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ABSTRACT

Contributing to 401(k)s and similar tax-deferred retirement accounts certainly lowers current taxes. But does it lower your lifetime taxes? If average and marginal tax rates were independent of income and didn't change through time, the answer would be an unambiguous yes. The reduction in current taxes would exceed the increase in future taxes when measured in present value. But tax rates may be higher when retirement account withdrawals occur, either because one moves into a higher marginal federal and state tax brackets or because the government raises tax rates. In addition, reducing tax brackets when young, at the price of higher tax brackets when old, may reduce the value of mortgage deductions. Finally, and very importantly, shifting taxable income from youth to old age can substantially increase the share of Social Security benefits subject to federal income taxation.

This paper uses ESPlanner, a detailed life-cycle personal financial planning model to study the lifetime tax advantage to stylized young couples of participating in a 401(k) plan. Assuming a 6 percent real return on assets, we find that low- and moderate-income households actually raise their lifetime taxes and lower their lifetime expenditures by saving in a 401(k) plan. In the case of a couple with \$50,000 in annual earnings, partaking fully in the typical 401(k) plan raises lifetime tax payments by 1.1 percent and lowers lifetime expenditures by 0.4 percent. The lifetime tax hike is 6.4 percent and the lifetime spending reduction is 1.7 percent for such households if they receive an 8 percent real rate of return. These figures rise to 7.3 percent and 2.3 percent, respectively, if taxes are increased by 20 percent when the couple retires. These findings are driven, in large part, by the additional Social Security benefit taxation induced by 401(k) withdrawals.

The picture is quite different for high-income young couples with so much income that 401(k) participation cannot a) lower and then raise their marginal income tax rates or b) raise the share of their Social Security benefits that is taxable. For such couples 401(k) participation means major lifetime tax savings. At a 6 percent real return, a couple earning at the rate of \$300,000 per year would enjoy a 6.8 percent lifetime tax break, which translates into a 3.9 percent increase in lifetime spending. These couples' continue to enjoy a large lifetime subsidy even if tax rates are raised by as much as a fifth when they retire.

In addition to demonstrating the regressivity of the federal government's tax-deferred saving policy, our findings call into question Social Security benefit taxation as well as the non-discrimination rules that induce employers to encourage greater 401(k) participation by low earners. They also suggest that low- and moderate-income households should consider contributing at lower rates and for shorter periods to their tax-deferred accounts. Finally, they indicate that saving through a Roth IRA affords much greater lifetime tax benefits than saving through either a 401(k) plan or a conventional IRA assuming employers provide the same gross compensation in all cases.

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I. Introduction

Does saving in 401(k) and similar tax-deferred retirement accounts really lower your lifetime taxes? If average and marginal tax rates were independent of income and didn't change through time, the answer would be an unambiguous yes. But tax rates may be higher when withdrawals occur, either because one moves into a higher tax bracket or because the government raises tax rates. In addition, reducing tax brackets when young, at the price of higher tax brackets when old, may reduce the value of mortgage deductions, since these are primarily taken when young. Finally and very importantly, shifting taxable income from youth to old age can substantially increase the share of Social Security benefits subject to income taxation.

These concerns about 401(k) participation raising taxes are, with one exception, inapplicable to those with high incomes. Such households are in high tax brackets and face the maximum degree of taxation of their Social Security benefits regardless of the extent of their tax-deferred saving. The one exception is the possibility that tax rates will be raised at the time these and other households withdraw their tax-favored savings.

This paper studies the impact on lifetime taxes of participating in a 401(k) plan. It does so using Economic Security Planner (ESPlanner) – a life-cycle personal financial planning program that makes highly detailed federal income tax, state income tax, and Social Security benefit calculations.¹ The paper considers stylized young couples who, together with their employers, contribute the maximum amounts stipulated by typical 401(k) plans. We measure the benefit from 401(k) participation in two ways – in terms of the percentage reduction in lifetime taxes and in terms of the percentage increase in

¹ ESPlanner was developed by Economic Security Planning, Inc.

lifetime spending financed by the tax break.² We find that low- and middle-income households (those earning up to \$50,000 per year) who earn a real pre-tax return of 6 percent or more subject themselves to higher lifetime taxes by fully participating in the typical 401(k) plan.

In the case of a young couple with \$50,000 in initial annual earnings that earns a 6 percent real return, partaking fully in the typical 401(k) plan raises lifetime tax payments by 1.1 percent and lowers lifetime expenditures by 0.4 percent. The lifetime tax hike is 6.4 percent and the lifetime spending reduction is 1.7 percent for such households if they receive an 8 percent real rate of return. These figures rise to 7.3 percent and 2.3 percent, respectively, if taxes are increased by 20 percent when the couple retires.

These findings are driven, in large part, by the additional Social Security benefit taxation induced by 401(k) withdrawals. For example, absent Social Security benefit taxation the \$50,000 couple earning a 6 percent real return would lower their lifetime taxes by 2.2 percent and raise their lifetime spending by 0.5 percent by participating fully in a 401(k).

The picture is quite different for high-income young couples with so much income that 401(k) participation cannot a) lower and then raise their marginal income tax rates or b) raise the share of their Social Security benefits that is taxable. For such couples 401(k) participation means major lifetime tax savings. At a 6 percent real return, a couple earning at the rate of \$300,000 per year enjoys a 6.7 percent lifetime tax break, which translates into a 3.8 percent increase in lifetime spending. These couples' continue

² The terms "lifetime taxes" and "lifetime spending" refer to present values of these flows where discounting is done using the real rate of return assumed in each experiment.

to garner a major lifetime subsidy even if tax rates are raised by as much as a fifth when they retire.

The paper proceeds by showing the ambiguous sign of the tax benefit to 401(k) participation. It then describes ESPlanner and the stylized young households used in our analysis. Next come the findings, which are presented under a range of alternative assumptions about rates of return, wage growth, and future tax rates. These findings raise a number of policy questions, many of which are taken up in the conclusion.

II. The Ambiguous Tax Advantage to 401(k) Participation

To see the ambiguous nature of the lifetime tax effect of participating in a 401(k), consider an agent who lives for two periods, earning a wage of W when young and facing a rate of return of r . Suppose the agent contributes an amount H to her 401(k) plan when young. Then her lifetime budget constraint is given by:

$$(1) \quad C_y + C_o/(1+r) = W - T_y[W-H-D_y] - T_o[Y_o + M(B, Y_o)]/(1+r),$$

where Y_o stands of taxable income in old age apart from Social Security benefits, i.e.,

$$Y_o = (W - T_y(W - H - D_y) - H - C_y)r + H(1+r) - D_o,$$

C_y and C_o stand for consumption when young and old, respectively, $M(B, Y_o)$ stands for the amount of taxable Social Security benefits, D_y and D_o , stand for deductions when young and old, respectively, and $T_y(\cdot)$ and $T_o(\cdot)$ are tax functions determining income-tax payments when young and old. Note that taxable income when young is computed by deducting 401(k) contributions, whereas taxable income when old is computed by including principal plus interest earned on the contribution.

If Social Security benefits were not subject to taxation ($M(B, Y_o)=0$) and both tax functions were a fixed tax rate, τ , times their respective tax bases, the household's lifetime budget constraint would equal

$$(2) C_y + C_o/(1+r) = W - \tau(W-H-D_y) - \tau[(W-\tau(W-H-D_y)-H-C_y)r+(1+r)H-D_o]/(1+r)$$

The right-hand side of (2) is wages less the present value of lifetime tax payments.

Collecting terms gives

$$(3) C_y + C_o/(1+r) = W - [\tau W - \tau D_y + \tau[(W(1-\tau) + \tau D_y - C_y)r - D_o]/(1+r) - \tau(1-\tau)Hr/(1+r)]$$

Lifetime net taxes are now written as the lifetime taxes that would be paid absent 401(k) contributions less the lifetime tax benefit of contributing to the 401(k). Holding C_y fixed, the larger is H the smaller is the agent's lifetime tax payment. Thus if tax rates are constant and additional taxable income in old age doesn't trigger additional taxation of Social Security benefits, the direct impact of contributing to a 401(k) plan is a reduction in lifetime taxes.

Such contributions may also indirectly lower lifetime taxes through their effect on consumption when young. Specifically, if the household is doing positive saving outside of the 401(k), 401(k) contributions will be intra-marginal. In this case, the reduction in lifetime taxes from 401(k) contributions will likely be spent, in part, on more consumption when young. This will lower non-401(k) saving and the income taxes paid when old on non-401(k) asset income. If all saving is done through the 401(k), non-401(k) saving, $(W - \tau(W - H - D_y) - H - C_y)$, will equal zero, and lifetime taxes will consist solely of taxes on labor earnings net of deductions.³

³ This is the well established point that 401(k) tax treatment effectively eliminates capital income taxation.

Next consider equation (2) under the assumption that tax rates are invariant to the tax base, but different when the agent is young and old. In this case,

$$(4) C_y + C_o/(1+r) = W - \{ \tau_y(W-H-D_y) + \tau_o[(W-\tau_y(W-H-D_y)-H-C_y)r+H(1+r)-D_o]/(1+r) \},$$

or

$$(5) C_y + C_o/(1+r) = W - \{ \tau_y(W-D_y) + \tau_o[(W-\tau_y(W-D_y)-C_y)r-D_o]/(1+r) - [\tau_o(1-\tau_y)rH/(1+r) + (\tau_y-\tau_o)H] \}$$

From (5) it's clear that lifetime taxes can be *increased* by contributing to a 401(k) if the tax rate when old, τ_o , is sufficiently high compared with the tax rate when young, τ_y .

In the U.S. federal income tax, there are five marginal tax brackets with rates of 15 percent, 28 percent, 31 percent, 36 percent, and 39.6 percent. In the case of married couple filing jointly, the corresponding taxable income tax brackets are \$0 to \$43,850, \$43,850 to \$105,950, \$105,950 to \$161,450, \$161,450 to \$288,350, and \$288,350 plus. These bracket amounts are indexed to inflation. The Massachusetts state income tax rate, which we consider here, is 5.95 on every dollar of taxable income. Of course, exemptions and deductions can make federal or state taxable income negative, in which case no tax is assessed, although the household may receive refundable tax credits of various kinds.

While the current U.S. federal income tax provides low- and middle-income households with lots of scope for moving into higher tax brackets, compound interest is a very powerful force, and one might expect that in a multi-period model the value of tax deferral would outweigh most increases in marginal tax rates that a 401(k) contributor might experience. However, the progressivity of the tax schedule is only one reason that a 401(k) contributor, particularly those in low tax brackets, might wonder about the size

of their ultimate tax savings. Another reason is the value of tax deductions. Although we've left it out of the notation, the tax rates τ_y and τ_o are themselves increasing functions of their respective tax bases.⁴ Hence, the larger is H, the smaller will be τ_y and the larger will be τ_o . If $D_y > D_o$, raising H may lower the value of the tax deductions; it will definitely do so if D_o equals zero. Since mortgage interest deductions are generally the largest deduction for those who itemize and since such deductions are concentrated in youth, 401(k) participation has the potential to reduce the value of tax deductions.

A final and very important factor in assessing the tax implications of 401(k) participation is the taxation of Social Security benefits. If the function determining the amount of Social Security benefits that are included in taxable income, $M(B, Y_o)$, is increasing in Y_o , larger contributions to 401(k) plans will raise Y_o and, thereby, raise the amount of taxes paid on Social Security benefits.

How much of Social Security benefits are included in federal AGI (adjusted gross income) depends upon a pair of dollar limits--call them X1 and X2. For single filers these limits are \$25,000 and \$34,000 respectively. For joint filers they are \$32,000 and \$44,000 respectively. These limits are not indexed for inflation, meaning that as nominal incomes rise, an ever-larger share of benefits become subject to income taxation.⁵

To determine the amount of Social Security benefits that must be included in federal AGI, we first calculate *provisional income*--which is modified AGI (non-Social Security income including tax-exempt interest) plus half of the Social Security benefit. If provisional income exceeds X1, but not X2, half of the excess over X1 or half of the

⁴ Or, at least, non-decreasing functions.

⁵ The non-indexation of these limits appears to be the brainchild of David Stockman, President Reagan's first Director of the Office of Management and Budget. Stockman viewed this as a way of making necessary cuts in net benefits through time without anyone noticing.

Social Security benefit, whichever is smaller, is included in AGI. If provisional income exceeds X2, then the amount to be included equals the smaller of two items: A) 50 percent of benefits or \$6000, whichever is smaller, plus 85 percent of the excess of provisional income over X2 and B) 85 percent of benefits.

This is a rather complicated formula. To understand its implications, Table 1 and Figure 1 present the share of Social Security that are taxable for different combinations of Social Security benefits and the non-Social Security component of AGI (other income). The table and figure incorporate high nominal values of Social Security benefits because when currently young workers begin receiving their benefits, their nominal values will be substantially higher than they are today. For example, assuming a 3 percent rate of inflation, the equivalent of a \$25,000 benefit in 2001 dollars would be \$81,551 in 2040. The share of Social Security benefits subject to taxation is highly sensitive to the level of other income and somewhat sensitive to the level of benefits. Also note that, for the range of nominal Social Security benefits shown, the taxable share of benefits equals its maximum value of 85 percent for levels of other income of \$100,000 or more. However, because of Social Security's taxable earnings ceiling, benefits are capped for very high earners. Hence, there's no scope for 401(k) participation to increase benefit taxation for very high-income households.

With progressive taxes, multiple periods of life, the option to itemize deductions, exemptions, tax credits, and the federal and, in some cases, state taxation of Social Security benefits, deriving an explicit formula for lifetime tax payments becomes intractable. But one can use ESPlanner to calculate annual tax payments and form their present value. Furthermore, one can run ESPlanner with and without 401(k)

contributions to determine the change in lifetime taxes from 401(k) participation as well as its impact on the present value of lifetime spending.

III. ESPlanner

ESPlanner is designed to smooth a household's living standard over its life cycle to the extent possible without having the household go into debt. The Appendix details ESPlanner's federal income- and state income-tax calculators, Social Security's payroll tax calculator, and Social Security benefit calculator. The income-tax calculators determine whether households should itemize their deductions, computes deductions and exemptions, deducts from taxable income contributions to tax-deferred retirement accounts, includes in taxable income withdrawals from such accounts as well as the taxable component of Social Security benefits, and calculates total tax liabilities. These tax calculations are made separately for each year that the couple is alive as well as for each year a survivor may be alive.

The program also takes into account a variety of additional factors involved in life-cycle consumption planning, including the non-fungible nature of housing, bequest plans, and the desire of households to make "off-the-top" expenditures on college tuition, weddings, and other special expenses. ESPlanner recognizes that a household's expenditures do not directly translate into its standard of living. Adjustments are made for household composition and household "economies of scale" -- the fact that people can live more cheaply together than apart.⁶ To be more precise, ESPlanner has a household provide for children until they reach age 19, and considers that children may cost more or

less than adults and that the relative costs of children can vary by age. It also adjusts for the number of adult equivalents based on a user-specified degree of economies to scale in shared living. Finally, ESPlanner simultaneously calculates the amounts of life insurance needed by each spouse to guarantee that potential survivors suffer no decline in their living standards compared with what would otherwise be the case.⁷

ESPlanner's principal outputs are recommended time-paths of consumption expenditure, taxable saving, and term-life insurance holdings. All outputs are displayed in today's dollars. Consumption in this context is everything the household gets to spend after paying for its "off-the-top" expenditures – its housing expenses, special expenditures, life insurance premiums, special bequests, taxes, and net contributions to tax-favored accounts. As mentioned, the amount of recommended consumption expenditures varies from year to year in response to changes in the household's composition. It also rises when the household moves from a situation of being borrowing constrained to one of being unconstrained. Finally, recommended household consumption will change over time if users intentionally specify that they want their living standard to change. For example, if users specify that they desire a 10 percent higher living standard after a certain year in the future, the software will incorporate that preference in making its recommendations, provided that it does not violate a borrowing constraint.

⁶ From the perspective of economic theory, the household is viewed as maximizing a Leontief intertemporal utility function with year-specific time preference and demographic weights subject to borrowing constraints and non-negativity constraints on life insurance.

⁷ ESPlanner's recommendations for annual term insurance are either positive or zero. If recommended term insurance is positive for a particular potential decedent (the household head or, if married, spouse) in a particular year and if the decedent dies at the end of that year, the surviving household will have precisely the same living standard as the household would have had absent the decedent's premature death. If the potential decedent's recommended insurance in a particular year is zero, the surviving household will have the same or higher living standard if the decedent dies in that year.

ESPlanner's recommended saving in a particular year equals the household's total income (non-asset plus asset income) in that year minus that year's sum of (a) recommended spending on consumption and insurance premiums, (b) specified spending on housing and special expenditures, (c) taxes, and (d) net contributions to tax-favored accounts (contributions less withdrawals). Given the household's data inputs, preferences, and borrowing constraints, ESPlanner recommends the highest and smoothest possible living standard over time, leaving the household with zero terminal assets apart from the equity in homes that the user has indicated would not be sold.

IV. Defining Our Stylized Couples

Our stylized couples consist of a husband and wife who are both age 25 and live at most to age 95. Each spouse works to age 65 and earns half of the household's total earnings, which range from \$25,000 to \$1 million per year when they are 25. Real earnings grow annually by 1 percent. The couples live in Massachusetts and have no initial assets apart from their homes. Each couple has two children. The first is born when the couple is age 25 and the second when the couple is age 30. The market value of each couple's house is set at three times household labor earnings as of age 25.

Each couple purchases its house at age 25 by paying 20 percent down and borrowing the remainder at 8 percent for 30 years. Annual homeowner's insurance, property taxes, and maintenance are set at 0.17 percent, 1 percent, and 1 percent of house value, respectively. Each child attends college for four years. A couple earning \$25,000 per year spends, by assumption, \$7,500 per child for each year of college. This college expense is set at \$15,000 for couples earning \$50,000 and \$30,000 for couples earning

\$100,000 or \$150,000. For couples earning \$200,000 or more per year, annual college expenses are capped at \$35,000. There are no bequests apart from the value of home equity, which the couple chooses not to sell.

Our calculations assume elective employee contributions and employer matching contributions equal to the average of maximum contributions permitted by employer-provided defined contribution plans. The household's elective contribution is set at 13.5 percent of earnings and the employer-matching contribution is set at 3 percent of earnings, bringing the total 401(k) contribution to 16.5 percent of earnings. At this contribution rate, the dollar contribution ceiling limits the household's contribution to \$60,000 at earnings exceeding of \$363,636.36.⁸

Our method of determining the lifetime net tax benefit of 401(k) participation is to compare lifetime taxes and spending with and without such participation. But to make the comparison meaningful, we need to ensure that the couple's gross income is the same in both cases. To do so we increase each spouse's earnings in the case they don't contribute to a 401(k) plan by the amount the employer contributes to their plan in the case that they do contribute. Hence, in the no-401(k) participation case, this additional income is subject to immediate federal and state income taxation as well as to payroll taxation.

V. Findings

Table 2 shows life-cycle profiles of spending, consumption, income (net of 401(k) contributions, but gross of withdrawals), taxes, and regular assets for the couple with \$50,000 in initial earnings (\$25,000 per spouse). Spending refers to all expenditures on

consumption, life insurance premiums, housing, and tuition. The table assumes a 6 percent real rate of return. These profiles are calculated for the two cases that the spouses do and do not contribute to 401(k) plans. Changes over time in the level of consumption in the two cases reflect the arrival and exit of children from the household and the binding force of borrowing constraints.

The table shows dramatic differences between the two cases. With 401(k) participation the couple is severely borrowing constrained (a point stressed in Gokhale, Kotlikoff, and Warshawsky, 2000) and must reduce its consumption dramatically when young in order to make its 401(k) contributions. Indeed, the couple's age-25 consumption declines by 24 percent due to participation. However, this sacrifice in consumption when young permits a 277 percent greater level of consumption in old age than would otherwise be the case. Participation in the 401(k) also tilts the couple's age-income profile. With participation, income at age 25 is 19 percent less and income at age 65 is 241 percent greater than in the no-participation case. Since this income is taxable, taxes are lower when the couple is young and higher, indeed much higher, when the couple is old.

Note that the couple is borrowing constrained when young even in the absence of 401(k) participation. And the couple's regular asset accumulation, once it begins, is relatively modest. The explanation is that the couple is contributing so heavily to Social Security and is receiving sufficiently large benefits from that program that it has little need and wherewithal to do additional saving. This picture, writ large, goes a long way in explaining Americans' low rate of personal saving.

⁸ We assume this ceiling grows at 1 percent real per year.

Table 3 shows the impact of 401(k) participation on lifetime taxes and spending assuming the couple earns either a 4, 6, or 8 percent real rate of return on its regular as well as 401(k) assets. For each case, the present values of lifetime taxes and spending are formed using the same rate of return assumed in generating the data. The figures in the table report the percentage changes in lifetime taxes and spending. Because U.S. federal tax rate schedules are progressive (average tax rates rise with taxable income), a given percentage change in taxes translates into a higher percentage change in spending (with the opposite sign) for high-income individuals than for low-income individuals.⁹

Gains and Losses from 401(k) Participation

Table 3, which considers the gains from 401(k) participation, contains a number of striking findings. Of foremost interest are the results for low-income households who earn 6 and 8 percent real on their investments. For these households, 401(k) participation raises lifetime taxes and lowers lifetime spending. Take the couple with \$50,000 per year in earnings that receives a 6 percent real return on its assets. 401(k) participation translates into 1.1 percent higher lifetime net taxes and a 0.39 percent reduction in lifetime spending. If the couple earns 8, rather than 6 percent real on its assets, the tax hike is 6.4 percent and the spending reduction is 1.7 percent. If, on the other hand, the couple earns a 4 percent real return, 401(k) participation leads to a 3.3 percent reduction in lifetime taxes and a 0.7 percent increase in lifetime spending.

Consider next Table 3's finding for upper income households. Households with incomes of \$200,000 or more enjoy a tax reduction from 401(k) participation regardless

⁹ Let S stand for the spending, E for earnings, T for taxes, and B for benefits, all measured in present value. Then $\Delta S/S = (T/(E+B-T))\Delta T/T$.

of the rate of return. However, the percentage reductions in lifetime taxes are not as large for the couple that initially earns \$1,000,000 as they are for other upper-income households because combined employee-employer 401(k) contributions are limited by law to the lesser of 25 percent of earnings or \$30,000.

Why, according to Table 3, is 401(k) participation worse if a couple earns an 8 rather than a 6 percent real rate of return? Since participating in 401k plans reduces capital income taxes, a higher rate of return would seemingly increase the benefit from participating. However, a higher rate of return implies greater asset accumulation within the 401k plan and larger plan withdrawals. For middle- and low-income households this means being pushed into higher marginal rate brackets in retirement and/or finding that more of one's Social Security benefits are subject to taxation. For upper income households, who rely much less on Social Security to finance their retirements, earning a higher rate of return significantly raises one's taxable capital income and therefore one's lifetime tax payments. Hence, 401(k) participation has a smaller percentage impact on lifetime tax payments and, therefore, on lifetime spending.

Table 4 sheds some more light on why 401(k) participation can be a costly experience for low-income couples. It considers the couple with \$50,000 in initial labor income and access to a 6 percent real return. It then successively adds Social Security, housing, children, and college tuition to the case. If the couple did not participate in Social Security, had no home, had no children, and faced no tuition expenses, 401(k) participation would provide a tremendous subsidy; it would reduce lifetime taxes by over one quarter and increase lifetime spending by almost 9 percent!

Starting from this position, forcing the couple to contribute to Social Security dramatically lowers its 401(k) lifetime tax reduction (to less than 5 percent) and its spending increase (to less than 2 percent). The addition to the case of housing, including a deductible mortgage, leaves the household essentially indifferent between participating and not participating in a 401(k). This, of course, assumes the household cares only about the present value of spending, not the timing of its spending. For, as we've seen, participating in a 401(k) plan comes at the price of a major reduction in consumption when young relative to old.

With the addition of children and their college tuition needs, 401(k) participation no longer saves taxes. It raises them. With children come additional tax exemptions. The tax savings from these exemptions will be reduced by 401(k) participation if such participation lowers the household's tax bracket when young. Spending down regular assets for college tuition leads the household to enter retirement with relatively little income other than Social Security benefits. Consequently, it is in a position to have the taxation of its Social Security benefits greatly influenced by the amount of its 401(k) withdrawals.

401(k) Participation and Marginal Tax Rates

Table 5 explores the changes in marginal tax brackets that the \$50,000 couple experiences from 401(k) participation. It shows changes in federal, state, and payroll taxes when ESPlanner is rerun after incrementing the household's earnings by \$100 at selected ages. The smoothing of lifetime consumption in response to receiving an extra \$100 in a future year, say t , raises consumption in earlier years and induces the household

to accumulate fewer assets through year t . Hence, year- t taxable income increases by less than \$100. For example, if the household is in the 15 percent federal income tax bracket in year t , those taxes rise by slightly less than \$15.

Table 5 shows that 401(k) participation lowers the couple's federal marginal tax rate during middle age, but raises it after retirement.¹⁰ Without 401(k) participation, the household is nominally in the 15 percent federal income-tax bracket after age 65, but an additional \$100 of earnings at this age generates an additional tax liability of \$27; i.e., the effective marginal tax rate is 27 percent. This occurs because less than 85 percent of the household's Social Security benefits are subject to taxation and an increment to earnings triggers an increase in the amount of taxable benefits, making the increment to taxable earnings \$180.

With participation, 401(k)-plan withdrawals are so large that taxable Social Security benefits are already at their upper limit of 85 percent. So, the increase in Social Security benefit taxation from 401(k) participation is purely intra-marginal: An increase in other income pulls in additional Social Security benefits into taxable income. For the \$50,000 household considered earlier, the *effective* marginal tax rate in retirement is roughly 10 percentage points higher with 401(k) participation than without. This is because the effective federal marginal rate rises from 27 percent to 31 percent and the effective state marginal tax rate rises from zero to 5.5 percent. Its large 401(k) withdrawals shifts the household from the 15 to the 31 percent federal *statutory* marginal rate bracket and from the 0 to the 5.95 state statutory rate bracket.

¹⁰ This table ignores employer-paid payroll taxes. Our subsequent analysis takes such tax payments into account in recognizing that employer contributions to 401(k) plans are not subject to payroll taxation.

Table 5's change in state marginal tax rate across the no-participation and participation cases deserves further discussion: Without participation, there is a slight decline in the State tax liability when age-65 earnings are increased by \$100. Massachusetts allows exemptions and deductions only on non-asset income (earnings, pensions, and annuities). Without participation, age-65 non-asset income (including the \$100 increment) net of allowable exemptions and deductions is zero. This makes asset income the only source of taxable income and, again, the \$100 increment induces the household to accumulate fewer assets through age 65. With participation, however, non-asset income net of exemptions and deductions is positive. Now, an increment of \$100 triggers an additional tax liability of \$5.49—again slightly less than the statutory marginal tax of 5.95 percent because of smaller asset accumulation through age-65. The induced change in asset accumulation also lowers the federal marginal tax recorded in the table from the statutory rate of 31 percent.

The Impact of Changing Social Security Benefit Taxation

How would the gains from 401(k) participation change were Congress to index for inflation the dollar limits, X1 and X2, which determine taxable Social Security benefits? Table 6 provides the answer. For the \$50,000 household, inflation indexing raises the nominal value of X1 and eliminates Social Security benefit taxation in the no-participation case. But with participation, indexing the limits makes no difference to Social Security benefit taxation. The reason is that the 401(k) withdrawals are so large that non-Social Security taxable income exceeds the top limit even if that limit is inflation

indexed. Indeed, despite the indexation of the thresholds, the full 85 percent of Social Security benefits remains taxable.

Given that the policy of indexing the limits lowers the taxes paid by the non 401(k) participating household and leaves unchanged the taxes paid by the 401(k) participating household, indexation makes participating in a 401(k) an even worse choice. Table 6 shows this. Its percentage increase in the present value of taxes and percentage decline in the present value of spending are both larger with participation than without.

At high earnings levels and/or high rates of return, the same reasoning explains the smaller percentage increases in the present value of spending and smaller percentage declines in the present value of taxes from participating in a 401(k) plan. Again, because indexing the dollar limits reduces the amount of benefits subject to taxation only when not participating, tax savings from participating are smaller in present value. The exception is the \$25,000 household reaping a 4 percent real rate of return on assets. In this case, 401(k) plan withdrawals are not large enough to trigger additional Social Security taxes when the dollar limits are indexed. Hence, compared to Table 3, tax savings and spending increases are larger with 401(k) participation. In general, indexing the dollar limits that determine the taxable portion of Social Security benefits will help those who do not participate in tax-favored saving plans, but will increase the lifetime loss (lower the lifetime gain) from participating for all but the lowest earners.

Table 7 shows the effect of eliminating Social Security benefit taxation altogether. Now, participating in a 401(k) plan does not induce any intra-marginal increase in taxable Social Security benefits. As a result, the lifetime tax liability decreases and the present value of spending increases for the \$50,000 household earning a 6 percent real return on

assets. Indeed, all cases with a negative lifetime spending change in Table 6 now have a positive or a smaller negative change in Table 7.

The Implications of Future Tax Increases and Bracket Adjustments

Table 8 repeats Table 3 but assumes that federal income tax rates will be increased by 20 percent when the couple reaches age 65. Compared with Table 3, Table 8 shows smaller percentage reductions in lifetime taxes from 401(k) participation at all but the top income level. For a low-income (\$25,000 per year of earnings) couple earning 8 percent real, lifetime taxes are raised by almost 11 percent and lifetime spending is reduced by just over 2 percent. In contrast, high-income households continue to benefit substantially from their 401(k) saving program. For example, at a 4 percent real return, a couple earning \$300,000 enjoys an 8.2 percent reduction in lifetime taxes that finances a 6.3 percent increase in lifetime spending. The gap in treatment between these two couples is, then, 8 percent of lifetime spending.

Table 9 considers an alternative assumption to indexing nominal tax brackets to inflation, namely indexing them to nominal wages, which are assumed to grow at 4.03 percent.¹¹ This assumption precludes real bracket creep and means that our stylized households will be in lower tax brackets in retirement than with just inflation indexation. As a comparison of Table 9 and Table 3 makes clear, this alternative assumption about indexing tax brackets makes very little difference to calculated gains and losses from 401(k) participation. While indexing the tax system to wage growth lowers lifetime taxes

¹¹ One minus the product of one plus the assumed 3 percent inflation rate times one plus the assumed 1 percent growth rate in real wages.

and raises lifetime spending, it doesn't alter by very much the percentage changes in lifetime taxes and spending from participating fully in a 401(k) plan.

Alternative Assumptions

Table 10 conducts our with- and without-401(k) comparison under the assumption that the household desires a 10 percent higher living standard in retirement. Table 11 makes the opposite assumption, namely that the household's living standard is 10 percent lower during retirement. Relative to Table 3, Table 10 shows larger declines (or smaller increases) in lifetime taxes and larger increases (or smaller declines) in lifetime spending due to 401(k) participation across all earnings-rate-of-return combinations. Table 11 shows the opposite.

Lowering Contributions

Table 3 demonstrates that fully participating in 401k plans may turn out to be detrimental to low-income and moderate-income households. What would be the consequence of reducing contribution rates by 50 percent? Table 12 provides the answer. At a 6 percent real rate of return, the household earning \$50,000 per year now enjoys a lifetime tax cut of 2.6 percent and a lifetime spending gain of 0.64 percent. These figures correspond to the 1.1 percent increase in lifetime taxes and the 0.39 percent reduction in lifetime spending reported for this couple if it contributes fully to the 401(k) plan. These results show that low-income households may be better served by limiting their contribution rates because doing so helps them avoid being taxed at higher rates during the withdrawal phase of their lifetimes. Making smaller contributions delivers small but

positive benefits if rates of return turn out to be low. If rates turn out to be high, such households would break even at worst.

The fact that low- and moderate-income workers are likely to do better contributing less than the maximum allowable amounts together with the severe borrowing constraints they are likely to face in making maximum contributions helps explain the findings in Poterba, Venti, and Weiss (2001) that 401(k) participants typically contribute only about 9 percent of their earnings to their plans.

Delaying or Shortening Contributions

Table 13 reports results under the assumption that the household does not commence participation until age 40. For low-income households, waiting until middle age to begin full participation is beneficial relative to making maximum contributions beginning at age 25. The same reasoning applies here as in the case of Table 12. Smaller accumulations in a tax-deferred plan imply smaller future withdrawals. This prevents taxation at a higher rate-bracket during retirement. Households earning less than \$50,000 now enjoy significant lifetime tax savings and non-negligible increments to lifetime spending from participation.

Table 14 shows the results assuming that the household contributes only during the first 25 years (as opposed to the last 25 years as in Table 13). Here, despite saving for the same number of periods as in Table 13, the savings in 401(k) accounts accumulate over a longer period of time and result in larger withdrawals upon retirement. This exposes retirement income, including Social Security benefits, to higher tax rates—just as

in the case of Table 3. The patterns of tax- and spending-changes are similar to those in Table 3.

Higher Real Wage Growth

If real annual wage growth is 2 percent rather than 1 percent, higher future wages may result in taxation at a higher marginal rate even without participation. After the first rate bracket jump in marginal income tax rates (from 15 to 28 percent) subsequent increments in income tax rates are much smaller (to 31, 36, and 39.6 percent). Moreover, the dollar-range between brackets is wider after the second bracket of \$43,850 (subsequent brackets are set at \$105,950, \$161,450, and \$288,350). Hence, with higher wage growth, participating in a tax-deferred saving plan reduces low-earners' likelihood of being subject to higher marginal income tax rates because of large future plan withdrawals. As Table 15 shows, low-income earners, whose earnings grow 2 percent annually and whose investments earn a 6 percent real return, raise their lifetime spending by a small margin by participating fully in a 401(k) plan.

The dollar-distance between brackets is widest after \$161,450, and the next rate jump is just 3.6 percentage points (from 36 percent to 39.6 percent). This suggests that the benefit from participation would be quite high for those earning around \$150,000. Earning \$150,000 at age 25 with real wage growth at 1 percent per year makes age 65 earnings approximately \$223,300 (measured in 2001 dollars) —less than the next bracket's dollar amount. With 2 percent annual wage growth, however, age-65 earnings become approximately \$331,200 (measured in 2001 dollars) —exceeding the highest rate bracket. Therefore, unlike the case where wage growth is 1 percent per year,

participating under 2 percent wage growth does not further bump up the tax-rate bracket during the withdrawal phase of the household's lifetime. Table 15 shows that the lifetime spending increase for the household earning \$150,000 and investing at 6 percent real is 2.54 percent—considerably higher than the corresponding lifetime spending increase in Table 3 of 1.15 percent.

Contributing to Regular and Roth IRAs

Not all employers offer tax-deferred saving plans. For workers in such firms, access to tax-sheltered saving plans is limited to regular or Roth IRAs. The contribution limits to these saving vehicles are much lower: \$2,000 per spouse per year. Table 16 shows the lifetime tax and spending advantage from investing up to the \$2,000 limit in a regular IRA throughout one's working lifetime. The table assumes, counterfactually, that high-income workers are able to contribute the same amount to a regular IRA. Table 17 repeats the exercise, but assumes an annual \$5,000 contribution limit. This higher limit is proposed in a bill now being considered by Congress.¹² Table 16 shows that contributing at the \$2,000 limit is a tax saver for all couples except for the lowest earning couple that invests at 8 percent real.

In contrast, Table 17 shows that investing \$5,000 per year to a regular IRA would be a mistake for almost all couples earning \$50,000 or less. Take the couple that initially earns \$25,000. If the couple invests \$5,000 per year to a regular IRA and does so at an 8 percent real return, it will raise its lifetime taxes by almost 30 percent and lower its lifetime spending by almost 5 percent. This is an extreme outcome as households earning

\$25,000 per year are unlikely to contribute save \$5,000 in a traditional IRA. All upper income households with comparable saving levels will gain on a lifetime basis if the IRA saving limit were increased from \$2,000 to \$5,000.

Tables 18 and 19 show the impact of contributing respectively \$2,000 and \$5,000 per year to Roth IRAs. Saving in these plans is done on an after-tax basis with withdrawals not subject to taxation. All within-plan accumulations are tax-free as well. Roth IRAs also eliminate the risk that plan withdrawals will be subject to higher tax rates. Hence, saving in these plans confers a tax and spending advantage at all income levels. However, the pattern of gains remains regressive. Interestingly, raising the contribution limit from \$2,000 to \$5,000 makes very little difference for couples earning \$50,000 or less, but roughly doubles the tax savings of those with higher incomes.

VI. Summary and Conclusion

Participating fully in 401(k) and similar tax-deferred saving vehicles appears to raise, rather than lower, the lifetime tax payments of most workers, namely those with low and moderate incomes. While contributing to such retirement accounts lowers current taxes, the increase in taxes paid on the withdrawal of accumulated contributions can exceed the immediate tax reduction when measured in present value. There are three forces at work. First, the size of the withdrawals can be large enough to place the household in a higher tax bracket, both at federal and state levels. Second, the size of the withdrawals can substantially raise the share of Social Security benefits subject to federal income taxation. Third, the size of the contributions can lower tax brackets when young

¹² A pension reform bill sponsored by Representatives Rob Portman (R-OH) and Ben Cardin, (D-MD) proposes these modifications. The current bill—the “Comprehensive Retirement Security and Pension

and middle aged and, thereby, reduce the value of current mortgage and other tax deductions.

Calculations for married couples based on ESPlanner – a detailed life-cycle personal financial planning model – show that contributing the maximum amounts stipulated by typical 401(k) plans and investing these contributions at a moderate 6 percent real rate of return raises, rather than lowers, the lifetime tax payments of low- and moderate-income couples. Similar results hold for low- and moderate-income households contributing annually the maximum permitted amount to a regular IRA.

In contrast, high-income couples, who, at least under current law, cannot be pushed into higher tax brackets and who face the maximum taxation of their Social Security benefits regardless of their tax-deferred withdrawals, reap major lifetime tax savings from 401(k) participation. At a 6 percent real return, a couple with annual earnings of \$300,000 reduces its lifetime taxes by almost 7 percent through full 401(k) participation. This translates into close to a 4 percent increase in lifetime spending.

The taxation of Social Security benefits appears to be the most important factor in transforming full 401(k) participation from a good to a bad deal for most workers who earn moderate to high rates of return on their savings. Indexing to inflation the nominal thresholds at which this benefit taxation is activated might seem like a way to remedy this situation. But such a policy would do more for non-401(k) participants than for 401(k) participants. Indeed, because of the potential size of 401(k) withdrawals, indexing the Social Security benefit income-tax thresholds would do little, if anything, to alter the extent to which Social Security benefits are subject to taxation. Raising the nominal thresholds at a faster pace than inflation is another option, but one that would leave more

Reform Act"—is very similar to H.R. 1102, which overwhelmingly passed the House twice in 2000.

of the middle class wishing, ex-post, that they hadn't participated in a 401(k). A third option is limiting the maximum share of Social Security benefits subject to taxation. In this regard, it's worth noting that some members of Congress are advocating returning to pre-1993 provisions under which a maximum of 50 percent of Social Security benefits is subject to federal income taxation. A fourth policy is leaving out retirement account withdrawals from the calculation of the portion of Social Security benefits that are subject to income taxation.

Another policy that merits consideration in light of our findings is the repeal of non-discrimination rules. According to these rules, the average of tax-deferred contribution rates by a firm's highly compensated employees cannot exceed the average for non-highly compensated employees by more than a factor of 1.25.¹³ Such rules lead firms to encourage their low-income employees to raise their contribution rates so that highly compensated employees can increase their contribution rates as well.

Tax policy with respect to 401(k) and similar tax-deferred saving vehicles is, of course, only one component of a complex fiscal system. But it's a remarkably regressive component. The policy appears to raise the lifetime taxes of many of the poor, while substantially lowering those of the rich, assuming they are a) lucky enough to work for an employer with a generous 401(k) or similar plan and b) take full advantage of the opportunity to contribute. The fact that employers have, at their discretion, the power to convey such large tax breaks on their highly compensated workers and convey non trivial

¹³ Alternatively, the average of tax-deferred contribution rates by HCE's can exceed the average for NCEs by a factor of 2 as long as this is not more than 2 percentage points above the NCE's average tax-deferred contribution rate. HCE's include workers earning more than \$85,000 or those in the top 20 percent of a firm's earners. More recently, "safe harbor" rules have been introduced that allow a firm to ignore non-discrimination requirements. To do so, the firm must either a) make immediately vested matching contributions of 100 percent up to the first 3 percent and 50 percent of the next 2 percent (alternatively 100

tax increases on their low and moderately compensated workers begs the question of whether employers should be allowed to exercise such great control over their workers' saving incentives. Indeed, the regressivity of tax-deferred saving incentives begs the more general question of whether the limits on contributions to 401(k) and similar tax-deferred saving vehicles should be lowered. Such a policy would, however, be orthogonal to current Congressional intent.

Assuming the government doesn't alter its policies, are there steps employers and their low- and moderate-income workers can take to respond to the findings presented here? There are indeed. Employers seeking to lower rather than raise the lifetime tax payments of such workers might consider abandoning their 401(k) plans in favor of making direct contributions to Roth IRAs for their workers. Alternatively, they might consider reducing the contributions they make on their workers' behalf to their 401(k) plans and instead contributing the same amounts to Roth IRAs or to taxable saving vehicles established in their employees' names.

For individual low- and moderate-income workers who are unable to get their employers to redirect their matching contribution, remaining in the company's 401(k) plan is likely to be better than withdrawing. The reason is that typical employer matches exceed the lifetime tax increases computed here with respect to 401(k) participation. But such workers should consider carefully whether they wish to contribute on their own to the plan once their contribution is large enough to secure their employers' match. Another issue is whether low- and moderate-income workers who participate in a 401(k) should invest in lower yielding securities to limit their exposure to higher taxes in

percent of the first 4 percent) of workers' elective contributions, or b) provide immediately vested 'across the board' tax-deferred contributions of 3 percent of wages for all workers regardless of participation.

retirement. The answer here is "no." Given that the marginal tax on additional 401(k) income neither equals nor exceeds 100 percent, earning a higher rate of return on one's 401(k) assets is always better than earning a lower rate of return. Our point, instead, is that many workers would do better to earn the same higher rate of return by saving in a Roth IRA or in a taxable account.

To conclude, the federal government has spent over a quarter of a Century encouraging workers of all stripes to save in tax-deferred retirement accounts. In promoting participation in such plans, the government has encouraged workers to believe they would be saving taxes on a lifetime, rather than simply a short-term, basis. For those at the upper end of the nation's income distribution, tax-deferred saving does, indeed, convey significant lifetime tax benefits. But for those at the lower end, 401(k) participation may represent more of a tax trap than a tax shelter.

References

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Table 1

Share of Social Security Income Included in Taxable Income

| Social Security Income → | 10,000 | 20,000 | 30,000 | 40,000 | 50,000 | 60,000 | 70,000 | 80,000 | 90,000 | 100,000 |
|---------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|----------------|
| Other Income ↓ | | | | | | | | | | |
| 10,000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.07 | 0.10 | 0.14 | 0.17 | 0.20 |
| 20,000 | 0.00 | 0.00 | 0.05 | 0.10 | 0.14 | 0.19 | 0.22 | 0.25 | 0.27 | 0.28 |
| 30,000 | 0.15 | 0.20 | 0.23 | 0.28 | 0.31 | 0.33 | 0.34 | 0.35 | 0.36 | 0.37 |
| 40,000 | 0.59 | 0.56 | 0.51 | 0.49 | 0.48 | 0.47 | 0.46 | 0.46 | 0.45 | 0.45 |
| 50,000 | 0.85 | 0.85 | 0.80 | 0.70 | 0.65 | 0.61 | 0.58 | 0.56 | 0.55 | 0.54 |
| 60,000 | 0.85 | 0.85 | 0.85 | 0.85 | 0.82 | 0.75 | 0.71 | 0.67 | 0.64 | 0.62 |
| 70,000 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.83 | 0.78 | 0.74 | 0.71 |
| 80,000 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.83 | 0.79 |
| 90,000 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 |
| 100,000 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 |

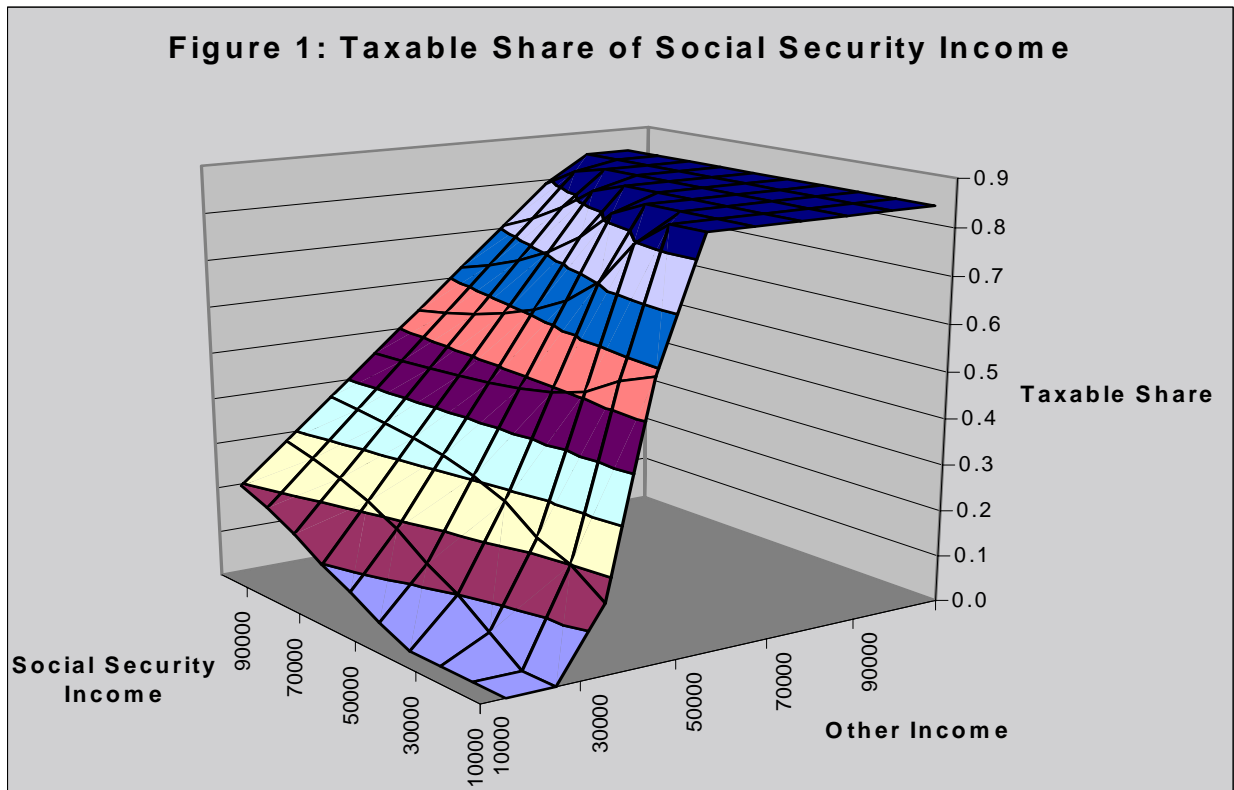


Table 2
Life-Cycle Profiles Assuming \$50,000 of Earnings at Age 25
and a 6 Percent Real Rate of Return

(constant 2000 dollars)

No 401(k) Participation

401(k) Participation

| Age | Spending | Consumption | Income | Taxes | Assets | Spending | Consumption | Income | Taxes | Assets |
|-----|----------|-------------|--------|--------|---------|----------|-------------|---------|--------|--------|
| 25 | 41,388 | 27,788 | 51,500 | 10,112 | 0 | 34,901 | 21,223 | 41,750 | 8,349 | 0 |
| 35 | 46,049 | 35,075 | 56,890 | 10,266 | 0 | 38,581 | 27,750 | 46,114 | 8,886 | 307 |
| 45 | 54,542 | 30,107 | 63,741 | 10,422 | 9,968 | 47,600 | 23,735 | 51,960 | 11,969 | 11,259 |
| 55 | 38,922 | 34,960 | 70,248 | 10,586 | 26,178 | 43,632 | 40,814 | 56,266 | 14,661 | 0 |
| 65 | 38,176 | 34,960 | 38,615 | 10,765 | 175,953 | 100,276 | 97,021 | 131,595 | 31,320 | 0 |
| 75 | 38,212 | 34,960 | 36,444 | 10,020 | 138,286 | 100,276 | 97,021 | 131,595 | 31,320 | 0 |
| 85 | 38,446 | 34,960 | 33,234 | 10,160 | 82,673 | 100,276 | 97,021 | 131,595 | 31,320 | 0 |
| 95 | 38,166 | 34,960 | 28,464 | 10,314 | 0 | 100,276 | 97,021 | 131,595 | 31,320 | 0 |

Source: Author's calculations.

Table 3
Percentage Change in Lifetime Taxes and Spending from 401(k) Participation

| Real Return → | 4 percent | | 6 percent | | 8 Percent | |
|-----------------------------|-----------|----------|-----------|----------|-----------|----------|
| | Taxes | Spending | Taxes | Spending | Taxes | Spending |
| Age-25 Earnings (\$) | | | | | | |
| 25,000 | -2.70 | 0.29 | 1.66 | -0.36 | 9.37 | -1.60 |
| 50,000 | -3.34 | 0.70 | 1.10 | -0.39 | 6.38 | -1.73 |
| 100,000 | -5.23 | 1.95 | -2.40 | 0.89 | 0.84 | -0.35 |
| 150,000 | -5.87 | 2.81 | -2.44 | 1.15 | 0.38 | -0.18 |
| 200,000 | -8.32 | 4.33 | -5.19 | 2.62 | -2.56 | 1.24 |
| 250,000 | -8.97 | 5.14 | -6.55 | 3.58 | -4.23 | 2.22 |
| 300,000 | -8.43 | 5.10 | -6.71 | 3.84 | -4.23 | 2.31 |
| 1,000,000 | -4.68 | 3.61 | -4.56 | 3.24 | -4.50 | 2.99 |

Note: Lifetime taxes and spending refer to the present value, discounted at 6 percent real, of the couples' annual taxes and spending on consumption, housing, college tuition, and life insurance premiums.

Table 4

Decomposing the Percentage Change in the Present Values of Taxes and Spending

| Included Factors | Taxes | Spending |
|--|--------------|-----------------|
| Earnings | -26.19 | 8.68 |
| Earnings and Social Security | -4.71 | 1.49 |
| Earnings, Social Security, and Housing | -0.56 | 0.07 |
| Earnings, Social Security, Housing and Kids | 0.37 | -0.19 |
| Earnings, Social Security, Housing, Kids, and College | 1.10 | -0.39 |

Source: Authors' calculations.

Table 5

Percentage Marginal Tax Rates At Selected Ages

\$50,000 Earnings, 6% Real Rate of Return, Social Security, Housing, Children, College

| Age | No 401(k) Participation | | | | 401(k) Participation | | | |
|------------|--------------------------------|--------------|----------------|------------|-----------------------------|--------------|----------------|------------|
| | Federal | State | Payroll | All | Federal | State | Payroll | All |
| 25 | 14.18 | 5.49 | 7.65 | 27.32 | 14.18 | 5.49 | 7.65 | 27.32 |
| 35 | 14.07 | 5.93 | 7.65 | 27.64 | 14.17 | 5.98 | 7.66 | 27.80 |
| 45 | 25.27 | 5.71 | 7.65 | 38.64 | 13.33 | 5.62 | 7.65 | 26.60 |
| 55 | 27.87 | 5.92 | 7.65 | 41.44 | 27.92 | 5.93 | 7.65 | 41.49 |
| 65 | 26.99 | -0.16 | 7.65 | 34.47 | 30.98 | 5.49 | 7.65 | 44.12 |
| 75 | 26.55 | -0.25 | 7.65 | 33.95 | 30.97 | 5.49 | 7.65 | 44.11 |
| 85 | 26.32 | -0.31 | 7.65 | 33.66 | 30.99 | 5.49 | 7.65 | 44.13 |

Source: Authors' calculations.

Table 6

**Percent Change in Lifetime Taxes and Spending from 401(k) Participation
Inflation -Indexing Dollar Limits For Determining Taxable Social Security Benefits**

| Real Return → | 4 percent | | 6 percent | | 8 Percent | |
|-----------------------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|
| | Taxes | Spending | Taxes | Spending | Taxes | Spending |
| Age-25 Earnings (\$) | | | | | | |
| 25,000 | -10.76 | 1.64 | 1.67 | -0.36 | 9.37 | -1.60 |
| 50,000 | -1.98 | 0.33 | 2.47 | -0.74 | 7.47 | -2.00 |
| 100,000 | -3.48 | 1.23 | -1.12 | 0.38 | 1.64 | -0.65 |
| 150,000 | -4.15 | 1.93 | -1.54 | 0.71 | 0.67 | -0.31 |
| 200,000 | -3.75 | 3.90 | -2.41 | 2.47 | -1.18 | 1.19 |
| 250,000 | -4.62 | 4.85 | -3.38 | 3.50 | -2.15 | 2.20 |
| 300,000 | -4.68 | 4.91 | -3.64 | 3.78 | -2.24 | 2.29 |
| 1,000,000 | -3.48 | 3.60 | -3.13 | 3.23 | -2.90 | 2.99 |

Note: Lifetime taxes and spending refer to the present value, discounted at 6 percent real, of the couples' annual taxes and spending on consumption, housing, college tuition, and life insurance premiums.

Table 7

**Percent Change in Lifetime Taxes and Spending from 401(k) Participation
Eliminating the Income Taxation of Social Security Benefits**

| Real Return → | 4 percent | | 6 percent | | 8 Percent | |
|-----------------------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|
| | Taxes | Spending | Taxes | Spending | Taxes | Spending |
| Age-25 Earnings (\$) | | | | | | |
| 25,000 | -11.62 | 1.78 | -5.04 | 0.77 | 4.91 | -0.86 |
| 50,000 | -9.55 | 2.31 | -2.24 | 0.50 | 4.22 | -1.15 |
| 100,000 | -8.61 | 3.18 | -4.42 | 1.64 | 0.01 | -0.03 |
| 150,000 | -7.71 | 3.54 | -3.32 | 1.52 | 0.15 | -0.07 |
| 200,000 | -9.26 | 4.63 | -5.45 | 2.68 | -2.46 | 1.17 |
| 250,000 | -9.58 | 5.25 | -6.63 | 3.54 | -4.08 | 2.11 |
| 300,000 | -8.78 | 5.10 | -6.41 | 3.58 | -4.02 | 2.17 |
| 1,000,000 | -4.48 | 3.38 | -4.37 | 3.07 | -4.36 | 2.87 |

Note: Lifetime taxes and spending refer to the present value, discounted at 6 percent real, of the couples' annual taxes and spending on consumption, housing, college tuition, and life insurance premiums.

Table 8**Percent Change in Lifetime Taxes and Spending from 401(k) Participation
Assuming 20 Percent Higher Tax Liability After Retirement**

| Real Return → | 4 percent | | 6 percent | | 8 Percent | |
|-----------------------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|
| | Taxes | Spending | Taxes | Spending | Taxes | Spending |
| Age-25 Earnings (\$) | | | | | | |
| 25,000 | -2.45 | 0.30 | 2.27 | -0.51 | 10.69 | -2.03 |
| 50,000 | -2.49 | 0.57 | 2.10 | -0.75 | 7.29 | -2.27 |
| 100,000 | -4.39 | 1.94 | -1.65 | 0.71 | 1.49 | -0.71 |
| 150,000 | -4.94 | 2.84 | -1.73 | 0.98 | 0.87 | -0.49 |
| 200,000 | -7.60 | 4.88 | -4.59 | 2.85 | -2.12 | 1.27 |
| 250,000 | -8.55 | 6.15 | -5.99 | 4.10 | -3.81 | 2.50 |
| 300,000 | -8.15 | 6.25 | -6.29 | 4.57 | -3.75 | 2.58 |
| 1,000,000 | -5.01 | 5.17 | -4.79 | 4.52 | -4.55 | 3.99 |

Note: Lifetime taxes and spending refer to the present value, discounted at 6 percent real, of the couples' annual taxes and spending on consumption, housing, college tuition, and life insurance premiums.

Table 9**Percent Change in Lifetime Taxes and Spending from 401(k) Participation
Assuming Nominal Tax Brackets are Indexed to Nominal Wages**

| Real Return → | 4 percent | | 6 percent | | 8 Percent | |
|-----------------------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|
| | Taxes | Spending | Taxes | Spending | Taxes | Spending |
| Age-25 Earnings (\$) | | | | | | |
| 25,000 | -3.08 | 0.35 | 1.10 | -0.26 | 8.87 | -1.50 |
| 50,000 | -3.39 | 0.71 | 1.10 | -0.39 | 6.39 | -1.73 |
| 100,000 | -5.26 | 1.96 | -2.41 | 0.89 | 0.87 | -0.36 |
| 150,000 | -5.88 | 2.80 | -2.43 | 1.14 | 0.42 | -0.19 |
| 200,000 | -8.33 | 4.32 | -5.18 | 2.60 | -2.52 | 1.22 |
| 250,000 | -9.02 | 5.15 | -6.57 | 3.58 | -4.24 | 2.22 |
| 300,000 | -8.48 | 5.12 | -6.75 | 3.86 | -4.27 | 2.32 |
| 1,000,000 | -4.68 | 3.61 | -4.56 | 3.23 | -4.51 | 2.99 |

Note: Lifetime taxes and spending refer to the present value, discounted at 6 percent real, of the couples' annual taxes and spending on consumption, housing, college tuition, and life insurance premiums.

Table 10**Percentage Change in Lifetime Taxes and Spending from 401(k) Participation Assuming a Desired 10 Percent Higher Living Standard in Retirement**

| Real Return → | 4 percent | | 6 percent | | 8 Percent | |
|----------------------|-----------|----------|-----------|----------|-----------|----------|
| | Taxes | Spending | Taxes | Spending | Taxes | Spending |
| Age-25 Earnings (\$) | | | | | | |
| 25,000 | -3.10 | 0.36 | 1.32 | -0.31 | 9.09 | -1.56 |
| 50,000 | -4.06 | 0.90 | 0.46 | -0.22 | 5.85 | -1.60 |
| 100,000 | -5.80 | 2.19 | -2.85 | 1.07 | 0.51 | -0.22 |
| 150,000 | -6.54 | 3.16 | -2.99 | 1.42 | 0.00 | 0.00 |
| 200,000 | -9.07 | 4.82 | -5.66 | 2.88 | -2.95 | 1.44 |
| 250,000 | -9.57 | 5.60 | -7.28 | 4.03 | -4.58 | 2.42 |
| 300,000 | -9.02 | 5.57 | -7.57 | 4.40 | -4.59 | 2.52 |
| 1,000,000 | -5.18 | 4.11 | -4.87 | 3.52 | -4.72 | 3.17 |

Note: Lifetime taxes and spending refer to the present value, discounted at 6 percent real, of the couples' annual taxes and spending on consumption, housing, college tuition, and life insurance premiums.

Table 11**Percent Change in Lifetime Taxes and Spending from 401(k) Participation Assuming a Desired 10 Percent Lower Living Standard in Retirement**

| Real Return → | 4 percent | | 6 percent | | 8 Percent | |
|----------------------|-----------|----------|-----------|----------|-----------|----------|
| | Taxes | Spending | Taxes | Spending | Taxes | Spending |
| Age-25 Earnings (\$) | | | | | | |
| 25,000 | -2.24 | 0.21 | 2.05 | -0.43 | 9.67 | -1.65 |
| 50,000 | -2.53 | 0.48 | 1.79 | -0.57 | 6.93 | -1.87 |
| 100,000 | -4.67 | 1.72 | -1.84 | 0.66 | 1.22 | -0.49 |
| 150,000 | -5.09 | 2.40 | -1.89 | 0.88 | 0.68 | -0.31 |
| 200,000 | -7.74 | 3.99 | -4.67 | 2.34 | -2.15 | 1.04 |
| 250,000 | -8.46 | 4.76 | -6.08 | 3.30 | -3.86 | 2.01 |
| 300,000 | -7.92 | 4.70 | -5.99 | 3.39 | -3.85 | 2.09 |
| 1,000,000 | -4.09 | 3.07 | -4.20 | 2.94 | -4.29 | 2.82 |

Note: Lifetime taxes and spending refer to the present value, discounted at 6 percent real, of the couples' annual taxes and spending on consumption, housing, college tuition, and life insurance premiums.

Table 12

**Percentage Change in Lifetime Taxes and Spending from 401(k) Participation
Assuming 50 Percent Smaller Contributions**

| Real Return → | 4 percent | | 6 percent | | 8 Percent | |
|-----------------------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|
| | Taxes | Spending | Taxes | Spending | Taxes | Spending |
| Age-25 Earnings (\$) | | | | | | |
| 25,000 | -5.64 | 0.84 | -1.50 | 0.21 | 1.13 | -0.20 |
| 50,000 | -4.54 | 1.09 | -2.60 | 0.64 | 0.19 | -0.08 |
| 100,000 | -4.57 | 1.73 | -4.05 | 1.54 | -0.77 | 1.70 |
| 150,000 | -4.94 | 2.34 | -4.28 | 2.00 | -1.94 | 0.88 |
| 200,000 | -6.26 | 3.23 | -5.68 | 2.84 | -3.22 | 1.55 |
| 250,000 | -7.47 | 4.25 | -6.55 | 3.56 | -4.23 | 2.20 |
| 300,000 | -7.62 | 4.57 | -6.68 | 3.80 | -4.23 | 2.30 |
| 1,000,000 | -2.75 | 2.12 | -2.71 | 1.92 | -2.72 | 1.80 |

Note: Lifetime taxes and spending refer to the present value, discounted at 6 percent real, of the couples' annual taxes and spending on consumption, housing, college tuition, and life insurance premiums.

Table 13

**Percent Change in Lifetime Taxes and Spending from 401(k) Participation
Assuming Couple waits until age 40 to Participate**

| Real Return → | 4 percent | | 6 percent | | 8 Percent | |
|-----------------------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|
| | Taxes | Spending | Taxes | Spending | Taxes | Spending |
| Age-25 Earnings (\$) | | | | | | |
| 25,000 | -5.22 | 0.77 | -0.69 | 0.06 | 0.86 | -0.17 |
| 50,000 | -4.69 | 1.12 | -2.98 | 0.73 | -0.63 | 0.13 |
| 100,000 | -3.36 | 1.25 | -1.99 | 0.75 | -0.13 | 0.03 |
| 150,000 | -4.89 | 2.34 | -3.68 | 1.73 | -1.63 | 0.75 |
| 200,000 | -5.52 | 2.88 | -4.98 | 2.51 | -3.23 | 1.57 |
| 250,000 | -6.01 | 3.44 | -4.80 | 2.63 | -3.95 | 2.07 |
| 300,000 | -6.00 | 3.63 | -4.68 | 2.68 | -3.81 | 2.08 |
| 1,000,000 | -2.67 | 2.06 | -2.47 | 1.76 | -2.06 | 1.37 |

Note: Lifetime taxes and spending refer to the present value, discounted at 6 percent real, of the couples' annual taxes and spending on consumption, housing, college tuition, and life insurance premiums.

Table 14

**Percent Change in Lifetime Taxes and Spending from 401(k) Participation
Assuming Couple Stops Contributing After Age 49**

| Real Return → | 4 percent | | 6 percent | | 8 Percent | |
|-----------------------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|
| Age-25 Earnings (\$) | Taxes | Spending | Taxes | Spending | Taxes | Spending |
| 25,000 | -2.35 | 0.30 | -0.10 | -0.03 | 7.83 | -1.32 |
| 50,000 | -3.03 | 0.69 | 1.27 | -0.39 | 5.78 | -1.54 |
| 100,000 | -5.04 | 1.90 | -2.91 | 1.10 | 0.33 | -0.14 |
| 150,000 | -5.11 | 2.42 | -2.64 | 1.23 | 0.23 | -0.11 |
| 200,000 | -6.61 | 3.43 | -5.17 | 2.59 | -2.54 | 1.23 |
| 250,000 | -7.66 | 3.83 | -6.82 | 3.32 | -4.43 | 2.04 |
| 300,000 | -6.96 | 4.21 | -6.57 | 3.76 | -4.11 | 2.24 |
| 1,000,000 | -3.95 | 3.05 | -3.94 | 2.80 | -4.03 | 2.67 |

Note: Lifetime taxes and spending refer to the present value, discounted at 6 percent real, of the couples' annual taxes and spending on consumption, housing, college tuition, and life insurance premiums.

Table 15

**Percent Change in Lifetime Taxes and Spending from 401(k) Participation
Assuming Couple's Real Wages Grow at 2%**

| Real Return → | 4 percent | | 6 percent | | 8 Percent | |
|-----------------------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|
| Age-25 Earnings (\$) | Taxes | Spending | Taxes | Spending | Taxes | Spending |
| 25,000 | -10.00 | 0.45 | -5.26 | 0.23 | 1.33 | -0.68 |
| 50,000 | -9.05 | 1.11 | -4.50 | 0.48 | 1.21 | -0.81 |
| 100,000 | -10.43 | 3.81 | -6.87 | 2.57 | -3.23 | 1.13 |
| 150,000 | -8.47 | 4.52 | -4.92 | 2.54 | -1.80 | 0.89 |
| 200,000 | -8.75 | 5.10 | -6.86 | 3.81 | -4.15 | 2.19 |
| 250,000 | -8.14 | 5.12 | -7.52 | 4.49 | -5.13 | 2.91 |
| 300,000 | -7.49 | 4.92 | -7.38 | 4.58 | -5.16 | 3.03 |
| 1,000,000 | -3.11 | 2.50 | -3.65 | 2.72 | -4.15 | 2.89 |

Note: Lifetime taxes and spending refer to the present value, discounted at 6 percent real, of the couples' annual taxes and spending on consumption, housing, college tuition, and life insurance premiums.

Table 16

**Percent Change in Lifetime Taxes and Spending from Participating in a Regular IRA
Constant Nominal Contribution of \$2000 Per Person Per Year**

| Real Return → | 4 percent | | 6 percent | | 8 Percent | |
|----------------------|-----------|----------|-----------|----------|-----------|----------|
| | Taxes | Spending | Taxes | Spending | Taxes | Spending |
| Age-25 Earnings (\$) | | | | | | |
| 25,000 | -4.49 | 0.73 | -1.29 | 0.21 | 3.64 | -0.58 |
| 50,000 | -2.08 | 0.54 | -2.96 | 0.78 | -0.62 | 0.16 |
| 100,000 | -1.29 | 0.49 | -1.93 | 0.74 | -2.55 | 0.96 |
| 150,000 | -1.15 | 0.54 | -1.32 | 0.61 | -1.78 | 0.81 |
| 200,000 | -1.15 | 0.59 | -1.62 | 0.80 | -1.72 | 0.82 |
| 250,000 | -1.60 | 0.90 | -1.34 | 0.72 | -1.75 | 0.91 |
| 300,000 | -1.38 | 0.82 | -1.26 | 0.71 | -1.44 | 0.77 |
| 1,000,000 | -0.56 | 0.43 | -0.55 | 0.39 | -0.59 | 0.39 |

Note: Lifetime taxes and spending refer to the present value, discounted at 6 percent real, of the couples' annual taxes and spending on consumption, housing, college tuition, and life insurance premiums.

Table 17

**Percent Change in Lifetime Taxes and Spending from Participating in a Regular IRA
Constant Nominal Contribution of \$5,000 Per Spouse Per Year**

| Real Return → | 4 percent | | 6 percent | | 8 Percent | |
|----------------------|-----------|----------|-----------|----------|-----------|----------|
| | Taxes | Spending | Taxes | Spending | Taxes | Spending |
| Age-25 Earnings (\$) | | | | | | |
| 25,000 | 2.39 | -0.39 | 15.86 | -2.58 | 29.67 | -4.75 |
| 50,000 | -3.55 | 0.92 | 1.04 | -0.27 | 5.55 | -1.44 |
| 100,000 | -2.89 | 1.11 | -3.82 | 1.46 | -2.03 | 0.76 |
| 150,000 | -2.17 | 1.02 | -3.04 | 1.41 | -2.58 | 1.17 |
| 200,000 | -2.61 | 1.34 | -3.15 | 1.56 | -3.45 | 1.65 |
| 250,000 | -2.85 | 1.60 | -3.11 | 1.67 | -3.35 | 1.73 |
| 300,000 | -2.91 | 1.73 | -2.69 | 1.52 | -2.89 | 1.56 |
| 1,000,000 | -1.31 | 1.01 | -1.27 | 0.90 | -1.32 | 0.88 |

Note: Lifetime taxes and spending refer to the present value, discounted at 6 percent real, of the couples' annual taxes and spending on consumption, housing, college tuition, and life insurance premiums.

Table 18

**Percent Change in Lifetime Taxes and Spending from Participating in a Roth IRA
Constant Nominal Contribution of \$2,000 Per Spouse Per Year**

| Real Return → | 4 percent | | 6 percent | | 8 Percent | |
|-----------------------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|
| Age-25 Earnings (\$) | Taxes | Spending | Taxes | Spending | Taxes | Spending |
| 25,000 | -2.27 | 0.37 | -1.77 | 0.29 | -1.27 | 0.20 |
| 50,000 | -3.20 | 0.83 | -3.21 | 0.84 | -2.38 | 0.62 |
| 100,000 | -1.76 | 0.68 | -2.85 | 1.09 | -2.68 | 1.00 |
| 150,000 | -1.61 | 0.76 | -2.07 | 0.96 | -2.65 | 1.20 |
| 200,000 | -1.27 | 0.65 | -1.78 | 0.88 | -2.18 | 1.04 |
| 250,000 | -1.59 | 0.89 | -1.58 | 0.85 | -1.99 | 1.03 |
| 300,000 | -1.66 | 0.99 | -1.51 | 0.85 | -1.93 | 1.04 |
| 1,000,000 | -0.87 | 0.67 | -0.89 | 0.63 | -0.96 | 0.63 |

Note: Lifetime taxes and spending refer to the present value, discounted at 6 percent real, of the couples' annual taxes and spending on consumption, housing, college tuition, and life insurance premiums.

Table 19

**Percentage Change in Lifetime Taxes and Spending from Participating in a Roth IRA
Assuming a Constant Nominal Contribution of \$5,000 per Spouse Per Year**

| Real Return → | 4 percent | | 6 percent | | 8 Percent | |
|-----------------------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|
| Age-25 Earnings (\$) | Taxes | Spending | Taxes | Spending | Taxes | Spending |
| 25,000 | -2.38 | 0.38 | -1.86 | 0.30 | -1.36 | 0.22 |
| 50,000 | -3.85 | 1.00 | -3.24 | 0.85 | -2.42 | 0.63 |
| 100,000 | -4.22 | 1.62 | -3.79 | 1.45 | -2.75 | 1.03 |
| 150,000 | -3.45 | 1.63 | -4.23 | 1.96 | -2.93 | 1.32 |
| 200,000 | -2.93 | 1.50 | -3.94 | 1.96 | -3.37 | 1.61 |
| 250,000 | -3.00 | 1.69 | -3.31 | 1.78 | -3.67 | 1.90 |
| 300,000 | -3.10 | 1.84 | -3.27 | 1.85 | -3.63 | 1.95 |
| 1,000,000 | -1.88 | 1.45 | -2.02 | 1.43 | -2.20 | 1.45 |

Note: Lifetime taxes and spending refer to the present value, discounted at 6 percent real, of the couples' annual taxes and spending on consumption, housing, college tuition, and life insurance premiums.

Appendix

ESPlanner's Tax and Social Security Benefit Calculations

Federal Income Tax Calculations

ESPlanner's calculations of federal income taxes in each future year take into account the household's year-specific marital status. Thus, in the case of married households, the marital status is married when both spouses are alive and single when one is deceased. Households that are married are assumed to file jointly. The tax schedules for each filing status are taken from the federal income tax booklet for the latest available tax year—usually the year prior to the “current” year entered by the user. The tax schedule is applied to the program's calculation of federal taxable income. Federal taxable income equals federal Adjusted Gross Income (AGI) less personal exemptions and less the standard or itemized deduction, whichever is larger.

AGI for each year includes projected incomes in current dollars from the following sources: Labor income (wages and salaries), self-employment income, asset income projected by the program based on user inputs of initial non-tax-favored net worth and rates of return, and on the optimal spending plan computed by the program. AGI also includes taxable asset income, taxable social security benefits, taxable special receipts, taxable distributions from defined benefit pension plans and taxable withdrawals from tax-favored saving plans. Each of these items is based upon the user's inputs and preferences. Non-taxable special receipts and withdrawals from non-deductible tax-favored accounts are not included in AGI. Deductible contributions to tax-favored retirement accounts are subtracted from income in calculating each year's AGI. Employer contributions to tax-favored retirement accounts are not included in AGI. However, withdrawals from these accounts are included.

The Tax Schedule

The tax schedules for the two types of filing statuses implemented in ESPlanner are taken from the federal income tax booklet for the 1998 tax year—the latest year for which the federal schedules are available. These schedules are as follows:

| (1) If taxable income is over-- | (2) but not over-- | (3) the tax is-- | (4) of the amount over-- |
|---|----------------------------------|--------------------------------|--|
| Married filing jointly: | | | |
| \$ 0 | \$42,350 | ----- 15 % | \$0 |
| 42,350 | 102,300 | \$6,352.50 + 28 % | 42,350 |
| 102,300 | 155,950 | 23,138.50 + 31 % | 102,300 |
| 155,950 | 278,450 | 39,770.00 + 36 % | 155,950 |
| 278,450 | ----- | 83,870.00 + 39.6% | 278,450 |

| | | | | |
|---------|-----------|--------------|-------|---------|
| Single: | | | | |
| \$ 0 | \$ 25,350 | ----- | 15 % | \$0 |
| 25,350 | 61,400 | \$3,802.50 + | 28 % | 25,350 |
| 61,400 | 128,100 | 13,896.50 + | 31 % | 61,400 |
| 128,100 | 278,450 | 34,573.50 + | 36 % | 128,100 |
| 278,450 | ----- | 88,699.50 + | 39.6% | 278,450 |

The Indexation of the Tax Schedule

Tax-rate brackets and infra-marginal tax amounts (all of the dollar amounts listed in the tax schedules) are adjusted for inflation in each year over the household’s lifetime. This is done to ensure that the schedule keeps pace with the growth of income in current dollars. The indexation is done using the user-specified rate of inflation.

Adjustment for the current year

Because the tax schedules listed above are applicable for the 1998 tax year whereas the user will enter 1999 as the current year, all tax brackets and infra-marginal tax amounts [the dollar amounts shown in column (3) in the schedules listed above] are indexed for inflation at the user-specified annual rate. This is done to avoid subjecting 1999 taxable income to tax schedules appropriate for 1998—that is, based on the wage and price levels prevailing in 1998.

Standard Deductions and Exemptions

The standard deduction and personal exemption amounts are also taken from the tax year prior to the “current” year (tax year 1998 in the current version). The amount subtracted from AGI for each personal exemption was \$2,700. The standard deductions were \$7,100 for the “married filing jointly” filing status and \$4,250 for the “single” filing status. These amounts are also indexed for inflation for each future year based on the user-specified future rate of inflation. The number of personal exemptions allowed equals 2 plus the number of children for “married and filing jointly” and 1 plus the number of children for the “single” filing statuses. The personal exemption amount that can be deducted from AGI in calculating taxable income is phased out if AGI is above certain dollar limits depending upon the filing status. ESPlanner takes account of the phase-out of personal exemptions based on these dollar limits indexed for inflation.

The Decision to Itemize

ESPlanner takes the maximum of the standard deduction or itemized deduction where the latter includes mortgage interest payments, property taxes, state and local income tax payments, and tax-deductible special expenditures that the user specifies—such as alimony payments, charitable contributions, and deductible medical expenses. Note that state and local income tax payments are deductible only if they are being withheld from pay or the user makes estimated tax payments during the during the tax year. ESPlanner assumes withholding or pre-payment in every case.

The Phase Out of Itemized Deductions

Federal income tax rules phase out itemized deductions for high income taxpayers (both, married filing jointly and single payers). For the 1998 tax year, the amount of the

deduction is reduced by 3¢ for every dollar of AGI in excess of \$124,500 with the total reduction limited to 80 percent of the original amount. The reduction does not apply to certain components of the itemized deductions claimed—such as medical care expenses, investment interest, and casualty and theft losses. Because ESPlanner does not distinguish between these and other sources of itemized deductions, the phase-out rules are applied to the entire itemized deduction.

The Child Tax Credit

The child tax credit equals \$400 times the number of qualifying children in the household. The tax credit is phased out if AGI is over the threshold of \$110,000 for the “married and filing jointly” status and of \$75,000 for the “single” filing status. The phase-out rate is \$50 for each \$1000 of income in excess of the applicable threshold. The amount of the child tax credit equals the computed amount or the federal income tax liability net of the earned income tax credit, whichever is less. If the earned income tax credit exceeds the federal income tax liability, the child tax credit is applied against the payroll tax liability.

The Earned Income Credit

The program’s calculation of the earned income credit adheres to the EIC worksheet in federal Form 1040. ESPlanner first checks for eligibility to take EIC based on investment income and on taxable and non-taxable (employer contributions to 401(k) plans, for example) earned income thresholds for households with no qualifying child and those with at least one qualifying child (adopted, foster, step-and grand-children are excluded in ESPlanner’s calculations). Next, EIC is computed based on the EIC schedule for taxable and nontaxable income. If the EIC is non-zero, it applies if AGI is less than certain dollar thresholds (\$5600 for households without a qualifying child and \$ 12,300 for households with at least 1 qualifying child). If AGI is greater than these dollar amounts, EIC is based on the AGI.

Payroll Taxes

In each year, the payroll tax for a married household is the sum of the two spouses’ payroll taxes. Each spouse’s tax equals the employee share of the OASDI tax rate (6.2 percent) applied to labor earnings up to the taxable maximum level plus the employee share of the HI tax rate (1.45 percent) applied to total labor earnings. If earnings from self-employment are present, these are included in the calculation only to the extent that labor earnings fall short of the taxable maximum limit for the OASDI tax. The entire labor income from self-employment is taxed on account of the HI tax. In the case of self-employment income, the employer plus employee tax rates for OASDI and HI are applied.

The Taxation of Social Security Benefits

Social Security benefits are taxed by including these benefits in the federal income tax base in the following manner. If the sum of AGI and 50 percent of Social Security benefits falls short of \$25,000 (adjusted for inflation for future years) if single and \$32,000 (same qualifier) if married, then none of the benefits are taxable. If the sum exceeds the applicable dollar threshold, but the excess is less than \$9,000 if single

(\$12,000 if married), then the smaller of one-half of the excess or 50 percent of the benefit is taxable and is included in the federal income tax base. In addition, if the aforementioned excess is greater than the dollar thresholds, 85 percent of this excess or 85 percent of the benefit, whichever is smaller, is also added to the federal income tax base.

State Income Tax Calculations

State income taxes are calculated for each state that imposes an income tax according to the specific tax rules applicable in user's state of residence. In most cases, the state income tax base equals the federal AGI re-adjusted for taxable Social Security benefits. State income tax calculations incorporate special features peculiar to each state: For example, some states (such as Massachusetts) impose special taxes on asset incomes. State-specific personal, spousal, and dependent exemptions (including additional exemptions for the elderly) and the applicable standard deductions are used to calculate the state taxable income. State taxes are calculated by applying the state's tax rate schedule to the taxable income.

Social Security Benefit Calculations

Retirement Benefits

Eligibility – Before ESPlanner provides you (and your spouse if married) Social Security retirement benefits, it checks that you are *fully insured*. Individuals must be *fully insured* to receive retirement benefits based on their earnings records. Becoming fully insured requires sufficient contributions at a job (including self-employment) covered by Social Security. For those born after 1929, acquiring 40 *credits* prior to retirement suffices for fully-insured status. Earnings between 1937 and 1951 are aggregated and divided by \$400, and the result (rounded down to an integer number) are the pre-1952 credits which are added to the credits earned after 1950 in determining insured status. After 1951, workers earn one credit for each quarter of the year they work in Social Security-covered employment and earn above a specified minimum amount. The year of *first eligibility* for retirement benefits is the year in which the individual becomes age 62. The individual is *entitled* to retirement benefits after an application for benefits is submitted, but never before age 62.

Determination of Primary Insurance Amount (PIA) -- The PIA is the basis for all benefit payments made on a worker's earnings record. There are several steps in computing the PIA. *Base years* are computed as the years after 1950 up to the first month of entitlement to retirement benefits begins. For survivor benefits, base years include the year of the worker's death.

Elapsed years are computed as those years after 1950 (or after attainment of age 21, whichever occurs later) up to (but not including) the year of first eligibility. The maximum number of elapsed years for an earnings record is 40 (it could be shorter, for purposes of calculating survivor benefits if the person dies prior to age 62).

Computation years are calculated as the number of elapsed years less 5, or 2, whichever is greater. Earnings in base years (up to the maximum taxable limit in each year, and

through age 60 or two years prior to death, whichever occurs earlier) are wage-indexed according to economy-wide average wages. Of these, the highest earnings in years equaling the number of computation years are added together and the sum is divided by the number of months in computation years to yield *Average Indexed Monthly Earnings (AIME)*.

Bend Points -- The AIME is converted into a PIA using a formula with *bend points*. The bend point formula is specified as 90 percent of the first X dollars of AIME plus 32 percent of the next Y dollars of AIME plus 15 percent of the AIME in excess of Y dollars. The dollar amounts X and Y are also wage indexed and are different for different eligibility years. The dollar amounts pertaining to the year of attaining age 60 (or, for survivor benefits, the second year before death, whichever is earlier) are applied in computing the PIA.

Benefits- A person who begins to collect benefits at his or her "normal retirement age" (currently age 65) receives the PIA as the monthly retirement benefit. In subsequent years, the monthly benefit is adjusted according to the Consumer Price Index (CPI) to maintain its purchasing power.

Increases in Normal Retirement Ages -- After 2003 normal retirement ages are scheduled to increase by 2 months for every year that a person's 65th birthday occurs later than the year 2003. This progressive increase in the normal retirement age for those born later ceases between the years 2008 through 2020; those attaining age 65 in these years have a normal retirement age of 66. The postponement in retirement ages resumes after 2020 such that those born after 2025 have a normal retirement age of 67. All cohorts attaining age 65 after that year have a normal retirement age of 67.

Reductions for Age -- A person who begins to collect retirement benefits earlier than the normal retirement age receives a *reduction for age*. The reduction factor is 5/9 of 1 percent for each month of entitlement prior to the normal retirement age. The reduced benefit payment (except for the inflation adjustment) continues even after the person reaches or surpasses the normal retirement age. If the number of months of reduction exceeds 36 months (for example, in case of entitlement at age 62 when the normal retirement age is 67), then the reduction factor is 5/12 of 1 percent for every additional month of early entitlement.

Delayed Retirement Credits--Those who begin to collect benefits after their normal retirement age (up to age 70) receive *delayed retirement credits*. The amount of the delayed retirement credit for each month of delayed entitlement depends on the year in which a person attains normal retirement age. For example, those attaining age 65 in 1997 receive an additional 5 percent in monthly benefits for each year of delay in entitlement. However, those attaining age 65 in the year 2008 will receive an additional 8 percent in benefits for each year of delayed entitlement.

Earnings Test -- If a person continues to work and earn after the month of entitlement, benefits are reduced because of an *earnings test*. Beneficiaries under the normal

retirement age, lose \$1 for each \$2 earned above an earnings limit. Those older than the normal retirement age, lose \$1 for each \$3 earned above a higher earnings limit. The earnings limits have already been specified through the year 2000 and are scheduled to grow with average wages in subsequent years. All benefits payable on a worker's earnings record, including the worker's own retirement benefits and spousal and child dependent benefits, are proportionally reduced by the testing of the worker's earnings.

Recomputation of Benefits -- Earnings in any year after entitlement to benefits are automatically taken into account in a recomputation of the PIA for determining the subsequent year's benefit amount. However, these earnings are not indexed before they are included in the AIME calculation. If such earnings are higher than some prior year's earnings (indexed earnings through age 60 or unindexed earnings after age 60), they result in an increase in the PIA and benefit payable. If they are lower than all previous year's earnings, they will not lower the PIA or benefits since only the highest earnings in base years are included in the calculations.

Spousal and Child Dependent Benefits

Eligibility -- Wives and husbands of insured workers (including divorced spouses) are entitled to *spousal benefits* if the couple was married for at least 10 years at the time of application for spousal benefits, the spouse is over age 62 or has in care a child under age 16 entitled to benefits under the insured worker's record, and the insured worker is collecting retirement benefits. Children of insured workers under age 16 are entitled to *child dependent benefits* if the child is unmarried and the worker is collecting retirement benefits.

Benefits -- Spousal and child benefits equal 50 percent of the insured worker's PIA (each). Child dependent benefits may be lower only if the *family maximum* applies. Spousal benefits may be lower due to the family maximum, a reduction for age, the application of the earnings test, or the spouse's receipt of retirement benefits based on her or his own earnings record.

Family Maximum -- All benefits paid under a worker's record (except retirement benefits or divorced spousal benefits) are reduced proportionately to bring them within the family maximum benefit level. The maximum benefits payable on a worker's earnings record is determined by applying a bend point formula to the PIA similar to that applied to the AIME in calculating the PIA. For example, the family maximum equals 150 percent of the first \$X of PIA plus 272 percent of the next \$Y of the PIA plus 134 percent of the next \$Z of the PIA plus 175 percent of the PIA greater than \$X+\$Y+\$Z. The values X, Y, and Z are adjusted for each year of the calculation according to the growth in economy-wide average wages. In case the spousal benefit is eliminated for any reason, the benefits payable on the insured worker's record are subjected to the family maximum test again, treating the spouse as though he/she were not eligible for spousal benefits. This may result in higher benefits for children who may be eligible for dependent benefits under the worker's record.

Reduction of Spousal Benefits for Age -- Spouses eligible for the spousal benefit may elect to receive (may become entitled for) their benefits before normal retirement age. In this case the spousal benefit is reduced by $25/36$ of 1 percent for each month of entitlement prior to normal retirement age. If the number of months of reduction exceeds 36 months (for example, in case of entitlement at age 62 when the normal retirement age is 67), then the reduction factor is $5/12$ of 1 percent for every additional month of early entitlement.

Earnings Testing and Redefinition of Spousal Benefits -- If a spouse is earning above the amount allowed by the earnings test, the spousal benefits he or she is eligible to receive will be earnings tested according to the pre- and post-normal retirement schedule described above. If a spouse is already collecting retirement benefits, the spousal benefit is redefined as the greater of the excess of the spousal benefit over the spouse's own retirement benefit or zero.

Survivor Benefits (Widow(er), Father/Mother, and Children)

Eligibility-- The surviving spouse of a deceased worker is eligible for *widow(er) benefits* if the widow(er) is at least age 60, is entitled (has applied for widow[er] benefits), the worker died fully insured, and the widow(er) was married to the deceased worker for at least 9 months. The widow(er) of a deceased worker is eligible for *father/mother benefits* if the widow(er) is entitled to benefits (has applied), the worker died fully insured, the widower has in care a child of the worker. A surviving child is eligible for *child survivor benefits* on the deceased worker's record if the child is under age 18 and is entitled (an application has been filed) and the worker was fully insured.

Survivor Benefits-- Monthly benefits equal 100 percent of the worker's PIA for a widow(er); they equal 75 percent of the PIA for father/mother and child survivor benefits. Widow(er) and child survivor benefits may be lower only if the family maximum applies. Widow(er)s may become entitled to (elect to receive) survivor benefits earlier than normal retirement age, but not earlier than age 60. In this case the reduction is $19/40$ of 1 percent for each month of entitlement prior to normal retirement age. After the widow(er) is 62, he or she is may become entitled to (elect to receive) retirement benefits based on her own past covered earnings record. In this case the widow(er) benefits are redefined as the excess over own retirement benefit or zero, whichever is greater. Finally, widow(er) survivor and own retirement benefits are also subject to the earnings test. If the deceased worker was already collecting a reduced retirement insurance benefit, the widow(er)'s benefit cannot be greater than the reduced widow(er) benefit or the greater of 82.5 percent of the worker's PIA or the worker's own retirement benefit. If the deceased worker was already collecting a retirement insurance benefit greater than the PIA because of delayed retirement, the widow(er) or is granted the full dollar amount of the delayed retirement credit over and above the (reduced) widow(er) benefit. Father/mother benefits are not similarly augmented by delayed retirement credits that the deceased worker may have been receiving.

Father/Mother Benefits -- These benefits may be reduced if the family maximum applies or if the father or mother is entitled to the own retirement benefit. In this case the

father/mother benefit is redefined as the excess over the father or mother's own retirement benefit or zero, whichever is greater. Father /mother benefits are also subject to the earnings test. On the other hand, they are not reduced for age. For those eligible to receive both widow(er) and father/mother benefits, the program calculates both and takes the larger benefit.

Calculation of a Deceased Worker's PIA -- The calculation of survivor benefits in the case of a widow(er) benefits uses the larger of two alternative calculation's of the deceased worker's PIA. These are the "wage indexing" method and the "re-indexing" method. Moreover, the year up to which the worker's wages are indexed may be different depending upon whether the deceased worker would have become age 62 before or after the widow(er) attains age 60.

The wage-indexing method -- the last year for indexing earnings is the earlier of a) the year the worker dies minus 2 years or b) the year worker would have attained age 60. Bend point formula dollar amounts are taken from the earlier of the year the worker dies or the year the worker would have attained age 62. The PIA thus calculated is inflated by the CPI up to the year the widow(er) turns age 60 (if later) to obtain the PIA value on which widower benefits would be based. Where applicable, these benefits are then adjusted for the family maximum, reduction for age, delayed retirement credits, and the earnings test.

The reindexing method -- The worker's original earnings are indexed up to the earlier of the year the widow(er) attains age 58 or b) the year the worker attains age 60. The elapsed years are computed as the number of years from 1951 (or the worker's age 22 if later) through the year the widow(er) attains age 60. The computation years equal elapsed years minus 5 years (computation years cannot be less than 2). Bend point formula dollar values are applied from the year the widow(er) attains age 60. There is no subsequent indexing of the PIA for inflation.

The Sequencing of Widow(er) Benefit Calculations -- Widow(er) benefit reductions follow these steps: First the widow(er) plus children's benefits are subjected to the family maximum. Second, the widow(er) benefit is reduced for early entitlement (of the widow(er) prior to normal retirement age). Third, the widow(er) benefit is compared to the widow(er) own retirement benefit if entitled to the latter. Fourth, the widow(er) benefit is redefined as the excess over own benefit if own benefit is positive. Finally the earnings test is applied, first to the widow(er)'s own benefit and then to the widow(er) benefit that is in excess of own benefit. If the widow(er) benefit is eliminated as a result of these tests, the benefits payable on the insured worker's record are subjected to the family maximum test again, treating the widow(er) as though he/she were not eligible for the widow(er) benefit. This procedure can potentially increase children's benefits if the family maximum limit was binding the first time through.