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Saving and Social Security Wealth: A Case of Turkey

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Abstract: This paper is the first attempt in the literature to investigate the effects of public social security on aggregate consumption in a time-series setting for a developing country, Turkey that has one of the most generous social security systems in the OECD region. In order to quantify the social security variable, the paper uses the social security wealth (SSW) series calculated for the first time for Turkey and shows that SSW is the largest part of the household wealth in Turkey and therefore should not be ignored in the aggregate consumption studies. After having all sensitivity tests for the major assumptions embedded in the SSW series, it shows that SSW has robust and positive effects on aggregate consumption, and therefore the PAYG system suppresses the Turkish national saving approximately 25% in 2003.

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Keywords: Social security, Saving, Social Security Wealth.

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Public insurance is the single largest item in government budgets and has a significant impact on the lives of thousands of people. In addition to its effect on the living standards of elderly people, Social Security may alter people's behavior in ways that could affect the economy. People who are entitled to some sort of social security payments in the future may prefer to consume more today and save less for their retirement. If public social security is unfunded (pay-as-you-go —PAYG), this decrease in personal saving may even reduce national saving.

There are two types of studies conducted in the literature to see whether or not social security affects personal and national savings: empirical studies and simulations. Empirical studies are based on three types of data sets and therefore might be classified accordingly: time-series, cross-sectional, and cross-country analyses.

This paper is the first attempt in the literature to investigate the saving effect of public social security in a time-series setting for a developing country, Turkey. One reason for this scarcity of studies might be the limited availability of data for developing countries. Even though Turkey is not immune to this sort of problem, it has relatively better data sources and a long history with a public social security system. Another reason could be the difficulty in calculating a proxy that represents an aggregate perception of household social security wealth.

The first step in time-series studies is to calculate the total (aggregated) Social Security Wealth (SSW) series over the years for the economy. SSW is the net present value of the future benefits and contributions with survival probabilities. Since it's a highly concentrated work, we have constructed the SSW series for Turkey from 1970 to 2003 in a separate study (Author, 2005). A simple comparison shows that SSW is the largest part of the total household wealth in Turkey.

A typical aggregate time-series study tests whether, as total SSW changes over time, aggregate saving also changes. Some studies observe changes in consumption, while others look directly at saving. The present study uses an aggregate consumption function in a life-cycle model (LCM) setting (Ando and Modigliani 1963) to investigate whether or not the time-series data provide some evidence for this claim. We extend the pure life-cycle consumption model to incorporate other factors that could influence aggregate consumption, such as uncertainty, credit constraints, unemployment, demographic changes and the interest rate.

The most important aspect of this study is not only that Turkey is a developing country but also that it has one of the most generous social security systems in the Organization for Economic Co-operation and Development (OECD) region. Our estimation results show that SSW has significant and positive effects on consumption, and this could be interpreted as implying that public social security reduces saving in Turkey. In order to see the magnitude of this reduction, we measured this decrease for the year 2003 approximately twenty four percent.

The plan for the paper is as follows. Section 1 provides a brief background on the relationship between saving and public social security and summarizes the time-series literature on the subject. The generosity of the Turkish social security system is discussed in Section 2. Section 3 discusses social security wealth in Turkey. The model and results of the empirical tests are given in Section 4. The conclusions are in Section 5.

1. Background and Literature Review

There are two major competing theories for testing whether or not social security or any type of government debt affects savings: the life-cycle model (Modigliani and Brumberg 1954) and the infinite-horizon model (Barro 1974). Agents in the life-cycle model receive utility only from their own consumption and take the whole life-span into account when planning consumption. They reduce their saving if their retirement is financed by levying taxes on the working generation. Whereas the Barro's infinite-horizon model shows that when the life-cycle model is extended with altruistic bequest where agents receive utility from their descendants, saving might not be affected.

The life-cycle hypothesis within a simple two-period overlapping generations setting provides a suitable framework for analyzing the effect of social security on saving where a rational forward-looking worker faces no borrowing constraints, capital market imperfections, and uncertainty. If the worker has a constant labor supply and saves only for retirement, when a social security system is introduced, he dissaves exactly the same amount that he contributes to the system, provided that the implicit rate of return on the taxes (contributions) is equal to the market interest rate. In other words, if the combination of social security contributions and benefits does not alter the individual's lifetime budget constraint, savings will fall by just enough to leave consumption during retirement unchanged. That is, he would substitute one asset for another, because social security and private saving are perfect substitutes. If the rate of return on the taxes is higher (lower) than the market interest rate, the worker dissaves more (less).[1] If the social security system is unfunded, i.e., if most of the revenue from contributions goes directly to retirees as in PAYG, this reduction in personal saving is not offset by a rise in government saving, and, as a result, national saving falls.

The simple model above assumes that people save only for retirement and do not receive and leave bequests in an environment where capital markets are perfect, the social security benefits are paid in lump sum, and there are no uncertainties in future income streams and life expectancies. Within the framework of a traditional life-cycle model, as we relax these assumptions, the provision of social security may not offset personal saving one-for-one even if the net social security wealth (NSSW) is zero as outlined below.

- *Uncertainty*. People may not be so certain about their future income stream. With uncertain earnings, households save more for precautionary motives relative to less urgent retirement saving in their early ages. As income uncertainty increases, the negative effect of old-age pension entitlements on personal saving becomes stronger for older people who are close to retirement, but not so for younger population. Thus the offset between social security and private saving tends to be less than one-for-one for younger households but increases as retirement saving becomes more important (Engen and Gale 1997).
- *Capital markets*. If financial markets are not well developed, people cannot smooth their consumption by borrowing against their future income. This may increase the need for precautionary saving. As precautionary savings become more important for short-term income risks, the effect of social security provisions on personal savings fades. Likewise, families may have fixed saving goals such as a down-payment for a house. With capital

[1] If the implicit return on contributions (*ssr*) is equal to the market interest rate (*r*) then the present value of benefits is equal to present value of contributions, i.e. the net social security wealth (NSSW) zero, when the discounting occurs at the market interest rate. If $ssr > r$ NSSW becomes positive. In this case, social security increases the lifetime budget constraint and consumption in each period would rise. Therefore, private saving would fall by more than the worker's contribution. If NSSW is negative, the opposite occurs. Seidman (1999).

market constraints, they may be forced to reduce their consumption in response to social security payments, which in turn prevents personal saving from falling one-for-one.

- *Annuity payments.* Benefits are received by annuities not in a lump sum payment at retirement. Annuity payments may not finance unexpected large expenses and cannot be bequeathed to heirs. Therefore social security wealth itself may not be compatible with other types of personal wealth and thus social security contributions may not crowd out personal saving one-for-one.
- *Other saving motives.* The effect of social security contributions on personal saving depends on the substitutability of personal saving and social security contributions. If households save primarily as a precaution, they will consider social security contributions illiquid since benefit payments will not start before retirement. Therefore, social security will not replace personal saving one-for-one.
- *Insurance.* Moreover, since annuities provide insurance against the risk of uncertainty about longevity and personal saving cannot offset the insurance part of social security contributions, one might argue that the existence of social security could magnify a reduction in personal saving.[2]
- *Retirement effect.* When we allow households to vary the amount of labor supply supplied, consumption could be substituted by leisure. As explained in the Feldstein's influential paper (1974), when social security is introduced, individuals may reduce their retirement age. This reduction in turn decreases the lifetime wealth by shortening the earning stream. Therefore, social security induces early retirement and increases personal saving during working years in order to finance longer retirement financial needs. This offsetting retirement effect reduces the power of the asset substitution effect. It is, therefore, theoretically possible that personal saving may even rise if the existing social security system induces a very early retirement age.
- *Partial equilibrium.* In addition to these partial equilibrium effects, there are general equilibrium effects as well. A reduction in saving may cause a lower capital accumulation and in turn may reduce real wages. A reduction in wages, in turn, may result in a decrease in consumption and an increase in saving. Therefore, as Siedman (1984) shows, general equilibrium effects may dampen effects of social security on saving.
- *Attached benefits.* Social security wealth calculations ignore attached benefits such as health insurance and unemployment benefits. All these additional benefits can make the social security effects on personal saving stronger.

Cultural factors, lack of urbanization (Novos 1989), inefficient social development, and an uneducated population would make a big difference in expected rational behaviors, which are supposed to be consistent with the life-cycle theory. Furthermore, there is a tension between the justifications for a compulsory social security system and the justification for why social security affects saving: social security (public social saving systems) exists because people are myopic and cannot plan and save for their future. However, social security systems affect personal saving because people are foresighted and adjust their consumption and saving behaviors due to future social security changes. As a result, it is theoretically ambiguous whether future social security entitlements negatively affect saving.

[2] This type of insurance is less available in the private sector due to the adverse selection problem. Empirical studies show clear evidence that there is indeed an adverse selection problem in voluntary annuity markets (Finkelstein and Poterba (2004)).

In the literature, empirical studies that study social security effects on savings are based on three different types of data sets and might be classified accordingly: cross-section, time-series, and cross-country analyses. While cross-section researches analyze whether people with relatively high expectations in social security benefits hold relatively low private wealth, time-series analyses calculate the SSW series for the entire economy and then use it to see whether or not the aggregate consumption over time is higher as the SSW gets higher. Cross-country analyses compare different countries to see if the saving rate is linked to the generosity of public social security provisions.

The first time-series analysis was done by Feldstein in 1974. He adopts the consumption function used by Ando and Modigliani (1963) and extends it by adding his new SSW variable. In both of his studies in 1974 and 1996, Feldstein found statistically significant results showing that SSW affects consumption positively. In his influential 1974 paper, he claims that the social security provision reduces personal saving by 30% to 50% in the US; while in 1996 he finds that the effect is almost 60%.

Many time-series studies were done following Feldstien (1974).[3] Among the most important studies on time-series analyses are the following. Munell (1974) looks at the same issue with endogenous retirement age and finds that a negative effect of benefits on saving is canceled out by a positive effect of early retirement. Darby (1979) uses the money supply and relative price of durables goods in his regression and finds negative effect in most cases. Coates and Humphreys (1999) investigate the linearity of the equation in Feldstein's (1996) paper. Meguire (1998) disaggregates the personal disposable income by using Kormandi's (1983) augmented consolidated approach and confirms Feldstein's (1996) results. Finally, Blake (2004) uses error correction models and finds that state pensions have a strong saving replacement effect in the UK. A more inclusive list for the literature on time-series studies is given in Table 1.

Table 1: Time-Series Studies

Authors - Country	Sample Period	Dependent Variable	SSW Coefficient
Feldstein (1974) USA	1930-71	Consumption	S
Munnell (1974) USA	1929-69	Personal Savings	S
Barro (1978) USA	1929-74	Consumption	NS
Darby (1979) USA	1924-74	Consumption	NS
Markowski and Palmer (1979) Sweden	1952-75	Pers. Saving/Income	S
Boyle and Murrey (1979) Canada	1946-75	Pers. Saving	NS
Pfaff, Hurler, Dennerlein (1979) Germany	1965-78	Pers. Saving/Income	NS
Leimer and Lesnoy (1982) USA	1930-74	Consumption	NS
Browning (1982) UK	1966-79 (Quarterly)	Consumption	S
Lee and Chao (1988) USA	1947-77	Pers. Saving & LFPR	NS
Magnussen (1994) Norway	1966-90	Consumption	NS
Rossi & Visco (1995) Italy	1954-93	Consumption	S
Feldstein (1996) USA	1930-92	Consumption	S
Meguire (1998) USA	1930-92	Consumption	S
Coates and Humphreys (1999) USA	1930-92	Consumption	S
Blake (2004) UK	1948-94	Consumption	S

Notes: S and NS denote Significant and Not Significant respectively

Three important criticisms of Feldstein's 1974 paper are Barro (1978), Leimer and Lesnoy

[3] For an extensive literature review on the subject see OECD (1998), Congressional Budget Office (CBO) memorandum (1998), Engen, E. and Gale, W. (1997), and Magnussen (1994).

(1982), and Auerbach and Kotlikoff (1983). The negative effect of funding structure of a social security program on national saving has been challenged by Barro (1974, 1989). Unlike the life-cycle model, the Barro's infinite-horizon model assumes that agents are altruistic and care about descendant's consumption as well. Barro claims that the mandatory transfers from young to old could be offset by voluntary transfers from old to young under altruistic bequest motives and therefore funding status does not affect national saving. Barro uses the same SSW data series with three additional major variables: unemployment, government deficit (or surplus), and a new SSW[4] variable in addition to Feldstein's SSW. He concludes that when the new variables are included the SSW coefficient becomes statistically insignificant. Barro grounds this result on two factors: intergenerational transfers offset the fall in saving, and an inept representation of the perception of people by Feldstein's SSW due to aggregation problems.[5]

The main criticism of Feldstein's paper came from Leimer and Lesnoy (1982). They find that the effect is insignificant when they use different methods for the formation of expectations in the perception of benefits. Their criticism can be summarized in three points. First, the regression results are very sensitive to the time frame. Second, small adjustments in the SSW calculation make a big difference in its coefficient. Third, the expectation formation method for the perception of benefits and taxes that Feldstein used is highly speculative.[6]

Finally, Auerbach and Kotlikoff (1983), in a simulation, show that time-series coefficients are not stable because of the aggregation problems. They argue that the coefficients of a life-cycle consumption function depend on the individual's age and differ at any point in time. Therefore, if the age structure of a population is not stable, aggregation of individual consumption functions over all households may cause unstable coefficients.

2. The Turkish Public Social Security System

The framework for old-age security in Turkey, as in most developing countries, traditionally involves state-managed pension schemes that pay an earning-related defined benefit financed on pay-as-you-go (PAYG) basis. Turkey's social security system consists of three distinct institutions—Social Insurance Institution (Sosyal Sigortalar Kurumu - SSK) for wage earners in private and public sectors, Bag-Kur (BK) for self-employed individuals and farmers, and Retirment Fund (Emekli Sandigi - ES) for civil servants—covering different areas of the labor market.

As most PAYG systems in the world, Turkey's PAYG system have created significant fiscal deficits, labor market distortions, and wicked redistribution to higher income groups, without providing adequate income security for the old. The populist social security policies of Turkish governments over the years have impaired the system whose total deficit approached 4.5% of GNP per year in 2004. Between 1990 and 2003, the present value of the total resources used to finance the deficit of the social security system is almost equal to the total GNP created by Turkey in 2003.[7]

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[4] Barro's alternative measure of social security is calculated based on current benefit rates and current worker coverage under social security.

[5] See Auerbach and Kotlikoff (1983) and Seidman (1984).

[6] Feldstein replies both Barro's (1978) and Leimer and Lesnoy's (1982) criticisms in Feldstein (1976a, 1976b, 1978 and 1982)

[7] "*Proposal for Reform in the Social Security System*" (2004), Ministry of Labor and Social Security

The financial problem of the Turkey's social security system is resulted from both decreasing revenues and increasing expenses. The lack of a minimum retirement age, which had been removed in 1992, has been the major factor for the financial imbalance—Turkey had retirement ages as young as 47 years of age in SSK and 48 years of age in ES, the lowest in the world.[8] Moreover, Turkey is the only country in the world that simultaneously had very low minimum contribution periods (in some cases as low as 10 years) and high replacement rates (90% in SSK, 127% in Bag-Kur, and 106% in ES)[9] with a lack of minimum retirement age before the 1999 reform (The World Bank Country Economic Memorandum, 2000).

The weak link[10] between contributions and benefits before 1999 created an incentive for workers to declare the earnings base for premium at a lower value. The high informal employment due to relatively high statutory contribution rates, the lack of automatic indexation of the contribution ceiling[11] under high inflation conditions, and the low premium collection rates because of administrative inefficiencies worsened the already financially imbalanced system. As a result, the system became a major fiscal burden, damaging Turkey's macroeconomic stability. Coupled with other structural problems in the economy, the severe financial crisis early in 1999 forced Turkish government led by the World Bank to reform the impaired social security system in August 1999. This "parametric" reform was intended to achieve the actuarial balance of the PAYG system in the mid-term and to reduce pressure on the borrowing needs of the government.

In summary, the most fundamental characteristics of the Turkish social security system have been its generosity (relative to income) due to very young average retirement ages (in some cases 38 for women and 47 for men[12]), low minimum contribution periods, and high replacement rates. As seen in Table 2 below, according to a new research by the OECD (2005), a new entrant in Turkey has $74,000 average gross pension wealth with $2,510 per capita gross national income, while the same numbers are $183,000 and $35,430 for the US in 2002. In addition, Turkey's gross replacement rate (87.2%) is the highest in the OECD region, which has 56.7% of the same rate as an average.[13] While this generosity has paved the way for the collapse of the system's actuarial and financial soundness and still presents a big problem for the system's sustainability, one would expect that this generosity would also have strong effects on consumption and saving behaviors of individuals, which in turn may influence macro economic dynamics. It is this generosity that makes the Turkish case special relative to other developing countries in the literature.

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[8] Minimum ages were very low even before 1999. The average minimum retirement ages for OECD countries are 64.4 for men and 63.9 for women in 2002 (OECD 2005).

[9] These rates reflects 2004 values and taken from "*Proposal for Reform in the Social Security System*" (2004), Ministry of Labor and Social Security. P.19

[10] In SSK, pensions were linked to wages paid in the last five years and the same link was even worse in ES and Bag-Kur: only the last year's wages were used to calculate pensions.

[11] The ceiling on wages subject to social security contribution in the fall of 1995 actually fell below the minimum wage.

[12] See "*Turk Emeklilik Sisteminde Reform*" (The Reform in Turkish Pension System) TUSIAD November 2004 P.108

[13] Excluding Luxemburg which is an outlier with 101.9% gross replacement rate.

Table 2: Pension and Income (2002, in US Dollars)

	Per Capita GNI	**Average Wage**	Replacement **Rate**	**Gross Pension Wealth**	**Relative Pension Wealth**	**Relative Pension Level**
Hungary	5,100	4,187	75.4	55,000	11.7	72.2
Slovak Republic	4,080	3,031	48.6	27,000	7.9	47.9
Czech Republic	5,880	6,306	44.4	47,000	6.9	41.7
Mexico	5,950	6,180	36.0	28,000	4.5	35.7
Poland	4,680	6,456	56.9	51,000	7.7	55.5
Turkey	**2,510**	**6,571**	**87.2**	**74,000**	**10.3**	**81.3**
United Kingdom	25,560	29,133	37.1	172,000	5.5	37.1
United States	35,430	32,360	38.6	183,000	5.2	36.5
Canada	22,610	24,756	42.5	163,000	6.1	39.9
OECD Average			56.9	202,367	8.7	55.4

Notes: Except GNI, the others are taken form OECD (2005). **Average Wage**: the average annual earning for a production worker. **Replacement Rate** (men): a pension entitlement (first annuity) as a share of individual's last earning. **Gross Pension Wealth** (average): the discounted stream of future pension payments for a new entrant in 2002. **Relative Pension Level** (men): the weighted average of the pension entitlements (first annuity) expressed as a percentage of economy-wide average earnings. **Relative Pension Wealth** (men): the weighted average of pension wealth as a multiple of economy-wide average earnings. Gross National Income, GNI, is taken from WDI (The World Bank).

3. Social Security Wealth Series for Turkey

The heart of the time-series analyses is the calculation of the aggregate social security wealth (SSW) variable. In a life-cycle setting, the future income should include both pensions and labor income. Since pension annuities are received only by retirees, the rest of the population should form expectations for the future pension entitlements based on their labor income and related social security regulations.

The social security wealth (SSW) is one of the calculations, as a proxy for expected benefits, for measuring the effect of social security on consumption. This proxy represents people's perception of social security benefits that they will have in the future.

The aggregate SSW, which is basically the net aggregate present value of future social security annuities and tax liabilities with survival probabilities anticipated by people, was conceptualized and calculated for the first time by Feldstein in his (1974) paper. The basic logic of the calculations for the net and gross social security wealth (SSWN and SSWG) is given below.

Benefits (Future Annuities -- SSWG):

- If an individual at the age of (*a*) in year (*t*) survives to age *ra*, and if his current real disposable income, $Y_{(a,t)}$, grows at a constant rate of growth, *g*, then he'll have a disposable income at the age of *ra*: $Y_{t+ra-a} = Y_t(1+g)^{(ra-a)}$

- In order to find the first annual social security benefit at *ra* for that particular individual, we look at the past data and come up with a benefit factor, *bf*, which is basically a ratio of per retiree annual old-age benefits to per capita NPrvDI.
- Given that factor, the individual will be entitled to his first annual social security benefit at age *ra*, which is $B_{(a,t)} = bf_t Y_t (1+g)^{(ra-a)}$.
- We assume that real annuities grow after *ra* by *ga* until the truncated maximum age of 85.
- Given the survival probabilities $S_{(i,j)}$ for that particular individual, the actuarial present value can be calculated at the age of *ra*, where $S_{(i,j)}$ presents the probability of living at least up to the age of *j*, given that the person lived to age *i*.
- With the personal discount rate (*d*) for future real incomes, the present value calculation becomes at the age of *ra*:
  $$\sum_{n \geq ra} S_{(ra,n)} B_{(a,t)} (1+g)^{(n-ra)} (1+d)^{-(n-ra)}$$
- At time (*t*), after substituting $B_{(a,t)}$, the person has
  $$A_{(a,t)} = bf_t Y_t S_{(a,ra)} \left[(1+g)/(1+d)\right]^{(ra-a)} \sum_{85 \geq ra} S_{(ra,85)} \left[(1+g)/(1+d)\right]^{(85-ra)}$$
  which also includes survival probabilities between *ra* and age *a* at time (*t*).
- We calculated the gross SSW annually by summing the wealth for each age group and genders in six groups: workers, workers' wives, old-age retirees, old-age retirees' wives, disability retirees and survivors.

Taxes (future social security tax liabilities – SSTX):

- If the same individual at the age of (*a*) in year (*t*) survives to age *ra*, and if his current real disposable income, $Y_{(a,t)}$, grows at a constant rate of growth, *g*, then the present value of all his future taxes until age *ra* is
  $$TAX_{a,t} = \sum_{m=a}^{ra} S_{a,m} \theta_{t+m-a} Y_t \left[(1+g)/(1+d)\right]^{m-a}$$
  , where θ is the ratio of social security taxes (Old-age, disability and survival — ODS) per worker to per capita disposable income and the person expects that at the age *m* he will pay a tax of $T_{t+m-a} = \theta_{t+m-a} Y_t (1+g)^{m-a}$. We compute the social security tax liabilities (SSTX) for a given year by summing the tax liability of current working men and working women.

When we subtract the present value of future taxes (*SSTX*) from the present value of benefits (*SSWG*), we find *SSWN*: $SSWN_t = SSWG_t - SSTX_t$.

The task to construct the SSW series for Turkey can be grouped in four major steps: The first step is to find the "benefit and tax factors". The second step is to create the demographics (including survival rates) of the labor market and current beneficiaries. The third step is to decide on the "reference income", which is real personal disposable income in Feldstein's calculations. The last step is to put all steps together in a software program to create a set of SSW series with different sets of assumptions. We calculated the SSW series for 34 years from 1970 to 2003 at 1987 prices. We chose this period because the data about the demographics of labor market were not readily available for earlier years.

3.1 Benefits and Tax Factors

The key components of the SSW calculation are the benefit and tax factors. The benefit factor is defined as the ratio of per retiree annual benefits to per capita "reference income". Likewise, the tax factor can be defined as the ratio of social security taxes (premiums) per covered worker to per capita "reference income". Because these ratios are not constant over the years, how individuals perceive them becomes a critical assumption.

3.1.1 Benefit Factors

There are three public social security institutions in Turkey (SSK, BK, and ES) and these institutions provide a range of coverage. We use only old-age, disability and survivor (death) insurance (ODS) in our SSW calculation. Since the benefit factor is the ratio of per retiree (excluding survivors and disability retirees) annual old-age benefits to per capita "reference income", we first find the number of retirees who are entitled to old-age annuity payments for each year, from 1970 to 2003, for each of the three social security institutions.

Even though we have a gender-based distribution of the numbers of retirees for each institution, some difficulties arise in obtaining the paid ODS benefits in terms of gender. Therefore, we had to make an educated assumption here to obtain the factor for males and females separately. We assumed that per retiree old-age benefits for females are 30% less than the benefits for male retirees.[14]

We do not have "Personal Disposable Income" (PDI) series in Turkey. Therefore, in order to find the benefit factors for each year, we used Net Private Disposable Income (NprvDI) as our "reference income" series and its derivation will be discussed in the third step.

The critical question is whether the benefit factors over the years show a trend. The benefit factors do have a negative trend, with very high t-value, as is clear in the graph below (Figure 1), and therefore different than what Feldstein (1974) finds, taking the benefit factor constant over the years is open to discussion.

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[14] ***Mn*** *(# of male retirees) +* ***Fn*** *(# of female retires) =* ***Tn*** *(total # of retires)*
Mb *(total benefits paid to male retirees) +* ***Fb*** *(total benefits paid to male retirees) =* ***Tn*** *(total benefits paid to all retires)*
If we divide the second expression by ***Tn*** and rearrange it, we get

$$\frac{Mb}{Mn} x \frac{Mn}{Tn} + \frac{Fb}{Fn} x \frac{Fn}{Tn} = \frac{Tb}{Tn}$$

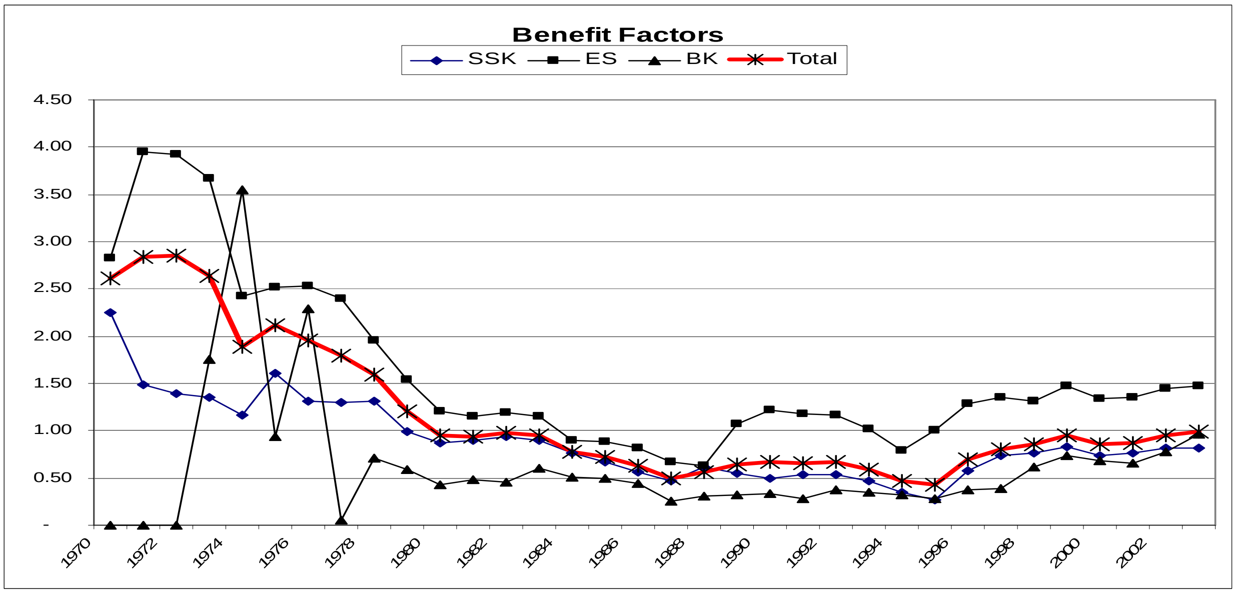
Since we assume that

$$\frac{Mb}{Mn} x0.7 = \frac{Fb}{Fn}$$

per retiree benefits are calculated for both genders as follows

$$\frac{Mb}{Mn} = \frac{Tb/Tn}{Mn/Tn + 0.7xFn/Tn} \text{ and } \frac{Fb}{Fn} = \frac{Tb/Tn}{1/0.7xMn/Tn + Fn/Tn}$$

Figure 1: Benefit Factors

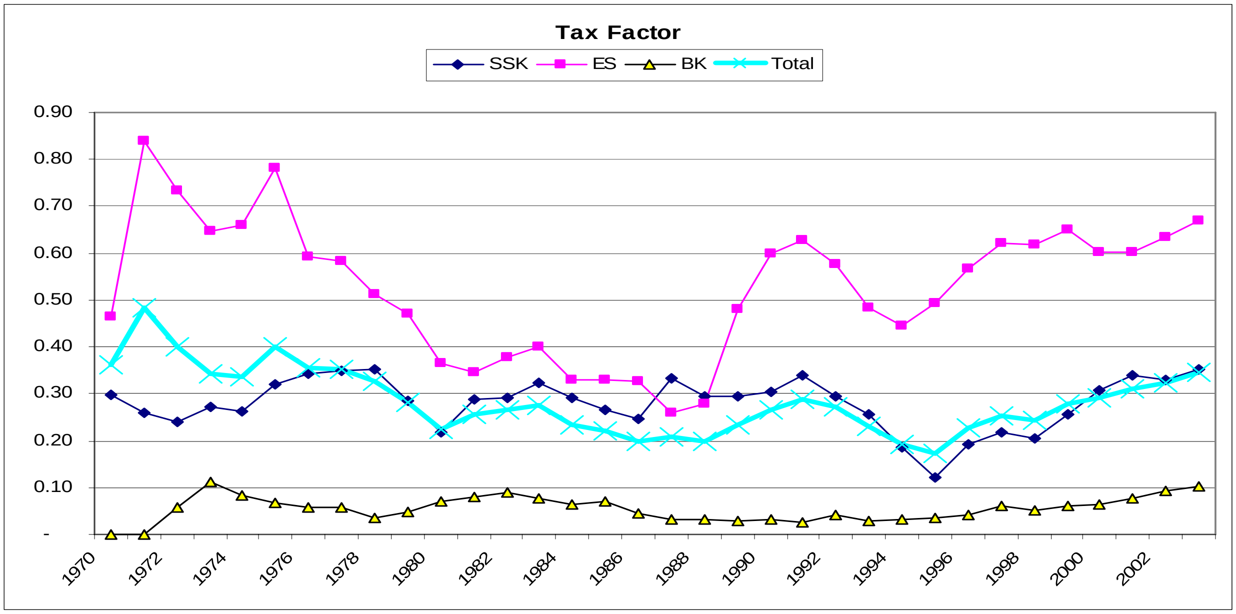


3.1.2 Tax Factors

As in the calculation of the benefit factor, we had the same difficulties in obtaining the incurred social security premiums (taxes) in terms of gender. Therefore, we made the same assumption for tax factors and reduced ODS contributions for females 30% in the same way as in the benefit factor calculations.

In calculating the incurred social security taxes, we found the premiums only for the ODS coverage. Since the total employer share is shifted onto workers through lower wages, the premiums are the sum of the employees' and employers' shares. Even though it is not as strong as in benefits factors, tax factors also exhibit trends as seen below.

Figure 2: Tax Factors



We believe that the perception of both benefit and tax factors is very critical in terms of the creation of SSW series. We consider that constant (average) factor applications are not appropriate with the strong trends in both factors. However, when the SSW series are formed, we use three different expectation methods, including average factors.

3.1.3. Expectation Methods—Alternative Perceptions for the Factors

In order to test the sensitivity of the SSW series to the perception method (constant benefit factor, varying tax factor), we use three different perception methods for benefit and tax factors as explained below.

Perception Method 1: Individuals base the anticipated benefit and tax ratios on some average over the period of analysis[15]. Therefore the factors can be taken as constant.

$$\hat{b}_t = \bar{b}$$

$$\hat{\theta}_t = \bar{\theta}$$

b denotes the benefits factor and θ denotes the tax factor. The average factors in the Turkish social security system are given in the following table.

	SSK		**ES**		**BK**		**Total**		
	Male	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Total**
Benefit Factors	0.93	0.65	1.76	1.23	0.71	0.50	1.24	0.87	1.17
Tax Factors	0.29	0.20	0.58	0.41	0.06	0.04	0.30	0.21	0.28

Perception Method 2: Individuals expect the future benefit and tax factors to equal their current benefit and tax factors. That is:

[15] The factor with a bar represents the average, and with a hat, expectation of the factor.

$\hat{b}_t = b_t$

$\hat{\theta}_t = \theta_t$

Perception Method 3: Individuals are able to consider both past and current values of the benefit and tax factors. They form their expectation by an adaptive expectation process.

$$\hat{b}_t = \delta\hat{b}_{t-1} + (1-\delta)b_t$$

$$\hat{\theta}_t = \beta\hat{\theta}_{t-1} + (1-\beta)\theta_t$$

In this method, we apply a 3-year moving average with the weights of 50% for the current year and 25% for the last two years each. These weights are chosen arbitrarily.

3.2. Demographics and Survival Rates

3.2.1 Demographics

Because the availability of the necessary data is limited, the most difficult part of constructing the SSW series for Turkey is the part that deals with the demographics of the labor force and the current beneficiaries. We used several different sources for data collection and had to estimate some years. There are six main groups in calculating the SSW series: workers, workers' wives, old-age retirees, old-age retirees' wives, disability retirees and survivors.

3.2.1.1 Workers

Since the ultimate task is to construct potential wealth series, which can be perceived by individuals, the number of potential individuals who can expect a social security wealth from a public social security system in the future should include all the potential workers, not only the covered workers who are currently in the labor force. In other words, even if a person at working-age is not currently in the labor force, she may expect to have some future retirement benefits conditional on future employment opportunities. Therefore, the SSW calculation should contain the prospect as well as the current workers. The ultimate number of people at working-age, therefore, is not simply the number of individuals who actively contribute to one of the public social security plans in a given year[16].

We estimated the ultimate number of persons for each age group who would eventually be entitled to a social security benefit by the number of current workers adjusted[17] for labor force participation. The key justification for this adjustment is that even those persons who are not currently labor-force participants can expect to draw social security benefits at some time in the future[18]. Then the major question becomes how many people at any given age could expect to have old-age benefits regardless of whether or not they are in the labor force? Similar to Feldstein's (1974) method, we used the maximum labor force participation rate (*MaxLFPR*) in a

[16] This is the main difference between the calculation of SSW series in the literature and the "Pension Wealth" calculated by OECD for 2002 (Pension at a Glance 2005, OECD).

[17] This adjustment factor, P, is usually taken constant for the entire period in the literature. We calculate it for each year.

[18] For example, a student in the age group of 15-19 can expect to have retirement benefits at 55, even if she is not currently in the labor force. Likewise, an older person, who is at the age of 57 and not currently in the labor force, might have been employed before and therefore she may expect to have retirement benefits even she is not currently in the labor force.

given year to find the number of individuals at the working age for each age group.[19]

The first task is to construct the demographics of the Turkish labor force market from 1970 to 2003. We have the following table (Table 3) for every year in that period. Because the State Institute of Statistics' (SIS) Labor Force Database starts from 1988, we could use them only for the years between 1988 and 2003 to build the tables. Before 1988, we utilized Bulutay's (1995) study for finding the numbers of employment, labor force and civilian population. However, because Bulutay's (1995) study is not based on gender and age, we referred to the International Labor Organization's (ILO) database for 1970, 1975, 1980 and 1985 in order to estimate gender and age distributions for these measures.

Unfortunately this is not the entire story for finding the number of individuals who may have a perception of social security wealth. The ratio of number of individuals who are actively contributing to a public social security program to the total employment is very low in Turkey[20]. Even though this ratio has been improving since 1970, as shown in the Table 5[21] below, more than 40% of the employed population is not contributing to the public pension system even in the year 2003.

When we discount the number of individuals who are expecting to have social security benefits some time in their future by these ratios for each year, we implicitly assume that people who do not contribute to one of the social security programs now expect that they will never contribute to the system later. However, as seen in Figure 2 above, the total ratio for covered workers has improved from 17 % to 55% in 33 years and is expected to continue improving in the future with the help of several administrative reforms achieved after 1999. That is, if we discount the numbers in 1970 by 83%, for example, we should assume that only 17% of the people in an age group (say 15-19) could expect to have a social security wealth in the future. However, in five years, the ratio improves 60% from 17% to 26%. The question then becomes whether or not the additional 9% people covered in 1975 can foresee this improvement and expect some future social security wealth in 1970?

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[19] In other words, we applied the following method for every age group and year:
Total individuals = Civilian Population (year, age, gender) X MaxLFPR (year, gender) X Employment Rate (year, age, gender)

$$P_{y,a} = \frac{LFPR_{y,a}}{MaxLFPR_y}$$

$$\frac{W_{y,a}}{P_{y,a}} = W_{y,a} * \left(\frac{1}{LFPR_{y,a}} \right) * MaxLFPR_y$$

$$W_{y,a} = (1 - Unemployment\%_{y,a}) * LF_{y,a}$$

$$\frac{W_{y,a}}{P_{y,a}} = (1 - Unemployment\%_{y,a}) * LF_{y,a} * \left(\frac{1}{LFPR_{y,a}} \right) * MaxLFPR_y$$

$$\Rightarrow (1 - Unemployment\%_{y,a}) * POP_{y,a} * MaxLFPR_y$$

where *W* is the number of employed people, *LF* is Labor Force and *POP* is Population. Subscripts, *a* and *y*, denote age groups and years respectively. The last expression is the number of people that would be employed if the maximum (prime age) labor force participation rate (*MaxLFPR)* were applied for this age group. This could be interpreted as the number of people in any given age group who would expect to receive benefits when they retire.

[20] The number of active insured persons also includes voluntary active insured individuals, farmers who are contributing to the public social security system and workers who are covered by private funds.

[21] The data is collected from SIS and Devlet Planlama Teskilati (State Planning Organization - SPO).

Table 3: An Example from the Labor Demographics

1970		15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65+	Total
		Age Groups										(Thousands)	
Male	***Population***	1,849	1,467	1,148	978	1,097	903	692	473	588	454	724	**10,371**
	Labor Force	1,210	1,244	1,045	903	1,025	845	628	428	504	367	498	**8,697**
	Employment	1,134	1,166	979	846	961	792	589	401	472	344	467	**8,152**
	LFPR	65%	85%	91%	92%	93%	94%	91%	90%	86%	81%	69%	**84%**
	Highest LFPR	94%	94%	94%	94%	94%	94%	94%	94%	94%	94%	94%	
	P	70%	91%	97%	99%	100%	100%	97%	97%	92%	86%	74%	
	W/P	**1,621**	**1,286**	**1,007**	**857**	**962**	**792**	**607**	**415**	**515**	**398**	**635**	**9,095**
Female	***Population***	1,876	1,308	1,062	1,034	1,044	841	668	476	545	439	802	**10,096**
	Labor Force	1,036	705	548	536	538	455	360	258	271	212	288	**5,209**
	Employment	971	661	514	503	504	426	338	242	254	199	270	**4,882**
	LFPR	55%	54%	52%	52%	52%	54%	54%	54%	50%	48%	36%	**52%**
	Highest LFPR	55%	55%	55%	55%	55%	55%	55%	55%	55%	55%	55%	
	P	100%	98%	94%	94%	93%	98%	98%	98%	90%	88%	65%	
	W/P	**971**	**677**	**550**	**535**	**540**	**435**	**346**	**246**	**282**	**227**	**415**	**5,225**

In order to avoid a speculative assumption about people's perception of this improvement, we assume that people are not able to anticipate that the public social security coverage will improve for the coming years. This assumption is also consistent with the second perception method, which, we believe, is the best among the others for Turkey. Barro (1978) criticized Feldstein's SSW series, which uses the current coverage rates and the average benefit factor, by indicating that *"the treatment of coverage and benefit rates (factor) is also asymmetric in that anticipated future coverage is assumed to correspond to current coverage, (…), while anticipated benefit rates are invariant—hence SSW— with respect to changes in actual benefit rates"* (p.15). In order to include those uncovered employees, however, this assumption can be changed by forming a "reasonable" expectation method for the perception of future improvements.

Table 4: Covered Employment Based on Gender

	Employment	Total Active Insured	SSK	BK	ES	PF	Covered Employment Ratio Male	Female	Total
1970	13,033,977	2,172,330	1,313,500	823,829	1	35,000	22%	8%	17%
1975	14,386,813	3,779,893	1,823,338	1,092,000	816,555	48,000	35%	10%	26%
1980	15,702,127	4,708,044	2,204,807	1,325,000	1,100,500	77,737	39%	12%	30%
1985	16,699,204	5,890,253	2,626,165	1,400,000	1,787,310	76,778	46%	15%	35%
1990	18,539,000	7,990,454	3,520,909	1,560,000	2,825,473	84,072	53%	21%	43%
1995	20,585,000	9,284,849	4,664,207	1,880,437	2,669,351	70,854	54%	22%	45%
2000	21,581,000	10,994,287	5,439,400	2,163,698	3,312,694	78,495	56%	38%	51%
2001	21,525,000	10,674,982	5,029,187	2,236,050	3,336,655	73,090	55%	36%	50%
2002	21,351,000	11,137,196	5,371,446	2,372,777	3,321,332	71,641	59%	36%	52%
2003	21,148,000	11,663,428	5,800,506	2,408,148	3,383,849	70,925	61%	41%	55%

3.2.1.2 Workers' Wives

After having the final gender and age specific base numbers for potential workers for each year, we also estimated the number of dependents who may expect to have some social security wealth in the future conditional on the potential workers' expected retirement benefits. In other words, if a worker is married, his wife can have an expectation about the future social security wealth conditional on her husband's future retirement benefits. For this, we made the following assumptions:

- Only wives have SSW expectations. We assume that workers' children, as dependents, do not have SSW expectations.
- If the worker dies, the benefit passes to his dependents with a generalized discount rate for all three social security systems, which is 75%[22].
- Wives are 3 years younger than workers.
- We used "Single Ratio" (from SIS's related statistics) for workers to estimate the number of married male workers for each age group and discounted the number of wives by these ratios.

3.2.1.3 Current Old-Age Retirees

In order to find the number of beneficiaries who receive annuities from the public social security system, we used the data provided by SSK, BK and ES. As explained before, the number of retirees includes all individuals who receive only old-age benefits from the public social security system.

We used gender base per retiree benefits and numbers to calculate SSW series for each public pension scheme. Since we could not have detailed age distribution, we used average ages for each scheme and gender.

3.2.1.4 Retirees' Wives

Similar to what we have done in the group of workers' wives, using the same assumptions, we estimated the number of wives who may expect to have some social security wealth in the future, conditional on the retirees' expected retirement benefits.

3.2.1.5 Disability Retirees

We found the number of individuals who are retired under the disability coverage for each public pension scheme. We used an average age for each gender and scheme. We have detailed information about the number of retirees based on gender for SSK. However, we had to estimate this gender distribution for ES and partly for BK. We assumed that 80% of disability retirees are male for ES and it's 93% for BK. Since the number of total disability retirees is about as low as 36,000 in 2003 for ES and BK, a possible mistake in the gender distribution is negligible in the overall SSW calculation.

3.2.1.6 Survivors

We have three types of survivors: wives, orphans and workers' spouses. We found the number of all wives, children and spouses who receive survival benefits from SSK, ES and BK. We ignored the gender distribution since the majority of the survivors are female (wives,

[22] There are several important rules in calculating survivor's annuities. These rules are slightly different in the three programs. The major rules are as follows: a wife's employment status does not affect her eligibility for survival benefits. A worker in SSK must pay 1800-day premium out of 7000 days in order for his dependents to be eligible for the retirement benefits. If the worker dies in a work accident, this rule is not applied and dependents receive full retirement benefits. If wives do not have kids who are eligible to survivor's benefits, wives receive 75% of benefits, otherwise the ratio becomes 50% and the rest is distributed to eligible children and parents (of worker). For BK and ES, a 5-year and 10-year paid premium periods (respectively) are sufficient for a worker's dependents to have retirement benefits. The other rules for ES and BK are similar to those for SSK.

daughters and mothers). We used average ages for wives, orphans and spouses for each scheme and each year. In addition to these, we made the following assumptions:

- We assumed that orphans could receive survivor benefits for ten years.
- Since the number of spouses is very low, we considered spouses and wives as a one group.
- Because we do not have exact numbers of wives and orphans for ES separately, we assumed that wives and veterans make up 55 % of the all survivors in ES and the rest is orphans

3.2.2 Survival Probabilities

Turkey does not have its own mortality rate tables. Therefore, the private pension schemes in Turkey have been using the mortality rates calculated for the U.S. There are four types of mortality rates commonly used in Turkey: CSO 1980, CSO 53-58, ADST 49-51, and Heubeck Fischer tables for disabled persons[23]. These mortality tables are also allowed by the government agency regulating the private pension market in Turkey. We have chosen ADST 49-51 for the following reason: it is the oldest mortality table among the three and therefore the rates are higher than the others. Even though we believe that the differences among these three tables would not have significant effects on the SSW series, by selecting the "worst" mortality rates, a kind of adjustment in terms of mortality rates was made for the difference between Turkey and the U.S.

3.3. Reference Income

We need a "reference income" to calculate SSW series in two places: in the calculation of benefit and tax factors, explained in the first step, and in the calculation of the first annuities, which will be explained in the last step. The SSW series are calculated in the literature by using personal disposable incomes (PDI). Unfortunately, PDI series based on surveys do not exist for Turkey.

As mentioned in the first step, we use Net Private Disposable Income (NPrvDI) in constructing SSW series. We fist attempted to create a "generated" PDI by using national account identities as follows:

PDI ≡ NNP – TX + TR – RE + NINT[24]

However, because of the difficulties in finding reliable information in Turkey about the

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[23] We thank Aviva Life Insurance for providing these mortality tables.

[24] Net National Product *(NNP) = GNP* – Depreciation
Net Income *(NI) = NNP* – Indirect Taxes *(InTX)* + Subsidies
*PDI = NI – (*Corporate Profits-Corporate Dividends*)* + Net Interest *(NINT)* + *(*Transfers *(TR)*-Contribution to Social Security *(SS))* – Personal Taxes *(PrsTX)*
Since (Corporate Profits-Corporate Dividends) = (Corporate Taxes (*CorpTX*)–Retained Earnings (*RE*))
PDI = NI – (CorpTX + RE) + NINT + TR - SSTX – PrsTX
PDI = NNP – (IndTX + Subsidies) – (CorpTX + RE) + NINT + TR - SSTX – PrsTX
If we group taxes then
PDI = NNP- (IndTX + CorpTX + SSTX + PrsTX) + TR + NINT -RE
Since the first parenthesis on the right hand side is simply TX (Taxes) we can generate the following identity for national account:
PDI ≡ NNP – TX + TR – RE + NINT. A similar method is used by Meguire (1998).

components of PDI above, we decided to use Net Private Disposable Income. The difference between NprvDI and PDI is simply RE, about which we do not have any information.[25] The difference between *NprvDI* and *PDI* is simply *RE*. As long as individuals perceive undistributed profits as capital gains (hence a part of their income), the difference between *NprvDI* and *PDI* is probability insignificant[26]. We used the following *NprvDI* definition as our reference income series in our calculations.

NprvDI = C + I – GS + FS - CoC

3.4 Putting All Pieces Together

As mentioned before, we have two SSW series: the *SSWG* and *SSWN* series. *SSWN* is defined as $SSWN_t = SSWG_t - SSTX_t$. Therefore, in order to have the *SSWN* series, the *SSWG* and *SSTX* series should be constructed first. We summarized the calculations in Figure 3 and the assumptions are given below.

Figure 3: Aggregate SSWG and SSTX Definitions

SSWG

Workers

$$SSWG_t = \sum_{a=15}^{ra} (W_{a,t} / P_{a,t})^G C_t^G bf_t^G Y_t S_{(a,ra)}^G \left[(1+g)/(1+d)\right]^{(ra-a)} \sum_{n=ra}^{85} S_{(ra,n)}^G \left[(1+ga)/(1+d)\right]^{(n-ra)}$$

Workers' Wives

$$SSWG_t = \sum_{a=15}^{ra} (W_{a,t} / P_{a,t})^M C_t^M bf_t^M sr^M Y_t (BR)(S_{(a-3,ra)}^F)(1-S_{(a,ra)}^M)\left[(1+g)/(1+d)\right]^{(ra-a)}$$

$$\sum_{n=ra}^{85} S_{(ra,n-3)}^F \left[(1+ga)/(1+d)\right]^{(ra-n)} plus$$

$$\sum_{a=15}^{ra} (W_{a,t} / P_{a,t})^M C_t^M bf_t^M sr^M Y_t (BR)(S_{(a-3,ra)}^F)(S_{(a,ra)}^M)\left[(1+g)/(1+d)\right]^{(ra-a)} \sum_{n=ra}^{85} (S_{(ra,n-3)}^F)(1-S_{(ra,n)}^M)\left[(1+ga)/(1+d)\right]^{(n-ra)}$$

Retirees

$$SSWG_t = N_t^G AVB_t^G \sum_{n=ara}^{85} S_{(ara,n)}^G \left[(1+ga)/(1+d)\right]^{(n-ara)}$$

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[25] *Gross National Product (GNP) = Household Consumption (C) + Investment (I) + Government Spending (G) + Net Foreign Trade (NX) + Net Factor Incomes from Abroad (NFI)*
If we subtract *TX* (taxes) and add *TR* (transfers) and *NINT* (net interest rates paid by government) from and to both sides, we get the following:
GNP – TX + TR + NINT = C + I - (TX – G – TR - NINT) + (NX + NFI)
The expression in the left hand side is Gross Private Disposable Income (*GPrvDI*) and the first and second parentheses in the right side are government saving (*GS*) and foreign sources (*FS*) respectively. Therefore the above identity becomes
GPrvDI = C + I – GS + FS[25]
Since *GPrvDI = GNP – TX + TR + NINT*, if the consumption of capital (*CoC*) subtracted from both sides, we get
NPrvDI = NNP – TX + TR + NINT
As seen from this identity, the difference between *NprvDI* and *PDI* is simply *RE*.

[26] See Feldstein (1974), Ando and Modigliani (1963).

Retirees' Wives $$SSWG_t = N_t^M (sr^M)(BR)AVB_t^M \sum_{n=ara}^{85} (S^F_{(ara,n-3)})(1-S^M_{(ara,n)})\left[(1+ga)/(1+d)\right]^{(n-ara)}$$

Disability Retirees $$SSWG_t = ND_t^G (ABD_t) \sum_{n=ara}^{85} S^G_{(ara,n)} \left[(1+ga)/(1+d)\right]^{(n-ara)}$$

Survivors -- Wives $$SSWG_t = NS_t^w (ABSW_t) \sum_{n=ara}^{85} S^F_{(ara,n)} \left[(1+ga)/(1+d)\right]^{(n-ara)}$$

Survivors – Orphans $$SSWG_t = NS_t^O (ABSO_t) \sum_{n=ara}^{ara+10} S^F_{(ara,n)} \left[(1+ga)/(1+d)\right]^{(n-ara)}$$

SSTX

Workers $$SSTX_t = \sum_{a=15}^{ra} (W_{a,t}/P_{a,t})^G C_t^G \theta_t^G Y_t \sum_{m=a}^{ra} S^G_{a,m} \left[(1+g)/(1+d)\right]^{m-a}$$

M = Male, F = Female, G=Gender, t = year, a = age at time t, ra = retirement age, ara = average age for retirees, m = age between current age a and retirement age ra, n = age between retirement age ra and the maximum age, 85, w= wives, O=orphans, d = personal discount rate, g = growth rate of real reference income, ga= growth rate of real annuities, W = number of employers, P = LFPR adjustment factor, C = ratio of active insured employment to total employment, θ = tax factor, Y = reference income, AVB = per retiree average old-age benefit, ABD= per retiree average disability benefit, ABSW= per retiree (wives) average survivors benefit, ABSO= per retiree (orphans) average survivors benefit $S_{(a,m)}$ = survival probability of a person who lives up to age m, given that she/he lived up to age a, bf = benefit factor, N = number of old-age beneficiaries, sr = % of male married, BR = discount ratio for benefits passed from worker or retirees to survivors.

3.4.1 Assumptions

1. The most critical assumptions are the personal discount rate (*d*), and the real income growth rate (*g*). For the growth rate, we looked at the entire period and found approximately 1.9% average growth for per capita GDP and NPrvDI. Therefore, the growth rate for the real income is taken as 2% in our entire SSW series. For the personal discount rate (*d*), we calculated the real interest rates for each year[27]. We used the consumer price inflation and time deposit interest rates to calculate the real interest rates. In our calculation, the average real interest rate is found to be about zero. One reason for this near-zero real interest rate is that before 1980 the nominal rates were not free and therefore real interest rates were mostly negative up to 1980. After the financial liberalization during the early 1980s, the average real interest rate started to rise to 1.6% for the period between 1980-2003. We took it to be 3% for our SSW calculations.

2. The other key parameter is the average retirement age. We used the related information from the three public social security programs and found that 55 could be taken as the average age for retirement for the <u>entire</u> public social security system. Therefore we used 55 for both genders and each year as the average retirement age in both the *SSWG* and *SSTX* calculations for working-age individuals[28]. We used 58 (female workers) and 60 (male workers) for 15-19 and 20-24 age groups after 1999. Moreover, we took 85 as a maximum age in all calculations[29]. The average ages that we used in our calculations are summarized in Table 5 below.

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[27] Real Interest Rate = (Nominal Int.Rate – Inflation)/(1 + Inflation).

[28] After the reforms since 1999, the retirement age has been increased to 58 (female) and 60 (male) for new entrants. These ages were reduced to 56 and 58 respectively in 2002. These minimum ages are phased-in gradually for the previously insured employees.

[29] Maximum life expectancies are projected 80 for males and 83 for females at age 65 for 2040 by OECD (2005).

Table 5: Average Ages[30]

	SSK		ES		BK	
	M	**F**	**M**	**F**	**M**	**F**
Retirement age	55	55	55	55	55	55
Maximum age	85	85	85	85	85	85
Average Age for Retirees	59	59	60	55	65	63
Average Age for Disability Retirees	60	57	60	55	61	63
	W&S	**O**	**W&S**	**O**	**W&S**	**O**
Average Age for Survivors	62	29	65	34	62	29

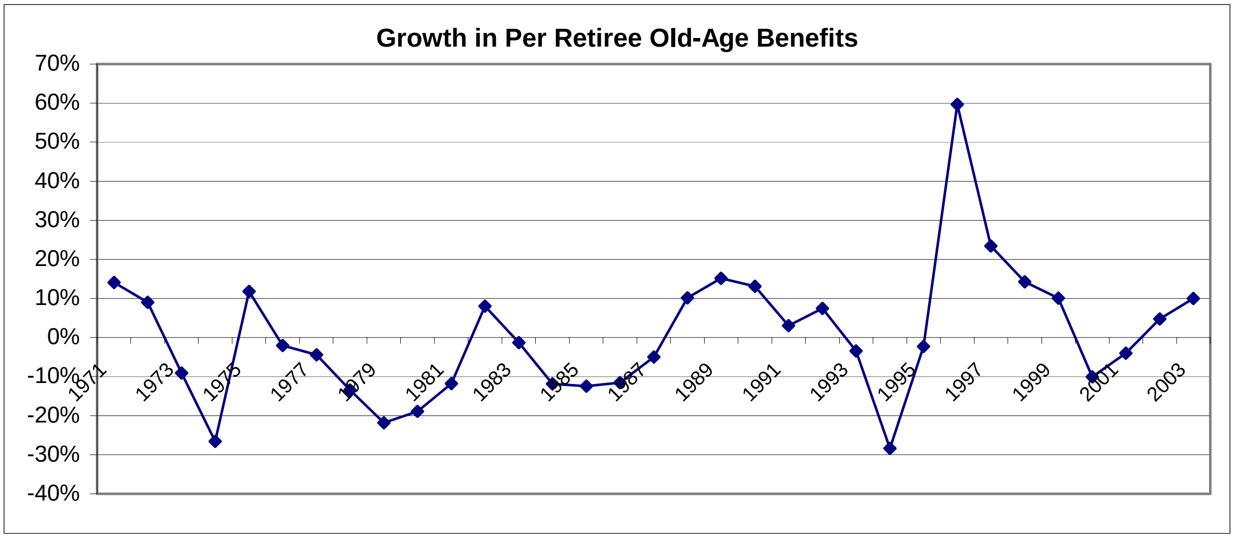
3. As the following graph (Figure 4) shows, there are fluctuations around the average rate of 0.5% in the growth of per retiree annuities (old-age) in real terms. Even though the same average for the last 24 years (1980-2003) is 2.4%[31], we calculated SSW series with and without 2%. In other words, we assumed that annuities grow only by the price inflation with the zero-percent real growth rate.

4. *P*, the labor force adjustment factor is the same for all years in Feldstein's SSW calculations, which is criticized by Leimer and Lesnoy (1980). We used the labor force adjustment factor, *P*, which varies each year.

5. Since we were not able to obtain a gender base benefit and tax information, we assumed that the per capita old-age benefits and ODS taxes would be 30% less for females than for males.[32] Therefore, instead of dealing with insufficient data and sensitive assumptions to calculate the "precise" values, we used a generalized discount factor to reflect the gender difference in SSW calculations.[33] We believe that a 30-percent discount for both factors is a reasonable and modest estimation for Turkey.

Figure 4: Growth in Annuities (with 1987 Prices)

[30] M, male; F, female; W&S, wives and spouses; O, orphans. In ES, W&S includes veterans.
[31] However, if we remove the outlier growth (60%) in 1996, the average approaches to zero.
[32] For example, the male benefit and tax factors are twice higher than the female factors in the U.S. (Feldstein – 1974).
[33] For this assumption, we made use of SIS's Social Structure and Gender Statistics in Income Distribution Study (1994).



6. Similarly, since we didn't have benefit distribution details between orphans and wives, we reduced per beneficiary benefits 50% for orphans using the same method as in benefit and tax factors calculations.

7. We adjusted the number of workers by MaxLFPR in SSTX calculations to reflect the perception of future taxes for individuals who are not currently in the labor force.

8. Since we could not have the number of covered people based on gender up to 1993 for ES, we used the same percentage for the gender distributions between 1970 and 1992 as in 1993.

9. We used the total "statutory revenues" as premiums received by ES. Since ES provides only ODS coverage we believe that any possible difference would be negligible.

10. Since BK started providing health coverage after 1985, we discounted total premiums collected 50% for ODS coverage.

11. In ES survivors group, we put wives, spouses and veterans together under the number of wives.

12. Individuals, once they are covered by the system, have full career paths without any interruptions.

13. As the time goes by, survival probabilities should change. We ignored these changes in survival probabilities and used only one series of survival probabilities in the entire calculations.

3.5. Results

The first thing to observe is the magnitude of the SSW series relative to other wealth series and NPrvDI as can be seen in Table 6 below. This observation reinforces the argument that the social security wealth variable could be an important determinant in saving and consumption studies.

Table 6: Total Wealth in Financial Assets, Housing and SSW[34] with NPrvDI
(Million TL in 1987 Prices)

	TFA[35]	Housing[36]	SSWG	SSWN	NPrvDI
1970	7,588,518	32,700,333	54,350,527	43,721,351	25,592,525
1975	10,806,548	41,781,557	89,508,490	69,086,105	33,269,315
1980	9,674,345	56,696,805	63,905,043	33,945,697	42,029,239
1985	20,075,898	63,750,469	62,728,296	24,296,819	45,873,753
1990	26,996,582	88,709,913	111,574,201	65,316,832	67,179,895
1995	46,704,601	128,391,319	103,123,054	49,536,263	84,157,732
1996	61,819,289	135,536,058	171,916,203	119,046,643	86,040,622
1997	69,998,934	152,101,623	231,487,100	160,536,942	92,590,536
1998	75,985,989	160,030,906	277,262,042	185,039,302	102,044,735
1999	96,063,696	159,652,714	292,422,907	198,503,687	102,748,644
2000	95,036,365	159,160,494	276,903,910	185,179,981	103,808,861
2001	146,103,010	165,728,972	270,810,987	198,497,777	100,472,296
2002	126,833,322	158,074,788	297,929,986	236,761,695	98,286,544
2003	117,491,297	166,061,466	342,736,721	283,310,716	105,211,662

The second important point is that the SSWG and SSWN series overweigh the NPrvDI most of the time. There are two major reasons for this increasing trend in the SSW series: first, the participation rate to the public social security system for the workers exponentially increases over the years, and second, even though the increase in the number of covered workers is high, the number of beneficiaries in the system even grows faster than the active contributors.

In addition to these observations, since the PAYG system provides a transfer from future generations to the current generation, per capita net social security wealth is always positive, as seen in the series[37]. This result is also consistent with the argument that any increase in the net social security wealth may cause a shift in the budget constraint of a representative individual and therefore affect personal consumption and saving decisions. Even though this topic beyond the scope of this work, our ultimate task in constructing the SSW series, as stated earlier, is to answer the following question: how does the unfunded social security system affect personal savings in Turkey?

As noted before, SSW is a proxy for the perception of future public social security

[34] SSW series are calculated by 3% discount rate, 2% growth rate in income (not in annuities) with "current benefit factor" method.
[35] Total Financial Assets (TFA) is calculated by State Planning Organization (SPO) for the entire economy regardless of who holds them.
[36] Housing wealth is an approximation, see the appendix.
[37] For this comparison, the more correct measure of SSWN should include all past tax payments as well as future. However, this can be done by looking at the youngest age group (15-19), which has a very high positive SSWN in our series.

entitlements. Many improvements can be made to have more "precise" SSW series. We didn't take the health benefits into account for example. Likewise, in calculating SSWG for beneficiaries, we applied gender based average ages. Additional micro level data and information can be used to make the SSW series more "precise". However, how appropriate the improvements are depends on the extent to which they are perceived and anticipated by people. We are not looking for a simulation that provides exact actuarial future values for the public social security system in Turkey. In principle, if the social security wealth series represent the perception of the people about the magnitude of the complex actuarial future benefits and tax liabilities in the social security, this would be satisfactory for our purposes. Instead of making more "fine-tunings" in our SSW series, we look at our assumptions more critically.

We consider the SSW series calculated with 3% discount rate, 2% growth rate and the "current" benefit and tax factors as our main SSW series.

4. Empirical Results

As mentioned before, we use an aggregate consumption function in a pure Life-Cycle model setting as a baseline model to investigate whether or not the time-series data provide some evidence for the claim that an unfunded social security system has positive effects on consumption, and thus, negative effects on saving. We also extend the model to incorporate other factors, which possibly influence aggregate consumption, such as uncertainty, unemployment, demographic changes, interest rate, and borrowing constraints.

4.1 The Model and Data

A rational, forward-looking Household (HH), with inelastic labor supply, maximizes its following lifetime utility subject to its lifetime budget constraint in a perfect capital market without uncertainty:

$$U(t) = \sum_{t=0}^{T-i} (1+\rho)^{-t} \log C_t$$

$$\sum_{t=0}^{T-i} C_t /(1+r)^t \leq W_t + \sum_{t=0}^{T-i} HW_t /(1+r)^t + SSW_t$$

T is the age of death and ***i*** is the age of household. For example, if the individual is 25 years old and T is 85, then the maximum life duration for the individual is $T\text{-}i=60$. ***C*** denotes consumption and ***W*** is real wealth, which is directly observable and consists of housing wealth and financial assets. ***SSW*** is discounted present value of future benefits with survival probabilities for every household. The retirement age is given by the law and the maximum life (T) might be truncated at 85.

HW is human wealth and not directly observable. It's the present value of current and future labor incomes. Since it includes social security taxes, *SSW* may be taken as gross.

The solution for this maximization problem is

$$C_t = d^t \left[\frac{W_t}{\sum_{t=0}^{T-i}(1+\rho)^{-t}} + \frac{\sum_{t=0}^{T-i} HW_t /(1+r)^t}{\sum_{t=0}^{T-i}(1+\rho)^{-t}} + \frac{SSW_t}{\sum_{t=0}^{T-i}(1+\rho)^{-t}} \right], \quad \textbf{(1)}$$

where $d = \left(\frac{1+r}{1+\rho} \right)$.

Since we further assume that the personal discount rate, ✕, is equal to the real interest rate, *r, d* drops out. When we aggregate this individual solution over all households, the resulting function can be represented by the following average (aggregate) consumption function for the entire economy.[38]

$$C_t = \beta_0 + \beta_1 Y_t^e + \beta_3 W_t + \beta_4 SSW_t \quad \textbf{(2)}$$

C represents consumption expenditures for households, Y^e is the present value of current and expected future income, *W* is the non-human household wealth and *SSW* is the social security wealth.

We start the empirical test with the above baseline aggregate consumption, which is used in Feldstein's studies both in 1974 and in 1996. In this application, the consumption expenditures include durable goods for the entire period between 1970 and 2003. This is because there is no information on the disaggregated household consumption prior to 1987. Since we estimate only long-term dynamics between the consumption and other variables by the equation above, the inclusion of durable goods in the consumption expenditures does not present a problem.[39] "Income", *Y*, was first defined in Modigliani's LCT study in 1963 as "labor income". However, because of the difficulties involved in calculating implicit labor income for self-employed people, "personal disposable income" (PDI) has been used as an alternative measure in later consumption studies[40]. We use Net Private Disposable Income (NprvDI) in the regressions in the absence of survey based PDI in Turkey. Nevertheless, PDI or NPrvDI is not a perfect measure for LCM: they both include non-human incomes and transfers, and therefore, constitute double counting. Since the expected future income is not directly observable, we use the following rational expectation method in which the current income is unknown and equal to the expectation of current income and a forecast error (ε) with the standard assumptions *NIID~(0,1),* as expressed below.

$$Y_t = Y_t^e + \varepsilon_t = E(Y_t / I_{t-1}) + \varepsilon_t$$
$$Y_{t+k}^e = \beta Y_t^e \quad \text{where } \beta \cong 1$$

Households form their expectations at time *t* by using the available information (*I*) at time *t-1* and it is assumed that expected future income is proportional to expected current

[38] See Ando and Modigliani (1963) and Auerbach and Kotlikoff (1983).
[39] See Mehra (2001).
[40] See Blinder *et al*. (1985), Darby (1979), Feldstein (1974 and 1996), Modigliani (1983).

income[41].

There is no ready-to-use wealth series for households in Turkey, and we have a range of problems in estimating both financial and housing wealth for households. In private equity markets, for example, the first stock exchange, ISE, was formed in 1986. Likewise, private pension funds are very new and not significant. Since the free float in the Turkish market is significantly lower than 30%[42] (of the total outstanding equity), the market capitalization is not an appropriate indicator for measuring the private equity market even for the entire economy. Besides, the share of foreign investors in the market is very high (approximately 50%) and the available information about the household holdings in stocks is very limited.

Before 1980, since the interest rates on deposits were not free, they are not able to reflect the "true" nominal rates under the conditions of high inflation and political instability. Therefore, it is not unreasonable to assume that the wealth was held mostly in gold and housing by households before the liberalizations of the financial markets (during the early 1980s). Since there are no available data, estimating gold holdings of household is quite speculative for Turkey.

Moreover, after 1988, increasing needs in government borrowings made government bonds one of the most demanded investment means for domestic investors. However, since new accounting standards were put into effect in the banking sector only after 2001, there is no reliable record for households' holdings in government bonds prior to that year.

The only adequate data among the household financial assets are on bank deposits, which is the most common financial investment tool for ordinary households particularly prior to 1990s. Therefore, we use the most common proxy for the financial wealth used in the aggregate time-series consumption and saving investigations for Turkey[43]: real money balances measured by Money-Quasi money (M2).

The second and most important part of household wealth is housing. The shallow financial markets (particularly before the liberalization in the early 1980s), high inflation and political instability made housing the most popular investment tool for households in Turkey. However, the available data on the number of existing dwelling units and their values are very limited. The only available data for each year on housing are the number of occupancy permits for each dwelling unit and their values. The total stock of dwelling units for each year between 1970 and 2003 can be estimated if the initial stock is known in 1970 and illegal constructions are ignored for the entire period in question. Even though the high urbanization cast doubts on this assumption, we use the relevant data from the State Institute of Statistics (SIS) as checkpoints in generating an approximation of the stock of dwelling units[44].

In the life-cycle theory, non-human wealth, which is a part of total lifetime resources, contributes to consumption by its anticipated "purchasing power". This purchasing power is divisible into two parts: the additional income that wealth earns and the consumption of this wealth itself (Hamburger 1955). In an economy with superficial financial markets (without mortgage markets) and high bequest motives, the second part of the purchasing power of housing wealth, i.e., the consumption of housing wealth itself, could be considered weak relative to that of more developed economies. Therefore, property incomes

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[41] See Ando and Modigliani (1963) and Mehra (2001).

[42] The World Bank Country Report (2003)

[43] See Akkoyunlu (2002), Ozcan et al. (2003)

[44] See Author(2005)

might be a better proxy for housing wealth than the total value of the dwelling units in measuring the anticipated "purchasing power" of the housing wealth. Therefore, instead of using an "approximated" total value of dwellings as a proxy for housing wealth, we use "Ownership of Dwellings"[45], which consists of direct and imputed incomes (net of inputs, representing the added value) of owners from their dwellings.

The baseline consumption function, Equation (2), omits potentially important factors that may influence consumption behaviors: credit constraints, demographic trends, uncertainty, the separation of non-human wealth in terms of liquidity, and the real interest rate. Therefore, we extend this baseline consumption function as follows

$$\begin{aligned} C_t &= \beta_0 + \beta_1 Y_t^e + \beta_2 SSW_t + \beta_3 HW_t + \beta_4 FW_t + \beta_5 CRTP_t + \beta_6 R_t + \beta_7 Inf_t + \beta_8 Old_t + \beta_9 Young_t \\ &+ \beta_{10} LFPR_t + \beta_{11} Urban_t + \beta_{12} Un_t \end{aligned} \quad \textbf{(3)}$$

where *HW* denotes the housing wealth using "Ownership from Dwellings", *FW* is financial wealth, which is proxied by the Money-Quasi Money (M2), and *CRPT* is "credit to private sector" representing the credit constraints. *Inf* is unexpected inflation, as a proxy for uncertainty, calculated by the difference between the current and 3-year moving average consumer price inflation.

The real interest rate, *R*, is calculated by adjusting nominal interest rates on one-year time deposit accounts[46]. While *R* has two well-known effects on consumption, substitution and income, it has a special importance in our case: all coefficients are affected by a common factor, the real interest rate, as seen in Equation (1).

Demographic variables have important roles in the life-cycle consumption models. The stability of averaged coefficients in Equation (2) depends on how quickly the demographic changes occur. Besides, according to LCM, while the young and elderly consume more relative to their income, working age people are supposed to save more and consume less[47]. We use *Old* and *Young* as dependency ratios, which are the ratios of the number of people (people younger than 15 and older than 64) to the working-age population (those ages 15-64), to see if their effects are different. Another demographic variable, the ratio of urban population to the total population denoted by *Urban*, could also be an important factor: a higher urbanization could lead to a decrease in precautionary saving, and therefore a higher consumption could be expected.

Unemployment rate, *Un*, is used by Ando and Modigliani (1963) as a part of permanent income. As Barro (1978) indicates, it would have a positive effect on current consumption, if future income were positively related to the unemployment rate given the value of current income and other factors. In other words, according to LCM, when people are unemployed, they smooth their consumption by reducing their saving, since they could anticipate that the current income is below the permanent income. On the other hand, a high unemployment rate, which is a common observation in most developing countries, might indicate uncertainty about the future income and therefore suppress consumption (Feldstein 1978). Its effect on consumption, therefore, is not necessarily positive.

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[45] It's from the National Accounts by Production, State Institute of Statistics (SIS).

[46] $Intr_t = \left(\frac{i_t - \pi_t}{1 + \pi_t} \right)$, where *i* denotes nominal rates, and π is the consumer price inflation.

[47] See Modigliani (1986), Darby (1979).

The labor force participation rate, *LFPR*, is supposed to affect the relationship between consumption and social security wealth: as the SSW increases it may push consumption up. However, a higher SSW can create downward pressure on LFPR and this may pull consumption down.

4.2 Estimations

As pointed in several time-series aggregate consumption studies[48], the consumption equations, which are linear in levels, may suffer from heteroskedasticity, with or without unit roots, simply because of economic growth that causes the residual variance to increase with time. Feldstein (1974, 1996) applies linear models in levels. Meguire (1998) criticizes this approach by pointing out that "neither logged nor weighted" (p.342) time-series linear models in levels may have heteroskedasticity problems, which should be corrected. He uses weighted series by the lagged level of dependent variable in his models. Coates et al. (1999) refer to the same problem in their investigation of social security and prefer to apply models linear in levels. We also test for heteroskedasticity in all estimations, which are linear in levels, by the White test. We then decided to use levels. The first results are given in Figure 5 below.

All variables are deflated to 1987 prices[49] and divided by population. SSW series are gross and calculated by 2% income growth and 3% discount rates. The benefit factors and coverage ratios used in SSW calculations are not average (constant) and change every year. Standard errors are presented below the coefficients. R2 is adjusted R2. SSR denotes the sum of squared residuals and negative numbers are in parentheses

We use a dummy variable, *Dummy95*, to take care of the outlier[50] in 1995, which is identified by observing the recursive residuals.[51] We also applied a dummy variable for economic recessions and found that it's statistically insignificant.

The first equation is without a correction for its apparent autocorrelation problem. The series in Equations 2 are transformed by the first-degree autoregressive AR(1) process.[52] We suspect that the specification of autocorrelation might be different than the AR(1) process. Even though it is not possible to know the exact form of autocorrelation, we add AR(2) to equation 2 and obtain the results in Equation 3. When the series are transformed by the AR(1) procedure, the first observations are lost. Therefore we also applied Prais-Winsten transformation (with AR(1) scheme) to save the first observations. We found insignificant differences in the coefficients with and without the first observations, and therefore the results are not presented here. In Equation 4, we use the full scale of variables.

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[48] See Mehra (2001), Coates and Humphreys (1999), Campell and Mankiw (1989), Meguire (1998).

[49] Except for the unexpected inflation, interest rate and all ratios. By calculation, SSW series are per capita and in real terms.

[50] A severe economic crisis took place in 1994 with a 9-percent decrease in per capita real NprvDI. In 1995 it turned up with a 4-percent growth rate.

[51] We plotted the recursive residuals (for Equation 1 in Figure 5), i.e., one-step-ahead prediction errors (see Johnston and Dinardo. 1997. p. 118) about the zero line. Residuals outside the two standard error bands are identified as outliers. We have two outliers: 1987 and 1995. However, a dummy for 1987 turned out to be insignificant with very high probability.

[52] We assume that the error term follows the first-order autoregressive scheme in Equations 2 as follows: $\mu_t = \rho\mu_{t-1} + \varepsilon_t$ where ε is a white noise process.

Figure 5: Estimation Results with SSWG

Equations	1	2	3	4	5	6	7
Income	**0.62683**	**0.52183**	**0.59112**	**0.41034**	**0.30530**	**0.28483**	**0.16886**
	0.05022	0.08141	0.071569	0.11616	0.07512	0.06942	0.07947
SSWG	**0.00385**	**0.01913**	**0.02114**	**0.01256**	**0.01222**	**0.01917**	**0.02346**
	0.00879	0.01219	0.010564	0.01081	0.00845	0.00827	0.00879
HW	**1.95662**	**1.66721**	**2.45531**	**0.62445**	**1.41514**	**1.55203**	**1.27313**
	0.45026	0.60926	0.427775	0.88683	0.35125	0.32706	0.35279
FW	**(0.05544)**	**(0.18854)**	**(0.22163)**	**(0.23044)**	**(0.14375)**	**(0.17374)**	**(0.18193)**
	0.07163	0.08842	0.07057	0.11091	0.06603	0.06181	0.06520
R	-	-	-	**(102,348.10)**	**(119,396.40)**	**(110,872.60)**	**(135,338.50)**
				71,917.01	43,173.77	39,755.31	42,421.80
CRTP	-	-	-	**0.33059**	**0.47303**	**0.47787**	**0.55697**
				0.13601	0.09655	0.08858	0.09575
Inf	-	-	-	**(185.50)**		-	-
				447.89			
Old	-	-	-	**(143,050.20)**		-	-
				109,456.40			
Young	-	-	-	**(36,754.32)**		-	-
				23,516.29			
LFPR	-	-	-	**8,932.35**		-	-
				5,695.40			
Un	-	-	-	**(627,799.90)**		-	-
				608,390.20			
Urban	-	-	-	**(20,737.49)**		-	-
				14,950.77			
Time	-	**4,081.28**	**3,457.18**	**22,370.24**	**7,539.39**	**8,054.35**	**10,521.57**
		2,752.08	2,153.01	11,557.03	1,901.79	1,757.21	1,966.36
Dummy95	-	**44,884.28**	**42,615.37**	-	-	**53,414.29**	**57,871.49**
		24,816.18	18,034.58			21,982.47	23,207.58
Constant	**146,748.80**	**236,464.60**	**123,574.00**	**2,701,405.00**	**321,834.10**	**320,572.00**	**402,502.20**
	60,249.83	78,831.86	66,485.42	1,740,420.00	60,892.92	55,855.17	62,823.22
AR(1) Rho	-	**0.51454**	**0.74580**	-	-	-	-
		0.20631	0.171172				
AR(2) Rho	-	-	**(0.60402)**	-	-	-	-
			0.18203				
DW	**1.14370**	**1.53819**	**1.79157**	**2.29047**	**1.96714**	**1.86096**	**2.13010**
R2	**0.96475**	**0.97194**	**0.97732**	**0.98108**	**0.98171**	**0.98461**	**0.98289**
SSR	**25.1E+9**	**16.2E+9**	**11.5E+9**	**9.3E+9**	**11.7E+9**	**9.5E+9**	**10.5E+9**
W	**0.04213**	**0.09371**	**0.73767**	**0.65525**	**0.12718**	**0.45301**	**0.36136**
LM	-	**0.01186**	**0.56409**	-	-	-	-

Since the DW statistic is not strictly applicable with autoregressive transformations, we also use the Breusch-Godfrey test to diagnose a possible autocorrelation, which is presented by the probability that there is no first-degree autocorrelation and denoted by LM in Figure

5 above[53]. The results of White test[54] — the probabilities that the estimations do not suffer from heteroskedasticity — are shown next to W.

As seen in equation 4, except for *CRTP*, the new variables do not contribute to the baseline consumption function defined in Equation (1) before. Very low pair wise correlations show that their insignificances are not merely due to their collinearity with each other. In equations 5 and 6, we remove the insignificant new additional variables[55] and add the dummy variable in equation (6).

Since income is defined as $NprvDI = C + I - GS + FS - CoC$, there might be a simultaneity problem. Therefore, in equation 7, we use *GS*, *FS* and *I* as instrumental variables and apply two-stage least squares (TSLS). This application improves the DW statistics as expected.

The first observation of all equations shows that the SSW variable has a stable positive sign consistent with the model. Even though equation 3 improves the significance of SSW, equations 1, 2 and 3 most likely suffer from possible specification problems.In equation 4, although not significant, the signs of demographic variables, *Urban*, *Young* and *Old*, contradict the model's predictions.[56] As pointed in Ozcan et al. (2003), this can be explained by the extended families under the poor economic and financial conditions in Turkey. The increased number of dependent children and elderly may reduce family resources, increase the economic burden, and pull the consumption down. As for the urbanization, the rapid increase in the urban population makes the living conditions in cities worse for new comers. Therefore, a high urbanization in a short time may create an additional income uncertainty with the effect of reducing consumption.

The sign of the proxy for financial wealth, *FW*, does not agree with the model's prediction in all regressions. However, there may be several reasons for this: the first reason could be that the M2 series may not be a good proxy for the financial wealth held by the private sector. As explained earlier, after the financial liberalization in the markets, the money held by the private sector is mostly invested in short term government bonds. Another reason might be that M2 is also an indicator for the financial depth in an economy. Therefore, an increase in M2 can trigger higher savings and therefore lower consumption[57]. Likewise, under the high inflation conditions, a higher expected inflation may reduce real interest rates (given inelastic nominal rates, which is especially true before the 1980s in Turkey) and therefore depress savings and draw consumption up[58]. When the prices fall down (or a decrease in expected inflation), which increases the real money balance in the markets, people save more and consume less due to the increased real interest rates. Thus, through the price levels, the real money balance could be negatively related to consumption.

Housing Wealth (*HW*) variable, which is represented by the income from dwellings is statistically significant in all estimations, except for equation 4. As explained before, this result is consistent with the fact that even though housing is the major investment tool for households, it's mostly bequeathed in Turkey. Therefore the imputed income from the

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[53] In computing LM statistics, we took the length of lags for residuals 1 with AR(1) and 2 for AR(2).
[54] Without cross terms
[55] We applied the Wald test and got very high p-values for the null hypothesis that the coefficients of all removed variables are jointly zero, except *R*
[56] Akkoyunlu (2002) and Ozcan et.al (2003) find similar insignificant results for demographic variables in their consumption and saving studies for Turkey .
[57] Ozcan et al. (2003) find a significant positive effect of M2/GDP on private savings in Turkey
[58] Akkoyunlu (2002) indicates that inflation in Turkey has positive effects on consumption.

housing wealth has a significant effect on consumption.

As explained before, if people can borrow more against their future income and current illiquid assets, they have more sources to consume. The significant relationship between consumption and *CRTP* confirms this argument. Moreover, the real interest rate has a negative and significant sign, which shows that substitution effect overweighs the income effect. Although insignificant, the sign of unexpected inflation agrees with the models prediction. Likewise, the rate of unemployment is insignificant and negatively related to the consumption level, indicating that the future income uncertainty embedded in unemployment prevails under poor financial and economic conditions.

Among the equations 5, 6 and 7 in Figure 5, equation 6 has better test measures relative to others in terms of R2 and SSR. Moreover, the inclusion of the dummy variable improves Akaike and Schwarz criterions. Its DW statistics is 1.8609, which is slightly higher than the upper level (1.86; n=34, k=8 with 0.01 significance level).

As Blinder et al. (1985) pointed, the important results should not be sensitive to the choice between linear and logarithmic forms. Therefore, equation 6 is re-estimated with the logarithmic transformation (except for real interest rate). As seen in Figure 6 below, the SSW variable is statistically significant with 10% significance level.

Figure 6: Estimation with Log Transformation

Variable	C	Y	SSWG	HW	FW	R	CRTP	DUMMY95	Time
Coefficient	7.4326	0.3156	0.0378	0.1154	(0.1450)	(0.0928)	0.1448	0.0115	0.0487
Std. Error	1.2565	0.0912	0.0191	0.0249	0.0419	0.0503	0.0287	0.0025	0.0240
t-Statistic	5.9153	3.4617	1.9759	4.6416	(3.4576)	(1.8446)	5.0476	4.6452	2.0319
Prob.	0.0000	0.0019	0.0593	0.0001	0.0020	0.0770	0.0000	0.0001	0.0529
Adjusted R-squared	0.98271	**Durbin-Watson stat**			1.763567				
Sum squared resid	1.13E-02	**F-statistic**			235.3797				

The SSW variable has a significant positive sign in equation (6), which confirms that the social security wealth has a positive effect on consumption, thus negative effect on saving. The results, in Figure 7 below, show that the net or gross definition of SSW does not alter the sign agreement and significance level of SSW. This result is also consistent with the notion that the future taxes are included in the expected future income and therefore the correct measure should be gross social security wealth, as indicated in Feldstein's (1974, 1996) results.

Figure 7: Estimation Results with SSWN

Variable	C	Y	SSWN	HW	FW	R	CRTP	DUMMY95	Time
Coefficient	**300,004**	**0.3126**	**0.0165**	**1.6587**	**(0.1653)**	**(112,334)**	**0.4949**	**49,561**	**7,688**
Std. Error	55,934	0.0675	0.0076	0.3392	0.0617	40,202	0.0900	21,814	1,721
t-Statistic	5.3636	4.6293	2.1653	4.8893	(2.6783)	(2.7943)	5.4999	2.2720	4.4667
Prob.	0.0000	0.0001	0.0401	0.0000	0.0129	0.0098	0.0000	0.0320	0.0001
Adjusted R-squared	0.98425		**Durbin-Watson stat**			1.82			

Sum squared resid	9.68E+09	**F-statistic**	258.81

As pointed before, the SSW series are calculated with the "current factors" method and 3% discount rate in Figure 5. However, the regression results should be tested against these assumptions embedded in the SSW calculations.

4.3 Tests of Assumptions

As explained earlier, we used three alternative expectation methods in calculating the SSW series: the average (constant), adaptive, and current benefit (and tax) factor methods. Since there are strong negative trends in both benefit and tax factors, we used only the adaptive and current factor methods. The results in Figure 5, 6 and 7 were found by the current benefit and tax methods. Therefore, Figure 8 below shows only the adaptive expectation results.

Figure 8: Estimation Results with Adaptive Expectations

Variable	C	Y	SSWG	HW	FW	R	CRTP	DUMMY95	Time
Coefficient	**330,511**	**0.2706**	**0.0189**	**1.4512**	**(0.1655)**	**(107,168)**	**0.5053**	**49405.3**	**8,243**
Std. Error	57,941	0.0740	0.0091	0.3321	0.0636	41,307	0.0912	22,008	1,889
t-Statistic	5.7042	3.6564	2.0734	4.3697	(2.6035)	(2.5944)	5.5390	2.2449	4.3628
Prob.	0.0000	0.0012	0.0486	0.0002	0.0153	0.0156	0.0000	0.0339	0.0002

Adjusted R-squared	0.98404	**Durbin-Watson stat**	1.773714
Sum squared resid	9.81E+09	**F-statistic**	255.373

The other assumption is about the discount rate. In Figure 9 below, the discount rate is changed from 3% to 5% and the SSW series are gross and calculated by both the current and adaptive expectations methods, denoted by (cr) and (ae) respectively.

Figure 9: Estimation Results with 5% Discount Rate

SSWG-cr	C	Y	SSWG	HW	FW	R	CRTP	DUMMY95	Time
Coefficient	324,313	0.2837	0.0310	1.5474	(0.1819)	(110,525)	0.4846	54,604	7,958
Std. Error	55,581	0.0687	0.0128	0.3241	0.0626	39,364	0.0879	21,874	1,706
t-Statistic	5.8350	4.1266	2.4281	4.7748	(2.9077)	(2.8078)	5.5140	2.4963	4.6637
Adjusted R-squared	0.9849	**Durbin-Watson stat**			1.872753				
Sum squared resid	9.30E+09	**F-statistic**			269.4626				

SSWG-ae	C	Y	SSWG	HW	FW	R	CRTP	DUMMY95	Time
Coefficient	334,354	0.2688	0.0313	1.4527	(0.1767)	(106,627)	0.5111	51,171	8,189
Std. Error	57,518	0.0728	0.0141	0.3283	0.0645	40,674	0.0905	21,887	1,818
t-Statistic	5.8130	3.6942	2.2285	4.4248	(2.7381)	(2.6215)	5.6474	2.3380	4.5045
Adjusted R-squared	0.9844	**Durbin-Watson stat**			1.7947				
Sum squared resid	9.59E+09	**F-statistic**			261.2627				

These results show that the sign and significance of the SSW variable are not sensitive to major assumptions. The DW statistics are between the lower and upper limits (with 0.01 significance), and therefore whether they have serial correlation problems is indeterminate. However, as indicated before, they have a simultaneity problem tested by the Hausman method[59]. When TSLS is used, the significance of SSW does not change but DW improves as shown in equation 7 in Figure 5

4.4 Alternative Proxies for Social Security

Even though SSW, the present value of future social security entitlements with survival probabilities, is the best proxy for people's perception of social security wealth, other alternative proxies can be used to test whether or not social security provisions affect consumption behaviors.

We used two proxies for social security: per capita real old-age benefits (*SSA1*) and a variable (*SSA2*) that is similar to one used by Barro (1978). This second proxy is calculated as a product of per retiree real old-age benefits, the cover ratio,[60] and the total number of workers[61]. The results are presented in Figure 10 below show that the provision of social security has positive and statistically significant[62] effects on consumption.

Figure 10: Estimation Results with Alternative Proxies

Variable	C	Y	SSA1	HW	FW	R	CRTP	DUMMY95	Time
Coefficient	366,170	0.2856	1.5418	1.3328	(0.2204)	(110,868)	0.5286	59,182	6,571
Std. Error	56,721	0.0648	0.5205	0.3132	0.0649	37,299	0.0858	21,097	1,444
t-Statistic	6.4557	4.4097	2.9623	4.2560	(3.3967)	(2.9724)	6.1606	2.8052	4.5501
Prob.	0.0000	0.0002	0.0066	0.0003	0.0023	0.0065	0.0000	0.0096	0.0001

Adjusted R-squared	0.9862	**Durbin-Watson stat**	1.9077
Sum squared resid	8.51E+09	**F-statistic**	294.87

Variable	C	Y	SSA2	HW	FW	R	CRTP	DUMMY95	Time
Coefficient	306,470	0.2927	0.2720	1.5580	(0.1514)	(112,062)	0.4705	48,716	8,301
Std. Error	57,059	0.0716	0.1440	0.3382	0.0619	41,385	0.0914	22,347	1,988
t-Statistic	5.3711	4.0867	1.8888	4.6067	(2.4470)	(2.7078)	5.1470	2.1800	4.1743
Prob.	0.0000	0.0004	0.0706	0.0001	0.0218	0.0120	0.0000	0.0389	0.0003

Adjusted R-squared	0.98363	**Durbin-Watson stat**	1.808979
Sum squared resid	1.01E+10	**F-statistic**	248.9205

4.5 Tests for Spurious Regressions

A spurious regression model is one in which the dependent and independent variables

[59] The forecasted income and residuals are obtained by using the reduced form income equation, which includes instrumental variables. When Equation 6 in Figure 1 was re-estimated with the forecasted income and residuals, I found that residuals are statistically significant with the t-value of 8.3.
[60] The cover ratio is the ratio of the number of workers covered by social security to the total employment.
[61] The data on employment is from SIS and Bulutay (1995).
[62] The second proxy is significant with 10% confidence level.

are non-stationary, but not cointegrated. Granger and Newbold (1974) observed that even when the series are independent of each other, the classical spurious regressions had very high *R*-squared (R2) statistics with very low Durbin-Watson (DW) statistics. Since our regressions use time-series data, we need to test whether the high degree of fit in the estimations, as measured by high R2 and significant *t*-tests, is a result of "spurious significance". The time series literature in our subject implicitly uses DW statistics to detect the "spurious significance" problem. Phillips (1986) developed an asymptotic theory that the DW statistic in spurious regressions converges in probability to zero as the sample size increases.[63]

In order to test whether the variables used in our regressions are stationary around a linear trend or have stochastic trends, we first perform the augmented Dickey-Fuller test (ADF) for the presence of unit roots in the variables. As seen in Table 7 below, *Old*, *Young*, and *Urban* are *I*(2); *Rintr* and *Inf* are *I*(0) and the rest are *I*(1).

Table 7: Augmented Dickey-Fuller (ADF) Test Results for Unit Roots

	Level			**1st Difference**			**2nd Difference**		
Variables	**ADF t-test**	**Lag**	**c&t**	**ADF t-test**	**Lag**	**c&t**	**ADF t-test**	**Lag**	**c&t**
CONS	-3.511099	0	ct	**-7.447739**	0				
Y	-2.051519	0	ct	**-5.749789**	0				
SSWG	-0.805777	2	ct	**-4.103717**	1				
SSWN	-0.246096	2	ct	**-4.909395**	1	Ct			
HW	-1.953167	1	c	**-4.332534**	0				
FW	-1.875746	1	ct	**-2.281867**	1				
Rintr	**-2.698091**	0							
CRTP	-3.294444	1	ct	**-5.305846**	1				
Inf	**-4.720763**	1							
Old	-2.091723	1	ct	-1.250801	0		**-5.496650**	0	
Young	-2.710636	1	ct	-0.991528	0		**-5.469800**	0	
LFPR	-1.896337	0	ct	**-6.240468**	0	C			
Un	-3.011565	1	c	**-4.700727**	0				
Urban	-2.310802	1	ct	-0.916081	0		**-5.477230**	0	
SSWGAE	-0442997	1	ct	**-4.640900**	1	Ct			
SSWG5	-0.708768	2	ct	**-4.021000**	1				
SSWG5AE	-0.290429	2	ct	**-3.757103**	1				
SSA1	-0.933166	1	ct	**-2.835510**	1				
SSA2	-1.539332	1	ct	**-3.580142**	0				
LCONS	-2.712982	1	ct	**-7.328273**	0				
LCRTP	-3.554406	1	ct	**-5.418992**	1				
LHW	-2.098230	1	c	**-3.931846**	0				
LFW	-2.105252	0	ct	**-5.397414**	0	C			
LSSWG	-1.797932	1	ct	**-4.334073**	1				

[63] The Cointegrating Regression Durbin-Watson (CRDW) test uses the DW statistics, *d*, obtained from the cointegrating regression to test the null hypothesis of $d = 0$. If *d* could be approximated by 2(1-✗) and the sample first-order correlation coefficient, ✗, is about 1 (indicating a unit root in the error term), *d* will be zero. (Sargan and Bhargava 1983). Therefore, a low DW statistics could be taken as a strong sign of spurious significance. Nevertheless, Maddala and Kim (1998) indicate that regressions with high DW statistics do not necessarily ensure that we do not estimate spurious regressions especially if the sample size is relatively small.

LY	-2.443473	0	ct	**-5.915426**	0	

Notes: The test results are obtained by Eviews. Bold numbers are significant at 5% level to reject the null hypothesis states the presence of unit root. We start with four lags in each variable's ADF regression. The longest lag is determined by its significance at 10%. The existence of a constant and time trend in the ADF regressions is indicated by c and t respectively. All variables are as defined before. *AE* and *5* attached to *SSWG* indicate the adaptive expectation method used in the benefit ratio and 5% discount rate respectively. The variables that start with *L* (except *LFPR*) are the log transformation of the original ones.

Any equilibrium relationship among a set of nonstationary variables implies that their stochastic trends must be linked. This linkage among the stochastic trends necessitates that the variables be cointegrated. Therefore, a key assumption of our consumption model is that the disturbance term is stationary. Since our interest in the current context is not to estimate coefficients of the cointegrating vector, we use a residual-based test for cointegration in a single equation suggested by Engle and Granger (1987) to investigate if the residuals in our regressions are stationary.[64] We perform the ADF test on our reference regression (Equation 6) in Figure 5 and on the other equations from Figure 2 to 6. As Enders (1995) argues, even though the order of integration among variables is important to perform the test, what is ultimately important is whether or not a combination of variables are cointegrated, and this could be achieved through combination of subsets rather than individual series.[65] In our case, since *Rintr* is *I*(0), we test whether the same equations (including only *I*(1) variables) without *Rintr* are *CI*(1,1).

The test results in Table 8 below show that the subsets of *I*(1) variables are *CI*(1,1) at 5% significance level except for Figure 2, which is *CI*(1,1) at 10%. We conclude that since a linear combination of any of these subsets, which are *I*(0), with *Rintr*, which is *I*(0), can only generate a stationary process, the resulting regressions are not spurious.

Table 8: Residual-Based Cointegration Tests

		ADF t-test	**Lag**
Figure1-6	(*Cons, Y, SSWG, HW, FW, CRTP*)	-6.0712	1
Figure2	(*LCons, LY,LSSWG, LHW, LFW, LCRTP*)	-5.5767	1
Figure3	(*Cons, Y, SSWN, HW, FW, CRTP*)	-6.0629	1
Figure4	(*Cons, Y, SSWGAE, HW, FW, CRTP*)	-5.8921	1
Figure5-1	(*Cons, Y, SSWG5, HW, FW, CRTP*)	-6.0586	1
Figure5-2	(*Cons, Y, SSWGAE5, HW, FW, CRTP*)	-5.9070	1
Figure6-1	(*Cons, Y, SSA1, HW, FW, CRTP*)	-5.8456	1
Figure6-2	(*Cons, Y, SSA2, HW, FW, CRTP*)	-5.9902	1

Notes: The results are obtained by Eviews. The null hypothesis states no cointegration among the variables. MacKinnon (1991) provides response surface equations for critical values of cointegration tests using ADF framework for different sample sizes, significance levels, and number of variables in the

[64] We have also used the Johansen (1988) test for the presence of multiple cointegrating vectors. The results confirm the residual-based ADF test.

[65] Enders (1995, 411) gives an example: "*Suppose that x_{1t} and x_{2t} are I(2) and x_{3t} is I(1). If x_{1t} and x_{2t} are CI(2,1), there exists a linear combination of the form $\beta_1 x_{1t} + \beta_2 x_{2t}$ that is I(1). It is possible that this combination of x_{1t} and x_{2t} is cointegrated with x_{3t} such that the linear combination of $\beta_1 x_{1t} + \beta_2 x_{2t} + \beta_3 x_{3t}$ is stationary*".

cointegrating equation. Given six stochastic explanatory variables with a constant and time trend in our cointegrating equations, the critical values calculated for the sample size of 34 are **-6.4621** for 1%, **-5.5987** for 5%, and **-5.1836** for 10%. Optimal lag is chosen using Akaike information criterion (AIC). Each equation has a dummy for the year 1995.

5. Conclusion

This paper investigates whether or not the public social security system affects consumption in a developing country, Turkey. It uses a time-series aggregate consumption model based on the life-cycle hypothesis. In order to quantify a social security variable in the model, the social security wealth series for Turkey were constructed (in a separate study). These series indicate that the social security wealth is a major component of household wealth.

The empirical tests here show that SSW has a positive effect on consumption. Moreover, when the insignificant variables are removed it becomes statistically significant. The sensitivity of these results was tested against the major assumptions embedded in the SSW calculation. The test results confirm that the significance level of SSW does not change.

In addition to the SSW series, "Income from Dwellings" and "Money and Quasi-money", M2, are used as proxies for housing wealth and financial wealth respectively. The first proxy for housing wealth has a significant positive effect on consumption. This is consistent with the fact that people under the conditions of shallow financial markets and high political instability invest heavily in housing. However, high bequest motives, together with the lack of proper financial instruments, such as mortgages, may reduce its power, as an asset, on consumption. Therefore, the direct and imputed income from dwellings may reflect the "true" effects of housing wealth on consumption, as we found in our regressions.

Although significant, the sign of financial assets (*FW*) contradicts the model. However, as noted before, through the price levels, the real money balance could be negatively related to consumption. For example, if nominal interest rates are not so responsive to a decline in inflation, as the inflation goes down, it pushes saving up by increasing real interest rates.

Even though time-series studies have several limitations, in order to assess the quantitative importance of the positive coefficient of SSW variable, one may want to see the magnitude of the reduction in Turkish national saving. With different assumptions and social security wealth definitions, the coefficient ranges from 0.0165 (Figure 7) to 0.0313 (Figure 9). In other words, every additional 1 TL of SSW increases the total consumption between 0.0165 and 0.0313 TL. For instance, if we take 2003 and SSWN (283,310,716 million TL, with 1987 prices) the consumption is higher 4,816,282 million TL (283,310,716 X 0.0165) than would be the case without any social security program. If we consume instead of saving by this amount, the private saving falls. Since Turkey has a PAYG system, this reduction is not offset by any increase in the public saving. As a result, the national saving falls as well. Moreover, the private disposable income is reduced by the total contributions (taxes for the old-age, disability and survivor insurance). The total premiums paid in 2003 to SSK, EM and BK is 5,943,740 million TL (with 1987 prices). Since the marginal propensity to save out of NPrvDI is around 72% (Figure 5, Equation 6), we can conclude that social security contributions also reduce saving by 4,279,493 million TL. Therefore, because of the PAYG system, the total saving is lower 9,095,775 million TL

(4,279,493 + 4,816,282) than would be the case without a PAYG system in Turkey. National saving in 2003 (by SPO, in 1987 prices, million TL):

Total Saving		**29,482,465**	
	Foreign Sources		**5,256,678**
	Government Saving (-)		**5,743,524**
	Private Saving		**29,969,310**

Without considering the negative effects of the current PAYG system on public saving, this implies a 24-percent reduction (9,095,775/(9,095,775 + 29,482,465)) in Turkish national saving in 2003. This reduction is calculated by SSWN and its coefficient, 0.0165. However, if we use SSWG and its coefficients estimated with different assumptions, the reduction becomes higher than 24%. Feldstein (1974, 1996) makes the same calculation and finds that social security depresses personal saving 30-60 percent for the US.

As Auerbach and Kotlikoff (1983) point out, time-series studies have several drawbacks in estimating the effects of social security on saving. Moreover, the empirical analyses could be extended to include some omitted variables, such as external and government savings by disaggregating the income variable[66]. Likewise, the SSW variable could also be improved by doing further "fine-tunings". Lastly, as commonly used in investigations, error correction models with flexible distributed lags can be applied.

But this paper's goal was limited: determining whether or not a time-series aggregate consumption model for a developing country, Turkey, could provide relatively consistent evidence that the social security wealth has negative effects on saving as argued in the literature for developed countries. Turkey has a generous public social security system. The results, with both social security proxies, show that social security wealth has a significant positive effect on consumption, and this could be interpreted that public social security reduces saving in Turkey.

If social security provisions reduce saving, as shown here, there should be an "opportunity cost" of having an unfunded social security system, regardless of whether or not it is in balance. Therefore, reforms ultimately need to address two problems together: financial sustainability of social security systems over the coming decades and their

[66] Since an increase in external saving raises the total sources available for the private sector, it might be positively related to consumption. Besides, given the value of government spending, an increase or decrease in government saving may have a direct effect on the total sources available for the private sector. The effects of government saving on consumption could be explained from a national accounting perspective. As you may recall, we define the net private disposable income (NPrvDI) as follows:

$NPrvDI = NNP - TX + TR + NINT \ (a)$

Since Government Saving (*GS*) can be defined as follows:

$GS = TX - G - TR - NINT$ ℗ $TR + NINT - TX = - GS - G \quad (b)$

when we substitute (*b*) into (*a*) we get the following expression:

$NPrvDI = NNP - GS - G$

Therefore, the income variable, *NPrvDI*, in the regressions, implicitly assumes that the sum of the coefficients of *NNP*, *GS* and *G* are restricted to be the same as the coefficient of *NPrvDI*. If we relax this restriction, we can observe whether or not *GS* and *G* have different negative effects on consumption. Observation of this effect is not possible with the standard LCM approach.

negative effects on saving.

Appendix 1. An Approximation of the Housing Wealth in Turkey

	# of Buildings	Total value YTL	#of Dwelling Units	Per Dwelling Value YTL	Stock of Dwellings	Total Housing (Current YTL)	Total Housing Constant YTL 1987=100
1970	35,299	2,381	71,589	0.03	8,097,432	269,280	44,230,162
1971	35,458	2,676	72,816	0.04	8,170,248	300,298	41,966,531
1972	43,822	3,464	88,231	0.04	8,258,479	324,235	40,724,831
1973	43,192	4,506	96,163	0.05	8,354,642	391,469	40,365,458
1974	39,072	5,906	84,199	0.07	8,438,841	591,963	47,530,223
1975	44,122	9,544	97,431	0.10	8,536,272	836,213	55,507,201
1976	45,141	10,536	102,110	0.10	8,638,382	891,291	51,410,212
1977	53,937	15,176	119,409	0.13	8,757,791	1,113,043	51,885,198
1978	52,273	35,405	120,615	0.29	8,878,406	2,606,165	82,830,576
1979	53,284	64,489	124,297	0.52	9,002,703	4,670,845	84,480,189
1980	58,970	116,739	139,207	0.84	9,141,910	7,666,419	73,717,907
1981	53,257	131,770	118,778	1.11	9,260,688	10,273,625	68,575,548
1982	50,261	161,315	115,986	1.39	9,376,674	13,041,200	67,887,029
1983	50,719	228,738	113,453	2.02	9,490,127	19,133,477	78,886,397
1984	54,187	362,184	122,580	2.95	9,612,707	28,402,396	78,996,221
1985	49,380	544,192	118,205	4.60	9,730,912	44,799,152	81,409,828
1986	67,528	1,234,924	168,597	7.32	9,899,509	72,511,037	96,883,443

1987	76,106	1,919,741	191,109	10.05	10,090,618	101,362,966	101,362,966
1988	78,787	4,038,420	205,485	19.65	10,296,103	202,350,491	119,486,420
1989	88,795	7,530,262	250,480	30.06	10,546,583	317,065,379	106,697,713
1990	89,217	11,165,964	232,018	48.13	10,778,601	518,724,747	110,313,008
1991	87,506	21,557,156	227,570	94.73	11,006,171	1,042,588,009	139,569,473
1992	100,090	45,639,626	268,886	169.74	11,275,057	1,913,782,798	156,482,649
1993	96,694	77,874,115	269,694	288.75	11,544,751	3,333,545,781	162,467,195
1994	95,469	140,341,023	245,610	571.40	11,790,361	6,736,986,997	159,038,163
1995	91,548	255,289,420	248,946	1,025.48	12,039,307	12,346,082,266	155,687,653
1996	99,257	501,132,881	267,306	1,874.75	12,306,613	23,071,867,499	163,595,922
1997	100,446	1,030,175,494	277,056	3,718.29	12,583,669	46,789,774,667	182,757,994
1998	86,770	1,605,674,843	238,958	6,719.49	12,822,627	86,161,460,131	191,565,907
1999	82,849	2,204,068,446	215,613	10,222.34	13,038,240	133,281,268,717	190,492,432
2000	86,279	3,662,766,998	245,155	14,940.62	13,283,395	198,462,124,714	189,230,514
2001	81,568	5,738,525,760	243,464	23,570.33	13,526,859	318,832,480,159	196,372,214
2002	56,029	5,159,938,602	161,491	31,951.86	13,688,350	437,368,320,676	186,895,082
2003	51,834	6,540,051,331	162,906	40,146.17	13,851,256	556,074,838,629	195,917,791

The numbers for buildings and dwelling units are based on occupancy permits, which are taken from the State Institutes of Statistics (SIS) together with their values. In order to find the total stock of dwelling units for each year, the total population is divided by 4.362 to find the total number of households in 1970 and the number of new dwelling units are added to this number (8,097,432) for the subsequent years. The number '4.362' is chosen to find the same number of households in 1985, which is found by SIS (9,730,018). The other checkpoint for this approximation is in 1990, which is 11,188,636 and not consistent with what I found.

The main reason for this discrepancy is that the number of total occupancy permits is not a correct measure to find each year's added dwelling units due to the existence of illegal occupations and high rural population in which there is no need for this permit. Therefore the total number of dwelling units underestimates the correct number each year. However, since the price of newly added dwelling units is taken as the average price of all dwelling units, the total value of dwelling units probability overestimates the true value of housing wealth. Even though these two factors may offset each other, it is difficult to speculate on the correct measure of housing wealth in Turkey.

Appendix 2: Data Sources

Benefit and Tax Factors

SSK

The number of beneficiaries, the amount of benefits (Old-age, Disability and Death - ODD) are from special tables sent by SSK. The number of contributors and incurred contributions are from SIS. Average ages and other related other information are from SSK's Web page.

ES

The number of beneficiaries, contributors and the amount of benefits (Old-age, Disability and Death - ODD) contributions are from "Statistical Indicator 1923-2002" SIS. Average ages and related other information are from ES's Web page.

Bag-Kur

The number of beneficiaries, contributors and the amount of benefits (Old-age, Disability and Death - ODD) contributions are from “Statistical Indicator 1923-2002” SIS and also sent by BK. Average ages and related other information are from BK’s Web page.

Reference Income

As explained in the text, I used Net Private Disposable income (NPrvDI), which is constructed by the following identity:

NPrvDI = C + I – GS + FS - CoC

The data on household consumption (C), investment (I) and Consumption of Capital (CoC) are from the OECD.

Government saving (GS) is calculated by the State Planning Organization (SPO) since 1975 under the title of “*Public Sector General Balance*”. For the years between 1970 and 1974, GS is estimated by taking 50% of the total government spending in corresponding years. This is because the same ratio is approximately 50% for the years between 1975 and 1985.

Foreign Saving (or resources) is taken from the table, “*General Macro Balance of the Economy*”, generated by SPO for the period between 1987 and 2003. Since it’s Net Export (NX) plus Net Foreign Income from Abroad (NFI), for the earlier years, it’s calculated by using the WDI database.

Gross private disposable income is calculated by SPO since 1987 using the same method. I checked whether or not there is an inconsistency between my and SPO’s numbers and I found some differences between the two series. Since I use national accounts by expenditure, these differences mainly come from the statistical error (discrepancy) between two different national account methods: by production and by expenditure.

Labor Force Demographics

The total population, age and gender based labor force, employment numbers and marriage ratios are taken from the database created by the State Institute of Statistics (SIS) for the years between 1987 and 2003. For the years before 1988, I used Bulutay (1995) and ILO statistics.

Survival Probabilities

In order to find survival probabilities, I used ADST 49-51 as the mortality table from the US. This table is extensively used by private pension companies and I took it from Aviva Life Insurance in Turkey.

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