The Tax Benefits and Revenue Costs of Tax Deferral

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ICI senior economist Peter Brady prepared this report.

Key Findings

» **A deferral of tax is not equivalent to a tax exclusion or a tax deduction.** Exclusions and deductions reduce taxes paid in the year taken, but do not affect taxes in any future year. Tax deferrals—such as the deferral of tax on compensation contributed to an employer-provided retirement plan—reduce taxes paid in the year of deferral, but increase taxes paid in the year the income is recognized.

» **The benefits an individual receives from deferring tax on compensation (and, equivalently, the revenue foregone by the government) cannot be calculated by simply multiplying the amount of compensation deferred by the individual's marginal tax rate.** The simple calculations used to quantify the tax benefits and revenue costs of tax exclusions and tax deductions do not apply to tax deferrals.

» **As a rough approximation, the benefits of tax deferral are equivalent to facing a zero rate of tax on investment income.** The benefits of facing a zero rate on investment income will depend on how much investment income is generated by the deferral and how much tax revenue would otherwise have been generated by that income. Thus, factors that influence the benefits of tax deferral (and, equivalently, the costs to the government in terms of foregone tax revenue) include the rate of return earned on investments, the length of deferral, and—to the extent that investments produce capital gains—the frequency with which capital gains are realized.

» **The relationship between the benefits of tax deferral and an individual's marginal tax rate on ordinary income is complex.** The benefits of tax deferral (and the revenue costs) do not increase proportionately with the marginal tax rate that applies to compensation. In fact, the benefits can decline as marginal tax rates increase. Further, the magnitude of the tax benefits depends on tax rates other than the marginal tax rate on ordinary income at the time a retirement plan contribution is made. The magnitude also is affected by the marginal tax rate that would apply to investment income generated during the deferral period, and the marginal tax rate on ordinary income at the time assets are distributed.

» **For a range of investment portfolios and distribution methods, there is little difference in the tax benefits per dollar of deferred compensation among individuals in the top four federal income tax brackets (marginal tax rates of 25 percent, 28 percent, 33 percent, and 35 percent).** As this paper will demonstrate, controlling for age and assuming no change in marginal tax rates over time, the difference in the tax benefits (and the revenue costs) of deferral for an individual in the 25 percent federal income tax bracket and for an individual in the 35 percent income tax bracket is typically 3 cents or less per dollar of deferred compensation.

» **An individual's age typically will be more important than an individual's marginal tax rate in determining the tax benefits of deferral.** For example, in realistic simulations for a variety of investments, the tax benefits per dollar of deferred compensation are greater for a 45-year-old in the 15 percent federal income tax bracket than for a 60-year-old in the 35 percent federal income tax bracket.

I. Introduction

The tax benefits that individuals receive from a specific tax code provision—as well as the costs of that provision to the government in terms of foregone tax revenue—typically are estimated by comparing taxes paid under current tax law to taxes paid if the provision were to be removed, but no other changes were made to the tax code. Calculating the tax benefits and revenue costs of exclusions and deductions from income is fairly straightforward: both the tax benefits and revenue costs are equal to the amount of the exclusion or deduction multiplied by an individual's marginal tax rate. For example, $1,000 of mortgage interest deducted by an individual facing a 25 percent marginal tax rate reduces the amount of tax owed by $250; $1,000 of mortgage interest deducted by an individual facing a 15 percent marginal tax rate reduces the amount of tax owed by $150.

Many policy discussions have used the same logic—relating the tax benefit of an exclusion or deduction from income to an individual's marginal tax rate—to explain the tax benefits of contributions to 401(k) plans. Below are two examples:

> "Consider the current deductions for retirement saving. If a person with a high income contributes $1 to his 401(k) plan, he saves 35 cents in income taxes.…A middle-income person contributing the same amount to a 401(k) would save only 15 cents in income taxes. So the system provides a smaller incentive for the middle-income person to save for retirement." (Orszag 2011)

> "Current tax breaks are very poorly targeted. For the same dollar contribution to a 401(k), high-income taxpayers in the 35 percent tax bracket get a tax break that's three-and-a-half times larger than the tax break received by moderate-income taxpayers in the 10 percent bracket." (Morrissey 2011)

Unfortunately, the insights gained from contemplating the exclusion of employer-provided health insurance, the mortgage interest deduction, and other similar provisions in the tax code do not apply to deferrals of tax, such as the deferral of taxation that is granted to compensation in the form of employer-provided defined benefit (DB) and defined contribution (DC) retirement plans, or to compensation contributed to individual retirement accounts (IRAs).[1] Tax deferrals are neither exclusions nor deductions. The tax benefits and the revenue costs of a deferral are not a simple function of an individual's marginal tax rate at the time of the deferral.

Tax deferrals are neither exclusions nor deductions. The tax benefits and the revenue costs of a deferral are not a simple function of an individual's marginal tax rate at the time of the deferral.

As this paper will show, all else equal, the difference in the tax benefit received by an individual subject to a 35 percent marginal tax rate under the federal income tax and the benefit received by an individual subject to a 25 percent marginal tax rate is typically 3 cents or less per dollar of deferred compensation.[2] In fact, the benefit actually can be higher for the individual in the 25 percent tax bracket.

The tax benefits and revenue costs of deferral can be difficult to understand. This report explains the benefits that tax deferral provides to individuals and the costs that tax deferral imposes on the government and illustrates the factors that affect the magnitude of the tax benefits and revenue costs.* As a rough

* This paper is largely based on a presentation made by the author on May 19, 2009, at the Urban Institute. Audio, transcripts, and presentation material from that event are available at www.taxpolicycenter.org/events/events_051909.cfm.

approximation, the benefits of tax deferral are equivalent to facing a zero rate of tax on investment income. Therefore, the tax benefits and revenue costs of deferral depend on how much investment income is generated and how much tax revenue would otherwise have been generated by that income, which in turn depends upon the rate of return earned on investments, the length of deferral, and the character of the income generated by investments. The revenue costs and tax benefits also depend on an individual's marginal tax rate on ordinary income in the year a contribution is made, but perhaps not in the way expected. For example, if deferred compensation is invested in stocks—all else equal—the tax benefits of deferral typically will be higher for an individual with a 25 percent marginal tax rate than for an individual with a 35 percent marginal tax rate.

II. An Intuitive Explanation of the Tax Benefits of Deferral

Typically, if an individual wishes to contribute a portion of compensation to a taxable investment account, the contribution has no effect on their taxable income. That is, compensation used to fund a contribution to a taxable account is included in income in the year it is earned and is subject to tax as ordinary income. In addition, any investment income earned on the contribution is taxed, with interest income and dividends taxed on an annual basis and capital gains taxed upon realization. Interest and short-term capital gains are taxed at ordinary income tax rates; lower tax rates generally apply to dividends and long-term capital gains.[3] When distributions are made from the account, no tax is due unless a portion of the distribution represents unrealized capital gains.

Deferrals of tax, such as contributions to 401(k) plans or IRAs, differ in tax treatment at three different points in time. First, compensation contributed to a retirement account is not included in income and is not subject to tax in the year the compensation is earned. Second, any investment income earned on the contributions is not included in income and is not subject to tax in the year received (in the case of interest and dividends) or the year realized (in the case of capital gains). Third, all distributions from the account are included in income and subject to tax as ordinary income.[4]

The benefit an individual receives from deferring tax on compensation is the increase in after-tax withdrawals (withdrawals less any associated income tax liability) generated by the investment relative to an investment in a taxable account. The crucial insight for analysis of tax deferrals is that the benefit is not equal to the up-front reduction in taxes. Perhaps the most intuitive way to understand this is to first understand something that is perhaps not intuitive: in many cases, the tax treatment of deferred compensation is equivalent to the tax treatment of Roth contributions.

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On the surface, Roth contributions to a 401(k) plan or IRA appear to be treated quite differently than deferrals. First, compensation used to fund the contribution is included in income and is subject to tax as ordinary income, rather than being deferred. Second, as in a tax-deferred account, any investment income subsequently earned is not included in income and is not subject to tax in the year received (in the case of interest and dividends) or the year realized (in the case of capital gains). Third, Roth distributions, unlike distributions from a tax-deferred account, typically are not included in income and are not subject to tax.[5]

Despite the apparent differences, if an individual's marginal tax rate on ordinary income is the same at the time contributions are made and at the time distributions are made, the two tax treatments will yield the same after-tax distribution per dollar of compensation used to fund the contributions.

A simple example may help illustrate the point. Suppose an individual facing a 25 percent marginal tax rate on ordinary income has $100 of wages and wishes to use this income to invest in corporate stock that is selling for $25 per share. To make a Roth contribution, an individual first would pay $25 dollars of income tax on the wages, contribute the remaining $75 to a Roth 401(k) or a Roth IRA, and use the contribution to purchase three shares of the stock. Because no further taxes are owed, when the account assets are eventually distributed, the individual would receive the three shares of stock plus all the dividends and capital gains associated with those shares.

Alternatively, the individual could defer taxation on the entire $100 of wages by making an elective deferral through a 401(k) plan or by making a deductible contribution to an IRA. Because no tax would be due at the time of the contribution, this would allow the individual to buy four shares of a $25 stock. When the account assets are eventually distributed and subject to income tax of 25 percent, one share of stock plus all the dividends and capital gains associated with the share would be paid to the government in tax. The individual would be left with three shares of stock plus all the dividends and capital gains associated with those three shares. In effect, the tax collected upon distribution pays back—with interest—the $25 of tax that was deferred at the time of the elective deferral or deductible contribution.

Despite the apparent differences in tax treatment, a $75 Roth contribution and a $100 tax-deferred contribution both produce the same amount of distributions after income taxes are paid: three shares and all the dividends and capital gains associated with those shares.

This simple example illustrates that, unlike an exclusion or a deduction, the benefit an individual receives from deferral is not the up-front reduction in taxes. It is clear that the benefit of Roth contribution is not the up-front tax savings, as the contribution does not reduce tax liability in the year of the contribution. Instead, the individual benefits from the fact that no taxes are paid on investment income earned on the contributions. However, because in this example a deferral and a Roth contribution produce identical after-tax distributions, the tax benefit from deferral must be the same as the tax benefit from making a Roth contribution. Because of this equivalence, the tax benefit of deferral is often summarized as being equivalent to facing a zero rate of tax on investment income. To some extent, this phrase represents a bit of professional shorthand. A more exact—but less eloquent—phrase would be that the tax benefit of deferral is equivalent to facing a zero rate of tax on the investment income that would have been generated if compensation was first subject to tax and the net-of-tax amount was then contributed to an investment account.

The tax benefit of deferral is often summarized as being equivalent to facing a zero rate of tax on investment income.

Tax deferral is not equivalent to Roth treatment in all cases.* Nonetheless, the rough equivalence of the two tax treatments provides intuition as to what factors affect the magnitude of the tax benefit. In general, anything that affects the taxes imposed on investment income will affect the benefits of tax deferral. These factors include: the rate of return earned on investments; the length of deferral; the character of the investment income—including whether the investments generate interest, dividends, short-term capital gains, or long-term capital gains. If the investments generate capital gains, the tax benefits will also depend on the frequency with which the gains are realized. Of course, the tax benefits also will depend on an individual's marginal tax rate on ordinary income at the time of deferral. However, the relationship between marginal tax rates and the tax benefits of deferral is complex. For example, an individual's ordinary income tax rate at the time of distribution and the rate at which investment income is taxed also impact the tax benefits.

III. Illustrating the Tax Benefits and Revenue Costs Using Numerical Examples

Calculating an individual's tax benefits and the government's tax revenue costs of deferral can be complicated. Before turning to the more difficult issues of marginal tax rates and the character of investment income, this section uses a series of simple numerical examples to illustrate the relationship between tax deferral and Roth tax treatment; the benefits accruing to individuals from tax deferral (in terms of higher after-tax distributions) and the costs to the government (in terms of foregone tax revenue); the relationship between the tax benefits and revenue costs of deferral; and the impact of the rate of return earned on investments and the length of deferral (two factors unrelated to an individual's marginal tax rate) on the tax benefits and revenue costs of deferral.

Differences Between Tax Expenditure Estimates and Revenue Estimates

This report is focused on the revenue costs of deferral. There also has been much discussion regarding a related concept—the tax expenditure related to allowing deferral of tax—which is not discussed in this report. For a discussion of the differences between tax expenditure estimates and revenue estimates, see Appendix I. Appendix I also discusses the differences between the official tax expenditure estimates and present-value tax expenditure estimates.

The method used by the Joint Committee on Taxation and the U.S. Treasury Department's Office of Tax Analysis to produce the official tax expenditure estimates for deferral contains an error that causes a portion of the tax expenditure to be counted twice. The exact magnitude of the effect of this error on the estimates is difficult to assess without knowing all the assumptions embedded in the calculations. The magnitude of the effect on the official estimate could be overstating the tax expenditure for DC plans by $5 billion to $10 billion a year. This same error appears to have been carried over to Treasury's present-value estimate for the tax expenditure of deferral, causing those estimates to be inflated as well.

* See discussion in "When Deferral and Roth Treatment Are Not Equivalent," on page 10.

Equivalence of Tax Deferral and Roth Contribution

The first numerical example illustrates the equivalence of tax deferral and Roth tax treatment, which was explained intuitively on page 4. In this example, an individual has $1,000 of compensation with which to fund a contribution to a 401(k) plan or IRA. The individual plans to invest the income in a bond that pays interest annually at 6 percent and plans to withdraw the contribution and the interest in 20 years. The individual's marginal tax rate on ordinary income is 25 percent, and the rate will remain constant over the entire 20-year period—including at the time the withdrawal is made. Suppose the individual has a choice between deferring tax on the compensation, making a Roth contribution, or simply making a contribution to a taxable investment account. Which choice would yield a higher distribution after all taxes were paid?

Deferral Through a 401(k) Plan or IRA

With a deferral through a 401(k) plan or IRA, the entire $1,000 of earnings is contributed and the contribution is not included in income and is not subject to tax. After 20 years earning 6 percent interest on the contribution of $1,000, the 401(k) account balance is $3,207 (Figure 1).[6] Upon distribution, the individual pays income tax equal to 25 percent of the balance (or $802), leaving $2,405 in distributions after taxes are paid.

Roth Contribution to a 401(k) Plan or IRA

With a Roth contribution to a 401(k) plan or IRA, the $1,000 of compensation used to fund the contribution is included in income and taxed as ordinary income. After paying income tax of $250, the remaining $750 is contributed to the account. After 20 years earning 6 percent interest on the contribution of $750, the account balance would be $2,405 (Figure 1).[7] Upon distribution, the individual owes no tax, leaving $2,405 in distributions after taxes are paid.

Contributions to a Taxable Investment Account

Alternatively, the individual could contribute to a taxable investment account. As with the Roth contribution, $1,000 of compensation funds a $750 contribution. Each year, 6 percent interest would be earned on the account balance. However, because the interest income would be subject to a 25 percent tax, the after-tax yield on the bond investment would fall to 4.5 percent. After 20 years earning 4.5 percent interest, the investment account balance would be $1,809 (Figure 1).[8] Upon distribution, the individual owes no tax, leaving $1,809 in distributions after taxes are paid.

Thus, the individual should be indifferent between deferring tax on $1,000 of compensation and making a Roth contribution of $750, and would prefer either the deferral or the Roth contribution to dedicating $1,000 of pretax compensation to a taxable investment account.

The Present-Value Revenue Costs to the Government of Allowing Tax Deferral

When calculating the costs to the government of a given tax provision in terms of the foregone tax revenue, the relevant comparison is the amount of tax that would have been collected if the investment had been in a taxable account.[9] In the case of tax deferral, the government loses $250 of tax revenue in the year the contribution is made and loses $353 of tax revenue on interest income over the 20-year deferral period (Figure 1). However, upon distribution of the account balance, the government collects $802 of tax revenue, which reduces the revenue costs of the deferral.

In the case of a Roth account, there is no loss of tax revenue in the year of the contribution and no gain of tax revenue in the year of the distribution. The only effect on government tax revenue is the loss of the $353 of taxes that would have been collected over the 20-year investment period (Figure 1).

FIGURE 1

Equivalence of Deferral and Roth Tax Treatment

Assumptions:

Pretax earnings used to fund contribution	$1,000
Number of years invested	20
Rate of return (annual)	6%
Marginal tax rate	25%
Investment income earned as annual interest payments	
No change in marginal tax rates over time	

	Traditional IRA or 401(k) *(dollars)*	Roth IRA or Roth 401(k) *(dollars)*	Taxable account *(dollars)*
Compensation	$1,000	$1,000	$1,000
Income tax paid on compensation	0	250	250
Amount invested (compensation after tax)	1,000	750	750
Tax collected during investment period	0	0	353
Account balance after 20 years	3,207	2,405	1,809
Taxable income upon distribution	3,207	0	0
Tax upon distribution	802	0	0
Distribution after tax	2,405	2,405	1,809

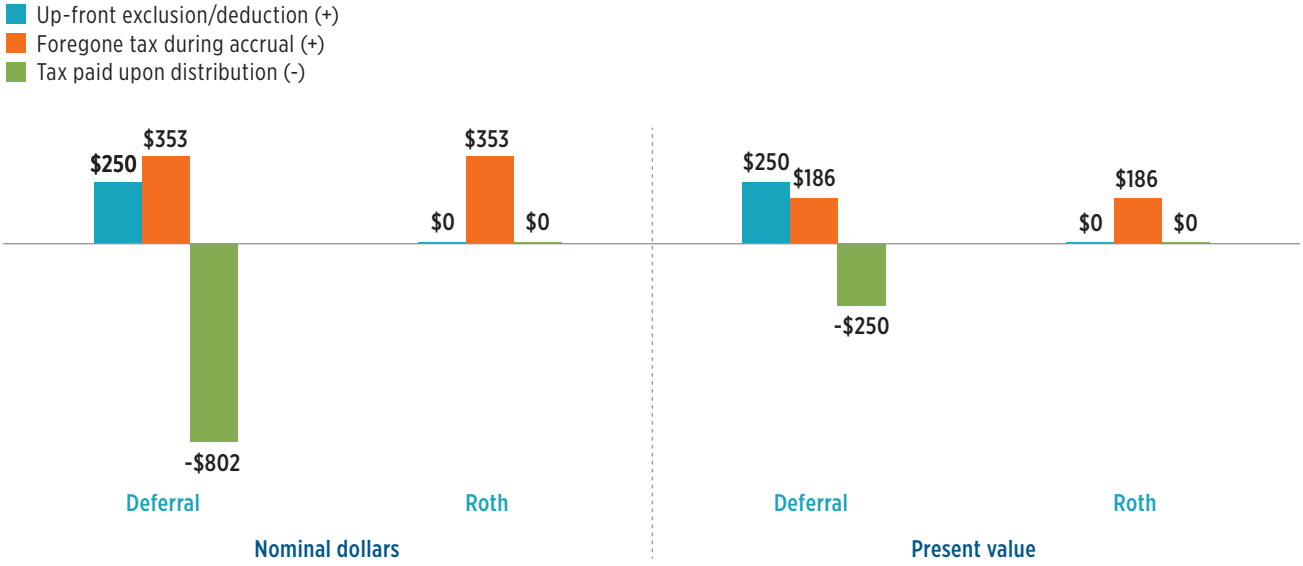
Source: ICI calculations

Although the streams of tax revenue collected are different, deferral and Roth treatment have the same revenue cost in present value (Figure 2). The tax revenue lost by the government at the time of deferral is subsequently collected, with interest, upon distribution. Because the expected rate of return is equal to the government's discount rate, the two amounts exactly offset each other, leaving the foregone tax revenue on investment income as the only net cost to the government. In this case, using a 6 percent discount rate, tax revenue of $802 collected in 20 years is equivalent to $250 in tax revenue collected today.[10] Thus, the revenue cost of both deferral and Roth treatment is the $353 of taxes that would have been collected on investment earnings from a taxable account funded by an initial $750 contribution. Discounted at a rate of 6 percent, this stream of tax revenue would be worth $186 in present value.[11]

FIGURE 2

When the Revenue Cost of Deferral and Roth Treatment Are Equivalent in Present Value

Foregone tax revenue related to contributions to tax-deferred accounts and Roth accounts funded with $1,000 of compensation



Note: Compensation of $1,000 is used to fund the contribution, resulting in a deferral of $1,000 and a Roth contribution of $750. The marginal tax rate is equal to 25 percent in all periods and applies to contributions, investment income, and distributions. The contribution is invested in bonds that pay interest annually. After 20 years, the contribution and all subsequent investment earnings are distributed. Both the nominal interest rate on the bonds and the government's discount rate are 6 percent.

Source: ICI calculations

When Deferral and Roth Treatment Are Not Equivalent

The equivalence of tax deferral and Roth tax treatment provides an intuitive explanation as to the factors that affect the revenue costs and tax benefits of deferral. However, the two are not always equivalent. In particular, equivalence requires that an individual's marginal tax rate on ordinary income be the same at the time of contribution and distribution; and it requires that the compensation used to fund a deferral be the same as the compensation used to fund the Roth contribution (i.e., that the pretax amount of a deferred contribution be equal to the tax paid plus the contribution amount for a Roth contribution).

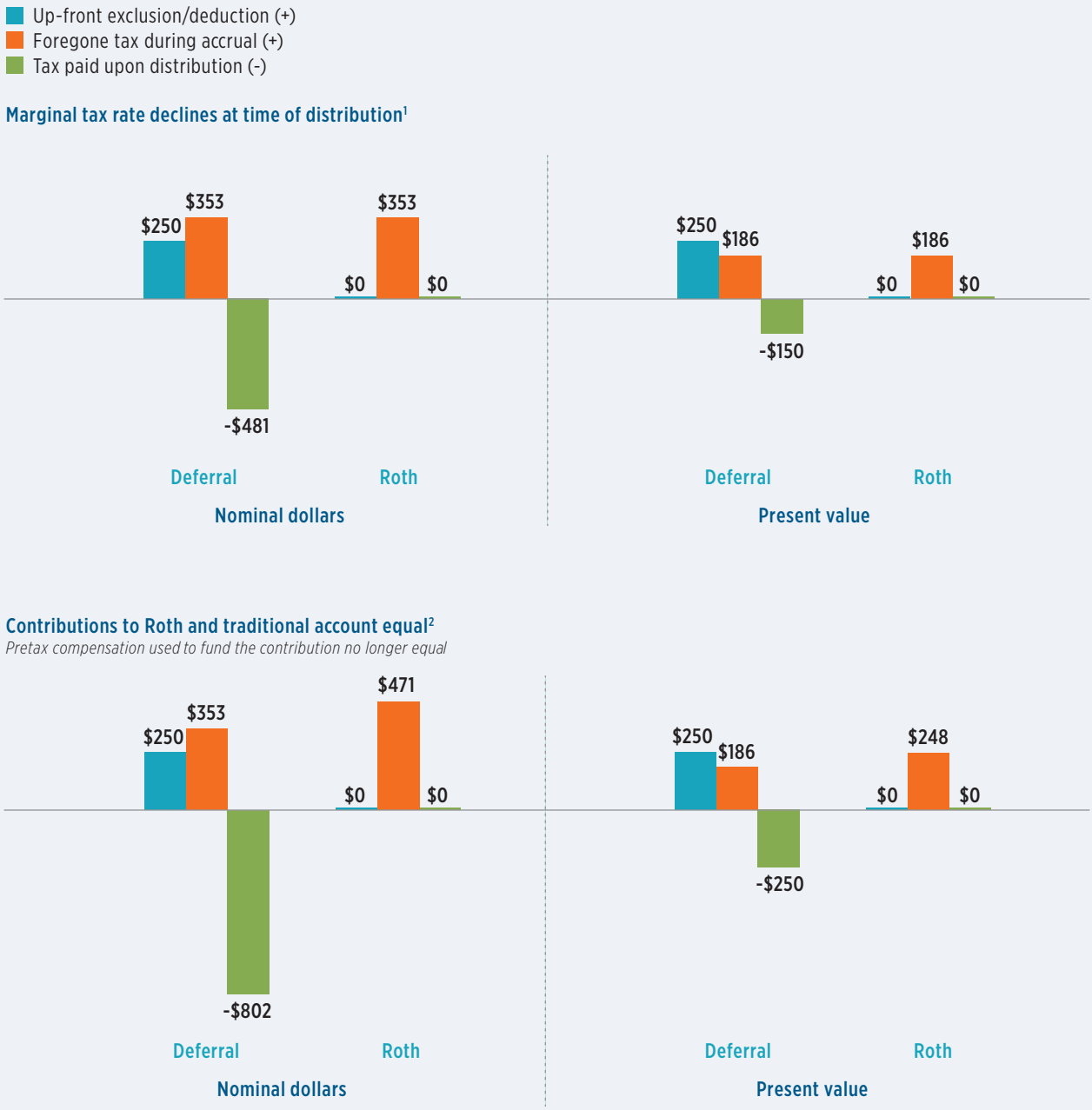
If an individual's marginal tax rate on ordinary income at the time of contribution differs from the marginal tax rate on ordinary income at the time of distribution, then deferral and Roth treatment are no longer equivalent. If taxes are higher at the time of distribution, then deferral provides fewer tax benefits and has lower revenue costs. If taxes are lower at the time of distribution, then deferral provides more tax benefits and has higher revenue costs. For example, if all other assumptions in the previous illustrations stayed the same, but distributions were taxed at a rate of 15 percent rather than 25 percent, then the nominal amount of tax revenue collected at the time the deferred compensation is distributed would fall to $481 (Figure 3, top panel) from $802 (Figure 2). In present value, the revenue collected upon distribution would fall to $150 from $250, and the revenue cost of the tax deferral would increase to $286 (=250+186–150) from $186 (=250+186–250).

If the amount contributed to a tax-deferred account is the same as the amount contributed to a Roth account, the two contributions are not equivalent. With a 25 percent marginal tax rate on ordinary income, a deferral of $1,000 is equivalent to a Roth contribution of $750. A deferral of $1,000 is not equivalent to a Roth contribution of $1,000. With a 25 percent marginal tax rate on ordinary income, $1,333 of compensation would be required to fund a Roth after-tax contribution of $1,000. The present value of the foregone tax revenue associated with a $1,000 Roth contribution would be $248 (Figure 3, bottom panel), compared with a revenue cost of $186, in present value, for a $750 Roth contribution (Figure 3, top panel).

FIGURE 3

When Deferral and Roth Treatment Are Not Equivalent

Foregone government tax revenue related to contributions to traditional deductible accounts and Roth accounts with alternative assumptions



[1] Assumptions are the same as those in the note to Figure 2, except the marginal tax rate at the time funds are distributed falls to 15 percent.

[2] Assumptions are the same as those in the note to Figure 2, except that the contributions to the two types of accounts are set equal, rather than the pretax compensation needed to fund the contributions. As in the other examples, the $1,000 contribution to the traditional deductible account is funded with $1,000 of pretax compensation. However, the Roth contribution is increased from $750 to $1,000, which requires just over $1,333 of pretax compensation to fund the contribution.

Source: ICI calculations

In this paper, the calculations assume that the rate of return earned on the contributions is the same as the government's discount rate. For an explanation of why it would be inappropriate to assume a rate of return other than the government's discount rate in a forward-looking revenue estimate, see the discussion in "Rate of Return and Discount Rate Assumptions Used When Estimating Present Values" on page 15.

Present-Value Equivalence of the Individual's Tax Benefits and Government's Revenue Costs

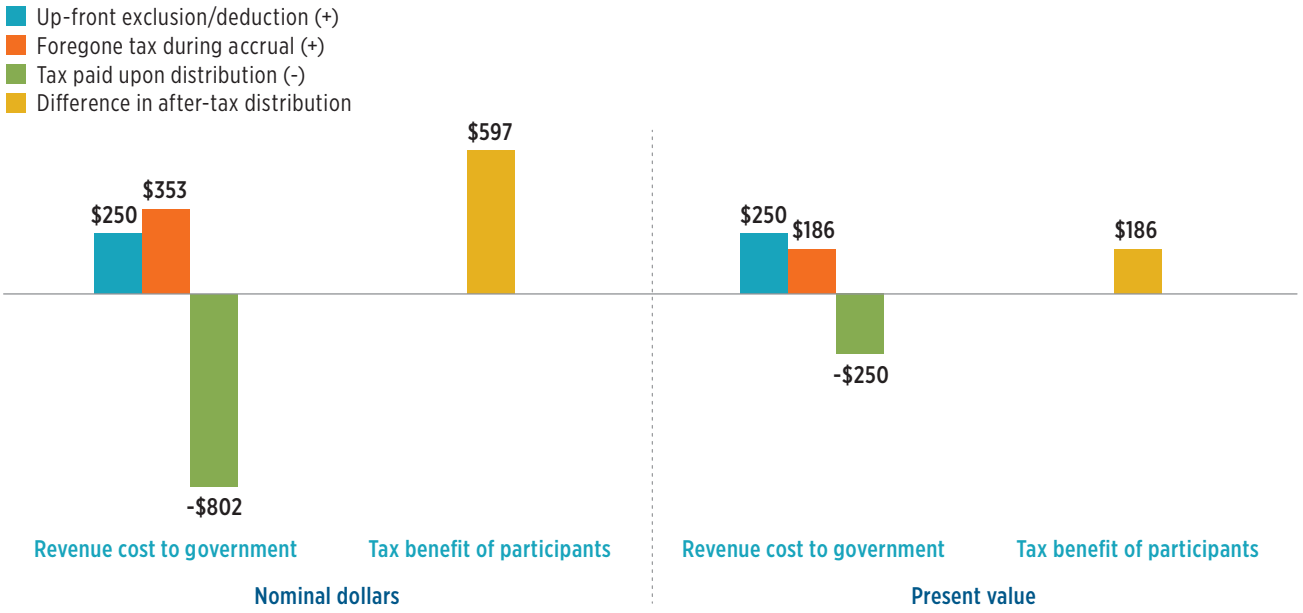
From the individual's perspective, the benefit of deferring tax on compensation is that doing so will produce more in after-tax distributions than including the compensation in income in the current year and making a contribution to a taxable investment account. In this case, a 20-year deferral of $1,000 of compensation invested in bonds yielding 6 percent would produce an after-tax distribution of $2,405, compared with a distribution of $1,809 from a taxable account (Figure 1). Thus the tax benefits of deferral in this case would be $597 (with rounding) in 20 years. Although this amount does not seem directly related to the $353 of tax revenue that the government would have collected on a taxable investment over the 20-year deferral period, the two amounts are equivalent in present value (Figure 4). That is, $597 in 20 years is worth $186 today, discounted at 6 percent.[12]

In subsequent discussions, either the cost to the government in terms of foregone tax revenue or the benefits to an individual in terms of higher after-tax distributions will be used to illustrate the factors that affect the revenue costs and tax benefits of deferral. However, the terms will be used interchangeably because, in all cases, the two measures will be equivalent in present value.[13]

FIGURE 4

Individual's Tax Benefit and Government's Revenue Costs Are Equivalent in Present Value

Foregone tax revenue and tax benefit related to deferral of $1,000 of compensation



Note: Compensation of $1,000 is used to fund the contribution, resulting in a deferral of $1,000. The marginal tax rate is equal to 25 percent in all periods and applies to contributions, investment income, and distributions. The contribution is invested in bonds that pay interest annually. After 20 years, the contribution and all subsequent investment earnings are distributed. Both nominal interest rate on the bonds and the government's discount rate are 6 percent.

Source: ICI calculations

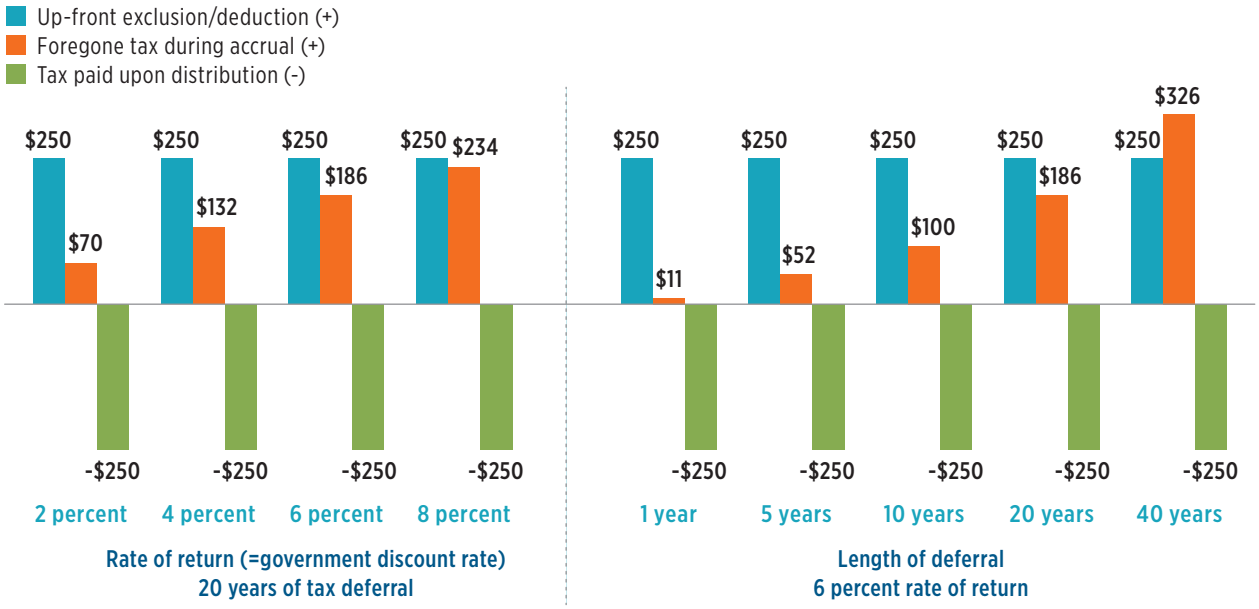
Rate of Return and Length of Deferral

The amount of revenue generated by a taxable investment account depends on the amount of investment income produced by the assets in the account. Up to this point in the analysis, the revenue cost and tax benefit calculations have all used a rate of return of 6 percent. The appropriate interest rate to use in the present-value calculations will vary over time. For example, since 1952, the yields on 10-year U.S. Treasury securities have averaged 6.2 percent.[14] However, the yields have ranged from 1.43 percent (on July 25, 2012) to 15.84 percent (September 30, 1981).[15] If a 2 percent rate of return was used in the calculation (along with a 2 percent government discount rate), then the present value of the revenue cost of the 20-year deferral calculated above would fall from $186 to $70 (Figure 5, left panel). Conversely, if an 8 percent rate was used in the calculation (along with an 8 percent government discount rate), the present value of the revenue cost would increase from $186 to $234.

FIGURE 5

Revenue Costs/Tax Benefits Increase with the Rate of Return and Length of Deferral

Present value of foregone tax revenue related to deferral of $1,000 of compensation



Note: Compensation of $1,000 is used to fund the contribution, resulting in a deferral of $1,000. The marginal tax rate is equal to 25 percent in all periods and applies to contributions, investment income, and distributions. The contribution is invested in bonds that pay interest annually. In the calculations where interest rates vary, the contribution and all subsequent investment earnings are distributed after 20 years. The nominal interest rate on the bonds and the government's discount rate vary, but in all cases, the bond interest rate and the government's discount rate are equal. In calculations where the length of deferral varies, the nominal interest rate on the bonds and the government's discount rate are 6 percent.

Source: ICI calculations

In addition to the rate of return, the investment income—and thus the tax revenue—generated by an investment crucially depends on the length of deferral. The examples so far have assumed that contributions were invested for 20 years before the assets were withdrawn. If deferral is only one year, the cost to the government is simply the amount of tax that would have been collected on one year of interest income. Assuming a 6 percent rate of return, the present value of one year of foregone tax would be about $11 (Figure 5, right panel).[16] If deferral lasts for 40 years, then government revenue is reduced by 40 years' worth of taxes on an ever-growing balance. In present value, the revenue cost for a 40-year deferral would be $326.

Rate of Return and Discount Rate Assumptions Used When Estimating Present Values

As shown in the study, if the expected rate of return on investments is equal to the government's discount rate, then an increase in the rate of return increases the present value of the revenue costs of deferral. However, if the expected rate of return on investments is not linked to the government's discount rate, then an increase in the rate of return can reduce the present value of the revenue costs. In fact, holding the government's discount rate constant, revenue costs typically decline if the rate of return exceeds the discount rate, especially if marginal tax rates are above 15 percent.*

For example, suppose an individual with a 25 percent marginal tax rate defers taxation of $1,000 of compensation for 20 years. If the government's discount rate is 4.0 percent and the expected rate of return is also 4.0 percent, then the tax revenue collected on distributions exactly offsets, in present value, the tax revenue that was not collected on the contribution, and the total revenue cost, in present value is $132 (Figure 6)—the same result illustrated in Figure 5.

If, however, the expected rate of return increases to 6 percent, then two components of the total revenue cost change (Figure 6). First, because more investment income is generated, the revenue that would have been collected on a taxable investment account increases to $227 from $132, in present value, a $95 change. Second, the tax collected on distributions increases to $366 from $250, in present value, a $116 change. Because the increase in taxes collected on distributions ($116) is greater than the increase in revenue lost from foregoing collecting taxes in investment income ($95), the total revenue costs falls to $111 from $132, in present value.

Similar calculations show that, holding the government's discount rate constant at 4.0 percent, the present value of the revenue costs of deferral declines as the rate of return increases from 4.0 percent to 10.0 percent (Figure 6). In fact, if the gap between the expected rate of return and the government's discount rate is large enough, it is possible for deferral to raise tax revenue in present value. In this example, if the expected rate of return is 10 percent, then the deferral would be estimated to raise government revenue by $15, in present value.

(continued on the next page)

Rate of Return and Discount Rate Assumptions Used When Estimating Present Values, *continued*

The intuitive explanation for this result is that—to the extent the government believes that risky assets are worth more than riskless assets—allowing individuals to defer tax on compensation provides an indirect way for the government to profit from the available arbitrage opportunity. That is, the government can sell a riskless asset (by issuing bonds to finance the up-front revenue loss of deferral) and buy a risky asset (by collecting tax on distributions from accounts invested in risky assets).

The analysis presented in this report sets equal the expected rate of return on investments in tax-deferred accounts and the government's discount rate. Looking back over historical data, the rate of return earned on risky assets has been, on average, higher than the rate of return earned on U.S. Treasury bonds (which are typically thought of as riskless assets). However, it would be inappropriate to use a rate of return other than the government's discount rate when estimating the revenue costs of deferral.† Risk premia in a competitive investment market should represent compensation for accepting undiversifiable risk—specifically the risk that the rate of return may be below that of the risk-free rate of return over any given time period. Because the premia represent compensation for risk, the empirical evidence that risky assets have historically had higher rates of return, on average, does not justify the assumption—implicit in any revenue estimate using a rate of return that is in excess of the government's discount rate—that a dollar worth of risky assets is worth more than a dollar worth of the riskless assets.

One way to illustrate the inappropriateness of assuming that investment returns will exceed the government's cost of finance going forward is to extend the logic of the assumption to its extreme. Allowing individuals to defer taxation of compensation lets the government benefit indirectly from the arbitrage opportunity presented by the discrepancy between the value of risky and riskless assets. However, if the arbitrage opportunity exists, the government could benefit directly by simply selling Treasury bonds and using the proceeds to purchase risky assets. Revenue estimates would show that such financial transactions (if they were of sufficient scale) would allow the government to eliminate all other sources of revenue in expectation of the revenue to be generated.

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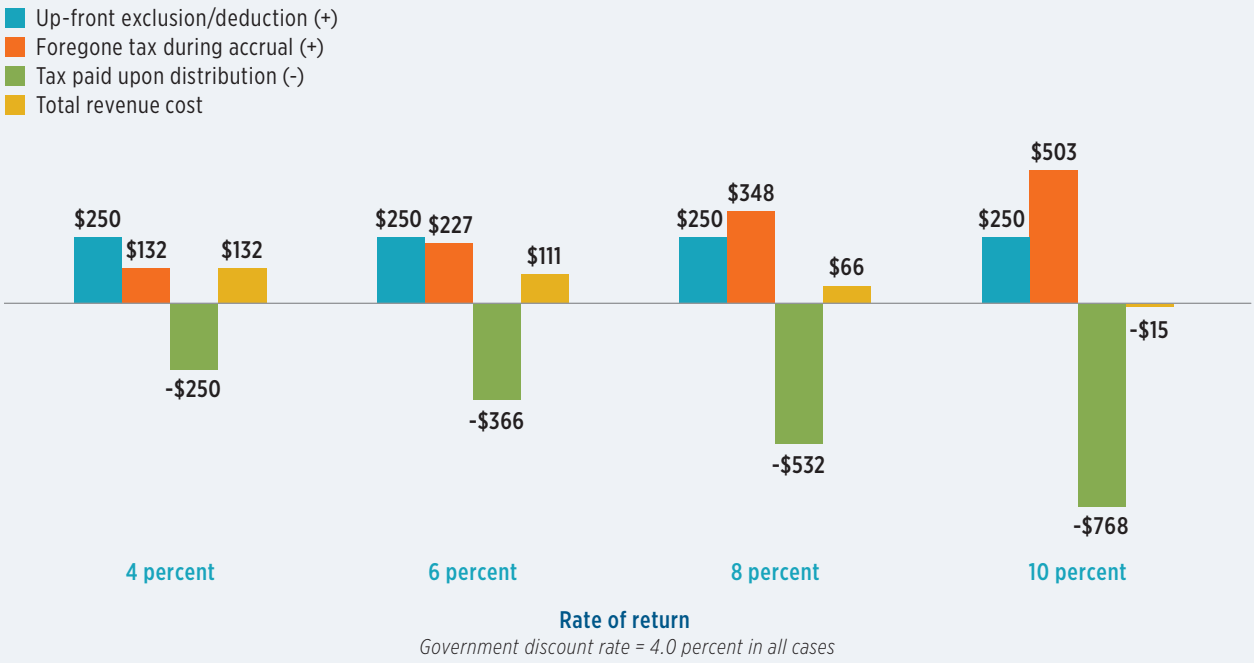
* For deferrals by individuals facing 10 percent or 15 percent marginal tax rates, the relationship between revenue costs and the rate of return—holding fixed the government's discount rate—is complex. In present value, whether or not the revenue costs of deferral decline when the expected rate of return on investments exceeds the government's discount rate will depend on the government's discount rate, the length of deferral, and the amount by which the rate of return exceeds the discount rate. For deferrals by individuals with marginal tax rates of 25 percent or higher, the relationship is less complex: the present value of the revenue cost will decline if the rate of return earned on investments exceeds the government's discount rate for most combinations of discount rates and deferral lengths.

† For any given historical time period, it would be appropriate to look back at realized market returns and the realized cost of government finance and estimate the cost to the government of tax deferral over that time period, as was done in Dusseault and Skinner 2000. It is the assumption of a rate of return on investments that exceeds the risk-free rate in a forward-looking revenue estimate that is objectionable.

FIGURE 6

Present Value of Revenue Cost May Decline If Rate of Return Exceeds Discount Rate

Present value of foregone tax revenue related to deferral of $1,000 of compensation; government's discount rate assumed equal to 4.0 percent in all cases



Note: Compensation of $1,000 is used to fund the contribution, resulting in a deferral of $1,000. The marginal tax rate is equal to 25 percent in all periods and applies to contributions, investment income, and distributions. Contributions are invested in bonds that pay interest annually. The contribution and all subsequent investment earnings are distributed after 20 years. The nominal interest rate earned on bonds varies, but in all cases, the government's discount rate is set equal to 4.0 percent.

Source: ICI calculations

IV. Marginal Tax Rates and the Character of Investment Income

The relationship between an individual's marginal tax rate and the benefits an individual receives from tax deferral—and, equivalently, the relationship between an individual's marginal tax rate and the cost to the government of allowing tax deferral—is not as direct as suggested in many policy discussions.[17] Unlike the benefits and costs of exclusions and deductions, the tax benefits and revenue costs of deferral do not increase proportionately with an individual's marginal tax rate.

> Unlike the benefits and costs of exclusions and deductions, the tax benefits and revenue costs of deferral do not increase proportionately with an individual's marginal tax rate.

In fact, after a certain point, the revenue costs and tax benefits per dollar of deferred compensation decline as marginal tax rates increase. The marginal tax rate at which revenue costs and tax benefits begin to decline depends on the character of the income generated by the investments and the length of deferral. In addition, the revenue costs and tax benefits of deferral not only depend on an individual's marginal tax rate at the time of contribution, but also depend on the marginal tax rates faced during the deferral period and at the time of distribution.

Marginal Tax Rates

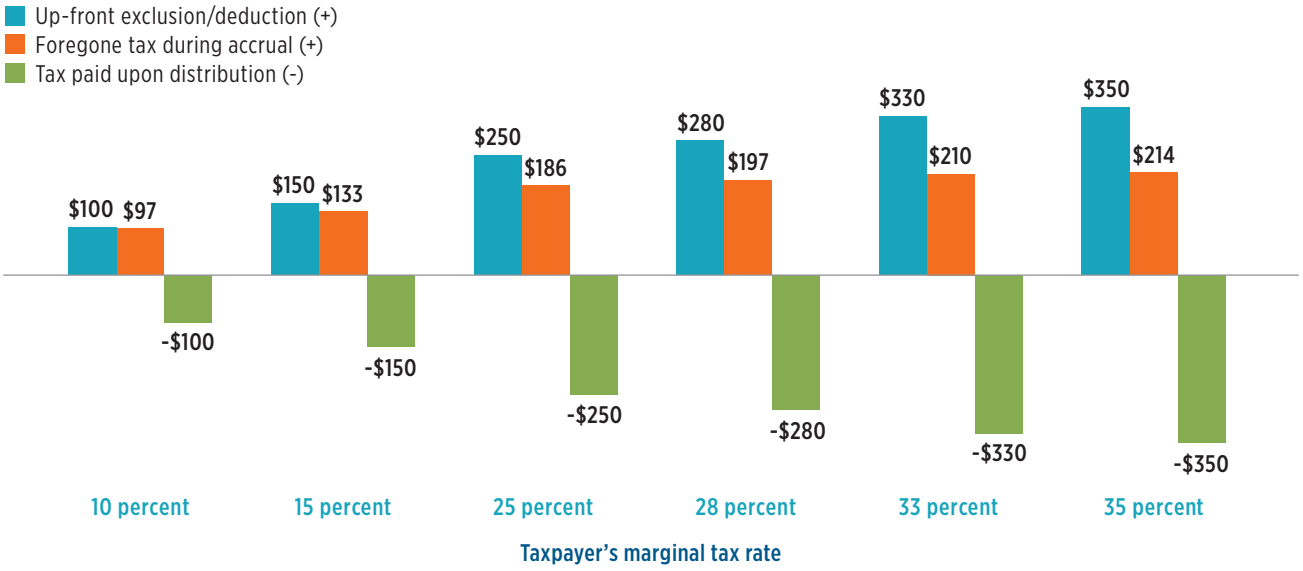
Figure 7 shows the revenue costs of $1,000 of deferred compensation for individuals with marginal tax rates that range from 10 percent to 35 percent. Other than allowing the marginal tax rate to vary, these calculations use the same assumptions as the previous examples. That is, contributions are invested for 20 years in bonds earning 6 percent interest and an individual's marginal tax rate remains the same throughout the deferral period, including at the time of contribution and at the time of distribution. Regardless of an individual's marginal tax rate, the tax revenue lost at the time of contribution (the blue bars) is offset, in present value, by the tax revenue collected upon distribution (the green bars). In all cases the revenue cost of allowing tax deferral is the tax revenue that would have been collected on the investment income generated by an after-tax contribution to a taxable investment account (the orange bars).

In these examples, the present value of the revenue costs of allowing deferral increases with an individual's marginal tax rate. However, the revenue costs do not increase proportionally with marginal tax rates, as is the case with exclusions and deductions. For example, if the revenue cost of deferral was proportional to an individual's marginal tax rate, then a deferral by an individual facing a 35 percent marginal tax rate would cost the government 3.5 times as much as a deferral by an individual facing a 10 percent marginal tax rate; instead, the revenue cost is just 2.2 times as high ($214 versus $97; Figure 7). Similarly, although they face a tax rate that is 40 percent higher, the revenue costs of a deferral by an individual with a 35 percent marginal tax rate is only 15 percent higher than the cost of deferral by an individual with a 25 percent marginal tax ($214 versus $186).

FIGURE 7

Present Value of Revenue Cost/Tax Benefit Increases with Marginal Tax Rates

Foregone tax revenue and tax benefit related to deferral of $1,000 of compensation



Note: Compensation of $1,000 is used to fund the contribution, resulting in a deferral of $1,000. The marginal tax rate is equal to 25 percent in all periods and applies to contributions, investment income, and distributions. The contribution is invested in bonds that pay interest annually. After 20 years, the contribution and all subsequent investment earnings are distributed. Both the nominal interest rate on the bonds and the government's discount rate are 6 percent.

Source: ICI calculations

The reason that the revenue cost of deferral does not increase proportionately with marginal tax rates is that tax rates have multiple offsetting effects on revenue costs. Recall the intuition that deferral is equivalent to making an after-tax contribution to an investment account, but then paying no tax on investment income generated by the contribution. Holding constant the amount of income generated by an investment account, the revenue that would have been collected in a taxable investment account does increase proportionately with the marginal tax rate. However, the amount of taxable investment income that would have been generated in a taxable account will decline as marginal tax rates increase.

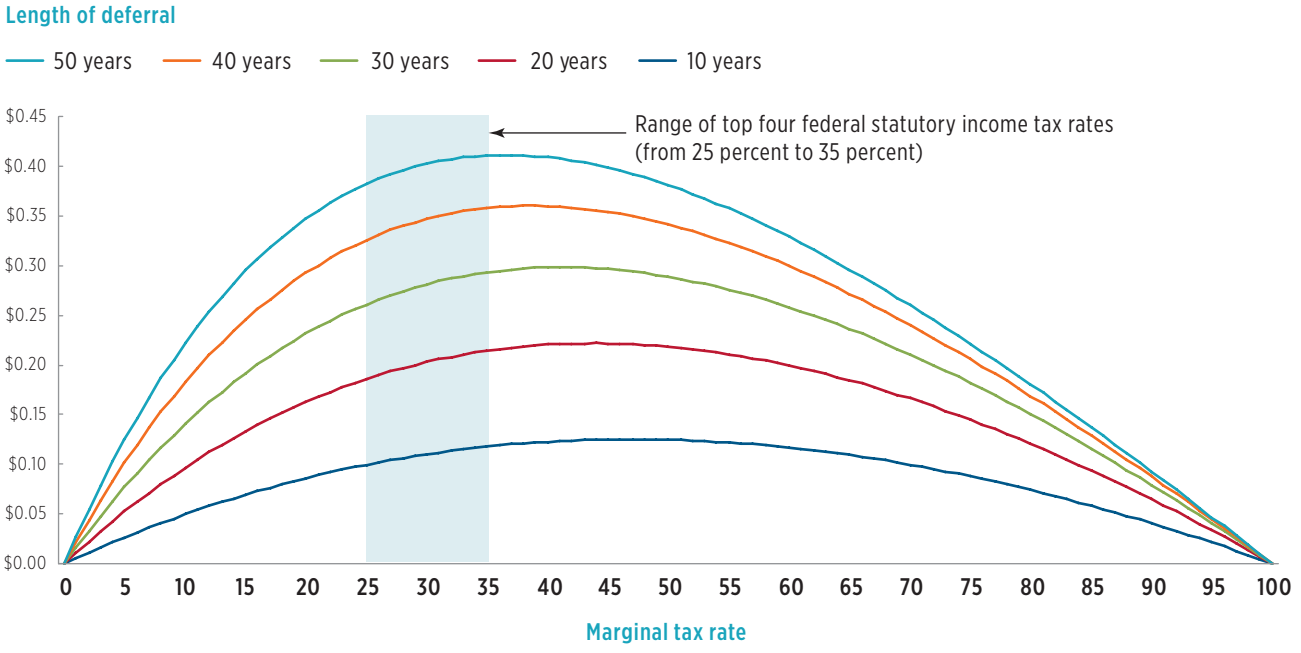
As marginal tax rates increase, the amount of investment income that would have been generated in a taxable account declines for two reasons. First, the equivalent after-tax contribution to an investment account will decline as marginal tax rates increase. That is, for an individual with a 25 percent marginal tax rate, deferring tax on $1,000 of compensation is equivalent to getting tax-free investment income on an investment of $750. For an individual with a 35 percent marginal tax rate, deferring tax on $1,000 of compensation is equivalent to getting tax-free investment income on an investment of just $650. Second, in addition to the equivalent after-tax contribution being lower, the assets held in a taxable investment account grow more slowly over time for individuals subject to higher marginal tax rates. This is because the growth rate of assets in a taxable account is the after-tax rate of return.[18]

For a more complete illustration of the impact of marginal tax rates, Figure 8 plots the revenue cost per dollar of deferred compensation, allowing the marginal tax rate to vary from 0 percent to 100 percent. As with the previous examples, it is assumed that marginal tax rates are unchanged over the deferral period and that contributions are invested in bonds earning 6 percent interest annually. Each line that is charted shows the present value of the revenue cost of deferral holding the length of deferral constant. For example, the dark blue line represents the revenue cost of a 10-year deferral period and the light blue line represents a 50-year deferral period. The previous example of a 20-year deferral by an individual with a 25 percent marginal tax rate, which produced a benefit of $0.186 per dollar of deferral ($186/$1,000), is plotted on the red line.

FIGURE 8

Revenue Cost and Tax Benefit of Deferral by Marginal Tax Rate and Length of Deferral

Present value of the revenue cost and tax benefit of a onetime deferral of $1 of compensation



Note: Calculations assume that the same marginal tax rate applies in all periods and thus is applicable to contributions, investment income, and distributions. Contributions are invested in bonds that pay interest annually. After the the period of deferral, the contribution and all subsequent investment earnings are distributed. Both the nominal interest rate on the bonds and the government's discount rate are 6 percent.

Source: ICI calculations

As expected, holding the length of deferral fixed, the revenue cost of deferral initially increases with an individual's marginal tax rate. However, as marginal tax rates increase, revenue costs increase more slowly, hit a maximum, and then decline. For a 10-year deferral, the maximum revenue cost occurs at a marginal tax rate of 47 percent, with a present value of 13 cents per dollar of deferred compensation (Figure 8). As the length of deferral increases, the revenue costs increase in present value for all marginal tax rates. However, as the length of deferral increases, the marginal tax rate at which the revenue cost is at its highest decreases. For example, for a 50-year deferral, revenue costs are highest at a marginal tax rate of 36 percent, with a present value of 41 cents per dollar of deferred compensation.

Individuals in the top four tax brackets of the federal income tax face marginal tax rates that range from 25 percent to 35 percent (the shaded area in Figure 8). Regardless of deferral length, the revenue cost curves are fairly flat in this range. The end result is that—holding the length of deferral constant—the revenue costs of $1 of deferred compensation for an individual in the 35 percent federal income tax bracket is little different from that of an individual in the 25 percent income tax bracket.

> The revenue costs of $1 of deferred compensation for an individual in the 35 percent federal income tax bracket is little different from that of an individual in the 25 percent income tax bracket.

Character of Investment Income

Another factor that affects the revenue costs and tax benefits of deferral is the character of the investment income; that is, whether the assets in which contributions are invested produce interest income, dividends, short-term capital gains, long-term capital gains, or unrealized capital gains. The examples so far have assumed that contributions were invested in bonds that paid interest annually. Qualified dividend income and long-term capital gains are subject to a lower tax rate than interest income and short-term capital gains. In addition, taxation of capital gains is deferred until the gains are realized.

The tax benefits of deferral vary for different types of investments. As has already been shown, for an individual with a 25 percent marginal tax rate on ordinary income, $1,000 of deferred compensation that earns a 6 percent rate of return would produce an after-tax distribution of $2,405 after 20 years (Figure 9, column 5). Relative to a taxable account invested in bonds, deferral increases the after-tax distribution by $597, or $186 in present value (Figure 9, column 1). However, the benefits an individual receives from deferring compensation will depend on the type of investment income generated by the assets in the account. The character of investment income does not affect the after-tax distribution from a 401(k) plan or IRA: regardless of the character of income, $1,000 of compensation on which tax is deferred, invested for 20 years in an asset earning a 6 percent rate of return, will produce after-tax distributions of $2,405, as both the deferred compensation and the distribution would be taxed as ordinary income. Instead, the tax benefits decline because the character of investment income affects the distributions generated by a taxable account. In particular, because dividends and capital gains are not taxed as heavily as interest income, the benefits of deferral are not as high for equity investments as they are for bonds.[19]

FIGURE 9

Present Value of Revenue Cost and Tax Benefit Depend on the Character of the Investment Income

Assumptions:

Compensation used to fund contribution	$1,000
Number of years invested	20
Rate of return (annual; same for bonds and stocks)	6%
Discount rate	6%
Marginal tax rate on labor earnings, interest income, and short-term capital gains	25%
Marginal tax rate on long-term capital gains and qualified dividends	15%
Character of investment income varies with investment portfolio	
No change in marginal tax rates over time	

	Taxable account				
	Interest-bearing bond (1)	Mixed stock and bond portfolio[1] (2)	Stock portfolio[2] (3)	Non-dividend-paying stock[3] (4)	Tax-deferred account (5)
Amount invested (compensation after tax)	$750	$750	$750	$750	$1,000
Account balance after 20 years	1,809	1,976	2,157	2,405	3,207
Taxable income upon distribution	0	309	649	1,655	3,207
Tax upon distribution	0	46	97	248	802
Distribution after tax	1,809	1,929	2,060	2,157	2,405
Tax benefit of deferral (=increase in after-tax distribution from account)					
Nominal dollars (after 20 years)	597	476	345	248	
Present value	186	148	108	77	

[1] Portfolio is 50 percent stocks and 50 percent bonds, rebalanced annually. Annual rate of return on stocks is 6.0 percent, composed of 1.0 percent qualified dividends, 2.0 percent long-term capital gains, 0.5 percent short-term capital gains, and 2.5 percent unrealized long-term gains. Bonds pay 6.0 percent interest annually.

[2] Portfolio is 100 percent stocks. Annual rate of return on stocks is 6.0 percent, composed of 1.0 percent qualified dividends, 2.0 percent long-term capital gains, 0.5 percent short-term capital gains, and 2.5 percent unrealized long-term gains.

[3] Investment is made entirely in non-dividend-paying stocks, which are held for the entire deferral period. The annual rate of return earned on the stocks is 6.0 percent, composed entirely of unrealized capital gains. No tax is due on the investment until the stocks are sold and the funds are distributed from the account.

Source: ICI calculations

Deferral gives the least tax benefit if the contributions are invested in non-dividend-paying stocks, with the stocks held until distribution. Such an investment in a taxable account would be lightly taxed because no taxes would be paid until long-term capital gains were realized upon distribution. If $1,000 of earnings were used to fund a taxable investment in a non-dividend-paying stock that appreciated at 6 percent per year, it would produce an after-tax distribution of $2,157 (Figure 9, column 4).[20] Relative to a portfolio of bonds, the tax benefit of deferral in the year of distribution falls to $248 (=$2,405-$2,157, rounded) from $597 (=$2,405-$1,809, rounded), and the present value of the tax benefit falls to $77 from $186 (Figure 9, columns 1 and 4).

Deferred compensation invested in assets that produce a mix of investment income would provide a tax benefit somewhere between that of an investment in a non-dividend-paying stock and an investment in an interest-bearing bond. For example, suppose contributions were invested in a portfolio of stocks that every year produced dividends equal to 1.0 percent of assets, realized long-term gains of 2.0 percent, realized short-term gains of 0.5 percent, and unrealized gains of 2.5 percent, for a total return of 6 percent. A $750 contribution to a taxable account invested in such a portfolio would yield an after-tax distribution of $2,060 after 20 years (Figure 9, column 3).[21] In this case, the benefit an individual would receive from the deferral of tax would be an increase in after-tax distributions of $345 in 20 years, or $108 in present value. Alternatively, a $750 contribution to a taxable account with half the assets invested in the portfolio of stocks just described and half the assets invested in bonds would produce an after-tax distribution of $1,929 after 20 years (Figure 9, column 2). In this case, the tax benefit of deferral would be $476 in 20 years, or $148 in present value.

In addition to changing the absolute amount of the tax benefits of deferral, the character of investment income also changes the way benefits change as marginal tax rates increase. For example, unlike bond investments, if contributions are invested in stocks, the tax benefits of deferral under the federal income tax are small or nonexistent for individuals in the 10 percent and 15 percent marginal tax rate brackets (Figure 10). This result can be explained by recalling the intuition that the tax benefit of deferral is equivalent to facing a zero rate of tax on investment income. Individuals in the two lowest statutory tax brackets currently face a zero rate on qualified dividends and long-term capital gains. For these individuals, deferring tax on corporate stock only provides a benefit to the extent that they realize short-term capital gains in their portfolios.

Another difference for investments in corporate stock is that the maximum tax benefit of deferral under the federal income tax accrues to individuals in the 25 percent tax bracket, and the benefit actually declines as the marginal tax rate increases above 25 percent (Figure 10). This result can be explained by recalling the intuition that deferral is equivalent to facing a zero rate of tax on the investment income that would have been generated in a taxable investment account. Because all taxpayers in the top four federal statutory rate brackets pay a 15 percent marginal tax rate on qualified dividends and long-term capital gains, the tax benefit per dollar of investment income of a zero rate of tax is the same for individuals in the 25 percent, 28 percent, 33 percent, and 35 percent tax brackets. However, as the marginal tax rate on ordinary income increases, the total amount of investment income effectively taxed at the zero rate declines. That is, the zero rate of tax effectively applies to investment earnings generated by an investment of $750 for taxpayers subject to a 25 percent tax on ordinary income; investment earnings generated by an investment of $720 for taxpayers subject to a 28 percent tax rate; investment earnings generated by an investment of $670 for taxpayers subject to a 33 percent tax rate; and investment earnings generated by an investment of $650 for taxpayers subject to a 35 percent tax rate. Because the benefit of the zero rate of tax is the same per dollar of dividends and capital gains, but the amount of dividends and capital gains that would have been generated declines, the benefits of deferring tax on investments in stock decline as marginal tax rates exceed 25 percent.

FIGURE 10

Character of Income Changes the Effect of Marginal Tax Rates

Assumptions:

Compensation used to fund contribution	$1,000
Number of years invested	20
Rate of return (annual; same for bonds and stocks)	6%
Character of investment income varies with investment portfolio	
No change in marginal tax rates over time	

	Present value of net benefit of deferral relative to taxable account			
	Interest-bearing bond	Mixed stock and bond portfolio[1]	Stock portfolio[2]	Non-dividend-paying stock[3]
Marginal tax rates (ordinary / capital gains)				
10 percent / 0 percent	$97	$54	$8	$0
15 percent / 0 percent	133	75	12	0
25 percent / 15 percent	186	148	108	77
28 percent / 15 percent	197	153	105	74
33 percent / 15 percent	210	159	101	69
35 percent / 15 percent	214	160	99	67

[1] Portfolio is 50 percent stocks and 50 percent bonds, rebalanced annually. Annual rate of return on stocks is 6.0 percent, composed of 1.0 percent qualified dividends, 2.0 percent long-term capital gains, 0.5 percent short-term capital gains, and 2.5 percent unrealized long-term gains. Bonds pay 6.0 percent interest annually.

[2] Portfolio is 100 percent stocks. Annual rate of return on stocks is 6.0 percent, composed of 1.0 percent qualified dividends, 2.0 percent long-term capital gains, 0.5 percent short-term capital gains, and 2.5 percent unrealized long-term gains.

[3] Investment is made entirely in non-dividend-paying stocks, which are held for the entire deferral period. The annual rate of return earned on the stocks is 6.0 percent, composed entirely of unrealized capital gains. No tax is due on the investment until the stocks are sold and the funds are distributed from the account.

Source: ICI calculations

An Illustration with Distributions Made over a Number of Years

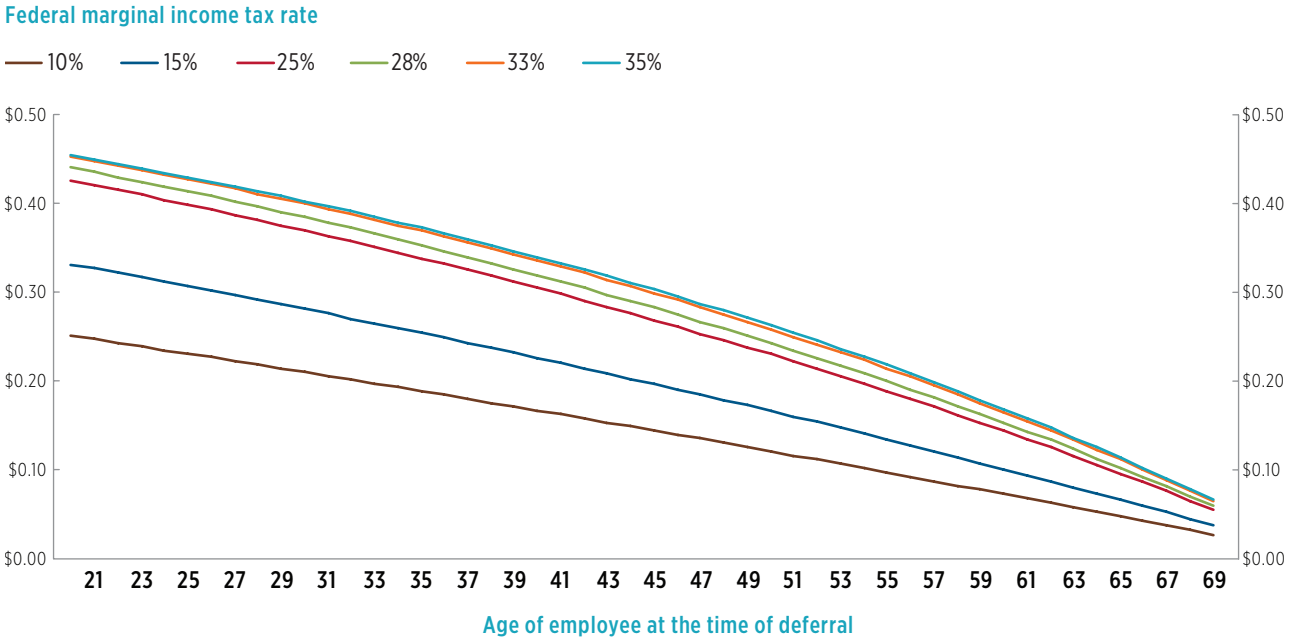
Although it simplifies the analysis to assume a contribution is held for a fixed period and then distributed all at once at the end of the period, most individuals distribute assets accumulated in a 401(k) plan or IRA over time. Individuals retiring with balances in a defined contribution (DC) plan use a variety of distribution methods. Some choose to annuitize the balance, some take installment payments from the plan, but the majority of participants roll the funds into an IRA.[22] Retirees with IRAs typically begin withdrawing funds when they are required to do so by law at age 70½.[23]

To illustrate estimates for more realistic holding periods and distributions, Figure 11 shows the tax benefits of a onetime contribution to a 401(k) plan or IRA of $1 made at ages ranging from age 20 to age 69, assuming the contribution is invested in bonds that pay interest annually, and with assets accumulated at age 70 used to purchase an actuarially fair, inflation-indexed, immediate life annuity.[24] Controlling for marginal tax rates on ordinary income, the lines plot the benefits of a onetime contribution to a tax-deferred account of $1 made at ages ranging from 20 to 69.

FIGURE 11

Present Value of Tax Benefit of Deferral by Federal Marginal Tax Rate and Age

Present value of the tax benefit of a onetime deferral of $1 of compensation by age at the time of deferral; deferral invested in bonds; inflation-indexed immediate life annuity purchased at age 70



Note: Tax benefit calculations assume investment in a portfolio that is 100 percent bonds earning 6 percent nominal interest with interest paid annually. Inflation is 3 percent a year. Contributions remain in the account until age 70. At age 70, the account balance is used to purchase an actuarially fair, inflation-indexed, immediate life annuity. Calculated benefits include benefits under federal income tax only. Tax rates are assumed to be the same at the time of distribution, the time investment income is earned, and the time of distribution.

Source: ICI calculations

Many of the effects illustrated in the simplified examples presented earlier can be discerned in Figure 11. The effect of the length of deferral is shown by the fact that, all else equal, younger individuals get more tax benefits per dollar of deferred compensation. For example, an individual in the 15 percent federal income tax bracket gets 10 cents of benefits for a $1 contribution made at age 60, 17 cents of benefits for a $1 dollar contribution made at age 50, and 23 cents of benefits for a $1 contribution made at age 40. Similarly, an individual in the 28 percent federal income tax bracket gets 15 cents of benefits for a $1 contribution made at age 60, 24 cents of benefits for a $1 contribution made at age 50, and 32 cents of benefits for a $1 contribution made at age 40.

The effect of tax rates can be seen in that, controlling for the age at which a contribution is made, the tax benefits per dollar of compensation deferred tend to increase with marginal tax rates. For example, an individual in the 15 percent federal income tax bracket gets 20 cents of benefits for a $1 contribution made at age 45, compared to 27 cents for an individual in the 25 percent bracket and 30 cents for an individual in the 35 percent tax bracket (Figure 11). Despite the fact that benefits tend to increase with marginal tax rates, for individuals in the top four federal income tax brackets (that is, with marginal tax rates of 25 percent to 35 percent), there is little difference in the tax benefits per dollar of deferred compensation: at every age, the difference in benefits is 3 cents or less across those tax brackets.*

What is clear in Figure 11 is a point that is overlooked in discussions of the tax treatment of retirement savings: an individual's age typically is more important than an individual's marginal tax rate in determining the tax benefits of deferral.

An individual's age typically is more important than an individual's marginal tax rate in determining the tax benefits of deferral.

In these examples, the tax benefits of deferring $1 in compensation are greater for a 49-year-old in the 15 percent tax bracket than for a 60-year-old in the 35 percent tax bracket. The exact magnitude of the tax benefit an individual receives will depend on the type of assets held in the account and the method of distribution. That said, similar calculations were made for investment portfolios that included stocks, for alternative distribution methods, and accounting for state income taxes.[25] In all cases, the tax benefits of deferring $1 in compensation are greater for a 45-year-old in the 15 percent tax bracket than for a 60-year-old in the 35 percent tax bracket.

Changes in Marginal Tax Rates over Time

This section explores the impact of a change in marginal tax rates over time on the tax benefits and revenue costs of deferral. In all of the examples presented up to this point in the report, it has been assumed that marginal tax rates on ordinary income are the same at the time of contribution and the time of distribution. The tax revenue collected upon distribution is no longer equivalent to the up-front loss of tax revenue associated with deferral—and deferral and Roth treatment are no longer equivalent—when tax rates vary over time (see "When Deferral and Roth Treatment Are Not Equivalent" on page 10).

* As shown in Appendix III, if state income taxes are also accounted for, at every age, the difference in benefits is typically 2 cents or less for individuals subject to the top four federal marginal income tax rates.

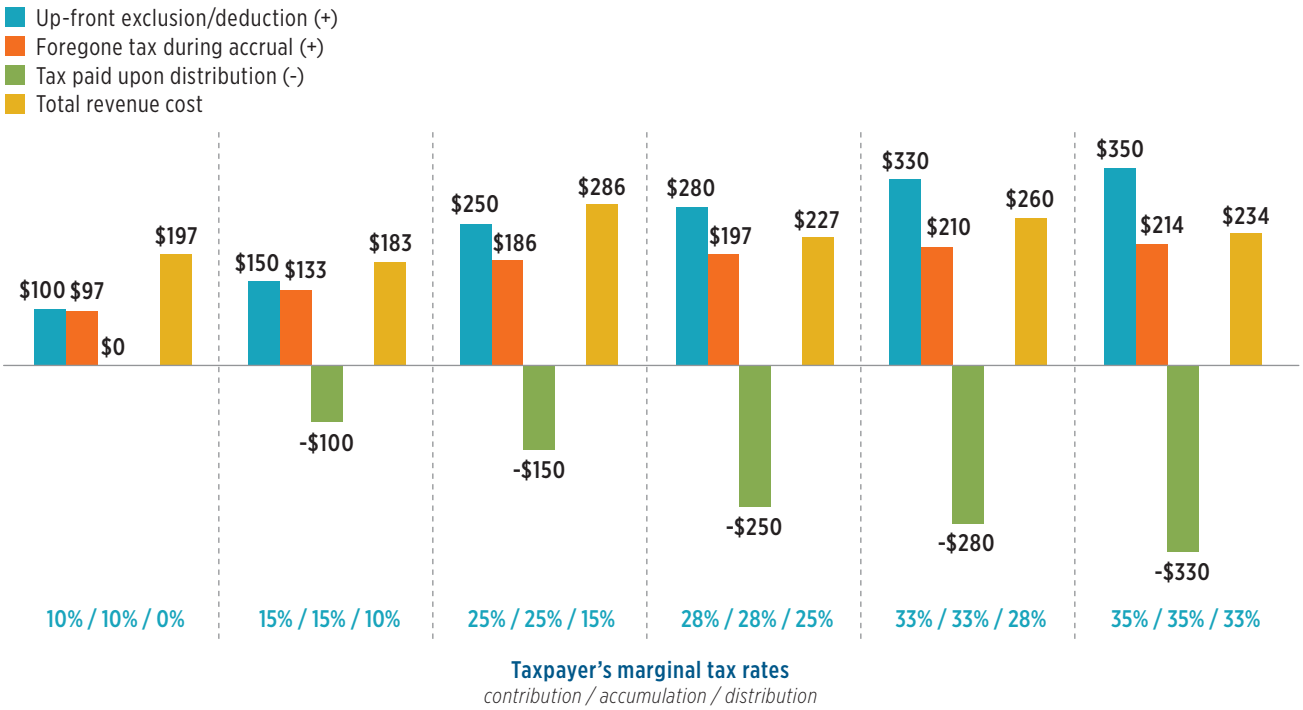
If an individual's marginal tax rate on ordinary income is lower at the time of distribution than it is at the time of contribution, the tax benefits and revenue costs of deferral are higher than when marginal tax rates are the same in both periods. This is because reducing the amount of tax collected at distribution leaves the tax collected upon distribution lower in present value than the tax revenue foregone at the time of contribution.

Figure 12 shows the calculation of the revenue costs of deferral for individuals with various marginal tax rates assuming that marginal tax rates under the federal income tax remain the same from the time of contribution until the period just prior to distribution. It is assumed that, for any given marginal tax rate, rates decline by one statutory tax bracket at the time of distribution. As with earlier examples, the calculations assume tax on $1,000 of earnings is deferred for 20 years, with contributions invested in bonds yielding 6 percent. Because the revenue costs depend on both the marginal tax rate at the time of contribution and the change in the tax rate at the time of distribution, in these examples the revenue costs of $1,000 of deferred earnings is not consistently higher for individuals who face a higher marginal tax rate at the time of contribution. For example, the tax revenue loss ($197) associated with a deferral by an individual with a 10 percent marginal rate—which falls from 10 percent to 0 percent at the time of

FIGURE 12

Present Value of Revenue Costs/Tax Benefits Increases If Marginal Tax Rates Decline

Foregone tax revenue and tax benefit related to deferral of $1,000 of compensation; taxpayers' federal income bracket at time of distribution is one tax bracket lower than at time of contribution



Note: Compensation of $1,000 is used to fund the contribution, resulting in a deferral of $1,000. The marginal tax rate is equal to 25 percent in all periods and applies to contributions, investment income, and distributions. The contribution is invested in bonds that pay interest annually. After 20 years, the contribution and all subsequent investment earnings are distributed. Both the nominal interest rate on the bonds and the government's discount rate are 6 percent.

Source: ICI calculations

distribution—is higher than the tax revenue loss ($183) associated with a deferral by an individual with a 15 percent marginal tax rate—which falls from 15 percent to 10 percent at the time of distribution (Figure 12). Similarly, the revenue costs ($286) of a $1,000 deferral by an individual with a 25 percent marginal tax rate that falls to 15 percent at distribution is higher than the revenue costs ($227) for an individual with a 28 percent marginal tax rate that falls to 25 percent at distribution.

V. Summary and Conclusion

In many discussions of tax reform, tax code provisions that allow individuals to defer taxation of compensation—such as the tax deferral granted to compensation in the form of employer-provided DB and DC retirement plans and compensation contributed to IRAs—are often discussed as if they were equivalent to exempting the compensation from tax. However, the tax benefits and revenue costs of deferral differ markedly from the tax benefits and revenue costs of provisions that exempt income from tax—such as provisions that allow individuals to deduct mortgage interest and to exclude employer-provided health insurance. In particular, the primary insight gleaned from analyzing tax exemptions—that tax benefits and revenue costs are a simple function of the individual's marginal tax rate—does not apply to tax deferrals. In fact, the tax benefit and revenue cost of deferral can be difficult to understand.

The benefits individuals receive from tax deferral and the costs to the government in foregone tax revenue depend on many factors. The primary intuition is that, provided marginal tax rates are unchanged over the deferral period, the benefits of tax deferral are equivalent to facing a zero rate of tax on the investment income that would have been generated if the deferred compensation was used to contribute to a taxable investment account. As such the tax benefits and revenue costs depend primarily on factors that affect the amount of tax that would have otherwise been collected by the government from the investment income. These factors include the rate of return earned on investments, the length of deferral, and the character of the income generated by the investments. The impact an individual's marginal tax rate has on the benefits of tax deferral tends to be overstated in policy discussions. All else equal, the difference in the tax benefits (and the revenue costs) of deferral for an individual in the 25 percent federal income tax bracket and for an individual in the 35 percent income tax bracket is typically 3 cents or less per dollar of deferred compensation. In fact, an individual's age typically will be more important than an individual's marginal tax rate in determining the tax benefits of deferral. That is, in a variety of realistic simulations, the tax benefits of deferring $1 in compensation are greater for a 45-year-old in the 15 percent tax bracket than for a 60-year-old in the 35 percent tax bracket.

A further complicating factor in determining the benefits of deferral is that these benefits depend on changes in an individual's marginal tax rates over time. Most of the calculations assumed that an individual was subject to the same marginal tax rate at the time of contribution and the time of distribution. If an individual is subject to a lower marginal tax rate at the time of distribution, the tax benefits—and the revenue costs—increase.

The true tax benefits and revenue costs of deferral cannot be determined at the time contributions are made. Determining the benefits received by any individual requires knowledge of the benefits that accrue over a lifetime.

The lifetime benefits of tax deferral for representative individuals is the subject of a forthcoming paper.

Appendix I: The Difference Between Tax Expenditure Estimates and Revenue Estimates

Several prominent tax reform proposals have included provisions that eliminate or substantially limit tax expenditures.[1] Largely because of these proposals, there has been an increased focus on the tax expenditure estimates from the Joint Committee on Taxation (JCT) and from the Office of Tax Analysis U.S. Department of the Treasury (Treasury).[2] However, tax expenditure estimates are not revenue estimates, and it is revenue estimates—rather than tax expenditure estimates—that will be relevant to any effort to reform the tax code.[3] In particular, back-of-the-envelope calculations of the revenue effects of various reform proposals based on tax expenditure estimates may not be at all predictive of the official revenue estimates associated with any tax reform legislation that is considered by Congress.

This appendix explains the difference between tax expenditure estimates and revenue estimates. It also describes two alternative methods for estimating tax expenditures for deferral of compensation through employer-sponsored defined benefit (DB) and defined contribution (DC) retirement plans and through deductible contributions to individual retirement accounts (IRAs): the official method and the present value method. This discussion will illustrate that the estimates produced by JCT and Treasury double count a portion of the tax expenditure for deferral of compensation. After describing the alternative estimation methods, various estimates of tax expenditures for employer-sponsored DC plans are compared—including two estimates that use the official method and two that use the present value method.

Tax Expenditures

As explained in JCT 2012, estimates of tax expenditures have been part of the budget process since 1974. Tax expenditures "are a measure of the economic benefits that are provided through the tax laws to various groups of taxpayers and sectors of the economy."[4] They are termed expenditures because it has been judged that the provisions are not strictly related to raising revenue—that is, not part of the normal income tax structure—but instead are related to policy goals that could otherwise be achieved with direct government expenditures. One goal of publishing tax expenditure estimates is to subject these tax code provisions to a level of scrutiny commensurate with that applied to direct expenditures.

Tax code provisions are classified as tax expenditures if they deviate from the normal structure of the individual income tax. What constitutes the normal structure of the individual income tax is subject to interpretation. For example, JCT defines the normal structure of the individual income tax to include "one personal exemption for each taxpayer and one for each dependent, the standard deduction, the existing tax rate schedule, and deductions for investment and employee business expenses."[5] Treasury uses a more restrictive definition of the normal tax structure by including a few more features of the current tax code.[6]

The estimate of the tax expenditures related to a specific provision of the tax code is the difference between tax liability under the existing tax code and tax liability if the provision was removed but the tax code was otherwise unchanged. The estimate of tax liability under current tax law is taken from the revenue baseline estimate. The revenue baseline estimate incorporates forecasts of economic activity during the estimation period and forecasts of taxpayer behavior. Forecasts of economic activity are provided to JCT by the Congressional Budget Office (CBO) and provided to Treasury by the Office of Management and Budget (OMB). Forecasts of taxpayer behavior are made by JCT and Treasury analysts and are predicated on both the economic forecast and current tax law. The estimate of tax liability with the tax code provision removed is static; that is, the estimate of tax liability assumes that—relative to the revenue baseline— forecasted taxpayer behavior does not change in response to the changes in the tax code.

Each tax expenditure estimate is done independently. Because of possible interactions between tax code provisions, it cannot be assumed that the tax expenditure of two or more code provisions would be equal to the sum of the individual tax expenditures.[7] Therefore, neither JCT nor Treasury presents aggregate estimates for categories of tax expenditures by summing the estimates in the category.[8]

Revenue Estimates

If a proposal is made to change the tax code, the effect of the change on future tax revenues is typically an important consideration for policymakers. Official revenue estimates are prepared for the legislative branch by JCT and for the executive branch by Treasury. Because of the adoption of PAYGO ("pay as you go") budget rules—which require that legislation not increase the federal deficit—JCT revenue estimates have taken on added importance.[9]

The revenue effect of proposed changes to the tax code is the difference between the estimate of the revenue that would be raised over the forecast period with the proposed changes and the estimated current law revenue baseline. Both the baseline estimate and the proposed policy estimate use the same forecast of economic activity. However, unlike tax expenditure estimates, revenue estimates are not static; that is, forecasted taxpayer behavior changes in response to changes in the tax code.[10]

If tax expenditures were eliminated as part of a tax reform, a revenue estimate would take into account changes in taxpayer behavior made in response to the reform; the timing of the tax law changes; and any effect due to the interaction between tax-code provisions. The resulting revenue estimates may or may not correspond to the tax expenditure estimates. However, it will be the revenue estimate—not the tax expenditure estimate—that will be relevant to the tax reform process.

Alternative Methods for Estimating the Tax Expenditure for Deferral

The tax expenditure for deferral—including deferral of compensation through contributions to employer-sponsored DB plans and DC plans, and deductible contributions to IRAs—is the difference between tax liability under current law and tax liability under the normal structure of the individual income tax. The estimates for these tax expenditures consist of three components, corresponding to the three points in time when the taxation of deferred compensation differs from normal tax treatment. First, deferral reduces tax revenue up front when compensation is contributed to an employer plan or IRA. Second, tax revenue is reduced because no tax is collected on the investment income that would have been generated in a taxable account. Third, tax revenue is increased when tax is collected on a distribution from an employer plan or IRA.

Both JCT and Treasury use similar methods to measure tax expenditures for deferrals. In addition to estimating the applicable marginal tax rates, three data components are forecast through the budget period to produce the estimate.[11] To measure the up-front cost of deferrals, the most recent data on contributions are used to forecast the amount of contributions that will be made during the budget period. To measure the cost of foregoing tax on investment income generated during the deferral period, the most recent data on assets held in employer plans and IRAs are used to forecast the amount of investment income that will be generated during the budget period. To measure the tax revenue collected on distributions from employer plans and IRAs, the most recent data on distributions are used to project the amount of distributions that will be taken during the budget period.

The advantage of the current estimation method is that all three parts of the estimate are based on recent data. Very few assumptions are required to forecast how these three components will change over the relatively short budget period.

The disadvantage of this method is that the data do not correspond to the goal of the estimation: the tax expenditure associated with deferral of tax on compensation that will occur over the (future) budget period. The first component—the revenue loss caused by contributions made to employer plans and IRAs during the budget period—corresponds to the proper time period to measure the up-front cost. However, the other components—the tax revenue lost by deferring tax on investment income and the tax revenue collected on distributions—are associated largely with contributions that have already been made.[12] These components do not correspond to the proper time period, and would only produce a reasonable estimate of the tax expenditure if the retirement system was characterized as being fairly stable. That is, if the composition of the workforce by age was fairly stable and the share of workers with DB plans, DC plans, and IRAs was fairly stable, then the investment income and distributions generated by past deferrals may be a reasonable estimate of the investment income and distributions of future deferrals.[13]

The conditions under which the estimation method would produce a reasonable result are unlikely to be met in the case of employer plans and IRAs. First, the leading edge of the Baby Boom generation just turned 66, meaning that—all else equal—the ratio of individuals taking distributions to individuals making contributions is likely to increase over time. Further, the composition of plan participants differs considerably by type of retirement plan. For example, 401(k) plans did not exist until 1981 and did not become the predominant form of retirement plan until more recently. The number of active participants in 401(k) plans has grown from 10 million in 1985 to 51 million in 2010.[14] Therefore, distributions from 401(k) plans by the current generation of retirees—and the tax revenue generated by those distributions—underestimate the retirement income that will be generated by the 401(k) plans for the current generation of workers.

An alternate method is to estimate the present value of tax expenditures related to deferrals made during the budget period. The advantage of this method is that it directly corresponds to the tax expenditure which is being estimated. That is, it is a forward-looking estimate of the tax benefits that will accrue to individuals—from the time a contribution is made to the time distributions are received—because of contributions to employer plans and IRAs made during the budget period.

The disadvantage of this method is that it relies less on data and more on assumptions. As explained in the main report, the present value of the tax benefits of deferral will depend on the marginal tax rate on ordinary income at the time of contribution; the character of investment income; the frequency with which capital gains are realized; the marginal tax rates that apply to different categories of investment income; the marginal tax rate on ordinary income at the time of distribution; the rate of return earned on investments; the government's discount rate; the length of deferral; and the method of distribution.

Choosing between the official method and the present value method involves tradeoffs. Few assumptions are needed to implement the official method, which makes the estimate (relatively) transparent and replicable. However, the estimate will only approximate the true tax expenditure if the age distribution of the workforce and the share of the workforce covered by the various types of retirement plans are stable—conditions unlikely to be met in the foreseeable future. Present-value estimates correspond directly to the concept of a tax expenditure. However, the estimate produced will be much more sensitive to the assumptions used by the estimator.

Double Counting in the Official Tax Expenditure Estimates for Deferral

As just discussed, the method used to produce the official tax expenditure estimates is flawed in that it is not a forward-looking measure. However, even accepting the conceptual flaws in the method, as currently implemented, both JCT and Treasury double count a portion of the tax expenditure related to deferral. The first part of the tax expenditure estimate is the up-front cost of deferral. This is calculated as the amount of compensation deferred multiplied by the applicable marginal tax rate. The second portion of the tax expenditure estimate is the amount of tax that would have been collected on investment income generated by contributions that would have been made to taxable investment accounts. Assuming that none of the contributions represents net new savings, the amount that would have been contributed to taxable accounts is the amount of compensation on which taxes were deferred less the taxes that would have been owed on that compensation absent deferral.[15] However, the second part of the tax expenditure is estimated using total assets in tax-deferred accounts, rather than the amount that would have been accumulated in taxable accounts. In other words, assets currently in tax-deferred accounts should be adjusted down to account for the tax that would have been collected on contributions. By using total assets, the estimates effectively double count a portion of the tax revenue foregone by allowing tax deferral. In the first portion of the estimate, it is assumed that taxes would be collected on deferred compensation under the normal structure of the individual income tax. Yet, in the second part of the estimate, it is assumed that the tax that would have been collected on compensation up front also would have produced a stream of investment income throughout the deferral period, on which additional taxes would be collected.

Although this double counting inflates the official tax expenditure estimates of deferral, it is hard to know the magnitude of its impact without knowing all the assumptions embedded in the calculations. Given that there were $4.8 trillion in assets in DC plans as of March 31, 2012, the magnitude of the effect for the tax expenditure of DC plans could be in the range of $5 billion to $10 billion a year.[16]

Comparison of Tax Expenditure Estimates

Figure A1 presents four different estimates of the tax expenditure for employer-sponsored DC plans and Keoghs (retirement plans for self-employed individuals). All four estimates are available for the 2011 fiscal year, and three of the four are available for fiscal year 2011 to fiscal year 2015 time period. There are two estimates that use the official method—the official Treasury estimate and the official JCT estimate. There are also two estimates that use the present value method—one estimate from the Treasury and one estimate from Xanthopoulos and Schmitt 2012.

Xanthopoulos and Schmitt 2012 and 2011 estimate the present value of the tax expenditure related to DC plans and Keoghs. For fiscal year 2011, the estimate in Xanthopoulos and Schmitt 2012 is about two-thirds of the Treasury estimates, and about three-quarters of the JCT estimates (Figure A1).[17] Over time, the difference between the official estimates and the present-value estimates in Xanthopoulos and Schmitt 2012 increases. For the 2011 to 2015 period, the present-value estimates from Xanthopoulos and Schmitt 2012 are less than half of the Treasury estimates and about 60 percent of the JCT estimates.

Without knowing all the assumptions used in the estimates, it is difficult to know why the disparity between the official estimates and the present-value estimates in Xanthopoulos and Schmitt 2012 grows over time. One possible explanation would be that the assumed rate of return increases over time in the JCT and Treasury estimates, whereas the rate of return in Xanthopoulos and Schmitt 2012 is assumed to be constant over all future periods. Another possible explanation would be that the portion of the JCT and Treasury estimates attributable to accumulated assets increases relative to the portion attributable to contributions. As 401(k) plans have expanded, this pool of assets has grown rapidly, and is presumably estimated to continue to grow during the budget period. Assets already accumulated in DC plans and Keoghs would not affect the present-value calculation. Rather, the present value method is affected by the forecasted amount of contributions made during the budget period and the forecasted amount of investment income and distributions associated with these contributions.

Given the differences in estimation method, it is not surprising that the present-value estimates in Xanthopoulos and Schmitt 2012 differ from the official tax expenditure estimates. However, Treasury also produces a present-value estimate of the tax expenditures for DC plans and Keoghs, and Treasury's present-value estimates are twice that of Xanthopoulos and Schmitt 2012 (Figure A1). Although present-value estimates are sensitive to the assumptions used, it is hard to account for the magnitude of this discrepancy.

The exact cause of the difference in the present-value estimates cannot be determined from the documentation that accompanies the two estimates. Some of the difference could be explained by differences in assumptions. For example, Treasury may use a higher rate of return assumption for investments than the 4.0 percent used in Xanthopoulos and Schmitt 2012. That said, a higher rate of return assumption could not, by itself, account for the large discrepancy in the estimates.

The more likely explanation for the discrepancy is the interaction of another assumption with an error in Treasury's method carried over from the official estimating method. Treasury also may assume, unlike Xanthopoulos and Schmitt 2012, that the rate of return earned on investments is greater than the government's discount rate. As explained in the main report, assuming the rate of return exceeds the discount rate will typically reduce the tax expenditure estimate. However, the method that Treasury uses to produce the present-value estimates carries over the same double counting embedded in the method used to produce the official tax expenditure estimates. Because of this double counting, the present-value estimates produced by Treasury will, in all cases, increase as the rate of return earned on investments increases, even if the government's discount rate is held constant.[18] Thus, the differences between the Treasury present-value estimates and the estimates in Xanthopoulos and Schmitt 2012 may be largely attributable to the double counting embedded in the Treasury estimation method in combination with an assumption that the rate of return earned on investments in DC plans and Keoghs exceeds the government's discount rate.

FIGURE A1

Alternative Tax Expenditure Estimates for Defined Contribution Plans

Billions of dollars

	Official tax expenditure estimates		Present-value tax expenditure estimates	
Time period	**U.S. Department of Treasury*** ***401(k)-type plans / self-employed plans***	**Joint Committee on Taxation*** ***DC plans / Keoghs***	**U.S. Department of Treasury*** ***401(k)-type plans / self-employed plans***	**Xanthopoulos and Schmitt 2012** ***DC plans + Keoghs***
2011	$53 / $15	$48 / $14	$89 / $3	$45
2011–2015	$354 / $95	$264 / $79	NA	$208

* For Treasury and JCT estimates, the DC plan and Keogh estimates are presented as separate estimates rather than the sum of the two estimates. Tax expenditures are estimated assuming specific tax code provisions are repealed and all other tax code provisions remain unchanged. Because of possible interactions between tax code provisions, the estimate of repealing two separate tax expenditures may differ from the sum of the individual tax expenditure estimates. Therefore, neither JCT nor Treasury presents aggregate estimates for categories of tax expenditures by summing individual tax expenditures estimates.

Sources: Joint Committee on Taxation 2012; Office of Management and Budget 2012; and Xanthopoulos and Schmitt 2012

Appendix II: Calculation of Tax Benefits and Revenue Costs of Deferral

This appendix demonstrates the algebra of the calculations for the tax benefits and revenue costs of deferral in cases where closed-form solutions for benefits and costs exist. A closed-form solution exists if the contributions are invested in one of two types of investments: (1) investments that pay returns annually, such as bonds that make periodic interest payments and experience no capital gain or loss over the deferral period; or (2) investments where the entire return is recognized as income in the year assets are withdrawn from the account, such as investments in non-dividend-paying stocks.

There is no closed-form solution for the tax benefits and revenue costs of deferral when investments are made in assets that provide some of their return as annual income (such as interest and dividends) and some as income that is recognized irregularly (capital gains with some portion realized and some portion unrealized). The benefits and costs for these types of investments must be derived by simulation, which is done in the main report.

The Tax Benefits of Deferral

The after-tax distribution that results from a deferral of tax on $1 of earnings through a contribution to a 401(k) plan or IRA can be expressed as:

$$D_D^T = (1 + r_c)^T (1 - t_o^T) \quad (1)$$

where

T = the number of years between the contribution and the distribution (in year T)
D_D^T = the after-tax distribution in year T from $1 of deferred earnings
r_c = the rate of return earned on contributions
t_o^T = the marginal tax rate on ordinary income in the year of distribution.

The after-tax distribution that results from a Roth contribution to a 401(k) plan or IRA funded by $1 of earned income can be expressed as:

$$D_R^T = (1 - t_o^0)(1 + r_c)^T \quad (2)$$

where

D_R^T = the after-tax distribution in year T from a Roth contribution funded with $1 of earned income
t_o^0 = the marginal tax rate on ordinary income in the year of the contribution.

The after-tax distribution that results from a contribution to a taxable savings or investment account funded by $1 of earned income and invested in a bond that pays interest annually can be expressed as:

$$D_{TA}^T = (1 - t_o^0)\left(1 + r_c(1 - t_o^d)\right)^T \quad (3)$$

where

D_{TA}^T = the after-tax distribution in year T from a contribution to a taxable account funded with $1 of earned income

t_o^d = the marginal tax rate on interest income earned during the investment period.

The after-tax distribution for a taxable account that invests in a non-dividend-paying stock would be:

$$D_{TA}^T = (1 - t_o^0)(1 + r_c)^T (1 - t_{cg}^T) \quad (4)$$

where

t_{cg}^{T} = the marginal tax rate on long-term capital gains in the year of distribution.

Comparison of deferral and Roth contributions

If an individual's marginal tax rate is the same at the time of distribution and at the time of contribution ($t_o^T = t_o^0$), then

$$(1 + r_c)^T(1 - t_o^T) = (1 - t_o^0)(1 + r_c)^T$$

and deferral and Roth contributions provide the same after-tax distribution to an individual per dollar of earned income used to fund a contribution.

If an individual's marginal tax rate is lower at the time of distribution than it is at the time of contribution ($t_o^T < t_o^0$), then

$$(1 + r_c)^T(1 - t_o^T) > (1 - t_o^0)(1 + r_c)^T$$

and deferral provides a higher after-tax distribution than a Roth contribution per dollar of earned income used to fund a contribution.

If an individual's marginal tax rate is higher at the time of distribution than it is at the time of contribution ($t_o^T > t_o^0$), then

$$(1 + r_c)^T(1 - t_o^T) < (1 - t_o^0)(1 + r_c)^T$$

and a Roth contribution provides a higher after-tax distribution than a contribution to a tax-deferred account per dollar of earned income used to fund a contribution.

Calculation of the tax benefit of deferral

Contributions to 401(k) plans and IRAs provide tax benefits to the individual making the contribution. The tax benefit is that the contribution eventually results in an after-tax distribution that is greater than the after-tax distribution that would result if the individual included the contribution in current income, paid tax on the income, and then contributed the net-of-tax amount to a taxable savings or investment account.

As shown above, if an individual's marginal tax rate is the same at the time of contribution and distribution, then the after-tax distribution that results from a deferral of $1 is the same as the after-tax distribution that results from a Roth contribution funded with $1 of earned income. If the further assumption is made that the taxpayer's marginal tax rate on ordinary income is constant throughout the deferral period ($t_o^0 = t_o^d = t_o^T$), then the tax benefit of $1 of deferred earnings and the tax benefit of a Roth contribution funded with $1 of earnings invested in an interest-paying bond is simply equation (1) less equation (3) and can be written as:

$$B_D^{nominal} = B_R^{nominal} = (1 - t)(1 + r_c)^T - (1 - t)\big(1 + r_c(1 - t)\big)^T \qquad (5)$$

where

$t = t_o^0 = t_o^d = t_o^T$

$B_D^{nominal}$ = nominal tax benefit associated with $1 of deferred earnings

$B_R^{nominal}$ = nominal tax benefit associated with a Roth contribution funded with $1 of earnings.

If an individual's marginal tax rate is the same at the time of contribution and distribution, then the tax benefit of a deferral of $1 and the tax benefit of a Roth contribution funded with $1 of earned income and invested in a non-dividend-paying stock is simply equation (1) less equation (4) and can be written as:

$$B_D^{nominal} = B_R^{nominal} = (1-t)(1+r_c)^T - (1-t)(1+r_c)^T(1-t_{cg}^T) \quad (6)$$

where

$$t = t_o^0 = t_o^T.$$

Thus, regardless of the character of the income, if tax rates are the same at the time of contribution and distribution, individuals are better off contributing to a 401(k) or IRA than they would be if they used the earnings to fund a contribution to a taxable savings or investment account.

The main report illustrates various results regarding the tax benefits and revenue costs of deferral in the case of the two investments for which a closed-form solution exists, as well as results for other types of investments derived by simulation. The remainder of this appendix focuses on the case of investments that yield their entire return in the form of interest payments that occur on an annual or sub-annual basis.

Relationship between the tax benefit of deferral and a taxpayer's marginal tax rate

As shown in Figure 8 of the main report, for a given rate of return (r_c) and length of deferral (T), as the marginal tax rate (t) increases from 0 percent to 100 percent, the benefit of deferral increases up to a certain marginal tax rate, and then diminishes. Because the formula for the tax benefit of deferral (equation (5)) is a complex polynomial, it is difficult to express the first derivative of the function with respect to the tax rate. However, the formula can be rearranged to provide an intuitive explanation as to why the tax benefit of deferral is not a linear function of the marginal tax rate.

For example, the tax benefit formula from equation (5) can also be expressed as

$$(1-t)\left[(1+r_c)^T - \left(1+r_c(1-t)\right)^T\right].$$

Thus, the benefit is the product of two components, one that increases with the marginal tax rate and one that decreases with the marginal tax rate. As t increases, the benefit of the higher rate of return earned on a deferral (the second term, $\left[(1+r_c)^T - \left(1+r_c(1-t)\right)^T\right]$) increases. However, as t increases, the portion of deferral that benefits from the higher rate of return (the first term, $(1-t)$) declines.

The tax benefit formula from equation (5) can alternatively be expressed as the difference between two components:

$$\left[(1+r_c)^T - \left(1+r_c(1-t)\right)^T\right] - t\left[(1+r_c)^T - \left(1+r_c(1-t)\right)^T\right].$$

Both components increase with t, but the second component increases as a faster rate. At a high enough marginal rate, the change in the second term associated with an increase in t is larger than the change in the first term, leading to the inverted U shape of the function.

The Effects of Deferral on Tax Revenue Assuming No Induced Savings

The analysis in this section assumes that that deferral does not induce additional savings. That is, if an individual defers $1 of earned income by contributing $1 to a 401(k) plan or IRA, then it is assumed that the individual would have contributed $(1 - t)$ dollars to a taxable savings or investment account if there were no options available to defer taxation. Similarly, if an individual uses $1 to fund a Roth contribution of $(1 - t)$ dollars, then it is assumed that the individual would have contributed $(1 - t)$ dollars to a taxable savings or investment account if there were no options available for a Roth contribution.

The effects of a deferral on government revenue can be separated into three distinct effects.

1. Government revenue is reduced in the year of the contribution, equal to the reduction in income tax attributable to the exclusion from income (in the case of a 401(k) plan contribution) or a deduction from income (in the case of a deductible IRA contribution).

2. Revenue is reduced in subsequent years due to the fact that taxes are not collected on the investment income earned on the portion of the contribution that would have been contributed to a taxable savings account. If it is assumed that none of the deferral represents new savings, then the amount that would have been contributed to a taxable savings account is simply the deferral less any tax that would be due on the deferral if it was included in income.

3. In the year the funds are withdrawn, revenue is increased as the entire withdrawal is subject to tax.

The revenue cost of a deferral in the form of a $1 contribution to a 401(k) plan or IRA can be expressed in nominal dollars—with no adjustment for the time value of money—as follows (where the numbers below the equation identify the portion of the expression corresponding to the numbered explanations above):

$$R_D^{nominal} = \underset{(1)}{t_o^0} + \underset{(2)}{\sum_{n=1}^{T} t_o^d r_c \left[(1 - t_o^0)\left(1 + r_c(1 - t_o^d)\right)^{n-1}\right]} - \underset{(3)}{t_o^T (1 + r_c)^T} \qquad (7)$$

where

$R_D^{nominal}$ = nominal revenue loss associated with $1 of deferred earnings over the entire time period of the deferral

n = index of years from contribution; contribution year = 0; distribution year = T.

In the case of a Roth contribution, there is no exclusion or deduction from income, and no tax is due at the time funds are distributed. Thus, the revenue effect is simply the revenue that would have been collected if the contribution had been made in a taxable savings or investment account. The revenue effect of a Roth contribution funded with $1 of earned income can be expressed in nominal dollars as:

$$R_R^{nominal} = \sum_{n=1}^{T} t_o^d r_c \left[(1 - t_o^0)\left(1 + r_c(1 - t_o^d)\right)^{n-1}\right] \qquad (8)$$

where

$R_R^{nominal}$ = nominal revenue loss associated with a Roth contribution funded with $1 of earnings over the entire time period of the investment.

The Present Value of Tax Benefits and Revenue Effects of Deferral

The present value of the revenue loss associated with a deferral—expressed in nominal terms in equation (7)—and the revenue loss associated with a Roth contribution—expressed in nominal terms in equation (8)—can be expressed as follows:

$$R_D^{PV} = t_o^0 + \sum_{n=1}^{T} \frac{t_o^d r_c \left[\left(1-t_o^0\right)\left(1+r_c\left(1-t_o^d\right)\right)^{n-1} \right]}{\left(1+r_g\right)^n} - \frac{t_o^T (1+r_c)^T}{\left(1+r_g\right)^T} \tag{9}$$

$$R_R^{PV} = \sum_{n=1}^{T} \frac{t_o^d r_c \left[\left(1-t_o^0\right)\left(1+r_c\left(1-t_o^d\right)\right)^{n-1} \right]}{(1+r_g)^n} \tag{10}$$

where

R_D^{PV} = present value of the revenue loss associated with $1 of deferral
R_R^{PV} = present value of the revenue loss associated with a Roth contribution funded with $1 of earnings
r_g = government's discount rate.

If an individual's marginal tax rate is the same at the time of distribution and at the time of contribution $(t_o^T = t_o^0)$, and if the government's discount rate is equal to the rate of return on contributions $(r_g = r_c)$, then the revenue loss associated with the up-front exclusion or deduction from income associated with deferral is equivalent in present value to the tax collected upon distribution $t_o^0 = t_o^T (1 + r_c)^T / \left(1 + r_g\right)^T$. In this case, the first and third term of equation (9) offset each other, and the present value of the revenue cost of $1 of deferred earnings is equivalent to the present value of the revenue effect of a Roth contribution funded with $1 of earned income. If, in addition, the individual's marginal tax rate remains constant throughout the deferral period $(t_o^0 = t_o^d = t_o^T)$ then present value of the revenue effect can be expressed as:

$$R_D^{PV} = R_R^{PV} = \sum_{n=1}^{T} \frac{tr\left[(1-t)(1+r(1-t))^{n-1}\right]}{(1+r)^n} \tag{11}$$

where

$t = t_o^0 = t_o^d = t_o^T$
$r = r_g = r_c$.

As noted above, if an individual's marginal tax rate is the same at the time of distribution and at the time of contribution $(t_o^T = t_o^0)$, then the tax benefit of $1 of deferred earnings is equivalent to the tax benefit of a Roth contribution funded with $1 of earnings. If, in addition, the individual's marginal tax rate remains constant throughout the deferral period $(t_o^0 = t_o^d = t_o^T)$, the present value of the tax benefit—expressed in nominal terms in equation (5)—can be expressed as:

$$B_D^{PV} = B_R^{PV} = \frac{(1-t)(1+r_c)^T}{(1+r_g)^T} - \frac{(1-t)\left(1+r_c(1-t)\right)^T}{(1+r_g)^T} \tag{12}$$

where

$t = t_o^0 = t_o^d = t_o^T$
B_D^{PV} = nominal tax benefit associated with $1 of deferred earnings
B_R^{PV} = nominal tax benefit associated with a Roth contribution funded with $1 of earnings.

If, in addition, the government's discount rate is equal to the rate of return on contributions $(r_g = r_c)$, then the first term in equation (12) can be decomposed into two components and equation (12) can be rewritten as:

$$B_D^{PV} = B_R^{PV} = \frac{(1-t)(1+r(1-t))^T}{(1+r)^T} + \sum_{n=1}^{T} \frac{tr\left[(1-t)(1+r(1-t))^{n-1}\right]}{(1+r)^n} - \frac{(1-t)(1+r(1-t))^T}{(1+r)^T} \qquad (12')$$

where

$t = t_o^0 = t_o^d = t_o^T$
$r = r_g = r_c$.

It can be seen that under these assumptions, that present value of the tax benefit of deferral is equivalent to the present value of the revenue cost, as the first and third terms of equation (12') offset each other, leaving the second term, which is equivalent to the present value of the revenue cost of deferral expressed in equation (11).

Allowing the marginal tax rate at contribution to differ from the rate at distribution

If an individual's marginal tax rate at the time of contribution is the same as the individual's tax rate at the time of distribution, then the present value of the revenue cost and tax benefit of deferral and Roth contributions no longer holds.

If the government's discount rate is equal to the rate of return on contributions $(r_g = r_c)$, then equation (9) can be rewritten as:

$$R_D^{PV} = (t_o^0 - t_o^T) + R_R^{PV} \qquad (9')$$

This equation demonstrates that, if the tax at the time of contribution is greater than the tax at the time of distribution $(t_o^0 > t_o^T)$, then the present value of the revenue cost of $1 of deferred earnings is greater than the present value of the revenue cost of a Roth contribution funded with $1 of earnings. Alternatively, if the tax at the time of contribution is less than the tax at the time of distribution $(t_o^0 < t_o^T)$, then the present value of the revenue cost of $1 of deferred earnings is less than the present value of the revenue cost of a Roth contribution funded with $1 of earnings $(R_D^{PV} < R_R^{PV})$.

Since it has already been shown that the nominal tax benefit in year T varies in the same manner relative to marginal tax rates at the time of contribution and at the time of distribution, then it also follows that if $t_o^0 > t_o^T$, then $B_D^{PV} > B_R^{PV}$; and, if $t_o^0 < t_o^T$ then $B_D^{PV} < B_R^{PV}$.

Allowing the rate of return and the discount rate to differ

The government's discount rate does not affect the relative tax benefit of deferral and Roth tax treatment. If an individual's marginal tax rate is the same at the time of distribution and at the time of contribution $(t_o^T = t_o^0)$, the nominal tax benefit in year T is the same for both (equation (5)), and the discount rate used to calculate the present value of the benefit does not affect this relationship.

However, if the rate of return earned on contributions is assumed to be different than the government's discount rate $(r_g \neq r_c)$, then the present value of the revenue cost of $1 of deferred earnings is no longer equivalent to the present value of the revenue cost of a Roth contribution funded with $1 of earned income $(R_D^{PV} \neq R_R^{PV})$.

Comparing equations (9) and (10) above, if an individual's marginal tax rate is the same at the time of distribution and at the time of contribution $(t_o^T = t_o^0)$, and if the government's discount rate is greater than the rate of return on contributions $(r_g > r_c)$, then the revenue loss associated with the up-front exclusion or deduction from income associated with deferral is greater in present value than the tax collected upon distribution $(t_o^0 > t_o^T(1 + r_c)^T/(1 + r_g)^T)$, and the present value of the revenue cost of $1 of deferred earnings is greater than the present value of the revenue cost of a Roth contribution funded with $1 of earned income $(R_D^{PV} > R_R^{PV})$. If, instead, $t_o^T = t_o^0$ and $r_g < r_c$, then $t_o^0 < t_o^T(1 + r_c)^T/(1 + r_g)^T$, and $R_D^{PV} < R_R^{PV}$.

For a Roth contribution, holding the government's discount rate constant, the present value of the revenue cost increases as the rate of return earned on the contributions increases $(\frac{\partial R_R^{PV}}{\partial r_c} > 0)$. For a deferral, holding the government's discount rate constant, the effect is more complex. As the rate of return earned on contributions increases, the tax revenue that would have been collected on a taxable account increases. However, the tax revenue collected on distributions from the 401(k) and IRA also increases. The net effect depends on the marginal tax rate, the rate of return, and the holding period. In many cases—and particularly for marginal tax rates above 15 percent—the present value of the revenue cost of deferral declines if it is assumed that the rate of return earned on contributions exceeds the government's discount rate regardless of the holding period, and in some cases the cost declines as the holding period increases. In fact, if the rate of return on contributions exceeds the government's discount rate, it is possible that the deferral of earnings can increase government revenues in present value.

The question arises, however, if it would be appropriate when estimating the present value of the revenue effects of deferral to assume a higher rate of return on contributions made to a 401(k) or IRA than the government's discount rate. It would certainly be appropriate ex post to investigate whether or not the rate of return earned on retirement accounts exceeded the cost of government finance over a given historical period. However, a risk premium is compensation for accepting undiversifiable risk. The typical assumption in economic models of financial markets is that the risk premium makes the marginal investor indifferent between a risky investment and a riskless investment earning the risk-free rate of return. Thus, although it would be appropriate to investigate the relationship of the rate of return earned on contributions and the cost of government finance ex post, it would be inappropriate to assume a risk premium will be earned on deferred earnings ex ante.

One way to illustrate the inappropriateness of assuming an ex ante risk premium is to extend the logic of the assumption to its extreme. If the government placed a higher value on $1 invested in a risky asset than it placed on $1 invested in a riskless asset, then allowing deferral would permit the government to benefit indirectly from the arbitrage opportunity presented by the discrepancy between the value of risky and riskless assets. That is, the tax revenue collected upon distribution is worth more in present value than the tax revenue lost by allowing the up-front exclusion or deduction. However, if the government places a higher value on risky assets, there is no reason the government should limit itself to benefiting from this arbitrage opportunity indirectly through allowing deferral of tax on earned income. If such an arbitrage opportunity existed, the government could benefit directly by selling Treasury bonds and using the proceeds to purchase risky assets. And, if revenue estimators assumed an ex ante risk premium associated with this activity, estimates would show that such financial transactions—if they were of sufficient scale—would allow the government to eliminate all other sources of revenue.

Appendix III: The Impact of Investments and Distribution Methods on the Benefits of Deferral by Age

Figure 11 in the report shows the tax benefits of a onetime contribution to a 401(k) plan or IRA of $1 made at ages ranging from age 20 to age 69, assuming the contribution is invested in bonds that pay interest annually, and with assets accumulated at age 70 used to purchase an actuarially fair, inflation-indexed, immediate life annuity. This appendix presents the results in the same manner as Figure 11, but with additional modifications. First, because deferral typically provides benefits under both federal and state income tax, these calculations account for state income taxes by using a population-weighted average of combined federal and state income taxes.[1] Second, in addition to presenting results for contributions to tax-deferred accounts which are invested in bonds and distributed with a purchase of an annuity, this appendix presents results for two other combinations of investments and distribution methods.

Figure A2 illustrates how tax benefits change when the character of investment income changes and when the method of distribution changes. The top panel of Figure A2 shows the tax benefits of a onetime contribution to a 401(k) plan or IRA of $1, assuming the contribution is invested in bonds that pay interest annually, with accumulated account assets used to purchase an actuarially fair, inflation-indexed, immediate life annuity with payments beginning at age 70. The middle panel of Figure A2 shows the same calculation, but assumes that—prior to purchasing the annuity—the contribution is invested in a portfolio that is half stocks and half bonds. The bottom panel of Figure A2 shows the calculation, assuming the contribution is invested in a portfolio that is half stocks and half bonds, but with a percentage of assets paid out every year starting at age 70. The percentage of assets paid out is equal to one divided by remaining life expectancy, conditional on age.[2] In all three panels, these calculations account for state income taxes by using a population-weighted average of combined federal and state income taxes. Controlling for marginal tax rates on ordinary income, the lines plot the benefits—at ages ranging from 20 to 69—of a onetime contribution to a tax-deferred account of $1.

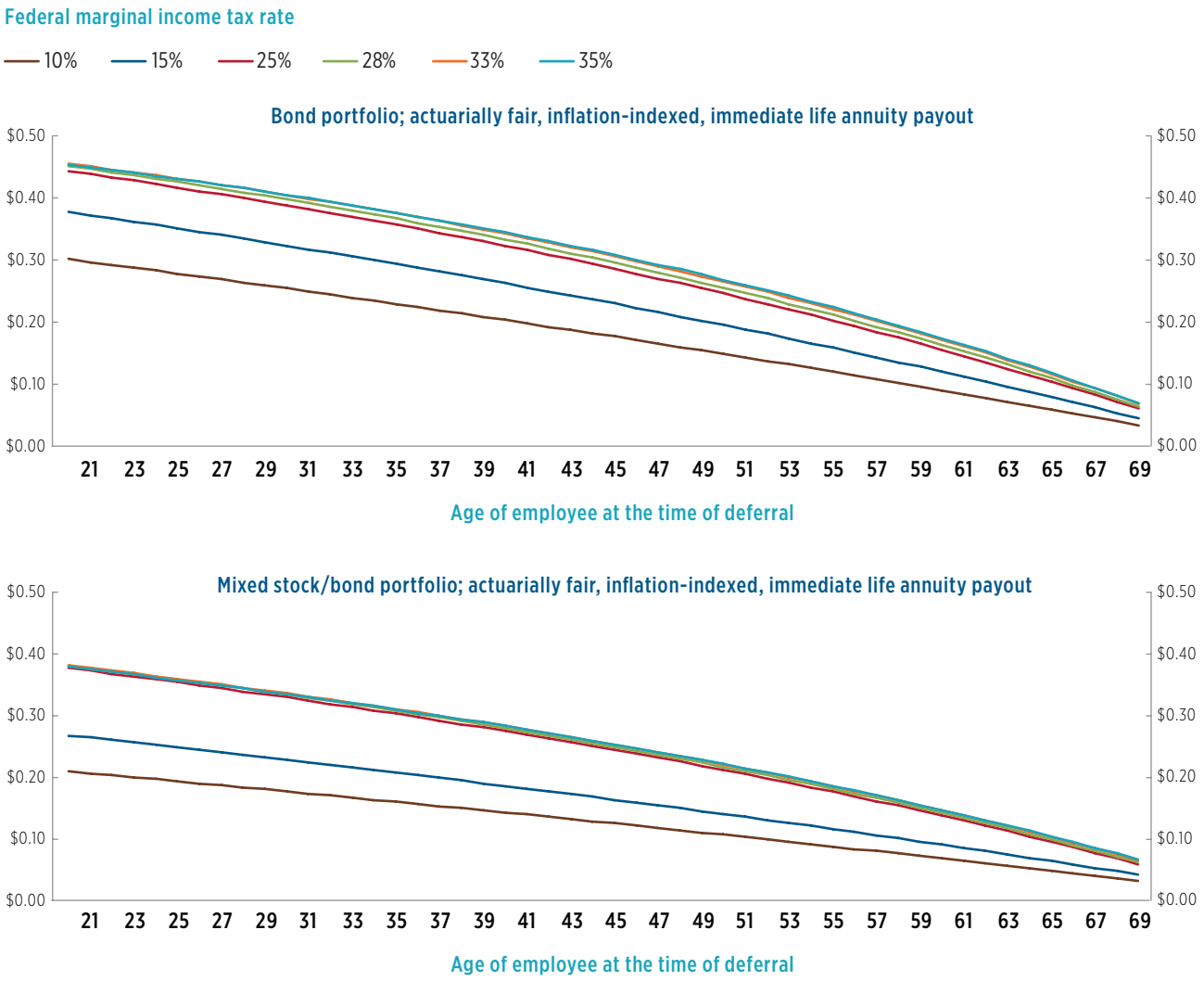
The effect of the character of investment income on the benefit of deferring tax on $1 of compensation can be seen by comparing the top and middle panels of Figure A2. Because interest income is taxed more heavily in a taxable account than dividends and long-term capital gains, the tax benefits from deferral are higher if the portfolio is invested completely in bonds than if the portfolio is invested in a mix of stocks and bonds. Further, the difference is more pronounced at younger ages. This is because, when comparing the top and middle panels, the two investment portfolios differ only in the period before an annuity is purchased at age 70, and the period before age 70 comprises a larger portion of the total deferral period for younger contributors.

The effect of the distribution method on the tax benefit can be seen by comparing the middle and bottom panels of Figure A2. Because the distribution method based on life expectancy is effectively more back-loaded than the annuity payout,[3] the tax benefits are higher for the payouts based on life expectancy than if the accumulated assets were used to purchase an annuity. In this case, the difference is more pronounced at older ages. This is because, when comparing the middle and bottom panels, the two investment portfolios only differ starting at age 70, and this period makes up a larger portion of the total deferral period for older contributors.

FIGURE A2

Present Value of Tax Benefit of Deferred Compensation by Federal Marginal Tax Rate and Age

Present value of the tax benefit of a onetime deferral of $1 of compensation by age at the time of deferral; distributions begin at age 70; investments and distribution methods vary

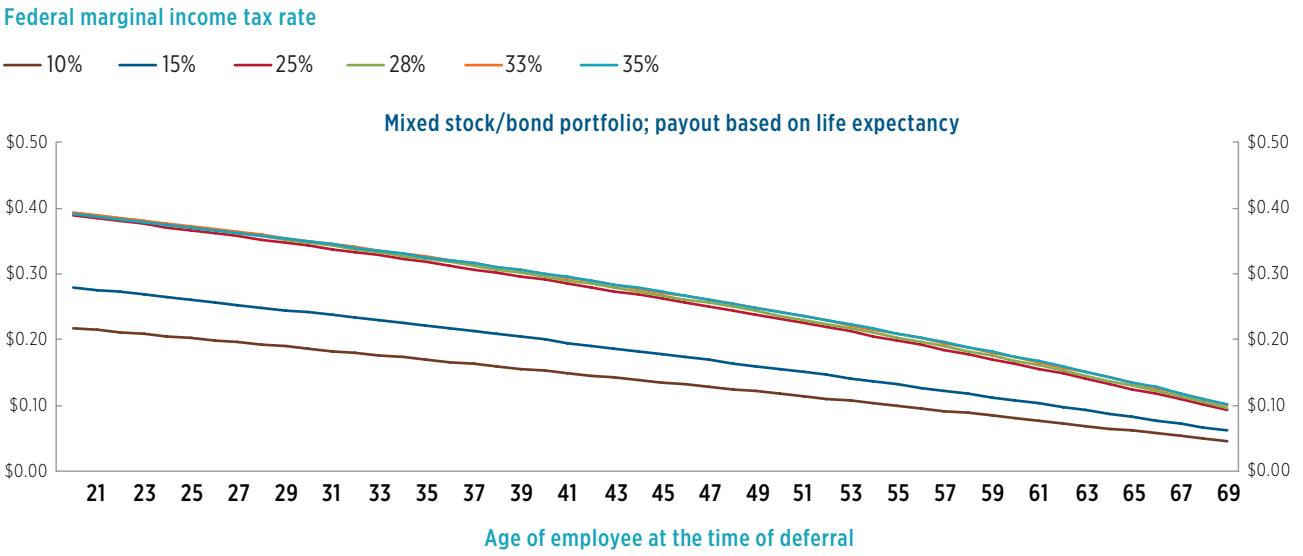


Continued on next page

FIGURE A2 CONTINUED

Present Value of Tax Benefit of Deferred Compensation by Federal Marginal Tax Rate and Age

Present value of the tax benefit of a onetime deferral of $1 of compensation by age at the time of deferral; distributions begin at age 70; investments and distribution methods vary



Note: Bond portfolio consists of bonds earning 6 percent interest, with interest paid annually. Mixed stock/bond portfolio is 50 percent stocks and 50 percent bonds. The rate of return on both stocks and bonds is 6 percent. See note on Figure 9 for the character of the income produced by the stock portion of the portfolio. Contributions remain in the account until age 70. In the case of an annuity purchase, the account balance is used to purchase an actuarially fair, inflation-indexed, immediate life annuity. Inflation is assumed to be 3 percent a year. In the case of the payout based on life expectancy, annual distributions are set equal to the account balance multiplied by 1/[T], where [T] is remaining life expectancy. Distributions continue to age 101, when the balance is distributed. Calculated benefits include benefits under both federal and state income tax. Tax rates are assumed to be the same at the time of distribution, the time investment income is earned, and the time of distribution. The federal statutory rate and the combined federal and state rates expressed in percents by type of income are as follows (statutory federal rate/wages and short-term gains/interest/dividends/long-term capital gains): (10/12.8/12.9 /3.3/3.1), (15/18.6/18.8 /4.5/4.4), (25/28.6/28.7/19.3/19.2), (28/31.6/31.7/19.4/19.3), (33/36.3/36.4/19.5/19.4), (35/38.2/38.3/19.5/19.4).

Source: ICI calculations

Notes

[1] Employer contributions to employer-sponsored retirement plans—either DB plans or DC plans—receive the same federal income tax treatment as employee deferrals. Importantly, allowing employers to deduct retirement plan contributions from revenue when calculating net business income is not a tax preference: under a normal income tax structure, business income is defined as revenues less expenses. Instead, it is the treatment of employer pension contributions under the individual income tax that represents preferential treatment. Compensation, including the present value of deferred compensation, would be included in individual income in a normal income tax structure. Special rules allow deferral of the individual income tax on compensation in the form of qualified deferred compensation, such as DB pension plans and DC pension plans.

[2] For ease in exposition, the term "deferred compensation" will be used in this report to mean qualified deferred compensation. Qualified deferred compensation refers to compensation deferred through a qualified employer plan—such as a DB or DC plan—or a deductible contribution to an IRA. Non-qualified deferred compensation—such as non-qualified stock options—does not benefit from tax deferral, as the employer cannot deduct a compensation expense until the compensation is recognized as income by the employee.

[3] For qualified dividends and for most types of long-term capital gains, individuals in the 10 percent and 15 percent federal income tax brackets pay a 0 percent rate, and individuals in the 25 percent, 28 percent, 33 percent, and 35 percent federal income tax brackets pay a 15 percent rate. Long-term capital gains on collectibles are subject to ordinary tax rates subject to a maximum rate of 28 percent. Long-term capital gains on certain small business stocks (Section 1202 gains) are eligible for a 50 percent exclusion from income and are taxed at ordinary rates subject to a maximum rate of 28 percent (producing an effective top rate of 14 percent). Long-term capital gains resulting from the deduction of depreciation on certain types of real estate (Section 1250 depreciation) are recaptured at ordinary tax rates subject to a 25 percent maximum rate. Recaptured accelerated depreciation is generally taxed at ordinary tax rates. Non-qualified dividends are subject to tax at ordinary tax rates.

[4] Distributions made prior to age 59½ may be subject to a 10 percent penalty. The tax benefit calculations in this paper assume that distributions made from tax-deferred retirement plans and IRAs are qualified distributions and are not subject to tax penalty.

[5] To be treated as a qualified distribution from a Roth IRA, the Roth account must have been established for five years. Distributions made prior to the five-year holding period or prior to age 59½ may be subject to tax and penalty on the portion of the distribution that represents investment earnings (see IRS Publication 590). The tax benefit and revenue cost calculations in this paper assume that all of the Roth distributions are qualified distributions and are subject to neither tax nor penalty.

[6] The account balance is equal to $X(1+r_c)^n$, where X is the amount contributed, r_c is the rate of return earned on contributions, and n is the number of years invested. In this case, the balance is \$3,207 ($=\$1{,}000^{\star}(1.06)^{20}$). For a mathematical derivation of the points illustrated numerically in this section, see Appendix II.

[7] Using the formula in note 6, the account balance is \$2,405 ($=\$750^{\star}(1.06)^{20}$).

[8] For a taxable investment that pays annual interest, the account balance is equal to $X(1+r(1-t_c))^n$, where t_c is the marginal tax rate on investment income. In this case, the balance is \$1,809 ($=\$750^{\star}(1.06^{\star}(1-0.25))^{20}$).

[9] The implicit assumption in all of these calculations is that contributions to tax-deferred or Roth accounts do not represent new savings. If contributions represent new savings, then neither deferral nor Roth treatment reduces government tax revenue. That is, as illustrated on page 7, the tax collected on Roth contributions and the tax collected on distributions of deferrals are equal—in present value—to the tax that would have been collected on cash compensation if the net-of-tax compensation was used by the individual to fund consumption.

[10] The present value of the revenue effect in any given year is $\frac{Y_n}{(1+r_d)^n}$, where Y_n is the revenue effect in year n, r_d is the discount rate (which is equal to the government's cost of finance), and n indexes the number of years from the time of the current period. Thus, the present value of \$802 in 20 years is \$250 ($=802/1.06^{20}$).

[11] The present value of the stream of foregone tax revenue is the sum of the present values of the foregone tax revenue in each year. That is, it is set equal to $\sum_{n=1}^{N} \frac{Y_n}{(1+r_d)^n}$, where N is the total number of years of the investment.

[12] The present value of $597 in 20 years is $186 (=597/$1.06^{20}$).

[13] This equivalence will hold provided the rate of return is the same as the government's discount rate. As explained in the text, it is assumed that the two rates are equal throughout the paper. For an explanation of why it would be inappropriate to assume otherwise, see "Rate of Return and Discount Rate Assumptions Used When Estimating Present Values," on page 16.

[14] From Federal Reserve Board 2012. Accessed on August 30, 2012.

[15] Ibid.

[16] In a taxable account, interest earned in the first year would be $45(=$750*6%), and taxes paid would be $11.25 (=$45*25%). If discounted at 6 percent, taxes of $11.25 in one year have a present value of $10.61 (=$11.25/1.06).

[17] See, for example, Orszag 2011 and Morrisey 2011, quoted on page 3.

[18] Assuming taxes on investment income are paid by withdrawing funds from the account, $1 of bonds yielding 6 percent annual interest for 20 years will produce $1.97 of taxable interest per dollar invested for an individual facing a 25 percent tax rate compared to a $1.84 of taxable interest per dollar invested for an individual facing a 35 percent tax rate.

[19] For a discussion of implications of differential taxation on the allocation of an individual's portfolio between taxable and tax-deferred accounts, see Poterba 2002.

[20] The after-tax distribution from a taxable account invested in a non-dividend paying stock is equal to $(1-t_o^0)X(1+r_c)^T(1-t_{cg}^T)$, where t_o^0 is the individual's marginal tax rate on ordinary income at the time of contribution, X is the amount of compensation used to fund the contribution, r_c is the rate of return earned on contribution, T is the year funds are withdrawn (with T equal to the number of years between contribution and distribution), and t_{cg}^T is the individual's capital gains tax rate in year T. In this case, the after-tax distribution is $2,157(=$750*(1.06)^20*(1-15%)).

[21] A closed-form solution for the tax benefits and revenue costs of deferral exists if contributions are invested in one of two types of investments: (1) investments that pay returns annually, such as bonds that make periodic interest payments and experience no capital gain or loss over the deferral period; or (2) investments where the entire return is recognized as income in the year assets are withdrawn from the account, such as investments in non-dividend-paying stocks held until distribution. For a discussion of those two types of investments, see Appendix II. There is no closed form solution for the tax benefits and revenue costs of deferral when investments are made in assets that provide some of their return as annual income (such as interest and dividends) and some as income that is recognized irregularly (such as capital gains with some portion realized and some portion unrealized). The tax benefits and revenue costs for these investments can be derived by simulation. The method used in this paper to simulate the benefits is based on the method used in Brady 2007.

[22] See Sabelhaus, Bogdan, and Holden 2008; and The Vanguard Group 2012.

[23] Holden and Schrass 2011 and Holden and Bass 2012 find that the most common method used by retirees to determine the amount to withdraw from their traditional IRAs is the required minimum distribution (RMD) amount formula provided by the IRS. RMDs start at age 70½, with the formula for determining the RMD based (although not in all cases directly) on life expectancy.

[24] The annuity is assumed to be actuarially fair so that payouts from the annuity will be equivalent in present value to non-annuity methods of distribution. Appendix III illustrates similar calculation for a bond portfolio, with an annuity purchased at age 70; a portfolio that is half stocks and half bonds, with an annuity purchased at age 70; and a portfolio that is half stocks and half bonds, with a percentage of assets paid out every year. The calculations in Appendix III account for both federal and state income taxes. For the non-annuity method of distribution, the percentage of assets paid out is equal to one divided by remaining life expectancy, conditional on age. Although not directly modeled on RMD rules, the second distribution method produces a similar pattern of withdrawals in retirement.

[25] See Appendix III.

Appendix I Notes

[1] See The Debt Reduction Task Force 2010; The National Commission on Fiscal Responsibility and Reform 2010; and Ryan 2010.

[2] The Treasury tax expenditure estimates are provided to the Office of Management and Budget (OMB), which publishes the estimates. See, for example, OMB 2012.

[3] For a discussion of the role tax expenditures have played in recent discussions of tax reform, see Buckley 2011.

[4] See JCT 2012, p. 3.

[5] See JCT 2012, p. 4.

[6] For example, the current tax code allows certain businesses (typically smaller businesses) to use the cash method of accounting. Treasury considers this to be part of the normal tax structure, whereas JCT treats this as a tax expenditure. For a more detailed explanation of differences between JCT and Treasury tax expenditure estimates, see JCT 2012, pp. 22–24.

[7] For example, itemized deductions only reduce tax liability to the extent that total itemized deductions are in excess of the standard deduction. Taxpayers may benefit from both the home mortgage interest deduction and the state and local tax deduction when analyzed independently. However, suppose some of these itemizers would switch to the standard deduction if the home mortgage interest deduction were eliminated. For this group, eliminating both deductions would not increase their tax liability relative to eliminating only the mortgage interest deduction. Thus, the tax expenditure related to both provisions would be less than the sum of the tax expenditure estimated for each provision.

[8] Although neither Treasury nor JCT sums up individual tax expenditure estimates to produce category aggregates, Burman, Toder, and Geissler 2008 compared their estimates for categories of tax expenditures to the sum of separate tax expenditures and found that "adding separate tax expenditures to compute total costs produces significant errors for some subgroups of provisions, but in the aggregate (and for many subcategories) comes close to the correct sum."

[9] In general, PAYGO rules require legislation that either reduces taxes or increases spending to offset those changes with either increased taxes or decreased spending. PAYGO provisions have been in effect since 1993, although the rules have changed over time. For a discussion of the Senate PAYGO rule, see Heniff 2010. For a discussion of the House PAYGO rule, see Keith 2007.

[10] Revenue estimates are dynamic in the sense that they take into account taxpayer behavior. However, the estimates assume that changes in tax policy will have no effect on the forecast of economic activity included in the budget baseline. For a discussion of the revenue estimating process, see JCT 2011. For a discussion of revenue estimates that account for macroeconomic effects of changes to the budget baseline, see U.S Department of Treasury, Office of Tax Analysis 2006, and Congressional Budget Office 2003. For a discussion of tax-deferred retirement savings in long-term revenue projections, see Congressional Budget Office 2004.

[11] The budget periods over which JCT and Treasury estimate tax expenditures differ. For example, JCT 2012 includes JCT estimates for the fiscal years 2011 to 2015, whereas OMB 2012 includes Treasury estimates for the fiscal years 2011 to 2017.

[12] It has already been noted that tax expenditure estimates are not the same as revenue estimates. However, because of the estimation method, the amount of revenue that could be raised over the budget period by eliminating tax-deferred compensation is likely to be a fraction of the estimated tax expenditure. That is, a substantial portion of the tax expenditure estimate is attributable to the investment income generated by assets already accumulated in IRAs and employer-sponsored DB and DC plans. However, it is unlikely that any proposal to eliminate the ability to defer tax on compensation would apply retroactively to compensation earned in prior years.

[13] Both JCT and Treasury estimate separate tax expenditures for DB plans, DC plans, and IRAs, respectively. Thus, the change over time in the share of the workforce covered by each plan will affect the measure.

[14] See U.S. Department of Labor, Pension, and Welfare Benefits Administration 1992, p. 89; and Holden, et al 2011, p. 60.

[15] That is, for a deferral of amount C_D, the method used by JCT and Treasury assumes C_D would have been contributed to a taxable account rather than $(1\text{-}t)C_D$.

[16] For example, if the estimates assume a 5 percent rate of return on retirement assets and an effective average tax rate of 20 percent on both contributions and investment income, then the estimates would be overstated by about $10 billion a year (20%*$4.8 trillion*5%*20%=$9.6 billion). If the estimates assume a 5 percent rate of return on retirement assets and an effective average tax rate of 15 percent on both contributions and investment income, then the estimates would be overstated by about $5 billion a year (15%*$4.8 trillion*5%*15%=$5.4 billion). In addition to the rate of return and tax rate assumptions, the portion of investment returns that are assumed to be unrealized capital gains would be an important component of the estimate. Unrealized capital gains would not be taxed under the normal tax structure, and thus do not generate a tax expenditure. Data on DC plan assets are from Investment Company Institute 2012.

[17] Calculations are for the Xanthopoulos and Schmitt 2012 estimate for DC plans and Keoghs divided by the sum of the official estimates for DC plans and the official estimates for Keoghs. Tax expenditures are estimated assuming specific tax code provisions are repealed and all other tax code provisions remain unchanged. Because of possible interactions between tax code provisions, the estimate of repealing two separate tax expenditures may differ from the sum of the individual tax expenditure estimates. Therefore, neither JCT nor Treasury presents aggregate estimates for categories of tax expenditures by summing individual tax expenditures estimates.

[18] Using Treasury's estimation method, Lurie and Ramnath 2011 illustrate the effect on present-value estimates of changing certain assumptions. Because of the flaw in the estimation method, the authors incorrectly conclude that present-value estimates of the revenue effects of deferral will increase with the rate of return in all cases, even if the government's discount rate is held constant.

Appendix III Notes

[1] Data on state tax rates are from Tax Foundation 2012. Alaska, Florida, Nevada, Texas, Washington, and Wyoming have no state income tax. Two other states—Tennessee and New Hampshire—do not tax compensation or capital gains, but do tax interest and dividend income. The Hawaii income tax has the highest marginal tax rate, with a maximum rate of 11 percent. Population weighting of the data to produce the relevant measures of state tax rates was done by ICI.

[2] Although this distribution method differs from the tax code's required minimum distribution (RMD) rules, it produces a similar pattern of withdrawals in retirement.

[3] For the payouts based on life expectancy, it is assumed that the individual receives the payments until age 101, at which point all proceeds are paid out. This is equivalent to assuming that payments are made until death, at which point the beneficiary of the account continues payments until all proceeds are paid by the time the account holder would have attained age 101. The second equivalent assumption conforms to the RMD rules as they pertain to inherited accounts. In the case of the annuity, it is assumed the annuity is paid until the individual dies or age 101, whichever occurs first. The price of the actuarially fair, inflation-indexed, immediate life annuity assumes no payments occur after age 101. In the case of the annuity, present-value measures of the tax benefits take into account the probability that the individual is alive at any given age. Both methods produce payments in retirement equal in present value to the account balance at retirement. However, because the probability that an individual is alive declines with age more quickly than the payouts based on life expectancy, payments from the annuity effectively occur earlier than the payments based on life expectancy. Thus the difference in tax benefits is attributable to the effectively longer deferral period.

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Washington, DC 20005
202-326-5800
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