Government Asset and Liability Management in an Era of Vanishing Public Debt

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Abstract

The paper examines alternative options for managing public debt and public assets in a government balance sheet framework that includes the Treasury, the Federal Reserve, and social security. Even after September 11, U.S. fiscal policy is on a trajectory to accumulate substantial "uncommitted funds." The paper examines how such funds should be invested. I conclude that high-quality fixed-income securities are the best benchmark and that social security is the most appropriate government asset manager. The analysis of policy alternatives reveals a trilemma between maintaining a liquid Treasury market, minimizing rent-seeking, and facilitating intergenerational risk sharing.

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1. Introduction

According to recent projections, the U.S. government is on a trajectory to pay off the public debt by 2012-15. Liquid Treasury securities that are needed for Federal Reserve open market operations will already become scarce within the next few years. Simultaneously, social security carries large and growing obligations toward the retiring baby boom generation and is trying to "pre-fund" some of them by accumulating Treasury securities. The combination of declining public debt and rising pension obligations suggest an out-of-balance public debt management. As illustrated in Figure 1, social security is monopolizing the Treasury debt.

Insert FIGURE 1 about here

The impression of an unbalanced fiscal situation is reinforced by the expected U-turn in fiscal conditions after about 2020, when the social security trust fund will start to redeem its bonds and when entitlement programs (especially Medicare and Medicaid) are expected to lead the general budget into deficits. These trends are illustrated in Figure 2, which shows a U-shaped debt-GDP ratio combined with an inverted-U for the trust fund.

Insert FIGURE 2 about here

The vanishing public debt and the subsequent accumulation of "uncommitted funds" create unprecedented challenges for public policy. Does it make sense for the Treasury to abandon the bond market, given the likelihood of budget deficits after 2020? How should the government manage uncommitted funds of a trillion dollars or more? Are there feasible alternatives, and how should they be evaluated?[1]

I will address all three questions, examining the empirical data and providing a theoretical analysis. To focus on the management of government assets and liabilities, I generally take the trajectories of federal revenues and non-interest outlays as given. This is in part to limit the scope of the paper and in part to rule out uninteresting answers. The vanishing Treasury debt can obviously be avoided by tax cuts or a spending spree. The projected surge in public debt after 2020 suggests, however, that turning current surpluses into deficits would be a short-sighted response to the vanishing debt. The real challenge for public policy is to avoid an illiquid Treasury market and to manage the uncommitted funds without an increase in net debt. My results about asset&liability management would apply analogously to policy reforms that involve a reduced net debt.

The empirical analysis starts off with a review of recent budget projections. This is to document that the likely implications of current U.S. policy include an accumulation of uncommitted funds, illiquidity in the

Treasury market, and a lack of Treasury securities for open market operations.[2] The fiscal trends are then placed in a balance sheet context that reveals the linkages between the Treasury, the social security system, and the Federal Reserve (Fed). The balance sheet analysis shows that decisions about investing uncommitted funds become unavoidable whenever the sum of implicit social security obligations and the monetary base exceeds the consolidated government net debt. According to current projections, this unavoidability condition will apply to U.S. fiscal policy starting around 2012.

Proposals to invest government funds in private securities are inevitably controversial, as illustrated recently by the debate about investing social security trust funds in the stock market (Advisory Council on Social Security 1997, GAO 1998, Greenspan 1999, White 1996). The objections tend to focus on the potential political manipulation of government investment choices. Looking forward, Fed officials have already expressed concern about the impending need to find alternatives to Treasury bonds (Broaddus and Goodfriend 2000). While total opposition to government investments is currently a feasible position, investment choices will soon become unavoidable as uncommitted funds accumulate.

To examine government investment choices, the paper develops an overlapping generations model in which government investments trigger rent-seeking activities. The model takes the concerns about political manipulation seriously and examines their policy implications. The model centers around entrepreneurs trying to sell claims against their firms. It is set up so that government securities purchases increase a firm's market value, thereby giving entrepreneurs an incentive to lobby. The main results is that the price-impact of government purchases is proportional to the riskiness of the securities, and approximately proportional to the variance of the firm's idiosyncratic risk. In equilibrium, rent-seeking will occur and create a deadweight losses if the government actively invests in risky assets, but not—or to a lesser extent—if investments are restricted to low-risk securities or to an index fund.

The paper then systematically examines the policy options for U.S. asset and liability management and their implications for three policy objectives: maintaining liquidity in the Treasury bond market, managing uncommitted funds without triggering rent-seeking, and facilitating intergenerational risk sharing.[3] I find that the social security trust fund is the most appropriate government entity to manage uncommitted funds. Its investment strategy involves a tradeoff between different objectives: Rent-seeking concerns suggest a restriction to low-risk

fixed income securities, diversification suggests a balanced portfolio, and risk sharing considerations suggest an equity index fund. Alternatively, if uncommitted funds are to be avoided entirely, a social security reform in the direction of private accounts or recognition bonds would be required. Such reforms would likely reduce intergenerational risk sharing, however. Policy changes in the opposite direction, toward more uncommitted funds, would be required to maintain a liquid Treasury market. Overall, I conclude that policy options exist that perfectly attain any two of the three objectives, but none that attains all three.

The paper's final section explores the tax-and-spending implications of a vanishing public debt, building on Bohn (1998). If the political process tends to stabilize the public debt/GDP-ratio, debt-management policies that increase the "visible" public debt will also increase the primary budget surplus and reduce the government's net debt. If the latter is considered desirable, the political economy of budget surpluses provides additional arguments for trust fund investments outside the Treasury and for social security reform.

The paper is organized as follows. Section 2 reviews the budget outlook. Section 3 places the fiscal trends in a balance sheet framework. Section 4 presents a rent-seeking model of government investments. Section 5 explains the implications for managing uncommitted funds and discusses the main alternatives for public debt management. Section 6 comments on endogenous taxes and spending. Section 7 concludes.

2. The Outlook: Uncommitted Funds and an illiquid Treasury Market

This section reviews recent budget projections to document that U.S. fiscal policy is on a trajectory to retire the available public debt and to accumulate substantial uncommitted funds.

2.1. Budget Surpluses, Public Indebtedness, and Uncommitted Funds

Table 1 shows a range of surplus projections and the implied paths of public indebtedness, i.e., public debt net of uncommitted funds. The analysis starts off with the most recent OMB (2001b) and CBO (2001c) estimates, which are dated August 2001. (I show both to document their similarity and then focus on OMB values.) The OMB and CBO baseline estimates show unified surpluses rising from about $150 bill. in 2001 to more than $600 bill. in 2011. Existing spending proposals alone reduce the 2011 value to under $500 billion according to OMB. Most of the remaining surplus is due to social security. By 2011, public indebtedness will fall to $348 bill. according to OMB (Projection A) and to $56 bill. to CBO (Projection D). The official projections assume constant discretionary

spending in real terms (apart from specific policy proposals), whereas many outside experts expect real spending to grow. Hence, I also compute public indebtedness for two scenarios with higher spending. Projection B assumes that all on-budget surpluses will be absorbed by additional spending, leaving only the social security surplus to retire public debt. Projection C assumes that discretionary spending will grow at the same rate as nominal GDP. The additional spending (as shown) implies on-budget deficits starting in 2002 and a slower decline in net indebtedness. Even in this scenario public indebtedness falls by almost two-thirds.[4]

Insert TABLE 1 about here

To gauge the liquidity of the Treasury market, it is important to account for Federal Reserve holdings and for non-marketable and long-term debt that cannot easily be redeemed. This is done in Table 2. For the calculations, I follow CBO (2001c) and OMB (2001b) and treat all non-marketable debt and all initially outstanding long-term debt as essentially irredeemable; this is labeled old or irredeemable debt below.[5] This measure is clearly an imperfect indicator of illiquidity. Some old bonds are probably retrievable through buybacks, and some new issues will likely vanish into buy-and-hold investors' portfolios. It is nonetheless a practically sensible measure and has the advantage of being used in the official projections. I also follow OMB and CBO in assuming that uncommitted funds accumulate at the Treasury whenever budget surpluses are high enough that public debt would otherwise fall below old debt.

Insert TABLE 2 about here

For Federal reserve holdings, a reasonable first approximation is to assume a fixed GDP-percentage, which would be consistent with a constant velocity of monetary aggregates. Whenever public debt net of privately-held irredeemable debt falls below the desired level, the difference is treated as "uncommitted funds" accumulating at the Fed. The similar labeling is intentional, to emphasize that discretionary investment decisions are required in both cases.

Table 2 shows how Treasury debt will evolve over the next decade according to the four projections in Table 1. Each panel starts with the respective path of public indebtedness. Whenever public indebtedness exceeds irredeemable debt plus desired Fed holdings, the positive difference can be interpreted as a "supply of liquidity" that is available to the Treasury bond market. Whenever the supply of liquidity turns negative, uncommitted funds accumulate.

The supply of liquidity should be interpreted as a relative indicator, not as an absolute measure. It likely underestimates the amount of debt needed to maintain a liquid market, because the Fed—being interested in trading—would not want to hold all the available public debt. Indeed, the Fed has already decided to limit its holding to at most 35-40 percent of any issue (FOMC 2000). Hence, a public debt of about three times Fed holdings would be needed for the Fed to avoid non-Treasury investments, i.e., about 15% of GDP (since Fed holdings are about 5%). Hence, a public debt below 15% of GDP can be interpreted as an alternative indicator of liquidity problems. (Both indicators will be used below.)

In Table 2, uncommitted funds appear in two places. First, if public indebtedness remains above old debt, the Fed must find alternatives to holding Treasury securities. This problem will arise in 2008 according to OMB and CBO projections (Cases A and D) and in 2009 with zero on-budget surpluses (Case B) and with additional spending (Case C). Secondly, if public indebtedness falls below old debt, uncommitted funds accumulate at the Treasury even if the Fed finds other investment vehicles. This is projected for 2010 in the OMB and CBO projections, for 2011 in Case B, and for 2012 in Case C (beyond Table 2's horizon).

Figure 3 displays the path of net indebtedness and the lower bound measures to highlight the central finding: In all projections, even with generous spending growth, public indebtedness will fall below 15% of GDP by 2008, and it will soon after cross the line of Fed needs plus old debt, resulting in uncommitted funds and a zero supply of liquidity. Thus, while the timing depends on the specific projection, the problem of investing uncommitted funds seems unavoidable.

Insert FIGURE 3 about here

Beyond 2011, the fiscal outlook is likely to turn negative. Though long-term projections are even more uncertain than the projections above, the negative trends have well-established demographic sources and they have significant implications for the medium-term policy options. Notably, the baby boom retirement suggests that the social security surpluses will turn into deficits, first on the primary balance and then with interest (see SSA 2001). In addition, unless the trend toward rising medical cost is miraculously stopped, the on-budget fiscal balance is likely to decline and turn negative (see CBO 2000).

These developments underlie the U-shaped and inverted-U shaped paths of public indebtedness and of the social security trust fund shown in Figure 2. The implications for uncommitted funds and for the supply of

liquidity are illustrated in Figure 4. For clarity and to save space, I only show one long-term projection, which is Projection B until 2010 (zero-on-budget surpluses), and extended beyond 2010 with the primary surplus assumptions in CBO (2000).

Insert FIGURE 4 about here

According to this projection, the supply of liquidity will hit zero in 2009 (as explained in Table 2B) and stays at zero until 2027. Uncommitted funds accumulate first at the Fed and then at the Treasury, reach almost 10% of GDP in 2015-2020 (more than $2 trillion), and then vanish by 2027. After 2020, public debt will start to rise, first slowly, then rapidly, driven largely by social security deficits and rising outlays for Medicare and Medicaid.

Though one might quibble with this specific projection, it provides two important and fairly robust insights. First, the decline in Treasury debt is best interpreted as a transitory phenomenon. As the baby boom generation retires, a substantial public debt is likely to reemerge. Second, uncommitted funds will accumulate in the meantime, the amounts will be substantial, and they will have to be invested for many years.

2.2. A Sensitivity Analysis: September 11, 2001

After the September 11 terrorist attacks, some commentators have declared the end of the era of declining public debt. This section explains why such claims are probably unwarranted. Although Congress passed emergency legislation appropriating an extra $40 bill. (half each for fiscal years 2001 and 2002), and although forecasts of future government spending have shifted up, the impact on the debt-GDP ratio should not be exaggerated.

To provide a sensitivity analysis, I consider two scenarios with much increased government spending. Scenario #1 assumes additional spending of $20 bill. in fiscal year 2001 (as enacted), and $100 bill. per year in 2002-2010, all relative to the August 2001 OMB projections. Scenario #2 assumes additional federal spending of $20 bill. in fiscal year 2001, and $300 bill. per year in 2002-2004. Scenario #1 might reflect the cost of a long-lasting war on terrorism, while Scenario #2 captures a shorter, more intense war. Both scenarios far exceed the spending proposals in the discussion after September 11. Figure 5 shows the implied trajectories of the debt-GDP ratio. In Scenario #1, the debt-GDP ratio declines more slowly than in the baseline. In Scenario #2, the decline is interrupted for three years and then resumes. Importantly, the long-term outlook remains largely unchanged. All the projected debt-GDP ratios have a U-shaped path, they fall below the 15% mark that indicates illiquidity on the

Treasury market, and they fall below the line of desired Fed holdings, i.e., they imply substantial uncommitted funds.

Insert FIGURE 5 about here

Intuitively, the long run budget outlook is primarily driven by social security—huge surpluses followed by huge deficits—and by secular GDP-growth, which reduces the debt GDP-ratio even in the absence of surpluses. The basic U-shaped path of the debt-GDP ratio is therefore quite robust against temporary changes such as war-time spending or a recession. Hence, I will continue to use Projection B for the analysis below. It assumes government spending well above the OMB and CBO projections but below the two extreme scenarios.[6] This projection is not meant as a point forecast—which would be a heroic undertaking—but as a tool that will allow a quantitative comparison of alternative policy choices.

3. Budget Surpluses and the Government Balance Sheet

This section places government asset and liability management in a balance sheet framework. The balance sheet analysis focuses on the financial status of the Treasury, the "off-budget" social security trust fund, and the Federal Reserve.

By Treasury, I mean the general "on-budget" budget including other trust funds and the (formally off-budget) Postal service. Though the Federal Reserve system is legally owned by its member banks, I treat it as a federal entity for purposes of economic analysis, motivated by the Treasury's claim on Fed earnings.

The U.S government balance sheet for Sept.2000 shown in Table 3. This is taken from OMB (2001a) with additions motivated by Bohn (1992). The OMB presentation shows assets valued at about $900 bill. and liabilities of about $6.9 trillion. The asset side documents that U.S. government is routinely making investment decisions, e.g., when extending student loans or providing credit lines to mortgage lenders. This is noteworthy, given the controversy about social security investments. For completeness, I have added tangible assets and claims on the Fed.[7] On the liability side, the Treasury shows public debt and federal employee and veterans pensions as main liabilities, to which I have added social security. Economically, the value of social security benefits to current participants is undeniably a government obligation. Its omission would seriously misrepresent the U.S. government's financial status.[8] The $9.6 trillion estimate is taken from OMB (2001a), and broadly consistent with Geneakoplos et al. (1999), Goss (1999), and Feldstein (1996).

Insert TABLE 3 about here

The overall balance of assets and liabilities is the government's net debt, a negative balance of about $13 trillion. The numerical value should be interpreted very cautiously and will only be used to verify that net debt (whatever it is) will remain unchanged under the policy options to be discussed. To acknowledge valuation uncertainties and avoid controversy, I add the notation "±?" to the totals and to net debt. In the following, the simplified balance sheet shown at the bottom of Table 3 will suffice. It highlights the interaction of Treasury, Social Security, and Federal Reserve and compresses all other entries into a single "balance" item that will be taken as given.

Table 4 decomposes the overall federal balance sheet into its Treasury and social security components, adds a simple Federal Reserve balance sheet, and shows a consolidated balance sheet that includes Fed assets and the monetary base (currency and reserves). The Treasury component shows the debt held by the private sector, the Fed, and the social security system. The social security balance sheet show the partial "funding" of obligations through Treasury bonds. The Federal Reserve component shows Treasury holdings, the monetary base, and a balance of other items that are inessential for our purposes. The consolidated balance sheet reveals that social security obligations, privately-held public debt, and the monetary base are the main liabilities of the federal government to the outside world.

Insert TABLE 4 about here

The consolidated balance sheet provides some immediate insights about public asset and liability management. By definition, public asset and liability management deals with the composition of the government's balance sheet for a given net debt. If the balance of other items is also taken as given, the monetary base determined by an independent Fed, and social security obligations fixed by law, then public debt managers have no discretion about the level of net privately-held Treasury debt. It is simply a residual determined by the balance sheet identity. To increase the privately-held debt (e.g. to maintain liquidity) the only option would be to lengthen the balance sheet by adding new, "uncommitted" assets. Otherwise, debt management must interfere with Fed operations or it must involve changes in social security.

From a balance sheet perspective, the vanishing Treasury debt is a necessary implication of the rise in social security obligations relative to overall net debt. Normally, public debt follows a smooth, random-walk-like

path with slight mean reversion in the debt-GDP ratio (Bohn 1998), a behavior predicted by and consistent with tax-smoothing considerations (Barro 1979). The U-shaped path of public indebtedness in Figure 1 is therefore highly unusual. It is perhaps best interpreted as an attempt to "smooth" the net debt over the baby boom without altering the hump-shaped path of social security obligations that results from the same baby boom.

Figure 6 displays the fiscal outlook from the perspective of net debt, showing the rise in social security obligations relative to the overall net debt. The balance sheet identity implies that Treasury debt must vanish and/or uncommitted funds must accumulate whenever social security obligations plus monetary base exceed the net debt. As projected, this condition will be satisfied by 2012.[9]

Insert FIGURE 6 about here

Finally, Table 5 presents a government balance sheet for 2010 that illustrates the allocation of uncommitted funds.[10] Uncommitted funds appear on the consolidated balance sheet whenever either the Fed, the Treasury, or both accumulate surplus funds. In addition, Table 5 highlights that the remaining public debt consists entirely of irredeemable old securities that are likely illiquid.

Insert TABLE 5 about here

4. Uncommitted Funds and Rent-Seeking

If government securities purchases were unproblematic, the problem of vanishing Treasury debt could be solved easily: Just issue more debt and invest the resulting uncommitted funds. Government purchases of financial assets are widely considered controversial, however. A common argument is that such investments would be dangerous because they could be manipulated by political interest groups (Greenspan 1999).

The U.S. government is nonetheless routinely buying private sector financial assets, as revealed by the federal balance sheet in Table 3. Moreover, the projected social security surpluses alone will lead to an accumulation of more than two trillion dollars of uncommitted funds by 2020. Opposing such government investments does not make the issue go away. How are uncommitted government funds best invested? Under what conditions are they more or less problematic? Knowing the answers seems a prerequisite for a discussion of policy alternatives.

This section presents a simple "lobbying" model of government security purchases embedded in a general equilibrium macro setting. The model accepts the critics' basic premise that security sellers will try to manipulate government purchase decisions. Though a fairly rich model is needed to formalize the policy environment, the

intuition will be fairly straightforward. (Readers not interested in economic modeling may jump to the statement of Results at the end of Section 4.2).

4.1. The General Equilibrium Setting

The economy has overlapping generations of individuals who live for two periods. The OG setting endows fiscal policy with real effects—avoiding Ricardian neutrality—it naturally includes social security, and it ensures tractability by limiting individual planning horizons. The model is designed to give individuals an incentive to sell financial assets. The main policy question will be which assets classes should be admissible for government purchases, taking as given that security selection within an asset class cannot be monitored by the public, and that public officials making the selection can be lobbied by self-interested securities sellers.

In any period t, generation t is a cohort of n working-age individuals. Individuals i have preferences over working age consumption c_{it}^1 and retirement consumption c_{it+1}^2. In period t, individuals inelasticly supply one unit of labor to earn a wage w_t, they may save or borrow on financial markets, and they may start a firm. All individuals are endowed with entrepreneurial skill that allows them to convert wage income into entrepreneurial capital e_{it}. This capital is assumed to have increasing cost in terms of consumption, e_{it}^{κ} with $\kappa>1$, due to limited skills and limited time. To produce output y_{it+1} at time t+1, a firm combines time-t physical capital k_{it} and entrepreneurial capital e_{it} with labor inputs l_{it+1}. Assuming constant returns, Cobb-Douglas production, and a stochastic productivity A_{it+1}, output is given by

$$y_{it+1} = A_{it+1} l_{it+1}^{1-\alpha} k_{it}^{\alpha\gamma} e_{it}^{\alpha(1-\gamma)} = A_{it+1} l_{it+1}^{1-\alpha} k_{it}^{*\alpha}, \quad (1)$$

where $k_{it}^* = k_{it}^{\gamma} e_{it}^{(1-\gamma)}$ is a composite capital good that combines physical and entrepreneurial capital. All entrepreneurial capital must be contributed by the firm's owner.

Individuals also pay a share 1/n of aggregate taxes T_t (lump-sum for simplicity), receive transfers B_{t+1}/n in retirement, and they may spend resources λ_{it} to lobby for government investments in their firm. Lobbying expenses may literally represent the cost of buying access, or they may represent the cost of catering to politicians' whims (say, being extra friendly to the environment). The individual budget equations are then

$$c_{it}^1 = w_t - T_t/n - f_{it} - e_{it}^{\kappa} - k_{it} - \lambda_{it} \quad (2)$$

$$c_{it+1}^2 = B_{t+1}/n - R_{it+1}^f f_{it} + \Pi_{it+1}. \quad (3)$$

where R^f_{t+1} is the yet-unspecified return on financial assets f_{it}, and Π_{it+1} is value of firm i. The firm value Π_{it+1} consists of revenues net of wage cost plus the value of old capital (denoted v_{it+1}),

$$\Pi_{it+1} = A_{it+1} l_{it+1}^{1-\alpha} k_{it}^{*\alpha} - w_{t+1} l_{it+1} + v_{ti+1} k_{it}^{*}. \tag{4}$$

Given k_{it}^{*}, firms maximize profits by equating the wage to the marginal product of labor, $w_{t+1} = (1-\alpha) A_{it+1} (k_{it}^{*} / l_{it+1})^{\alpha}$, which yields a labor demand function $l_{it+1} = k_{it}^{*} (A_{it+1} / w_{t+1})^{1/\alpha} (1-\alpha)^{1/\alpha}$. Since $\sum_i l_{it+1} = n$, the equilibrium wage rate can be written as $w_{t+1} = (1-\alpha) n^{-\alpha} [\sum_i k_{it}^{*} A_{it+1}^{1/\alpha}]^{\alpha}$. The common wage ensures that all generation-(t+1) workers start off with the same income. The returns to capital are heterogenous, however, with

$$V_{it+1} = \Pi_{it+1} / k_{it}^{*} = \alpha A_{it+1}^{1/\alpha} [(1-\alpha) / w_{t+1}]^{(1-\alpha)/\alpha} + v_{ti+1}$$

denoting the period-(t+1) payoff per unit of capital in firm i.[11] In reality, capital incomes and resale values are likely uncertain and heterogeneous across firms. Though this could be modeled here, it is convenient to assume a common productivity, $A_t = A_{it}$, and let heterogeneity appear only in the v_{it}-values. The wage then reduces to a function of the aggregate capital-labor ratio, $w_{t+1} = (1-\alpha) A_{t+1} (k_t^{*})^{\alpha}$, where $k_t^{*} = \sum_i k_{it}^{*} / n$, and the value of capital in firm i reduces to

$$V_{it+1} = \alpha A_{t+1} (k_t^{*})^{-(1-\alpha)} + v_{ti+1}. \tag{5}$$

The government is modeled as an entity that taxes the young, gives transfers to the old (e.g., social security), issues government debt, and buys privately-issued financial assets F_t^G (e.g., to fund future transfers). The government budget constraint is

$$T_{t+1} = B_{t+1} + R_{t+1}^{D} D_t - D_{t+1} - [R_{t+1}^{FG} F_t^G - F_{t+1}^G], \tag{6}$$

where R_{t+1}^{D} is the return on government debt and R_{t+1}^{FG} is the return on period-t financial assets. Assuming old-age transfers are defined benefits, any unexpectedly high return on government assets (or low return on debt, if stochastic) accrues to future generations through the tax system. This assumption is critical for government debt and transfers to have real effects. It implies that financial assets held or issued by the government are not part of current savers' net wealth. For now, government activity is taken as given.

To examine intertemporal decisions, suppose individuals have homothetic preferences $u(c_{it}^1) + \beta u(c_{it+1}^2)$ with $u(c) = c^{1-\eta} / (1-\eta)$, where $\eta > 0$ is the relative risk aversion. Assuming individuals can trade arbitrary financial assets, individuals with a generation can and will perfectly pool risk, i.e., equalize their marginal rates of

substitution. Let $m_{t+1} = \sum_i c^2_{it+1} / \sum_i c^1_{it}$ be their common consumption growth rate, then $\beta m^{-\eta}_{t+1}$ provides a well-defined pricing kernel. That is, the period-t value of any financial asset x with stochastic payoff V^x_{t+1} can be written as $P^x_t = E_t[V^x_{t+1}\beta m^{-\eta}_{t+1}]$. Government debt and assets are normalized to have unit price, which means that the returns are implicitly defined by $E_t[R^D_{t+1}\beta m^{-\eta}_{t+1}] = E_t[R^{FG}_{t+1}\beta m^{-\eta}_{t+1}] = 1$. (If government bonds yield liquidity services, one may assume a reduced R^D_{t+1} value without changing the rest of the model.) Risk pooling requires that individuals hedge against shocks to their entrepreneurial profits by selling the payoffs Π_{it+1} into the market, at a price $P^\Pi_{it} = E_t[\Pi_{it+1}\beta m^{-\eta}_{t+1}]$ for the firm or $P^k_{it} = E_t[V_{it+1}\beta m^{-\eta}_{t+1}]$ per unit capital.

Savings behavior can be expressed in terms of individual i's demand for state-contingent financial claims, $f^*_{it+1} = c^2_{it+1} - B_{t+1}/n - \Pi_{it+1}$. The cost of these claims, $f_{it} = E_t[f^*_{it+1}\beta m^{-\eta}_{t+1}]$, enters the period-t budget equation. The budget equations for generation t therefore reduce to a present value constraint

$$c^1_{it} + E_t[(c^2_{it+1} - B_{t+1}/n)\beta m^{-\eta}_{t+1}] = w_t - T_t/n + NPV_{it}, \tag{7}$$

where $NPV_{it} = E_t[\Pi_{it+1}\beta m^{-\eta}_{t+1}] - e^\kappa_{it} - k_{it} - \lambda_{it}$

is the net present value of firm i.

The equilibrium marginal rate of substitution is determined by aggregate consumption. Aggregate retiree consumption can be written as

$$C^2_{t+1} = \sum_i c^2_{it+1} = \alpha A_{t+1}(k^*_t)^\alpha + \sum_i v_{it+1}k^*_{it} + [B_{t+1} + R^D_{t+1}D_t - R^{FG}_{t+1}F^G_t], \tag{8}$$

i.e., as the return on aggregate capital plus a policy term. The latter, $GA_{t+1} = B_{t+1} + R^D_{t+1}D_t - R^{FG}_{t+1}F^G_t$, can be interpreted as the time-(t+1) generational account of cohort t. Thus, all variations in consumption across states of nature, and hence all variations in m_{t+1}, are driven by the stochastic returns on capital and by the state-dependent pattern (if any) of government transfers and of government assets and liabilities.

Turning to investment decisions, every entrepreneur maximizes the net present value NPV_{it} in (7), taking the aggregate variables m_{t+1} and k^*_t as given. For any given k^*_t, decisions about the inputs (e_{it}, k_{it}) are internal to the firm. It is straightforward to show that the optimal input choices result in a cost function of the form $\chi(k^*_{it}) = e^\kappa_{it} + k_{it} = \chi_0(k^*_{it})^\phi$, where $\chi_0 > 0$ and $1 < \varphi < \kappa$ are inessential constants. The equilibrium size of the firm, k^*_{it}, is uniquely determined by equating the present value of capital with the marginal cost, $P^k_{it} = \chi'(k^*_{it}) = \phi\chi_0(k^*_{it})^{\phi-1}$.

Overall, the model describes a neoclassical economy that is standard except for the role of entrepreneurial skill. Every period, the initial capital-labor ratio determines wage incomes, capital incomes, and the value of the

firm. The old consume the capital income. The young either consume or save their income from wages and entrepreneurial activity. Their savings constitute the next period's capital stock, and so on. As usual, government taxes and transfers have the potential to crowd out capital.

4.2. Government Investments and Rent-seeking

Now consider government purchases of privately-issued securities. To focus on the choice between alternative government investments, I assume that the scale of government investments F_t^G, the level of benefits B_t, and the level and composition of government debt (D_t and R_t^D) are exogenous. The only issue is <u>how</u> F_t^G is invested.

As potential investments, I consider securities issued by the i firms. The capital structure of a firm typically consists of equity and a collection of fixed-income securities, e.g., loans, bonds, and CDs, often with a ranking in terms of seniority. Because equity holders have limited liability, most so-called fixed income securities include an element of risk, which can be interpreted as a put option retained by the equity holders. The riskiness of the different corporate securities can be summarized concisely by the "delta" values (Δ) of their embedded options.

For the modeling, let total government purchases F_t^G be divided into financial assets $f_{\Delta it}^G$ as follows: $f_{\Delta it}^G$ is the amount invested in firm i with risk class Δ, $f_{it}^G = \sum_\Delta f_{\Delta it}^G$ is the total government investment in firm i, and $F_t^G = \sum_i f_{it}^G$ is the sum over firms. Securities with Δ=1 represent unleveraged equity, securities with $\Delta \approx 0$ can be interpreted as top-quality bonds, securities with Δ inside the (0,1) interval represent risky debt, and securities with Δ>>1 include leveraged equity, warrants, and other risky derivatives. Thus, the Δ-representation captures a variety of capital structures while avoiding distracting institutional details.

Every firm must issue securities that exhaust its value P_{it}^Π, i.e., a menu of securities $f_{\Delta it}$ (without superscript) that satisfy $\sum_\Delta f_{\Delta it} = P_{it}^\Pi$ and have an average Δ-value equal to 1. The returns $R_{\Delta it+1}$ must satisfy $\sum_\Delta R_{\Delta it+1} f_{\Delta it} = \Pi_{it+1}$ for every state of nature. Option pricing theory implies that the value of any class-Δ security is linear in the firm's value. Hence, one may assume without loss of generality that the payoffs are linear, i.e., that $R_{\Delta it+1} = \Delta \Pi_{it+1} / P_{it}^\Pi + (1-\Delta) R_{0t}$, where $R_{0t} = 1/E_t[\beta m_{t+1}^{-\eta}]$ is the safe interest rate. The value of the government's portfolio of financial assets can then be written in terms of securities as

$$R_{t+1}^{FG} F_t^G = \sum_i \sigma_{it}^G \Pi_{it+1} + (1-\Delta_t^G) R_{0t} F_t^G,$$

where $\sigma_{it}^G = \sum_\Delta \Delta f_{\Delta it}^G / P_{it}^\Pi$ is the share of firm i's equity risk held by the government and $\Delta_t^G = \sum_i \sum_\Delta \Delta f_{\Delta it}^G = \sum_i \sigma_{it}^G P_{it}^\Pi / F_t^G$ is the average riskiness of the government's portfolio. The remainder, $1 - \Delta_t^G$, is the safe or zero-Δ component of the government's portfolio. Re-arranging (8), one obtains aggregate consumption

$$C_{t+1}^2 = \alpha A_{t+1}(k_t^*)^{\alpha-1}[\sum_i k_{it}^*(1-\sigma_{it}^G)] + \sum_i v_{it+1} k_{it}^*(1-\sigma_{it}^G) + [B_{t+1} + R_{t+1}^D D_t - (1-\Delta_t^G)R_{0t+1}F_t^G]. \quad (9)$$

This equation shows that government investments in a firm's risky securities, σ_{it}^G, reduce the retiree generation's exposure to the valuation risk v_{it+1} of this particular firm, as well as their exposure to the general productivity risk A_{t+1}. The risks are shifted to future tax payers.

The intergenerational implications of risky government investments are studied elsewhere (e.g., Bohn 1997, 1999b, 2001). The thrust of this research is that intergenerational risk sharing is beneficial. While productivity risk A_{t+1} is naturally shared by workers and retirees, the valuation risks v_{it+1} are entirely carried by retirees unless the government intervenes, e.g., by holding equity on behalf of future generations.

Taking these effects for granted, the focus here is on the cross-sectional implications of government investments. Recall that the present value of firm i's capital, $P_{it}^k = E_t[V_{it+1}\beta m_{t+1}^{-\eta}]$, depends on the covariance between the future value V_{it+1} and the marginal rate of substitution. Government investments reduce the weight of the firm-specific risk v_{it+1} in retiree consumption. This tends to reduce the correlation between V_{it+1} and the marginal rate of substitution and should therefore increase the market value of the firm.

For the formal argument, a symmetric allocation serves as natural reference point. Assuming the joint distribution of firm-specific risks v_{it} is symmetric across firms, then whenever the government follows a symmetric investment policy and sets $\sigma_{it}^G = \sigma_t^G$ equal for all i, all firms will have equal investment levels $k_{it}^* = k_t^*$ and equal capital values $P_{it}^k = P_t^k$. Holding the government's aggregate equity exposure Δ_t^G constant, consider a marginal increase in σ_{it}^G by ε at the expense of a reduction in σ_{jt}^G by ε/(n-1) for all $j \neq i$. The effect on the value of firm i is $\partial P_{it}^k / \partial \sigma_{it}^G = -\eta E_t[V_{it+1}\beta m_{t+1}^{-\eta-1}\partial m_{t+1} / \partial \sigma_{it}^G]$, where $\partial m_{t+1} / \partial \sigma_{it}^G = -(v_{it+1} - v_{\neq i})k_t^* / C_t^1$ and $v_{\neq i} = \frac{1}{(n-1)} \sum_{j \neq i} v_{jt+1}$.

Assuming n is large, this price effect can be written as

$$P_\sigma = \frac{\partial P_{it}^k}{P_t^k \partial \sigma_{it}^G} = \eta E_t[(v_{it+1} - v_{\neq i})^2 \beta m_{t+1}^{-\eta-1}] \frac{k_t^*}{P_t^k C_t^1} > 0, \quad (10)$$

which is strictly positive, provided the idiosyncratic risk $v_{it+1} - v_{\neq i}$ is non-zero with positive probability. This price effect motivates lobbying, both to encourage government investment in one's own firm and to offset the lobbying of others.

The political mechanism of how government investments can be manipulated is unfortunately less clear than the motivation. For any given pool of uncommitted funds F^G, the starting point without lobbying is the symmetric policy of equal investments in all firms, $f_i^G = F^G/n$. (Time subscripts are omitted now because lobbying is a static problem.) Let $\varphi(\lambda_i, \lambda_{\neq i}, F^G)$ be a general "influence function" that describes how the lobbying efforts $\lambda_i \geq 0$ of firm i affect the allocation of F^G for given lobbying efforts of other firms, $\lambda_{\neq i} = 1/(n-1) \sum_{j \neq i} \lambda_j$. The popular notion that lobbying matters can then be formalized by writing

$$f_i^G = F^G / n + \varphi(\lambda_i, \lambda_{\neq i}, F^G), \tag{11}$$

where $\varphi_1 = \partial\varphi(\,)/\partial\lambda_i > 0$ and $\varphi_2 = \partial\varphi(\,)/\partial\lambda_{\neq i} < 0$. To be clear, I am not asserting that government officials would in reality be swayed by lobbying, nor that firms would actually engage in such activities. (Policy makers that are immune to lobbying would be the special case of $\varphi(\,) \equiv 0$. Then rent-seeking would vanish and government policy would presumably be determined by the usual welfare considerations, e.g., as described in my other work.) The motivation for assuming $\phi_1 > 0$ is to take the widespread concerns about rent-seeking seriously and to explore the ramifications.

A sensible influence function should have a few additional properties that will be useful below. To satisfy the adding-up constraint $F^G = \sum_i f_i^G$, it must satisfy $\sum_i \varphi(\lambda_i, \lambda_{\neq i}, F^G) \equiv 0$. This implies $\varphi_1(\lambda_i, \lambda_{\neq i}, F^G) = -\sum_j \varphi_2(\lambda_j, \lambda_{\neq j}, F^G)/(n-1)$ for all i. Lobbying should also cancel out when all firms lobby equally, $\varphi(\lambda, \lambda, F^G) \equiv 0$ for all $\lambda > 0$. To ensure non-negative government investments, ϕ must also satisfy $\varphi(\,)/F^G \quad [1/n, 1-1/n]$. This boundedness condition implies that the marginal impact of lobbying must decline for large λ_i (that $\phi_1 \to 0$ as $\lambda_i \to \infty$), and it motivates the dependence of ϕ on F^G. More generally, writing ϕ as function of F^G allows for scale economies in lobbying. As an example, functions of the form $\varphi(\,) = \varphi_0 F^G \ (\lambda_i / \sum_j \lambda_j - 1/n)$ with any scale factor $\varphi_0 \quad (0,1]$ would satisfy all the above restrictions, showing that such functions exist.

In general, if lobbying is effective on the margin, entrepreneurs face a non-trivial lobbying decision, namely to maximize NPV_i by choice of $\lambda_i \geq 0$. The first order condition for λ_i is

$$\partial NPV_i / \partial \lambda_i = P_\sigma \Delta \partial\varphi(\,)/\partial\lambda_i - 1 \leq 0, \text{ with equality if } \lambda_i > 0, \tag{12}$$

where $P_\sigma > 0$ is the derivative defined in (10).[12] Equation (12) has a number of significant implications that I will state as general results and then explain.

Result 1: If rent-seeking opportunities are symmetric, their primary effect is to create deadweight losses.

Argument: If all firms have access to the same influence function and offer securities in the same risk class Δ, they will make identical decisions, $\lambda_i = \lambda$ for all i. This implies $\lambda_{\neq i} = \lambda$, hence $\varphi = \varphi(\lambda, \lambda, F^G) = 0$. There is no effect on the real allocation except to the extent that the wasted resources $\lambda > 0$ have negative income effects.

Result 2: Rent seeking can be avoided by restricting government investments to low risk assets.

Argument: For Δ near zero, $\partial NPV_i / \partial \lambda_i$ in (12) is strictly negative provided P_σ and $\partial \varphi(\,) / \partial \lambda_i$ are bounded. The equilibrium outcome is the corner solution $\lambda=0$ for all $\Delta \leq \Delta_0 \equiv [P_\sigma \partial \varphi(0,0,F^G) / \partial \lambda_i]^{-1}$. Thus, concerns about rent seeking provide a valid argument against government purchases of equities and other risky assets, but not against purchases of safe assets.

Result 3: Rent seeking can be avoided by restricting government purchases to assets with low idiosyncratic risk.

Argument: A low value of P_σ also yields the corner solution $\lambda=0$. The price effect P_σ in (10) is approximately proportional to the variance of the idiosyncratic risk $v_{it+1} - v_{\neq i}$.[13] A sufficiently low variance therefore avoids rent seeking. Broadly interpreted, this results favors government investments through mutual funds—ideally through an index fund—and may justify restrictions against speculative or exotic investments.

Result 4: If rent-seeking occurs in equilibrium, the deadweight loss increases in the riskiness of government investments and it depends on the shape of the influence function ϕ.

Argument: An interior solution to (12) requires $P_\sigma \Delta \partial \varphi(\lambda, \lambda, F^G) / \partial \lambda_i = 1$ at some $\lambda_i = \lambda_{\neq i} = \lambda > 0$. As linear approximation, the equilibrium level of rent-seeking is

$$\lambda \approx \frac{\varphi_1(0,0,F^G)}{-\varphi_{11} - \varphi_{12}} (\Delta - \Delta_0).$$

Provided $\phi_1>0$ and $\phi_{11}+\phi_{12}<0$,[14] the solution for λ is increasing in Δ. Thus, if rent-seeking occurs, the deadweight loss λ is smaller the closer Δ is to Δ_0, the smaller the marginal effect of lobbying (smaller ϕ_1), and the faster the gains decline on the margin (the larger $|\phi_{11}+\phi_{12}|$).

Whenever rent seeking occurs in equilibrium, the zero-sum nature of the rent-seeking game (or rather, negative-sum after lobbying cost) suggests that entrepreneurs might agree to change the rules. Namely, a proposal to limit government investments to an index fund should meet unanimous approval by all entrepreneurs. It would implement the equilibrium outcome without imposing lobbying cost. It is an open question, however, if a commitment to an index fund would be feasible and credible in practice.[15]

More broadly, government investment decisions are first about allocating government funds F_t^G to different asset classes and secondly about securities selection within an asset class. The choice of asset classes (Δ) is best interpreted as a question of policy design. For uncommitted funds, the top-level design question is whether to allow unrestricted investments in say, stocks and bonds, or to restrict them to specific assets classes, say, investment-grade bonds.[16] For trust funds like social security, an additional top-level question is whether or not to maintain a Treasuries-only investment policy.

A restricted investment policy would translate into restrictions on Δ. For example, investing in bonds but not equities is equivalent to setting an upper bound $\Delta^+ << 1$ and constraining portfolio managers securities choices to $\Delta \in [0, \Delta^+]$. A Treasuries-only policy would be a decision to cancel out part of gross debt, i.e., to replace the debt/investments pair (D_t, F_t^G) by $(D_t - F_t^G, 0)$. However, investments in private securities can only be avoided if the net indebtedness $D_t - F_t^G$ is positive—or, more realistically, if $D_t - F_t^G$ remains above some lower bound $D_{\min} > 0$ that is determined by old debt and Federal reserve needs. As government debt declines and $D_t - F_t^G$ approaches $D_{\min}$, a Treasuries-only investment policy minimizes uncommitted funds but leads to the demise of the government bond market. If $D_t < D_{\min} + F_t^G$, a Treasuries-only investment policy becomes impossible.

If $D_t < D_{\min} + F_t^G$, or if the government decides to invest in private securities for other reasons, the economic analysis shows that rent-seeking problems are minimized or even eliminated by either restricting government investments to low-risk securities (i.e., by setting Δ^+ near zero) or by committing (if possible) to an index fund. The underlying economic intuition is that neither safe securities nor an index fund will distort the composition of risks that are priced in the market. Hence, their purchase should have a negligible impact on asset prices and therefore create no significant incentives for security sellers to lobby the government. Applied to Federal Reserve policy, the model provides support for the FOMC's plan to replace Treasury holdings by reverse-repurchase agreements, if necessary (FOMC 2000). Reverse-REPOs are competitively-priced loans to investment-grade borrowers secured by high-quality collateral. They can be interpreted as essentially zero-Δ securities. Applied to social security, the rent-seeking model provides valid arguments against equity investments, especially against actively managed ones. Rent-seeking does not, however, provide an argument against the purchase of fixed-income securities and therefore does not justify a Treasuries-only investment policy.

5. Alternative Options of Public Asset and Liability Management

This section returns to the practical implications of the declining Treasury debt. I will systematically examine the policy alternatives and the related question which government entity should make investment decisions about uncommitted funds.

The analysis is guided by the balance sheet framework of Section 3, to ensure a complete and comparable coverage of policy alternatives. It is limited to asset-liability management, i.e., to alternatives that do not alter the path of consolidated net debt, as motivated in the introduction. To present different perspectives without duplication, the balance sheets are based the OMB projection (Case A of Section 2) while the figures will rely on the projection with additional spending (Case B of Section 2). The latter is arguably more likely, but the former is more challenging for dealing with uncommitted funds.[17]

5.1. Which Federal Entity Should Manage Uncommitted Funds?

The first question is who should make investment decisions about uncommitted funds, given their level. Balance sheet logic implies that the maximum number of distinct answer equals the number government entities—here three.

According to the trajectories described in Sections 2-3, uncommitted funds will first accumulate at the Federal Reserve, making this the default entity to make investment choices. Not surprisingly therefore, the Fed has shown the most concern about the declining Treasury debt. The projections for government debt show, however, that uncommitted funds will eventually exceed total Fed assets. This means that investment decisions about uncommitted funds cannot be left entirely to the Fed, even if that were desirable.

Broaddus and Goodfriend (2000) have argued convincingly that discretionary Fed investments are in fact undesirable because they would expose the Fed to political pressures that might undermine monetary policy independence. They plead for cooperation from the Treasury, asking that the Treasury issue enough securities to allow the Fed to maintain a Treasuries-only investment policy. The balance sheet implications of the Broaddus-Goodfriend proposal are illustrated in Table 6a. Compared to Table 5, which extrapolates current policy, the key difference is that all uncommitted funds are shifted to the Treasury. As Broaddus and Goodfriend note, this would ensure maximum political accountability.

Insert TABLE 6a about here

A look at the consolidated balance sheet reveals that there is third alternative, which is to delegate investment choices to social security. Table 6b shows the resulting government balance sheets for 2010, in a format comparable to Table 5 and Table 6a. The novelty is the investment of trust funds outside the Treasury. Figure 7 shows the public debt and trust fund balances associated with the policy option (top) and displays the required portfolio share of non-Treasury securities (bottom). The assumption is that social security buys enough non-Treasury assets to absorb all uncommitted funds, but no more.[18]

Insert TABLE 6b about here

Insert FIGURE 7 about here

The social security option would also subject an independent entity to political pressure. The Broaddus-Goodfriend arguments about accountability could be applied analogously. One difference is that from the state and local level, we have legal precedents and a long history of how to organize public pension funds, e.g., how to appoint trustees and how to define their fiduciary responsibilities. In terms of the rent-seeking model, the decision-making entity matters if different agencies have different influence functions (ϕ). Rent-seeking is minimized if investment responsibilities are delegated to the entity with the lowest sensitivity to lobbying. One might suspect that pension fund trustees with fiduciary duties are less sensitive to political pressures than regular government officials. Thus, social security should be a better manager of uncommitted funds than the Treasury. Rent-seeking could be discouraged further if—as part of the transition to non-Treasury investments—the governance of the social security trust fund were reorganized to give the trustees more political independence and clear fiduciary duties.[19] Though political accountability is desirable in principle, economists have long realized—notably with regard to monetary policy—that some government activities are best handled by an independent agency. In the presence of a rent-seeking problem, this applies to government investment decisions.

The case for letting social security handle uncommitted funds becomes even more compelling if one recognizes that there are arguments for non-Treasuries investments that apply even without the uncommitted funds issue: diversification, rent-seeking applied to the general budget, and intergenerational risk sharing.

For the diversification argument, consider the asset composition of typical private pension funds shown in Table 7. The table shows that neither the managers of defined contribution plans nor individuals managing defined contribution accounts allocate more than 5% of their assets to Treasury securities. Even within the fixed income

category, less than 20% of investments are in Treasury securities. These private investment decisions presumably reflect the interests of retirement savers and/or fund sponsors. The very different and highly undiversified investment policy of the social security trust fund should raise doubts about the wisdom of this policy.

Insert TABLE 7 about here

The second, somewhat related argument is that the current policy can easily be rationalized as politically motivated. It gives politicians complete discretion to cover general fund deficits with social security surpluses. As long as there is lobbying for tax cuts and for more government spending, leaving social security funds in the Treasury is more likely to trigger rent-seeking than to avoid it. Hence, even if trust funds investments outside the Treasury are subject to political manipulation, such investments may well reduce the influence of politics over the use of social security contributions.

In the political debate, non-Treasury investments are often identified with equity investments—perhaps because the initial proposals centered around misguided attempts to capture the equity premium. The debt-equity decision is, however, distinct from the choice of Treasuries versus non-Treasuries. If non-Treasury investments in social security are motivated primarily by an inflow of uncommitted funds and the main concern is rent-seeking, the model suggests a 100-percent fixed-income portfolio. If diversification is the main motive for non-Treasury investments, a balanced portfolio with debt and equity weights as in Table 7 would be the benchmark. The optimal debt-equity mix therefore depends on a trade-off between rent-seeking and diversification. Importantly, however, the Treasury share would be small in either case, around 5% for a diversified debt-and-equity portfolio and about 17% in a representative fixed-income-only portfolio (see Table 7).

A third benchmark is suggested by intergenerational risk sharing. The argument requires a broader perspective on asset-liability management, one that includes the interaction of investment returns with debt returns and social security benefits. If one interprets the benefits B_{t+1} in the model as government obligations, government net debt consists of explicit debt minus financial asset plus present value of future benefits, $ND_t = D_t - F_t^G + E_t[B_{t+1}\beta m_{t+1}^{-\eta}]$. In the OG model, net debt can also be interpreted as the generational account of generation t valued at the end of period t, $ND_t = E_t[GA_{t+1}\beta m_{t+1}^{-\eta}]$. From this perspective, public asset-liability management is about the stochastic structure of the generational account $GA_{t+1} = B_{t+1} + R_{t+1}^D D_t - R_{t+1}^{FG} F_t^G$ for given net debt.

Optimal risk sharing calls for managing the generational account to equalize the exposure of retiree consumption and worker consumption to aggregate risks (Bohn 2001). Without government intervention, retiree consumption depends on the asset values v_{it+1} while worker consumption does not. An obvious way to share v_{it+1}-shocks across cohorts is for the government to hold equities. Risk sharing arguments therefore favor government investments in risky, high-Δ assets like equities.

This suggests a conflict between risk sharing and rent-seeking. Safe investments minimize rent-seeking at the expense of imperfect risk sharing. Equity investments yield better macroeconomic risk sharing but potentially incur deadweight losses from rent seeking.[20]

Finally, note that the federal employee pension fund could serve as alternate asset manager in case social security investments remain too controversial. Employee pensions are clearly government obligations, i.e., unlike social security not subject to legalistic disputes about their status. According to Treasury estimates, employee and veterans pensions liabilities amount to more than $2.7 trillion, none of which are funded by outside assets (OMB 2001a). Even a partial funding of these obligations with non-Treasury assets—perhaps with an asset structure matching private employer plans—would be enough to absorb all projected uncommitted funds. Since future tax payers are responsible for the promised employee benefits, the intergenerational implication are the same as for social security. In this paper, I focus on social security because it seems more relevant for the current policy debate and involves a larger pool of funds. One should keep in mind, however, that federal employee pensions raise similar questions about investment management.

To conclude, non-Treasury investments in the social security trust fund—or other federal pension funds—appear to be the most efficient solution for managing uncommitted funds at any given level of such funds. The optimal debt-equity mix is a separate question that involves non-trivial tradeoffs. Figure 8 (bottom) shows that less than 50% of the trust fund would have to be invested in non-Treasury assets to absorb all uncommitted funds and relieve both the Treasury and the Fed from investment responsibilities.

5.2. Maintaining Liquidity by Issuing Additional Treasury Debt

Once procedures to manage uncommitted funds are developed, it is not obvious that the amount should be kept minimal, especially if maintaining a liquid Treasury market is a separate objective. The illiquidity problem could be solved by issuing additional Treasury bonds and investing the resulting uncommitted funds.

Figure 8 and Table 8 describe an example of such a policy, taking for granted that social security manages the funds and documenting that net debt remains unchanged (as compared to Figure 4 and Table 5). The projection assumes that starting in 2002, social security surpluses are invested in non-Treasury assets until the portfolio share of Treasuries has fallen to 5% (their portfolio share in private pension funds). Figure 8 shows that liquidity in the Treasury market is maintained at all times, as measured by either the supply of liquidity or the criterion of public debt exceeding 15% of GDP. Table 8 shows balance sheets for 2010 that are comparable to Tables 5 and 6a-b. According to this projection, non-Treasury securities will reach $2070 billion (63% of assets) and raise public debt enough to keep the supply of liquidity above 1 trillion dollars (vs. zero without policy change).

Insert TABLE 8 about here

Insert FIGURE 8 about here

Existing trust fund investments are assumed untouched just to demonstrate that maintaining liquidity and adjusting the trust fund portfolio can be done without large transactions that might disrupt the Treasury market. Otherwise, liquidity would be provided more quickly by a large-scale swap of Treasury securities in the trust fund against private securities.

The literature discussing the declining Treasury market liquidity seems to take for granted that Treasury bonds trade at a premium because they are somehow "special" and desirable for some investors, e.g., because of their safety, high liquidity, or benchmark status in world financial markets (Fleming 2000a,b; Reinhart and Sack 2000). In the model, a special premium would appear as a price premium PR relative to the pricing kernel, $PR = 1 - E_t[R^D_{t+1} \beta m^{-\eta}_{t+1}] > 0$. If debt is safe, the premium would also appear as interest rate spread $R^D_{t+1} - R_{0t}$ between government bond rate and safe rate. Either way, a positive premium provides an arbitrage opportunity for the government—on behalf of taxpayers—to earn seignorage-like profits by issuing debt and investing the proceeds.

A plausible decision rule for government debt management in this case would be to maximize the "quasi-seignorage" revenue $PR \ D$. If PR depends negatively on the stock of public debt and reaches zero as debt becomes excessive, revenues are maximized at some finite debt level D_{max}. (For example, the intermediation cost model in Bohn 1999a has these features.) In the presence of rent-seeking, debt management would have to balance the marginal revenue from additional debt against the marginal deadweight loss from rent-seeking; optimal debt would then lie below D_{max}. If the premium also depends on benchmark effects and declines when Treasury debt becomes

too small to maintain its benchmark status—as suggested by Fleming (2000a,b) and Reinhart and Sack (2000)—the optimal debt calculation is more complicated. Then the government may effectively face a discrete choice, either to give up on premium income, or to maintain a substantial debt even at the cost of accumulating uncommitted funds.

Overall, the argument for maintaining a liquid bond market seems convincing, given the likelihood of substantial budget deficits after about 2020, at least if uncommitted funds are reasonably managed.[21]

5.3. Avoiding Uncommitted Fund through Social Security Reform

Going in the opposite direction, one may wonder about policy options that avoid uncommitted funds, or at least reduce their level without reducing Treasury market liquidity. The consolidated government balance sheet reveals that there is one class of policies that has these features: Social security reform.

Inspecting the consolidated balance sheet in Table 5, one finds that if the "other items" and the monetary base are taken as given, social security reform is in fact the only way to avoid uncommitted funds without changing consolidated net debt.[22] To reduce uncommitted funds and provide liquidity, the direction of such reforms must be to reduce social security obligations, either in exchange for higher Treasury debt or for reduced uncommitted funds.

The social security side of these two exchanges fits well into the current privatization debate. Popular proposals to divert a percentage of social security contributions into "private accounts" would automatically reduce the unified surplus and thereby reduce the accumulation of uncommitted funds, presumably in exchange for reduced traditional benefits. At a sufficiently large scale, private accounts would require the issue of additional bonds. A direct exchange of social security obligations for "recognition bonds" (Feldstein 1996) would have essentially the same balance sheet effects. For this paper, I interpret these reform proposals as asset and liability exchanges that leave net debt unchanged.[23]

Figure 9 and Table 9 illustrate the balance sheet and government debt implications of private accounts. The projection assumes that 2% of payroll taxes are placed in individual accounts instead of the trust fund. The accounts are privately managed and therefore off the government balance sheet. Future traditional benefits that are payable around the time when the trust funds is expected to run out (in the 2030s) are assumed to be reduced by a matching amount. Net debt remains unchanged because the decline social security obligations matches the rise in public indebtedness. (See Figure 4 and Table 5 for comparison.) The main point is that diverting payroll taxes from the

unified budget into private accounts is a way to avoid uncommitted funds entirely and to maintain a positive supply of liquidity.

Insert TABLE 9 about here

Insert FIGURE 9 about here

Feldstein's recognition bonds are apparently meant to be issued in the context of a discrete, one-time swap of new bonds for a reduction in implicit obligations (unlike the gradual introduction of private accounts). Figure 10 and Table 10 illustrate the balance sheet and government debt implications of such a policy, specifically a 10% reduction in social security obligations in exchange for recognition bonds that are taken out of the trust fund, effective in 2002.[24] Assuming social security taxes and benefits are reduced by the same percentage, the social security system is permanently scaled down by 10%. Because of the lumpy restructuring, Figure 10 displays jumps in public debt and in the trust fund. After 2002, both series follow similarly-shaped paths as in the previous figures. The increase in net debt is sufficient to keep the Treasury market liquid and to avoid uncommitted funds.[25]

Insert TABLE 10 about here

Insert FIGURE 10 about here

These examples should suffice to illustrate that social security privatization provides substantial degrees of freedom for shaping the consolidated balance sheet. Importantly, the examples document that there are debt-management policies that maintain liquidity AND avoid all uncommitted funds.

The disadvantages of the privatization options lie in the area of intergenerational risk sharing. In the context of managing the stochastic structure of the generational account $GA_{t+1} = B_{t+1} + R^{D}_{t+1} D_t - R^{FG}_{t+1} F^{G}_{t}$ for given net debt ND_t, privatization is a reduction in benefits B_{t+1} in exchange for reduced trust fund balances and/or reduced debt. U.S. social security benefits are partially wage-linked (indexed to aggregate wage growth until age 60), and therefore contingent on all productivity and demographic shocks that affect wage growth. If debt and uncommitted funds are essentially safe (the most conservative benchmark for uncommitted funds), privatization exchanges wage-contingent claims for safe claims. Analyses of intergenerational risk sharing suggest that retirees already carry too little exposure to productivity and demographic uncertainty (see Bohn 2001 for a summary). Privatization would therefore make intergenerational risk sharing less efficient.

In summary, the vanishing Treasury debt presents a trilemma for public policy. Current policy sacrifices Treasury market liquidity to minimize uncommitted funds, while keeping social security unchanged. There are policies that maintain a liquid Treasury market without affecting social security benefits—notably social security non-Treasury investments. However, they require more uncommitted funds than the default trajectory of vanishing Treasury debt, and therefore may trigger increased rent-seeking. There are policies that maintain Treasury market liquidity and avoid uncommitted funds—as shown by the social security reform scenarios—but only at the expense of less efficient intergenerational risk sharing. There is no feasible policy that simultaneously leaves social security benefits untouched, maintains Treasury market liquidity, and avoids an accumulation of uncommitted funds.

6. The Politics of a Treasuries-only Investment Policy

The rent-seeking model might give the misleading impression that the investment of uncommitted funds is the only political-economy problem resulting from the declining Treasury debt. This would ignore the possibility that low public debt encourages lobbying for increased spending and reduced taxes. Though taxes and spending changes lie outside the realm of debt management, a political economy analysis would be unbalanced without commenting on this possibility.

The political economy literature provides substantial empirical support for the hypothesis that budget surpluses and low public debt trigger increased spending and reduced taxes (Bohn 1991, 1998). Specifically, Bohn (1998) estimates that changes in the debt-GDP ratio have about a negative 5% impact on the following year's primary surplus—ceteris paribus, after controlling for business cycles and military needs. While the projected accumulation of uncommitted funds is unprecedented, one might suspect that such funds provide at least as much political pressure for more spending and for tax cuts as a low public debt.[26]

To gauge the potential significance of endogenous taxes and spending, I will simply apply the 5% response value from Bohn (1998) to the baseline path of public indebtedness, over time and across alternative policies, for the same 2001-2035 projection period that was used in Section 5. This exercise is clearly out of sample and applied to data that lie outside historical range of debt-GDP ratios. The results should therefore be interpreted as rough estimates of possible tax-and-spending responses, and not as predictions.[27]

The first exercise is a political-economy interpretation of the 2001 tax cuts. Suppose one treats the CBO (2001a) projection made prior to the tax cuts as optimal "non-political" forecast, as a projection that include all

relevant controls without taking into account endogenous policy responses. This is a strong assumption, but since CBO focuses on economic and "technical" issues and takes instructions about spending assumptions from Congress, it is not unrealistic. Starting from the CBO debt projection, an endogenous path of surpluses is computed by reducing the primary surplus-GDP ratio by 5% of the deviation between actual and steady state debt-GDP ratio (35% for private debt, from Bohn 1998), and feeding the resulting values into the determination of next period's debt.

The implied series for surpluses and public indebtedness are shown in Figure 11. The top chart shows the endogenous path of public debt together with the pre- and post-tax cut projections (CBO 2001a and 2001b, respectively). The bottom chart show the endogenous reduction of the surplus (in absolute value) together with estimates of the enacted tax cuts. The endogenous policy model predicts cumulative tax cuts of $1370 bill. for 2001-2010, as compared to a $1220 bill. CBO estimate of the tax cuts actually enacted. The similarity suggests that it is not far fetched to interpret the tax cuts an endogenous responses to the declining Treasury debt. The underprediction toward the end of the 2001-10 period suggests a likelihood of higher spending.

Insert FIGURE 11 about here

The second application is to the debt-management options discussed above. A balance sheet restructuring will trigger revenue and spending responses if the political process treats public debt and uncommitted funds differently than pension obligations and trust funds (as noted by GAO 1998). Figure 12 presents the implication for the policy options discussed above. In each case, low public indebtedness is treated as the variable that triggers endogenous tax cuts and/or spending increases. Since all the policy options raise public debt and/or reduce uncommitted funds, they imply higher primary surpluses than the baseline and therefore all reduce the consolidated net debt.

Insert FIGURE 12 about here

According to Figure 12, even the "minimal" shift of social security investments to non-Treasury securities (as in Fig.7) will reduce net debt by as much as 4% of GDP over 20 years. A more complete shift towards non-Treasury holdings (as in Fig.8) and the introduction of private accounts (as in Fig.9) will both reduce net debt by more than 10% of GDP by 2030. A one-time restructuring with recognition bonds (as in Fig.10) yields a faster response because there is no phase in period, but the subsequent debt reductions are smaller. (A shift of trust funds

to non-Treasury holdings without phase-in would yield an equally quick response.) To reiterate, Figure 12 should be interpreted cautiously because the underlying assumptions are strong and essentially untestable due to the unprecedented scale of the projected uncommitted funds. The calculation suggest, however, that endogenous tax and spending changes are potentially large and should not be assumed away. Thus, aversion to lobbying is not necessarily an argument against government securities investments: The alternative, a vanishing public debt, may trigger even more lobbying, namely for tax breaks and for increased public spending.

7. Conclusions

Overall, the paper provides three general insights about government asset and liability management, and some new perspectives on social security.

First, if budget surpluses accumulate at anywhere near the rate currently projected, the question how the government should invest uncommitted funds is unavoidable. To some extent, the government is already making investment decisions, e.g., by extending student loans and insuring banks and mortgage companies. Much larger-scale investment decisions will be needed, however, as the Treasury debt declines and uncommitted funds accumulate. The paper suggests that the social security trust fund is the most appropriate government entity to manage government security purchases: social security is somewhat protected from political pressures, and a more diversified portfolio would be desirable anyway for diversification and intergenerational risk sharing reasons.

Second, a formal "lobbying" model suggests that inefficiencies due to rent-seeking are minimized if government investments are limited to assets with low idiosyncratic risk. This would be satisfied by high-quality fixed-income investments or by index funds, but not by active equity investments or discretionary loans to risky borrowers. The optimal debt-equity mix depends on the relative importance of rent-seeking, portfolio diversification, and intergenerational risk sharing issues, and it may range from all-debt to all-equity.

Third, a systematic analysis of policy options yields a trilemma between avoiding uncommitted funds, maintaining a liquid Treasury market, and efficient intergenerational risk sharing. The current policy of paying off the public debt is sacrificing Treasury market liquidity to minimize uncommitted funds at a given level of social security benefits. To maintain market liquidity, the U.S government would either have to accept more uncommitted funds (given social security), or execute a social security reform that exchanges traditional benefits for Treasury bonds (given uncommitted funds). The former would create rent-seeking problems, while the latter would harm

intergenerational risk sharing. Social security reforms could also exchange traditional benefits for reduced uncommitted funds (at given Treasury debt), showing that government assets and liabilities can be restructured in many ways. The balance sheet identity implies, however, that there is no feasible policy that simultaneously avoids investment decisions about uncommitted funds AND maintains a liquid Treasury market AND maintains intergenerational risk sharing.

All these choices pertain to debt management alternatives, i.e., policies that do not change the path of net debt. Treasury debt could of course be increased arbitrarily by tax cuts or lavish spending, thereby "solving" the liquidity and uncommitted funds problems; but given the expected fiscal problem after 2020, these would be short-sighted solutions. Instead, the political temptation to respond to the vanishing debt with spending growth and tax cuts provides an separate argument for policies that maintain a high public debt, either by committing the social security trust fund to outside investments or by reforming social security in a way that diverts the social security surpluses to other uses than to pay off the public debt.

Given the trilemma, a definitive policy recommendation would require judging the relative significance of the three policy objectives. This is beyond the scope of economic science, however, because it would require judgments about deeply political questions, e.g., about the desirable size of government. Economic analysis can, however, distinguish dominated choices from those on the "frontier" of potentially optimal policies. From this perspective, current fiscal policy seems to be on a dominated trajectory, because it will destroy the Treasury market without avoiding the uncommitted funds problem.

A shift of social security trust funds into private fixed-income securities is arguably a superior and undominated alternative. It would solve the illiquidity problem in the Treasury market and mitigate the uncommitted funds problem by delegating it to social security, all without affecting social security benefits. This option is also an instructive reference point for discussing other equally undominated alternatives. Voters who care about risk sharing and don't worry about rent-seeking may consider replacing the fixed-income investments in the trust fund by equities or other securities that optimize intergenerational risk sharing. Voters who prefer less government and don't care about risk sharing may instead prefer social security reforms that move investment choices from the trust fund to individual accounts. Thus, social security fixed-income investments are not

necessarily optimal from all (or any) voters perspective, but they solve the problem of the vanishing Treasury debt and they provide a point of reference for discussing other options.

Footnotes

[1] The term "uncommitted funds" is used by both CBO and OMB and aptly describes the challenge, which is to make decisions about investing surplus funds. The term is used throughout the paper whenever investment decisions are not to be prejudged.

[2] The budget outlook is uncertain, of course, but it would be pointless for this paper to dwell on well-known economic and political uncertainties. The premise of this conference is that the declining Treasury debt is a phenomenon that deserves analysis. The baseline budget surpluses are large enough that even substantial additional spending (e.g., as proposed in the aftermath of Sept. 11, 2001) would not affect the thrust of the projections.

[3] The intergenerational risk sharing objective is based on the government's unique ability to enter commitments on behalf of future taxpayers. As I have shown elsewhere (Bohn 1999b, 2001), efficient risk sharing calls for state-contingent government liabilities and it tends to favor government investments in risky assets. The welfare argument for maintaining a liquid Treasury bond market is actually unclear, though it is widely believed that the Treasury reaps cost savings from the benchmark role of its bonds (Fleming 2000a, 2000b, Reinhart and Sack 2000). Concerns about monetary policy complications are also mentioned. Conceptually, the government may have an advantage over the private sector in issuing safe securities due to its powers to tax and to create money (see Bohn 1999a for a model). The magnitude of the rent seeking problem is also unclear, though it is widely considered serious enough to have prevented social security investments in equities. For the policy analysis, I will simply consider the ramifications of different policy objectives. The implications of placing zero weight on one them will become clear enough.

[4] Apart from these spending alternatives, I adopt the economic, political, and demographic assumptions made by OMB, CBO, and/or SSA (intermediate scenario). Budget projections are of course sensitive to such assumptions, but as noted above, repeated reminders about budgetary risks would be unproductive. Recent emergency appropriations do not significantly change the medium-term outlook and are ignored to present projections consistent with official data. The qualitative insights are robust even if one assumes much larger increases in spending (see below).

[5] CBO and OMB use slightly different approaches, with OMB apparently accounting for some buybacks and for "needed" growth in non-marketed issues. This results in higher estimates of irredeemable debt and uncommitted

funds. I follow the more conservative CBO method to avoid exaggerating the issue, using Sept. 2000 as starting date.

[6] When I wrote the first draft of this paper in August 2001, Projection B was supposed to address concerns that OMB and CBO were overoptimistic about future domestic spending, to show that the level of discretionary spending is not a critical issue. The same robustness applies to post-September 11 defense spending.

[7] Tangible assets are extrapolated from Bohn (1992) assuming a constant ratio to GDP. Claims on the Fed are the assets minus liabilities on the Federal Reserve system's balance sheet for Sept. 30, 2000, as published in the Federal Reserve Bulletin.

[8] For economists, the economics should override legalistic objections; see Bohn (1992), cf. Goss (1999). Medicare liabilities are a more questionable item because of the intermingling of trust fund and general fund financing; it is simply entered as "?" and inessential for the analysis.

[9] Note that since social security obligations are a component of net debt, their "crossing" in Figure 6 does not depend on the valuation of social security obligations. As projected, a crossing would occur even with a zero monetary base.

[10] Only the OMB projection (Case A) is shown to save space. Fed holdings and "other items" are extrapolated under the assumption of constant GDP shares. Projected social security obligations are projected under the assumption that accrued liabilities grow at the discount rate, are reduced by benefit payments, and increased by new contributions. Note that social security obligations rise despite the social security surplus. This reflects estimated new accruals that exceed the surplus. The estimated accruals assume that new contributions generate obligations of equal value. Alternatively, one could assume that only a fraction of contributions creates new obligations and treat the remainder as a pure tax, e.g., following Geneakoplos et al. (1998) by assuming a 25% tax share. Such modifications would reduce the estimated social security obligations but not affect the policy analysis. The notation "±?" is intended to emphasize that the valuation of potentially controversial balance sheet items is again irrelevant.

[11] Note that the returns to e_{it} and k_{it} depend on V_{it+1} in the same way, i.e., they are in the same risk class. This means that trading in claims on capital k_{it} suffices for risk-pooling within a cohort even though entrepreneurial capital is non-tradeable. For convenience, I will allow trading in state-contingent claims.

[12] The implicit assumption that entrepreneurs recognize the price-effects of government investments requires some care, given the previous assumption of price taking behavior. In practice, corporate lobbying often takes place through industry associations or other cooperative political ventures, i.e., involves a degree of collusion. Eq.(12) is therefore a reasonable characterization of lobbying behavior in a competitive industry where entrepreneurs are forced by antitrust laws to act independently on factor markets, while they are allowed to cooperate in the political arena. Alternatively, one may interpret the competitive solution for k_t^* above as approximation to the solution that would result from monopolistic competition between entrepreneurs who equate the marginal cost $\chi'(k_{it}^*)$ with the marginal revenue from selling securities. Given such a solution, lobbying would be characterized by the same first order condition. Hence, price taking behavior is not essential for eq.(12).

[13] The proportionality is exact if $v_{it+1} - v_{\neq i}$ and $\sum_j v_{jt}$ are independent; this applies, e.g., if the v_j are jointly Normal.

[14] The latter is a reasonable assumption if the marginal return to lobbying is declining $\phi_{11}<0$. The condition $\phi_{11}+\phi_{12}<0$ is also needed to ensure a unique solution for λ.

[15] As usual in cartel situations, each entrepreneur would have an incentive to deviate and start lobbying. Another problem (noted by White 1996) is the existence of different index funds with different weights. The lobbying model actually provides an answer: If the marginal return to lobbying is declining, the broadest possible index fund will find the most lobbying support. A multiplicity of index funds is therefore not a convincing objection to an index fund proposal. Many practical issue must be addressed, of course; see White (1996) for a survey.

[16] Throughout, the model takes for granted that investments are restricted to publicly-traded securities, i.e., assets with well-defined market prices. Large scale "investments" in non-marketable private assets would invite fraud and should probably be ruled out; they would certainly not fit into the framework of this model.

[17] The two scenarios should suffice to demonstrate that the qualitative insights are robust. Projections C and D would yield similar results and are omitted to save space.

[18] Implicitly, Figure 7 assumes the same interest rate on non-Treasury investments as on Treasuries. If outside investments earn higher returns, say, because of risk taking, the gains are implicitly credited to the future generations that take the risk. See Bohn (1999b) for more discussion of risk allocation issues.

[19] As is, three of the six trustees are cabinet secretaries. As a practical matter, social security investments would probably be protected against lobbying even under the current governance structure (at least, better than general Treasury investments), because U.S. retirees are politically well organized. They will presumably oppose any attempts to manipulate social security investments.

[20] A practical caveat weighting against safe investments is the limited supply of safe private securities. If uncommitted funds exceed the supply of $\Delta \approx 0$ securities, policy makers would be forced to set Δ^+ above zero, perhaps above the rent-seeking model's critical Δ_0-value. This would not only trigger rent-seeking in the $[\Delta_0, \Delta^+]$ interval, but might also lead to asymmetric lobbying situations that pit sellers of $\Delta \approx 0$ securities against sellers of securities with $\Delta \quad (\Delta_0, \Delta^+]$. In an asymmetric lobbying situation, the model would imply that sellers of higher-Δ securities have stronger incentives to lobby and will successfully distort the government's portfolio to higher-risk securities. If equity investments are beneficial for risk-sharing and diversification purposes, the distortion towards higher-risk securities per se would be innocuous; the deadweight loss from lobbying is a problem, however.

[21] Note that liquidity effects provide another argument for non-Treasury investments in the social security trust fund. As long-term investor, the trust fund has no need to keep its entire portfolio in liquid securities. If current Treasury interest rates include a liquidity premium, the social security trust fund earns a lower risk-adjusted return than it could earn on non-Treasury securities. In effect, the Treasury is extracting quasi-seignorage revenues from social security.

[22] In general, a balance sheet with n items allows n(n-1)/2 distinct pairwise changes that leave the consolidated balance unchanged. For the five-item consolidated balance sheet in Table 5, this implies 10 distinct debt management operations. Of these, a debt-cum-uncommitted funds change was discussed above, four of the 10 would involve changes in the monetary base and three others would involve changes in "other items." The monetary base is best viewed as determined by monetary policy considerations that are exogenous with respect to debt management (in accordance with Broaddus and Goodfriend, 2000). The "other items" are taken as given here, though some of them may deserve more attention in future work (e.g., federal employee pensions, as noted above, and loans that raise similar investment issues as uncommitted funds). This leaves social security reforms: they account for the remaining two of the 10 possible policies, namely as a swap against debt and as a swap against uncommitted funds.

[23] Most practical reform proposals have elements that would likely change the net debt. My analysis focuses on the restructuring elements and abstracts from more far reaching changes. The distinction between a debt-restructuring and a change in net obligations is conceptually clear and important, though it is in practice obscured by the ill-defined status of the system's current obligations. OMB does not even recognize them as liabilities in its balance sheet presentation. A better definition of property rights in the existing system and their official recognition would probably help the public understand social security reform.

[24] Alternatively, one might treat the recognition bonds as a Treasury obligation, in which case net debt would shift from social security to the Treasury. This would be necessary if the desired reduction in social security obligations exceeds the trust fund, but it would not change the consolidated government net debt.

[25] The 2% private accounts proposal and the recognition bonds plan keep the supply of liquidity positive, but both break the 15% of GDP lower bound for public debt. A 15% of GDP debt would require reforms at a somewhat larger scale.

[26] Only once in history, in 1836, the U.S. government paid off the entire public debt. In the following decade, federal revenues declined from 2% to 1.2% of GDP (comparing decade averages) while non-interest spending rose slightly from 1.1% to 1.2% of GDP. The primary surplus fell from +0.88% of GDP to zero. (The data are from Bohn 1991.) With debt declining from 10% in 1826 to zero in 1836, one obtains a crude response coefficient of 0.088 (=0.88%/10%), i.e., a value even higher than the 0.05 regression estimate in Bohn (1998).

[27] See Elmendorf and Liebman (2000) for an analysis of alternative political economy models. They focus on policy responses to flow imbalances—annual surpluses/deficits—and do not consider responses to a changing stock of public debt.

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Table 1: Projected Budget Surpluses and their Components

OMB Projections

Budget Category:	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Unified Surplus (baseline)	158	187	211	250	304	342	388	431	485	559	686
President's policy initiatives	-0	-14	-16	-33	-50	-61	-74	-81	-87	-112	-202
Unified Surplus (with initiatives)	158	173	195	217	254	281	314	350	398	447	484
Social Security Surplus	157	171	192	211	236	249	266	280	293	310	327
On-budget surplus[a]	1	2	3	6	19	32	48	70	105	137	157
Potential for spending growth[b]	1	2	5	19	35	60	87	111	141	175	209
Implications for Public Indebtedness:											
A. OMB Projection (with initiatives)	3300	3145	2965	2769	2531	2264	1969	1632	1248	819	**348**
B. With zero on-budget surpluses	3300	3147	2970	2780	2561	2326	2079	1812	1533	1241	**927**
C. With additional spending growth	3300	3147	2972	2795	2592	2385	2177	1951	1708	1453	**1191**

CBO Projections

Budget Category:	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Unified Surplus	153	176	172	201	244	289	340	389	450	507	628
Social Security Surplus	162	174	190	204	224	242	262	283	303	323	345
On-budget surplus[a]	-9	2	-18	-3	20	47	78	106	147	184	283
Implications for Public Indebtedness:											
D. CBO Projection	3294	3138	2983	2797	2572	2300	1976	1601	1165	671	**56**

Notes: Top panel: From OMB (2001b) and own calculations. Bottom panel: From CBO (2001c). Case A is the OMB projection accounting for President's policy proposals. Case B assumes all OMB-projected on-budget surpluses are spent. Case C assumes discretionary spending growth at GDP growth rate.

[a] The on-budget surplus includes the Postal service in the OMB data, but not in the CBO data.

[b] Additional outlays if discretionary spending grows at the rate of GDP growth.

Table 2: Projected Treasury Debt, Fed holdings, and Uncommitted Funds

Panel A: OMB Projection

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Net Indebtedness	3300	3145	2965	2769	2531	2264	1969	1632	1248	819	348
+ Uncommitted funds in Treasury[a]	0	…							0	**134**	**584**
Memo: OMB estimate:	0	…							0	**274**	**710**
= Public Debt	3300	3145	2965	2769	2531	2264	1969	1632	1248	953	932
Of which:											
Desired Federal Reserve holdings	537	566	597	628	659	691	725	761	798	838	881
Irreducible privately-held debt[a]			1498	1376	1248	1178	1094	1022	940	893	872
Available for the Fed portfolio:			ok	ok	ok	ok	ok	610	308	60	60
"Supply of Liquidity"			870	765	624	395	150	0	0	0	0
Implied: Uncommitted Fed assets	0	…					0	**151**	**490**	**778**	**821**

Panel B: Assuming zero on-budget surplus

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Net Indebtedness	3300	3147	2970	2780	2561	2326	2079	1812	1533	1241	927
+ Uncommitted funds in Treasury[a]	0	…								0	**5**
Memo: using OMB method:	0	…								0	**130**
= Public Debt	3300	3147	2970	2780	2561	2326	2079	1812	1533	1241	932
Of which:											
Desired Federal Reserve holdings	537	566	597	628	659	691	725	761	798	838	881
Irreducible privately-held debt[a]			1498	1376	1248	1178	1094	1022	940	893	872
Available for the Fed portfolio:			ok	ok	ok	ok	ok	ok	593	348	60
"Supply of Liquidity"			875	776	653	456	260	29	0	0	0
Implied: Uncommitted Fed assets	0	…						0	**205**	**490**	**821**

Notes: In all panels, uncommitted funds are assumed to accumulate in the Treasury whenever net indebtedness falls below irreducible old debt. Fed needs are assumed to be a constant share of GDP. Amounts available for the Fed are only shown when they fall short of needs. Then the difference is entered as Uncommitted Fed assets. The Supply of Liquidity is the residual of public debt minus irreducible debt minus Fed holdings.

[a] To ensure comparability, uncommitted funds and irreducible debt are computed using the CBO method applied to the Sept. 2000 maturity distribution of marketable public debt, starting in 2003. Alternative estimates are shown in the "memo" lines.

Table 2 (cont.)

Panel C: Assuming additional spending growth

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Net Indebtedness	3300	3147	2972	2795	2592	2385	2177	1951	1708	1453	1191
+ Uncommitted funds in Treasury	0	…									0
= Public Debt	3,300	3,147	2,970	2,780	2,561	2,326	2,079	1,812	1,533	1,241	932
Of which:											
Desired Federal Reserve holdings	537	566	597	628	659	691	725	761	798	838	881
Irreducible privately-held debt			1,498	1,376	1,248	1,178	1,094	1,022	940	893	872
Available for the Fed portfolio:			ok	ok	ok	ok	ok	ok	768	560	320
"Supply of Liquidity"			876	791	685	516	358	168	0	0	0
Implied: Uncommitted Fed assets	0	…						0	**30**	**278**	**561**

Panel D: CBO Projections

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Net Indebtedness	3294	3138	2983	2797	2572	2300	1976	1601	1165	671	56
+ Uncommitted funds in Treasury	0	…							0	**282**	**876**
Memo: CBO estimate:	0	…							0	**259**	**820**
= Public Debt	3,294	3,138	2,983	2,797	2,572	2,300	1,976	1,601	1,165	953	932
Of which:											
Desired Federal Reserve holdings	534	559	589	620	652	686	722	759	798	839	882
Irreducible privately-held debt			1,498	1,376	1,248	1,178	1,094	1,022	940	893	872
Available for the Fed portfolio:			ok	ok	ok	ok	ok	579	225	60	60
"Supply of Liquidity"			896	801	672	436	160	0	0	0	0
Implied: Uncommitted Fed assets	0	…					0	**180**	**573**	**779**	**822**

Table 3: The U.S. Government Balance Sheet as of Sept. 2000

Complete Version

Assets	$bill	Liabilities	$bill
Cash and other monetary assets	104.9	Accounts payable	91.0
Accounts receivable	32.3	Federal debt securities held by the public	3408.5
Loans receivable	207.6	Federal employee and veteran benefits	2757.8
Taxes receivable	23.3	Environmental and disposal liabilities	301.2
Inventories and related property	185.2	Benefits due and payable	77.8
Property, plant, and equipment	298.5	Loan guarantee liabilities	37.3
Other assets	59.7	Other liabilities (itemized)	175
		Commitments and contingencies	?
TOTAL assets listed by U.S. Treasury	911.5	TOTAL liabilities listed by U.S. Treasury	6848.6
Other tangible assets (approx.)	2559±?	Social Security Obligations (approx.)	9636.0
Net claims on the Federal Reserve	10.8	Medicare Obligations	?
Total assets	3482±?	Total liabilities	16485±?
		Net Debt	13003±?

Simplified Version

Assets	$bill	Liabilities	$bill
Net claims on the Federal Reserve	10	Federal debt securities held by the public	3410
Balance of other items	30±?	Social Security Obligations	9630
		Net Debt	13000±?

Notes: From OMB (2001a) and own calculations. The simplified balance sheet highlights the connections between Treasury debt, social security, and the Federal Reserve. To avoid misleading inferences about the precision of the estimates, "±?" is added to particularly uncertain items, and rounded numbers are used for the analysis below.

Table 4: Treasury, Social Security, and Federal Reserve

(September 2000)

Consolidated Balance Sheet

Assets	$bill	GDP%	Liabilities	$bill	GDP%
Balance of other items	90±?	.9%	Treasury Debt - Privately held	2900	29.5%
			Social Security Obligations	9630	98.0%
			Base Money	560	5.7%
			Net Debt	13000±?	132.3%

U.S. Treasury

Assets	$bill.	GDP%	Liabilities	$bill.	GDP%
Balance of other items	30±?	.3%	Debt - SSA holdings	1000	10.2%
			Debt - Fed holdings	510	5.2%
			Debt - Privately held	2900	29.5%
			Net Debt	4380±?	44.6%

Social Security (Old Age & Disability)

Assets	$bill	GDP%	Liabilities	$bill	GDP%
Treasury Securities	1000	10.2%	To Current Participants (Net)	9630	98.0%
			Net Debt	8630	87.8%

Federal Reserve System

Assets	$bill	GDP%	Liabilities	$bill	GDP%
Treasury Securities	510	5.2%	Base Money	560	5.7%
Balance of other items	60	.6%			
Net Worth	10	.1%			

Notes: The Federal Reserve System is treated as a federal entity for the economic analysis though it is legally owned by member banks. All numbers are rounded to place the emphasis on qualitative insights and to avoid misunderstandings about their precision.

Table 5: Projected Federal Balance Sheets in 2010

Consolidated Balance Sheet

Assets	$bill	GDP%	Liabilities	$bill	GDP%
Balance of other items	140±?	.9%	Social Security Obligations	18750	116.4%
Uncommitted Funds	**910**	**5.7%**	Base Money	910	5.7%
			Treasury Debt - privately held[a]	890	5.5%
			Note: Supply of Liquidity[a]	**0**	
			Consolidated Gov. Net Debt	19500±?	121.0%

U.S. Treasury

Assets	$bill	GDP%	Liabilities	$bill	GDP%
Balance of other items	50±?	.3%	Debt - SSA holdings	3270	20.3%
Uncommitted Funds	**130**	**.8%**	Debt - old Fed-holdings[a]	60	.4%
			Debt - old private holdings[a]	890	5.5%
			Treasury Net Debt	4040±?	25.1%

Social Security (Old Age & Disability)

Assets	$bill	GDP%	Liabilities	$bill	GDP%
Treasury Securities	3270	20.3%	To Current Participants (Net)	18750	116.4%
			Social Security Net Debt	15480	96%

Federal Reserve System

Assets	$bill	GDP%	Liabilities	$bill	GDP%
Treasury Securities	60	.4%	Base Money	910	5.7%
Balance of other items	90	.6%			
Uncommitted Funds	**780**	**4.8%**			
Federal Reserve Net Worth	20	.1%			

Notes: The assumptions about debt are as in Table 2A, based on OMB (2001b). Fed balances assume constant GDP-shares. Social security obligations assume that contributions create new obligations.

[a] Privately and Fed-held debt consist entirely of long-term or non-marketable issues issued before Sept. 2000. Supply of liquidity refers to privately-held debt minus irreducible old debt, as computed in Table 2A.

Table 6a: Shifting Uncommitted Funds to the Treasury
(Broaddus-Goodfriend proposal)

Consolidated Balance Sheet

Assets	$bill	GDP%	Liabilities	$bill	GDP%
Balance of other items	140±?	.9%	Social Security Obligations	18750	116.4%
Uncommitted Funds (Treasury)	**910**	**5.7%**	Base Money	910	5.7%
			Treasury Debt - privately held	890	5.5%
			Note: Supply of Liquidity	**0**	
			Net Debt	19500±?	121.0%

U.S. Treasury

Assets	$bill	GDP%	Liabilities	$bill	GDP%
Balance of other items	50±?	.3%	Debt - SSA holdings	3270	20.3%
Uncommitted Funds	**910**	**5.7%**	**Debt - Fed-holdings (as needed)**	**840**	**5.2%**
			Debt - old private holdings	890	5.5%
			Net Debt	4040±?	46.5%

Social Security (Old Age & Disability)

Assets	$bill	GDP%	Liabilities	$bill	GDP%
Treasury Securities	3270	20.3%	To Current Participants (Net)	18750	116.4%
			Social Security Net Debt	15480	96%

Federal Reserve System

Assets	$bill	GDP%	Liabilities	$bill	GDP%
Treasury Securities (as needed)	**840**	**5.2%**	Base Money	910	5.7%
Balance of other items	90	.6%			
Note: Uncommitted Funds =	*0*				
Net Worth	20	.1%			

Note: Compared to the balance sheets in Table 5, $780 bill. in uncommitted funds are shifted from the Federal Reserve to the Treasury, in exchange for Treasury debt held by the Fed. The consolidated balance sheet remains unchanged.

Table 6b: Shifting Uncommitted Funds to Social Security
(Minimal non-Treasury investments)

Consolidated Balance Sheet

Assets	$bill	GDP%	Liabilities	$bill	GDP%
Balance of other items	140±?	.9%	Social Security Obligations	18750	116.4%
Uncommitted trust fund assets[a]	**910**	**5.7%**	Base Money	910	5.7%
			Treasury Debt - privately held	890	5.5%
			Note: Supply of Liquidity	**0**	
			Net Debt	19500±?	121.0%

U.S. Treasury

Assets	$bill	GDP%	Liabilities	$bill	GDP%
Balance of other items	50±?	.3%	**Debt - SSA holdings (reduced)**	**2360**	**14.7%**
Note: Uncommitted Funds =	*0*		**Debt - Fed-holdings (as needed)**	**840**	**5.2%**
			Debt - old private holdings	890	5.5%
			Net Debt	4040±?	25.1%

Social Security (Old Age & Disability)

Assets	$bill	GDP%	Liabilities	$bill	GDP%
Treasury Securities (reduced)	**2360**	**14.7%**	To Current Participants (Net)	18750	116.4%
Uncommitted outside assets[a]	**910**	**5.7%**			
			Net Debt	15480	96%

Federal Reserve System

Assets	$bill	GDP%	Liabilities	$bill	GDP%
Treasury Securities (as needed)	**840**	**5.2%**	Base Money	910	5.7%
Balance of other items	90	.6%			
Note: Uncommitted Funds =	*0*				
Net Worth	20	.1%			

Notes: Compared to the balance sheets in Table 5, all $910 bill. of uncommitted funds are shifted to social security and invested in non-Treasury assets. In exchange, Treasury bonds in the trust fund are reduced and Treasury holdings by the Fed are increased. The consolidated balance sheet remains unchanged.

[a] Uncommitted assets are investments outside the Treasury; they may be fixed income securities or equities.

Table 7: Portfolio Choices of Private Pension Funds

	Defined Benefit Plans (DB)	Defined Contribution Plans (DC)	Social Security Trust Fund if managed like a DB plan
Total financial assets ($bill)	2062.6	2525.7	1168
Flow of Funds Categories:			
Corporate equities	48.9%	39.3%	
Mutual fund shares	5.9%	28.3%	
Credit Market:	28.9%	8.8%	
Treasury	5.0%	3.1%	
Corporate and foreign bonds	11.5%	3.3%	
Other	12.4%	2.4%	
Other fixed income (Bank deposits, GICs, etc.)	16.3%	23.5%	
Broad Categories:			
Equities and mutual funds	54.8%	67.6%	640
Treasury securities	5.0%	3.1%	58
Fixed income exc. Treasury	40.2%	29.2%	470
Memo: Treasury securities as share of Credit Market	17.2%		201a

Notes: From Federal Reserve Release Z.1 (Flow of Funds), and own calculations.

a If investments are restricted to the credit market.

Table 8: Supplying liquidity to the Treasury market by managing the Social Security Trust Fund like a pension fund

Consolidated Balance Sheet

Assets	$bill	GDP%	Liabilities	$bill	GDP%
Balance of other items	140±?	.9%	Social Security Obligations	18750	116.4%
Uncommitted trust fund assets	**2070**	**12.9%**	Base Money	910	5.7%
			Treasury Debt - privately held	2050	12.8%
			Old issues	890	5.5%
			Supply of Liquidity	**1160**	**7.2%**
			Net Debt	19500±?	121.0%

U.S. Treasury

Assets	$bill	GDP%	Liabilities	$bill	GDP%
Balance of other items	50±?	.3%	Debt - SSA holdings	1200	7.4%
Note: Uncommitted Funds =	*0*		Debt - Fed holdings (as needed)	840	5.2%
			Debt - Privately held	2050	12.8%
			Net Debt	4043±?	25.1%

Social Security (Old Age & Disability)

Assets	$bill	GDP%	Liabilities	$bill	GDP%
Treasury Securities (reduced)	**1200**	**7.4%**	To Current Participants (Net)	18750	116.4%
Uncommitted outside assets	**2070**	**12.9%**			
			Net Debt	15480	96.0%

Federal Reserve System

Assets	$bill	GDP%	Liabilities	$bill	GDP%
Treasury Securities	840	5.2%	Base Money	910	5.7%
Balance of other items	90	.6%			
Note: Uncommitted Funds =	*0*				
Net Worth	20	.1%			

Notes: Compared to Table 5, social security invests $2070 bill. outside the Treasury, thereby keeping public debt high enough to avoid uncommitted funds at the Treasury and at the Fed. This is as in Table 6a, except that social security non-Treasury investments are $1160 bill. higher, which provides a supply of liquidity.

Table 9: Avoiding Uncommitted Funds by Partially Privatizing Social Security
(Private accounts contribution = 2% of payroll)

Consolidated Balance Sheet

Assets	$bill	GDP%	Liabilities	$bill	GDP%
Balance of other items	140±?	.9%	**Social Security Obligations**	**17550**	**108.9%**
Uncommitted Funds	0		Base Money	910	5.7%
			Treasury Debt - privately held	1180	7.3%
			Old debt	890	5.5%
			Supply of Liquidity	**290**	**1.8%**
			Net Debt	19500±?	121.0%

U.S. Treasury

Assets	$bill	GDP%	Liabilities	$bill	GDP%
Balance of other items	50±?	.3%	Debt - SSA holdings	2070	12.9%
Note: Uncommitted Funds =	*0*		Debt - Fed holdings (as needed)	840	5.2%
			Debt - private holdings	1180	7.3%
			Net Debt	4040±?	25.1%

Social Security (Old Age & Disability)

Assets	$bill	GDP%	Liabilities	$bill	GDP%
Treasury Securities (reduced)	**2070**	**12.9%**	**To Current Participants (Net)**	**17550**	**108.9%**
			Net Debt	15480	96.0%

Federal Reserve System

Assets	$bill	GDP%	Liabilities	$bill	GDP%
Treasury Securities	840	5.2%	Base Money	910	5.7%
Balance of other items	90	.6%			
Note: Uncommitted Funds =	*0*				
Net Worth	20	.1%			

Notes: Compared to Table 5, the obligations and the cumulative surpluses of social security are reduced by $1200 bill., which are placed in private accounts. This keeps public debt high enough to avoid all uncommitted funds and to provide a $290 bill. supply of liquidity.

Table 10: Down-sizing Social Security with Recognition Bonds (Feldstein-type proposal)

Consolidated Balance Sheet

Assets	$bill	GDP%	Liabilities	$bill	GDP%
Balance of other items	140±?	.9%	**Social Security Obligations**	**16880**	**104.7%**
Uncommitted Funds	**0**		Base Money	910	5.7%
			Treasury Debt - privately held	1850	11.5%
			Old issues	890	5.5%
			Supply of Liquidity	**960**	**6.0%**
			Net Debt	19500±?	121.0%

U.S. Treasury

Assets	$bill	GDP%	Liabilities	$bill	GDP%
Balance of other items	50±?	.3%	Debt - SSA holdings	1400	12.9%
Note: Uncommitted Funds =	*0*		Debt - Fed holdings (as needed)	840	5.2%
			Debt - private holdings	1850	11.5%
			Net Debt	4040±?	25.1%

Social Security (Old Age & Disability)

Assets	$bill	GDP%	Liabilities	$bill	GDP%
Treasury Securities (reduced)	**1400**	**8.7%**	**To Current Participants (Net)**	**16880**	**104.7%**
			Net Debt	15480	96.0%

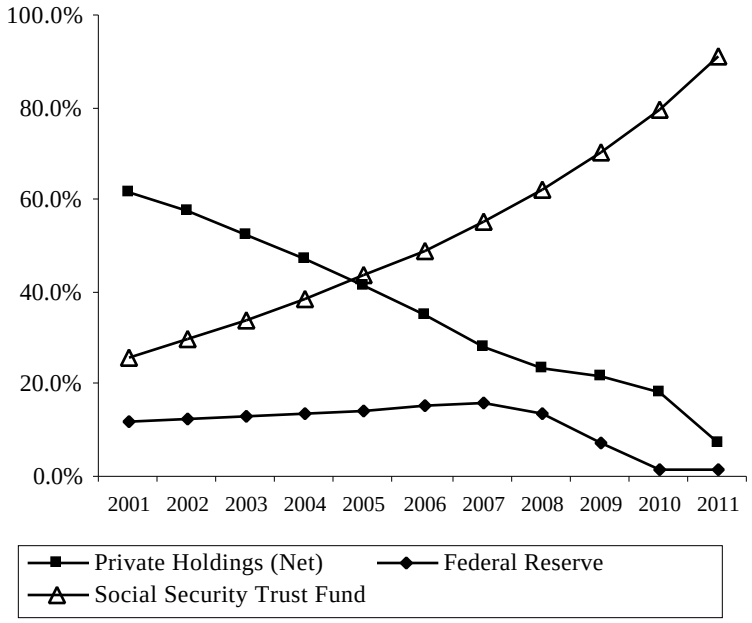
Federal Reserve System

Assets	$bill	GDP%	Liabilities	$bill	GDP%
Treasury Securities	840	5.2%	Base Money	910	5.7%
Balance of other items	90	.6%			
Note: Uncommitted Funds =	*0*				
Net Worth	20	.1%			

Notes: Compared to Table 5, social security obligations are reduced by $1870 bill. (10% of obligations) in exchange for recognition bonds, keeping public debt high enough to avoid uncommitted funds and to provide a $960 bill. supply of liquidity.

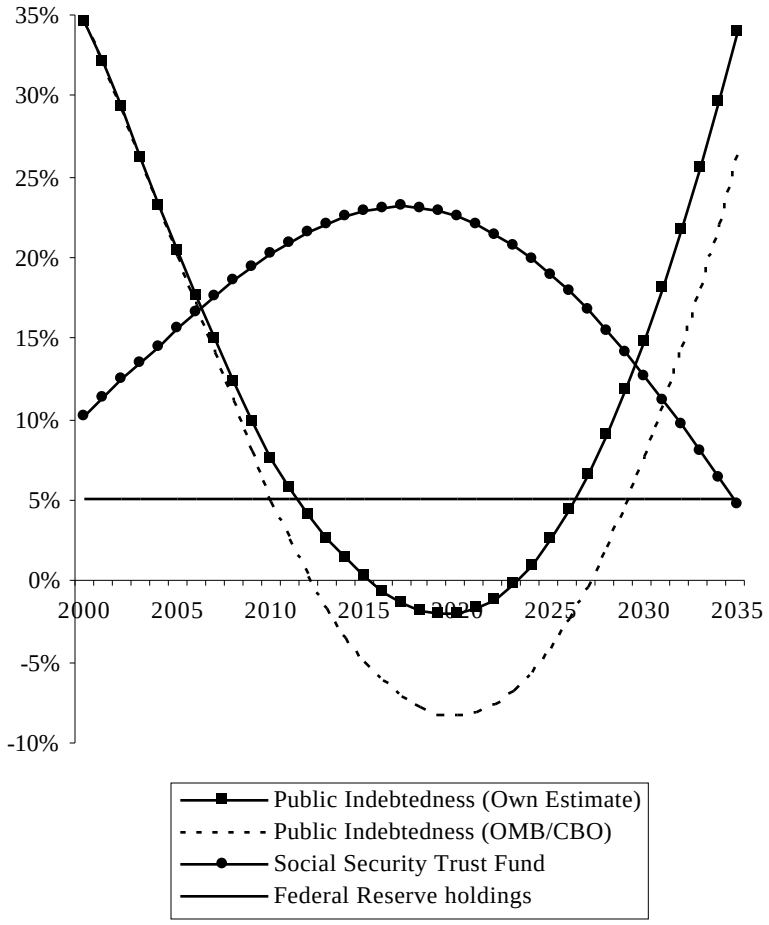
Figure 1: The Changing Ownership of Treasury Debt

(Projections of public plus social security holdings)



Notes: From OMB (2001b) and own calculations. The values are the percentages of public debt plus social security trust fund holdings held by social security, the Federal Reserve, and the private sector, respectively. The 2010-11 values include uncommitted funds that are netted against the privately-held debt.

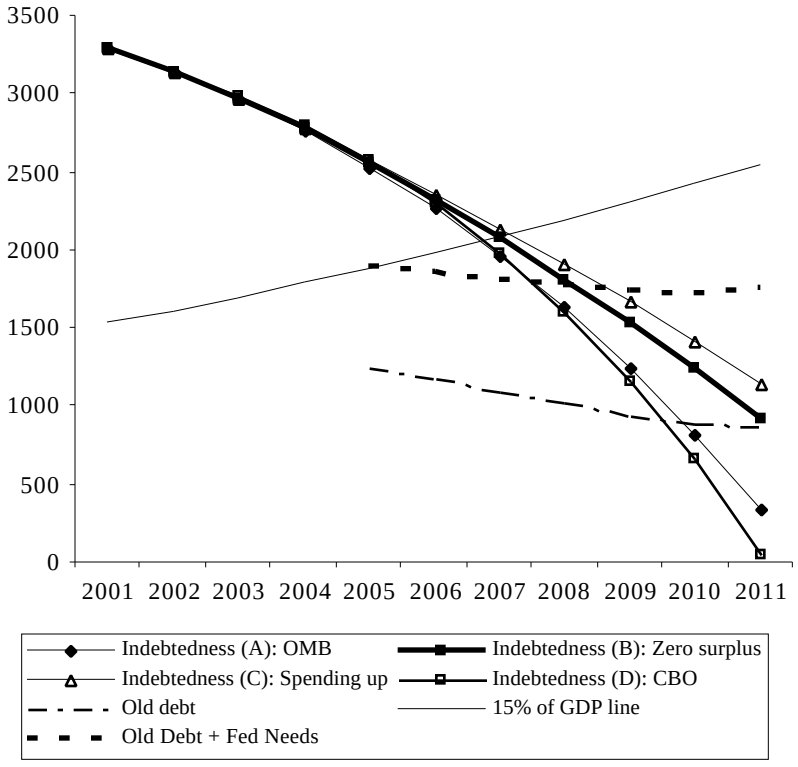
Figure 2: The Budget Outlook: Public Debt, Social Security, and Fed Holdings



Notes: Public Indebtedness = Public Debt minus Uncommitted Funds. The projection labeled OMB/CBO is taken from OMB (2001b) and extended beyond 2011 using deficit values from CBO (2000). The Own Estimate assumes higher spending, as explained in Section 2.

Figure 3: The Projected Path of Public Debt

in relation to old debt and to Fed needs



Memo: Uncommitted Fed Assets

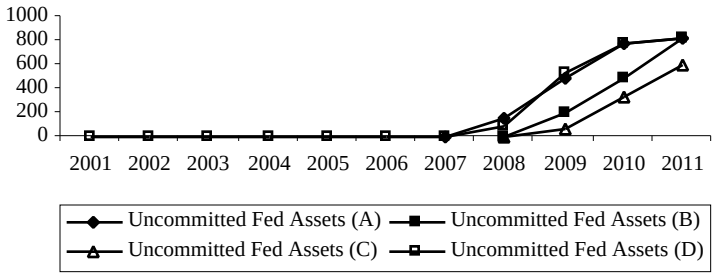
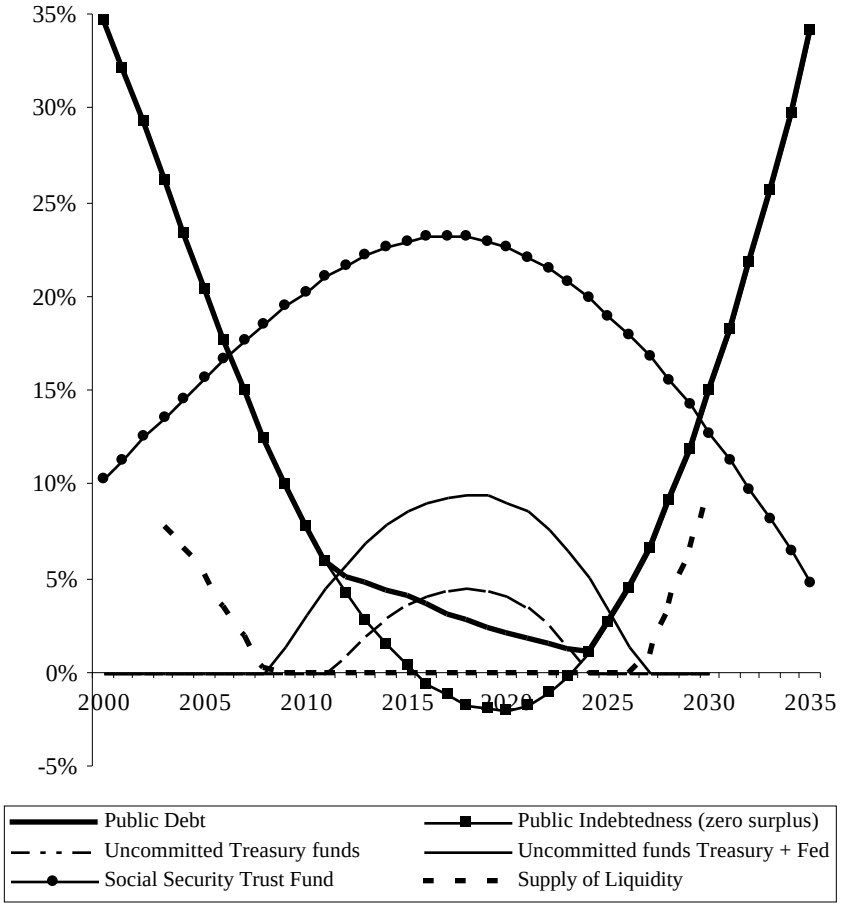
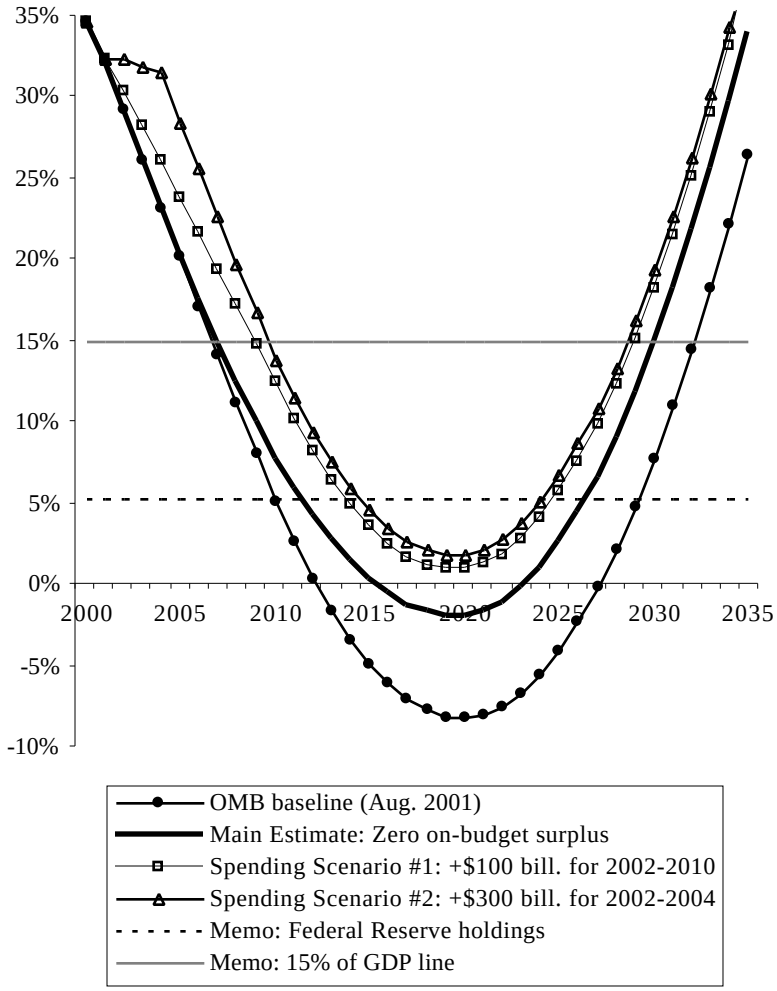


Figure 4: Public Debt and Uncommitted Funds
(Projection B, Percent of GDP)



Notes: The projections to 2010 are from Panel B of Table 2, assuming zero on-budget surpluses. For the projections after 2010, the same method is applied to budget surplus values in CBO (2000).

Figure 5: Public Debt with Substantial Extra Spending
(Sensitivity Analysis, Percent of GDP)



Notes: Spending scenarios #1 and #2 assume higher government spending than the OMB and CBO baselines, as noted. The overall trajectories are not much different than the main estimate, Projection B.

Figure 6: Government Debt and Social Security Obligations
(Projection B, Percent of GDP)

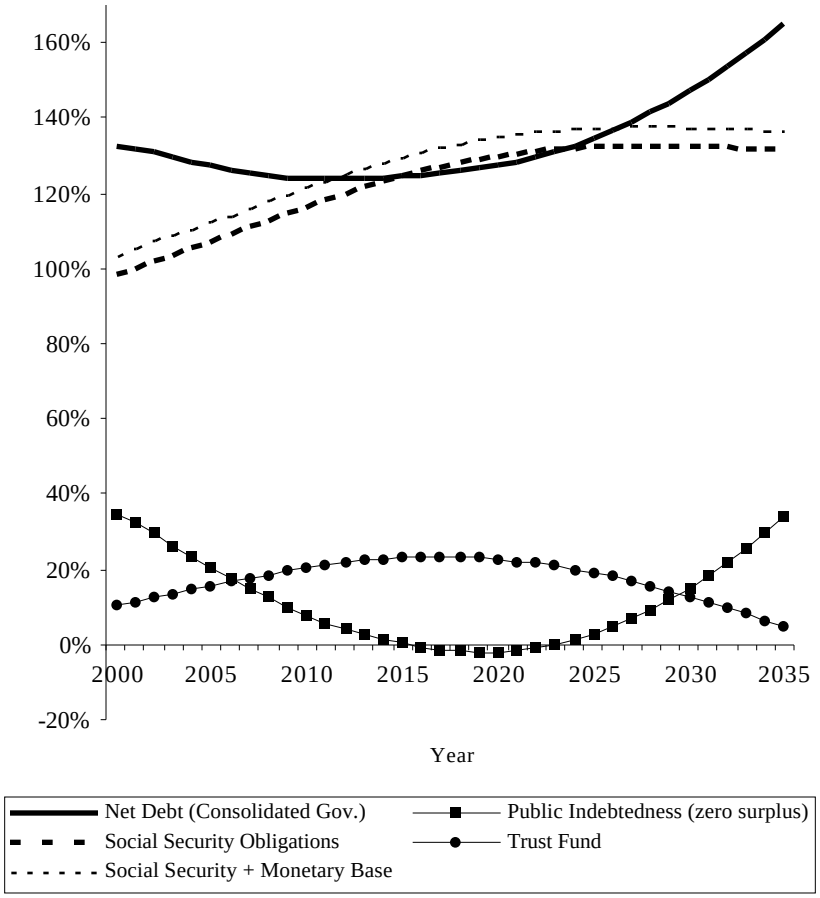
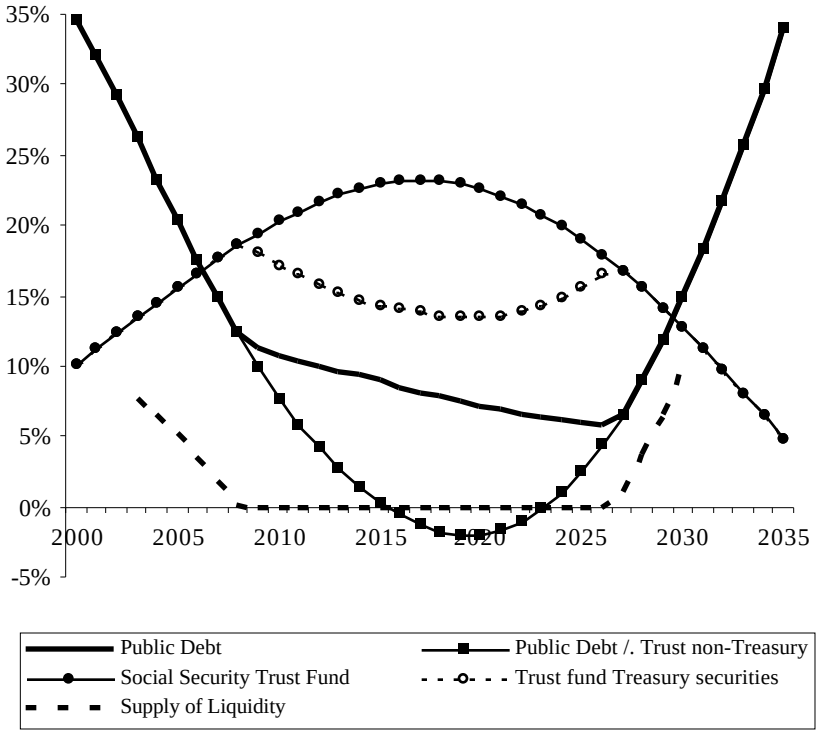
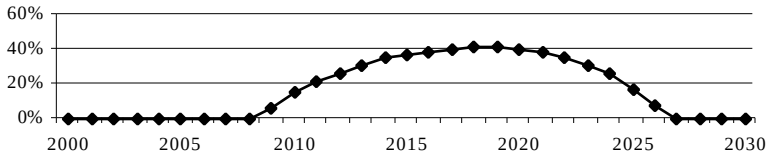


Figure 7: Shifting Investment Choices to Social Security
(Minimal non-Treasury investments)

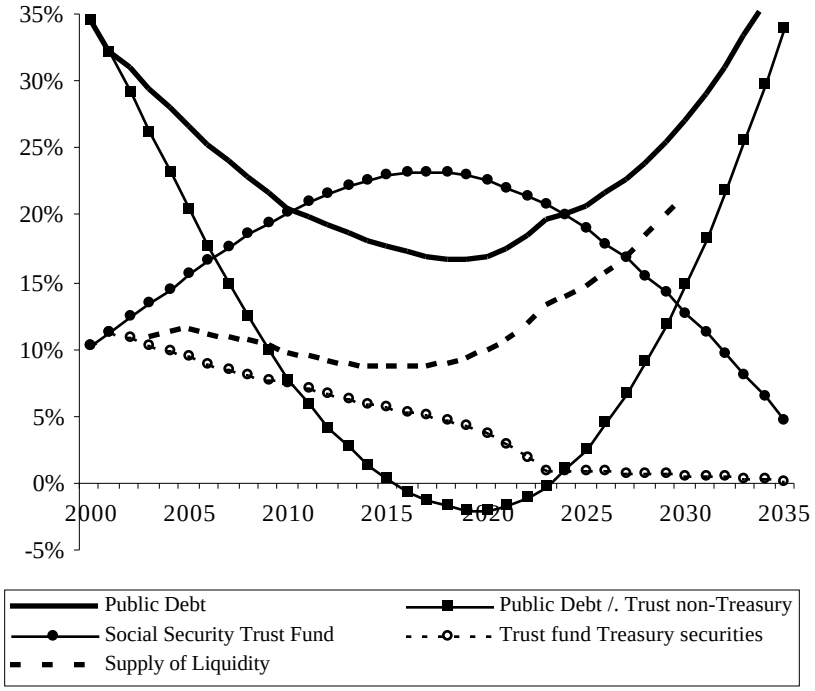


Memo: Share of Trust Fund in Non-Treasury Assets

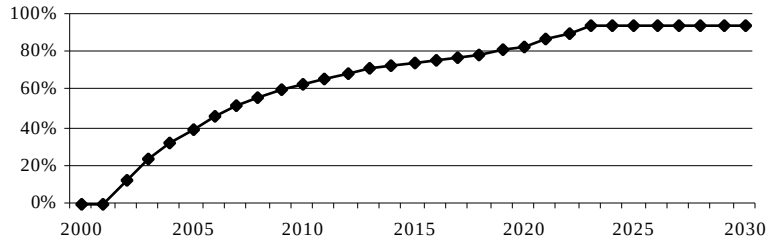


Notes: The projections use the same assumptions as Figure 4, except that part of the social security trust funds is invested non-Treasury securities, the minimal amount needed to avoid uncommitted funds at Treasury and Fed.

Figure 8: Supplying liquidity to the Treasury market by managing the social security trust fund like a pension fund

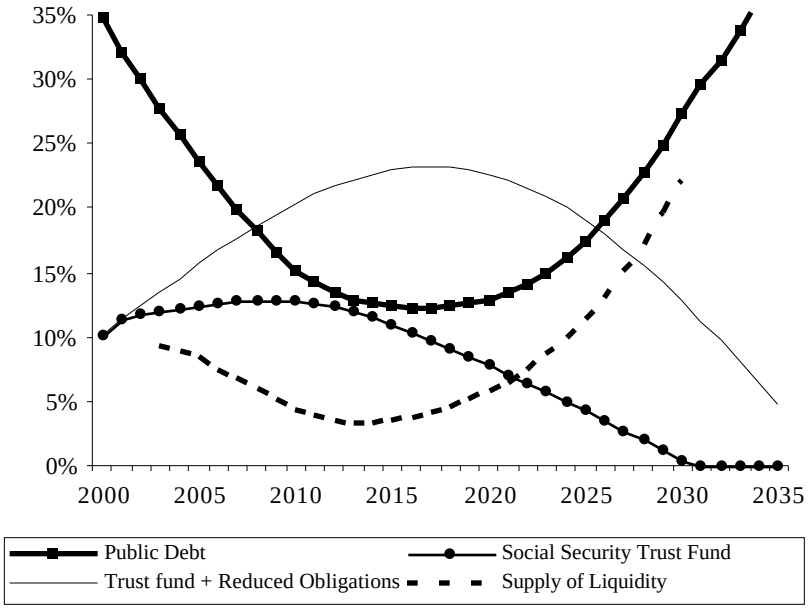


Memo: Share of Trust Fund in Non-Treasury Assets



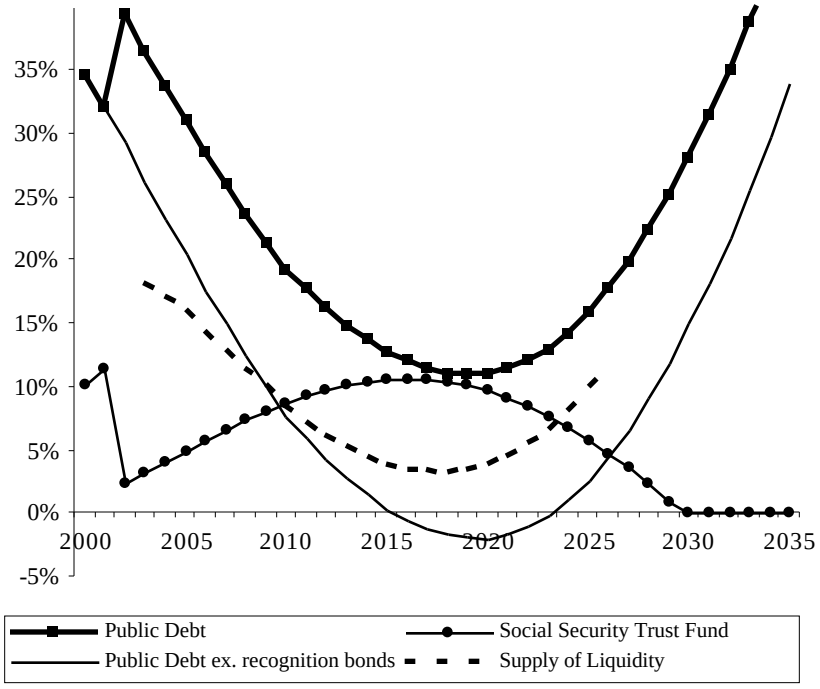
Notes: The projections use the same assumptions as Figure 4, except that all social security surpluses are invested in non-Treasury assets until the Treasury share has fallen to 5%, here projected for 2023.

Figure 9: Avoiding Uncommitted Funds by partially privatizing Social Security
(Private accounts contribution = 2% of payroll)



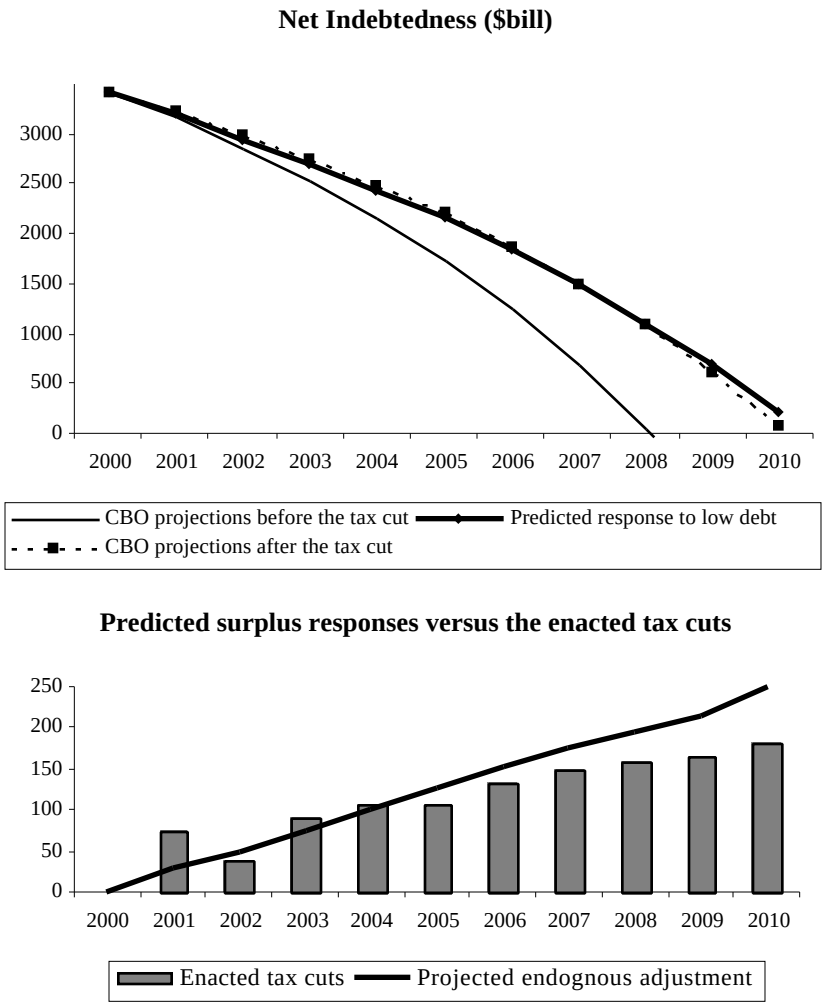
Notes: The projections use the same assumptions as Figure 4, except that payroll taxes equal to 2% of payrolls are placed in private accounts. This reduces trust fund accumulation and maintains a higher public debt. Traditional benefits are reduced equally in present value, as highlighted by the "trust fund + reduced obligations" line, which matches the trust fund trajectory of Figure 4.

Figure 10: Down-sizing social security with recognition bonds (Feldstein-type proposal)



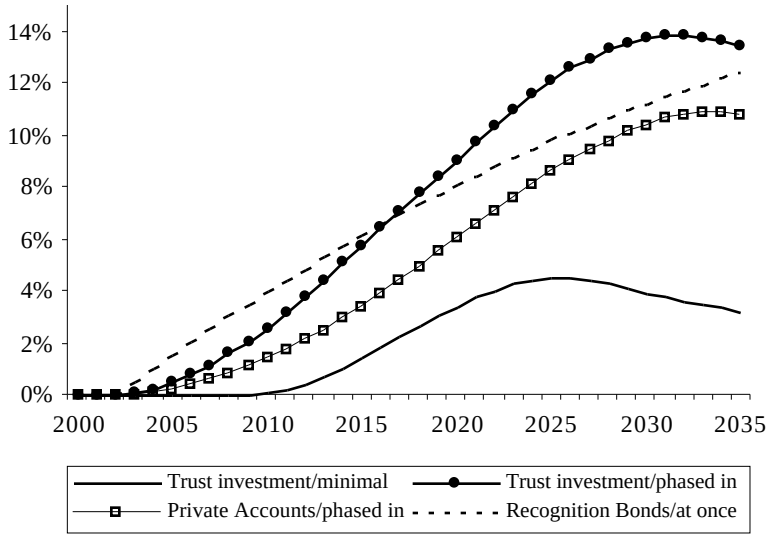
Notes: The projections use assumptions as in Figure 4, except that social security is scaled down by 10% in exchange for recognition bonds that are added to the public debt.

Figure 11: Endogenous responses to low debt: the 2001 tax cut



Notes: Baseline with tax cut: from CBO (2001a). With tax cut as enacted: from CBO (2001b), budget projections updated for Public Law 107-16. With endogenous policy response: response implied by Bohn (1998) added to the baseline.

Figure 12: The impact of debt management on net debt when taxes and spending are endogenous



Notes: Percentage values indicate the reductions in government net debt over time implied by endogenous tax and spending responses to the various policy options, all measured in percent of GDP.