution, but still they are positive.

### **5.7.3. Combined Adjustment: The Worst Case**

There are many combinations of parameters possible. To establish a lower bound for PVdNB, however, we estimated what appears to be the worst-case scenario. This is a scenario in which the ROR is 5 percent, the discount rate is 4 percent, the elasticity of labor supply is 0.1, and administrative costs are doubled. Under these circumstances the PVdNB falls to TL 1,171 Trillion for SSK, to TL 759 Trillion for ES, and to TL 1,596 Trillion for BK, as reported in the last row of table 5.6. Even in this most conservative case, we still get positive present values of social net benefits.<sup>18</sup>

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<sup>18</sup> The only combination of parameters that produces negative net present values, with the exception of BK, is the same combination mentioned above with using the 0.3 value of the elasticity of labor supply in the combination instead of 0.1. The resultant PVdNB is TL -3,315 Trillion for SSK, TL-1,142 Trillion for ES, and TL 298 Trillion for BK.

TABLE 5.6. SENSITIVITY RESULTS: COMBINED ADJUSTMENTS (IN TRILLION TL, 1995 TL VALUES, PERCENT)

| Measure   | Parameter Value                                     | SSK   |                  |       |                | ES    |                  |       |                | BK     |                  |       |                |
|---|---|-------|------------------|-------|----------------|-------|------------------|-------|----------------|--------|------------------|-------|----------------|
|   |   | PVdNB | $\partial$ PVdNB | IRR   | $\partial$ IRR | PVdNB | $\partial$ PVdNB | IRR   | $\partial$ IRR | PVdNB  | $\partial$ PVdNB | IRR   | $\partial$ IRR |
| Reference   | Original Value                                      | 5,930 |                  | 10.94 |                | 2,092 |                  | 9.30  |                | 22,449 |                  | 11.86 |                |
| Risk Adj.   | 7%  | 3,858 | -2,072           | 7.45  | -3.49          | 1,536 | -556             | 7.36  | -1.94          | 16,377 | -6,072           | 8.84  | -3.02          |
| Disc. Adjustment  | 4%  | 2,064 | -1,794           | 7.14  | -0.31          | 865   | -671             | 7.11  | -0.25          | 10,094 | -6,283           | 8.77  | -0.07          |
| Capital Age   | 9 Year  | 2,038 | -26              | 7.09  | -0.05          | 857   | -8               | 7.08  | -0.03          | 10,084 | -10              | 8.75  | -0.02          |
| Capital Age   | 8 Year  | 1,929 | -109             | 6.89  | -0.20          | 853   | -4               | 7.06  | -0.02          | 10,070 | -14              | 8.72  | -0.03          |
| Labor Supply Elasticity   | 30%   | 1,422 | -507             | 5.27  | -1.62          | 630   | -223             | 5.38  | -1.68          | 14,744 | 4,674            | 8.14  | -0.58          |
| Labor Supply Elasticity   | 10%   | 2,705 | 776              | 26.27 | 19.38          | 1,066 | 213              | 12.02 | 4.96           | 5,424  | -4,646           | 12.54 | 3.82           |
| Administration Costs  | 2%  | 2,127 | -578             | 19.38 | -6.89          | 964   | -102             | 11.45 | -0.57          | 4,005  | -1,419           | 9.76  | -2.78          |
| <b>The Worst Case:</b><br>A combination of:<br>ROR, Disc. Rate,<br>Adm. Costs, and $\eta$ | ROR 5%<br>D. R 4%<br>Adm.<br>Costs 2%<br>$\eta=0.1$ | 1,171 | -4,759           | 8.62  | 2.32           | 759   | -1,333           | 9.65  | -0.35          | 1,596  | -20,853          | 5.93  | -5.93          |

## 5.8 Privatization Impact on Representative Individuals

Up to now, we have analyzed benefits and costs from a social perspective. The positive net present values of social benefits that we obtained cover the period, 2000 to 2050. However, not everyone will gain from privatization. Results of a similar analysis for the U.S. by Feldstein and Samvick (1998) suggest that many current Turkish workers would experience reductions in the wealth they get under the current law pay-as-you-go system. This is because they will pay higher taxes, but receive the same level of benefits that they would have received without privatization.

To see if this is also the case for Turkey, we calculated the change in wealth expected from privatizing each of the Turkish institutions for representative individuals born between 1945 and 1985. Each representative individual is assumed to earn the monthly average wage reported in ILO (1996b), to be in the labor force every year from age 25 to 60, and get retirement benefits until age 75.<sup>19</sup> The amount of the average yearly benefits assumed to be same one in ILO (1995b) that was converted to annual data using the procedure outlined in chapter 3.

For each representative individual, under each Institution, four measures were calculated: the present value of benefits with privatization (PVPB), the present value of benefits with the current law pay-as-you-go system (PVCLB), the present value of contributions with privatization (PVPC), and the present value of contributions with the current law pay-as-you-go system (PVCLC). The change in wealth for each representative individual is equal to  $(PVPB - PVCLB)$  minus  $(PVPC - PVCLC)$ .

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<sup>19</sup> This age is inline with the life expectancy in Turkey.

Table 5.7 presents a summary of the changes in public retirement wealth for representative individuals born between 1945 and 1985. For each institution, the results are presented with and without a risk adjustment on privatization tax rates. With risk adjustment, tax rates under privatization must be higher to maintain trust fund solvency.

The results show that all representative individuals born 1945 and 1980 suffer net losses in wealth with the privatization associated with SSK and ES. Under BK, those individuals born between 1945 and 1975 suffer a reduction in wealth. Only those who are born after 1980 would experience a net gain in wealth under SSK and ES in the without risk adjustment case. All representative individuals born between 1980 and 1985 would gain net wealth under BK, in the non-risk adjustment case. No individuals gain wealth in the risk-adjustment case.

By looking the trend in the table, we can presumably conclude that all representative individuals born after 1985 would experience net gains from privatizing all the three Turkish social security institutions in the no-risk case. There are no data available, however, to support the calculations necessary to determine when individuals start to gain wealth in the risk-adjustment case.

TABLE 5.7 CHANGE IN WEALTH FOR REPRESENTATIVE INDIVIDUALS, BY  
YEAR OF BIRTH AND INSTITUTION, MILLION TL (IN 1995 TL VALUES)

| Years of Birth | Change in Wealth    |               |                     |               |                     |               |
|----------------|---------------------|---------------|---------------------|---------------|---------------------|---------------|
|                | SSK                 |               | ES                  |               | BK                  |               |
|                | W/O Risk Adjustment | Risk Adjusted | W/O Risk Adjustment | Risk Adjusted | W/O Risk Adjustment | Risk Adjusted |
| 1945           | -125                | -208          | -111                | -184          | -356                | -589          |
| 1950           | -341                | -558          | -293                | -484          | -964                | -1574         |
| 1955           | -643                | -1047         | -545                | -899          | -1781               | -2914         |
| 1960           | -971                | -1613         | -793                | -1356         | -2435               | -4239         |
| 1965           | -1193               | -2122         | -894                | -1708         | -2359               | -4968         |
| 1970           | -1169               | -2394         | -794                | -1872         | -1724               | -5166         |
| 1975           | -871                | -2367         | -527                | -1839         | -654                | -4856         |
| 1980           | -292                | -1980         | -73                 | -1553         | 914                 | -3827         |
| 1985           | 532                 | -1279         | 618                 | -970          | 2895                | -2191         |



## CHAPTER 6

### CONCLUSIONS AND RECOMMENDATIONS

#### 6.1 Conclusions

Due to the effects of adverse demographic developments on pay-as-you-go social security systems, several developed and developing countries have moved toward privatizing their publicly managed retirement systems. Although the causes of social security insolvency are not the same as in other countries, Turkey has also been facing social security financial problems since the early 1990s. As deficit of the three social security institutions increased rapidly, Turkey adopted a new social security law in 1999 to reform the system and keep the deficit at least under control. The new law did not introduce reforms sufficient to solve the long-run financial insolvency of the pay-as-you-go Turkish system, however.

The main objective of this dissertation was to investigate, by applying a benefit-cost model, whether privatizing the three Turkish social security institutions would be economically superior to the current pay-as-you-go system, given a set of relevant assumptions.

As shown in chapter 3, the current pay-as-you-go system would require much higher effective social security contribution rates for the next 50 years in order to pay promised benefits. With the current system, the deficit (the difference between statutory and effective contribution rates) would not disappear during the study period, 2000-2050. The higher taxes required to finance the deficit would probably distort the labor market equilibrium so severely that a substantial welfare cost of such taxes would occur along with a lower level of national saving, resulting in a smaller GDP for each year.

We have identified the sources of benefits and costs associated with privatizing the three Turkish social security institutions. By applying the conventional benefit-cost model, we obtained results that indicate a long-run economic gain from privatizing the three Turkish social security institutions. A number of sensitivity analyses were conducted to check the robustness of our findings. Even in the case combining parameters most likely to negatively affect present values the most, the present values of net benefits for all institutions still remain positive. Therefore, our analysis indicates, from a social point of view, that privatizing the three Turkish social security institutions would quite likely produce a net economic gain in the long run. This would be achieved for future generations, however, at the expense of the current working population. Thus, from an individual standpoint, privatization would be a mixed blessing. As our analysis shows, the impact of privatization on representative individuals is negative for those who born before 1980. Our finding shows that older workers would be losers from privatization, while younger employees and their children would be net gainers. Specifically, those who will be working between 2000 and 2025 would be net losers since they would pay very high contribution rates. Those who would enter the labor force after 2025 would pay relatively low taxes and therefore be better off, *ceteris paribus*.

## **6.2 Policy Recommendations**

Our results indicate that the privatization of SSK and BK should be given serious and immediate attention. These two institutions require significantly higher effective tax rates (rates required to avoid a deficit) for the whole period, 2000-2050, under current law. Specifically, the effective tax rate for SSK under current law would be higher than the statutory rate for the entire period, and both rates would become equal at the end of

the period. However, under privatization, the effective tax rate for SSK would be half of the statutory tax rate at the end of the period. As a result, the present value of net benefits from privatizing SSK is substantial. As for BK, the effective tax rate under current law would increase rapidly and it would be 100 percent higher than the statutory tax rate, and it would not decrease. Given the self-employed, and therefore self-contributed characteristics of the scheme, it probably cannot function at this high contribution rate. Our calculation shows that the effective tax rate under privatization would be higher than the effective rate under current law for the first 22 years. It will be smaller, however, for the rest of the period. In fact, at the end of the period, the effective privatization rate would be less than the statutory rate. As a result, the present value of net benefits from privatizing BK is also huge. It is hard to escape the conclusion, therefore, that the privatization of both BK and SSK are matters for urgent consideration.

Our results show that the present value of net benefit from privatizing ES is positive, leading us to conclude that ES is also a viable candidate for privatization. However, it is not as urgent as the other two institutions. The high statutory contribution rate of ES keeps it from having a large deficit. On the contrary, the low contribution rates and contribution bases for both SSK and BK under current law pay-as-you-go system make these two institutions have large and unsustainable deficits for the whole period, 2000-2050.

Our analysis shows that the net benefit of SSK and BK from privatizing, in year 2050 alone, is 2.46 percent, and 9.05 percent of GDP, respectively. This fact, alone, is sufficient to attract immediate attention to privatization or other reform options for these two institutions.

### **6.3 Suggestions for Further Research**

This study is the first that conducts a benefit cost analysis of the Turkish social security system. We believe that there are many issues that need to be addressed by further research. One important issue is the assumed real rate of return on capital in Turkey. There is no clear-cut estimation of this rate based on Turkish data. There is also a need for better Turkish-specific estimates of the compensated elasticity of labor supply and the aggregate marginal tax rate. And there is a need to know more about the impact of privatization on the Turkish capital market, the empirical dimensions of administrative costs, the effects of different types of taxes to finance social security deficits, and the relationship between private saving and Turkish social security. Further research is also needed on the relationships between the income and age distributions and social security privatization. In fact, studies from political economy perspective on the privatization issue deserve further research and may be fruitful.

Our analysis is partly based on ILO' s data that were produced in 1995-1996. We have adjusted these data for inflation, but recent high inflation rates may require additional adjustments. Finally, we assumed in this study the imposition of a gradual Feldsteinian-type privatization that is essentially based on a two-tiered system. Additional studies could be done, assuming different privatization schemes.

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## **Appendixes**

APPENDIX A.1. BENEFIT-COST RESULTS FOR SSK

(In Present Values, Trillion TL)

| Year | dMWC   | dAC   | dGDPg | dGDPp | PVdNB        |
|------|--------|-------|-------|-------|--------------|
| 2000 | -31.0  | -2.9  | 8.6   | 6.9   | <b>-18.4</b> |
| 2001 | -37.0  | -3.1  | 10.4  | 8.4   | <b>-21.2</b> |
| 2002 | -43.6  | -3.3  | 13.3  | 10.3  | <b>-23.2</b> |
| 2003 | -50.4  | -3.6  | 16.5  | 12.4  | <b>-25.0</b> |
| 2004 | -58.0  | -3.8  | 20.5  | 15.0  | <b>-26.4</b> |
| 2005 | -65.8  | -4.1  | 24.6  | 17.9  | <b>-27.4</b> |
| 2006 | -81.6  | -4.4  | 27.2  | 22.6  | <b>-36.2</b> |
| 2007 | -90.9  | -4.7  | 34.2  | 25.6  | <b>-35.7</b> |
| 2008 | -98.7  | -5.1  | 39.8  | 28.4  | <b>-35.6</b> |
| 2009 | -106.2 | -5.4  | 45.9  | 31.1  | <b>-34.6</b> |
| 2010 | -107.0 | -5.8  | 55.3  | 32.0  | <b>-25.5</b> |
| 2011 | -128.8 | -6.3  | 57.8  | 37.3  | <b>-40.0</b> |
| 2012 | -144.3 | -6.8  | 68.5  | 40.5  | <b>-42.1</b> |
| 2013 | -161.1 | -7.3  | 77.4  | 43.8  | <b>-47.2</b> |
| 2014 | -180.2 | -7.9  | 87.2  | 47.5  | <b>-53.4</b> |
| 2015 | -193.5 | -8.6  | 100.0 | 49.4  | <b>-52.6</b> |
| 2016 | -210.9 | -9.2  | 108.3 | 52.0  | <b>-59.9</b> |
| 2017 | -225.7 | -9.9  | 117.5 | 53.6  | <b>-64.5</b> |
| 2018 | -237.2 | -10.7 | 126.5 | 54.3  | <b>-67.0</b> |
| 2019 | -240.5 | -11.5 | 134.4 | 53.2  | <b>-64.4</b> |
| 2020 | -227.8 | -12.3 | 139.8 | 48.7  | <b>-51.6</b> |
| 2021 | -217.1 | -13.1 | 142.4 | 47.0  | <b>-40.7</b> |
| 2022 | -202.5 | -14.0 | 148.9 | 44.5  | <b>-23.1</b> |
| 2023 | -180.9 | -14.9 | 153.7 | 40.4  | <b>-1.6</b>  |
| 2024 | -151.7 | -15.8 | 156.5 | 34.5  | <b>23.5</b>  |
| 2025 | -115.5 | -16.6 | 157.1 | 26.7  | <b>51.7</b>  |
| 2026 | -73.5  | -17.4 | 150.3 | 17.5  | <b>77.0</b>  |
| 2027 | -31.4  | -18.1 | 146.1 | 7.7   | <b>104.4</b> |
| 2028 | 14.8   | -18.7 | 139.2 | -3.7  | <b>131.6</b> |
| 2029 | 62.5   | -19.2 | 130.1 | -16.3 | <b>157.0</b> |
| 2030 | 111.0  | -19.7 | 118.5 | -29.8 | <b>180.0</b> |
| 2031 | 138.7  | -20.1 | 105.0 | -38.9 | <b>184.7</b> |
| 2032 | 163.4  | -20.4 | 96.2  | -47.9 | <b>191.4</b> |
| 2033 | 186.7  | -20.6 | 99.0  | -57.2 | <b>207.9</b> |
| 2034 | 206.7  | -20.7 | 111.3 | -66.2 | <b>231.1</b> |
| 2035 | 224.2  | -20.8 | 123.4 | -74.9 | <b>251.9</b> |
| 2036 | 239.2  | -20.8 | 135.1 | -83.7 | <b>269.9</b> |
| 2037 | 250.1  | -20.7 | 148.4 | -91.5 | <b>286.3</b> |
| 2038 | 258.9  | -20.4 | 160.9 | -99.0 | <b>300.4</b> |

APPENDIX A.1. CONTINUES

|              |               |               |               |                |               |
|--------------|---------------|---------------|---------------|----------------|---------------|
| 2039         | 264.6         | -20.1         | 173.4         | -105.6         | <b>312.3</b>  |
| 2040         | 269.0         | -19.8         | 184.8         | -112.0         | <b>322.1</b>  |
| 2041         | 281.2         | -19.3         | 195.8         | -121.0         | <b>336.7</b>  |
| 2042         | 290.7         | -18.7         | 202.1         | -129.3         | <b>344.9</b>  |
| 2043         | 296.7         | -17.9         | 208.7         | -136.0         | <b>351.4</b>  |
| 2044         | 300.8         | -17.1         | 214.2         | -142.0         | <b>355.9</b>  |
| 2045         | 302.9         | -16.2         | 219.2         | -147.1         | <b>358.8</b>  |
| 2046         | 310.1         | -15.1         | 223.3         | -154.3         | <b>364.0</b>  |
| 2047         | 314.5         | -13.9         | 224.7         | -160.0         | <b>365.3</b>  |
| 2048         | 317.3         | -12.6         | 224.9         | -164.8         | <b>364.8</b>  |
| 2049         | 318.4         | -11.2         | 224.3         | -168.6         | <b>362.9</b>  |
| 2050         | 318.4         | -9.6          | 222.5         | -171.8         | <b>359.5</b>  |
| <b>Total</b> | <b>1748.4</b> | <b>-660.1</b> | <b>6253.9</b> | <b>-1412.5</b> | <b>5929.7</b> |

Note: Negative values indicate costs and positive values indicate benefits.

APPENDIX A.2. BENEFIT-COST RESULTS FOR ES  
(in Present Values, Trillion TL)

| Year | dMWC  | dAC  | dGDPg  | dGDPp | PVdNB  |
|------|-------|------|--------|-------|--------|
| 2000 | -18.0 | -1.4 | 3.8    | 6.1   | -9.4   |
| 2001 | -21.1 | -1.4 | -228.0 | 7.4   | -243.1 |
| 2002 | -24.3 | -1.5 | 5.2    | 9.1   | -11.5  |
| 2003 | -28.2 | -1.6 | 6.4    | 11.1  | -12.3  |
| 2004 | -32.1 | -1.7 | 8.1    | 13.3  | -12.4  |
| 2005 | -35.3 | -1.9 | 9.7    | 15.9  | -11.6  |
| 2006 | -39.5 | -2.0 | 12.2   | 18.6  | -10.7  |
| 2007 | -43.0 | -2.1 | 14.2   | 21.2  | -9.6   |
| 2008 | -45.6 | -2.2 | 16.4   | 23.6  | -7.8   |
| 2009 | -48.0 | -2.4 | 18.8   | 26.0  | -5.6   |
| 2010 | -50.6 | -2.5 | 21.5   | 28.6  | -3.0   |
| 2011 | -56.3 | -2.7 | 24.3   | 31.1  | -3.6   |
| 2012 | -62.4 | -2.8 | 27.2   | 33.7  | -4.4   |
| 2013 | -68.9 | -3.0 | 30.3   | 36.3  | -5.3   |
| 2014 | -76.1 | -3.2 | 33.7   | 39.2  | -6.4   |
| 2015 | -83.7 | -3.4 | 37.3   | 42.1  | -7.7   |
| 2016 | -90.9 | -3.7 | 40.9   | 43.5  | -10.2  |
| 2017 | -95.7 | -3.9 | 44.4   | 43.7  | -11.5  |
| 2018 | -97.2 | -4.1 | 48.2   | 42.4  | -10.8  |
| 2019 | -91.8 | -4.4 | 51.9   | 38.3  | -5.9   |
| 2020 | -74.2 | -4.6 | 55.5   | 29.8  | 6.5    |
| 2021 | -67.2 | -4.8 | 59.3   | 27.0  | 14.3   |
| 2022 | -58.3 | -5.1 | 63.3   | 23.5  | 23.4   |
| 2023 | -46.3 | -5.3 | 67.2   | 18.8  | 34.3   |
| 2024 | -30.9 | -5.5 | 71.0   | 12.6  | 47.1   |
| 2025 | -12.4 | -5.7 | 74.7   | 5.1   | 61.7   |
| 2026 | 5.0   | -5.9 | 77.1   | -2.1  | 74.2   |
| 2027 | 21.4  | -6.0 | 79.7   | -9.4  | 85.6   |
| 2028 | 38.7  | -6.1 | 81.9   | -17.7 | 96.8   |
| 2029 | 55.7  | -6.3 | 84.0   | -26.5 | 107.0  |
| 2030 | 72.3  | -6.3 | 86.0   | -35.9 | 116.1  |
| 2031 | 78.6  | -6.4 | 87.8   | -41.3 | 118.6  |
| 2032 | 83.4  | -6.5 | 89.6   | -46.6 | 120.0  |
| 2033 | 87.7  | -6.5 | 91.3   | -52.0 | 120.5  |
| 2034 | 90.7  | -6.5 | 92.9   | -57.1 | 120.0  |
| 2035 | 92.8  | -6.5 | 94.4   | -62.0 | 118.6  |
| 2036 | 93.0  | -6.5 | 95.8   | -67.0 | 115.4  |
| 2037 | 91.8  | -6.5 | 97.3   | -71.1 | 111.5  |
| 2038 | 90.2  | -6.4 | 98.6   | -75.2 | 107.1  |
| 2039 | 87.5  | -6.4 | 99.8   | -78.5 | 102.5  |
| 2040 | 84.8  | -6.3 | 100.8  | -81.9 | 97.4   |
| 2041 | 91.9  | -6.2 | 101.4  | -93.3 | 93.8   |

APPENDIX A.2. CONTINUES

|              |              |               |               |                |               |
|--------------|--------------|---------------|---------------|----------------|---------------|
| 2042         | 97.7         | -6.0          | 101.6         | -104.1         | 89.2          |
| 2043         | 101.8        | -5.8          | 101.8         | -113.8         | 84.0          |
| 2044         | 105.0        | -5.6          | 101.7         | -123.0         | 78.0          |
| 2045         | 107.0        | -5.4          | 101.2         | -131.4         | 71.4          |
| 2046         | 121.3        | -5.0          | 100.0         | -150.1         | 66.1          |
| 2047         | 135.1        | -4.7          | 98.4          | -167.9         | 60.9          |
| 2048         | 148.9        | -4.2          | 96.1          | -185.2         | 55.7          |
| 2049         | 162.7        | -3.7          | 93.3          | -201.6         | 50.7          |
| 2050         | 176.6        | -3.1          | 89.9          | -217.5         | 45.9          |
| <b>Total</b> | <b>923.9</b> | <b>-227.7</b> | <b>2959.9</b> | <b>-1564.6</b> | <b>2091.5</b> |

Note: Negative values indicate costs and positive values indicate benefits.

APPENDIX A.3. BENEFIT-COST RESULTS FOR BK  
(in Present Values, Trillion TL)

| Year | dDW    | dAC   | dGDPg | dGDPp  | PVdNB         |
|------|--------|-------|-------|--------|---------------|
| 2000 | -44.6  | -1.0  | 0.6   | 19.4   | <b>-25.5</b>  |
| 2001 | -56.1  | -1.1  | 12.1  | 23.9   | <b>-21.2</b>  |
| 2002 | -69.7  | -1.2  | 15.0  | 29.4   | <b>-26.5</b>  |
| 2003 | -85.2  | -1.3  | 17.9  | 35.3   | <b>-33.3</b>  |
| 2004 | -103.5 | -1.5  | 21.6  | 42.9   | <b>-40.5</b>  |
| 2005 | -123.6 | -1.7  | 25.6  | 50.9   | <b>-48.9</b>  |
| 2006 | -163.5 | -1.9  | 29.8  | 63.5   | <b>-72.2</b>  |
| 2007 | -195.6 | -2.1  | 34.3  | 72.0   | <b>-91.3</b>  |
| 2008 | -228.2 | -2.3  | 39.3  | 79.7   | <b>-111.6</b> |
| 2009 | -264.1 | -2.6  | 44.6  | 87.4   | <b>-134.7</b> |
| 2010 | -288.5 | -2.9  | 50.5  | 91.0   | <b>-150.0</b> |
| 2011 | -333.6 | -3.3  | 58.1  | 99.7   | <b>-179.1</b> |
| 2012 | -384.3 | -3.7  | 61.7  | 108.8  | <b>-217.4</b> |
| 2013 | -441.1 | -4.1  | 68.9  | 118.2  | <b>-258.1</b> |
| 2014 | -507.6 | -4.5  | 76.8  | 128.6  | <b>-306.8</b> |
| 2015 | -562.9 | -5.0  | 85.1  | 135.1  | <b>-347.7</b> |
| 2016 | -597.5 | -5.5  | 92.3  | 137.6  | <b>-373.1</b> |
| 2017 | -599.6 | -6.1  | 98.2  | 133.1  | <b>-374.3</b> |
| 2018 | -550.6 | -6.7  | 102.2 | 118.7  | <b>-336.3</b> |
| 2019 | -419.9 | -7.2  | 102.4 | 89.0   | <b>-235.8</b> |
| 2020 | -191.6 | -7.8  | 96.4  | 40.5   | <b>-62.5</b>  |
| 2021 | -119.9 | -8.2  | 84.7  | 24.8   | <b>-18.5</b>  |
| 2022 | -38.1  | -8.6  | 83.5  | 7.7    | <b>44.6</b>   |
| 2023 | 59.9   | -8.9  | 83.3  | -11.9  | <b>122.4</b>  |
| 2024 | 173.6  | -9.3  | 85.1  | -33.8  | <b>215.7</b>  |
| 2025 | 298.4  | -9.5  | 86.6  | -56.9  | <b>318.4</b>  |
| 2026 | 410.6  | -9.7  | 84.0  | -78.3  | <b>406.5</b>  |
| 2027 | 516.8  | -9.9  | 84.3  | -98.3  | <b>492.8</b>  |
| 2028 | 630.8  | -10.0 | 83.8  | -119.8 | <b>584.7</b>  |
| 2029 | 745.1  | -10.1 | 82.8  | -141.2 | <b>676.6</b>  |
| 2030 | 859.6  | -10.1 | 81.5  | -162.4 | <b>768.5</b>  |
| 2031 | 933.7  | -10.1 | 79.4  | -178.6 | <b>824.4</b>  |
| 2032 | 999.1  | -10.0 | 79.2  | -193.2 | <b>875.1</b>  |
| 2033 | 1062.6 | -9.9  | 78.5  | -207.8 | <b>923.4</b>  |
| 2034 | 1118.1 | -9.8  | 77.8  | -220.8 | <b>965.4</b>  |
| 2035 | 1169.3 | -9.6  | 76.8  | -233.0 | <b>1003.5</b> |
| 2036 | 1214.4 | -9.4  | 75.5  | -245.3 | <b>1035.1</b> |
| 2037 | 1247.4 | -9.2  | 74.8  | -254.9 | <b>1058.2</b> |
| 2038 | 1278.0 | -8.9  | 73.7  | -264.0 | <b>1078.8</b> |
| 2039 | 1301.2 | -8.6  | 72.5  | -271.3 | <b>1093.8</b> |
| 2040 | 1326.1 | -8.2  | 70.6  | -279.3 | <b>1109.1</b> |
| 2041 | 1368.7 | -7.8  | 68.5  | -289.9 | <b>1139.4</b> |
| 2042 | 1406.2 | -7.4  | 65.6  | -299.1 | <b>1165.2</b> |



APPENDIX A.3. CONTINUES

|              |                |               |               |                |                |
|--------------|----------------|---------------|---------------|----------------|----------------|
| 2043         | 1434.1         | -7.0          | 62.9          | -305.7         | <b>1184.3</b>  |
| 2044         | 1461.5         | -6.5          | 59.6          | -312.1         | <b>1202.6</b>  |
| 2045         | 1486.2         | -6.0          | 56.0          | -317.7         | <b>1218.6</b>  |
| 2046         | 1520.8         | -5.4          | 52.1          | -324.7         | <b>1242.7</b>  |
| 2047         | 1549.4         | -4.8          | 47.7          | -329.9         | <b>1262.4</b>  |
| 2048         | 1578.7         | -4.2          | 42.7          | -335.2         | <b>1282.0</b>  |
| 2049         | 1606.5         | -3.5          | 37.4          | -340.1         | <b>1300.2</b>  |
| 2050         | 1636.1         | -2.8          | 31.3          | -345.4         | <b>1319.2</b>  |
| <b>Total</b> | <b>24023.2</b> | <b>-316.8</b> | <b>3255.7</b> | <b>-4513.5</b> | <b>22448.6</b> |

Note: Negative values indicate costs and positive values indicate benefits.

APPENDIX A.4. COMPARISON BETWEEN NB AND PROJECTED GDP, TRILLION

TL (IN 1995 TL VALUES)

| Year | GDP    | SSK    |              | ES     |              | BK     |              |
|------|--------|--------|--------------|--------|--------------|--------|--------------|
|      |        | NB     | Ratio to GDP | NB     | Ratio to GDP | NB     | Ratio to GDP |
| 2000 | 10,464 | -18.4  | -0.18%       | -9.4   | -0.09%       | -25.5  | -0.24%       |
| 2001 | 11,081 | -21.9  | -0.20%       | -250.4 | -2.26%       | -21.9  | -0.20%       |
| 2002 | 11,735 | -24.6  | -0.21%       | -12.2  | -0.10%       | -28.2  | -0.24%       |
| 2003 | 12,427 | -27.3  | -0.22%       | -13.4  | -0.11%       | -36.4  | -0.29%       |
| 2004 | 13,160 | -29.7  | -0.23%       | -13.9  | -0.11%       | -45.6  | -0.35%       |
| 2005 | 13,937 | -31.8  | -0.23%       | -13.4  | -0.10%       | -56.7  | -0.41%       |
| 2006 | 14,494 | -43.2  | -0.30%       | -12.7  | -0.09%       | -86.2  | -0.59%       |
| 2007 | 15,074 | -43.9  | -0.29%       | -11.8  | -0.08%       | -112.3 | -0.74%       |
| 2008 | 15,677 | -45.0  | -0.29%       | -9.9   | -0.06%       | -141.3 | -0.90%       |
| 2009 | 16,304 | -45.2  | -0.28%       | -7.2   | -0.04%       | -175.7 | -1.08%       |
| 2010 | 16,956 | -34.3  | -0.20%       | -4.0   | -0.02%       | -201.5 | -1.19%       |
| 2011 | 17,634 | -55.4  | -0.31%       | -5.0   | -0.03%       | -247.9 | -1.41%       |
| 2012 | 18,340 | -60.0  | -0.33%       | -6.3   | -0.03%       | -309.9 | -1.69%       |
| 2013 | 19,073 | -69.3  | -0.36%       | -7.8   | -0.04%       | -379.0 | -1.99%       |
| 2014 | 19,836 | -80.8  | -0.41%       | -9.7   | -0.05%       | -464.1 | -2.34%       |
| 2015 | 20,630 | -82.0  | -0.40%       | -12.0  | -0.06%       | -541.6 | -2.63%       |
| 2016 | 21,455 | -96.2  | -0.45%       | -16.3  | -0.08%       | -598.8 | -2.79%       |
| 2017 | 22,313 | -106.7 | -0.48%       | -19.0  | -0.09%       | -618.7 | -2.77%       |
| 2018 | 23,205 | -114.1 | -0.49%       | -18.4  | -0.08%       | -572.6 | -2.47%       |
| 2019 | 24,134 | -112.9 | -0.47%       | -10.4  | -0.04%       | -413.5 | -1.71%       |
| 2020 | 25,099 | -93.2  | -0.37%       | 11.8   | 0.05%        | -112.9 | -0.45%       |
| 2021 | 25,977 | -75.7  | -0.29%       | 26.6   | 0.10%        | -34.5  | -0.13%       |
| 2022 | 26,886 | -44.2  | -0.16%       | 44.8   | 0.17%        | 85.4   | 0.32%        |
| 2023 | 27,827 | -3.2   | -0.01%       | 67.7   | 0.24%        | 241.6  | 0.87%        |
| 2024 | 28,801 | 47.9   | 0.17%        | 95.8   | 0.33%        | 438.4  | 1.52%        |
| 2025 | 29,808 | 108.3  | 0.36%        | 129.2  | 0.43%        | 666.7  | 2.24%        |
| 2026 | 30,851 | 166.0  | 0.54%        | 159.9  | 0.52%        | 876.6  | 2.84%        |
| 2027 | 31,931 | 231.8  | 0.73%        | 190.2  | 0.60%        | 1094.8 | 3.43%        |
| 2028 | 33,048 | 301.1  | 0.91%        | 221.4  | 0.67%        | 1337.7 | 4.05%        |
| 2029 | 34,204 | 370.1  | 1.08%        | 252.0  | 0.74%        | 1594.5 | 4.66%        |
| 2030 | 35,401 | 436.9  | 1.23%        | 281.8  | 0.80%        | 1865.5 | 5.27%        |
| 2031 | 36,463 | 461.7  | 1.27%        | 296.6  | 0.81%        | 2061.1 | 5.65%        |
| 2032 | 37,557 | 492.8  | 1.31%        | 309.1  | 0.82%        | 2253.4 | 6.00%        |
| 2033 | 38,684 | 551.3  | 1.43%        | 319.5  | 0.83%        | 2449.3 | 6.33%        |
| 2034 | 39,844 | 631.4  | 1.58%        | 327.7  | 0.82%        | 2637.3 | 6.62%        |
| 2035 | 41,040 | 708.8  | 1.73%        | 333.9  | 0.81%        | 2823.6 | 6.88%        |
| 2036 | 42,271 | 782.3  | 1.85%        | 334.4  | 0.79%        | 3000.1 | 7.10%        |
| 2037 | 43,539 | 854.6  | 1.96%        | 333.0  | 0.76%        | 3158.9 | 7.26%        |

APPENDIX A.4. CONTINUES

|                 |        |        |       |       |       |        |       |
|-----------------|--------|--------|-------|-------|-------|--------|-------|
| 2038            | 44,846 | 923.5  | 2.06% | 329.4 | 0.73% | 3317.2 | 7.40% |
| 2039            | 46,191 | 989.0  | 2.14% | 324.6 | 0.70% | 3464.1 | 7.50% |
| 2040            | 47,577 | 1050.9 | 2.21% | 317.6 | 0.67% | 3618.0 | 7.60% |
| 2041            | 49,004 | 1131.3 | 2.31% | 315.2 | 0.64% | 3828.4 | 7.81% |
| 2042            | 50,474 | 1193.8 | 2.37% | 308.6 | 0.61% | 4032.4 | 7.99% |
| 2043            | 51,989 | 1252.5 | 2.41% | 299.4 | 0.58% | 4221.6 | 8.12% |
| 2044            | 53,548 | 1306.6 | 2.44% | 286.2 | 0.53% | 4415.1 | 8.25% |
| 2045            | 55,155 | 1356.8 | 2.46% | 270.1 | 0.49% | 4608.3 | 8.36% |
| 2046            | 56,809 | 1417.9 | 2.50% | 257.4 | 0.45% | 4840.5 | 8.52% |
| 2047            | 58,513 | 1465.5 | 2.50% | 244.4 | 0.42% | 5064.7 | 8.66% |
| 2048            | 60,269 | 1507.3 | 2.50% | 230.0 | 0.38% | 5297.5 | 8.79% |
| 2049            | 62,077 | 1544.5 | 2.49% | 215.9 | 0.35% | 5534.1 | 8.91% |
| 2050            | 63,939 | 1575.8 | 2.46% | 201.3 | 0.31% | 5783.3 | 9.05% |
| 51 year average |        |        | 0.78% |       | 0.27% |        | 3.0%  |

VITA

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