

Bohn, Henning

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## Will Social Security and Medicare Remain Viable as the U.S. Population is Aging? An Update

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WILL SOCIAL SECURITY AND MEDICARE REMAIN  
VIABLE AS THE U.S. POPULATION IS AGING?  
AN UPDATE

HENNING BOHN

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# WILL SOCIAL SECURITY AND MEDICARE REMAIN VIABLE AS THE U.S. POPULATION IS AGING? AN UPDATE

## Abstract

Yes, subject to concerns about Medicare inefficiencies and potentially self-confirming skepticism. The U.S. social security system-broadly defined to include Medicare-faces significant financial problems as the result of an aging population. But demographic change is also likely to raise savings, increase wages, and reduce interest rates, and up to a point, a growing GDP-share of medical spending is an efficient response to an aging population. Thus viability is more a political economy than an economic feasibility issue. To examine the political viability of social security, I focus on intertemporal cost-benefit tradeoffs in a median voter setting. For a variety of assumptions and policy alternatives, I find that social security should retain majority support.

JEL Classification: H55, E6, J1.

*Henning Bohn*  
*Department of Economics*  
*University of California at Santa Barbara*  
*Santa Barbara, CA 93106*  
*U.S.A.*  
*bohn@econ.ucsb.edu*

## **Preface**

This is an updated and shortened version of my 1998 Carnegie-Rochester conference paper (Bohn 1999). At the time, the paper was received with great skepticism. While most of the conference audience seemed convinced that social security reform was imminent, the paper's voting analysis suggested that a majority will rationally support the existing pay-as-you-go programs. Five years later, no reforms have occurred. The political debate is dominated instead by proposals for new Medicare drug benefits, suggesting voter preferences favor expanded pay-as-you-go programs over cost-reducing reforms. This update re-examines the viability of social security on the basis of current, much different fiscal and economic projections. The results are similar, even strengthened because of lower interest rates and deflated stock market expectations.

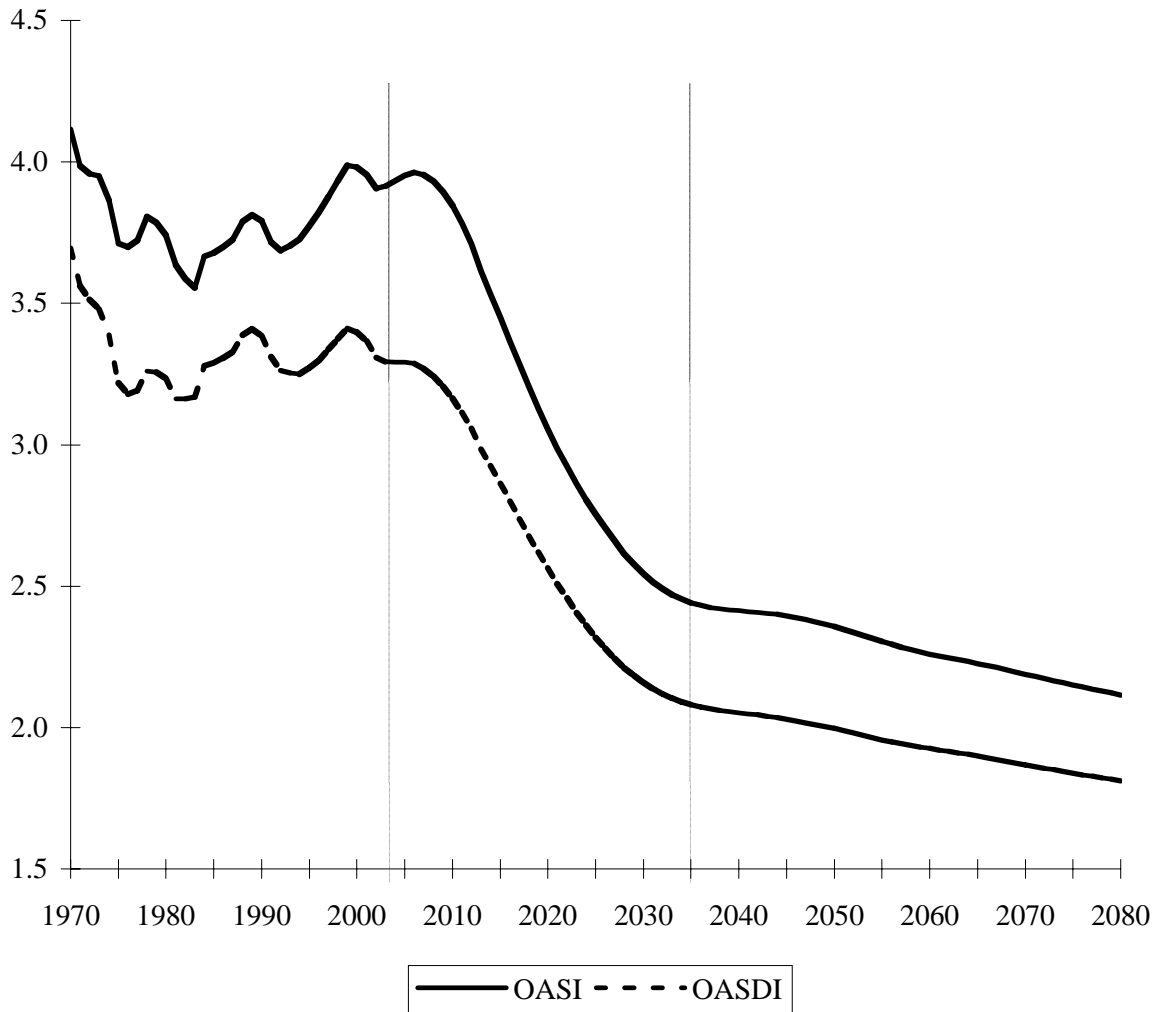
### **1. Introduction**

The U.S. social security system—broadly defined to include Medicare—faces tremendous financial problems as the population is aging. According to Social Security Administration (SSA) projections, the ratio of workers to retirees will fall from 3.9 in 2003 to 2.4 in 2035 (Fig. 1). The cost of retirement benefits (OASI) will rise from 3.8% of GDP in 2003 to 5.5% by 2035 (Fig. 2). Medicare cost are projected to grow even faster, from 2.5% to 5% of GDP by 2035. Though long run projections are always uncertain, the underlying demographics are firmly in place: The growth rate of the labor force has declined sharply (Fig. 3) and life-expectancy is rising (Fig. 4).

Not surprisingly, these alarming projections have created doubts about the system's viability. According to opinion polls, many young Americans do not expect to receive any social security benefits when they are old. Economists have voiced similar concerns. Some have concluded that continuing social security is simply infeasible (e.g., President's Commission to Strengthen Social Security, 2001); others are mainly thinking about alternative versions of radical reforms, apparently taking the existing system's demise for granted.

**Figure 1**

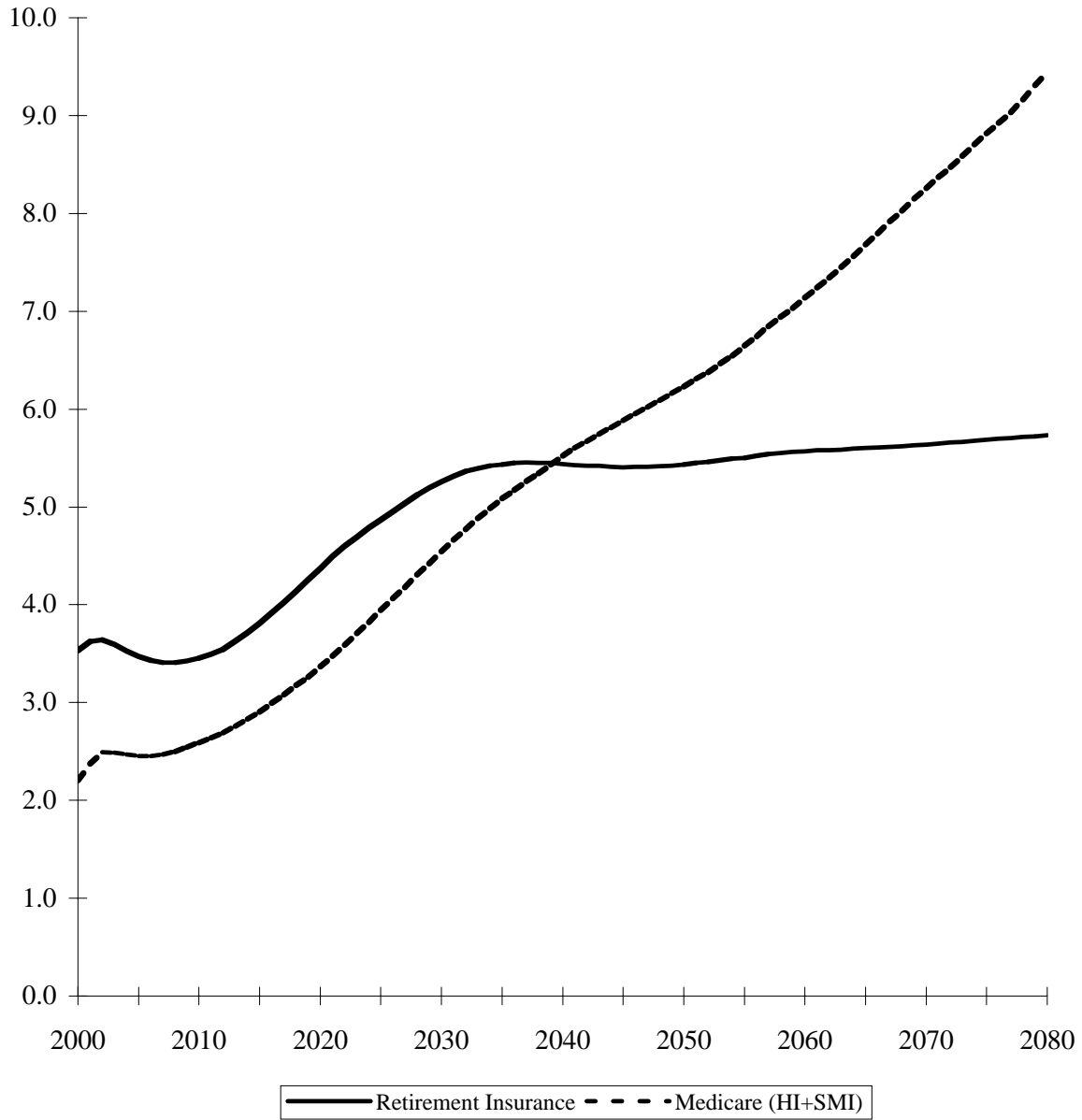
**The Ratio of Workers to Beneficiaries:  
Retirement and Disability Insurance**



Notes: The chart illustrates the rapid decline in the worker-retiree ratio between now and 2035 under the SSA (2003) Intermediate Projection. The OASDI series is lower than the OASI series because it includes the disabled. See Section 2 for more explanation.

**Figure 2**

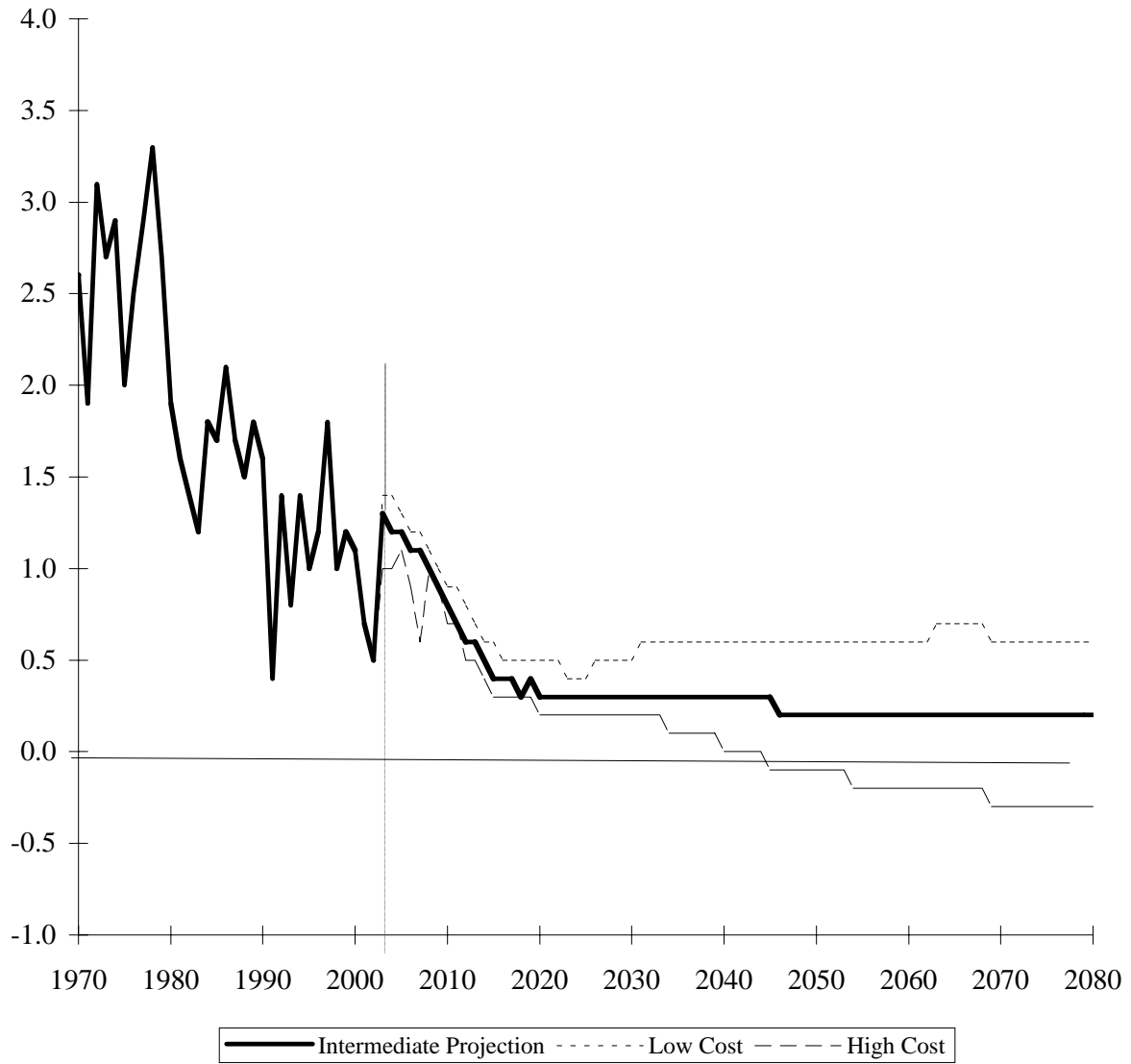
**Retirement (OASI) and Medicare Cost  
in Percent of GDP**



Notes: From SSA (2003), Intermediate Projection.

**Figure 3**

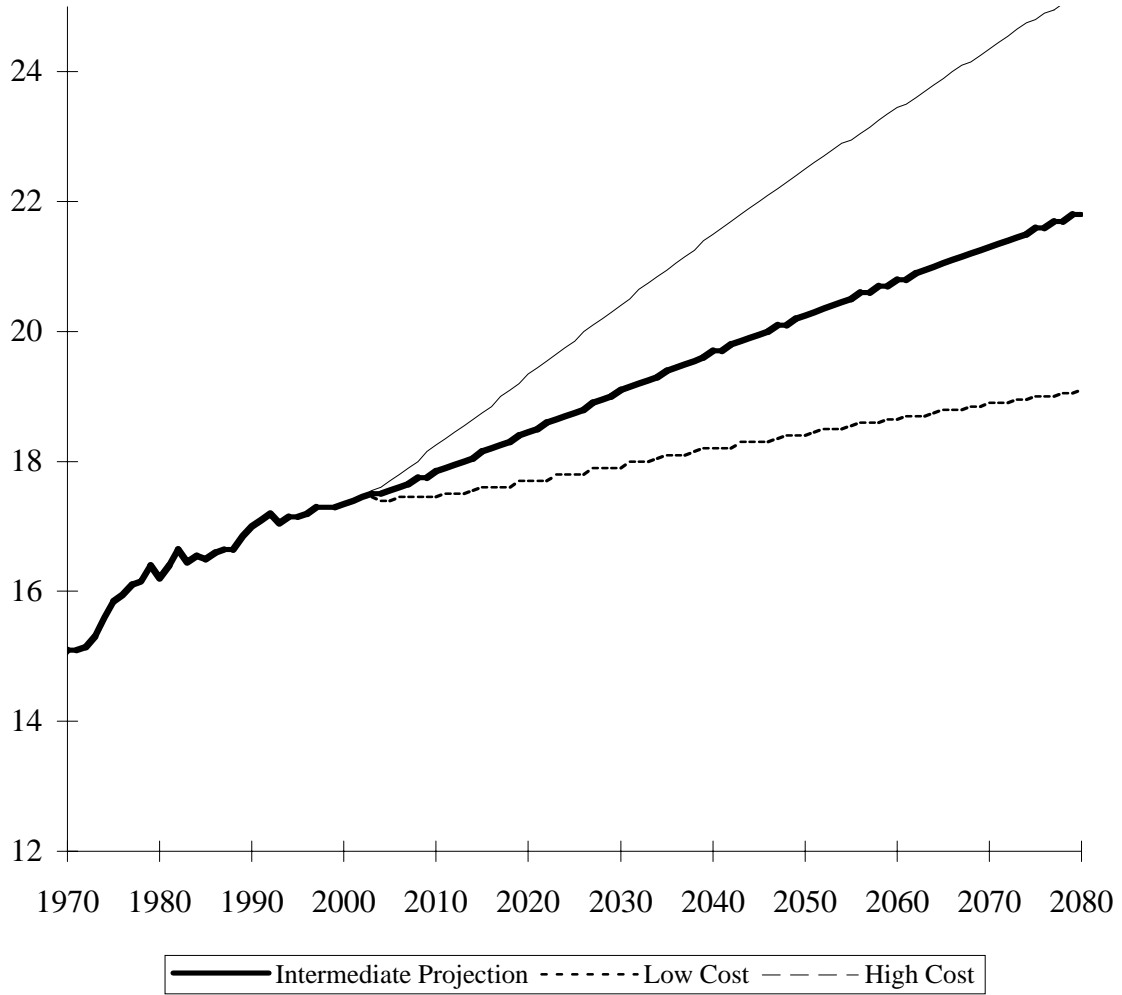
**The Growth Rate of the Labor Force**



Notes: Historical data and alternative projections from SSA (2003).

**Figure 4**

**Life Expectancy at Age 65**



Notes: Average of male and female life expectancy, historical data and alternative projections from SSA (2003).



Though the social security debate sometimes focuses narrowly on retirement, this paper examines retirement and retiree medical insurance together. This is because OASI and Medicare share the same payroll tax, have common beneficiaries, and raise similar public choice issues. To anticipate, I find that despite the rising cost, social security remains viable, economically and politically. To the extent caveats are required, the most likely source of trouble is Medicare and not retirement insurance.<sup>1</sup>

The biggest challenge in modeling social security is perhaps the lack of consensus about the basic nature of the system. Does the government have an obligation—moral or otherwise—to take care of retirees who previously contributed to social security? If so, does this “entitlement” include an open-ended promise to cover all “necessary” medical expenses even when health care cost are rising sharply? Or is social security just a transfer program that Congress could repeal at any time?

Such interpretational questions are especially relevant for social security because the existing laws do not provide a coherent plan for the future. Instead, the law specifies fixed benefits and fixed tax rates, which are almost surely inconsistent in the long run and must be modified periodically to adapt to changing circumstances. The question to what extent benefits and taxes can be adjusted within the system is therefore important for the system’s overall viability.

When discussing changes, the interpretation of promised benefits is a key issue. To those who believe that social security represents an irrevocable obligation, the question of viability is about economic feasibility, about honoring a moral commitment, and not about politics. To discuss the politics of terminating social security might even be viewed as immoral, no less outrageous than a debate about defaulting on Treasury bills. To those who consider social security a transfer program without meaningful intertemporal dimension, questions about viability are entirely about politics,

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<sup>1</sup> I should emphasize that the paper is not about the normative desirability of marginal, system-saving adjustments versus more fundamental social security reforms, nor primarily about forecasting the future of social security. While a negative answer to the viability question should strongly affect expectations and may create momentum for reform, a positive answer does not rule out that voters might prefer some other alternative to the status quo. The challenge for reformers is to convince voters without using the cheap argument that reforms are inevitable.

about the odds that social security retains majority support; and any comment about moral obligations might be viewed as unscientific or politically naive.<sup>2</sup>

All sides apparently agree that Congress is legally sovereign and has the ability to modify social security at will. Hence, majority support is a necessary condition for the existence of social security. From this perspective, the politics of social security should be a legitimate topic even if one views social security as a moral commitment.<sup>3</sup> On the other hand, if one views social security as discretionary, an economic analysis of voter behavior cannot ignore that rational voters have to form expectations about the likely voting behavior of others. This creates a potential for multiple equilibria and for public debate—perhaps revolving around moral obligations—to serve as an equilibrium selection mechanism. From this perspective, social security can be given an intertemporal dimension without assuming a moral commitment.

Thus, the viability question is ultimately political. Is social security likely to maintain majority support as the population ages? To obtain robust answers, I will examine several different political-economy models. Purely economic concerns play a role in this context as voters weigh the cost and benefits of social security: How expensive would it be to continue the current system? Is it even feasible? To put the politics in context, I first examine the allocational implications of an aging population and of rising medical cost. The main points are (a) that aging has basically favorable implications—increasing the savings rate, wages, and the capital-labor ratio—and (b) that an efficient allocation will likely display a growing GDP-share of medical spending.

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<sup>2</sup> Politicians seem to pick the best of both views, telling workers that payroll taxes entitle them to retirement benefits, but denying that the promised benefits should appear as liabilities in the budget (see Bohn 1992, 1997).

<sup>3</sup> Note that Congressional sovereignty cannot be used to dismiss the moral commitment view of social security because a sovereign Congress could also default on government bonds. Since entitlements are paid out automatically while it takes an act of Congress to raise the statutory debt ceiling, it would actually take a stronger political consensus among House, Senate, and President to end social security than to default on the national debt. Pursuing the analogy with debt, it is worth knowing under what conditions a government might default on bonds, even if one views the idea of defaulting on government bonds as outrageous. The same argument applies to social security.

Thereafter I examine the politics of social security. Two key issues are altruism and the intertemporal dimension of the social security system. Altruism is almost too powerful to be interesting: Social security is obviously viable if the young are eager to make transfers to the old. But if social security were based on pure altruism, why should high-income workers receive higher transfers in retirement than low-income workers? The linkage between benefits and prior contributions suggests that intertemporal arguments play a role. Hence, I will focus on intertemporal models of social security and, to make it challenging, abstract from operational altruism.<sup>4</sup>

In any intertemporal model of social security, the main task is to explain why working-age voters can rationally expect future benefits in exchange for their current transfers to retirees. Following Cooley and Soares (1996, 1999), I interpret the intertemporal linkage as a repeated voting game with trigger strategies. To support social security as a sequential equilibrium, one has to show that for the median-age voter the present value of future benefits exceeds the value of payroll taxes until retirement. In a partial equilibrium setting, I find that the net present value (NPV) of social security is positive for the median voter (about age 45) for a variety of specifications. General equilibrium arguments provide additional support for social security, because a vote against social security would raise the capital-labor ratio and reduce interest rates, making private savings a less attractive alternative to social security. Overall, Cooley and Soares' (1999) approach provides substantial evidence in favor of viability, contrary to their own (1996) conclusions.

Throughout the political-economy analysis, the criterion for viability is that social security finds majority support at all times against the alternative of ending social security. To limit the scope of the paper, I do not explicitly examine more elaborate transition paths or reforms that replace social security with some other government-sponsored retirement system. I show, however, that social

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<sup>4</sup> It is important to distinguish between operational altruism supporting transfers on the margin and "latent" altruism that might become operational if social security ever lost majority support. While I doubt that the current benefit structure can be justified by altruism, the existence of general welfare and SSI (supplemental social security) suggests latent altruism. This is important for the politics of social security because the young gain less from abolishing social security if most retirees would still be entitled to SSI benefits (presumably motivated by altruism towards the poor).

security gains substantial voter support if partial payments to current retirees would be continued after a no vote. Since the reform plans in the current policy debate largely protect current retirees, the paper suggests that their political prospects are either doubtful or really due to other features (e.g., implicit capital-income tax reform via tax-favored retirement accounts).

The paper is organized as follows. Section 2 reviews the demographic and financial trends. Section 3 examines efficiency issues with particular emphasis on Medicare. Section 4 considers intertemporal models of social security without operational altruism. Section 5 briefly comments on other considerations. Section 6 concludes.

## **2. The Demographic Problem**

The aging of the U.S. population is driven by two main forces, declining birth rates and increasing life-expectancy. Both of these demographic changes increase the ratio of social security beneficiaries to workers. Their economic effects are somewhat different. At a fixed life-expectancy, declining fertility would reduce the number of workers per retiree, but not the expected time each person spends in retirement. Rising life-expectancy increases the length of retirement and therefore the per-capita cost. The per-capita cost increases are especially severe for Medicare because medical cost are increasing with age.

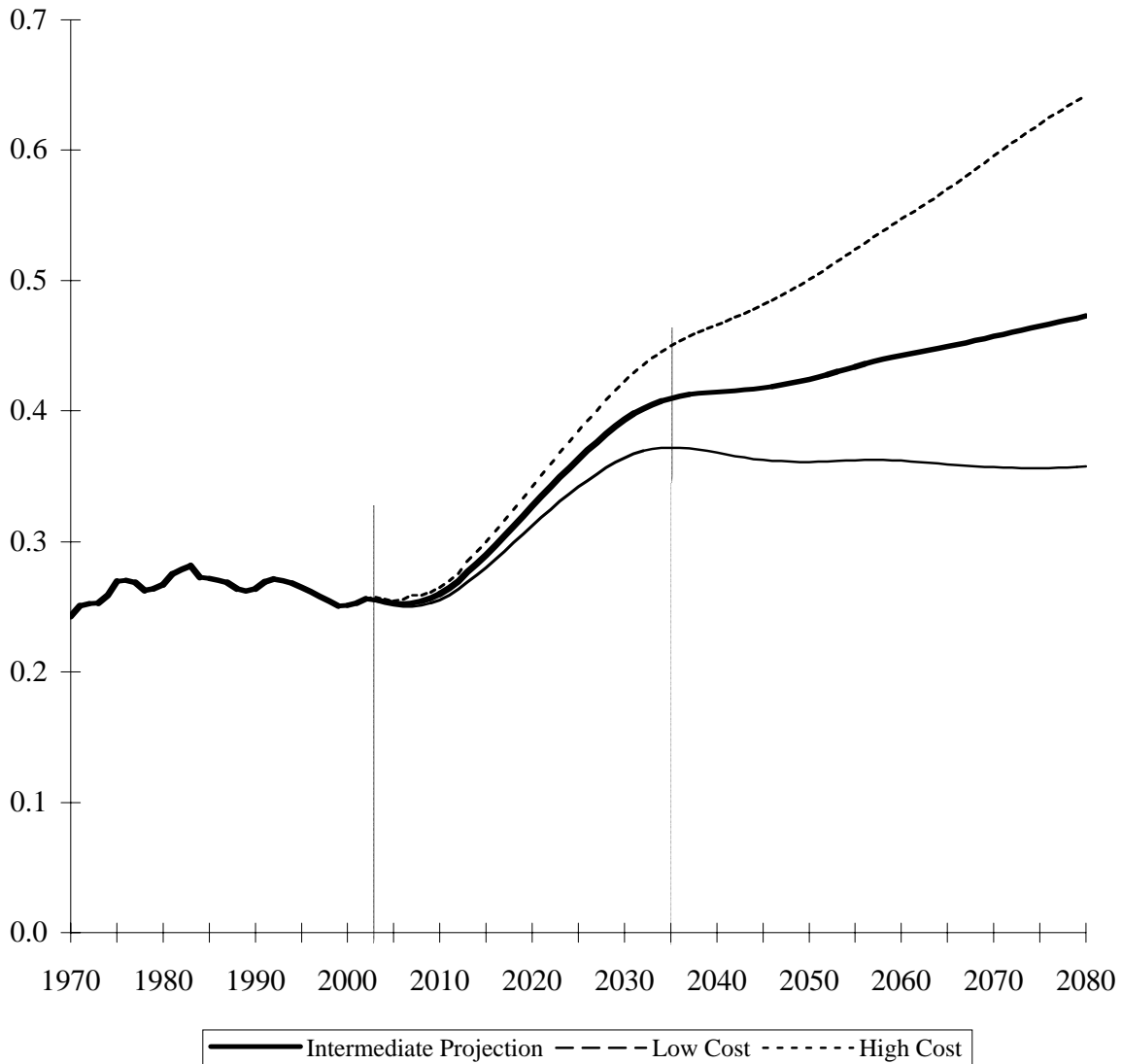
While the demographic projections until about 2030-40 are relatively clear—the 20-year ahead labor force has already been born—there is considerable uncertainty about further-ahead projections. As is common in the literature, I focus on the SSA's Intermediate Projection as the baseline forecast and use their alternative projections as a suggestive measure of uncertainty.

Figures 3-5 show the SSA's three alternative projections for the growth rate of the labor force, the life expectancy at age 65 (averaged male and female), and the ratio of retirees to contributors. In all cases, the population growth rate is expected to stabilize once the baby boom has passed through, but at different levels depending on the projection. Life expectancy, in contrast, is rising persistently but slowly. Combining the two trends, the ratio of retirees to contributors will increase sharply

between 2010 and 2035 as the baby boom retires. The path beyond 2035 is more uncertain, but the growth seems to slow down considerably, except in the most pessimistic alternative.

**Figure 5**

**The Ratio of Beneficiaries to Workers:  
Historical and Projected**



Notes: Historical data and alternative projections from SSA (2003).

The financial implications are best examined separately for the different components of the social security system. Fig.6 shows the projected rise in the cost of retirement benefits as share of GDP. Because the cost rises while revenues/GDP are constant or slightly declining, the OASI program faces a funding shortfall around 2018. In the baseline projection, the funding gap grows quickly until about 2035, then stabilizes at 1.5-2% of GDP.<sup>5</sup> The alternative projections show similar paths until 2040 and then diverge, as uncertainty increases with the forecast horizon. Except in the most pessimistic case, cost/GDP stops rising after about 2035, consistent with the demographic trends. In terms of economic feasibility, a 1.5-2% funding gap is serious, but far from insurmountable, especially with more than a quarter century advance warning. (It's not uncommon for Congress to debate fiscal changes impacting 2% of GDP.) Beyond 2035, cost increases are largely due to slow growth in life-expectancy. This suggests that a one-time adjustment covering the 1.5% funding gap of 2035 plus an indexation of retirement age to life-expectancy should be sufficient to stabilize the OASI cost rate permanently.

The projections for Medicare look much more troubling in comparison. Fig.7 shows the projected outlays and revenues of the hospital insurance fund (HI, a.k.a. Medicare Part A). Revenues are insufficient even in the most optimistic scenario. In the intermediate case, the HI benefit cost as fraction of GDP will almost double by 2035, and total Medicare cost (Parts A&B, as shown in Fig. 2) will exceed the cost of retirement insurance. More ominously, the ratio of Medicare cost to GDP shows no sign of stabilizing; by 2080, HI cost is projected to exceed HI revenues by a 3:1 ratio. Because OASI and Medicare are subject to similar demographic pressures, the relative growth of Medicare must be attributed to increased per-capita medical spending. These projections suggest that

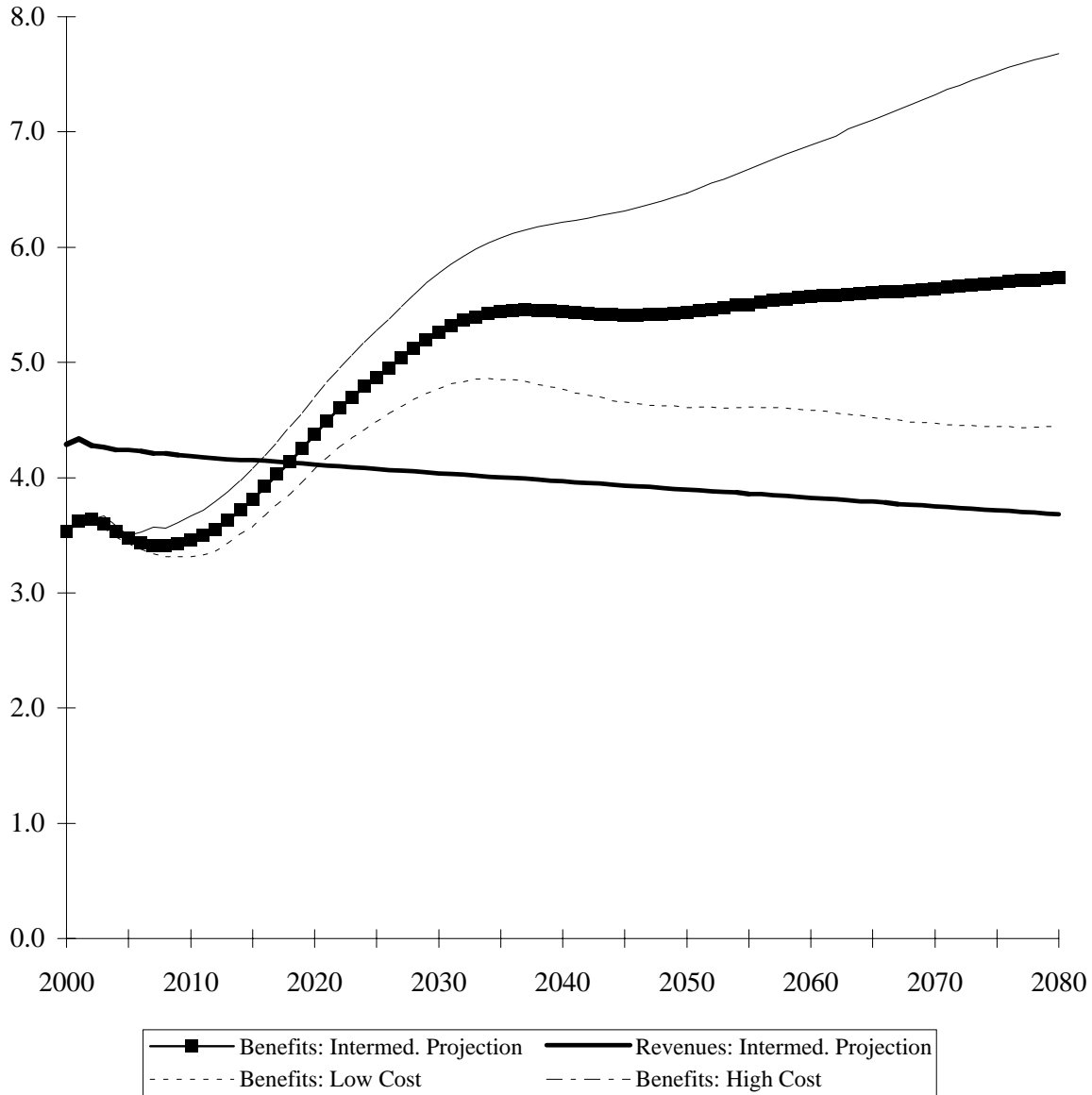
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<sup>5</sup> Until about 2040, the projected OASDI cash-flow shortfall could be covered from the social security trust fund. But since the trust fund holds Treasury securities, its value is questionable (see below). The disability component (DI) of OASDI is excluded for most of my analysis, because DI covers the working age population and is therefore not an intergenerational program. DI financing is also unbalanced because projected outlays of about 2.5% of payroll by 2030 will exceed the program's fixed 1.8% of payroll revenue base.

studies of intergenerational redistribution should pay at least as much attention to Medicare as to retirement insurance.

**Figure 6**

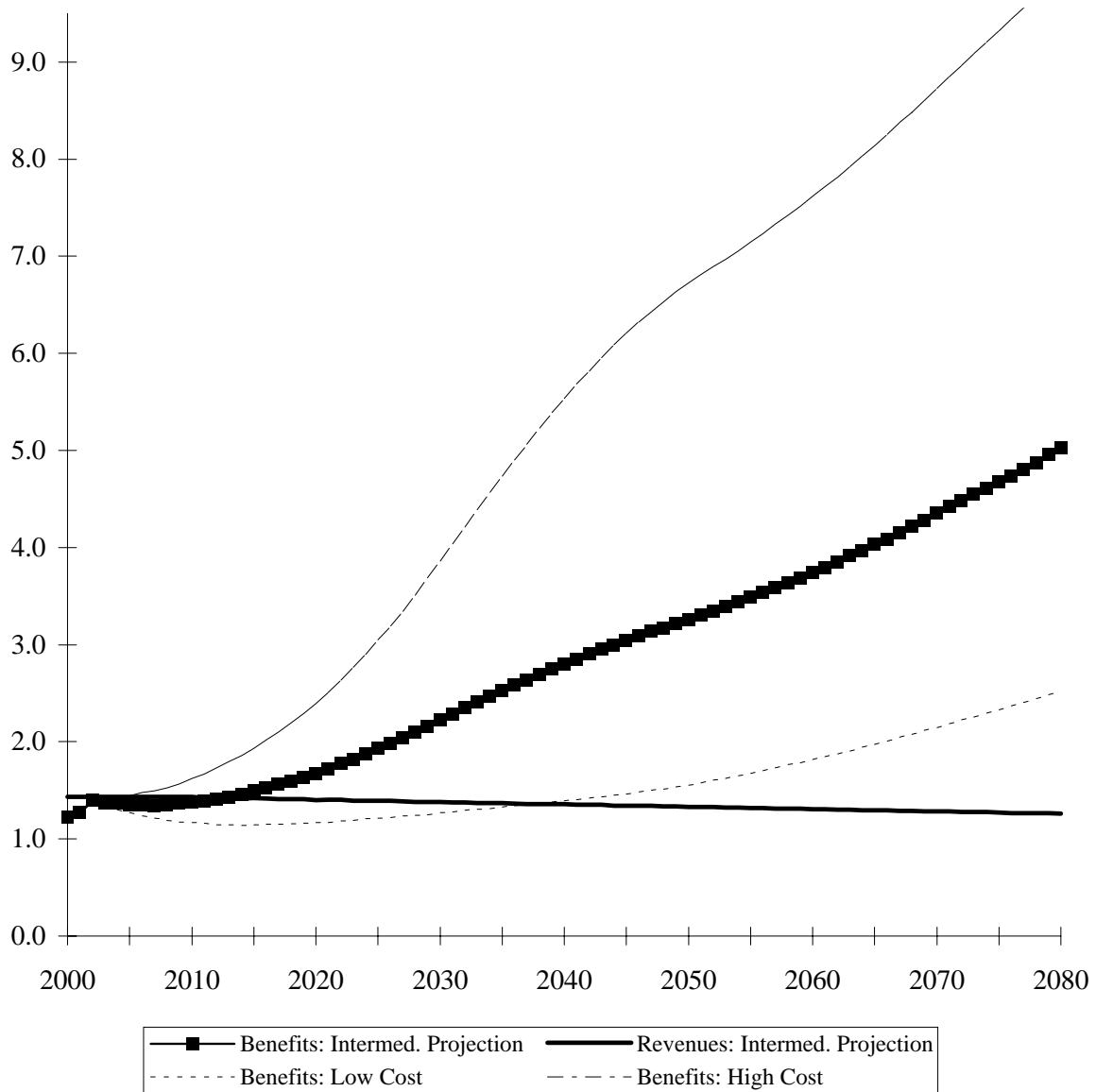
**Outlays and Revenue of the Retirement Insurance Fund  
(OASI) in Percent of GDP**



Notes: Projections from SSA (2003). Trust fund transactions and taxes on benefits are excluded.

**Figure 7**

**Outlays and Revenue of the Hospital Insurance Fund (HI)  
in Percent of GDP**



Notes: Projections from SSA (2003). Trust fund transactions and taxes on benefits are excluded.



These trends raise a number of questions. First, what are the economic consequences if the growing cost of social security is financed through rising taxes on the young? Second, is it politically viable to continue social security? If voters care about cost-benefit tradeoffs, the answer will depend on the economic consequences, but it is ultimately a question about politics.

### 3. Efficient Responses to Demographic Change

This section examines some basic economic questions about demographic change: What are the macroeconomic effects of lower population growth and higher life expectancy? How are they modified in the presence of social security? And how should we interpret the rising GDP-share of Medicare? The answers may surprise those who see demographic change as a huge problem: Lower population growth and rise life-expectancy will raise wages and reduce interest rates even if rising taxes crowd out capital. A growing GDP-share of medical spending is an efficient response to these demographic changes. And after one generation, welfare is unambiguously improved.

#### 3.1 Demographic Change without Government

For the basic analysis, consider a standard Diamond (1965) two-period OG model. Generation  $t$  consists of  $N_t$  members who consume and work (earning  $w_t$ ) in period  $t$  and retire in period  $t+1$ . Individuals survive into retirement with probability  $\mu_{t+1}$ , which is also the aggregate, deterministic fraction of survivors. Individuals have utility

$$U_t = u(c_t^1) + \rho \cdot \mu_{t+1} \cdot u(c_{t+1}^2) \quad (1)$$

where  $c_t^1$  and  $c_{t+1}^2$  are the first and second period consumption and  $\rho$  is a discount factor;  $u$  is increasing, concave, and (to obtain a steady state) homothetic.

With stochastic survival, the availability of annuities is important for savings decisions. If fair annuities are available, a market interest rate  $r_{t+1}$  translates into a survival-contingent gross return of  $(1+r_{t+1})/\mu_{t+1}$  on individual assets  $a_t$ . Because private annuity markets are empirically highly imperfect, I model survival-contingent returns more generally as  $(1+r_{t+1})/\mu_{t+1}^{1-\lambda}$  where  $\lambda \geq 0$  is the “charge” on annuities ( $\lambda = 0$  means fair annuities,  $\lambda = 1$  means no annuities).

The budget equations are then  $c_t^1 = w_t - a_t$  and  $c_{t+1}^2 = (1 + r_{t+1})/\mu_{t+1}^{1-\lambda} \cdot a_t$ . Combined with the first order condition  $u'(c_t^1) = \rho\mu_{t+1}u'(c_{t+1}^2) \cdot (1 + r_{t+1})/\mu_{t+1}^{1-\lambda} = u'(c_{t+1}^2) \cdot \rho(1 + r_{t+1})\mu_{t+1}^\lambda$ , they imply a savings function  $a_t = s(1 + r_{t+1}, \mu_{t+1})w_t$ . The savings rate  $s$  is unambiguously increasing in  $\mu_{t+1}$ , i.e., individuals save more when the life-expectancy rises.

To close the model, suppose output is produced with a Cobb-Douglas technology with capital share  $\alpha$ , full depreciation between generational periods, and an exogenous productivity index  $\gamma_t$  that grows at rate  $g$ :

$$Y_t = K_t^\alpha (N_t \gamma_t)^{1-\alpha}, \text{ where } \gamma_t = \gamma_{t-1}(1 + g) \text{ and } N_t = N_{t-1}(1 + n_t). \quad (2)$$

Then the capital-labor ratio  $k_t \equiv K_t/(N_t \gamma_t)$  determines the interest rate  $r_t = \alpha k_t^{\alpha-1} - 1$ , the wage  $w_t = (1 - \alpha)k_t^\alpha \gamma_t$ , and all other relevant variables; its dynamics are characterized by

$$k_t = \frac{a_{t-1}}{(1+n_t)\gamma_t} = \frac{1-\alpha}{(1+n_t)(1+g)} s(\alpha k_t^\alpha, \mu_t) k_{t-1}^\alpha. \quad (3)$$

As in Diamond (1965), one must assume a positive or “not too negative” interest elasticity of savings to ensure uniqueness, dynamic stability, and monotone convergence.

How then does demographic change affect welfare? Eq. (3) shows that any reduction in the population growth and any increase in the survival rate will raise the capital-labor ratio, and hence raise wages and lower interest rates. While higher wages are clearly a plus, lower interest rates are negative for savers. A decline in  $n_t$  is definitely welfare-reducing for generation  $t-1$  because it reduces  $r_t$  without changing  $w_{t-1}$ : This is the U.S. baby boomers’ problem. A rise in  $\mu_t$  will also reduce  $c_t^2$ , but assuming people like to live, their utility should nonetheless rise. For all subsequent generations  $t+i$  ( $i \geq 0$ ), a lower  $n_t$  and/or a higher  $\mu_t$  are unambiguously positive: One can show that their utility increases, provided the economy is dynamically efficient and the model displays monotone convergence ( $0 < dk_{t+1}/dk_t < 1$ ). It is also true that a permanent reduction in population growth and/or a permanent increase in  $\mu_t$  will increase utility in steady state. Overall, one must conclude that (a) the demographic changes observed in the U.S. are basically good news for future generations; and (b), lower population growth reduces the welfare of the “last” cohort prior to the decline—the baby boomers.

### 3.2. Government Debt and Social Security

How does government activity modify the above conclusions? From a positive perspective, social security and government debt are likely to dampen the macroeconomic effects of demographic change, because the existing national debt and social security obligations will impose a lighter (heavier) per-capita burden on larger (smaller) cohorts. From a normative perspective, a defined-benefits social security system therefore provides valuable insurance against demographic changes.

To examine the positive role of government, suppose there is a social security system with payroll tax  $\theta_t$  and benefit rate  $b_t$ , and a fiscal authority that imposes net taxes  $\tau_t^1$  on the young and  $\tau_t^2$  on the old (both expressed as wage-shares). Real government spending is ignored to avoid being sidetracked into public finance issues. Government debt must nonetheless be included because social security, debt, and direct transfers are close substitutes for purposes of intergenerational redistribution (Auerbach et al. 1991). For the U.S., the regular budget is also important because the social security trust fund holds Treasury securities. If they are—as planned—redeemed between 2015-2040, who pays?

To answer this question, let  $D_t$  denote gross Treasury debt and let  $TR_t$  denote the trust fund, both at the start of period  $t$ . Initial debt is financed by taxes and new debt, and social security benefits and trust fund accumulations are financed by payroll taxes, as captured by the budget equations

$$D_t = \tau_t^1 w_t N_t + \tau_t^2 w_t \mu_t N_{t-1} + \frac{D_{t+1}}{1+r_{t+1}}, \text{ and} \quad (4)$$

$$b_t w_t \mu_t N_{t-1} + \left(\frac{TR_{t+1}}{1+r_{t+1}} - TR_t\right) = \theta_t w_t N_t. \quad (5)$$

Individual consumption values  $c_t^1 = (1 - \theta_t - \tau_t^1)w_t - a_t$  and  $c_{t+1}^2 = (b_{t+1} - \tau_{t+1}^2)w_{t+1} + \frac{1+r_{t+1}}{\mu_{t+1}^{1-\lambda}} \cdot a_t$

depend on taxes and social security only through the total tax rate  $\theta_t + \tau_t^1$  and the net benefit rate  $b_{t+1} - \tau_{t+1}^2$ . Hence individual behavior depends only on the unified government budget equation

$$\frac{D_{t+1} - TR_{t+1}}{1+r_{t+1}} + (\theta_t + \tau_t^1)w_t N_t = (D_t - TR_t) + (b_t - \tau_t^2)w_t \mu_t N_{t-1} \quad (6)$$

and not on its components. The net, or publicly held, debt  $D_t - TR_t$  is the only relevant measure of public liabilities. Capital market equilibrium requires  $K_{t+1} + (D_{t+1} - TR_{t+1})/(1+r_{t+1}) = a_t N_t$ , i.e., also involves net debt. According to equations (4-6), trust fund redemptions must either be financed by

taxes on the old  $\tau_t^2$ , or by taxes on the young  $\tau_t^1$ , or they impose a burden on future generations by increasing  $D_{t+1} - TR_{t+1}$ .

For our purposes, the most relevant transfer to the old is the general funds subsidy to Supplemental Medical Insurance (SMI, a.k.a. Medicare Part B) Hence let  $\tau_t^2 = -m_t^{SMI} < 0$  be the Medicare subsidy as a share of wages and abstract from other taxes on the old. (Debt and social security would be irrelevant if the government could simply tax its creditors, the old; see Bohn 1992.) Let the benefits financed through payroll taxes,  $b_t = \beta_t + m_t^{HI}$ , be the sum of retirement benefits  $\beta_t$  and Hospital Insurance  $m_t^{HI}$ .

In the OG model, the macroeconomic effects of alternative policies depend critically on their impact on savings and capital accumulation. The case of log-utility,  $u(c) = \ln(c)$ , is most instructive here because it yields easily interpretable formulas. Specifically, one finds

$$k_{t+1} = \frac{1-d_{t-1}^+}{(1+n_t)(1+g)} \cdot \frac{\rho\mu_t}{1+\rho\mu_t+(1-\alpha)/\alpha \cdot d_t^{++}} \cdot (1-\alpha)k_t^\alpha, \quad (7)$$

where  $d_t^+ \equiv \frac{D_t - TR_t}{Y_t(1-\alpha)} + \frac{\mu_t}{1+n_t}(b_t - \tau_t^2)$  and  $d_t^{++} \equiv d_t^+ + (b_t - \tau_t^2) \frac{\mu_t^{1-\lambda}}{1+n_t}(1-\mu_t^\lambda)$ .<sup>6</sup> Equation (7) provides answers about the impact of alternative policies. If  $d_t^+$  and  $d_t^{++}$  are held constant, lower population growth and higher survival rates will raise the capital-labor ratio, reduce interest rates, and raise wages, as in the model without government.

At a constant debt-GDP ratio, holding  $d_t^+$  constant is equivalent to keeping tax rates constant. Social security is, however, a defined-benefits system. With constant benefits,  $d_t^+$  and  $d_t^{++}$  will increase as  $\mu_t$  rises and/or  $n_t$  falls. This implies a crowding-out effect that raises interest rates and reduces wages. But unless the fixed benefits are huge, the net effect of the demographic changes is still to reduce interest rates and to raise wages, just somewhat less than without a defined-benefits social

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<sup>6</sup> The variable  $d_t^+$  is a sum of debt, social security claims, and transfers that can be interpreted as the old cohort's generational account (Auerbach et al. 1991) scaled by wages, and  $d_t^{++}$  is adjusted version that accounts for imperfect annuity markets. With perfect annuity markets, all transfers are equivalent and  $d_t^+$  is the only relevant policy variable ( $\lambda = 0 \Rightarrow 1 - \mu_t^\lambda = 0 \Rightarrow d_t^{++} = d_t^+$ ). With imperfect annuities, social security benefits contingent on survival are more valuable than other transfers ( $\lambda > 0 \Rightarrow 1 - \mu_t^\lambda > 0 \Rightarrow d_t^{++} > d_t^+$ ).

security system.<sup>7</sup> One may conclude that a defined-benefit social security system dampens the macroeconomic effects of demographic change, without realistically overturning them. Hence one should not be overly concerned about the economic viability of U.S. social security as a defined-benefits system.

One caveat concerns distortionary taxation. At fixed benefits, tax rates would rise as  $\mu_t$  rises and  $n_t$  falls, perhaps triggering increased tax-avoidance. Feasibility may become an issue as one approaches the peak of the Laffer curve. This is a valid concern in theory, but a remote possibility for the U.S., since the total U.S. tax burden is well below that of many other countries (Hansson and Stuart, 2002). Hence, I do not attempt to model the Laffer curve nor tax distortions. Another caveat relates to growth in Medicare spending, which increases  $d_t^+$  and therefore reduces the capital labor-ratio, depresses wages, and raises interest rates; because Medicare growth has these effect, it is examined more closely in the next section.

### 3.3. *The Rising Cost of Medical Care*

Medical cost are worth modeling separately, because they are the fastest growing component of social security and because health insurance raises separate efficiency issues. Does Medicare create viability problems?

For the analysis, I reinterpret old-age consumption in the two-period OG model as a CES-composite of health care consumption  $h_{t+1}$  and “regular” consumption  $c_{t+1}^*$ ,

$$c_{t+1}^2 = [(c_{t+1}^*)^\varepsilon + \eta_{t+1}^{1-\varepsilon} \cdot h_{t+1}^\varepsilon]^{1/\varepsilon}, \quad (8)$$

where  $1/(1-\varepsilon)$  is the elasticity of substitution and  $\eta_{t+1}$  parameterizes the weight of medical care in utility. Empirically, medical needs are strongly correlated with age, suggesting that  $\eta_{t+1}$  will increase over time as life expectancy rises. Working-age medical cost are omitted because they do not affect social security (ignoring disability).

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<sup>7</sup> This is consistent with the calibration results in Bohn (2001). Additional support is provided by simulation evidence in larger-scale models, notably De Nardi et al. (1998). De Nardi et al. simulate alternative policies in a 69-period OG model over the period 1975-2060 and show that interest rates decline in every scenario.

Retiree medical care is funded by three sources, payroll taxes covering Hospital Insurance, general taxes subsidizing Medicare SMI (about 75% of SMI cost), and payments by the retirees themselves. Let  $p_t$  be the exogenous relative price of medical services, let  $h_t^{HI}$  and  $h_t^{SMI}$  be the real medical services provided by HI and SMI, and let  $h_t^* = h_t - (h_t^{HI} + h_t^{SMI})$  be privately-funded medical services. Medicare cost as share of the wage are then  $m_t^{HI} = p_t h_t^{HI} / w_t$  and  $m_t^{SMI} = p_t h_t^{SMI} / w_t$ ; and the individual budget constraints are

$$c_t^1 = (1 - \theta_t - \tau_t^1) w_t - a_t, \text{ as before, and} \quad (9)$$

$$c_{t+1}^* + p_{t+1} h_{t+1}^* = \beta w_{t+1} + (1 + r_{t+1}) / \mu_{t+1} \cdot a_t. \quad (10)$$

To simplify, I assume log-utility over  $c_t^1$  and  $c_{t+1}^2$ , and—as efficiency benchmark—perfect annuities.

Then the first order conditions for  $h_{t+1}^*$  and  $a_t$  are

$$h_{t+1} / c_{t+1}^* = \eta_{t+1} \cdot p_{t+1}^{-1/(1-\varepsilon)} \text{ and } 1/c_t^1 = \rho (c_{t+1}^*)^{\varepsilon-1} / (c_{t+1}^2)^{\varepsilon} (1 + r_{t+1}), \quad (11)$$

which simplifies to 
$$c_{t+1}^* = \frac{\rho(1 + r_{t+1})}{1 + \eta_{t+1}^*} c_t^1, \quad (12)$$

where  $\eta_{t+1}^* = \eta_{t+1} \cdot p_{t+1}^{-\varepsilon/(1-\varepsilon)}$  is a composite of demand ( $\eta$ ) and price ( $p$ ). This composite also determines the share of medical services in total spending,  $p_t h_t / c_t^* = \eta_t^*$ .

It is a non-trivial exercise to translate the policy debate about the “cost explosion” in Medicare into a preference-technology framework. While it seems undisputed that demand ( $\eta$ ) is rising rapidly as result of new treatment options, the role of price changes is more obscure. Some argue that rising relative prices ( $p$ ) combined with a low elasticity of substitution contribute to the observed growth in medical spending (Cutler 1997). But it is difficult to believe that rapid technical progress would not lead to declining relative prices if one properly adjusted for quality improvements. In any case, it seems clear that the composite  $\eta_t^*$  is rising, as is the share of medical services in total spending.

The latter is the main point: In response to rising life-expectancy and improvements in medical technology, a growing share of medical spending within overall consumption is efficient. Thus, projections like Fig. 7 that show unending growth in medical spending are not *per se* evidence of inefficiency. Like increases in  $\mu_t$  in the previous section, increases in  $\eta_t^*$  will increase individual savings, the capital-labor ratio, and wages, and reduce interest rates. Again, such “unbalanced” growth

does not prove inefficiency; to the contrary, it would be inefficient to keep the economy on a balanced growth path.

One must recognize, however, that Medicare spending growth beyond the efficient amount, or a wasteful use of Medicare revenue, is problematic. Indeed, much of the Medicare policy debate seems to be about moral hazard—the incentives of insured patients to overuse medical services (see Cutler 1997). As discussed in Bohn (1999), a failure to address moral hazard could threaten the system’s economic feasibility. Perhaps worse, moral hazard creates a political economy dilemma: To convince voters that future benefits are secure, social security is likely to require some “rigidity” in the name of precommitment. Voters may interpret “unfair” cost controls as a breach of an intergenerational commitment—as a signal that social security cannot be trusted. Discretionary interventions to resolve moral hazard may therefore destroy the system’s political viability. A failure to intervene, on the other hand, results in wasteful spending and adversely affects voters cost-benefit calculations.

#### **4. The Political Economy of Social Security**

From the perspective of voting theory, the existence of social security is a mystery. Since retirees are a minority, standard median voter arguments imply that workers should not let themselves be taxed for the benefit of the retirees. To rationalize social security in a democracy, the key task is to explain why a substantial fraction of workers vote in favor of social security.

The literature has provided several explanations. The most prominent ones are based on intertemporal considerations and altruism. Intertemporal models build on the fact that individual social security benefits are linked to past contributions. Hence, workers may be induced to vote in favor if they expect future benefits that outweigh the payroll tax. This argument is consistent with the political rhetoric surrounding social security, but it is logically tricky. If there is a sequence of votes, each about whether or not to pay a transfer to current retirees, it is not obvious why current voters should care about past voting outcomes. By the same logic, current workers should not expect future voters to compensate them for their current support of social security. The centerpiece of virtually all

intertemporal models of social security is therefore an expectational linkage between current and future voting outcomes.

I will examine models of this kind below. The focus is on pure age-dependent voting. This is not to deny other considerations, but to document that intertemporal arguments alone can provide majority support for social security.

While early intertemporal models such as Browning (1975) and Boadway and Wildasin (1989a,b) simply assume static expectations, recent models have used an explicitly game-theoretic reasoning that imposes sequential rationality—notably, Cooley and Soarez (1996, 1999). The task is to show that an equilibrium with social security is a sequential equilibrium in an infinitely repeated voting game. The critical support mechanism is provided by trigger strategies. 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.<sup>8</sup>

Since the U.S. social security system is a defined-benefit system, I will assume throughout this section that a collapse would be triggered by a failure to pay promised benefits to old. The main steps in determining the viability of the system are then

- (a) to sort voters by age, to determine the age of the median voter; and
- (b) to determine if the median-age voter would keep social security under the working assumption that the system is viable in the future.

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<sup>8</sup> There is a long literature on intertemporal models. Aaron (1966) first suggested that median-aged voters compare their contributions to the present value of future benefits, treating past contributions as sunk. Hu (1982) recognized the re-voting problem. Sjoblom (1985) presents a first model of social security as a dynamic game. Note that one can give the early static-expectations models (where voters believe the current system will remain in place for their lifetimes) a modern game-theoretic interpretation, because a static majority for social security at all times means that the system is supported by the simple trigger strategy of voting in favor as long as all prior votes have gone in favor. Kotlikoff et al.'s (1988) generational contracting explanation for social security is differently motivated, but represents a similar approach. Kotlikoff et al. assume that cohorts pass on a "generational contract" obliging each generation to receive benefits from their successor. The assumption that non-payment by the young invalidates the "contract" is essentially a trigger mechanism.



If these two conditions are satisfied now and in the future, there is sequential equilibrium with a majority for social security.

#### *4.1. How Old Is the Median Voter?*

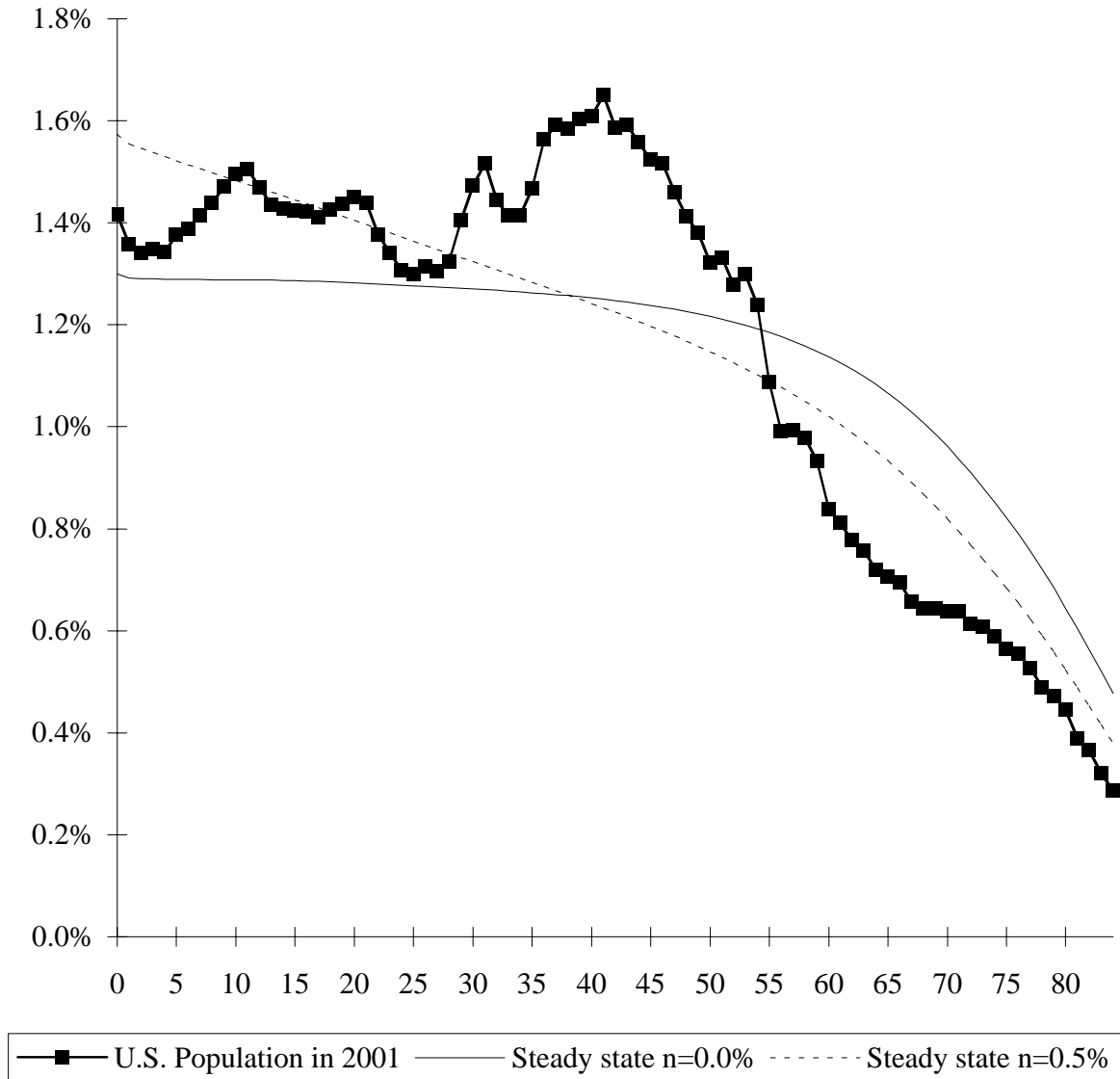
Without altruism, voters decide about social security by comparing the present value of benefits to the present value of their own current and future contributions. Retirees are obviously in favor. Workers will be increasingly in favor as they approach retirement age. To obtain a majority for social security, benefits must be high enough for the median-age voter that they outweigh the remaining contributions. To determine the relevant present values, the first question is: How old is the U.S. median voter?

Figure 8 shows the U.S. age distribution for 2001, and the steady-state age distributions for 0.0% and 0.5% population growth. The comparison highlights the baby boom phenomenon. As of 2001, the median age of the U.S. voting-age population was 43 years. This estimate might be too low, however, because voter registration and actual voter participation are positively correlated with age. Table 1 shows the raw population shares of different age groups and the shares of voters that were (a) registered to vote and (b) actually voted in recent elections. If one assumes that voting participation within age-groups is constant, the median age of actual voters is around 46-47. These numbers should be interpreted cautiously, however, because the young might start to vote more in the future if social security becomes more burdensome.

Table 2 illustrates how the age of the median voter will rise over time as the U.S. population ages and the baby boom passes through retirement. Two estimates are provided for each year, one based on population size and one corrected for age-dependent participation rates. The raw median is more conservative because it does not rely on the empirical correlation of age and voter participation. But the corrected number is more accurate if voter participation remains unchanged.

**Figure 8**

**The U.S. Age Distribution**



Notes: Actual distribution from the Statistical Abstract of the United States, 2002. Steady states from SSA Period Life Table for 1999 and own calculations, assuming unchanged mortality.

**Table 1: How Old Is the U.S. Median Voter?**

Age Groups	Voting-age Population (2001)	Percent of Age Group that is:		
		Registered	Voting	Registered
		Nov.2000	Nov.2000	Nov.1998
18-20	<b>12.3%</b>	40.5%	28.4%	32.1%
21-24	<b>15.6%</b>	49.3%	35.4%	35.0%
25-34	<b>39.6%</b>	54.7%	43.7%	52.4%
35-44	<b>45.0%</b>	63.8%	55.0%	62.4%
45-64	<b>64.5%</b>	71.2%	64.1%	71.1%
65+	<b>35.3%</b>	76.1%	67.6%	75.4%
Voters 65+	16.6%	19.8%	20.5%	20.4%
Voters 45+	47.0%	53.6%	56.1%	55.4%
<b>Median Voter</b>	<b>43</b>	<b>46</b>	<b>47</b>	<b>47</b>

Notes: From Statistical Abstract of the United States (2002) and own calculations. To compute the age of the median voter, voter participation is assumed constant within each age bracket. Several elections are listed because voter participation varies: Nov.2000 refers to the most recent Presidential election (registration and voting data). Nov.1998 refers to the Congressional election (registration only; voting data not available).

**Table 2: How old are likely median voters in the future?**

Year	Equal Participation		Participation as in Nov.2000	
	Median Voter	Share 65+	Median Voter	Share 65+
2003	44	16.7%	47	19.8%
2010	46	17.4%	49	20.6%
2020	47	21.7%	51	25.3%
2030	48	26.3%	52	30.5%
2040	48	26.8%	52	31.1%
2050	48	26.6%	52	30.9%
Zero Growth	48	24.8%		

Notes: Statistical Abstract of the United States, 2002; SSA Period Life Table for 1999; and own calculations, using SSA (2003) intermediate assumptions about increasing survival rates.

As the baby boomers age, the median age rise from 43 to 48. Age 48 is also the median of the 0%-growth steady-state distribution in Figure 8. If U.S. population growth is near zero in the long-run, as projected by the SSA beyond 2030, this limiting distribution provides a conservative estimate of the post-baby boom median age (conservative, because life-expectancy is likely to increase). At historical participation rates, the age of the median voter will rise from 46 to 52 by 2030 and stabilize at this age.

#### *4.2. Voting Decisions*

This section examines how voters' net present value of social security depends on age and on various modeling assumptions. In contrast to Cooley and Soares (1999), I assume voters take interest rates and wages as given. This partial equilibrium analysis is instructive because it allows a more detailed modeling of the life-cycle than a more parsimonious general equilibrium model. As explained below, endogenous factor prices can only strengthen voter support for social security, so the fixed rate

assumption is conservative. A partial equilibrium analysis also provides a useful perspective on how voters should evaluate social security in an open economy.

The setting is a “many-period” OG model with stochastic survival. Cohort  $t$  enters the workforce at time  $t$  and consists of  $N_t$  members. Age is indexed by  $i = 1, \dots, I_{\max}$ , with upper bound  $I_{\max}$ . The unconditional survival probability to age  $i$  is  $\mu_{t,i}$ . Over time, the size of cohorts grows at a time-varying rate  $n_t = N_t / N_{t-1} - 1$ . One may interpret this setting as a time-disaggregated version of the OG model of Section 3. The retirement age  $I_{ret} < I_{\max}$  is assumed exogenous. To focus on intertemporal issues, I abstract from within-cohort heterogeneity. All workers of the same cohort earn the same wage and all retirees of the same cohort obtain the same benefits.<sup>9</sup>

The net present value of social security is computed by discounting sequences of benefits  $b_{t,i}^*$  and taxes  $\theta_{t,i}^*$ , to be specified below. Let  $P_{t,j}^i$  be the set of discount factors for  $j$ -period-ahead survival-contingent claims at time  $t$  and age  $i$ . Then the present value of benefits at retirement is

$$NPV_{t,I_{ret}}^* = \sum_{j=0}^{I_{\max}-I_{ret}} P_{t,j}^{I_{ret}} b_{t+j}^* w_{t+j} > 0. \quad (13)$$

For individuals of age  $i < I_{ret}$ , the net present value of benefits is

$$NPV_{t,i}^* = -\left[ \sum_{j=0}^{I_{ret}-i-1} P_{t,j}^i \theta_{t+j}^* e_{i+j} w_{t+j} \right] + P_{t,I_{ret}-i}^i \cdot NPV_{t+I_{ret}-i,I_{ret}}^* \quad (14)$$

where  $e_{i+j}$  are the relative earnings of an age- $(i+j)$  worker. Because the years after median-age are empirically years with relatively high earnings, age-earnings variations are a likely negative for social security and therefore deserve to be modeled.

Going backwards a year, benefits are discounted and a year of contributions is deducted. Hence, the net present value series for ages  $i < I_{ret}$  satisfy the backwards recursion

$$NPV_{t,i}^* = P_{t,1}^i \cdot NPV_{t+1,i+1}^* - \theta_t^* e_i w_t. \quad (15)$$

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<sup>9</sup> Homogeneity is a conservative assumption. Given the skewness of the income distribution and given a benefit formula biased towards lower incomes, voter support for social security is likely strengthened by heterogeneity (see Section 5). The ramifications of variable family structure—differences in benefits for single, married, and widowed participants—are left for future research.

The recursion implies that if  $NPV_{t+1,i+1}^* < 0$  for any age  $i$ , then  $NPV_{t,i}^* < 0$  at all younger ages. Hence, there is either a unique age  $i^*$  at which a worker becomes net beneficiary ( $NPV_{t-1,i^*-1}^* < 0$  and  $NPV_{t,i^*}^* > 0$ ) or  $NPV_{t,1}^* > 0$ , which means that even workers entering the labor force anticipate net benefits. (If the latter were true for all cohorts, social security would be beneficial in the Pareto sense, an unlikely scenario for the U.S.)

Overall, social security imposes payroll taxes for OASI, DI, and HI at rates  $\theta_t^{OASI}$ ,  $\theta_t^{DI}$ ,  $\theta_t^{HI}$  (including the employer share). These taxes pay for retirement benefits  $\beta_{t,i}$  and HI benefits  $m_{t,i}^{HI}$  to individuals of age  $i \geq I_{ret}$ , and for disability benefits to ages  $i < I_{ret}$ . If voters view the entire system as a unit, they will weigh the sum of taxes against the sum of benefits. If not, each component must prove its own viability.<sup>10</sup> Since the latter is a more stringent requirement, I will examine OASI and HI separately. I exclude disability insurance from most calculations (except for robustness checks) because taxes and benefits involve the same working-age cohorts. I similarly exclude SMI because it is financed from general revenues.

Social security benefits vary over time and over age-groups. Retirement benefits are indexed to aggregate wages until age 60 and inflation-indexed thereafter. If real wages are growing, the replacement rate in terms of current wages is declining over time,  $\beta_{t,i} = \beta_{t+I_{ret}-i,I_{ret}} \cdot w_{t+I_{ret}} / w_{t+i}$ . From 2003 to 2027, the regular retirement age is scheduled to increase from 65 to 67. I capture this by varying  $I_{ret}$  over time, which leaves replacement rate at retirement,  $\beta_{t+I_{ret},I_{ret}}$ , roughly constant. The value of medical benefits is, in contrast, rising with age and increasing over time.

It is not obvious how individuals value survivors benefits. To be conservative, I exclude survivor benefits from the benchmark calculations—also consistent with the assumed absence of

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<sup>10</sup> Game-theoretically, the issue is whether or not a failure to pay one type of benefits would trigger a shift in expectations about all categories of future benefits in the sense of Cooley and Soarez (1996, 1999). In Kotlikoff et al.'s (1988) contracting context, the equivalent question is if there is one comprehensive social contract or separate social contracts for OASI and for Medicare.

altruism—and weigh the total OASI contributions against the “OAI” benefits paid to workers and their families during the worker’s lifetime.<sup>11</sup>

Also to be conservative, I will not rely on trust fund sales to sustain promised benefits in excess of payroll taxes. The benchmark assumption, to determine if the existing defined-benefit system is viable, is that future payroll taxes will be increased to match the projected cost whenever the cost rate exceed the current contribution rate.<sup>12</sup> Throughout, taxes on benefits are treated as benefit reductions and not as revenues; this is economically appropriate but differs from SSA accounting.

For discounting taxes and benefits, I follow the SSA Intermediate Projection and assume a 3% real interest rate. The discount rate is important because a too low discount rate would overstate the NPV of future benefits. The SSA value is above observed market yields on inflation-indexed Treasury bonds (below 2.7% at all maturities as of April 2003) and therefore yields conservative NPV estimates. Higher discount rates are considered in the sensitivity analysis.

With these assumption, what are the critical ages  $i^*$  for the various U.S. transfer programs? And how are they likely to change as the U.S. population ages?

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<sup>11</sup> This is perhaps overly conservative, not only because most people have some level of concern for their closest relatives, but also because spouses vote and because the relevant decision unit may well be the family. Moreover, federal law requires spousal consent for married workers to choose single-life annuities (Diamond 1998), so that even in a model of selfish workers, survivor benefits should not be excluded when one compares the return on social security with the return on annuitized private savings.

<sup>12</sup> The specific assumptions about taxes are inessential, provided social security pays all promised benefits. Then workers will face rising taxes, either explicitly through higher payroll taxes or indirectly through higher general taxes (e.g., to redeem trust fund securities). In the sensitivity analysis below, I also examine voter support for social security with constant tax rates and proportionally reduced benefits.

**Table 3: At What Age Are Voters Starting to Benefit from Social Security?**

**Benchmark Values**

Year	OASI	HI	OASDI
2003	38	25	41
2010	39	26	42
2020	41	29	44
2030	42	30	45
2040	42	31	45
2050	42	32	45
<i>2030 Age 65</i>	<i>41</i>	<i>30</i>	<i>44</i>

Notes: The table entries are the critical ages  $i^*$  at which the NPVs of projected taxes and benefits turn positive, all based on SSA intermediate projections. Whenever cost exceed revenues under current law, payroll taxes are assumed to rise as necessary to cover PAYG cost. Normal retirement age is assumed, except in the last row, which shows age 65 (early) retirement in 2030.

OASI: Weighs retirement benefits against OASI taxes, assuming a zero value of survivor benefits.

HI: Weighs hospital insurance benefits against HI taxes, excluding the disability component.

OASDI: Weighs retirement benefits against OASDI taxes, assuming a zero value of survivor and disability benefits.

Table 3 provides answers for a set of benchmark calculations. The economic and demographic assumption are taken from the SSA Intermediate Projection. To be conservative, I further assume a zero value of survivor benefits, average lifetime earning (i.e. above median), retirement at the normal retirement age (except in the final row), and no correction for incomplete annuities. Table 3 shows that the critical ages  $i^*$  for OASI and HI are rising over time as the baby boom generation retires, but they remain well below the corresponding median ages shown in Table 2. Even if one added the cost of disability insurance to retirement insurance and assumed a zero value of benefits, the critical ages



remain below the median age, as shown under OASDI. Since all columns show values below the median age, the NPVs are also positive if one treated old-age retirement, HI, and/or DI as a unit.<sup>13</sup>

Table 4 provides critical age values for the SSA’s High Cost and Low Cost projections and for a scenario with fixed tax rates and pro-rated benefits. Interestingly, the High Cost scenario yields more near-term voter support for social security and Medicare than the Intermediate or (even less) the Low Cost scenario. Intuitively, rising benefits increase the ratio future benefits to current payments, provided the system remains viable—then everyone likes to be in the first generation that receives new benefits. This logic applies to, and largely explains, the variation in critical ages across the High, Intermediate, and Low Cost scenarios, the variations over time as the baby boom passes through, and it explain the very low critical ages for HI (as health care cost are expected to rise). After 2030, when the baby boom effect has largely vanished, the High, Low, and Intermediate Cost scenarios yield similar critical ages for OASI and a more narrow range of  $i^*$ -values for HI.

Because expansion helps, the Fixed-Tax-Rates calculations serves as an instructive “worst case” scenario: For OASI, the critical ages are slightly higher than with defined benefits, but they remain below the median age, suggesting that the “expansionist” logic is not a major factor, except perhaps before 2030 and in the High Cost scenario. For HI, holding tax rates fixed is more important because fixed rates would require severe cuts in benefits (e.g., 46% reduction by 2030, 75% by 2030) that raise the  $i^*$ -values significantly. In all cases, the critical values nonetheless remain below the respective median values in Table 2.

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<sup>13</sup> Even if SMI were included and one arbitrarily assumed that the entire SMI cost falls on workers through general taxes subsidizing SMI (and a zero value of DI and survivors insurance), the critical age for the entire HI+SMI system would not exceed age 37. For close cases, note that the viability condition is still satisfied when  $i^*$  equals the median age, because  $i^*$  is determined by the NPV at the start of the year.

**Table 4: Alternative Projections**

Year	Low Cost		High Cost		Fixed Tax Rates	
	OASI	HI	OASI	HI	OASI	HI
2003	41	43	34	*	42	43
2010	42	42	35	*	43	44
2020	42	37	38	23	43	44
2030	43	31	39	28	43	44
2040	42	29	40	31	42	44
2050	42	29	41	33	42	44
<i>2030 Age 65</i>	42	31	39	28	42	44

Notes: Entries are critical ages  $i^*$  at which NPVs turn positive, as in Table 3, except for the following changes:

Low cost = Based on SSA low cost projection.

High cost = Based on SSA high cost projection.

Fixed tax rates = SSA intermediate projection, but whenever benefit cost exceed revenues under current law, benefits are reduced proportionally to keep payroll taxes frozen at 2003 levels.

Stars (\*) denotes cases where the NPV is positive for all age groups, due to high projected growth in benefits.

Table 5 examines the sensitivity of critical age values to specification issues. To save space, this is done only for 2030, the peak of the baby boom retirement. To start, note that the calculations are robust against a substantial number of changes. Social security looks better if workers value the survivors component (line 1) or if one includes an explicit surcharge of  $\lambda = 0.25$  on private annuities (line 2). It looks worse, if Medicare is inefficient (line 3), if one considers a high-income worker (line 4) or if voters are males with lower survival rates than females (line 5). In case of high income workers, the increase in  $i^*$  for HI is large but  $i^*$  remains far below the median age of 48. With this exception, all these changes are minor in comparison to the next two.

**Table 5: Sensitivity Analysis**

Scenarios and Assumptions:	Critical Ages $i^*$ for:	
	OASI	HI
Benchmark Values for 2030:	42	30
<b>A. Changes with relatively minor impact:</b>		
1 Voters value OASI Survivor Insurance	37	N/A
2 Imperfect annuities: 25% surcharge over the actuarially fair level	40	23
3 Inefficient Medicare: 80% Value/cost	N/A	37
4 High income: Reduced replacement rate at 160% of average wage	45	43
5 Lower survival: Male life table	44	35
<b>B. Latent Altruism: <math>i^*</math> declines</b>		
6 Unavoidable welfare cost 20%	37	*
7 Unavoidable welfare cost 40%	29	*
<b>C. Higher Discount rates: <math>i^*</math> increases</b>		
8 Real rate $r = 5\%$	49 <sup>?</sup>	44
9 Real rate $r = 6\%$	51 <sup>?</sup>	47
10 $r = 5\%$ & Welfare cost = 20%	46	43
11 $r = 6\%$ & Welfare cost = 40%	45	42
12 $r = 5\%$ & Annuity surcharge = 50%	46	39
13 $r = 6\%$ & Annuity surcharge = 100%	45	36

Notes: Entries are critical ages  $i^*$  at which NPVs turn positive, as in Table 3, but with modified assumptions as noted, all for votes taken in the year 2030. Stars (\*) denotes cases where the NPV is positive for all age groups. A question mark (?) indicates that a majority for the program is questionable because the value exceeds 48, the median age in 2030, but remains below 52, the median age of registered voters in 2030 based on the Nov.2000 registration pattern.

The first critical issue is whether or not a vote against social security really ends all payments to the old. By abstracting from altruism, this is implicitly assumed. But if a substantial fraction of the old would be destitute without social security, a small amount of latent altruism (not operational when social security operates) would be sufficient for voters to maintain some welfare support. This would significantly reduce the benefits of voting against social security.<sup>14</sup> Lines 6-7 show how the critical ages decline if just 20-40% of social security cost are unavoidable. Under current law, retirees without income are entitled to Supplemental Social Security (SSI) and Medicaid benefits. SSI benefits to individuals amount to about 20% of average wages, i.e., about half of the OASI replacement rate for average earners. If one views SSI as revealing voter preferences towards poverty, it suggests that terminating social security would avoid only about half the cost, even less than I assume in lines 6-7. If so, OASI has positive NPV for voters age 29 and older, and HI has positive NPV for everyone, suggesting an overwhelming majority support for social security.

The second critical issue is the discount rate. For discount rates in the 5-6% range—e.g., motivated by stock returns, naively disregarding risk—the critical age rises towards the median (lines 8-10). But even then, majority support for social security remains solid if one uses somewhat less conservative assumptions along other dimensions of the model, e.g., a small unavoidable welfare cost (lines 11-12) or imperfect annuities (lines 13-14).<sup>15</sup> It is nonetheless clear that the support for social security is weakened if individuals become convinced that private savings will deliver huge real returns. Excessive optimism about the stock market is therefore a problem for social security, and this may explain the popularity of social security reform during the 1990s stock market boom.

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<sup>14</sup> The history of Cooley and Soares (1996) paper highlights the relevance of this issue: In a draft circulated at the Carnegie-Rochester conference, they argued that social security is not viable assuming all cost are avoided by a no vote. In the published version, they assert that the old simply cannot be cut off at all, and find—not surprisingly—that social security is viable. The existence of general welfare raises some deeper issues, however, notably about the need for forced savings to avoid moral hazard.

<sup>15</sup> As motivation, note that private annuities are typically fixed income products. A real return on private savings in the 5-6% range presumably requires significant stock market investments. Hence, the higher return one assumes, the less plausible it is to assume annuitization. Risk-adjustment is beyond the scope of this deterministic model.

Overall, the results strongly suggest that social security is viable. The NPV of social security is positive for a majority of the voting population even under quite adverse assumptions, and positive for an overwhelming majority under reasonable assumptions. Compared to the results with 1997 SSA projections reported in Bohn (1999), the critical age values here are equal or lower than the corresponding values previously reported. A major reason for the lower values is the decline in real interest rates (3.7% in Bohn 1999 vs. 3% here), but it is not the only one, because much has changed. Most importantly, the conclusions about viability remain unchanged and appear robust, not contingent on a particular vintage of SSA projections.

#### *4.3 General Equilibrium Considerations*

General equilibrium issues are examined in more detail in Bohn (1999) and in Cooley and Soarez (1996, 1999). Endogenous interest rates do change the calculus for voting decisions. Namely, if social security crowds out capital and raises interest rates, a termination of social security will increase capital accumulation and thereby reduce interest rates. Voters who understand this linkage will realize that a successful no vote would reduce the return on their own retirement savings. They are more likely to support social security than voters who employ partial equilibrium reasoning. The partial equilibrium estimates of voter support for social security are therefore conservative. General equilibrium considerations can only strengthen voter support for social security.<sup>16</sup>

#### *4.4. What Could Go Wrong?*

Though the analysis above presents a strong case for the viability of social security, it would be unbalanced if I did not discuss some important caveats. This section focuses on multiple equilibria and uncertain medical cost, the two issues that I consider most troubling for the U.S.

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<sup>16</sup> The capital accumulation effect is also a common argument for why “privatizing” social security would be good for the U.S. economy. Advocates of privatization do not seem to realize that for savers, lower interest rates are an argument against privatization. General equilibrium argument also provide endogenous upper bounds on the size of social security; this is discussed in Bohn (1999) and omitted here.

The first concern is that a repeated voting game with trigger strategies has a huge number of sequential equilibria supported by different expectations. Intertemporal, trigger-type models of social security assume that voters agree on how to form expectations about future votes. Some variations in voting strategies could probably be accommodated (presumably anything that keeps the median voter in place). But the widespread skepticism about U.S. social security among the young suggests that a major shift in expectations cannot be ruled out.

To think about changing expectations, one might imagine an evolutionary process where some fraction of each new cohort is born with “mutant” expectations. The most interesting mutation would be the belief that future voters will abolish social security just when oneself reaches old age. If only a small fraction of voters hold such beliefs and vote against social security, social security will retain its majority and the skeptics will be proven wrong. In this sense, the equilibrium with social security is evolutionary stable. But if a large fraction suddenly starts to hold skeptical beliefs, they would be proven right. Note, however, that the popular skepticism about social security seems concentrated in the under-30 age group. These cohorts are irrelevant in the median voter context, provided they have learned about the stability of the system by the time they reach their 40s.<sup>17</sup>

The second significant concern is about uncertainty, notably about uncertain Medicare cost in a setting where voters view Medicare as an unconditional promise to subsidize all medically justified care regardless of cost. The political viability of such a system requires that future median voters receive a higher expected utility with than without Medicare in all states of nature, and this requirement may be violated if doubts develop about the system's ability to pay off in the highest cost state. (See Bohn 1999 for more analysis.) Thus Medicare is arguably the most problematic part of the overall social security system.

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<sup>17</sup> Another stabilizing factor is the built-in inertia of the U.S. political system. To change an entitlement program, one needs a majority in the House, the Senate, and approval by the President; they often represent different parties. Hence, a repeal of social security may in effect require a super-majority; see Hansson and Stuart (1988) for the implications.

## 5. Additional Considerations: Income Inequality and Altruism

The previous section has focused on purely intertemporal considerations. This section briefly comments on two other issues, intra-cohort income inequality and altruism, that are also likely to influence voting decisions on social security. (Additional issues are discussed in Bohn 1999.)

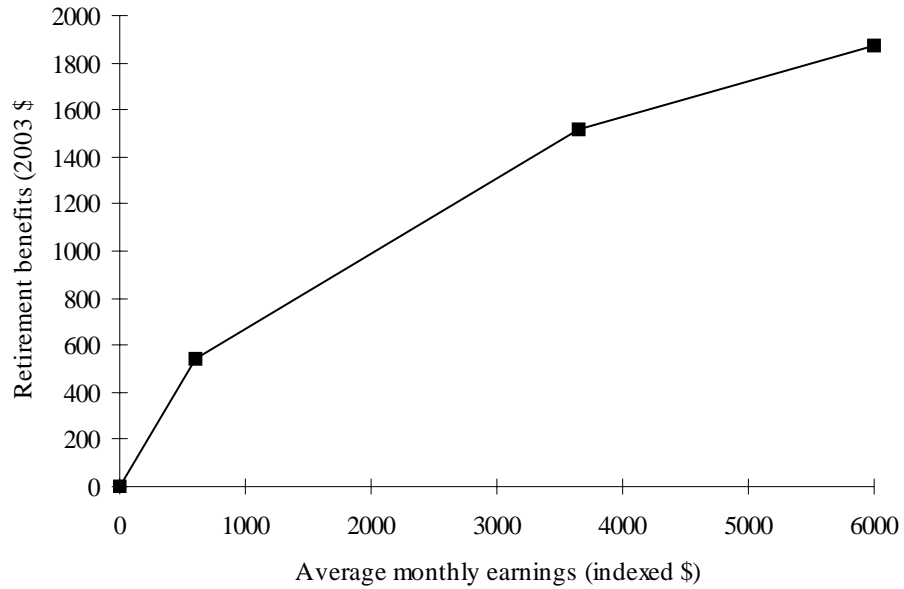
Within-cohort heterogeneity is important because social security promises a replacement rate that declines with income. This is illustrated in Figure 9. Figure 9(a) shows that retirement benefits under current law are a concave function of average lifetime wages. Figure 9(b) shows the implied negative relationship between income and replacement rates. Income-independent Medicare benefits are an even better deal for low-income workers. Conditional on viability in the future, low-income workers will therefore vote for social security at a much younger age than predicted in Tables 3-5, while high-income earners will not be supportive until a higher age. (For the latter, Table 5, line 4 provides an upper bound.) Given a skewed income distribution, more than 50% of a cohort has below average incomes. Hence income inequality is likely to increase the voter support for social security.

Altruism is important because in the presence of an altruistically motivated welfare system, social security cannot be terminated without increasing the cost of welfare. As noted the intertemporal model above, this reduces workers' incentives to vote against social security. More strikingly, Tabellini (1990) has shown that altruism alone may suffice to rationalize social security, without any intertemporal arguments. Tabellini considers an OG model with heterogeneous within-cohort incomes and mutual altruism between parents and children. In his model, a coalition of all the old plus the low-income young can provide a majority for social security. The young poor vote in favor, because their wage-proportional tax is small and they have altruistic feelings towards their parents.

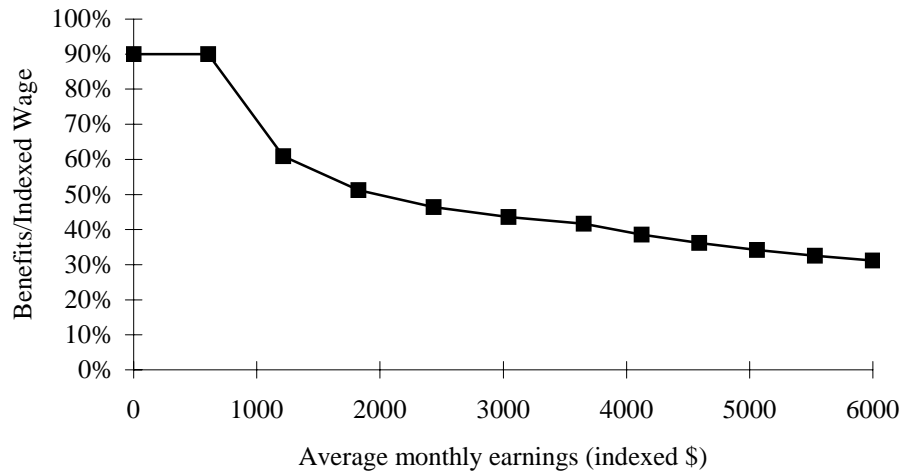
In summary, intertemporal arguments, income inequality, and altruism provide a multitude of mutually reinforcing reasons for voters to support social security. While Section 4 has shown that intertemporal arguments alone are sufficient to obtain majority support, this is not to deny the relevance of other factors.

**Figure 9**

**A. Monthly Retirement Benefits as Function of  
Lifetime Wages**



**B. Replacement Rate**



Note: From SSA (2003) and own calculations.



## **6. Conclusions**

Despite all the concerns about social security, my economic and voting analysis concludes that the system is almost certainly viable. The U.S. median voter is currently about 43-46 and will be about 48-52 at the peak of baby-boom retirement. Under a variety of assumptions and cost-benefit projections, the net present value of social security is reliably positive for the critical age range. The system's viability is further reinforced by altruism, imperfect private annuity markets, within-cohort redistribution, and other considerations, but such additional considerations are not even necessary.

The most serious caveats to this conclusion are about self-confirming skepticism within the population and about Medicare's potential inability to handle moral hazard problems effectively. Since retirees are a minority, a majority for social security requires the support of a significant fraction of working-age voters. As long as middle-aged voters believe that for a few more years of contributions, they earn retirement and medical benefits for the rest of their lives, their support can probably be taken for granted. This might change, however, if a substantial fraction of the over-45 age group started to believe that social security is doomed.

Given these concerns and the alarming projected cost increases, it is remarkable that the current political debate is about adding drug benefits to Medicare, not about cost-cutting. This suggests that neither politicians nor most voters are overly concerned about the system's viability, and this is consistent with my cost-benefit analysis.

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