

**IMES DISCUSSION PAPER SERIES**

**Privatizing Social Security: A Political-Economy Approach**

Assaf Razin and Efraim Sadka

**Discussion Paper No. 2004-E-16**

**IMES**

**INSTITUTE FOR MONETARY AND ECONOMIC STUDIES**

**BANK OF JAPAN**

C.P.O BOX 203 TOKYO

100-8630 JAPAN

You can download this and other papers at the IMES Web site:

<http://www.imes.boj.or.jp>

Do not reprint or reproduce without permission.

NOTE: IMES Discussion Paper Series is circulated in order to stimulate discussion and comments. Views expressed in Discussion Paper Series are those of authors and do not necessarily reflect those of the Bank of Japan or the Institute for Monetary and Economic Studies.

## Privatizing Social Security: A Political-Economy Approach

Assaf Razin\* and Efraim Sadka\*\*

### Abstract

The aging of the population shakes the public finance of pay-as-you-go social security systems. We develop a political-economy framework in which this demographic change leads to the downsizing of the social security system, and, as a consequence, to the emergence of supplemental individual retirement programs. Allowing for a one-shot budget deficit, earmarked to accommodate the cost of the social security reforms, is shown to facilitate the political-economy transition from a national to a private pension system.

**Key words:** Dependency ratio, Median voter, Privatization, Individual saving accounts

**JEL classification:** H0

\* Mario Henrique Simonsen Professor of Public Economics, Tel-Aviv University and Friedman Professor of International Economics, Cornell University. E-mail address: razin@post.tau.ac.il.

\*\*Henry Kaufman Professor of International Capital Markets, Tel-Aviv University. E-mail address: sadka@post.tau.ac.il.

This paper was prepared for the conference of the IMES of the Bank of Japan held on July 5-6, 2004. Some of the work on this paper was done while the authors were visiting the Economic Policy Research Unit (EPRU) at the University of Copenhagen, February, 2003. We also acknowledge the sponsoring RTN project, "The Analysis of International Capital Markets: Understanding Europe's Role in the Global Economy." We benefitted from discussions in a seminar presentation at the Hebrew University; in particular, we wish to thank Elchanan Ben-Porath, Sergiui Hart, Oded Galor, Motty Perry, and Eytan Sheshinski. We thank our discussants Gregory D. Hess and Yasushi Iwamoto and participants for their comments.

# 1 Introduction

The economic viability of national old-age security systems has been increasingly deteriorating in the wake of aging of the population. Indeed, aging raises the burden of financing the existing pay-as-you-go (PAYG), national pension (old-age security) systems, because there is a relatively falling number of workers, that have to bear the cost of paying pensions, to a relatively rising number of retirees. Against this backdrop, there arose proposals to privatize social security, as a solution to the economic sustainability of the existing systems. This, by and large, means a shift from the current PAYG systems to individual retirement accounts (or fully-funded systems).

The increased fragility of national PAYG pension, caused by the aging of the population, raises doubts among the young about whether the next generations will continue to honor the implicit intergenerational social contract, or the political norm, according to which, “I pay now for the pension benefits of the old, and the next young generation pays for my pension benefits, when I get old”. These doubts are, after all, not unfounded, for there will indeed be more pensioners per each young worker of the next generation, and hence each one of the young workers will have to pay more in order to honor the implicit social contract. With such doubts, the political power balance may indeed shift towards scaling down the PAYG system, encouraging the establishment of supplemental individual retirement accounts. Such accounts are, by their very nature, fully funded, so that they are not directly affected by the aging of the population. <sup>1</sup> Naturally, the existing old generation opposes any scaling down

---

<sup>1</sup>Naturally, the aging of the population has some bearing on individual retirement accounts too through the general-equilibrium effects on the return to capital (stemming from the induced change in the capital-labor ratio).

of the PAYG system, because it stands to lose pension benefits (without enjoying the reduction in the social security contributions). This opposition can, however, be softened, or altogether removed, if the government creates a one-shot budget deficit in order to support the social security system and allow it not to scale down the pension benefits to the current old, so as to fully offset the reduction in social security contributions, or even allow it to maintain these benefits intact. (Of course, this deficit will be carried over to the future, with its debt service smoothed over the next several generations.)

In this paper we develop an analytical model in which a PAYG, old-age security system is designed as a political-economy equilibrium. We then investigate how the aging of the population can shift the equilibrium towards scaling down this fiscal system (thereby encouraging the emergence of individual retirement accounts). We further examine how a one-shot budget deficit, earmarked for a partial privatization of social security, can politically facilitate a scaling down of PAYG systems.<sup>2</sup>

The organization of the paper is as follows. Section 2 develops a political-economy

---

<sup>2</sup>In his 2001 testimony to the US Congress, Alan Greenspan argued on the basis of budget projections (which turned out to be drastically off the mark) that the federal government would pay off all its debt in a few years. If this happened, the government would be forced to invest future surpluses in the financial markets, which may adversely affect corporate governance. To avoid this bad outcome, Greenspan favored tax cuts that would reduce the surpluses. However, a partial privatization of the US Social Security, that would have imposed "transition costs", where the federal government fulfills its obligations to those who have already paid the social security tax and, at the same time allows individuals to contribute to their pension accounts, could have taken care of the budget surpluses, without any implications for corporate governance. Following Greenspan's testimony, the resistance in the Congress to Bush's tax cut package collapsed; and the US government headed for a persistent budget deficits, where a large part of them are a direct result of the tax cuts.

framework for determining the social security system. Section 3 considers the effect of aging on the social-security system.

## 2 Political-Economy Model Of Social Security

Consider a standard overlapping-generations model in which each generation lives for two periods: a working period and a retirement period. There are two types of workers: skilled workers who have high productivity and provide one efficiency unit of labor per unit of labor time, and unskilled workers who provide only  $q < 1$  efficiency units of labor per unit of labor time. Workers have one unit of labor time during their first period of life, but are born without skills and thus with low productivity. Each worker chooses whether to acquire an education and become a skilled worker, or else remain unskilled. After the working period, individuals retire, with their consumption funded by private savings and social security pension, discussed below.

There is a continuum of individuals, characterized by an innate ability parameter,  $e$ , which is the time needed to acquire skill. By investing  $e$  units of labor time in education, a worker becomes skilled, after which the remaining  $(1 - e)$  units of labor time provide an equal amount of effective labor in the balance of the first period. There are also pecuniary costs of acquiring skills,  $\gamma$ , which are not tax deductible.<sup>3</sup> The cumulative distribution function of innate ability is denoted by  $G(\cdot)$  with the support being the interval  $[0, 1]$ . The density function is denoted by  $g = G'$ .

If an individual with an innate ability level (henceforth an  $e$ -individual) acquires skill, then her income is  $(1 - \tau)w(1 - e) - \gamma$ , whereas if she remains unskilled her

---

<sup>3</sup>This is a realistic assumption. Unlike corporations for which depreciation of capital is deductible, for individuals the pecuniary cost of investment in human capital is not.

income is  $(1 - \tau)qw$ , where  $w$  is the wage rate per efficiency unit of labor and  $\tau$  is the social security contribution (tax) rate. There exists a cutoff level,  $e$  of the education-cost parameter  $e^*$ , such that those with education-cost parameter below  $e^*$  will invest in education and become skilled, whereas everyone else remains unskilled. The cutoff level is determined by an equality between the return to education and the cost of education (including foregone income):

$$e^* = 1 - q - \gamma/[(1 - \tau)w]. \quad (1)$$

We assume a linear production function in which output,  $Y$ , is produced using labor,  $L$ , and capital,  $K$ :

$$Y = wL + (1 + r)K. \quad (2)$$

The wage rate,  $w$  and the gross (before depreciation) rental price of capital,  $1 + r$ , are determined by the marginal productivity conditions for factor prices:

$$w = \partial Y/\partial L \text{ and } 1 + r = \partial Y/\partial K.$$

These conditions are already substituted into the production function. For simplicity, we assume that capital fully depreciates at the end of the production process.

We assume that the population grows at a rate of  $n$ . Labor supply of each individual is assumed to be fixed, so that the social security tax does not distort the individual labor-supply decisions, at the margin. The aggregate labor supply does, however, depend on the income tax rate, as this affects the cut-off ability,  $e^*$ , and thus the mix of skilled and unskilled individuals in the economy. This distortion keeps the tax rate from being driven up to 100%. At the current period the aggregate

labor supply is given by:

$$\begin{aligned} L &= \left\{ \int_0^{e^*} (1 - e)dG + q[1 - G(e^*)] \right\} N_o(1 + n) \\ &= \ell(e^*)N_o(1 + n), \end{aligned} \tag{3}$$

where  $N_o(1+n)$  is the size of the working-age population at present ( $N_o$  is the number of young individuals born in the preceding period), and  $\ell(e^*) = \int_0^{e^*} (1 - e)dG + q[1 - G(e^*)]$  is the average labor supply (per worker) in the current period.

There is initially a PAYG, old-age social security system by which the taxes collected from the young (working) population are earmarked to finance a pension-benefit to the old (retired) population.<sup>4</sup> Thus, the benefit ( $b_t$ ), paid to each old individual at present, must satisfy the following PAYG budget constraint:

$$b = \tau w \ell(e^*)(1 + n), \tag{4}$$

where  $\tau$  is the social security tax at present.

Votes are repeated every period. In each period, the benefit of the social-security system accrues only to the old, whereas the burden (the social-security taxes) are borne by the young. Then, one may wonder why would not the young, who outnumber the old with a growing population, drive the tax and the benefit down to zero in a political-economy equilibrium. We appeal to a sort of an implicit intergenerational social contract which goes like this: “I, the young, pay now for the pension benefits of the old; and you, the young of the next generation, will pay for my pension benefit, when I grow old and retire”. This implicit intergenerational contract could be an

---

<sup>4</sup>This specification put explicitly the benefit,  $b$ , as an old-age social security benefit. In contrast, in an earlier work [e.g. Razin, Sadka and Swagel (2002a, 2002b)], the benefit  $b$  was uniformly paid in cash or in kind to all young and old alike. It was intended to capture intragenerational redistributive features of a welfare state reached by some social consensus.



outcome of an intergenerational game, with trigger strategies, as shown in Cooley and Soares (1999a and 1999b) and Bohn (1999).<sup>5</sup> The young believe that if they do not pay the old a pension benefit, then the next young generation will punish them by not providing for their pensions. With such a contract in place, the young at present are willing to politically support a social security tax,  $\tau$ , which is earmarked to pay the current old a pension benefit of  $b$ , because they expect the young generation in the next period to honor the implicit social contract and pay them a benefit  $\alpha b$ . The parameter  $\alpha$  is assumed to depend negatively on the share of the old in the population. If the current young will each continue to bring  $n$  children, then the share of the old will not change in the next period and  $\alpha$  is expected to be one. But if fertility falls and the share of the old in the next period rises relative to the present, then  $\alpha$  is expected to fall below one. This is because the young believe that if fertility falls in the future, the next young generation will either find it harder or will be plainly reluctant to continue to support the old (the current) young at the

---

<sup>5</sup>Cooley and Soares (1999a, 1999b) and Bohn (1999) have used an explicit game-theoretic reasoning to address the issue of the survivability of the PAYG social security system. This literature demonstrates the existence of an equilibrium in an overlapping-generations model with social security as a sequential equilibrium in an infinitely repeated voting game. The critical support mechanism is provided by trigger strategies. As put by Bohn:

“The failure of any cohort to adhere to the proposed equilibrium triggers a negative change in voters’ expectations about future benefits that destroys social security. Since survival and collapse are discrete alternatives, trigger strategy models provide a natural definition of what is meant by social security being viable.”

To support social security as a sequential equilibrium, there is a very simple condition that must be fulfilled. For the median voter, the present value of future benefits exceeds the value of social security contributions until retirement. This condition is easily satisfied in our overlapping generations model.

current level.

Because factor prices are constant over time, current saving decisions will not affect the rate of return on capital that the current young will earn on their savings. Hence, the dynamics in this model are redundant. For any social security tax rate,  $\tau$ , equations (1) and (4) determine the functions  $e^* = e^*(\tau)$  and  $b = b(\tau)$ . Denote by  $W(e, \tau, \alpha)$  the lifetime income of a young  $e$ -individual:

$$W(e, \tau, \alpha) = \begin{cases} (1 - \tau)w(1 - e) - \gamma + \alpha b(\tau)/(1 + r) & \text{for } e \leq e^*(\tau) \\ (1 - \tau)wq + \alpha b(\tau)/(1 + r) & \text{for } e \geq e^*(\tau). \end{cases} \quad (5)$$

In each period, the political-economy equilibrium for the social security tax,  $\tau$  (and the associated pension benefit,  $b$ ), is determined by majority voting among the young and old individuals who are alive in this period. The objective of the old is quite clear: so long as raising the social security tax rate,  $\tau$ , generates more revenues, and consequently, a higher pension benefit,  $b$ , they will vote for it. However, voting of the young is less clear-cut. Because a young individual pays a tax bill of  $\tau w(1 - e)$  or  $\tau wq$ , depending on her skill level, and receives a benefit of  $\alpha b/(1 + r)$ , in present value terms, she must weigh her tax bill against her benefit. She votes for raising the tax rate, if  $\partial W/\partial \tau > 0$ , and for lowering it, if  $\partial W/\partial \tau < 0$ . Note that:

$$\partial^2 W(e, \tau, \alpha)/\partial e \partial \tau = \begin{cases} w & \text{for } e < e^*(\tau) \\ 0 & \text{for } e > e^*(\tau). \end{cases} \quad (6)$$

Therefore, if  $\partial W/\partial \tau > 0$  for some  $e_o$ , then  $\partial W/\partial \tau > 0$  for all  $e > e_o$ ; and, similarly, if  $\partial W/\partial \tau < 0$  for some  $e_o$ , then  $\partial W/\partial \tau < 0$  for all  $e < e_o$ . This implies that if an increase in the social security tax rate benefits a particular young (working) individual (because the increased pension benefit outweighs the increase in the tax bill), then all young individuals who are less able than her (that is, those who have a higher

cost-of-education parameter,  $e$ ), must also gain from this tax increase. Similarly, if a social security tax increase hurts a certain young individual (because the increased pension benefit does not fully compensate for the tax hike), then it must also hurt all young individuals who are more able than her.

As was already pointed out, the old always opt for a higher social security tax. But as long as  $n > 0$ , the old are outnumbered by the young. To reach an equilibrium, the bottom end of the skill distribution of the young population joins forces with the old to form a pro-tax coalition of 50% of the population, whereas the top end of the skill distribution of the young population forms a counter, anti-tax coalition of equal size. In determining the outcome of majority voting the decisive voter must be a young individual, with an education-cost index denoted by  $e_M$ , such that the young who have an education-cost index below  $e_M$  (namely, the anti-tax coalition) form 50% of the total population. The political-economy equilibrium tax rate maximizes the lifetime income of this median voter.

Formally,  $e_M$  is defined as follows. There are  $N_o(1+n)G(e_M)$  young individuals with cost-of-education parameter  $e \leq e_M$  (more able than the median voter), and  $N_o(1+n)[1-G(e_M)]$  young individuals with cost-of-education parameter  $e \geq e_M$  (less able than the median voter). There are also  $N_o$  retired individuals at present who always join the pro-tax coalition. Hence,  $e_M$  is defined implicitly by:

$$N_o(1+n)G(e_M) = N_o(1+n)[1-G(e_M)] + N_o$$

Dividing this equation by  $N_o$  and rearranging terms yield the cost-of-education parameter for the median voter:

$$e_M = G^{-1} \left[ \frac{2+n}{2(1+n)} \right]. \quad (7)$$

As noted, the political equilibrium tax rate,  $\tau$ , denoted by  $\tau_o(e_M, \alpha)$ , maximizes the lifetime income of the median voter:

$$\tau_o(e_M, \alpha) = \arg \max_{\tau} W(e_M, \tau, \alpha). \quad (8)$$

This equilibrium tax rate is implicitly defined by the first-order condition:

$$\frac{\partial W[e_M, \tau_0(e_M, \alpha), \alpha]}{\partial \tau} \equiv B[e_M, \tau_0(e_M, \alpha), \alpha] = 0, \quad (9)$$

and the second-order condition is:

$$\frac{\partial^2 W[e_M, \tau_0(e_M, \alpha), \alpha]}{\partial \tau^2} = B_{\tau}[e_M, \tau_0(e_M, \alpha), \alpha] \leq 0, \quad (10)$$

where  $B_{\tau}$  is the partial derivative of  $B$  with respect to its second argument.

### 3 Social Security under Strain: Aging Population

We now examine how aging affects the political-economy equilibrium of social security. We first continue to maintain in sub-section 3.1 the strict PAYG, feature of social security assumed so far. In sub-section 3.2 we relax this feature.

#### 3.1 Strict Balanced-Budget Rules

In a PAYG system, the burden of financing the pension benefits to the old falls on fewer young shoulders, when population ages. If the fertility of the current young falls below the fertility rate ( $n$ ) of their parents, then the share of the old in the next period will rise. The current young expects the next young generation to reduce the benefit it pays to the old (current young) generation. That is, the current young generation perceives a smaller  $\alpha$ .

In order to find the effect of aging on social security, we investigate the effect of a decline in  $\alpha$  on the equilibrium social security tax rate,  $\tau_o(e_M, \alpha)$ . Differentiate

equation (9) totally with respect to  $\alpha$  to conclude that

$$\frac{\partial \tau_o(e_M, \alpha)}{\partial \alpha} = -\frac{B_\alpha[e_M, \tau_0(e_M, \alpha), \alpha]}{B_\tau[e_M, \tau_0(e_M, \alpha), \alpha]}, \quad (11)$$

where  $B_\alpha$  is the partial derivative of  $B$  with respect to its third argument. Because  $-B_\tau$  is nonnegative [see the second-order condition (10)], it follows that the sign of  $\partial \tau_o / \partial \alpha$  is the same as the sign of  $B_\alpha$ . It also follows from equation (9) that  $B_\alpha = \partial^2 W / \partial \alpha \partial \tau$ . Employing equation (5) we find that:

$$B_\alpha[e_M, \tau_o(e_M, \alpha), \alpha] = \frac{\partial^2 W[e_M, \tau_o(e_M, \alpha), \alpha]}{\partial \alpha \partial \tau} = \frac{1}{1+r} \frac{db[\tau_0(e_M, \alpha)]}{d\tau}. \quad (12)$$

Naturally, no one will vote for raising the social security tax if  $db/dt < 0$ , because in such a case, the pension-benefit falls when the social security tax is raised. Put differently, a political-economy equilibrium will never be located on the “wrong” side of the Laffer curve, where a tax rate hike lowers revenue. This can also be seen formally. From equation (5),

$$B(e, \tau, \alpha) = \frac{\partial W(e, \tau, \alpha)}{\partial \tau} = \begin{cases} -w(1-e) + \frac{\alpha}{1+r} \frac{db(\tau)}{d\tau} & \text{for } e \leq e^*(\tau) \\ -wq + \frac{\alpha}{1+r} \frac{db(\tau)}{d\tau} & \text{for } e \geq e^*(\tau) \end{cases}, \quad (13)$$

so that, when the lifetime income of the median voter is maximized that is, when  $B = 0$  [see equation (9)], we have

$$\frac{db[(\tau_0(e_M, \alpha))]}{d\tau} = \begin{cases} w(1-e_M)(1+r)/\alpha & \text{if } e_M \leq e^*(\tau) \\ wq(1+r)/\alpha & \text{if } e_M \geq e^*(\tau) \end{cases} \geq 0. \quad (14)$$

Thus, it follows from equations (12) and (14), that  $B_\alpha[e_M, \tau_o(e_M, \alpha), \alpha] \geq 0$ , and hence, from equation (11), that

$$\frac{\partial \tau_o(e_M, \alpha)}{\partial \alpha} > 0. \quad (15)$$

We conclude that when the young population expects reduced social security benefits because of the aging of the populations (that is, when  $\alpha$  falls), the public indeed votes for scaling down the social security system already at present (that is, for lowering  $\tau$  and  $b$ ). As a result, the young resort to supplemental old-age savings, such as individual retirement accounts. Naturally, the old are worse-off as a result of reducing  $b$ . But, they are outvoted by the young, whose attitude for lowering  $\tau$  has turned stronger, following the reduction in the social security benefits that they will get.

### 3.2 Reform-Earmarked Budget Deficit

The old, naturally, continue to oppose the (partial) transition from a PAYG, old age social security system to individual retirement accounts, because they lose some of their pension benefits. They also have a strong moral claim that they contributed their fair share to the social security system, when they were young, but they receive at retirement less than what they paid when they were young. Their opposition, strengthened perhaps by being morally justified, can be accommodated, in part or in full, if the government is allowed to make a **one-shot, debt-financed** transfer to the social security system, so as to allow the system to pay pension benefits in excess of the social security tax revenues. This deficit is carried forward to the future, and its debt-service is smoothed over the next few generations, so that its future tax implications for the current young generation is not significant. Such a reform-earmarked budget deficit may indeed be considered in the expected revision of the Stability and Growth Pact in the EU.

For simplicity, suppose that the government makes a transfer at the exact amount that is required to keep the pension benefits of the current old intact, despite the

reduction in the social security tax rate. Specifically, when  $\tau$  falls, then the term  $b$  in equation (4), that is financed by this  $\tau$ , falls as well. But we assume that the government compensates the old generation, so as to maintain the total pension benefits intact. Therefore, despite the fall in  $b$ , the old are indifferent to the reduction in  $\tau$  (and, consequently, the reduction in  $b$ ). Thus, the outcome of the majority voting is now effectively determined by the young only. The median voter is now a median among the young population only. This median voter has a lower cost-of-education index than before; that is,  $e_M$  will fall.

In order to find the effect of the fall in  $e_M$  on the political-economy equilibrium social security tax rate,  $\tau_0(e_M, \alpha)$ , we follow the same procedure as in the preceding section, and conclude that:

$$\frac{\partial \tau_0}{\partial e_M} = -\frac{B_{e_M}[e_M, \tau_0(e_M, \alpha), \alpha]}{B_\tau[e_M, \tau_0(e_M, \alpha), \alpha]}, \quad (16)$$

where, as before, the sign of  $\partial \tau / \partial e_M$  is the same as the sign of  $B_{e_M}$ , because  $B_\tau \leq 0$ . Note that  $B_{e_M} = \partial^2 W / \partial e_M \partial \tau$ , [see equation (9)], so that it follows from equation (5) that:

$$B_{e_M}[e_M, \tau_0(e_M, \alpha), \alpha] = \begin{cases} w & \text{for } e_M < e^*(\tau) \\ 0 & \text{for } e_M > e^*(\tau) \end{cases}. \quad (17)$$

Thus, we conclude that  $\partial \tau / \partial e_M$  is nonnegative: it is positive when the median voter is a skilled individual (that is, when  $e_M < e^*$ ), and zero when the median voter is an unskilled individual (that is, when  $e_M > e^*$ ). Hence, a decline in  $e_M$  decreases (or leaves intact) the social security tax  $\tau_0(e_M, \alpha)$  and the associated benefit  $b$ .

The rationale for this result is straightforward. All unskilled people have the same lifetime income, regardless of their cost-of-education parameter,  $e$ . Therefore, the attitude towards the  $(\tau, b)$ -pair is the same for all of them. Hence, the change in the median voter has no consequence on the outcome of the majority voting, when

this median voter is an unskilled individual. For skilled individuals, lifetime income increases when the education-cost parameter,  $e$ , declines. Because the social security system is progressive with respect to the cost-of-education parameter, the net benefit from it (that is, the present value of the expected pension benefit minus the social security tax) declines, as lifetime income increases (that is, as  $e$  falls). Therefore, a decline in the cost-of-education parameter of the median voter,  $e_M$ , lowers the political-economy equilibrium social security tax and pension benefit

## 4 Conclusion

Making the fiscal constraints, of the sorts previously imposed by the Stability and Growth Pact in the European Union, more flexible, may facilitate the political-economy transition from a national PAYG, old-age social security system to a fully funded private pension system. Such a transition, will, of course, improve the viability of the national system during and after the transition. But this comes at a cost of a lesser degree of income redistribution, an inherent feature of a national system.

## References

- [1] Bohn, Henning (1999), "Will Social Security and Medicare Remain Viable as the U.S. Population is Aging?" *Carnegie-Rochester Series on Public Policy*, 50 (June): 1-53.
- [2] Cooley, Thomas and Jorge Soares (1999a), "A Positive Theory of Social Security Based on Reputation", *Journal of Political Economy*, 107 (1), 135-160.



- [3] Cooley, Thomas and Jorge Soares (1999b), "Privatizing Social Security", *Review of Economic Dynamics*, 2 (3), 731-755.
- [4] Razin, Assaf, Efraim Sadka and Phillip Swagel (2002a), "The Aging Population and the Size of the Welfare State", *Journal of Political Economy*, 110(4), August, pp. 900-918.
- [5] Razin, Assaf, Efraim Sadka and Phillip Swagel (2002b), "The Wage Gap and Social Security: Theory and Evidence", *American Economic Review: Papers and Proceedings* Vol. 92, No. 2, (May): 390-395.