Deferred Taxes in the Public Finances
Michael J. Boskin
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ABSTRACT

The value of deferred taxes already accrued and likely to accrue in tax-deferred saving vehicles such as IRAs, 401(k)s, and DB plans is at the core of numerous analytical, empirical and policy issues in macroeconomics and public finance. These include such issues as the reach and efficacy of the saving incentives in the income tax; the effects of the national debt; forecasts of future income tax revenue, deficits and debt; the wealth effect on private consumption; the adequacy of retirement saving; and the state of the government's balance sheet. Surprisingly, and in marked contrast to data on government liabilities, virtually no information on deferred taxes beyond historical short-run flows is available anywhere, in any form.

This paper builds a simple model of the various (positive and negative) revenue effects of deferred taxes and, together with data from numerous sources, develops estimates of the deferred taxes already accrued and likely to accrue in the future under alternative assumptions about impacts on personal saving, budgetary responses to changes in revenues, capital formation effects of changes in national saving, contribution rates, rates of return on assets, inflation, age of withdrawal, discount rates, tax rates, management fees, etc. Generally conservative assumptions imply that 1) the deferred tax vehicles have already recouped foregone revenue and interest costs; 2) the deferred taxes already accrued in tax-deferred saving vehicles amounted to about $3 trillion at the start of 2003, about equal to the privately held national debt; 3) the real present value of the net budgetary impact of future deferred taxes is likely to amount to an additional five to ten trillion dollars, more than the actuarial deficit in Social Security and Medicare; 4) withdrawals from tax-deferred accounts will increase so dramatically relative to wages and salaries in coming decades that, cet. par., government forecasts of projected deficits are seriously overstated; 5) the deferred taxes add a major new element with a strong interest in lower tax rates, at least on their withdrawals, to the future political economy of budget policy.

Michael J. Boskin
Economics Department and Hoover Institution
Stanford University
Stanford, CA 94305-6010
Tel: 650-723-6482
Fax: 650-723-6494
boskin@hoover.stanford.edu

Introduction

There are many reasons to be interested in the value of deferred taxes already accrued in tax-deferred saving vehicles and likely to accrue in the future. Indeed, deferred taxes are at the core of numerous analytical, empirical and policy issues in macroeconomics and public finance. Analyzing the economic effects of government debt, deferred taxes lie at the heart of the matter. Estimating the effects of changes in private wealth on consumption, deferred taxes are a sizeable part of the story. Evaluating the reach and success of personal saving incentives in the income tax, deferred taxes are center stage. Forecasting future income tax revenues, deferred taxes are of rapidly growing importance. Measuring the sectoral composition of the nation's wealth and/or the government's balance sheet, deferred taxes are among the largest items. Debating intergenerational equity, the adequacy of retirement savings, the unfunded liabilities in social security, the sustainability of the fiscal program or the size of long-run fiscal gaps, government investment in equities, fiscal history and/or the political economy of social security reform, deferred taxes are essential to an accurate conceptual and empirical framework for the debate. So it is surprising, perhaps disconcerting, that virtually no information on deferred taxes beyond short-run historical flows is currently available in any form, anywhere. Not in the Fed's Flow of Funds sectoral balance sheets. Not in

Treasury Financial Statements of the U.S. Government. Not in OMB's Analytical Perspectives on the Budget. Not in academic research[1].

This stands in marked contrast to the substantial information on Federal government liabilities. The Treasury and OMB are redoubling their considerable previous efforts to improve the federal government's accounting systems, both conceptually and practically. Historically, the two most glaring problems have been the lack of accrual accounting and capital budgeting. While good progress is being made on the liability side[2], the asset side has received comparatively little attention[3].

Looking at one topic in more detail, the economic effect of the taxation of saving is a subject with a long and rich tradition in analytical and empirical public finance; it often takes center stage in tax policy debates. Numerous studies attempt to evaluate the effect of tax deferral in vehicles such as individual retirement accounts (IRAs) and 401(k)s on personal and national saving (see Poterba, Venti and Wise [2000], Gale and Scholz [1994], Feldstein [1995], for example). The welfare theoretic issues surrounding the taxation of saving and the debate over whether the appropriate base is consumption or income are

[1] An exception is the short-run IRA projection in Sabelhaus (2000).
[2] Indeed, the move to accrual accounting for future liabilities is gathering momentum. For example, starting in 2003, the Defense Department will be required to move to an accrual basis for health care costs for Medicare-eligible retirees. The President's FY2003 budget proposes to extend accrual budgeting to all military retirees' health care and to civil service retirement benefits government-wide.
[3] An important exception is in the discussion of government investment and the government's balance sheet in the *Analytical Perspectives* supplement to the *Budget of the United States*. See also Boskin, et al. (1985); Boskin, et al. (1989).

likewise extensive (e.g., Saez [2001], Judd [1985], Chamley [1986]). Far less appreciated is the important role played by accrued deferred taxes owed by private households to the Federal Treasury (also, to state and local governments) in the balance sheets of both private households and the federal government. The combination of the natural maturation of tax-deferred saving vehicles introduced and/or expanded in the 1980s and '90s, combined with (despite the past three years) strong market returns, renders the value of already accrued deferred taxes about $3 trillion, on par with the national debt held outside the government.

Roughly $400 billion a year is contributed to various tax-deferred saving vehicles, and the amount is likely to grow with nominal income growth and the increased limits on tax-deferred contributions recently passed into law. Immense additional future deferred taxes, larger than the long-run actuarial deficits in Social Security and Medicare, will accrue on these new contributions and their nominal returns plus the future returns on already accumulated balances. Of course, there will be large revenue losses from the tax deductible contributions, and from income that would have been taxable on any saving that is shifted to tax-deferred accounts, as well as interest on any additional debt. Taxes on the withdrawals will be supplemented by taxes on any interest paid on additional debt and by business taxes on the income from additional capital generated from the change in national saving.

In sharp contrast to the extensive literature on deferred taxes for private firms in the accounting literature, very little such information exists for the public sector. Further, it is possible that taxes on future withdrawals from these accounts have been underestimated in the typical ten-year budget window because the tax-deferred saving, which will be taxed at withdrawal as ordinary income, is growing rapidly relative to other sources of income. It is certain that deferred taxes are greatly understated in long-run government budget analyses and academic studies that rely on them.

The so-called tax expenditure of the foregone taxes on the tax-deductible contributions has in essence been reinvested on behalf of the government by the private sector and has, historically, earned impressive returns[4]. The government has directly participated as a silent partner in the strong market returns earned on these tax-deferred accounts. Indeed, the present value of taxes net of the foregone revenue may well be positive, especially if account is taken of corporate tax revenue[5]. Four of the fifteen largest so-called tax expenditures are for deferred-tax vehicles: 401ks, employer plans, saving in life insurance and IRAs. Just these four are estimated to total more than $150b in FY2003, and more than $800b in the five years FY2003-7[6].

Finally, the sheer size of the accumulated balances and numbers of affected households will add a third side to the future political economy of budget

[4] For a critique of the tax expenditure budget, see Sitiglitz and Boskin (1977).
[5] See Dusseault and Skinner (2000) and Feldstein (1995).
[6] Budget of the United States Government FY2003, Analytical Perspectives

policy. In addition to the retirees pressing higher taxes on younger workers and younger workers resisting, a large percentage of future retirees will have a strong stake in the lowest possible tax rates on their withdrawals. This could manifest itself in greatly increased support for tax reform that lowers rates or retrospectively indexes the definition of income, as well as more narrowly focused relief from the taxes on the withdrawals. Indeed, while concern with inflation indexing the tax code has waned in recent years, due both to the indexing of tax brackets and lower overall inflation, the cumulative effect over a long period of time of even modest inflation leads to an immense tax paid on purely inflationary returns, quantitatively larger than the inflation tax problems of the 1970s. Of course, contributions were deducted so there was no standard double taxation of saving distortion.

This paper proceeds as follows: Section 2 briefly discusses deferred taxes in theory and practice. To set concepts and magnitudes, we start with a discussion of the national debt – in principle, the negative of deferred taxes owed to the government. We then turn to how deferred taxes are estimated and incorporated into the public finances in practice. What are the effects of these vehicles on government revenue and national saving? Finally, where, if at all, do they show up on the nation's and the federal government's balance sheets? In budget forecasting?

Section 3 presents a simple partial equilibrium model of the several life-cycle budget effects of deferred taxes and their implications for the present value of taxes, the evolution of the national debt, national saving and capital formation.

Section 4 presents estimates of accrued accumulated balances in tax-deferred accounts, an estimate of the effective weighted average marginal tax rate on future withdrawals, and an estimate of the already-accrued deferred taxes due the federal government. The already accrued deferred taxes amount to about $3 trillion, roughly on par with the national debt held outside the government.

Section 5 presents base case estimates of the several flows of taxes, foregone revenue and interest and of their expected present value. Separate historical estimates reveal the deferred accounts imminently reaching “break-even”, and then turning progressively into large net revenue generators. Using conservative base-case assumptions, the expected present value of future net deferred taxes amounts to fourteen trillion dollars, larger than the sum of the 75-year actuarial deficits in Social Security and Medicare plus the national debt.

Section 6 presents a sensitivity analysis of the results to variations in several of the important assumptions: future rates of return, management fees, discount rates, the diversion effects on other saving, fiscal reactions, the effects of changes in national saving on domestic capital formation, retirement ages and

future tax rates. It also provides a brief perspective on the effect of random returns on the results. While of course each of these assumptions matters, the basic conclusion is that these effects are quite large even under the most conservative assumptions, and massive under less conservative assumptions.

Section 7 briefly discusses estimates the various flows of taxes and interest under traditional government budget projections and methodology. Because the balances are large and growing, reflecting the run-up in the markets, demography and the maturation of tax-deferred vehicles introduced in the 1980s, the taxes on withdrawals are large and important, and unlikely to follow the same relationship to personal income as taxes on withdrawals from these accounts displayed in the 1980s and 1990s. Hence, to the extent that short-run forecasted future taxes do not yet fully account separately for these withdrawals and their independent evolution, they may be underestimated. Since longer-run budget analyses do not deal with this issue at all, they are certainly seriously underestimating future revenue, cet. par. We discuss the several life-cycle budget effects of tax-deferred saving vehicles and their implications for the present value of taxes, national saving, the evolution of the national debt and the size of projected future fiscal gaps.

Section 8 briefly discusses the political economy of deferred taxes, especially the likely future pressure to reduce tax rates or retrospectively index the definition of income. For example, about $1 trillion of taxes is owed on purely

inflationary balances and, even at modest inflation rates, perhaps another $1 trillion or so in expected present value of taxes on inflationary income will be paid on future contributions and returns. We also perform a sensitivity analysis to alternative future inflation rates. The economist's perspective that the contributions were deducted and that this consumption tax treatment is equivalent (under certain assumptions) to exempting the yield may be uphill sledding, given the stakes. The huge flows of deferred taxes will create a third dimension to the intergenerational pressures on taxes and entitlement benefits: a growing group of elderly pressing for lower taxes, at least on their withdrawals.

Section 9 offers a brief summary and conclusion.

Section 2. Deferred taxes, the national debt, the unfunded liabilities in Social Security, and the nation's balance sheet.

There are many reasons to be interested in an estimate of the value of deferred taxes already accrued in tax-deferred accounts and likely to accrue in the future. Such an estimate is interesting in its own right, as a reflection of the size, breadth and efficacy of the set of tax-deferred retirement saving mechanisms, and also because it forms a large and important piece of several much larger pictures. First, deferred taxes are an important part of an accurate measure of the sectoral composition of the nation's wealth. Second, measures of private wealth which form the foundation of virtually all modern theories of

household behavior, in particular of consumption, clearly require a netting of deferred taxes owed or at least some indication of the likely differential taxation of various assets. The wealth effect on consumption is unlikely to be invariant to large swings in tax liabilities on the wealth[7]. Third, measures of the government's assets and liabilities typically have focused almost exclusively on the federal government's explicit debt. History – the saving and loan debacle in the U.S. – and current events – the Japanese banking crisis -- remind us that governments also have potential and contingent liabilities. Recent analyses and policy debates focus on the likely large unfunded future liabilities in Social Security and Medicare. But the national debt held by the public has been the primary focus of attention.

From the standpoint of the nation's balance sheet, which consolidates households and governments, it is irrelevant where the deferred taxes show up in the sectoral accounts. But for analyzing the decision making of private households, e.g, with respect to consumption, and for understanding the context of the public policy debates on debt and Social Security, it can make a big difference whether the deferred taxes are properly recognized[8]. Consider, for example, the debate over the economic effects of the national debt. I discuss the debt both to help set concepts and to indicate its quantitative importance as a preamble to the volume of already-accrued deferred tax assets of the federal

[7] Indeed, the apparent differential wealth effect on consumption from equity and housing price changes may be partly a reflection of differential tax treatment. Much of the former is in tax deferred vehicles and will eventually be taxed at ordinary income rates, whereas the latter will be taxed as capital gains, with tax-free rollovers, large exemptions and stepped up basis at death.
[8] Unless the strong ultrarationality law (Bailey [1962], Barro [1975]) holds.

government. The current data on the federal government's debt are presented in Figure 2.1. As can be seen as of mid-2002, the gross debt of $6.1 trillion greatly exceeds the debt held by the public of $3.4 trillion, the $2.7 trillion difference being held by government accounts, especially Social Security; the FED holds an additional $0.6 trillion; private ownership of the debt is $2.8 trillion[9]. Also, as Figure 2.2 shows, the fraction of the debt held internally has declined over time to about two-thirds. The distinction between internal and external debt is a non-trivial one, but I will not focus on it here[10].

For several years, policy disputes in Washington revolved around how rapidly the national debt should be paid off. After several years of sizeable surpluses, the return to deficits in wartime and recession has refocused attention on the level and evolution of the debt.

To set concepts, suppose the federal government issues net additional debt of *dD* to finance government consumption expenditures. It then commits to pay interest at rate r to service the debt, or *rdD* per period, usually assumed to

[9] While netting out the FED's holdings of government debt yields a more appropriate measure for our purposes, I generally will follow convention and make comparisons to the more widely quoted debt held by the public.

[10] Diamond (1965) carefully re-examines the burden of government debt, explicitly accounting for taxes to finance future interest payments. When the change in output arising from changes in the capital stock is explicitly incorporated, the taxes needed to finance the interest payments to service the external or internal debt directly reduce the lifetime consumption of households; they also reduce saving and therefore the capital stock. Internal debt also further reduces the capital stock due to a substitution of government debt for physical capital in individual portfolios. Thus, Diamond concludes, in the long run, internal debt causes an even larger decline in steady-state utility than external debt.

Figure 2.1

Holding of the National Debt as of 09/30/2002

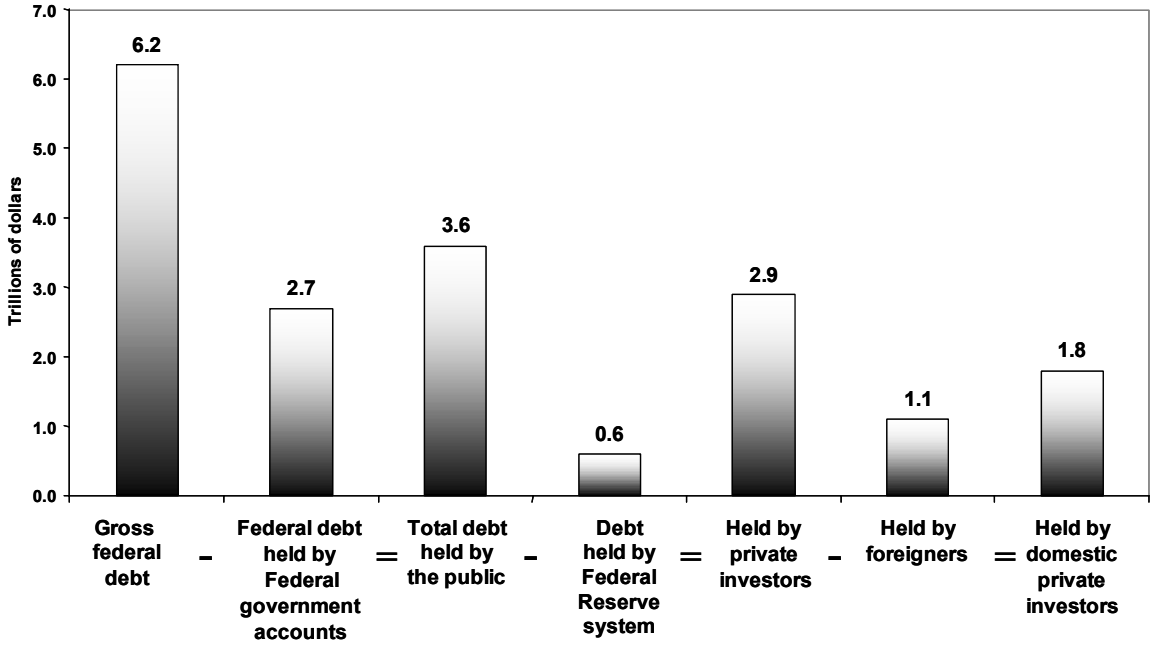
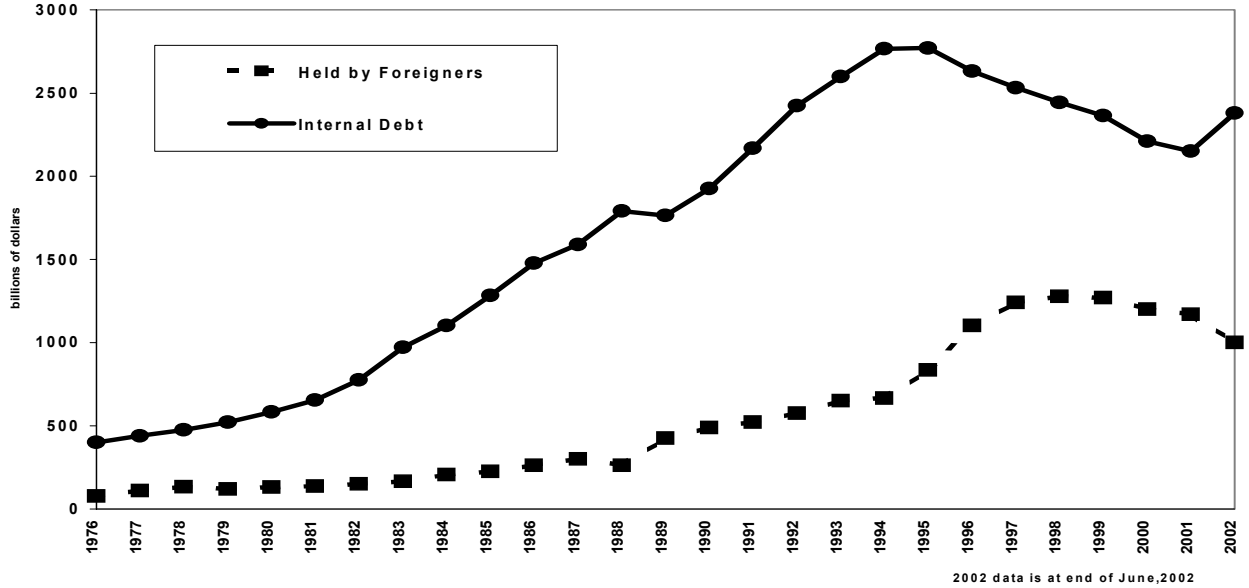


Figure 2.2

National Debt: Internal vs. External



be paid out of future taxes[11]. If the debt is continually rolled over, the discounted present value of the future interest payments is *rdD/r* or *dD*, the same as the original debt issuance. Thus, for the debt plus future interest service/taxes to affect private behavior, the financing activity must enable (at least some) private households or firms to do something differently than they were already doing, e.g., bear risk, achieve greater liquidity, etc.

Early analyses of the economic effects of the national debt (Modigliani [1961], Mundell [1971], Tobin [1971]) focused on the likelihood that the government's issuing bonds somehow created net wealth for households, e.g., households ignored or differentially discounted the future taxes necessary to finance interest payments and possible repayment of principal. This, of course, was famously challenged by Barro (1975), who emphasized that the future tax liabilities of households linked intergenerationally by operative bequests would cause the bequests to adjust, to account for the debt left to future generations. The dominant view in the Washington policy community, however, remains Modigliani's conclusion that the debt (viewed as a new source of wealth by households, which leads them to increase their consumption) drives up interest rates and crowds out capital formation. It is the lower income from this reduced rate of capital formation that is the long-run burden of the debt. However, evidence linking government debt to interest rates is weak (Elmendorf and Mankiw [1998]).

[11] Of course, the substitution of debt for tax finance might also affect government spending and/or its composition between consumption and investment.

The standard analysis of the long-run effect of the debt on output and consumption assumes that each dollar of debt crowds out a dollar of physical capital formation. This is an even more unrealistic assumption in an open economy. Nevertheless, given the debt/GDP ratio, the productivity of capital and the capital-output ratio, this implies that eliminating the current national debt would in the long run increase national income about 3%. Of course, the long-run gain to future living standards is offset by short-run losses in disposable income and consumption. The net effect is modest. For comparisons to the welfare gains from eliminating capital income taxes, eliminating inflation, dampening business cycles, at least under a consistent set of assumptions, etc., see Lucas (1990).

Clearly, at the heart of all these analyses is paying careful attention to future flows of taxes as well as debt. It is not my purpose here to shed any new light on the debate over the debt neutrality hypothesis, although, in its strongest version, the Ricardian equivalence neutrality hypothesis implies that consumption is independent of the age-distribution of resources, a conclusion which Larry Kotlikoff and I rejected some time ago (Boskin and Kotlikoff [1985]). Indeed the extreme implications were developed, rejected and caricatured by Bagwell and Bernheim (1988). My point is only that, if we are interested in the debates over the national debt, whether analytical or policy, we have to draw some conclusion about likely future tax liabilities. It would be inconsistent to be concerned about

possible future tax liabilities households must pay to service the debt but to ignore larger sums which were already accrued and accruing as deferred taxes owed the government in retirement saving accounts that were generally ignored in long-run budget forecasts and macroeconomic analyses. Obviously, the starting point for discussing the impact of these fiscal decisions would require an accurate view of the net assets and liabilities, including deferred taxes already accrued and likely future taxes, including those resulting from any change in the national debt and interest outlays.

Many households are forward looking and not particularly liquidity-constrained. Their consumption will depend in part on expected future taxes, and only unexpected changes in debt or deferred taxes will alter their behavior because the expected portion was already incorporated into their decisions (see the classic paper by Hall [1978]). Thus, it may well be that household behavior already reflects an estimate of future taxes that will be paid on retirement accounts and/or some notion of taxes that will finance interest payments on the debt. One might argue that to get the macroeconomics right would require an accurate measure of accrued deferred taxes, or more generally, assets as well as liabilities. One could then test whether the net asset data contain all the relevant information or, given differences in risk, liquidity, political risk, etc., the separate effects of (separate, current and expected future) government liabilities and assets must be estimated.

Partly because the different tax-deferral vehicles have different historical antecedents, legislative origins and oversight, data on them are not easy to come by. This is perhaps one reason why the Federal Reserve's important national balance sheet information in the Flow of Funds does not carry accrued deferred taxes owed to the government in tax-deferred accounts as part of the government's assets, but rather leaves the gross of tax values in the household sector. The fact that the Federal Reserve does not separate them out in the balance sheets in the Flow of Funds reflects the general lack of knowledge of the extent and importance of these deferred taxes in public economics and macroeconomics.[12]

It is, of course, well known that federal budget concepts can be seriously misleading under certain circumstances. The federal government budget is primarily on a cash basis; there is little accrual accounting. Important federal tangible assets and their depreciation are ignored (Boskin, et al. [1989]), as are the vast amounts of federal government land and mineral rights (Boskin [1985]). Similar points have also been made on intangibles by Eisner (1985). An important and influential approach to reducing some of the arbitrary nature of

[12] Indeed, the contrast with the private sector's accounting literature is remarkable. A typical intermediate accounting textbook (Kieso and Weygandt [1998]) contains six separate references in its index to deferred tax assets, benefits, consequences, disclosure requirements, financial statement presentation, expenses, and liabilities, covering sixteen pages of text. Neither typical public finance textbooks nor the influential *Handbook of Public Economics* (Auerbach and Feldstein [1983]) contains any such reference although the taxation of saving is heavily emphasized. Nor does it contain a paper on the national debt, perhaps because Elmindorf and Mankiw (1998) is in the *Handbook of Macroeconomics*. Many of these issues, analogous to those raised by an unfunded Social Security system, are, however, discussed in a chapter in (Feldstein and Liebman [2002]) Vol. 4 of *The Handbook of Public Economics*.

current budget concepts – at the cost of additional assumptions -- is generational accounting (Auerbach, Gokhale and Kotlikoff [1994]). Recently, Bradford (2001) suggests ways to improve the information content in federal budget reporting.

Of course, the federal government can and should do lots of things that private households and firms do not; an exact analogy in federal government accounting to generally accepted accounting principles for the private sector may well be impossible, but progress can be made. Certainly, account could be taken of already legally accrued liabilities of the household sector and assets of the government. Though it is perhaps a fine point, these are at least somewhat different from potential and contingent liabilities. Indeed, I like to think in terms of a continuum of assets and liabilities, from tangible already accrued through contingent and potential, which differ somewhat in the economic, demographic and/or political events required for them to eventuate.

To help drive home the concept of the flow of future taxes from tax-deferred accounts, we can conceive of a new financial instrument, issued by or on behalf of the federal government, in analogy with mortgage-backed securities, which is backed by the revenues from the deferred taxes[13]. The Deferred Tax Backed (DTB) Securities could be sold in the domestic capital market and abroad. The proceeds could be used for various purposes, including, as will be

[13]I leave aside the issue of the commitment of the government to the holders of these securities once the government has monetized the value of its asset; there may be a fear that the government would change its tax laws and let the taxpayers off the hook, sticking the holders of the security with a sharply devalued asset.

seen by the estimates in the next section, to retire the explicit national debt. I am not proposing that the federal government do this, but the concept helps to place the discussion of the national debt and the unfunded liabilities in Social Security in perspective.

Before turning to some estimates of already accrued and likely future deferred taxes, it will be useful to discuss the impact of contributions to, and accumulations in, deferred tax vehicles on private and national saving. For household i, the nominal assets A_{ti} at time t are equal to last period's assets $A_{t-1,i}$ plus contributions C_{ti} plus nominal (real plus inflation) returns ($r_{ti} + \pi_t$) on assets minus withdrawals W_{ti} :

(2.1) $A_{ti} = A_{t-1,i}\,(1+r_{ti} + \pi_t) + C_{ti} - W_{ti}$.

Let μ_{tci} and μ_{twi} be the marginal tax rates at which contributions are deducted and withdrawals are taxed as ordinary income, respectively. Thus, in year t, the direct effect of the contributions and withdrawals is a foregone revenue of $\sum_i \mu_{twi} C_{ti}$ and income tax revenue of $\sum_i \mu_{twi} W_{ti}$. For any given person or cohort, of course, the contributions occur in advance of the withdrawals. If that were all there were to future revenue gains and losses, we could simply compare the tax rates and the relative rates of return $r + \pi$ and discount rate δ over the relevant time periods to determine the net effect on the present value of revenue.

Of course, there are several other effects on realized and foregone revenue. These include the taxes that would have been paid on any taxable saving diverted (from old assets or from potential new saving) to the tax-deferred 401(k), IRA, etc. To calculate the foregone revenue, assume diverted taxable saving is a constant fraction α of contributions, C_t (note α excludes the portion of C_t that comes from the tax deduction). Thus, the "outside buildup", A'_t, is given by:

$$(2.2) \quad A'_{ti} = A'_{t-1,i} + A'_{t-1,i}\,(r'_{ti} + \pi_t)(1 - \mu'_{ti}) + \alpha\, C_{ti} - W'_{ti}.$$

The rate of return, the time pattern of withdrawal and the tax rate that would have been paid on the returns to the "outside" buildup all could differ from the corresponding magnitudes for the buildup inside the tax-deferred account. Penalties for early withdrawal from tax-deferred balances could affect withdrawal patterns, possible taxation at other than ordinary income rates in the "outside" account, and possible different asset mix could affect r and μ. For simplicity, assume the withdrawal patterns and rates of return are the same, but the tax rate, μ'_{ti} , on the foregone personal capital income could be different. Then the second component of foregone revenue is given by $\mu'_{ti}\,(r_{ti}+\pi_t)\,A'_{ti}$ for year t. As Feldstein (1995) showed, there is a personal income tax revenue loss in the preretirement years of these two components, then a revenue gain on the withdrawals that must be netted against the second, presumably continuing,

component of foregone revenue in retirement. The sign of the net present value is theoretically ambiguous. If returns are high relative to discount rates, and tax rates are not much lower during retirement, among other factors, the present value could well be positive.

Two additional potential consequences for revenue gains and losses concern corporate (more generally, business) taxes and the need to finance interest on any additional debt associated with short-run revenue losses. First, corporate tax revenue. If the deferred tax vehicles increase national saving, i.e., if they succeed at all in raising personal saving, the additional saving will result in an increase in net foreign investment and domestic investment, with the latter split between the corporate sector, housing, and unincorporated businesses. The additional capital earns income. This results in additional business tax revenue, what we will call the Feldstein effect (Feldstein [1995]).

The usual assumption in simulation exercises (Feldstein [1995]) or historical evaluations (Desseault and Skinner [2000], Hubbard and Skinner [1996]) is that early revenue losses are presumed to result in additional government debt as opposed to an adjustment in spending or other taxes. Because this may be a dubious empirical proposition, we allow for alternatives below. The presumed changes in the national debt consist both of the revenue changes and any changes in interest outlays (net of the taxes on the interest) due to increases or decreases in the debt. The initial foregone revenue from the

tax-deductible contribution, plus foregone income taxes on the return from any diverted saving, will increase the debt and interest outlays. As funds are withdrawn, the revenues will eventually exceed the interest outlays and any continuing foregone revenue, so the debt will be reduced. Whether the long-run net impact on the debt will be positive or negative depends upon a variety of empirical parameters; Feldstein (1995) reports hypothetical simulations and Desseault and Skinner (2000) historical calculations through 1998, suggesting that IRAs eventually reduce the national debt.

It is important to keep track of these several effects, both to assess the net impact of the programs on national saving and to evaluate budget forecasts that may, explicitly or implicitly, exclude or include some but not all of these effects. To a simple model of these effects we now turn.

Section 3. A simple model of the budget effects of deferred taxes.

We now build the simplest model of the full budget effects of deferred taxes. We suppress household-specific notation and deal with aggregates. We begin with the asset accumulation equation:

(3.1) $A_t = A_{t-1}(1+r_t+\pi_t) + C_t - W_t$

which, to repeat, notes the total value of assets, A_t, is just equal to the previous year's total, A_{t-1} plus the nominal returns on last year's balances (positive or negative) $A_{t-1}(r_t+\pi_t)$, plus contributions C_t, less withdrawals W_t.

A similar equation defines the hypothetical "outside buildup", A'_t, from any diverted saving:

(3.2) $$A'_t = A'_{t-1} + A'_{t-1}(r'_t + \pi_t)(1-\mu'_t) + \alpha C_t - W'_t$$

as equal to last year's balance plus the nominal after-tax returns that would have been earned on last year's balances, $A'(r'_t + \pi_t)(1-\mu'_t)$, where μ'_t is the tax rate that would have applied to such returns, plus the amount of contributions that were diverted, the fraction α times C_t, less withdrawals, W'_t.

As the model is partial equilibrium, we do not endogenously determine real returns $(r_t \text{ or } r'_t)$ or inflation (π_t). In principle, of course, it would be desirable to embed this analysis in a computable general equilibrium model with factor supplies and demands determining returns to capital, wage rates, and the evolution of national income and thus income taxes. Such a model would raise all the issues of the appropriate specification of preferences and technology and proper calibrations to real data. The major issue for the analysis conducted here would likely be the supply of capital (domestic and international) to the economy.

Alternative specifications presented in Section 6 partially account for this possibility. In any event, it is unlikely the basic conclusion would be significantly altered.

There are five flows of taxes plus interest outlays to determine. First, revenue losses from the tax-deductible contributions are determined by

(3.3) $T_{1t} = \mu_{tc} C_t$,

where μ_{tc} is the marginal tax rate at which contributions are deducted.

The foregone revenue from diverted saving is determined by

(3.4) $T_{2t} = \mu'_t A'_{t-1} (r'_t + \pi)$.

Note μ'_t may well differ from μ_{tc}. Also note that $\mu'(r' + \pi)$ and α generally being small fractions implies that T_2 is likely to be modest. Of course, this foregone revenue continues, whereas each contribution is only deducted once, so the present value of the revenue loss on the diverted saving from any year should be compared to the revenue loss from the original deduction of the contribution. For example, a $2000 contribution would save $500 to the contributor, and lose $500 in revenue for the government, at a 25% tax rate. If α = .25, i.e. one quarter of

the contribution came from diverted saving, and $r_t'+\pi$ were 8%, the foregone taxable income would be $40; at a 25% tax rate, this amounts to $10 per year of revenue, a capital value of $125, one quarter of the revenue loss from the deductible contribution.

Next, as the government loses revenue early in the life cycle of deferred tax programs, additional government debt may ensue, necessitating additional interest payments:

(3.5) $I_t = i_t \sum_t \Delta D_t$,

where i_t is the interest rate paid (or received) by the government and ΔD_t is the change in the level of the debt (see below). Note that it is possible for the cumulative change in the debt to turn negative, into a surplus, in which case $I_t < 0$, i.e., interest receipts.

There are three sources of positive revenue flows for the government from deferred-tax accounts. First, and quantitatively most important, are the taxes on withdrawals, which are taxed as ordinary income:

(3.6) $T_{3t} = \mu_{wt} W_t$,

where μ_{wt} is the marginal tax rate on withdrawals.

Next, federal interest payments on government debt are taxable to taxpaying investors. Thus,

(3.7) $T_{4t} = \mu_{it}\, i_t \sum_t \Delta D_t,$

where μ_{it} is the marginal tax rate on interest reflecting the distribution of interest receipts by tax brackets as well as the percentage received by taxpaying entities. Because about 30% of federal interest payments goes to non-taxpaying entities, a plausible starting value for μ_{it} would be about 20%. Of course, i_t is the interest rate (a weighted average across maturities) paid on government debt .

The final revenue flow is the incremental business taxes from the larger capital stock resulting from the increased national saving:

(3.8) $T_{5t} = \mu_{bt}\, (r_{bt} + \pi_\tau) \sum_t \Delta K_t,$

where μ_{bt} is the marginal business tax rate (a weighted average of the corporate rate and the tax rate on unincorporated business and real estate), r_{bt} is the real return, gross of personal tax, to business investment and ΔK_t is the change in the capital stock.

The cumulative change in the debt resulting from these effects, D_t, is given by:

(3.9) $D_t = D_{t-1} + \Delta D_t = \sum_t \Delta D_t,$

i.e., last year's cumulative debt change plus the change during the current year or the sum of all previous changes in the debt plus the change in the current year. To repeat, at some *t*, it is possible $D_t < 0$, a cumulative surplus.

The five tax flows plus interest outlays defined in equations (3.3) – (3.8) cause a change in the budget position which must result in an equal change among other taxes, spending and government debt. Because current deficits may result in some future pressure to raise taxes or cut spending, and surpluses the opposite, the net effect on the debt may not be dollar for dollar. We allow for this possibility by making the change in the debt, ΔD_t, a fraction β of these net effects:

(3.10) $\Delta D_t = \beta(T_1 + T_2 + I_t - T_3 - T_4 - T_5),$

where $0 \leq \beta \leq 1$. The case of $\beta = 1$ is the case usually modeled (Desseault and Skinner [2000]; Feldstein [1995]), although the recent fiscal history would appear to imply $\beta<1$. The modeling below assumes that when $\beta<1$, tax and spending effects will fall on consumption. To the extent tax changes affect saving and investment, and hence future revenue, these effects should also in principle be

included. Finally, some government spending is for investment purposes, some of which will affect private investment and hence business tax revenue. These additional effects are not modeled here, but can be important.

If some fraction of the contributions is net new saving, i.e., foregone consumption as opposed to diverted saving or tax savings, the direct effect of deferred taxes is to raise national saving. However, the extra personal saving must be netted against any change in government saving, equal to but opposite in sign to the change in the national debt, to obtain the change in national saving:

(3.11) $\Delta NS = \Delta PS - \Delta D_t$.

Of course, the Ricardian equivalence (e.g., Barro [1975]) hypothesis argues that, for ΔD_t resulting from tax changes at a given level of expenditure, ΔPS would respond, in the extreme dollar for dollar. We do not separately model this potential effect here, but do discuss it in the results of Section 6 for alternative parameter values. Recall also the discussion in Section 2.

The change in personal saving is just the portion of contributions that does not come from diverted saving:

(3.12) $\Delta PS_t = (1 - \alpha_t)C_t$.

While numerous factors may influence the personal saving effect of the deferred tax vehicles, e.g., the responsiveness of saving to the rate of return, we subsume all these effects in estimates of λ (see below) and α.

The change in national saving will result in an equal change in the combination of domestic investment and investment abroad. Defining the change in the capital stock, ΔK_t, as:

(3.13) $\Delta K_t = \gamma [(1-\alpha) C_t - \Delta D_t]$,

where γ is the fraction of the change in national saving that is invested domestically.

The additional capital accumulates according to:

(3.14) $K_t = \Delta K_t + (1-\rho) K_{t-1}$

where ρ is the depreciation rate, calibrated to be consistent with NIPA data.

Contributions are determined as a fraction λ of wages and salaries (Y_{Lt}):

(3.15) $C_t = \lambda Y_{Lt}$,

although we do use actual historical data. Wages and salaries are exogenously determined. In this study we use the intermediate projections of the Social Security actuaries (Social Security Administration [2002]).

Finally, withdrawals are demographically driven, i.e., determined by age/retirement patterns and previous accumulation:

(3.16) $W_t = f(A_{t-1}. R_t)$

Thus, at any point in time *t*, including at the start of the programs, some fraction of wages and salaries is contributed, some other saving shifted and revenue is lost from the tax deduction. This starts, or adds to, the two asset accumulation processes, the debt accumulation and capital formation. Given exogenously determined demography, rates of return, inflation and tax rates, equations (3.1) – (3.16) determine the evolution of the effects of the deferred tax vehicles.

Before turning to estimates of the full (historical and projected) system, a simpler, partial calculation is useful and instructive. We can get a very rough idea of what has already accrued in the system by examining the current balances in tax-deferred accounts. Since the largest component of revenue loss has already occurred – the historical tax deductible contributions – and is in the data already, the taxes on withdrawals are likely to dwarf all the other remaining

effects on already-accumulated balances. So as a partial preliminary insight, we turn to such an estimate.

Section 4. Already-accrued tax balances in tax-deferred accounts.

Numerous tax-deferred saving vehicles, each with its own history, legal requirements, and reporting venues, now exist in the United States. There appears to be no official public data source that accumulates all the information on them in one place. These vehicles include federal and state and local pension funds, traditional private pension funds, some life insurance products, individual retirement accounts (IRAs), 401(k)s, 403(b)s, Keoghs, etc. The rapid growth of the tax-deferred saving vehicles is well known, even if there is no simple, direct official data series available on them in the aggregate. Poterba, Venti and Wise (2001) report valuable estimates of the accumulated balances in these accounts which, with minor modification, are reproduced and updated in Table 4.I. As of the end of the year 2001, the estimate of the accumulated balances in these accounts was $11.4 trillion dollars, a sizeable fraction of the total value of assets in the United States[14,15]. An aggregate update to the end of 2002 is provided below.

[14] Of course, some of these are ownership of financial assets abroad; and, conversely, some of the securities in U.S. financial markets are owned by foreigners.
[15] We have rechecked these estimated numbers and, with the exception of some minor double counting for Keogh accounts, reconfirmed the estimates, and updated them.

TABLE 4.1

Balances in Tax Deferred Accounts, 1985-2001 ($ billions)

Year	IRA[2]	Total Private Pension Assets[3]	Life Insurance Company[4]	State & Local [5]	Federal [6]	Total
1975		244.3	72.3	104.0	52.2	
1976		275.3	88.7	119.2	57.4	
1977		297.3	103.2	130.9	64.7	
1978		351.3	121.6	152.0	72.4	
1979		413.1	143.5	167.7	80.9	
1980		513.1	172.0	196.6	90.4	
1981		539.2	199.8	222.8	101.0	
1982		669.0	242.9	260.9	113.9	
1983		814.9	281.7	305.4	129.4	
1984		875.1	328.3	350.3	149.0	
1985	234.7	1,226.3	260.4	398.7	190.0	2,310.1
1986	319.2	1,284.1	327.9	476.5	220.6	2,628.3
1987	389.7	1,352.6	348.6	521.7	252.0	2,864.6
1988	451.3	1,407.5	435.5	609.0	286.0	3,189.3
1989	546.0	1,634.3	495.5	752.6	321.7	3,750.1
1990	634.4	1,634.5	569.8	800.6	356.2	3,995.5
1991	773.5	1,939.6	621.2	867.8	395.8	4,597.9
1992	863.6	2,051.4	693.4	960.2	437.0	5,005.6
1993	993.0	2,303.5	775.1	1,051.4	475.5	5,598.5
1994	1,079.4	2,459.8	796.6	1,088.2	514.4	5,938.4
1995	1,352.0	2,923.4	880.6	1,303.3	536.2	6,995.5
1996	1,599.0	3,251.1	953.9	1,494.6	591.9	7,890.5
1997	1,967.0	3,746.5	1,086.1	1,817.1	634.0	9,250.7
1998	2,344.0	4,178.3	1,248.1	2,054.1	676.5	10,501.0
1999	2,536.0	4,630.8	1,431.0	2,226.8	719.0	11,543.6
2000	2,737.0	4,521.6	1,456.1	2,287.8	741.3	11,743.8
2001	2,734.2	4,171.7	1,465.3	2,179.6	803.6	11,354.4
2002p	2,570.3	3,725.2	1,499.6	1,998.7	857.1	10,650.9

Source: Board of Governors of the Federal Reserve, Flow of Funds Accounts, December 2002 and Sabelhaus (2000).

p: Author's preliminary estimates, based on 2002 Q3 FFA data, market return for Q4.

The $11.4 trillion aggregate value at the end of 2001 is comprised of several broad categories. The largest, or $4.1 trillion, over one-third of the total is composed of private pension assets. Individual retirement account assets total

$2.7 trillion; state and local pension assets $2.2 trillion; life insurance company pension fund reserve assets $1.5 trillion, and federal pension assets, $0.8 trillion. It should be noted that federal pension assets have grown the most slowly in recent years, IRAs the most rapidly. The latter has occurred despite the income limits on IRAs. It probably reflects the fact that IRAs are a common recipient of other tax-deferred assets that are rolled over, e.g., upon termination of employment. IRAs now include a non-deductible back-loaded Roth IRA that accumulates tax free, but from which withdrawals are not taxed. In the exercises, below, I do not separate out Roth IRAs. Working in the opposite direction are several other types of deferred tax vehicles in which some taxes or fines will be paid, if not put fully to the targeted use (e.g., college saving).

It is instructive to compare the year-end 2001 data with those for year-end 2000. 2001 was a poor year for stocks—large company stocks yielded a nominal –11.8%. Despite the decline in the stock market, the decline in the nominal value of overall cumulative balances is quite modest, because of the large flow of new contributions (estimated at $405 billion) and the good year for bonds. The stock market ended down even more in 2002, but as the 2001 data demonstrate, it would take a prolonged collapse in stock prices along recent Japanese lines to severely dent the total accumulation and taxes. Despite the stock market ending the year down 20% or so, the good year for bonds plus hefty new contributions offsetting most of the withdrawals leaves the total accumulation somewhat under

$11 trillion. We temporarily use a conservative estimate of $10.6 trillion as of year-end 2002 in the calculations that follow.

We next turn to an estimate of the effective weighted average marginal tax rate on future withdrawals. We start by examining the most recent comprehensive data available – the 1998 *Survey of Consumer Finances* (the 2003 *Survey of Consumer Finances* will be publicly available shortly; it is unlikely the tax rate calculated below will change very much.) We reproduce in Table 4.2 below the estimated balances by age and tax bracket (derived from a mapping from adjusted gross income). If the withdrawals occurred today, many would be pushed into higher tax brackets due to the income from the withdrawals. Also, we have not accounted for real bracket creep since 1998. Of course, at retirement – for many of these people in the distant future – the likely effective marginal tax rate on their withdrawals is quite uncertain. For many, incomes will fall somewhat in retirement, leading to lower tax rates, *cet. par.* Also, the 2001 tax law phases in some modest reductions in tax rates over the next ten years. The alternative minimum tax is projected to apply to many more households in coming years. Real bracket creep will raise rates in the future. It is also well known that there are possible future upward pressures on taxes, given likely long-run financial issues facing Social Security and Medicare. Of course, to the extent these are financed by payroll taxes, not income taxes, they will not directly affect taxes on withdrawals from tax-deferred accounts. The growing political power of the voters paying taxes on their withdrawals might lead to lower tax

rates, either directly or through tax-preferenced withdrawal mechanisms. In any event, we start with the premise that the taxes on future withdrawals will

TABLE 4.2

Balance in Tax Deferred Accounts[1] by Age and Tax Bracket

Tax Rate [2]	Under 23	23 - 32	33 - 42	43 - 52	53 - 62	63 - 72	Over 72	Total
15.0%	0.6	69.6	141.8	287.7	289.6	246.1	72.2	1,107.6
28.0%	0.1	33.3	162.8	175.2	186.2	80.7	16.2	654.5
31.0%	0.0	41.0	209.5	300.3	234.2	146.8	84.3	1,016.1
36.0%	0.0	5.1	73.0	111.5	190.2	118.6	15.1	513.5
39.6%	0.0	1.8	38.9	111.5	222.7	137.3	7.9	520.1
Total	0.6	150.9	625.9	986.2	1,123.0	729.6	195.7	3,811.8

approximate what taxes would be on withdrawals today; alternatives are discussed in Section 6 below.

As can be seen from Table 4.2, the Survey of Consumer Finances provides evidence on about one-third of the deferred tax balances. Partly this is because several tax-deferred vehicles are not expressly categorized. Undoubtedly some SCF respondents provide out-of-date or otherwise inaccurate information; it is well known that asset data tend to be greatly underreported in household surveys. Hence, we must blow up the totals to the national control totals. Whether the under-reporting is roughly consistent across tax brackets

and/or ages, is of course very difficult to tell. Perhaps it varies by type of vehicle[16], which also may be correlated with income and therefore tax rate; also, by age. For example, defined benefit plan assets are not attributed to plan participants. DB plans probably are less likely to be held on behalf of younger workers or those with very high or very low incomes.

But in the first instance I report estimates – see Table 4.3 -- based on the very simple assumption that tax-deferred assets are distributed among age and tax brackets in the same percentages as IRAs, Keoghs and PPAs are distributed in the 1998 SCF. Alternative sensitivity analyses are reported in Section 6.

Simple calculation yields a weighted-average (weighted by balances in each bracket) effective marginal tax rate of 27.7%[17]. This produces total deferred taxes at year-end 2000 of $3.24 trillion, by happenstance almost exactly equal to the publicly held national debt at year-end 2000. Assuming that the slight reduction in taxes was roughly offset by real bracket creep, the total for year-end 2001 would still amount to $3.2 trillion, roughly equal to the debt held by the public[18], and substantially larger when the holdings of the Federal Reserve

[16] We make no attempt to analyze the distribution of deferred taxes by income other than to estimate the weighted average tax rate.
[17] The average for the elderly is slightly lower; for those in peak earnings years, slightly higher.
[18] As the already accrued deferred taxes are like a negative internal national debt, a modern physicist might call them “antibonds”.

TABLE 4.3

Balance in Tax-Deferred Accounts by Age and Tax Bracket

(Billions of 2001 dollars)

Tax Rate [(1)]	Under 25	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	Over 75	Total
15.0%	1.7	207.4	422.3	857.1	862.7	733.0	215.1	3,413.0
28.0%	0.2	99.3	485.0	521.8	554.7	240.4	48.2	2,016.8
31.0%	0.0	122.2	623.9	894.4	697.6	437.3	251.2	3,130.9
36.0%	0.0	15.3	217.3	332.1	566.6	353.4	44.9	1,582.4
39.6%	0.0	5.4	115.7	332.1	663.5	409.0	23.5	1,602.6
Total	1.9	449.5	1,864.3	2,937.6	3,345.1	2,173.2	582.9	11,354.4

Note:

(1) The total ($11,354.4) is total tax-deferred assets from end of year 2001, taken from Table 1.

(2) Apportioned according to the proportions in Table 2. We assume total tax-deferred assets ($11,354.4) are distributed among age and tax brackets the same as PPAs, IRAs, and Keoghs are distributed in the *Survey of Consumer Finance 1998* data.

(3) Total tax-deferred assets, end of 2000: PPAs, Life Insurance Company, State & Local, Federal.

(4) Average marginal tax rate = 0.28636.

are excluded[19]. If the aggregate balance fell to our conservatively estimated $10.3 trillion at year end 2002, consistent with a 20% stock market decline, the total deferred taxes would still amount to about $2.9 trillion, slightly less than the roughly $3.5 trillion debt held by the public, slightly more than the $2.8 trillion national debt held outside the government. Figure 4.1 portrays the time series relationship of accrued taxes on future withdrawals relative to the national debt, both historically and as projected for the next decade.

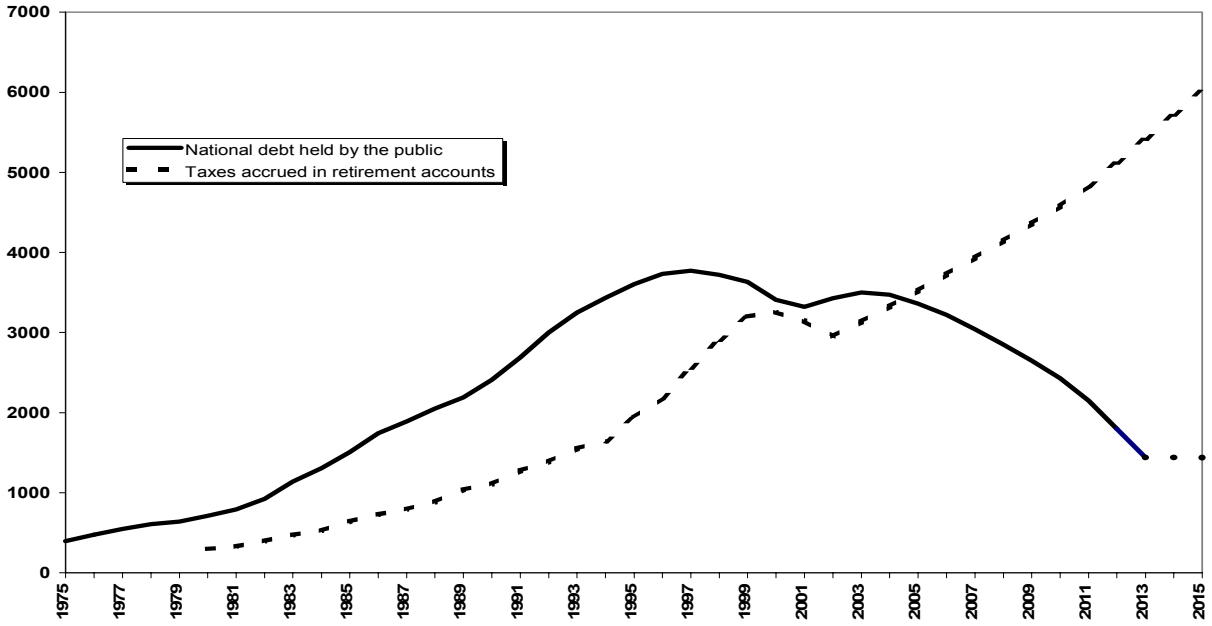
[19] Ricardians might note the growth of the nominal national debt and accrued deferred taxes in retirement accounts simultaneously in the 1980s and 1990s, although the pattern in the late 1990s and early 2000s was quite different..

My purpose in comparing the deferred taxes to the national debt is not to suggest any particular use of the taxes as they are paid, but rather only to point out that if we are interested in a federal government liability of $3½ trillion, we might usefully recognize a government asset of comparable size. Further, while $3.0 - $3.5 trillion is large in absolute size, it is modest in an economy with an annual GDP of $10 trillion and a wealth several times as large. Also, while the deferred taxes are significant in size now and will almost certainly grow more rapidly than most other tax sources, the overwhelming bulk of taxes is likely to continue to come from the traditional sources. Especially when future deferred taxes are compared to the actuarial deficits in Social Security and Medicare (below), it should be borne in mind that the payroll taxes financing these programs will be several times as large as either the actuarial deficits or the deferred taxes on these saving vehicles.

Even if no additional contributions were made, of course, the already-accrued balances will earn nominal returns in the future. The returns may -- over the long term are likely to – outstrip the borrowing costs of the federal government. Additional deferred taxes likely will accrue on the already-existing balances in the tax-deferred accounts at a pace more rapid than the discount rate generally used to discount revenues; however, there are serous issues, which are discussed below, concerning the appropriate discount rate.

Figure 4.1

Accrued Deferred Taxes in Retirement Accounts vs. National Debt Held by the Public



Sources: 1975-2013 debt data are from CBO, 2003;
Tax data are from author's calculations.

Recall the several other effects on revenue and interest outlays, in addition to the tax deductions on the contributions and the taxes paid on the withdrawals. There were foregone revenues on the income from diverted saving, additional interest outlays on any incremental debt, taxes on interest received on the government bonds and additional business taxes on the additional capital income. We will examine these additional effects in the next section to get a full account, historically and prospectively, of the effects of deferred taxes.

Finally, what do households know or assume about these accrued deferred taxes? Are they headed for a rude shock when they start withdrawing from the tax-deferred saving vehicles? Many receive reports indicating the annuity they will receive at retirement. The traditional view in the investment/benefits community is that the most common comparison is to pre-retirement taxable earnings, so the implicit assumption is that the withdrawals will be taxed at rates similar to those currently paid. However, when confronted with the aggregate amount of deferred taxes, let alone the additional taxes on capital gains taxed as ordinary income and the taxes on purely inflationary returns, no doubt many would be shocked. Whether and how the news would affect their economic behavior, as discussed above, is not currently known.

Section 5. Base case model estimates of deferred tax effects

Every year, households and employers contribute hundreds of billions of dollars to tax-deferred savings vehicles. Table 5.1 presents some recent data on contributions of various types and of their total, relative to wages and salaries. Of course, the funding of defined benefit plans reflects portfolio performance and interest rates, but as a general proposition, defined benefit plans are more fully funded than they were a decade or two ago, despite the recent shortfall[20]. Also,

[20] Since the decline in portfolios in 2001 and 2002 decreased assets and lower interest rates increased liabilities, many firms and governments will be making contributions to plans that are now underfunded. Many DB plans have too aggressive return assumptions and, as returns

for some of these vehicles, data are hard to come by. But as a rough estimate, from the historical data, households and employers were contributing roughly 8-9% of wages and salaries to such vehicles in the 1990s.

These contributions currently amount to about $400 billion per year. As current workers continue to contribute to various tax-deferred saving vehicles, the nominal value of their balances will eventually be taxed. So we need estimates of contributions and of future nominal returns. We start with estimates of wages and salaries and their likely growth over time, reflecting the demographic trends and productivity assumptions in the Social Security Administration's intermediate projection series[21]. There are numerous reasons why the historic percentage of contributions might increase or decrease, reflecting the age distribution of the population, changes in tax rules, especially the limits on tax-deferred contributions, the evolution of defined benefit plans (Schieber and Shoven [1994]), and other factors. In particular, the higher contribution limits and still larger "catch-up" limits for those approaching retirement may argue for this percentage to increase. To be conservative, we make the simplifying assumption that, for the next several decades, the ratio will be constant[22] at 8% (a sensitivity analysis is performed in Section 8 below).[23]

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turned negative, are justifying these aggressive assumptions with riskier asset allocations without explicit recognition of the added risk.

[21] We follow the Social Security Trustees' actuarial assumptions in assuming the ratio of wages and salaries to GDP is constant in the long run.

[22] More precisely, we estimate balances and taxes through 2040. The 75-year estimate in analogy with the Social Security Administration's (2002) long-run actuarial forecast would be much larger (See Section 7.) But again, even conservative estimates are immense.

TABLE 5.1

Contributions to Tax-Deferred Accounts
Historical and Projected

Year	Total contributions[1] ($billions)	Salaries & wages[2] ($trillions)	Contribution as % of wages & salary
1990	204.6	2,599.4	7.9%
1991	220.1	2,674.3	8.2%
1992	240.3	2,805.7	8.6%
1993	266.5	2,892.1	9.2%
1994	259.6	3,026.8	8.6%
1995	276.4	3,206.3	8.6%
1996	293.8	3,397.4	8.6%
1997	306.6	3,636.5	8.4%
1998	329.2	3,894.4	8.5%
~ 2000$_p$	384.3	4,804	8.0%
~ 2010$_p$	618.7	7,733	8.0%
~ 2020$_p$	983.2	12,290	8.0%
~ 2030$_p$	1546.4	19,330	8.0%
~ 2040$_p$	2449.7	30,621	8.0%

Note:
(1) Historical data (1990-1998) are from Private Pension Plan Bulletin,
Table E14, Department of Labor; & SOI, IRS.
Projected data (2000-2040) assume contributions are 8% of projected wages & salaries.
Projected data (2002-2040) are estimated as 48% of projected GDP (CBO & SSA).

This generates a sequence of contribution levels (the C_t in equation 1), examples of which are reported in Table 5.1. Contributions are projected to increase from about $400 billion to over $600 billion by 2010, almost $1 trillion by 2020 and

[23] For comparison, Poterba, Venti and Wise (2001) assume 9% as a base case for 401(k) contributions. While the percentage for other programs may differ, there are also households with more than one plan.

$2.4 trillion by 2040, at which time SSA estimates nominal GDP to be over $60 trillion. Recall these are nominal future values, and thus neither real nor discounted. We now need an estimate of the returns earned on these contributions, as well as future returns earned on already-accumulated balances (the r_t and π_t in equations 1 and 2).

We assume for the base case that investors receive a 7½% nominal return on their investments[24]. (A sensitivity analysis to alternative assumed returns is presented in Section 6) Obviously, there are numerous combinations of assumptions on real returns to stocks and bonds, inflation rates, management fees and asset allocations that could yield a 7½% nominal (or any other) return. I believe such an assumed long-run, many-decade average nominal return is reasonable, despite the recent difficulty in equity markets. In any event, the actuarial assumption on nominal returns in current DB plans is commonly in the 8.5%-9.0% range, which I view as too high. It is, however, worth digressing into the factors from which one might build up an assumed nominal return to assess its reasonableness.

There are numerous candidates for likely future real rates of return on equities and fixed income instruments[25]. The three types of sources are historical data,

[24] Again for comparison, Schieber and Shoven (1994) assume 8.1% and Poterba, Venti and Wise (2000) assume 9.3% for their base case but also report results for 6% and 12.7%.
[25] I ignore the possible effects of the changing age distribution of the population and of asset ownership on asset returns, wages, etc. The most careful study of the relationship of age structure and asset returns (Poterba [1999]) does not find any clear evidence supporting the theoretical relationship between them.

valuation models, and econometric estimates of the marginal product of capital. Table 5.2 presents historical data on real returns to stocks, bonds, and other financial instruments, as well as inflation, over several sub-periods for the last two centuries, taken from Siegel (2002) and Ibbotson (2002). The returns for 2002 are discussed below. A few points are worth noting before we turn to our base case and sensitivity analyses. First, of course, the arithmetic mean return would be a statistically sensible estimate only if returns were uncorrelated. Given that the long-term data exhibit mean reversion (Campbell and Schiller, 2001), the geometric mean or upward-adjusted geometric mean would be more appropriate. All this, of course, assumes past as prologue. The long-run numbers are impressively stable over two centuries of remarkable economic and demographic change – several depressions, numerous recessions, an almost-doubling of life expectancy, world wars, etc. Of course, these averages suppress the substantial short-run variation in real returns – the standard deviation of real stock returns is more than twice the mean.

We consider a base case of the 1926-2001 geometric mean real rate of return to equities of about 7.0%. Since it is nominal returns that are taxed, we need an estimate of inflation. Most estimates of medium to longer-term inflation are in the 2 ½ - 3 ½ % range. The Social Security actuaries assume long-run CPI inflation of 3.0% in their 2002 intermediate projection, down from 3.3% in last year's projection. This range would yield nominal stock returns of about 10% as

TABLE 5.2

Compound Annual Real Returns by Type of Instrument (1802-2001)

Period	Stock (arithmetic mean)	Stocks	Bonds	Bills	Gold	Inflation	Equity premium
1802-2001*	8.4	6.9	3.5	2.9	0.0	1.4	3.4
1802-1870*		7.0	4.8	5.1	0.2	0.1	2.2
1871-1925*		6.6	3.7	3.2	-0.8	0.6	2.9
1926-2001*		6.9	2.2	0.7	0.4	3.1	4.7
1946-2001*		7.1	1.3	0.6	-0.3	4.1	5.8
1926-2001**		7.7	2.3	0.8	--	3.1	5.4

Sources: *Siegel 2002; **Ibbotson, 2002

a base case, if concerns about current valuation levels or other factors did not lead to a more conservative estimate; a sensitivity analysis to more conservative estimates is presented in Section 6 below. Certainly, the possibility of lower returns must be considered given current P/E ratios. The roughly 20% decline in stock prices in 2002 implies the updated historical geometric mean real return would fall somewhat, whereas the strong year for bonds would increase the average real rate of return on bonds. A rough preliminary estimate would be about a 35bp decrease for stocks and an 8bp increase for bonds. Estimates reflecting still lower returns are presented in the sensitivity analyses in Section 6.

The long-run real return to government bonds, which we consider as our base case, averaged about 2.3% real. This is well below real bond yields in the last two decades as well as the 3.3% implied in CPI-protected Treasuries in 2001 and 3% in 2002. The Social Security Administration actuaries assume long-run real government interest rates of 3% and 3% inflation, so 6% nominal yields on government bonds. To be sure, short-term bills and notes usually will yield less than bonds. With assumed inflation, our base case is slightly over 5% nominal returns to fixed income investments. Thus, a 60/40 stock/bond weighted average return[26] of slightly over 8% nominal, slightly over 5% real and 3% inflation (management fees are discussed below), is consistent with the long-run historical data. We round down 12bp to an even 5% real. The decline once explicit 2002 data are available from Ibbotson would still leave the Ibbotson numbers above this level; while the Siegel estimates would be slightly lower, the measurement issues discussed below would more than make up for any mismeasured shortfall.

The invaluable Siegel and Ibbotson measures, however, overstate historical inflation and understate real returns because the change in the official consumer price index (CPI) is generally used as the measure of inflation. The CPI was created around World War I. In recent decades, it has overstated inflation by about 1.1% per year (Boskin, et al. [1997]; [1998]) because of several types of bias in its computation. Important improvements by the BLS in the last

[26] Comprehensive data on asset allocation within and without tax-deferred vehicles is not available. The fragmentary data suggest historically pre-boom IRA balances were less heavily weighted to equities than the common 60/40 assumptions. There are tax reasons, mainly lower capital gains tax rates, to have equities outside/fixed income inside (Shoven and Sialm, 1998). However, as recent events have shown, the limited loss offset rules greatly reduce this incentive.

few years have reduced the overall upward bias to about 60-75 basis points. The size of the bias for earlier periods is not known, but likely it was also sizeable. In any event, I follow convention in quoting the Siegel and Ibbotsen numbers; a more accurate inflation measure would substantially increase all the measures of real returns (for stocks and bonds), by more than 100 basis points in recent decades. Just using a CPI series consistent with current, as opposed to mid-1990's, BLS procedures would raise the estimate of real returns for recent decades by 40-50bp[27,28]. Thus, just adjusting the Siegel (2002) estimates to be consistent with current CPI inflation measurement techniques plus factoring in the terrible year in 2002 for equities would leave the adjusted Siegel estimate at almost exactly a 7.0 percent real return to stocks.

Hence, while the real return to equity investment assumed as a base case might prove too high – see the sensitivity analysis in Section 6 for estimates using lower nominal returns consistent with lower real returns to equity – there are at least three senses in which a weighted average assumed real return to stocks and bonds of 5% may as well be conservative: 1) the historic real returns are understated because inflation was overstated; 2) the historic real government bond yields are below recent long-run inflation protected government bond yields; 3) the use of government bond yields is a conservative proxy for all fixed income securities. Working in the opposite direction are the lower returns on

[27] Of course, it would correspondingly decrease the inflation estimate.
[28] See Stewart and Reed (1999)

shorter-term fixed income assets such as bills, which we have not considered here.

Of course, the traditional corporate valuation model (Gordon [1962]) equates the value of a security to the discounted present value of future disbursements to shareholders and the rate of return to the dividend price ratio plus the rate of growth of dividends[29]. This model fits the long-run data quite well. Likewise, as is well known, when investment comes out of retained earnings which produce a rate of return equal to the discount rate, the reciprocal of the P:E ratio equals the rate of return. Given the historical long-term P:E ratio of just under 15, this also fits quite well with the 7% real return estimates. However, with P:E ratios around 20 at the moment, there are many who believe that more conservative estimates of returns are likely and that a correction (or at least subpar rate of return) is likely, if not imminent. It is not my purpose here to debate such issues. I present estimates, in Section 6 below, of the expected present value of future taxes on tax-deferred saving vehicles, based on lower nominal returns consistent with more conservative estimates of stock returns and conservative assumptions about fixed income returns and asset allocation.

Thus, our base case is consistent with the historical real returns to equities and fixed income securities from 1926 through 2002. These data include the poor returns in the Great Depression and the 1970's, the strong returns in the

[29] Share repurchases may have been more important than dividends as a source of cash disbursements to shareholders since the late 1980s (Shoven [2001]).

1980s and the spectacular returns of the late 1990s, as well as the recent terrible years for equity returns. It should be noted that a substantial reduction of inflation from recent and projected levels would lower the real present value of taxes substantially, given nominal returns are taxed. The possibility of outright deflation would dramatically alter these results, but would likely be the result of far more serious economic problems than some lost government revenue.

Economists naturally start with the return to the physical capital stock equal to the marginal product of physical capital, determined by investment demand and the supply of domestic and foreign savings to the economy (whereas the relative returns to riskier and safer assets are determined primarily by investors' risk tolerance). This provides an alternative long-run sensibility check on financial return assumptions. Most econometric estimates of the production side of the economy, including my own (Boskin and Lau, [2000]), conclude that the marginal product of physical capital is about 7% net of depreciation and 10% gross of depreciation.

It should be noted that investors will not receive all of the returns to their investments. Most of us pay various types of management fees and other charges for the various services provided – fiduciary, trading, reporting, etc. Again, there are widely differing estimates of management fees and likely future management fees, based on different types of accounts; witness the great debate over the cost of establishing individual accounts for Social Security

(Diamond [2000], Feldstein [2000]). To account for management fees, nominal base case returns are reduced by 50 basis points per year[30]. Therefore, the base case assumes investors receive 7.5% nominal returns. In the sensitivity analyses presented in Section 6, the possibilities of higher or lower management fees are accounted for using higher or lower expected nominal returns to investments. It should be noted that scale economies and consolidation may decrease management fees somewhat over time.

To repeat, while we have built up to a base case assumption of a weighted average nominal return received by investors of 7.5% from various assumptions, there are of course many other combinations of assumptions that are consistent with these estimates. If the reader prefers thinking in terms of a bottoms-up projection of stock and bond returns, it should be noted that the projections would imply no rebalancing of portfolios.

We next need to estimate withdrawals from tax-deferred accounts, the W_t in equation (3.16)[31]. We need to know when the funds are withdrawn. First, there are complex rules restricting the time and speed of withdrawals, e.g.,

[30] For comparison, Poterba, Venti and Wise assume 35bp for bonds and 70bp for stocks. The management fees on my two main tax-deferred accounts are 33bp and 41bp.

[31] There are early withdrawals from these accounts. Sabelhaus (2000) estimates these at about 2% per year for IRAs. Poterba, Venti and Wise suggest a smaller net of rollover withdrawal rate from 401(k)s. While we could build these into our model and separately estimate the fines and taxes paid, we will ignore these early withdrawals. To the extent there is an overstatement of future balances and taxes, it will surely be far more than counterbalanced by other conservative assumptions, e.g., the shortened period for which we calculate present values. Alternatively, use a set of slightly lower return assumptions from Section 6. It should also be noted that some of the withdrawals may pass to heirs and the taxes may be delayed, additional saving may ensue and additional income taxes may result.

minimum distribution requirements, from defined contribution plans. Generally, funds must start to be withdrawn by age 70½ and may be withdrawn as early as 59½, without penalty[32]. Funds may be withdrawn in alternate ways, but the choice of a joint-survivor annuity for married couples is generally a default option. In the base case, we model withdrawals as if they are lump sum at age 64½, assuming also that contributions then cease. Annuitization implies continued "inside earnings", so the effect on the present value of taxes depends on the rate of return relative to the discount rate. A sensitivity analysis to later "average withdrawal" age, whether actual current practice or due to future demographic trends, is performed in Section 6. Recall that the normal retirement age for Social Security is gradually being increased to 67 in coming decades.

Finally, in order to be quite conservative in the estimates, balances are projected and taxes discounted only through 2040. We smooth decade totals. The truncation at 2040 drops those in the 2035-2044 cohort that would retire in the 2041-44 period.[33] Using a 75-year projection period in analogy to the social security actuaries would increase these totals, as discussed in Section 6.

Table 5.3 presents an estimate of the nominal taxable balance in several future years under the base case scenario for contributions and nominal rates of

[32] Some DB plans commence benefit payments earlier.
[33] Thus occasionally the numbers for year 2040 will look slightly anomalous relative to 2030. Dropping this group makes most of the estimates presented below still more conservative.

TABLE 5.3

Nominal Taxable Balances in Future Years ($billions)

Year	Previous Year Balance	New Contributions	Total Tax-Deferred Balances
2000	~	~	11,745.6
~	~	~	~
2010	15,741.7	618.7	16,522.8
~	~	~	~
2020	25,886.1	983.2	26,817.9
~	~	~	~
2030	41,361.5	1,546.4	42,829.7
~	~	~	~
2040	66,846.7	2,449.7	69,742.6

Note: It is assumed that contributions are added at the end of the year so they do not earn investment returns until the year after contribution.

return[34]. We call these our "nominal values". As is immediately obvious, the hundreds of billions of dollars per year of contributions keep pouring in and accumulate along with the balances at the nominal rates of return. For example, by the beginning of 2010, total tax-deferred assets will have increased to about $16 trillion, and will increase over sixfold by 2040. While this may seem like an enormous number, recall it is a nominal future value, neither adjusted for inflation nor discounted. This estimated growth is less than the estimated growth in mean 401(k) balances estimated for a synthetic cohort retiring in 2035 by Poterba, Venti and Wise (2000).

[34] As is usual for studies that project balances using assumed returns, we neither rebalance portfolios nor examine general equilibrium effects on factor returns. The mean reversion property of stock returns helps prevent the portfolio from getting too far out of line for too long.

We turn now to our first full set of results, for what we call the base case. As discussed above, we have set $\mu_{tc} = \mu_{tw} = 27.7\%$; $r_t = 4.5\%$ and $\pi_t = 3\%$ going forward. We now need base case values for the parameters μ'_t, μ_{it} and μ_{bt}, α, β, γ and λ.

The parameter α measures the share of tax-deferred contributions diverted from other personal saving, whether from existing assets or from the new flow of other saving that would have occurred. Hubbard and Skinner (1995) review the evidence for IRAs – mostly on data for the 1980s – in several (conflicting) studies, and view 0.26 cents per dollar as the best estimate. It is likely the substitution effect started higher and then declined as the amount of previously accumulated discretionary shiftable assets fell. The current income limits for IRAs also likely reduce the fraction of IRA contributors with assets to reshuffle. Poterba, Venti and Wise (1995) conclude that there is little substitution of saving in 401(k)s for other personal saving. Hence, we assume a base case α=25%[35]. This implies that just under one-half of contributions is net new national saving. In Section 6, we consider values of α reflecting more (40%) and less (15%) substitution.

[35] Recall that α is the percentage of total contributions, including that portion from the tax deduction, coming from diverted saving. The fraction of the net of tax deduction funds coming from diverted saving would be $\alpha/(1-\mu)$.

The parameter β maps the revenue flows, positive and negative, into changes in government debt. Most studies assume any decrease in revenue adds to the deficit, debt and future interest outlays (and conversely for increases in revenues). We start with a base case β=1 for consistency with these previous studies (Feldstein [1995], Dessault and Skinner [2000]). However, changes in tax revenues can also affect government spending and other taxes. Thus, in Section 6, we consider the intermediate case of β=.5, in which spending and other taxes offset one-half of revenue losses or gains from deferred taxes and one-half is reflected in government debt, and the other extreme case of β=0, in which none of the revenue change is reflected in debt.

The parameter γ measures the proportion of the change in national saving that crowds out (or in) domestic investment. As noted in the discussion of the national debt in Section 2, the standard, if increasingly controversial, treatment is $\gamma = 1.0$. In a world capital market, one might expect γ to be less than one. However, as noted by Feldstein and Horioka (1980), there was a very high correlation between national saving and investment. That correlation has likely declined in the last two decades. The U.S., of course, is a large share of the world capital market. We take as our base case a γ=1.0. In Section 6, we explore alternative values of γ of 0.75, 0.50 and 0.25.

The parameter λ, the percentage of wages and salaries contributed to tax-deferred accounts, was between 8% and 9% in the 1990s. While the increased

limits might increase this level, we adopt a base case λ=8%. In Section 6, we explore the effects of higher (9%) and lower (7%) values for λ.

The three tax parameters μ_{it}, μ'_t, and μ_{bt} are the marginal tax rates applied to interest income, income from diverted saving and business income from the additional capital. For our base case, we take μ_{it}=20%, as about 30% is received by tax-exempt entities. The tax rate that would have applied to saving had it not been diverted reflects a number of factors, including the lower rate, deferral until realization, and stepped-up basis at death, netted against failure to index for inflation, for capital gains. We take a base case of μ'_t=15%. Finally, the business income taxes paid on the additional capital income reflects the disparate tax treatment, ranked highest to lowest tax, of corporate investment, non-corporate investment and real estate. We take a base case μ_{bt} of 25%. We explore the sensitivity of the results to alternative estimates of these parameters in Section 6.

With these assumptions, Table 5.4 presents the full life-cycle budget effects of the deferred tax vehicles. For expository purposes, the top panel presents the data in current dollars; the bottom panel the real present value in 2001 dollars discounted to the start of 2002.

The six budget effects are reported in columns 1-6, separated into the three components of foregone revenue and outlays and the three components of positive

revenue flows. Column 7 reports the change in the national debt for the year (by the 1990s turning to surpluses). Column 8 reports the cumulative change in the national debt (by 1999 turning negative). Column 9 reports the change in the capital stock for the year. Column 10 reports the cumulative change in the capital stock. Totals are reported at the bottom of the table and are also broken down into history (total -*h*) and going forward (total –*f*).

A few initial comments will help to calibrate the effects and navigate the several sets of results in the remainder of the paper. First, examining the current dollar figures, we confirm the earlier intuition that the largest items are the tax deduction on the original contributions and the taxes on the withdrawals, although by the 2030s, business taxes have grown to an annual level on par with taxes on withdrawals. By the late 1990s, taxes on withdrawals have slightly overtaken the tax losses on the contributions. This is consistent with late 2000 SOI data.

Focus next on Column 2, the foregone revenue on diverted saving. In 2040, for example, the current dollar foregone revenue is $141 billion. At a 7.5% nominal yield and an effective tax rate of 15% (reflecting deferral and step-up of basis at death on capital gains), this implies an *A*', the hypothetical accumulated diverted saving, of $12.6 trillion (in 2040 dollars).

Table 5.4 The Base Case

Life Cycle Budget Effect of Deferred Tax Vehicles

Year	Forgone Revenue/Outlays			Revenue			ΔD(t)	Cumulative Change of gov't debt due to deferred accounts D(t)	ΔK(t)	Cumulative change of capital stock due to deferred taxes K(t)
	Taxes foregone on original contribution	Forgone Revenue on diverted saving	Interest Outlays on D(t-1)	Taxes on Withdrawals	Taxes on interest on D(t-1)	Business taxes on investment from K(t-1)				
Current dollars										
1980	33.0			13.9					89.3	89.3
1990	56.7	4.5	14.9	50.9	3.0	31.1	-8.9	165.5	162.4	1198.1
2000	110.8	5.7	-1.4	122.8	-0.3	67.8	-75.3	-101.1	375.3	3091.8
2010	171.4	30.5	-92.1	282.1	-18.4	168.7	-322.5	-2047.0	786.5	7332.3
2020	272.4	52.5	-355.0	552.0	-71.0	363.4	-874.5	-7522.6	1612.0	15712.6
2030	428.3	86.0	-974.1	880.9	-194.8	728.7	-1874.5	-20115.4	3034.3	31308.1
2040	678.6	141.0	-2280.4	1265.2	-456.1	1401.2	-3671.1	-46374.7	5508.4	59873.7
Real present value, 2002 dollars										
1980	125.3			52.9					339.1	339.1
1990	104.3	8.3	27.3	93.6	5.5	57.2	-16.4	304.5	298.8	2205.3
2000	121.7	6.2	-1.6	134.9	-0.3	74.5	-82.7	-111.1	412.3	3397.2
2010	112.8	20.1	-60.6	185.6	-12.1	111.0	-212.3	-1347.1	517.6	4825.4
2020	106.2	20.5	-138.5	215.3	-27.7	141.8	-341.2	-2934.5	628.8	6129.4
2030	99.0	19.9	-225.2	203.7	-45.0	168.5	-433.4	-4651.2	701.6	7239.3
2040	93.0	19.3	-312.5	173.4	-62.5	192.0	-503.2	-6356.1	755.0	8206.3
Sub total (historical)	2733.4	280.2	284.1	2178.2	56.8	1130.6				
Sub total (projected)	3979.3	761.4	-5892.4	6512.7	-1178.5	5451.4				
Total	6712.7	1041.6	-5608.3	8690.8	-1121.7	6582.0				
	Total outflow		2146.0	**Total inflow**		14151.2	**Total surplus**		12005.2	

Next consider the interest outlays on the end of the previous year's debt D_{ti}. By 1999, the cumulative effective debt is just turning negative; i.e., until 1998, there is still a small cumulative extra debt due to the deferred taxes. This results in net interest outlays of $2.0 billion. From 1999 on, the net effect of the various effects is to lead to ever-larger incremental surpluses (on the tax-deferred accounts separately from the rest of the budget), resulting in negative interest outlays starting in 2000. Recall for the moment $\beta=1$. We discuss cases with $\beta<1$ in Section 6. Thus, the government is a net receiver of interest (capital income), or, given the state of the overall budget, a payer of less interest.

Next, the taxes paid on interest received from government bond payments, reported in column (5), also turn negative beginning in 2000. This can be thought of as foregone revenue due to tax-deductible interest payments made to the government.

Business taxes on the capital income earned on the larger capital stock are reported in Column (6). While they start small, they grow to sizeable amounts, by 2010 rivaling the revenue lost from the initial contributions. Thus, the Feldstein effect is large, both absolutely and relatively.

Now examine the changes in the national debt and in the capital stock. It is easier to focus on the real present value number in the second panel. By 2020, the cumulative effect of deferred tax vehicles has been to provide a $2.9 trillion surplus and a $6.1 trillion larger capital stock (somewhat over half of which

had occurred by the start of 2003). These are impressive figures (recall the assumptions and see the sensitivity analyses in Section 6).

Turn now to the bottom line. First, history: The real present value of the historical lost revenue from the original contribution amounts to about $2.7 trillion. Adding $284 billion in interest and $280 billion in foregone revenue from diverted saving results in net budgetary losses of $3.3 trillion. Taxes on withdrawals amount to $2.2 trillion, business taxes to $1.1 trillion and taxes on the interest payments to $57 billion, a total of $3.4 trillion. By 2002, the net budgetary effects had turned positive, with growing surpluses and capital formation. The unwinding through time of the front-loading of the revenue losses and back-loading of the gains was gathering momentum. Thus, these results presage a swing to large positive net budgetary effects going forward. It is also worth noting that the flow of investment from the net cumulative historical effects amounts to roughly $400 billion, or 4% of GDP, by 2002[36].

As noted above, to be somewhat conservative, we simulate only through 2040. The total real present value of the various effects going forward are given in the second-to-last row at the bottom of Table 5.4. Revenue losses from future contributions amount to almost $4 trillion. An additional $0.76 trillion of revenue is foregone on diverted saving. In the future, however, the government is netting large interest receipts from the net surpluses. Recall this does not necessarily mean the government actually receives interest, or more generally, capital

[36] The model ignores cyclical effects, so this should be compared to an average year, neither the recently depressed levels of investment nor the late 1990s boom levels.

income. The total government may still have a national debt and pay interest; but the size of the debt and the corresponding interest payments are much lower than otherwise because of the deferred saving plans. The interest received is about $5.9 trillion. Taxes on withdrawals amount to $6.5 trillion (this figure includes the $3.0 trillion or so accrued on already accumulated balances discussed in Section 4). The government loses $1.2 trillion of taxes on interest it receives. Finally, business taxes on the additional capital income generated by the larger capital stock amount to $5.5 trillion. The business taxes on capital income from the larger capital stock have both a direct effect and an indirect effect through smaller budget deficits in the short run and larger surpluses in the long run, which in turn feed back to a larger capital stock. Thus, going forward, the government loses $4.7 trillion in revenues, gains $4.7 trillion in net interest, and gains $12.0 trillion in taxes on withdrawals and business taxes. The total net budgetary effect is therefore a real present value gain of $11.9 trillion.

Figure 5.1 places the future projected net effect of the deferred tax vehicles in perspective; it is four times the national debt held outside government and larger than the sum of the national debt and the unfunded liabilities in Social Security and Medicare. The extent to which these flows are already in future budget projections is discussed in Section 7.

Also presented in Table 5.4 is a total of the historical and projected estimates. The $7.8 trillion of revenue losses are swamped by $15.3 trillion of revenue gains ($8.7 trillion from taxes on withdrawals and $6.6 trillion from

business taxes) and $4.5 trillion in net interest receipts, for a total real present value surplus of $12.0 trillion.

The large decline in the stock market in 2002 merits additional attention. While numerous alternative scenarios for lower nominal rates of return will be explicitly analyzed in Section 6, the approximately 20% stock market decline will be only partially offset by the strong year for bonds and the large inflow of new contributions to deferred tax accounts. As discussed in Section 4, the net effect would be to reduce the overall balances in deferred tax accounts, to about $10.6 trillion. What was the net effect of the reduction in A_t from the terrible year for stocks? If the nominal return and other base case assumptions continued to apply[37], what would have happened to the flows of taxes, foregone revenues and interest, had 2002 been an average year for stocks and bonds? Table 5.5 provides these estimates, assuming A_{2001} = $11.4 trillion and $(r+\pi)$ = 7.5%. Several of the six budgetary effects increase, relative to the base case. The taxes on withdrawals (since there is a larger 2002 balance, A_t) increase by about 6% to $9.2 trillion, the net interest receipts rise by about 11% to $5.0 trillion, but the other effects are all small. The total (and future) surplus increases about $1.2 trillion, from $12.0 trillion to $13.2 trillion.

[37] The terrible year for equities, combined with the good year for bonds, of course reduces the historical average return. This would be more than accounted for by using the 7% return case discussed in Section 6.

Figure 5.1

Future Budgetary Effect of Deferred Taxes

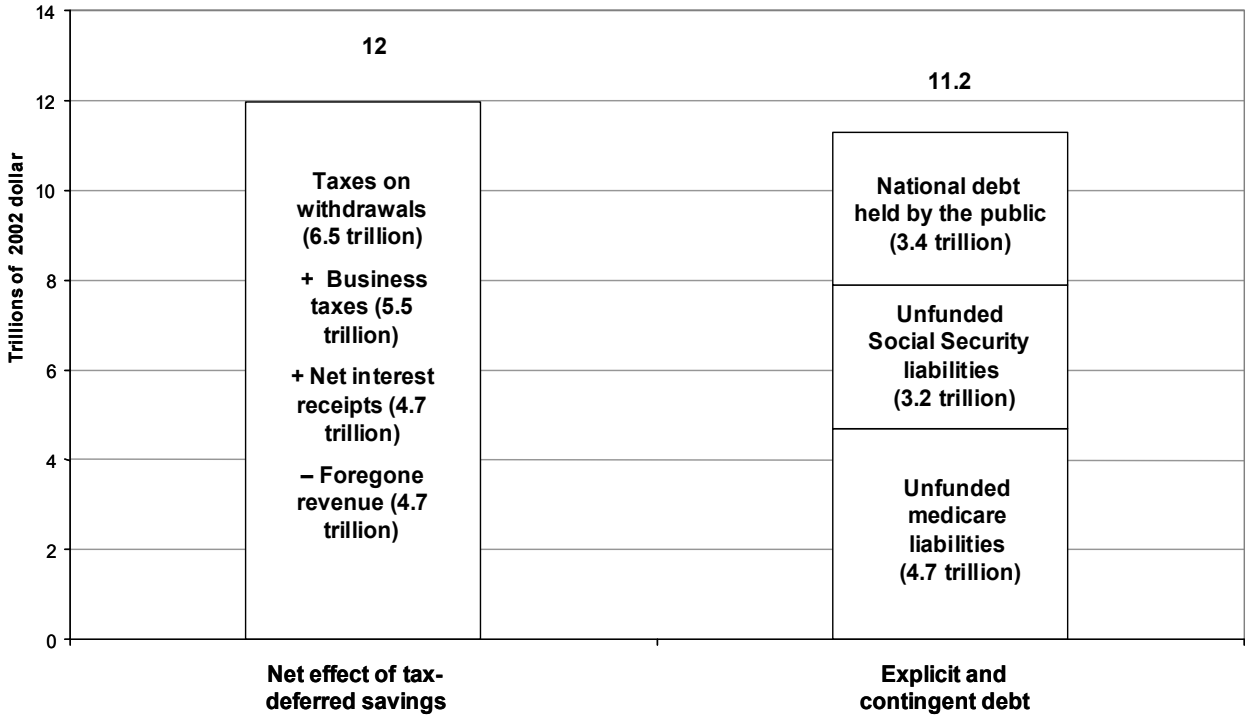

Table 5.5

Estimated Impact of Stock Market Decline in 2002
(Real Present Value, 2002 dollars)

Year	Forgone Revenue/Outlays			Revenue			ΔD(t)	Cumulative Change of gov't debt due to deferred accounts D(t)	ΔK(t)	Cumulative change of capital stock due to deferred taxes K(t)
	Taxes foregone on original contribution	Forgone Revenue on diverted saving	Interest Outlays on D(t-1)	Taxes on Withdrawals	Taxes on interest on D(t-1)	Business taxes on investment from K(t-1)				
1980	125.3			52.9					339.1	339.1
1990	104.3	8.3	27.3	93.6	5.5	57.2	-16.4	304.5	298.8	2205.3
2000	121.7	6.2	-1.6	134.9	-0.3	74.5	-82.7	-111.1	412.3	3397.2
2010	112.8	21.4	-67.3	207.9	-13.5	113.9	-241.5	-1501.2	546.8	4967.4
2020	106.2	20.9	-155.5	235.7	-31.1	148.5	-381.4	-3294.0	669.1	6431.9
2030	99.0	19.8	-250.1	215.2	-50.0	177.6	-474.0	-5157.5	742.2	7632.8
2040	93.0	19.1	-341.5	176.8	-68.3	201.9	-539.8	-6934.8	791.6	8626.1
Sub total (historical)	2733.4	314.5	283.7	2207.0	56.7	1130.8				
Sub total (projected)	3979.3	782.2	-6528.3	7009.7	-1305.7	5689.8				
Total	6712.7	1096.8	-6244.7	9216.7	-1248.9	6820.6				
	Total outflow		1564.8	**Total inflow**		14788.3	**Total surplus**		13223.6	

A few comments on perspective are in order. First, these totals seem vast in absolute size, but total real GDP over this period is projected to be about $600 trillion, they are relatively (to the size of the economy) modest. In any event, these programs are large enough to be consequential—for the tax system, for the budget and for the overall economy.

Second, left to their own evolution, the budget effects are as estimated. But if all turns out as projected, the vast revenue flows are likely to lead to greater spending, especially given the demographic pressures on entitlement programs, and/or lower taxes. In terms of our model, $\beta<1$; and we present alternative scenarios in Section 6 below.

To be sure, the returns are random. The shorter-term variation is particularly severe. A simulation of random returns is presented in Section 6. But I believe, on balance, that most of the assumptions made thus far are likely to be conservative and, in any event, sensitivity analyses are presented in Section 6 below. What should be borne in mind is that, for better or worse, the Federal government is a one-quarter to one-third silent partner, participating in the market outcomes of the private investments held in tax-deferred accounts. Put another way, the government is a limited partner in millions of "funds" managed by taxpayers. The contribution of taxes on withdrawals to the unexpected surge in revenues in the late1990s and shortfall in 2001-2002 are only the tip of a very large iceberg.

We turn next to a sensitivity analysis of alternative parameter estimates, discount rates, rates of return, retirement ages, etc. We then turn to a brief discussion of the potential political economy issues raised by the likely evolution of deferred taxes. In particular, almost all the attention in the political process has focused on the tax treatment of contributions and accumulations. This is understandable in the start-up phase of these programs, when far more people are contributing than withdrawing. But the success of these programs and the inexorable march of demography suggest political pressure may soon accompany the withdrawals.

Section 6. Sensitivity analyses

In making the very rough estimates presented above, we have relied on various assumptions concerning the fraction α of contributions diverted from other saving; the fraction β of the change in the federal government's budget position from the six flows of taxes and interest that results in a change in government debt as opposed to spending or taxes; the fraction γ of the change in national saving that results in domestic investment; contribution rates λ; likely future rates of return, nominal and real, $r + \pi$, on stocks and bonds; management fees; "retirement/withdrawal age"; likely future tax rates on contributions, withdrawals, interest, business capital income, and the foregone capital income on the projected outside accumulation from the diverted saving μ_{ct}, μ_{wt}, μ_{it}, μ_{bt}, μ_t'; and the length of the forecast period. Sensible variations in these parameters would not change the qualitative results mentioned in Section 5 above but obviously would change the specific numbers. We present a simple example of each to

make the basic point. For simplicity, we focus on total real present values, including the history; since the history is generally close to a wash for the budgetary effects, the total is close to the real present value considering only the future.

In the base case estimates, we set the fraction of contributions diverted from taxable assets or new saving that would have occurred in taxable form, α, equal to 25%; the fraction of changes in tax revenues and interest outlays that resulted in a change in government debt rather than spending or other taxes, β, equal to 100%; and the share of the change in national saving (itself resulting from tax induced changes in government debt and personal saving) that crowded (in or) out domestic investment, γ, equal to 100%. We examine the sensitivity of the results to plausible variations in these parameters one at a time. In each case, the other parameters are set equal to the base case.

Diverted taxable saving: α

Table 6.1 presents the summary results for variations in α. We consider cases of more and less substitution, each of which would find some rough support in the literature discussed above, and for comparison also the case of zero substitution. If the share of contributions from diverted taxable savings was as high as 40%, the foregone revenue from the diverted saving would increase by about 60%, from $1.0 trillion, to $1.66 trillion; net-of-tax interest receipts would decline by $1.5 trillion, as smaller future surpluses accrue; and business taxes on the income from the more slowly-growing capital stock would decline by $1.9 trillion (see the top panel in Table 6.1). The total net

change in the real present value of the budget is to reduce the large net surplus by $4.4 trillion, or 36% of the base case total. The higher α reduces (by 2040) the cumulative changes in the government surplus and the nation's capital stock by $1.9 trillion and $2.1 trillion, respectively. In any event, even with α = 40%, generally considered the extreme upper limit, and invoked as a major argument by those opposed to tax-deferred saving plans and their expansion, the deferred tax vehicles still have a real net present value budgetary surplus of $7.6 trillion, and by 2040 left a $4.4 trillion surplus and a $6.1 trillion larger capital stock. Note, however, that two large effects, the foregone revenue on contributions and the taxes on withdrawals, are not affected by alternative values of α.

Some would consider the base case assumption of α = 25% likely on the high side. It may well be correct for IRAs in the 1980s, but after most IRA asset shifting had occurred, and given the apparent low α for 401(k) programs, it is instructive to consider cases with less diverted saving. The bottom panel of Table 6.1 reports results for α = 15%. Not surprisingly, the results move in the opposite direction relative to the base case. Foregone revenue declines by $400 opposite direction relative to the base case. Foregone revenue declines by $400 billion, net interest receipts rise by $1.4 trillion, and business income tax receipts rise by $1.2 trillion, causing a net increase in the real present value surplus budgetary effects of deferred taxes of about $2.9 trillion to a total of $14.9 trillion. The capital formation effect increases by $1.3 trillion to $9.6 trillion.

Table 6.1 Sensitivity Analysis: α (Real present value, 2002 dollars)

Year	Forgone Revenue/Outlays			Revenue			ΔD(t)	Cumulative Change of gov't debt due to deferred accounts D(t)	ΔK(t)	Cumulative change of capital stock due to deferred taxes K(t)
	Taxes foregone on original contribution	Forgone Revenue on diverted saving	Interest Outlays on D(t-1)	Taxes on Withdrawals	Taxes on interest on D(t-1)	Business taxes on investment from K(t-1)				
α = 40%										
1980	125.3			52.9					271.3	271.3
1990	104.3	13.3	36.6	93.6	7.3	41.2	12.1	441.7	213.9	1586.4
2000	121.7	9.9	21.5	134.9	4.3	51.2	-37.3	348.5	301.0	2355.1
2010	112.8	32.2	-24.1	185.6	-4.8	80.3	-140.2	-591.6	384.5	3498.9
2020	106.2	32.8	-83.2	215.3	-16.6	104.3	-247.1	-1805.5	477.2	4522.2
2030	99.0	31.8	-150.1	203.7	-30.0	125.1	-318.0	-3128.3	532.5	5385.7
2040	93.0	30.9	-216.9	173.4	-43.4	143.0	-366.0	-4427.9	567.5	6117.3
Sub total (historical)	**2733.4**	**448.3**	**525.1**	**2178.2**	**105.0**	**806.7**				
Sub total (projected)	**3979.3**	**1218.2**	**-3656.7**	**6512.7**	**-731.3**	**4007.4**				
Total	**6712.7**	**1666.6**	**-3131.6**	**8690.8**	**-626.3**	**4814.1**				
	Total outflow		5247.7	**Total inflow**		12878.6	**Total surplus**		7630.9	
α = 15%										
1980	125.3			52.9					384.3	384.3
1990	104.3	5.0	21.2	93.6	4.2	67.9	-35.3	213.1	355.5	2617.9
2000	121.7	3.7	-17.0	134.9	-3.4	89.9	-113.0	-417.5	486.6	4091.9
2010	112.8	12.1	-84.9	185.6	-17.0	131.5	-260.3	-1850.8	606.3	5709.8
2020	106.2	12.3	-175.3	215.3	-35.1	166.8	-403.8	-3687.2	729.9	7200.8
2030	99.0	11.9	-275.3	203.7	-55.1	197.4	-510.4	-5666.6	814.4	8475.0
2040	93.0	11.6	-376.3	173.4	-75.3	224.7	-594.6	-7641.6	880.0	9599.0
Sub total (historical)	2733.4	168.1	123.4	2178.2	24.7	1346.5				
Sub total (projected)	3979.3	456.8	-7382.9	6512.7	-1476.6	6414.1				
Total	6712.7	625.0	-7259.5	8690.8	-1451.9	7760.6				
	Total outflow		78.2	**Total inflow**		14999.5	**Total surplus**		14921.3	

Table 6.1 Sensitivity Analysis: α (cont.)
(Real present value, 2002 dollars)

Year	Forgone Revenue/Outlays			Revenue			ΔD(t)	Cumulative Change of gov't debt due to deferred accounts D(t)	ΔK(t)	Cumulative change of capital stock due to deferred taxes K(t)
	Taxes foregone on original contribution	Forgone Revenue on diverted saving	Interest Outlays on D(t-1)	Taxes on Withdrawals	Taxes on interest on D(t-1)	Business taxes on investment from K(t-1)				
α = 0%										
1980	125.3			52.9					452.2	452.2
1990	104.3	0.0	11.9	93.6	2.4	84.0	-63.7	76.0	440.4	3236.8
2000	121.7	0.0	-40.0	134.9	-8.0	113.2	-158.4	-877.1	597.9	5134.0
2010	112.8	0.0	-121.4	185.6	-24.3	162.3	-332.3	-2606.3	739.4	7036.4
2020	106.2	0.0	-230.6	215.3	-46.1	204.3	-497.9	-4816.3	881.4	8808.0
2030	99.0	0.0	-350.5	203.7	-70.1	240.9	-625.9	-7189.5	983.5	10328.7
2040	93.0	0.0	-472.0	173.4	-94.4	273.7	-731.7	-9569.9	1067.4	11688.1
Sub total (historical)	**2733.4**	**0.0**	**-117.6**	**2178.2**	**-23.5**	**1670.4**				
Sub total (projected)	**3979.3**	**0.0**	**-9618.6**	**6512.7**	**-1923.7**	**7858.1**				
Total	**6712.7**	**0.0**	**-9736.2**	**8690.8**	**-1947.2**	**9528.5**				
	Total outflow		-3023.5	**Total inflow**		16272.1	**Total surplus**		19295.6	

opposite direction relative to the base case. Foregone revenue declines by $400 billion, net interest receipts rise by $1.4 trillion, and business income tax receipts rise by $1.2 trillion, causing a net increase in the real present value surplus budgetary effects of deferred taxes of about $2.9 trillion to a total of $14.9 trillion. The capital formation effect increases by $1.3 trillion to $9.6 trillion.

Finally, rather than present full results for $\alpha = 0$, we simply report the total real present value budgetary surplus rises to $19.3 trillion, the 2040 change in the debt to $9.6 trillion and the increase in the capital stock to $11.7trillion.

Thus, clearly the size of α matters. While I would consider an α in the15% to 25% range most plausible, even with far higher α, the net effects of the deferred tax vehicles are still enormously positive for the net budget position of the government and the nation's capital stock and, hence, productivity and real wages.

Fiscal reaction: β

It is quite possible that one of the effects of the changes in revenues and interest outlays/receipts will be to create fiscal reactions other than passive adjustment of debt levels. Certainly, in the political process historically, there have been different emphases on spending, taxes and deficits at different points in time. Did the early revenue losses just add to deficits and debt, as assumed in the base case of $\beta = 1.0$? Or did they constrain subsequent spending somewhat? Will future large net inflows to the Treasury pay down the national debt or finance other spending or tax reductions?

Such queries raise passions as well as positive analyses. My own view, judging from the 1997-2000 period at the federal level and the 2000-2001 experience in California, not to mention the long history of funding other spending from Social Security surpluses, is that it is unlikely that large net inflows will all go to reduce debt and eventually accumulate assets.

We thus explore the implications of β = 50% and the extreme case of β=0 (all surpluses are used for increased spending or tax cuts and conversely the early revenue losses constrained other spending and tax cuts.) The results are presented in Table 6.2. Obviously, compared to the base case, the net interest and increased business tax effects decline sharply.

In the case of β = 50%, reported in the top panel, the real present value of net interest receipts declines by $2.9 trillion and the business taxes by about $1.4 trillion, a total decline of $4.3 trillion. However, the cumulative real present value of the net budgetary surplus is still large at $7.7 trillion. In the β = 0 case, reported in the bottom panel of Table 6.2, there is no effect on deficits, debt, surpluses or assets of the government, and hence the interest outlay and taxes on interest effects are also zero. The failure to build large surpluses, at least some of which would lead to a larger capital stock, also implies a reduction in the additional business taxes of $2.3 trillion. The net result is to reduce the cumulative budget effect to $5.4 trillion and leave the nation with

a capital stock larger by about $3.4 trillion[38] and no cumulative surplus, rather than the $8.2 trillion and $6.4 trillion in the base case. While the taxes on withdrawals and foregone taxes on contributions are unaffected by alternative β, the smaller effect on national saving implies the impacts on the capital stock and business taxes[39] are not as pronounced.

Crowding out and in: γ

The base case attempted to adopt assumptions generally used in previous studies or consistent with empirical estimates. Usually we erred on the side of conservative estimates. We were trying to establish these effects were large, consequential and, on balance, quite positive, even with assumptions that tended to reduce the size of the positive effects. The base case assumption of γ = 1.0 is also most commonly used, but is not particularly conservative, at least for the United States. But there is a wide range of professional opinion on international capital flows and the relationship between domestic saving and investment. The results are quite sensitive to plausible changes in the parameter γ.

Table 6.3 reports results for γ = 25%, 50% and 75% to compare to the base case assumption of 100%. Note again, the foregone taxes on contributions and diverted saving, and the taxes on withdrawals are unaffected by changes in γ. But

[38] The apparent anomaly of K_{2030} exceeding K_{2040} is due to the truncation of the decade retirement pattern 2035-2044 in 2040.
[39] Ricardians would model changes in tax revenue as being offset by personal saving.

Table 6.2 Sensitivity Analysis: β
(Real present value, 2002 dollars)

Year	Forgone Revenue/Outlays			Revenue			ΔD(t)	Cumulative Change of gov't debt due to deferred accounts D(t)	ΔK(t)	Cumulative change of capital stock due to deferred taxes K(t)
	Taxes foregone on original contribution	Forgone Revenue on diverted saving	Interest Outlays on D(t-1)	Taxes on Withdrawals	Taxes on interest on D(t-1)	Business taxes on investment from K(t-1)				
β = 50%										
1980	125.3			52.9					339.1	339.1
1990	104.3	8.3	10.0	93.6	2.0	62.5	-17.7	99.5	300.2	2380.6
2000	121.7	6.2	-4.4	134.9	-0.9	74.8	-42.7	-122.5	372.3	3369.2
2010	112.8	20.1	-29.2	185.6	-5.8	97.1	-86.6	-632.9	392.0	4160.4
2020	106.2	20.5	-55.0	215.3	-11.0	108.4	-120.5	-1151.3	408.2	4613.0
2030	99.0	19.9	-76.7	203.7	-15.3	112.4	-129.3	-1565.9	397.4	4758.3
2040	93.0	19.3	-91.5	173.4	-18.3	111.9	-123.1	-1837.4	374.9	4718.5
Sub total (historical)	2733.4	280.2	82.1	2178.2	16.4	1184.4				
Sub total (projected)	3979.3	761.4	-2111.5	6512.7	-422.3	3998.1				
Total	6712.7	1041.6	-2029.5	8690.8	-405.9	5182.6				
	Total outflow		5724.9	**Total inflow**		13467.5	**Total surplus**		7742.6	
β = 0%										
1980	125.3			52.9					339.1	339.1
1990	104.3	8.3	0.0	93.6	0.0	65.3	0.0	0.0	282.5	2458.9
2000	121.7	6.2	0.0	134.9	0.0	72.6	0.0	0.0	329.6	3238.3
2010	112.8	20.1	0.0	185.6	0.0	84.9	0.0	0.0	305.4	3600.6
2020	106.2	20.5	0.0	215.3	0.0	87.2	0.0	0.0	287.7	3670.9
2030	99.0	19.9	0.0	203.7	0.0	84.7	0.0	0.0	268.2	3556.4
2040	93.0	19.3	0.0	173.4	0.0	80.7	0.0	0.0	251.8	3383.0
Sub total (historical)	2733.4	280.2	0.0	2178.2	0.0	1199.1				
Sub total (projected)	3979.3	761.4	0.0	6512.7	0.0	3214.4				
Total	6712.7	1041.6	0.0	8690.8	0.0	4413.5				
	Total outflow		7754.3	**Total inflow**		13104.3	**Total surplus**		5350.0	

changing the degree of crowding out and in of domestic investment from changes in national saving alters capital formation, business taxes and net interest. Note this also changes the historical estimates. For the case of γ = 75% (recall γ is designed to capture long-run average tendencies), the increase in the capital stock falls to $5.1 trillion and the real present value of business taxes decreases by $2.2 trillion (relative to the base case) to $4.4 trillion. This, in turn, causes net interest receipts to fall by $1.5 trillion (relative to the base case) to $2.9 trillion. The result from all these effects decreases the real present value of the net surplus by 31%, or $3.8 trillion, from the base case, to $8.2 trillion.

While I consider it unlikely for the U.S. economy, in the even less crowding out (or in) of domestic investment by changes in national saving case of γ = 50%, the positive capital formation effects fall further. In this case, the capital stock decreases by $3.1 trillion, or a little more than one-third the base case amount. Business taxes are $4.0 trillion smaller than the base case at $2.6 trillion. Net interest receipts decrease by $2.9 trillion, to $1.9 trillion. The result is a budgetary surplus real present value net effect of $5.1 trillion, or under half of the base case.

For the extreme case of γ = 25% (which might well be less than the U.S. share of the world capital market), the total of the future effects shrink to $3.7 trillion. The historical effect is a $1.1 trillion loss; the grand total, including history, is $2.5 trillion.

Table 6.3 Sensitivity Analysis: γ
(Real present value, 2002 dollars)

Year	Forgone Revenue/Outlays			Revenue			ΔD(t)	Cumulative Change of gov't debt due to deferred accounts D(t)	ΔK(t)	Cumulative change of capital stock due to deferred taxes K(t)
	Taxes foregone on original contribution	Forgone Revenue on diverted saving	Interest Outlays on D(t-1)	Taxes on Withdrawals	Taxes on interest on D(t-1)	Business taxes on investment from K(t-1)				
γ = 75%										
1980	125.3			52.9					254.3	254.3
1990	104.3	8.3	33.6	93.6	6.7	41.4	4.5	399.1	208.5	1588.5
2000	121.7	6.2	11.9	134.9	2.4	52.1	-49.5	164.5	284.4	2372.0
2010	112.8	20.1	-35.1	185.6	-7.0	75.9	-156.8	-813.7	346.6	3293.4
2020	106.2	20.5	-95.9	215.3	-19.2	94.5	-259.8	-2056.0	410.6	4077.3
2030	99.0	19.9	-161.4	203.7	-32.3	109.1	-322.9	-3344.9	443.3	4676.0
2040	93.0	19.3	-223.6	173.4	-44.7	120.5	-360.5	-4548.4	459.2	5134.0
Sub total (historical)	2733.4	280.2	439.8	2178.2	88.0	807.8				
Sub total (projected)	3979.3	761.4	-4067.9	6512.7	-813.6	3588.9				
Total	6712.7	1041.6	-3628.1	8690.8	-725.6	4396.7				
	Total outflow		4126.2	**Total inflow**		12361.9	**Total surplus**		8235.7	
γ = 50%										
1980	125.3			52.9					169.6	169.6
1990	104.3	8.3	39.7	93.6	7.9	26.7	24.1	489.7	129.2	1017.3
2000	121.7	6.2	24.4	134.9	4.9	32.4	-19.9	417.7	174.8	1474.0
2010	112.8	20.1	-12.4	185.6	-2.5	46.3	-108.9	-340.4	207.2	2004.0
2020	106.2	20.5	-59.3	215.3	-11.9	56.3	-192.3	-1301.9	240.0	2422.8
2030	99.0	19.9	-108.2	203.7	-21.6	63.2	-234.5	-2260.1	251.3	2703.6
2040	93.0	19.3	-152.0	173.4	-30.4	67.8	-250.5	-3097.3	251.2	2881.7
Sub total (historical)	2733.4	280.2	586.0	2178.2	117.2	513.5				
Sub total (projected)	3979.3	761.4	-2529.1	6512.7	-505.8	2113.5				
Total	6712.7	1041.6	-1943.0	8690.8	-388.6	2627.0				
	Total outflow		5811.3	**Total inflow**		10929.2	**Total surplus**		5117.9	

Table 6.3 Sensitivity Analysis: γ (cont.)
(Real present value, 2002 dollars)

Year	Forgone Revenue/Outlays			Revenue			ΔD(t)	Cumulative Change of gov't debt due to deferred accounts D(t)	ΔK(t)	Cumulative change of capital stock due to deferred taxes K(t)
	Tax deduction on original contribution	Forgone Revenue on diverted saving	Interest Outlays on D(t-1)	Taxes on Withdrawals	Taxes on interest on D(t-1)	Business taxes on investment from K(t-1)				
γ = 25%										
1980	125.3			52.9					84.8	84.8
1990	104.3	8.3	45.5	93.6	9.1	12.9	42.5	576.5	60.0	488.7
2000	121.7	6.2	35.9	134.9	7.2	15.1	6.6	650.3	80.8	687.8
2010	112.8	20.1	7.9	185.6	1.6	21.2	-67.7	80.1	93.3	917.3
2020	106.2	20.5	-27.6	215.3	-5.5	25.2	-135.9	-652.7	105.9	1085.1
2030	99.0	19.9	-63.6	203.7	-12.7	27.6	-163.3	-1355.0	107.9	1180.6
2040	93.0	19.3	-94.0	173.4	-18.8	28.9	-165.1	-1924.7	104.2	1224.4
Sub total (historical)	2733.4	280.2	723.4	2178.2	144.7	245.0				
Sub total (projected)	3979.3	761.4	-1224.6	6512.7	-244.9	939.2				
Total	6712.7	1041.6	-501.1	8690.8	-100.2	1184.2				
	Total outflow		7253.2	**Total inflow**		9774.8	**Total surplus**		2521.6	

Rates of return: $r + \pi$

Table 6.4 presents estimates of the present value of future taxes under alternative assumptions of nominal and related real rates of return to stocks and bonds for the base case assumptions of the other parameters such as $\alpha, \beta, \gamma, \lambda$ and the μ's. Obviously, compounding nominal returns on assets at a higher rate increases the present value of future taxes, whereas a lower assumed geometric mean return decreases the present value.

Comparing the results in the different panels of Table 6.4, corresponding to nominal net returns to investors of 4%, 5%, 6%, 7%, 7.5% (the base case), and 8%, some general remarks about the results are in order. First and most obviously, there is no impact on any of the historical effects – those reflect historical ex post returns, and assumptions about future returns to stocks and bonds are irrelevant.

Secondly, these nominal returns could arise from many combinations of stock and bond returns and asset allocations. However, to map the assumed nominal returns to real returns on stocks and bonds, management fees and inflation, we recall the construct of a 60/40 stock/bond mix, 50bp in management fees, 3% inflation and 2.3% real bond yields would imply real returns to stocks of 1.0%, 2.7%, 4.3%, 6.0%, 6.8% and 7.7% for the nominal returns cases of 4%, 5%, 6%, 7%, 7.5% and 8%[40]. Clearly, cases corresponding to higher real returns

[40] Recall some negative shocks to stock returns are likely to be positive shocks to bond yields.

Table 6.4 Sensitivity Analysis: $r + \pi$
(Real present value, 2002 dollars)

Year	Forgone Revenue/Outlays			Revenue			ΔD(t)	Cumulative Change of gov't debt due to deferred accounts D(t)	ΔK(t)	Cumulative change of capital stock due to deferred taxes K(t)
	Taxes foregone on original contribution	Forgone Revenue on diverted saving	Interest Outlays on D(t-1)	Taxes on Withdrawals	Taxes on interest on D(t-1)	Business taxes on investment from K(t-1)				
$r + \pi = 4\%$										
1980	125.3			52.9					339.1	339.1
1990	104.3	8.3	27.3	93.6	5.5	57.2	-16.4	304.5	298.8	2205.3
2000	121.7	6.2	-1.6	134.9	-0.3	74.5	-82.7	-111.1	412.3	3397.2
2010	112.8	9.2	-56.9	144.3	-11.4	109.4	-177.3	-1243.4	482.6	4725.8
2020	106.2	8.4	-110.9	128.3	-22.2	130.2	-232.5	-2309.3	520.2	5571.2
2030	99.0	8.0	-160.1	102.8	-32.0	142.9	-266.7	-3264.6	534.9	6079.5
2040	93.0	7.8	-205.8	84.5	-41.2	152.4	-300.8	-4154.7	552.6	6463.8
Sub total (historical)	2733.4	280.2	284.1	2178.2	56.8	1130.6				
Sub total (projected)	3979.3	325.3	-4390.3	4154.8	-878.1	4863.2				
Total	6712.7	605.5	-4106.2	6333.0	-821.2	5993.8				
	Total outflow		3212.0	**Total inflow**		11505.6	**Total surplus**		8293.6	
$r + \pi = 5\%$										
1980	125.3			52.9					339.1	339.1
1990	104.3	8.3	27.3	93.6	5.5	57.2	-16.4	304.5	298.8	2205.3
2000	121.7	6.2	-1.6	134.9	-0.3	74.5	-82.7	-111.1	412.3	3397.2
2010	112.8	12.0	-57.9	155.2	-11.6	109.8	-186.6	-1271.5	491.9	4752.8
2020	106.2	11.3	-117.8	148.6	-23.6	133.1	-258.4	-2465.1	546.1	5709.8
2030	99.0	10.8	-175.5	124.3	-35.1	148.9	-303.7	-3589.7	571.9	6349.4
2040	93.0	10.5	-230.0	102.7	-46.0	161.3	-344.5	-4651.3	596.3	6853.7
Sub total (historical)	2733.4	280.2	284.1	2178.2	56.8	1130.6				
Sub total (projected)	3979.3	432.1	-4746.2	4692.5	-949.2	5001.9				
Total	6712.7	712.3	-4462.1	6870.7	-892.4	6132.5				
	Total outflow		2962.9	**Total inflow**		12110.8	**Total surplus**		9147.9	

Table 6.4 Sensitivity Analysis: $r + \pi$ (cont.)
(Real present value, 2002 dollars)

Year	Forgone Revenue/Outlays			Revenue			ΔD(t)	Cumulative Change of gov't debt due to deferred accounts D(t)	ΔK(t)	Cumulative change of capital stock due to deferred taxes K(t)
	Taxes foregone on original contribution	Forgone Revenue on diverted saving	Interest Outlays on D(t-1)	Taxes on Withdrawals	Taxes on interest on D(t-1)	Business taxes on investment from K(t-1)				
r + π = 6%										
1980	125.3			52.9					339.1	339.1
1990	104.3	8.3	27.3	93.6	5.5	57.2	-16.4	304.5	298.8	2205.3
2000	121.7	6.2	-1.6	134.9	-0.3	74.5	-82.7	-111.1	412.3	3397.2
2010	112.8	15.1	-59.0	166.8	-11.8	110.3	-196.4	-1300.8	501.8	4780.9
2020	106.2	14.6	-125.5	172.4	-25.1	136.3	-288.2	-2638.2	575.8	5864.1
2030	99.0	14.0	-193.2	151.0	-38.6	155.9	-348.3	-3966.8	616.5	6664.1
2040	93.0	13.6	-258.7	125.9	-51.7	171.9	-398.1	-5243.0	650.0	7320.8
Sub total (historical)	2733.4	280.2	284.1	2178.2	56.8	1130.6				
Sub total (projected)	3979.3	552.1	-5155.8	5328.1	-1031.2	5162.1				
Total	6712.7	832.3	-4871.7	7506.2	-974.3	6292.7				
	Total outflow		2673.3	**Total inflow**		12824.6	**Total surplus**		10151.3	
r + π = 7%										
1980	125.3			52.9					339.1	339.1
1990	104.3	8.3	27.3	93.6	5.5	57.2	-16.4	304.5	298.8	2205.3
2000	121.7	6.2	-1.6	134.9	-0.3	74.5	-82.7	-111.1	412.3	3397.2
2010	112.8	18.4	-60.0	179.1	-12.0	110.8	-206.8	-1331.3	512.2	4810.3
2020	106.2	18.4	-133.9	199.9	-26.8	139.9	-322.3	-2830.5	609.9	6036.1
2030	99.0	17.8	-213.8	184.2	-42.8	164.0	-402.3	-4405.4	670.5	7032.2
2040	93.0	17.3	-293.0	155.5	-58.6	184.7	-464.3	-5950.8	716.2	7883.0
Sub total (historical)	2733.4	280.2	284.1	2178.2	56.8	1130.6				
Sub total (projected)	3979.3	687.3	-5628.7	6082.7	-1125.7	5347.7				
Total	6712.7	967.5	-5344.6	8260.9	-1068.9	6478.3				
	Total outflow		2335.6	**Total inflow**		13670.3	**Total surplus**		11334.7	

Table 6.4 Sensitivity Analysis: $r + \pi$ (cont.)
(Real present value, 2002 dollars)

Year	Forgone Revenue/Outlays			Revenue			ΔD(t)	Cumulative Change of gov't debt due to deferred accounts D(t)	ΔK(t)	Cumulative change of capital stock due to deferred taxes K(t)
	Taxes foregone on original contribution	Forgone Revenue on diverted saving	Interest Outlays on D(t-1)	Taxes on Withdrawals	Taxes on interest on D(t-1)	Business taxes on investment from K(t-1)				
r + π = 7.5%										
1980	125.3			52.9					339.1	339.1
1990	104.3	8.3	27.3	93.6	5.5	57.2	-16.4	304.5	298.8	2205.3
2000	121.7	6.2	-1.6	134.9	-0.3	74.5	-82.7	-111.1	412.3	3397.2
2010	112.8	20.1	-60.6	185.6	-12.1	111.0	-212.3	-1347.1	517.6	4825.4
2020	106.2	20.5	-138.5	215.3	-27.7	141.8	-341.2	-2934.5	628.8	6129.4
2030	99.0	19.9	-225.2	203.7	-45.0	168.5	-433.4	-4651.2	701.6	7239.3
2040	93.0	19.3	-312.5	173.4	-62.5	192.0	-503.2	-6356.1	755.0	8206.3
Sub total (historical)	2733.4	280.2	284.1	2178.2	56.8	1130.6				
Sub total (projected)	3979.3	761.4	-5892.4	6512.7	-1178.5	5451.4				
Total	6712.7	1041.6	-5608.3	8690.8	-1121.7	6582.0				
	Total outflow		2146.0	**Total inflow**		14151.2	**Total surplus**		12005.2	
r + π = 8%										
1980	125.3			52.9					339.1	339.1
1990	104.3	8.3	27.3	93.6	5.5	57.2	-16.4	304.5	298.8	2205.3
2000	121.7	6.2	-1.6	134.9	-0.3	74.5	-82.7	-111.1	412.3	3397.2
2010	112.8	21.9	-61.2	192.3	-12.2	111.3	-217.8	-1363.2	523.2	4840.9
2020	106.2	22.7	-143.3	231.9	-28.7	143.8	-361.4	-3044.3	649.0	6227.9
2030	99.0	22.2	-237.6	225.5	-47.5	173.4	-467.7	-4916.8	735.9	7463.6
2040	93.0	21.5	-334.0	193.7	-66.8	200.1	-546.4	-6800.8	798.3	8562.0
Sub total (historical)	2733.4	280.2	284.1	2178.2	56.8	1130.6				
Sub total (projected)	3979.3	840.2	-6176.5	6982.6	-1235.3	5563.3				
Total	6712.7	1120.4	-5892.4	9160.8	-1178.5	6693.9				
	Total outflow		1940.7	**Total inflow**		14676.2	**Total surplus**		12735.5	

to stock are feasible, but since the main point of the paper is to indicate the favorable deferred tax effects are large even with conservative assumptions, those with a more bullish outlook for stocks can infer the results from those reported here.

Third, varying nominal returns has no effect on the foregone revenue from deductible contributions, which depend only on future wages, and the tax and contribution rates[41]. The differences in the modest diverted saving effects are small, $500 billion between the nominal returns of 4% and 8% cases.

Fourth, the changes in the other effects are much larger in total real present value through 2040. For the taxes on withdrawals, the total ranges from $6.3 trillion to $9.2 trillion. For the interest receipts on the surpluses, the total ranges from $4.1 trillion to $5.9 trillion. For the taxes foregone on the interest receipts, the total ranges from $0.8 trillion to $1.2 trillion. For business taxes, the total ranges from $6.0 trillion to $6.7 trillion.

Finally, the total effects vary substantially, but far less than proportionally. For the base case, the total real present value netting all budgetary effects ranges from $8.3 trillion to $12.7 trillion, a difference of 35% as $r+\pi$ ranges from 4% to 8%. The percentage difference is quite similar for different discount rates; for example, at δ = 3%, the total ranges from $7.1 trillion to $10.8 trillion, a 52%

[41] As noted above, we do not model the effects of returns on contribution rates.

difference; at δ = 4.5%, the total ranges from $5.1 trillion to $7.7 trillion, a difference of 50%,

Discount rate: δ

A similar analysis can be performed for different discount rates, as presented in Table 6.5. Comparing the panels in Table 6.5 for different discount rates of 2%, 2.3%, 3%, 4% and 4.5% for the base case of other parameters also reveals some interesting patterns. First, the differences in the historical effects are small, reflecting as they do only a short grossing up to the future (i.e., present day) real values. The foregone revenue on the original contributions increases by about a third, from $2.6 trillion to $3.5 trillion as we increase the discount rate from 2% to 4.5%. The increase in the foregone revenue on diverted saving is a modest percentage, but of a (relatively) small amount. The same is true of the interest receipts and taxes. While the differences in business taxes and taxes on withdrawals are larger, the differences are still modest.

Second, discounting at different rates has a slightly smaller relative effect on the future tax deduction on original contributions and the foregone revenue on diverted saving, since these are somewhat front-loaded. It has a relatively larger effect on future taxes on withdrawals, the interest effects and the business taxes, since these are somewhat back-loaded. For example, the real present value (through 2040) of the foregone revenue on future deductible contributions falls

Table 6.5 Sensitivity Analysis: δ
(Real present value, 2002 dollars)

Year	Forgone Revenue/Outlays			Revenue			ΔD(t)	Cumulative Change of gov't debt due to deferred accounts D(t)	ΔK(t)	Cumulative change of capital stock due to deferred taxes K(t)
	Taxes foregone on original contribution	Forgone Revenue on diverted saving	Interest Outlays on D(t-1)	Taxes on Withdrawals	Taxes on interest on D(t-1)	Business taxes on investment from K(t-1)				
δ = 2%										
1980	117.4			49.6					317.9	317.9
1990	100.7	8.0193	26.4	90.4	5.3	55.3	-15.8	294.0	288.5	2128.9
2000	121.0	6.2	-1.6	134.1	-0.3	74.0	-82.2	-110.4	409.9	3377.3
2010	115.5	20.6	-62.0	190.0	-12.4	113.7	-217.3	-1379.2	529.9	4940.1
2020	112.0	21.6	-146.0	227.0	-29.2	149.5	-359.7	-3093.8	662.9	6462.1
2030	107.5	21.6	-244.5	221.2	-48.9	182.9	-470.6	-5049.9	761.7	7859.8
2040	104.0	21.6	-349.4	193.9	-69.9	214.7	-562.6	-7106.6	844.1	9175.2
Sub total (historical)	2643.1	273.0	272.6	2120.8	54.5	1103.6				
Sub total (projected)	4207.3	806.7	-6359.2	6900.1	-1271.8	5815.5				
Total	6850.4	1079.6	-6086.5	9020.9	-1217.3	6919.1				
	Total outflow		1843.6	**Total inflow**		14722.7	**Total surplus**		12879.1	
δ = 2.3%										
1980	125.3			52.9					339.1	339.1
1990	104.3	8.3	27.3	93.6	5.5	57.2	-16.4	304.5	298.8	2205.3
2000	121.7	6.2	-1.6	134.9	-0.3	74.5	-82.7	-111.1	412.3	3397.2
2010	112.8	20.1	-60.6	185.6	-12.1	111.0	-212.3	-1347.1	517.6	4825.4
2020	106.2	20.5	-138.5	215.3	-27.7	141.8	-341.2	-2934.5	628.8	6129.4
2030	99.0	19.9	-225.2	203.7	-45.0	168.5	-433.4	-4651.2	701.6	7239.3
2040	93.0	19.3	-312.5	173.4	-62.5	192.0	-503.2	-6356.1	755.0	8206.3
Sub total (historical)	2733.4	280.2	284.1	2178.2	56.8	1130.6				
Sub total (projected)	3979.3	761.4	-5892.4	6512.7	-1178.5	5451.4				
Total	6712.7	1041.6	-5608.3	8690.8	-1121.7	6582.0				
	Total outflow		2146.0	**Total inflow**		14151.2	**Total surplus**		12005.2	

Table 6.5 Sensitivity Analysis: δ (cont.)
(Real present value, 2002 dollars)

Year	Forgone Revenue/Outlays			Revenue			ΔD(t)	Cumulative Change of gov't debt due to deferred accounts D(t)	ΔK(t)	Cumulative change of capital stock due to deferred taxes K(t)
	Taxes foregone on original contribution	Forgone Revenue on diverted saving	Interest Outlays on D(t-1)	Taxes on Withdrawals	Taxes on interest on D(t-1)	Business taxes on investment from K(t-1)				
δ = 3%										
1980	145.5			61.4					394.0	394.0
1990	113.2	9.0	29.7	101.6	5.9	62.1	-17.8	330.5	324.3	2393.4
2000	123.4	6.3	-1.6	136.8	-0.3	75.5	-83.8	-112.6	418.0	3443.9
2010	106.8	19.0	-57.4	175.8	-11.5	105.1	-201.0	-1275.6	490.1	4569.2
2020	94.0	18.1	-122.5	190.5	-24.5	125.4	-301.7	-2595.6	556.2	5421.4
2030	81.8	16.4	-186.1	168.3	-37.2	139.2	-358.1	-3842.8	579.7	5981.0
2040	71.8	14.9	-241.2	133.8	-48.2	148.2	-388.3	-4905.1	582.6	6333.0
Sub total (historical)	2959.5	298.0	312.6	2320.7	62.5	1197.3				
Sub total (projected)	3510.3	668.5	-4950.3	5716.7	-990.1	4709.2				
Total	6469.8	966.4	-4637.7	8037.5	-927.5	5906.5				
	Total outflow		2798.5	**Total inflow**		13016.4	**Total surplus**		10217.9	
δ = 4%										
1980	180.0			76.0					487.3	487.3
1990	127.1	10.1	33.3	114.1	6.7	69.8	-19.9	371.1	364.2	2687.6
2000	125.8	6.4	-1.6	139.5	-0.3	77.0	-85.5	-114.8	426.2	3511.0
2010	98.9	17.6	-53.1	162.7	-10.6	97.3	-186.0	-1180.7	453.7	4229.4
2020	79.0	15.2	-102.9	160.1	-20.6	105.4	-253.6	-2181.2	467.4	4556.0
2030	62.4	12.5	-142.0	128.4	-28.4	106.2	-273.2	-2931.9	442.3	4563.3
2040	49.7	10.3	-167.1	92.7	-33.4	102.7	-269.0	-3397.8	403.6	4386.9
Sub total (historical)	3324.1	325.4	358.2	2547.2	71.6	1301.9				
Sub total (projected)	2966.4	561.1	-3894.4	4796.4	-778.9	3862.6				
Total	6290.5	886.5	-3536.2	7343.7	-707.2	5164.5				
	Total outflow		3640.8	**Total inflow**		11800.9	**Total surplus**		8160.1	

Table 6.5 Sensitivity Analysis: δ (cont.)
(Real present value, 2002 dollars)

Year	Forgone Revenue/Outlays			Revenue			ΔD(t)	Cumulative Change of gov't debt due to deferred accounts D(t)	ΔK(t)	Cumulative change of capital stock due to deferred taxes K(t)
	Taxes foregone on original contribution	Forgone Revenue on diverted saving	Interest Outlays on D(t-1)	Taxes on Withdrawals	Taxes on interest on D(t-1)	Business taxes on investment from K(t-1)				
δ = 4.5%										
1980	200.0			84.5					541.6	541.6
1990	134.7	10.7	35.3	120.9	7.1	73.9	-21.1	393.1	385.8	2846.8
2000	127.0	6.5	-1.6	140.8	-0.3	77.7	-86.3	-115.9	430.3	3544.9
2010	95.1	17.0	-51.1	156.6	-10.2	93.6	-179.0	-1136.3	436.6	4070.1
2020	72.4	14.0	-94.4	146.8	-18.9	96.7	-232.6	-2000.8	428.7	4179.1
2030	54.6	11.0	-124.1	112.3	-24.8	92.9	-238.9	-2563.5	386.7	3989.9
2040	41.4	8.6	-139.2	77.3	-27.8	85.6	-224.2	-2831.7	336.3	3656.0
Sub total (historical)	3526.8	340.2	383.3	2671.7	76.7	1358.8				
Sub total (projected)	2739.6	516.4	-3467.9	4413.5	-693.6	3514.9				
Total	6266.4	856.6	-3084.6	7085.2	-616.9	4873.6				
	Total outflow		4038.4	**Total inflow**		11341.9	**Total surplus**		7303.5	

from $4.2 trillion to $2.7 trillion, about a one-third decrease, as δ rises from 2.0% to 4.5%. The future taxes on withdrawals range from $6.9 trillion to $4.4 trillion, a 36% decrease, as δ increases from 2.0% to 4.5%. Future business taxes decrease from $5.8 trillion to $3.5 trillion, a 40% decrease as δ ranges from 2.0% to 4.5%.

Third, the total real present value net budgetary effects of deferred taxes range from $12.9 trillion to $7.3 trillion as δ increases from 2.0% to 4.5%, a 43% decrease. Thus, while the choice of discount rate is quite consequential, these are vast sums even at the higher end of the spectrum.

Fourth, of course, the relationship of growth to discount rates is what is important for items growing in the future – taxes on withdrawals, business taxes, net interest.

Finally, it should be mentioned that extreme values can combine to greatly enhance or reduce these budgetary effects. For example, very low nominal returns plus high discount rates (it is not obvious how these go together over long time frames) or low discount rates and high returns (perhaps likewise), especially when combined with aggressively high or low values for the model parameters, can yield a large range of outcomes. But in any event, the net budgetary effect of deferred taxes is still consequential: at one extreme, “only” on the order of the

national debt, and at the other, larger than the combined national debt and Social Security and Medicare deficits.

A word about relevant discount rates. There is a long and distinguished debate in public finance on whether the public sector should be discounting at the same rate as the private sector or a lower rate, perhaps between the after-tax real rate of return to saving and the before-tax marginal product of capital, which differ due to the distortions of personal and corporate taxes on capital income. These so-called weighted average rules reflect the foregone private consumption and investment of the resources transferred to the government (e.g., Harberger (1974]).

The debate is also whether the government is so systematically better at spreading or attenuating risk that this should be accounted for with lower discount rates than in the private sector. (See, among others, the classic work of Arrow and Lind [1970]). However, the important thing to note about the expected present value of deferred taxes is that the federal government essentially has a partnership in asset returns which broadly reflect the market portfolio. Actually, both because of the taxation of nominal income and the failure of depreciation allowances to account for future asset price risk (Bulow and Summers [1984]), the government's partnership interest is larger than simple examination of tax rates would suggest.

We hypothesized in Section 2 that the government could issue or cause to be issued deferred tax-backed securities that could monetize the value of these future taxes. Perhaps a better name for those securities would be "market participation certificates"[42]. In fact, these would bear the same relationship to the structure of risk in the economy as the broad set of investments made by the private households making the investments. Of course, the deferred taxes are paid on nominal capital income (recall nominal contributions are deducted), whereas the taxes to finance the interest on the national debt come also from labor income. As to the spreading over more people, each of whom has very little at risk in public projects relative to their other income, the latter argument is not accurate with deferred taxes, and the former has weakened relatively in recent decades with the spreading of stock ownership and the development of mutual funds. Hence, a case could be made for discounting these risky future revenues at a risky private rate, say 4.5% real, or for calculating the equivalent certain income before discounting it at a risk-free rate.

The marginal opportunity cost of public funds usually assumed in these calculations is the Treasury's borrowing rate, and some have argued that the real return to Treasury bonds, historically about 2.3% and in 2001-2002 about 3.0%, as evidenced by the yields on Treasury inflation-protected securities (TIPS), is the appropriate discount rate. The Social Security actuaries assume a long-run real yield on government bonds of 3.0%, and the Office of the Actuary uses 3% real in calculating the real present value of the Social Security and Medicare

[42] A name suggested to me by Bill Sharpe.

surpluses discussed throughout this paper. Recall from the discussion above that nominal interest on government bonds is taxable and that much of it is held by taxable entities. Thus, the net of tax interest cost to the Treasury is well below the interest rate on government bonds. At 5% taxable and 3% inflation, the real net cost to the Treasury is likely about 1% (5% minus the marginal tax rate times the fraction taxable minus the inflation rate.) The after-personal income tax weighted average real return to stocks and bonds received by investors for the past 75 years has been about 2-3%. Thus, we have rows with 2%, 2.3%, 3.0%, 4% and 4.5% as candidate discount rates. As can be seen, lower discount rates cause a substantial increase in the expected present value of future deferred taxes.[43]

My purpose here is not to settle the issue, just to provide some understanding of the possible array of outcomes that might make sense. I should add, once again, the proviso mentioned early in the paper, that of course these are random returns, and despite the impressive longer-term stability from the historical data discussed above, better or worse outcomes in general are certainly possible, as the late 1990s and early 2000s so vividly demonstrate. A brief analysis of random returns is presented below.

[43]Some might also argue that future taxes—either those necessary to finance the national debt or those accruing in tax-deferred accounts – may be discounted by private individuals differently from other returns. Tobin (1976) argues that different risk and liquidity characteristics of government bonds compared to other assets, and Mundell (1971) argues that variations in discount rates across people, would lead to differential discounting by households.

Management fees

While it costs most of us something to have our funds professionally managed, overseen, and traded, debates about appropriate management fee assumptions, e.g., surrounding the development of possible individual accounts for Social Security, are intense (see Diamond [2000], Feldstein [2000]). Suppose that management fees were 100 basis points per year rather than 50. Instead of reproducing all the estimates in the paper, examine adjacent panels in Table 6.4, and it is immediately obvious that a 100 basis point management fee structure, which would reduce net returns to investors by an additional 50bp, would entail reduced real total net budgetary effects of deferred taxes of about one-half trillion dollars, a sizeable sum but not nearly large enough to alter the basic points being made.

Future tax rates

Finally, future tax rates are also uncertain. There will be tremendous pressure for higher taxes coming from the Social Security and Medicare programs. Some worry these will crowd out other important public services; others believe that taxes will be raised to pay for them. That is not my subject here; it is just to figure out what different assumptions about future tax rates would mean for the expected present value of deferred taxes. A wide range of eventualities is possible: the modest declines in marginal tax rates from President Bush's 2001 tax program, due to take effect in coming years, might be accelerated as he has proposed. Some have suggested postponing or

eliminating the future scheduled rate reductions. There will be additional fiscal pressure in coming decades from demographic developments, which may not all be met by adjustments in the entitlements programs or in payroll taxes; some may spill over to higher income taxes[44]. There will be some real bracket creep. Many tax reform proponents, myself included, favor fewer and lower tax rates on a broader base. President Bush's FY2004 proposals to eliminate the double taxation of dividends and to consolidate some tax-deferred saving vehicles into new instruments with high but non-deductible contribution limits and without income limits on eligibility could greatly affect participation, contributions, asset allocation and the time pattern of tax revenues.

Of course, the tremendous growth in these balances in tax-deferred accounts, combined with an increasing fraction of the voting population aware of their tax burden and voting accordingly, may create pressure to lower taxes on these withdrawals or on income in general. The spread of Roth IRAs and new life insurance-based deferred tax products may lead to lower future tax rates without, or in addition to, any legislated change in tax rates or other features. Thus, we present four hypothetical scenarios below, ranging from an increase in income tax rates of three percentage points, slightly over 10%, to a reduction of three percentage points, as might result from either a modified flat tax with rates of 10-20-30 percent or a (slightly over) 10% tax reduction, to a 20% flat rate tax

[44] Subjecting Social Security benefits to income taxation while crediting the proceeds to Social Security and financing part of Medicare with general revenue certainly provide historical precedent.

on either income or consumption (all commencing in 2005). We also discuss the President's proposed reforms. Table 6.6 presents these results.

The first panel presents the results for the case of personal income tax rates increasing three percentage points; more precisely, it assumes $\mu_{wt}=\mu_{ct}$=30%; μ_{bt} = 25%; μ_{it} = 22%; μ'_t = 17%. Obviously, both the taxes on withdrawals and taxes foregone on contributions rise, by about $700 billion and $400 billion, respectively. The foregone revenue on diverted saving, business taxes and net interest receipts change very little. The net result is an increase in the real present value of the surplus from $12.0 trillion to $12.2 trillion.

The second panel presents the results for the case of personal income tax rates decreasing three percentage points; more precisely, $\mu_{wt}= \mu_{ct}$=24.7%; μ_{bt}=25%; μ_{it}=20%; μ'_t=13%. Again obviously, both the taxes on withdrawals and the foregone revenue from the deduction of contributions decrease, by about the same $700 billion and $400 billion, respectively. The foregone revenue from diverted saving declines slightly. However, the net interest and business taxes (as less capital builds up because of smaller surpluses) decline a bit more than they increase in the previous case. This is because the foregone revenue from the deduction of the contributions comes earlier than the taxes on the withdrawals. Thus, while the real present values are quite similar in the two cases, there is a modest difference in the annual flow of surpluses, and hence of investment, the capital stock, and business taxes. This process in turn feeds

back slightly on the net interest. The net effect is a real present value surplus of $11.6 trillion compared to a base case of $12.0 trillion.

The third panel of Table 6.6 presents a scenario of income tax reform in which it is assumed a flat rate personal and business income (not consumption) tax of 20% replaces the current tax system. It is assumed deferred tax vehicles continue to be tax deductible (and that, perhaps implausibly, α and λ remain unchanged). Thus, the base broadening occurs elsewhere than in tax-deductible saving vehicles. More precisely, $\mu_{wt}=\mu_{ct}=\mu_{bt}$=20%; μ_{it}=13%; μ'_t=12%. Not surprisingly, the impact on the components of the budgetary effects of tax-deferred saving vehicles is much larger. The taxes on withdrawals decline by $1.7 trillion, the foregone revenue on contributions declines by $1.0 trillion, business taxes decline by $1.4 trillion and net interest declines by $600 billion. The net result is a reduction in the real present value surplus from $12.0 trillion to $9.5 trillion, a decline of 21%. The capital stock effect is also smaller by 2040, by about 13%. However, as mentioned earlier, these results do not incorporate the additional beneficial effects on the economy of lower tax rates. The lower tax rates might well enhance labor supply in one or more dimensions, thereby increasing wages and salaries, taxable income and generating a reflow of taxes. It might reduce non-taxable fringe benefits in favor of taxable earnings. It might increase saving in non-tax-deductible form. Recall, we are dealing with the

Table 6.6 Sensitivity Analysis: μ (Real present value, 2002 dollars)

Year	Forgone Revenue/Outlays			Revenue			ΔD(t)	Cumulative Change of gov't debt due to deferred accounts D(t)	ΔK(t)	Cumulative change of capital stock due to deferred taxes K(t)
	Taxes foregone on original contribution	Forgone Revenue on diverted saving	Interest Outlays on D(t-1)	Taxes on Withdrawals	Taxes on interest on D(t-1)	Business taxes on investment from K(t-1)				
μ_{wt} = 30.7%; μ_{ct} = 30.7%; μ_{bt} = 25.0%; μ_{it} = 22.0%; μ'_t = 17%										
1980	125.3			52.9					339.1	339.1
1990	104.3	8.3	27.3	93.6	5.5	57.2	-16.4	304.5	298.8	2205.3
2000	121.7	6.2	-1.6	134.9	-0.3	74.5	-82.7	-111.1	412.34	3397.2
2010	125.0	22.6	-61.3	205.7	-13.5	111.3	-217.2	-1364.8	522.6	4842.2
2020	117.7	22.9	-140.9	238.7	-31.0	142.7	-350.6	-2988.5	638.3	6176.8
2030	109.8	22.1	-229.0	225.8	-50.4	169.9	-442.4	-4730.0	710.6	7302.5
2040	103.1	21.4	-316.5	192.2	-69.6	193.4	-507.9	-6434.2	759.8	8262.1
Sub total (historical)	2733.4	280.2	284.1	2178.2	56.8	1130.6				
Sub total (projected)	4386.1	845.7	-5978.7	7185.6	-1314.5	5484.0				
Total	7119.4	1125.9	-5694.6	9363.8	-1257.7	6614.6				
	Total outflow		2550.7	Total inflow		14720.7	Total surplus		12170.0	
μ_{wt} = 24.7%; μ_{ct} = 24.7%; μ_{bt} = 25.0%; μ_{it} = 20.0%; μ'_t = 13%										
1980	125.3			52.9					339.1	339.1
1990	104.3	8.3	27.3	93.6	5.5	57.2	-16.4	304.5	298.8	2205.3
2000	121.7	6.2	-1.6	134.9	-0.3	74.5	-82.7	-111.1	412.3	3397.2
2010	100.6	17.5	-59.7	165.5	-11.9	110.6	-205.8	-1324.1	511.2	4803.6
2020	94.7	18.0	-134.9	192.0	-27.0	140.3	-327.5	-2853.9	615.1	6058.5
2030	88.3	17.6	-218.3	181.6	-43.7	165.8	-416.2	-4504.7	684.4	7119.0
2040	82.9	17.2	-302.4	154.6	-60.5	188.3	-484.8	-6147.3	736.6	8044.3
Sub total (historical)	2733.4	280.2	284.1	2178.2	56.8	1130.6				
Sub total (projected)	3572.6	674.5	-5728.9	5839.7	-1145.8	5388.3				
Total	6306.0	954.7	-5444.8	8017.9	-1089.0	6518.9				
	Total outflow		1815.9	Total inflow		13447.8	Total surplus		11631.9	

Table 6.6 Sensitivity Analysis: μ (Real present value, 2001 dollars) (cont.)

Year	Forgone Revenue/Outlays			Revenue			ΔD(t)	Cumulative Change of gov't debt due to deferred accounts D(t)	ΔK(t)	Cumulative change of capital stock due to deferred taxes K(t)
	Taxes foregone on original contribution	Forgone Revenue on diverted saving	Interest Outlays on D(t-1)	Taxes on Withdrawals	Taxes on interest on D(t-1)	Business taxes on investment from K(t-1)				
μ_{wt} = 20.0%; μ_{ct} = 20.0%; μ_{bt} = 20.0%; μ_{it} = 13.0%; μ'_t = 12%										
1980	125.3			52.9					339.1	339.1
1990	104.3	8.3	27.3	93.6	5.5	57.2	-16.4	304.5	298.8	2205.3
2000	121.7	6.2	-1.6	134.9	-0.3	74.5	-82.7	-111.1	412.3	3397.2
2010	81.4	16.2	-53.1	134.0	-6.9	86.2	-168.7	-1163.4	474.1	4652.5
2020	76.7	16.8	-112.4	155.5	-14.6	104.9	-264.7	-2369.3	552.4	5641.6
2030	71.5	16.4	-178.0	147.1	-23.1	120.5	-334.5	-3668.5	602.7	6445.0
2040	67.2	16.0	-244.2	125.2	-31.7	133.9	-388.4	-4961.8	640.2	7133.8
Sub total (historical)	2733.4	280.2	284.1	2178.2	56.8	1130.6				
Sub total (projected)	2935.4	630.0	-4739.1	4785.4	-618.9	4043.2				
Total	5668.8	910.2	-4455.0	6963.5	-562.1	5173.8				
	Total outflow		2124.0	**Total inflow**		11575.3	**Total surplus**		9451.3	
μ_{wt} = 20.0%; μ_{ct} = 0.0%; μ_{bt} = 20.0%; μ_{it} = 0.0%; μ'_t = 0.0%										
1980	125.3			52.9					339.1	339.1
1990	104.3	8.3	27.3	93.6	5.5	57.2	-16.4	304.5	298.8	2205.3
2000	121.7	6.2	-1.6	134.9	-0.3	74.5	-82.7	-111.1	412.3	3397.2
2010	0.0	0.0	-80.0	134.0	0.0	95.7	-309.7	-1807.8	615.1	5256.8
2020	0.0	0.0	-202.4	155.5	0.0	134.0	-491.9	-4282.6	779.6	7278.6
2030	0.0	0.0	-342.6	147.1	0.0	170.4	-660.1	-7075.5	928.2	9193.2
2040	0.0	0.0	-495.9	125.2	0.0	207.3	-828.4	-10115.2	1080.2	11134.0
Sub total (historical)	2733.4	280.2	284.1	2178.2	56.8	1130.6				
Sub total (projected)	223.9	37.5	-8839.2	4785.4	-8.0	5304.0				
Total	2957.3	317.7	-8555.1	6963.5	48.8	6434.5				
	Total outflow		-5280.1	**Total inflow**		13446.9	**Total surplus**		18727.0	

accounts of a subset of the economy and budget. While the lower tax rate might decrease contributions to tax-deductible accounts, it may increase saving in taxable forms as much or more. The lower business tax rate reduces the cost of capital, cet. par., and will likely increase investment. The larger capital stock would yield additional business taxes, and might well increase wages and future income and payroll taxes on labor income. None of these additional effects is modeled here.

The last panel of Table 6.6 presents the results for the adoption of a 20% flat rate consumed income tax, similar to that proposed by Hall and Rabushka (2000). Of course, in such a tax system, there is no deduction for contributions and no personal taxation of interest, dividends or capital gains. Investment is expensed in the business tax. More precisely, the tax rates are μ_{wt}=20%; μ_{ct}=0%; μ_{bt}=20%; μ_{it}=0%; μ'_t=0%. Recall there are no taxes directly on interest, dividends or capital gains in the personal tax component of the Hall-Rabushka flat tax. As revenue losses from contributions cease, they obviously fall dramatically, by $3.8 trillion. Withdrawals are now taxed at a lower rate, so taxes on them fall by $1.7 trillion. Business taxes fall by $150 billion, but it is debatable whether μ_{bt} = 20% fully models the transition to Hall-Rabushka, where the business tax is essentially a consumption-type value-added tax. Foregone revenue on diverted saving falls to zero after the presumed start date of 2005. Net interest receipts obviously increase a lot, due to the much smaller foregone revenue on contributions, which occur early, thus greatly increasing surpluses.

Net interest receipts increase to $8.6 trillion from $4.5 trillion, an increase of 90%. The net result is an increase in the overall surplus from $12.0 trillion to $18.7 trillion, a gain of 56%. The capital stock effect is also 36% larger by 2040.

Before we all get too excited by these figures, in addition to all the provisos mentioned above about the likely effects on α and in this case especially λ, additional benefits to the economy and revenue feedback from the lower tax rates, recall that historically large changes in the tax base have been accompanied by complex transition rules, especially on "old" capital. These are not modeled here. Also, the business tax changes are important and need to be examined in conjunction with the personal wage tax in a full analysis, especially in the Hall-Rabushka flat tax, as it is purposely designed to be an integrated system. For example, the non-taxation of interest in the personal tax is accompanied by non-deductibility of interest expense in the business tax. Before-tax interest rates might well change, as well as the relative reliance on personal and corporate debt. Finally, the overall saving, investment, labor supply and income would likely increase, as would the efficiency of the allocation of investment among different activities; these effects are not modeled here.

[Insert discussion of President Bush's suggested reforms]

It is important to understand that part of the pressure to change future tax rates will stem from the pressure in the entitlement programs, given the

impending demographic transition. As discussed in Section 7, the political economy will become more complex in the future, as it can be expected that those with sizeable balances in their tax-deferred accounts will be uninterested in higher taxes on their withdrawals to fund increased benefit payments for Social Security, Medicare or other purposes, establishing more of a three-way clash of interests than the usually-discussed two-way, purely generational one.

Contribution rates

Table 6.7 performs a similar sensitivity analysis to contribution rates. Recall that our assumed 8% ratio of contributions to wages and salaries is somewhat below the recent historical data. However, the historical data does reflect demography, and in recent years a growing fraction of the population has been in their peak earning and saving years[45]. Recall also that numerous factors explored in our sensitivity analyses above, such as tax rates and returns, could affect λ. We report the real present value of deferred taxes of contribution rates of 7% and 9% to compare to our base case of 8%. It is readily apparent that such a range of variation has only a small effect on the real present value of deferred taxes. The real present value net surplus hardly varies. Obviously, for

[45] There is also an issue of the employer contributions and their tax deductibility in the calculations performed above and in the estimate of λ. To the extent λ includes some employer contributions, a more detailed analysis, probably at the level of programs rather than the aggregate, would net differential tax rates for the deductions by tax-paying employers and employees. The Federal and state and local governments would not be deducting contributions on business taxes.

Table 6.7 Sensitivity Analysis: λ (Real present value, 2001 dollars)

Year	Forgone Revenue/Outlays			Revenue			ΔD(t)	Cumulative Change of gov't debt due to deferred accounts D(t)	ΔK(t)	Cumulative change of capital stock due to deferred taxes K(t)
	Taxes foregone on original contribution	Forgone Revenue on diverted saving	Interest Outlays on D(t-1)	Taxes on Withdrawals	Taxes on interest on D(t-1)	Business taxes on investment from K(t-1)				
λ = 7%										
1980	125.3			52.9					339.1	339.1
1990	104.3	8.3	27.3	93.6	5.5	57.2	-16.4	304.5	298.8	2205.3
2000	121.7	6.2	-1.6	134.9	-0.3	74.5	-82.7	-111.1	412.3	3397.2
2010	98.7	19.1	-65.2	183.2	-13.0	107.5	-225.0	-1445.5	492.2	4661.2
2020	93.0	18.5	-145.4	207.4	-29.1	135.7	-347.8	-3070.2	599.5	5862.9
2030	86.7	17.4	-230.0	189.0	-46.0	160.2	-429.1	-4735.8	663.7	6880.5
2040	81.4	16.8	-311.2	154.9	-62.2	181.2	-486.8	-6313.8	707.2	7737.0
Sub total (historical)	2719.5	280.2	284.1	2178.1	56.8	1130.6				
Sub total (projected)	3481.9	692.9	-6053.4	6161.3	-1210.7	5213.7				
Total	6201.4	973.1	-5769.3	8339.4	-1153.9	6344.3				
	Total outflow		1405.2	**Total inflow**		13529.8	**Total surplus**		12124.6	
λ = 9%										
1980	125.3			52.9					339.1	339.1
1990	104.3	8.3	27.3	93.6	5.5	57.2	-16.4	304.5	298.8	2205.3
2000	121.7	6.2	-1.6	134.9	-0.3	74.5	-82.7	-111.1	412.3	3397.2
2010	126.9	21.1	-56.0	188.1	-11.2	114.6	-199.5	-1248.8	543.1	4989.6
2020	119.5	22.5	-131.6	223.3	-26.3	147.9	-334.5	-2798.8	658.1	6395.9
2030	111.4	22.4	-220.5	218.4	-44.1	176.8	-437.8	-4566.5	739.5	7597.9
2040	104.6	21.9	-313.9	191.9	-62.8	202.9	-519.4	-6398.0	802.7	8675.3
Sub total (historical)	2747.3	280.2	284.1	2178.2	56.8	1130.6				
Sub total (projected)	4476.8	830.3	-5731.2	6864.0	-1146.2	5689.0				
Total	7224.0	1110.5	-5447.1	9042.2	-1089.4	6819.6				
	Total outflow		2887.4	**Total inflow**		14772.4	**Total surplus**		11885.0	

Table 6.7 Sensitivity Analysis: λ (Real present value, 2001 dollars)

Year	Forgone Revenue/Outlays			Revenue			ΔD(t)	Cumulative Change of gov't debt due to deferred accounts D(t)	ΔK(t)	Cumulative change of capital stock due to deferred taxes K(t)
	Taxes foregone on original contribution	Forgone Revenue on diverted saving	Interest Outlays on D(t-1)	Taxes on Withdrawals	Taxes on interest on D(t-1)	Business taxes on investment from K(t-1)				
λ = 0%										
1980	125.3			52.9					339.1	339.1
1990	104.3	8.3	27.3	93.6	5.5	57.2	-16.4	304.5	298.8	2205.3
2000	121.7	6.2	-1.6	134.9	-0.3	74.5	-82.7	-111.1	412.3	3397.2
2010	0.0	12.1	-97.2	166.0	-19.4	82.4	-314.0	-2133.9	314.0	3511.8
2020	0.0	5.3	-193.5	151.5	-38.7	92.8	-393.8	-4016.5	393.8	3994.5
2030	0.0	1.3	-262.6	85.7	-52.5	102.1	-396.7	-5315.1	396.7	4358.3
2040	0.0	0.1	-300.2	25.3	-60.0	104.7	-370.0	-5992.0	370.0	4430.6
Sub total (historical)	2622.1	280.2	284.1	2177.6	56.8	1130.6				
Sub total (projected)	0.0	236.3	-7166.9	3701.8	-1433.4	3544.8				
Total	2622.1	516.5	-6882.8	5879.4	-1376.6	4675.4				
	Total outflow		-3744.2	**Total inflow**		9178.2	**Total surplus**		12922.4	

example, a lower λ reduces the foregone revenues from the now lower deductible contributions and lower diverted saving, which work to increase the surplus. But working in the opposite direction is a reduction in taxes on withdrawals as the lower C_t lowers A_t and hence future withdrawals. The net effect in the time frame to 2040 is small. The effects work in the opposite direction with a higher λ.

All the estimates discussed thus far assume contributions continue to be made. It is interesting to note the budgetary effects of deferred taxes in the case when no additional tax deductible contributions are made, e.g., the tax laws are changed to disallow future tax-deferred saving. This case of $\lambda = 0$, beginning in 2005, is also presented in Table 6.7. The future foregone revenue on contributions and diverted saving falls $4.6 trillion; taxes on withdrawals fall $2.8 trillion; business taxes fall $1.9 trillion and net interest rises by $0.5 trillion, for a net increase in the real present value of the surplus of $900 billion. While the cumulative positive effect on the government debt by 2040 falls by 6% to $6.0 trillion, there is a large difference in the capital stock effect by 2040, $3.8 trillion less at $4.4 trillion than in the base case. Of course, such a tax policy shift might well be brought about by a tax reform that also changed other tax rates, and such a large change could also affect other personal saving beyond what is subsumed in α.

Retirement/withdrawal age

The modeling of the age pattern of withdrawals, what we have loosely called retirement age, because we also assume contributions cease, can be an important determinant of the budgetary effects of tax-deferred saving vehicles. More people collect their first Social Security check at age 62 than at age 65. The age of eligibility for "full" benefits in Social Security under current law will gradually rise to 67 during our forecast period. Up until the 1980s, there was a substantial trend to earlier retirement, but that appears to have roughly leveled off (Quinn [1999]). This has occurred despite the enormous increase in life expectancy. The life expectancy of the elderly has been increasing steadily for decades and is projected to continue to rise. Through our 2040 forecast, the life expectancy of the elderly is projected by SSA to rise about another two-plus years; many believe this is conservative.

The mix of types and times of withdrawal – lump sum, year certain, annuity, etc. –is diverse. Our base case models withdrawals as if they occurred as a lump sum in the year the potential retiree reaches 64½. With large accumulated balances to be taxed at withdrawal, the foregone revenue on the original contributions being history, and small continuing foregone revenue on any diverted saving, the real present value of the cumulative budgetary effects will depend on several factors. With no time limit to the forecast period, a later "retirement" age would tend to raise or lower the total surplus depending upon the strength of offsetting effects. First, if returns exceed the discount rate, later

withdrawal should increase present values. Second, later withdrawal generates less interim revenue on taxes from withdrawals compounded by revenue losses from continuing contributions. This reduces the cumulative surplus and hence net interest receipts and adds less to the capital stock and thus business taxes during the interim period. Third, continuing contributions plus their returns add to inside buildup of balances to be taxed at withdrawal. Finally, there is a non-trivial fraction of A_t in 2002 for people in their 60s and older; thus, assuming 69½ as the retirement age causes a temporary sharp drop in withdrawals relative to history, trend and base case assumptions.

However, as we have adopted the (conservative) convention of projecting only through 2040, several of these effects will be recorded partially beyond this date. As the losses precede the gains in timing, the projection period would have to be carried out further to account for these effects fully. Instead, Table 6.8 presents the case of withdrawal at 69½ with all other base case assumptions. As is evident, the large difference is in interest receipts, which take much longer to build up, partly because of the drop in withdrawals in the very short term mentioned above. In any event, even modeling withdrawals as lump sum at age 69 ½ beginning immediately reduces the total cumulative surplus by 16%, from $12.0 trillion to $10.0 trillion. For comparison, Poterba, Venti and Wise (2000) report that retirement five years later adds roughly 15% to estimated 401(k) balances for the mean member of a synthetic cohort retiring in 2035.

To illustrate the effect of later withdrawal/retirement with other return/discount combinations, we present several cases in Table 6.9. Consider the case where $r+\pi$=6% and δ=3%. The lower return and higher discounting causes a greater relative effect of later withdrawal/retirement: the total surplus declines from about $8.7 trillion to $6.8 trillion, or 22%. In the case of a larger differential, for example $r+\pi$=8.0% and δ=3.0%, the total surplus declines from $10.8 trillion to $9.1 trillion, a decline of 16%.

75-year projection

While many assumptions form the basis for the estimates above, each of which can be debated, we have generally been conservative in the comparisons to the 75-year actuarial deficits in Social Security and Medicare, in part because we have deliberately projected deferred taxes for only roughly half this period.[46]. We think this makes our basic point even more forcefully, but especially in comparing the estimates for different assumptions, note that some will affect the front-loaded revenue losses, and hence debt, interest, capital formation and business taxes differently from the back-loaded revenues.

[46] My own view is that the SSA actuaries' intermediate projection understates the actuarial deficits. While I believe that with sound economic policies the economy can do better than the modest long-run growth projections, I also believe that life expectancy is likely to increase far more than SSA projects.

Table 6.8

EFFECTS OF R = 69½

Base Case

	Taxes foregone on original contribution	Forgone Revenue on diverted saving	Interest Outlays on D(t-1)	Taxes on Withdrawals	Taxes on interest on D(t-1)	Business taxes on investment from K(t-1)	Total surplus
Total	6712.7	1195.9	-4313.2	8379.6	-862.6	6119.3	10040.9

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Table 6.9

EFFECT OF LATER WITHDRAWAL / RETIREMENT

R = 69½, ALERNATIVE RETURNS AND DISCOUNT RATES;
TOTAL SURPLUS IN REAL PRESENT VALUE IN TRILLIONS OF 2002 DOLLARS;
PERCENT DECLINE FROM R = 64 ½ IN PARENTHESES

	6%	**7.5%**	**8%**
2.3%	8.1 (20%)	10.0 (17%)	10.8 (15%)
3.0%	6.8 (22%)	8.4 (18%)	9.1 (16%)
4.0%	5.3 (24%)	6.6 (20%)	7.1 (17%)

Underreporting of assets

Two other building block assumptions dealt with how to blow up the deferred tax assets reported in the *Survey of Consumer Finances* to national control totals and the estimated contribution rates to all the deferred tax vehicles out of wages and salaries. We explored two alternative assumptions on the proper mapping from the SCF data to national totals. The first assumed that the SCF over-weights the share of tax-deferred assets in the top two tax brackets; the second assumed that the SCF over-weights the bottom two tax brackets. By reducing the share of tax-deferred assets in the top two and bottom two tax brackets, we lower and raise the weighted average tax rate to 26.8% and 29.3%, respectively. But, as was readily seen in the discussion of the rates above, even relative to each other, let alone relative to the base case assumption in the middle, the variation in the real present value of deferred taxes would be quite modest.

DB plans

One important complexity is what to assume about the future of defined benefit plans. DB plans have been eclipsed by DC plans but are still important. Reasonable alternate scenarios range from DB plans progressively being replaced at the margin (e.g., new workers) by DC plans[47], to growing in contributions and returns in some formulaic way to "keep up full funding", to growing in importance in the future. In our simplified modeling, these alternate

[47] Poterba, Venti and Wise (2001) conclude that the decline in DB plans has not been caused by the growth of DC plans.

scenarios could be accommodated by assuming some combination of different contribution rate and nominal returns in the aggregate. But as the results in Section 6 demonstrate, this would alter the results only modestly. For example, a quite conservative approximation might be to use a 7% contribution rate and a 6% nominal return[48] to compare to our base case. But this would reduce the real present value of deferred taxes only about 19%[49].

Random returns

The estimates presented above convey some sense of how the deferred taxes vary with alternative constant rates of return on the accumulations. Variation in a constant mean return is only one type of potential risk. There are, of course, numerous other types of risk. For example, the sequence of draws from the same ex ante probability distribution of prospective annual returns will have its own distribution around the mean ex ante return. Future tax revenue is thus highly dependent on asset, especially stock, returns. Of course, this is also true of capital gains revenue, stock option exercise revenue, financial services bonus revenue, and several other sources. Our focus here is on long-run revenue; clearly, the year-to-year variation is likely to be substantial. To obtain a very rough sense of this effect, we take the Ibbotson return data for 1926-2002[50] as an empirical approximation to the distribution of returns, with the means discussed in Section 5, and take five thousand sequences of draws to determine

[48] Higher realized returns would depress future contributions, and for plans that were not overfunded, conversely.
[49] See Scheiber and Shoven (1994) for an interesting perspective on demography and DB plans.
[50] 2002 are author's preliminary estimates.

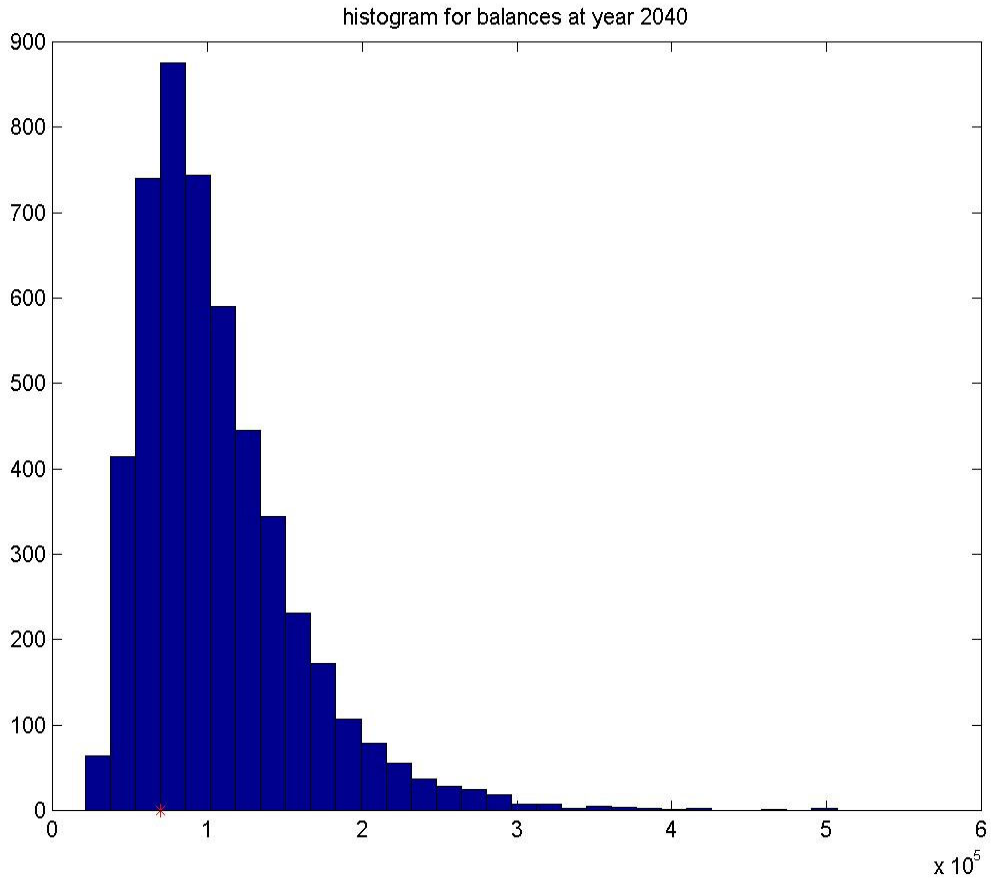
the probability distribution of ex post year 2040 balances.[51] Recall that accumulations inside deferred tax vehicles accumulate tax-free and then are taxed as ordinary income when withdrawn during retirement. Thus, the serious policy problems surrounding the extremely limited offset rules for capital losses do not apply.

Figure 6.1 portrays the histogram of projected balances A_t in 2040, not surprisingly resembling a lognormal distribution, relative to the mean and median. Relative to the balance of nominal accumulations of $69.7 trillion in 2040, based on a constant annual nominal mean return of 7.5%, the mean and median balances are $106.2 trillion and $94.6 trillion, respectively. There is a 90% probability that the balance will exceed $54.4 trillion or 78% of the corresponding constant annual return specification, and a 10% chance it will exceed $171.4 trillion. The independent random draw assumption is obviously extreme for a period this long. Recall the discussion in Section 5 of stock returns in particular exhibiting mean reversion.

[51] Poterba, Venti and Wise (2000) perform a similar experiment for their projection of a synthetic cohort's future 401(k) balances.

Figure 6.1

Histogram for Balances At Year 2040



Section 7. Deferred taxes in the Federal budget

As noted above, taxes on withdrawals from tax-deferred accounts are already substantial and will grow enormously in coming years. Because the ratio of taxes on withdrawals to taxes on other sources of income is likely to rise substantially, as it is relative to historical values, failure explicitly to take full account of this phenomenon could lead to an underestimate of projected future

tax revenues. To be sure, projecting future income tax revenues, or those from any other tax, is a difficult process. Fluctuations in economic activity, changes in inflation, shifts in the composition of income among categories that are taxed differently, and numerous other factors can cause forecasts to go seriously awry. It was only a couple of years ago that we were debating why actual revenues greatly exceeded previously forecast revenues. Much serious analysis concluded that the growth of stock options and bonuses plus larger than expected capital gains realizations were the largest part of the story, but that higher than anticipated revenues from withdrawals from IRAs and 401ks were also a culprit.

Fortunately, the Congressional Budget Office (CBO) and the Treasury are making some headway on this matter. The CBO has been separately estimating and forecasting taxes on withdrawals from individual retirement accounts for some time and is just starting to include separate estimates from some, not all, of the other tax-deferred vehicles[52]in its 10-year budget projections. However, no account is currently taken in its longer-term forecasts, although a project is under way to do so. Likewise, Treasury separately estimates taxable IRA distributions based on assets, earnings, contributions and age, basing contributions and earnings on interest rates and personal income among other variables. For other pension distributions, Treasury develops a model based on personal income and retired population growth.[53] Like CBO, the long-term budget outlook presented

[52] Very helpful conversations with Bob Dennis and Tom Woodward, in addition to CBO (2001).
[53] Helpful conversations with Drew Lyon.

by OMB in the *Analytical Perspectives on the Budget* ignores this phenomenon. CBO and OMB assign constant long-run tax shares of 19% and 19.6%, respectively[54]. Thus, the likely large growth in revenue from deferred taxes is currently left out of all the long-run budget calculations, which leads to a serious overstatement, cet. par., of long-run budget deficits or "fiscal gaps". Alternatively, the constant rate inadvertently sets up a policy baseline with other taxes assumed to be continuously reduced as the uncounted growth in revenues from retirement distributions rolls in.

Figure 7.1 presents historical data and projections of withdrawals as a percentage of wages and salaries. This ratio is likely to rise substantially, more than doubling between 1990 and 2020. By 2013, the last year of the ten-year projection period for the federal government, the ratio is almost 40% higher than in 2000, even with a very conservative estimate of the contribution rate. The withdrawal rate will increasingly dominate the contribution rate. Thus, while not a large issue for the shorter term, these estimates reveal a possibly large payoff in still greater accuracy from the CBO, Treasury and OMB as they continue their important work to develop and incorporate improved estimates in future budget forecasts.

To get a rough idea of the size of this omission, Table 7.1 reports estimates of the likely tax and interest effects from deferred tax accounts

[54] Thus, real bracket creep is also not explicitly modeled. The income elasticity of tax revenue under current law is surely greater than one.

Table 7.1

Budgetary Effects of Deferred Tax Vehicles Relative to GDP and Wages and Salaries

Year	Taxes foregone on original contribution	Forgone revenue on diverted saving	Interest outlays on D(t-1)	Taxes on withdrawals	Taxes on interest on D(t-1)	Business taxes on investment from K(t-1)	Total
			As percentage of GDP				
1990	0.98%	0.08%	0.26%	0.88%	0.05%	0.54%	0.15%
2000	1.12%	0.06%	-0.01%	1.24%	0.00%	0.69%	0.76%
2010	1.07%	0.19%	-0.57%	1.76%	-0.11%	1.05%	2.01%
2020	1.07%	0.21%	-1.39%	2.16%	-0.28%	1.42%	3.42%
2030	1.07%	0.21%	-2.43%	2.19%	-0.49%	1.81%	4.67%
2040	1.07%	0.22%	-3.58%	1.99%	-0.72%	2.20%	5.77%
			As percentage of wages & salaries				
1990	2.18%	0.17%	0.57%	1.96%	0.11%	1.20%	0.34%
2000	2.47%	0.13%	-0.03%	2.73%	-0.01%	1.51%	1.67%
2010	2.22%	0.39%	-1.19%	3.65%	-0.24%	2.18%	4.17%
2020	2.22%	0.43%	-2.89%	4.49%	-0.58%	2.96%	7.12%
2030	2.22%	0.45%	-5.04%	4.56%	-1.01%	3.77%	9.70%
2040	2.22%	0.46%	-7.45%	4.13%	-1.49%	4.58%	11.90%

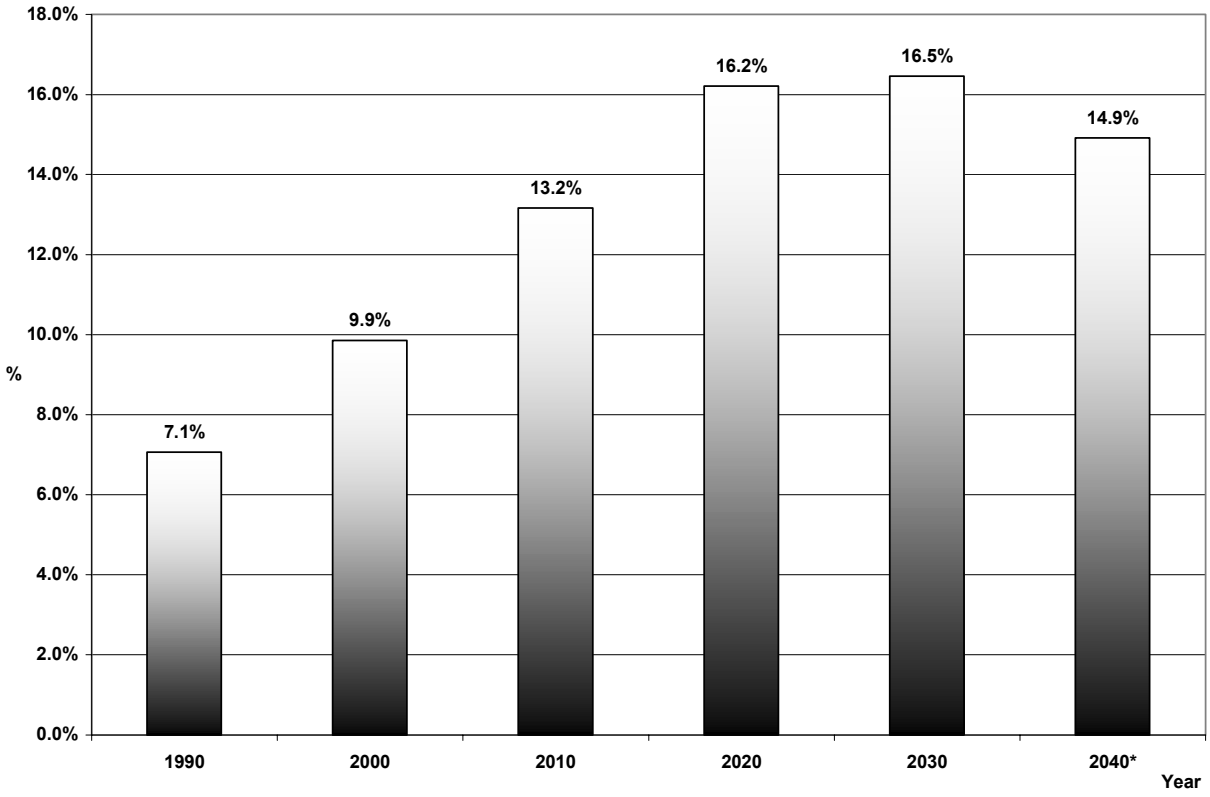
by decade, relative to GDP and wages and salaries. For a sense of the absolute values, the current total of a little over $100 billion will increase to an average of about $600 billion in the 2020s. This roughly corresponds with the synthetic projections of Poterba, venti and Wise (2000) on the percentage growth of 401(k) balances at retirement for a typical member of the cohort retiring in 2025.

CBO and OMB each report long-run projections of "fiscal gaps", the difference between outlays and receipts as percentages of GDP, for a 75-year projection period. Their focus is primarily on the immense expected future growth in entitlement spending, especially for Social Security, Medicare and Medicaid. They must make assumptions about the other spending categories that are annually appropriated, so-called discretionary spending, such as defense, homeland security, energy, natural resources and the environment, etc., and for interest costs. The two most common assumptions are that discretionary spending is constant relative to GDP after some period and that it grows at the (slower) rate of inflation. This total as a percentage of GDP is then compared to the usually assumed constant tax share (19% or so) of GDP which, as noted above, is greatly understated because of the omission of the deferred taxes.

In principle, to estimate the effects of the deferred tax vehicles on revenue, the taxes on the withdrawals should be netted against any foregone revenue not already included. Much of the foregone revenue comes from the

Figure 7.1

Taxable Withdrawals as a Percentage of Wages and Salary



* Apparent reduction due to truncation of series.

deductibility of the contributions, the $\mu_{tc}\ C_t$ from Section 3. For the balances already accumulated, these have already been netted in the historical budget data. For future contributions, these are implicitly already included in the tax share relative to GDP, reflecting their inclusion in the historical data. The foregone revenue also includes taxes on income that would have been earned on assets that would have been accumulated in the absence of the deferred tax vehicles.

A full accounting would also explore the effect on corporate tax revenues and of any change in the debt and resulting interest outlays from foregone revenue. Thus, in the base case, $2.7 trillion of historical revenue losses on contributions was already included in historical budget data; the $4.0 trillion of revenue losses on future contributions is implicitly included; the $0.3 trillion of foregone revenue on diverted saving is not explicitly accounted for but is subsumed in historical relationships and, in any event, is small; the business taxes are not explicitly accounted for, and are only partially included in historical relationships; the taxes on withdrawals are certainly underestimated in the long-run analyses and may be in the medium-term; and the net interest receipts (or decreases in net interest paid) are likewise not separately accounted for and likely greatly underestimated. A rough guide to the budgetary treatment is summarized in Table 7.2.

Additionally, the failure to project the deferred tax revenues creates larger interim deficits and a larger national debt and therefore interest payments, which worsen the (total, not primary) deficit by adding to the growth of outlays. CBO's projection of interest expense goes from 1% of GDP in 2010 to 4.1% in 2050 and 11.1% in 2070. This all adds up to outlays relative to GDP for OMB of 24.3% and 32.2% in 2050 and 2075, respectively. The corresponding figures for CBO are 28.0% and 41.9%. The corresponding projected "fiscal gaps", i.e., projected future annual deficits, are 4.7% and 13.3% for OMB and 9% and 22.9% for CBO.

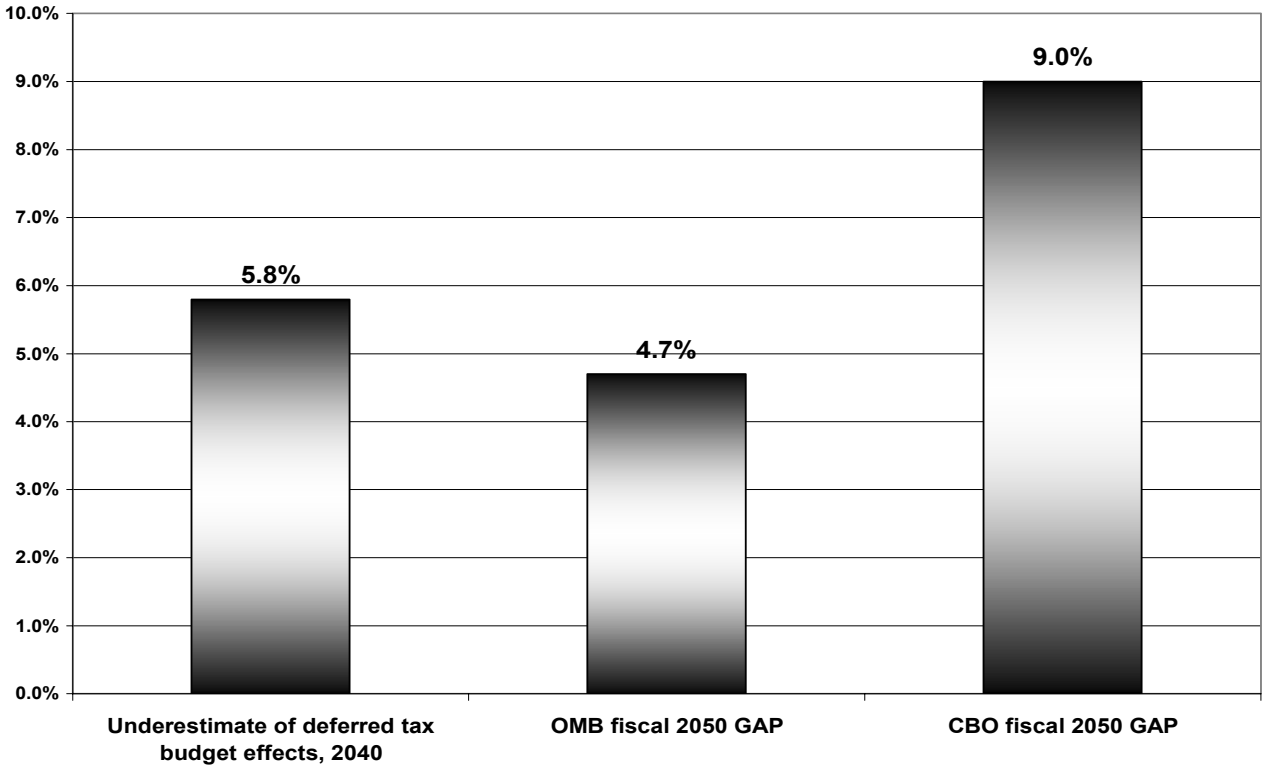
Table 7.2

The Effects of Deferred-Tax Vehicles in the Federal Budget

Foregone Revenue Outlays		**Treatment in Budget Projections**
1) Tax deduction on original contribution	$\mu_{ct} C_t$	Included in historical data
2) Revenue foregone on taxable returns to diverted saving	$\mu'_t A'_{t-1} (r_t + \pi_t)$	Implicit in historical data
3) Interest outlays on any increased government debt (can eventually be negative)	$i_t \sum_t dD_t$	Baseline amount implicit in short -run projections; swing to interest receipts not in long-run projections
Revenue		
1) Taxes on withdrawals	$\mu_{wt} W_t$	In historical data; partially forecast in short-term growth; not in long-term projections
2) Taxes on interest on any increased government debt (can eventually be negative)	$\mu_{it} i_t \sum_t dD_t$	Implicit in historical data; baseline amount implicit in short-run projection
3) Business taxes on any additional taxable business investment from increased national saving	$\mu_{bt} (r_{bt} + \pi_t) dK$	Implicit in historical data; not separated explicitly in projections, either short-run or long-run; some effect of change in national saving in some models, but likely under-estimated, e.g., because of under-estimate of taxes on withdrawals.

Figure 7.2

Estimated Underestimated Future Favorable Budget Impact of Deferred Tax Vehicles Relative to Projected fiscal GAP, 2040



NB: The OMB and CBO fiscal gaps are for 2050; the 2040 figures would be considerably less.

As we forecast through 2040, the figures are not quite comparable. But if we ignore the likely additional growth relative to GDP and take the net budgetary effect due the deferred taxes of about 5.8% of GDP, it is larger than the deficit projected by OMB and almost two-thirds of the CBO gap (Figure 7.2). If we take just the growth in taxes on withdrawals, business taxes and net interest relative to GDP, net of the growth in foregone revenue on diverted saving – a rough estimate of what is excluded in these long run budget forecasts, the total is about

five percent of GDP, slightly larger than the 2050 OMB deficit and over half the CBO projection. Correctly accounting for the deferred taxes would eliminate most or all of the fiscal gap in 2050. Before anyone gets too excited, I should state my view that the long-run Social Security and Medicare deficits are underestimated due to very conservative assumptions about gains in life expectancy of the elderly, only partially offset, in my view, by too conservative assumptions about future economic growth.

Section 8. The Political Economy of Deferred Taxes

The many trillions of dollars of future taxes due to be paid on withdrawals from deferred tax vehicles will almost certainly alter the future political economy of budget policy. Current discussions focus on potential for growing intergenerational tension as the increasingly numerous elderly seek to preserve and extend entitlement benefits while the (relatively) less numerous taxpayers resist tax hikes. A third dimension will be added to the political dynamic as a growing fraction of retirees have a strong stake in lower tax rates, at least on their withdrawals. Indeed, for many, these taxes will become the bulk of their total tax liability. They are likely to add to the constituency for lower tax rates, which has shrunk considerably in recent years as income tax payments have become increasingly concentrated among fewer taxpayers. There are many ways this might manifest itself, e.g., in efforts for tax reform such as a flat tax or for indexing the definition of capital income for inflation, as well as outright rate

reductions (e.g., for inside capital gains treatment) or special rollover provisions limited to these withdrawals.

Given the political power of the elderly and their projected rapidly rising relative percentage of the voting population, it can be expected that the political process will be pressured to respond. It should also be noted that pressure may occur quite soon; the first year that the "baby boom" generation will be eligible to start withdrawing funds from their DC accounts without penalty is 2005[55].

The failure of the tax code fully to adjust for inflation used to be a hot topic in academic public economics, macroeconomics, and tax policy debates. The early 1980s indexing of the tax brackets reduced the politically most contentious part of the taxation of nominal income. But it is still nominal capital income which is taxed: The tax code recognizes historic cost depreciation deductions, nominal capital gains, and nominal interest income and deductions, for example. With inflation much lower than in the decade and one-half prior to indexing, and with the indexing of tax brackets in place, the inflation tax argument has certainly not been at center stage recently. The growing political importance of those paying taxes on their withdrawals could refocus attention on it. That is because of the trillions of dollars of inflationary balances in tax-deferred accounts and the nature of the tax-deferred accounts themselves.

[55] While attention focuses on the post-World War iI "baby-boom" generation of those born beginning in 1946, it is not generally appreciated that the birth rate during WWII, while below the baby boom years, was 15-25% higher than during the Great Depression of the 1930s.

Because the tax-deferred saving accounts are primarily a vehicle for retirement saving and hence usually reflect a long period of accumulation prior to withdrawal, even the modest inflation of recent years accumulates to a potentially immense tax on purely inflationary income when compounded over decades. While not the sort of year-to-year widely fluctuating real effective tax rate and inequity story that was told in the '70s and early '80s[56], these sums are quite large. Of course, as the earlier discussion indicated, the nominal contributions were tax-deductible and this is roughly equivalent (precisely equivalent under certain assumptions which do not quite hold) to having no deduction and exempting the yield from the income tax. This "consumption-tax", or "single-taxation" treatment removes the distortion of the double taxation of saving in the income tax for these accounts. But as the sums are vast, it may well be an uphill battle to argue a fine point of theoretical economics in a political battle for the votes of these taxpayers.

Section 9. Summary and conclusion.

We have presented estimates of the historical flows and projected future flows of taxes and interest, debt and capital formation effects of deferred tax vehicles. From understanding the present and likely future state of the public finances to the direct interest in the size and breadth of the programs themselves; from a more thorough and accurate context for understanding the macroeconomic implications of the national debt and the unfunded liabilities in

[56] See Feldstein and Slemrod (1978)

Social Security and Medicare to more accurate measures of private wealth for analyzing consumption; these estimates are fundamental.

The already-accrued taxes in tax-deferred accounts amount to about $3 trillion, slightly more than the national debt held outside the government and slightly less than the publicly held national debt. Even conservative estimates of the likely real present value of future budgetary effects amount to roughly an additional $5-$10 trillion. The total size may well rival the 75-year actuarial deficits in Social Security and Medicare, plus the national debt.

The sheer size of the flows of deferred tax and interest effects will add an important third dimension to the future political economy of budget policy. In addition to the recipients of entitlement benefits pressing to preserve and extend them, and younger workers resisting tax increases, a rapidly growing group of elderly will have a large stake in lower taxes, at least on their withdrawals. The taxes on purely inflationary returns could become a focus of likely future political contention over taxes on the withdrawals. Or the debate could focus on general tax reform toward a flat or flatter tax, or specific special treatment of the withdrawals, e.g. lower rates or capital gains treatment of capital gains inside the accounts. The historic consumption tax treatment of the contributions may not be sufficient to offset the growing political power of the people paying taxes on the withdrawals and the vast sums involved.

Numerous simplifying assumptions have been made in generating these estimates. Undoubtedly, each and every one can be refined. In particular, there are undoubtedly numerous specific features of the various types of tax-deferred saving vehicles which it has not been possible to model, while focusing on their aggregate. We have attempted to deal with the generic set of concerns with various sensitivity analyses. These demonstrate the robustness of the conclusions to modest changes in simplifying assumptions concerning the diversion from taxable saving, the budgetary response to changes in the flows of taxes and interest, the effects of changes in personal and government saving on domestic capital formation, expected returns, discount rates, future rates of inflation, the age at which funds are withdrawn, and tax rates.

Of course, we are focusing here on one, albeit quite large, component of the federal finances. If it remains in place, additional estate tax revenue would also accrue. Analogous issues arise for state and local governments. Importantly, as mentioned above, there are many other assets and liabilities with numerous conceptual and measurement issues which affect both the public and private sectors. The unfunded liabilities in Medicare are similar in amount to those in Social Security. There are large contingent liabilities in explicit and implicit guarantees; for example, for deposit insurance and to back Fannie Mae and Freddie Mac. To be sure, other expenses of the government, such as defense, are not prefunded.

Hopefully, this work will spur others in and out of government to refine the estimates and incorporate the ideas into budget presentations and projections, the nation's balance sheets, and studies that use them. These improved data should be quite useful in macroeconomics and public finance. The hope is that more accurate information will lead, on balance, to better public and private decision making.

Undoubtedly some will seek to use this new information to support their particular agenda with regard to spending, taxes, debt and social security. I most certainly do not mean to imply that the long-run concerns about entitlement costs are misplaced. Nor do I mean to imply any particular use of the deferred taxes as they are paid. There is still an urgent need for rigorous cost-benefit analysis in making spending, tax, debt and social security reform decisions.

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