TO ROTH OR NOT? -- THAT IS THE QUESTION

Laurence J. Kotlikoff
Ben Marx
David Rapson

ABSTRACT

Do regular 401(k) and IRA accounts offer greater tax benefits than Roth 401(k)s and Roth IRAs? This is a tough question. Regular 401(k)s and IRAs save taxes in the short term; Roth accounts save taxes in the long term. Regular 401(k)s and IRAs are vulnerable to future income tax hikes, but may benefit from a future switch to consumption taxation if the switch exempts withdrawals from income taxation. Roth accounts are exempt from future income tax hikes, but are exposed to future consumption taxation. For any given assumption about future tax policy, assessing the relative merits of the two types of saving vehicles requires very accurate calculations of taxes in each future year -- calculations that incorporate not just standard federal income tax provisions, but also the Savers Credit, the taxation of Social Security benefits, the Alternative Minimum Tax, and state income taxation.

This paper uses ESPlanner (Economic Security Planner) -- a financial planning software program co-developed by Kotlikoff -- to study the relative merits of regular and Roth retirement accounts. In providing its consumption smoothing recommendations, ESPlanner makes the highly detailed tax and Social Security benefit calculations needed to compare retirement account options. In particular, ESPlanner can determine how different retirement account options affect different households' living standards under different assumptions about future tax policy.

Our main findings are these: Absent future tax changes, middle-income, single-parent households benefit slightly more from Roth accounts; other single and married households generally fare better with a regular 401(k). Future tax changes, however, can dramatically change this horse race. In the case of low- and middle-income households, Regular 401(k) accounts under-perform Roth accounts in terms of long-run living standards assuming income taxes will rise by 30 percent in retirement. But the Roth falls far short of the regular 401(k) if taxes in retirement are assessed on consumption rather than on income and the transition to consumption taxation exempts 401(k) withdrawals from income taxation.

Laurence J. Kotlikoff
Department of Economics
Boston University
270 Bay State Road
Boston, MA 02215
and NBER
kotlikoff@bu.edu

Ben Marx
Department of Economics
270 Bay State Road
Boston, MA 02215
benmarx@bu.edu

David Rapson
270 Bay State Rd
Department of Economics
Boston University
Boston, MA 02215
rapson@bu.edu

1. Introduction

The year 2006 ushered in a new way for U.S. workers to reduce their lifetime, if not their current, taxes – the Roth 401(k) plan.[1] Like regular 401(k) plans, the Roth 401(k) is designed to encourage workers to save for retirement. But unlike the regular 401(k), the Roth 40(k) cannot accept employer contributions. It also provides no tax exclusion for contributions. Instead, it assesses no taxes either on the accumulation of asset income or on the subsequent withdrawal of accumulated balances.

The Roth 401(k) operates just like a Roth IRA. Indeed, the only differences are first, the Roth 401(k) is employer-provided, second there are no personal income limits for investing in a Roth 401(k), and third, Roth 401(k) contributions count toward the limit for employee savings plans ($15,500 for most individuals in 2007) rather than toward the limit for IRA contributions ($4,000 in 2007).

The Roth 401(k) provides additional tax-advantaged saving opportunities for employees who are either maximizing their Roth IRA contributions or are income-ineligible to make Roth IRA contributions. Moreover, the new Roth 401(k) will likely raise general awareness of tax-advantaged saving opportunities and lead more Americans to weigh the benefits of using a Roth rather than tax-deferred saving vehicles.

Having more options is always beneficial. But choosing between regular and Roth retirement accounts isn't easy. And given the complex factors entering this decision, the potential for making the wrong choice is significant. Conventional advice generally favors tax-deferred over Roth accounts based on the following reasoning: "Your tax bracket will be lower when you're old, so it's better to lower your current taxable income even if it means raising it after retirement." The counter argument is: "Tax rates are likely to rise in the future. And even if they don't rise, your tax bracket when old may be higher thanks to the Alternative Minimum tax and the taxation of Social Security benefits."

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[1] For non-profits, the new Roth option is called a Roth 403(b). In what follows, references to Roth 401(k) plans are meant to include Roth 403(b) plans.

Another consideration is radical tax reform. The government could choose to tax consumption rather than income under the FairTax (a progressive federal retail sales tax), a VAT (value added tax), the Flat Tax (a more progressive version of the VAT), the X Tax (a more progressive version of the Flat Tax), or the USA Tax (a progressive personal consumption tax). Such a shift would represent a great benefit for those with regular 401(k) accounts because it would mean no income taxation of withdrawals from these accounts. True, regular (as well as Roth) 401(k) account balances would be subject to consumption taxation as these balances were spent, but unlike monies contributed to Roth 401(k) accounts, the funds contributed to regular 401(k) accounts would, in retrospect, escape income taxation.[2]

Given the potential for tax changes as well as the complexities of existing federal- and state-tax and Social Security-benefit provisions, back-of-the-envelope calculations comparing regular and Roth accounts are highly problematic. It's not even clear what size Roth 401(k) contribution one should compare with a given regular 401(k) contribution since Roth contributions are made after-tax and regular 401(k) contributions before-tax. Because of this, it's possible to contribute less to the Roth and still end up with the same or higher living standard in both the short and long runs.

Our approach in comparing contributing to regular and Roth 401(k)s is to focus on the household's *living standard*. "Living standard" refers to discretionary consumption expenditure (consumption expenditures apart from housing expenses and special expenditures) per equivalent adult adjusted for economies in shared living. Specifically, we compare a 6 percent employee contribution to a regular 401(k) with an annual Roth contribution that delivers the same living standard to the household in the short run. Since living standards are equalized in the short run, our focus is on the 401(k) option providing the highest living standard in the long run.

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[2] One can envision a transition to consumption taxation that includes a special withdrawal tax levied on withdrawals from tax-deferred retirement accounts. But our analysis assumes no such tax would be implemented.

We make our comparisons for a set of stylized households with different levels of earnings and other characteristics and for three different assumptions about future tax policy – no change, a 30 percent increase in income taxation, and a switch from income to consumption taxation, with the latter two tax changes occurring just when the household retires.

Our comparisons are of two types. First, we compare the present value difference in remaining lifetime consumption that results from making either regular or Roth 401(k) contributions. Second, we compare the household's living standard path over time from contributing to the two types of accounts with the living standard path associated with making no contributions.

For almost all households, contributing to either type account at the levels we consider lowers lifetime taxes (the present value of future taxes) and raises lifetime consumption (the present value of future consumption expenditures). But we also show that doing so comes at the price of a much lower current living standard and at the benefit of a much higher future living standard. The reason is that most of the working households we examine are borrowing constrained thanks to their need to pay off mortgages, feed children, and cover college tuition. The significant decline in most workers' short-run living standards from making rather modest retirement account contributions surely explains why so many workers opt-out of their employer's retirement plans or make only limited contributions to these plans.

We rely on *ESPlanner*^{TM} to determine the living standard levels and life-cycle patterns that households experience from contributing to the alternative 401(k) accounts. ESPlanner is a life-cycle financial planning software program.[3] It calculates a household's highest sustainable living standard taking into account the household's demographics, economies of shared living, relative cost of children, economic resources,

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[3] ESPlanner^{TM} (Economic Security Planner) was developed by Economic Security Planning, Inc. of which Kotlikoff is a principal.

housing, other "off-the-top" expenses, annual federal and state tax obligations, and borrowing limit.

In contributing to the regular 401(k), households accumulate more retirement account assets than they would in contributing to the Roth 401(k). The reason is that regular 401(k) contributions come with an immediate tax break, whereas Roth contributions do not. So less can be contributed to the Roth account if one is going to match the short-term living standard arising from regular 401(k) contributions. But the fact that the Roth balances will be smaller doesn't mean that long-run consumption will be lower for households contributing to Roth 401(k)s. Recall that withdrawals from the Roth aren't subject to taxation, at least under the income tax. Hence, the smaller, non-taxable Roth 401(k) balances have the potential to provide a higher long-run living standard than the larger, but taxable regular 401(k) account balances.

So which vehicle is best? The answer depends. Absent future tax changes, our middle-income, single-parent households benefit slightly more from a Roth, whereas other households generally fare better with a regular 401(k). Future tax changes, however, can dramatically change this horse race. Regular 401(k) accounts under-perform Roth accounts in terms of long-run living standards and consumption for low- and middle-income households if income taxes rise by 30 percent in retirement. But the Roth falls far short of the regular 401(k) if taxes in retirement are assessed on consumption instead of income.[4]

We proceed in section 2 with a description of *ESPlanner* and our stylized households and reports. Section 3 presents our findings, and section 4 concludes.

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[4] To repeat, in this scenario income contributed to a Roth is, effectively, taxed twice – once when it's contributed to the Roth and once when it's withdrawn and spent. In contrast, income contributed to a Regular 401(k) is taxed only once -- when it is withdrawn and spent.

2. *ESPlanner* and Our Stylized Households

ESPlanner uses dynamic programming to smooth households' living standards subject to borrowing constraints and non-negativity constraints on life insurance holdings. The program takes into account the following user-specified inputs:

> The household's marital status, the ages of household heads and spouses/partners, the household's state of residence, current and future planned children and their years of birth, current and future regular and self-employment earnings, current and future special expenditures and receipts (as well as their tax status), current and future levels of a reserve fund, current regular and retirement account balances, current and future own and employer contributions to retirement accounts (with Roth accounts treated separately), current and future primary and vacation home values, mortgages, rental expenses, and other housing expenditures, current and future states of residence, ages of retirement account withdrawals, ages of initial Social Security benefit receipt, past and future covered Social Security earnings, desired funeral expenses and bequests, current regular saving and life insurance holdings, economies of shared living, the relative cost of children, the extent of future changes in Social Security benefits, the extent of future changes in federal income taxes, FICA taxes, and state income taxes, current and future pension and annuities (including lump sum and survivor benefits), the degree to which the household will annuitize its retirement account assets, and current and future regular and self employment earnings, special expenditures, receipts, and other variables in survivor states in which either the head or her spouse/partner is deceased.

The living standard per adult in a multi-person household equals the amount of consumption expenditure she'd need as a single adult to make to achieve the same living standard as she enjoys in the household. The equation relating a household's living standard per equivalent adult to its total consumption expenditure takes into account economies in shared living and the relative cost of children.

Specifically, let C stand for a household's total consumption expenditure, s for its living standard per equivalent adult, k_i for the number of children age i, θ_i for relative cost of a child age i, N for the number of adults, and v for the degree of economies of shared living. The relationship between C and s in a given year is $C = s(N + \sum_i \theta_i k_i)^v$.

Consumption expenditure is defined by *ESPlanner* as all expenditures apart from "off-the-top" spending. Off-the-top spending includes college tuition and other special expenditures, housing expenditures, taxes, life insurance premiums, regular saving, taxes, and contributions to retirement accounts. Thus, consumption expenditures correspond to disposable spending.

ESPlanner's Tax and Benefit Calculations

ESPlanner's federal and state income-tax calculators determine whether the household should itemize its deductions, compute deductions and exemptions, deduct from taxable income contributions to tax-deferred retirement accounts, include in taxable income withdrawals from such accounts as well as the taxable component of Social Security benefits, check, in the case of federal income taxes, for Alternative Minimum Tax liability, and calculate total tax liabilities after all applicable refundable and non-refundable tax credits including the Earned Income Tax Credit, the Saver's Credit, and the Child Credit. These federal and state tax calculations are made separately for each year that the couple is alive as well as for each year a survivor may be alive.

Given the non-linearity of tax functions, one can't determine a household's tax rates in future years without knowing its regular asset and other taxable income in those years. But one can't determine how much a household will consume and save and thus have in asset income in future years without knowing the household's future taxes. Hence, we have a chicken and egg (a simultaneity) problem that needs to be resolved to make sure that consumption and saving decisions are consistent with the future tax payments they help engender.

ESPlanner's Algorithm

ESPlanner's calculates time-paths of consumption expenditure, taxable saving, and term

life insurance holdings in constant 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. Given the household's demographic information, preferences, borrowing constraints, and non-negativity constraints on life insurance, *ESPlanner* calculates the highest sustainable and smoothest possible living standard over time, leaving the household with zero terminal assets (apart from the equity in homes that the user has chosen not to sell) if either the household head, her spouse/partner, or both live to their maximum ages of life.

The amount of recommended consumption expenditures needed to achieve a given living standard varies from year to year in response to changes in the household's composition. Moreover, the relationship between consumption and living standard in a given year is non-linear for two reasons. First, as indicated, a non-linear function governs the program's assumed economies of shared living, with the function depending on the number of equivalent adults. Second, the program permits users to specify that children are less or more expensive than adults in terms of delivering a given living standard. The default setting is that a child is 70 percent as expensive as an adult.

The program's recommended consumption also rises when the household moves from a situation of being liquidity constrained to one of being unconstrained. Finally, recommended household consumption will change over time if users intentionally specify, via the program's standard of living index, that they want their living standard to change as they age.

The simultaneity issue with respect to taxes mentioned above is just one of two such issues that need to be considered. The second is the joint determination of life insurance holdings of potential decedents and survivors. *ESPlanner* recognizes that widows and widowers may need to hold life insurance in order to protect their children's living standard through adulthood and to cover bequests, funeral expenses, and debts (including mortgages) that exceed the survivor's net worth inclusive of the equity on her/his house.

Accordingly, the software calculates these life insurance requirements and reports them in its survivor reports.

However, the more life insurance is purchased by the potential decedent, the less life insurance survivors will need to purchase, assuming they have such a need. But this means survivors will pay less in life insurance premiums and have less need for insurance protection from their decedent spouse/partner. Hence, one can't determine the potential decedent's life insurance holdings until one determines the survivor's holdings. But one can't determine the survivor's holdings until one determines the decedent's holdings.

Dealing with the tax and life insurance simultaneity issues as well as the borrowing and non-negative life insurance constraints all within a single dynamic program isn't feasible given the large number of state variables such an approach entails. To overcome this problem, *ESPlanner* uses an iterative method of dynamic programming. Specifically, the program has two dynamic programs that pass life-cycle paths of data to one another on an iterative basis until they both converge to a single mutually consistent solution to many decimal points of accuracy.

One program takes age-specific life insurance premium payments as given and calculates the household's consumption smoothing conditional on these payments. The other program takes the output of this consumption smoothing program -- the living standard in each year that needs to be protected – as given. This second program calculates how much life insurance is needed by both potential decedents and their surviving spouses/partners.

This iterative procedure also deals with our two simultaneity issues. The trick here is to form initial guesses of future taxes and survivor life insurance holdings and update these guesses across successive iterations based on values of these variables endogenously generated by the program in the previous iteration. When the program concludes its calculations, current spending is fully consistent with future taxes and vice versa, and the recommended life insurance holdings of heads and spouses/partners are fully consistent

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with the recommended life insurance holdings of survivors.

Our Stylized Households

Our analysis is based on 14 stylized households. The 14 households differ with respect to their marital status, annual labor earnings, assets, housing expenses, college expenses, and age. The ages we consider for the household head and, if married, spouse are 30, 45, and 60. We first run the program for each stylized household, setting the age of each adult to 30. In this initial run we specify the presence of two children ages 1 and 3. Using values from table 1, we also enter age-30 asset levels, housing expenses including the annual payment on a 30-year mortgage, initial earnings, and annual college expenses when the children are ages 19 to 22. Each household invests 6 percent of its annual income in a regular 401(k) retirement account, and in all cases considered this amount falls within the allowable contribution limit. We assume 3 percent annual inflation, a 6 percent nominal pre-tax rate of return on all investments, fixed real labor earnings for all households, and 100 as the maximum age of life.

Using the results from these initial runs, we extract each household's age-45 and age-60 regular asset levels, regular 401(k) retirement account balances, and mortgage balances. We then use these age-45 and age-60 values, together with the inflation-adjusted value of mortgage payments and any remaining college expenditures, as inputs to create profiles for households at ages 45 and 60 with, in the case of the 45-year old households, 16 and 18 year-old children. These age-45 and age 60-profiles, together with those for age 30, are then used to compare contributing, from the household's current age through age 65, a) 6 percent of earnings with no employer match to a regular 401(k), b) the percent of earnings to a Roth 401(k) needed to generate the same living standard in the short term as arises from contributing to the regular 401(k), and c) nothing to either regular or Roth 401(k) accounts.

To find the level of the Roth contribution rates needed to produce the same living standard in the short run as arises from contributing 6 percent to the regular 401(k) with no employer match we simply tried different values until we found the right one. "Short

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run," in this context, generally means through age 51; this is the age at which most of the 14 stylized households emerge from under their borrowing constraint.[5]

As mentioned, our three tax scenarios contemplate an expected income tax increase, a switch from income to consumption taxation, and no tax change. In the first scenario we have each household plan for a 30 percent increase in all state and federal income taxes that starts when that household reaches our assumed retirement age of 65. To model a switch from income taxes to a consumption tax we take the amount of income taxes each household would have paid in each year of retirement, add this amount to the household's consumption in that year, add in an annual progressive "rebate" of $2,348 for single households and $4,697 for married couples, and then tax this augmented consumption at 23%. This corresponds to the consumption taxation that would arise under the FairTax – the consumption tax reform currently receiving the most political support. In each of the tax change scenarios, we assume the level of regular and Roth 401(k) contributions as arises in the corresponding base case.

3. Results

Tables 2-7 present the net change in the present value of future consumption that results from contributing to Roth 401(k) accounts as well as regular 401(k) accounts with and without an employer match. In the case of the employer match, we assume that the employer and household members each contribute 3 percent of earnings, but that the members' compensation is not reduced due to the employer's match.

Working through the household's lifetime budget constraints, it's easy to show that the change in lifetime consumption (the present value of future consumption) equals the negative of the change in lifetime taxes (the present value of future taxes). Note also that "lifetime" is short hand here for "remaining lifetime."

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[5] One might consider a different experiment, namely equating the gross contribution to each type of account. Kotlikoff and Rapson (2007) follow this approach.

Tables 2 and 3 assume no future changes in tax policy. Tables 4 and 5 assume a 30 percent income tax starting at age 65, and tables 6 and 7 assume a switch to consumption taxation at age 65. The reference level of the present value of consumption for each cell is the present value that would arise in the absence of any 401(k) contributions but in the presence of the tax policy changes specified in the table.

The first thing to notice is that, with just three exceptions, all the values in all the tables are positive. This means that regardless of the household in question, the type of 401(k) being used, and the tax policy change that may arise, contributing to a regular or Roth 401(k) almost invariably lowers remaining lifetime taxes and, thereby, permits higher remaining lifetime consumption. The three exceptions all involve middle-class, age-30 single households contributing to Roth.[6]

The second significant finding is the massive size of some of the lifetime tax breaks afforded to rich households. Consider, for example, the 30 year-old married household earning $500,000 a year and assume no future tax changes. For this household, contributing to a regular 401(k) raises lifetime consumption by $437,693 – or by almost a full year's earnings! Contributing to the Roth 401(k) raises lifetime consumption by $373,932. Though smaller, this is still a huge gain. These gains dwarf the $12,840 and $10,041 respective gains provided to the same age-30, married household earning only $50,000 a year.

A third interesting finding is that the absolute size of the lifetime consumption increase (lifetime tax break) does not rise monotonically with earnings. According to table 3, thirty-year old couples earning $20,000, for example, gain $15,892 in present value from contributing to a regular 401(k), whereas comparable couples earning $50,000 gain only $12,840. The difference reflects the application of the Saver's Credit, which isn't available to middle- and upper-income couples.

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[6] For these households, the short-term sacrifice in consumption (discussed below) coupled with having to pay taxes on their old-age consumption expenditure entails a net decline in lifetime consumption.

A fourth result is the significant dependence on age of the gains from retirement account contributions. This is no surprise. Having fewer years to contribute means having less opportunity to benefit from retirement account tax breaks. On the other hand, the amounts involved even at age 60 are non-trivial. For example, a single 60 year-old making $100,000 a year nets $6,453 in higher remaining lifetime consumption by contributing over her remaining five years of work to either a regular or Roth 401(k). The reason the Roth and non-Roth gains are the same for these 60 year olds is that by age 60 the households in these runs of *ESPlanner* are no longer liquidity constrained and experience the same short-run and long-run changes in living standard from contributing to either account.

Point five is our main punch line – the Roth 401(k) option beats the regular 401(k) option in some, but far from all cases. And the potential for the Roth option to win the competition depends very much on future tax policy.

Consider first no change in future tax policy and take, for example, married households age 45 with $50,000 in annual earnings. For such households, contributing to the regular 401(k) generates a $11,874 increase in lifetime consumption, whereas contributing to the Roth 401(k) generates a $11,151 increase. So the regular 401(k) beats the Roth. But were the couple to earn only $35,000 per year, the Roth beats the regular 401(k); the regular 401(k) gain, in this case, is $4,637, which is lower than the $6,995 Roth 401(k) gain. These dollar differences are small; the big dollar differences between the two 401(k) options arise for high earners. Take single 30 year-olds earning $250,000 per year. The net lifetime consumption gain is $138,430 with the regular 401(k), but only $98,569 with the Roth 401(k).

Next consider 60 year olds under the assumption of no future tax policy changes. As tables 2 and 3 show, for all such households there is no difference in lifetime consumption gains from contributing to regular or Roth 401(k)s. For these households, liquidity constraints don't bind. Hence, the short-term as well as long-term living standard improvements from making annual 6 percent regular 401(k) contributions

through age 65 are the same. And since the Roth 401(k) contribution is set to replicate the household's short-term living standard gain and since ESPlanner delivers a perfectly smooth living standard if possible, the Roth contribution will reproduce the same constant living standard path as arises in the case the household makes regular 401(k) contributions.

Turn next to tables 4 and 5, which consider a 30 percent hike in income tax rates in retirement. The pending tax hike makes the Roth look more favorable and, in some cases, makes Roth the winner. An example here is single age-30 households earning $100,000. In table 4 these households do better contributing to the Roth, whereas in table 2 they do better contributing to the regular 401(k). The tax hike also matters to 60 year-olds. For example, 60 year old couples earning $70,000 now gain more ($4,009) from the Roth option than they do with the regular option ($2,616).[7]

Tables 6 and 7 consider the switch to consumption taxation. Under this policy outcome, the Roth option looks decidedly worse for many households. For example, 45 year-old couples earning $30,000 a year now gain only $3,175 from the Roth compared with $8,421 from the regular 401(k). Or take single 60 year-olds earning $50,000. Their gain is now only $278 under the Roth, but $3,046 under the regular option.

The fifth and final finding emanating from tables 2-7 involves the gain from participating in a regular 401(k) if the employer provides a 3 percent match and provides no greater remuneration to employees who don't participate in the regular 401(k). These gains are very large in of themselves and in comparison with the gains arising when households make the entire 6 percent contribution on their own. Compare, for example, the table 3 $79,469 gain available through the match for age-30 couples with $100,000 in annual earnings with the rather meager $27,815 gain if there is no match. Or compare the $2,347 gain available in the case of the match to single 60 year-olds earning $15,000 with the $1,051 gain if there is no match.

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[7] The tax hike induces liquidity constraints to bind for this and other 60-year old households.

No Pain, No Gain

If the lifetime/present value gains from participating in 401(k) accounts are generally positive and, under many assumptions, relatively large, why do so many workers, particularly young ones, choose not to participate in their employers' 401(k) plans?[8] Behavioral economists would point to time-inconsistent preferences, lack of self-control, and spending addictions. But the most important fact may well be liquidity constraints, which require households to sacrifice their current living standard in order to enjoy a higher future living standard. Tables 8-13 reveal the two sides of the liquidity constraint coin. They show the percentage change in living standards before and after age 51 from contributing to regular and Roth 401(k)s under our different scenarios.[9]

With the exception of the poorest and wealthiest 30-year-old married couples, all of our 30 year-old households are liquidity-constrained when it comes to making 401(k) contributions. Take 30 year-old married households earning $100,000; they experience their age group's largest short-run living standard drop -- 10.2 percent – from making the 6 percent regular or equivalent Roth contribution. After age 51, when their liquidity constraints no longer bind, their early sacrifice pays off and these households experience, respectively, 20.8 percent higher living standard if they contribute to regular 401(k)s and 19.4 percent higher if they contribute to Roth 401(k)s.

If income taxes are raised when these households retire, they experience an 8.8 percent short-term living standard reduction and an 18.8 percent long-term living standard gain regardless of the type of 401(k) account to which they contribute. On the other hand, if a consumption tax is implemented, such households no longer are liquidity constrained (thanks to the higher tax burden in old age) and they experience immediate and permanent living standard increases of 18.4 percent and 17.0 percent in the regular and Roth cases, respectively.

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[8]See http://www.nytimes.com/2005/11/13/business/yourmoney/13reti.html

[9] Age 51 is the age beyond which the borrowing constraint no longer binds.

Very poor and wealthy households are able to divert resources to retirement accounts without enduring a decrease in standard of living, albeit for very different reasons. The wealthy households are simply not liquidity constrained. The college payments that loom in their late forties are dwarfed by the size of their income and existing assets. For their part, poor households benefit from the Savers Credit, a federal government program that encourages low-income households to participate in tax-advantaged retirement savings programs. The Saver's Credit, enacted in 2001, matches low-income households' retirement account contributions by as much as 50 cents per dollar up to the first $2,000 contributed. It does so by reducing their tax payments to the extent these payments are positive (a determination made prior to consideration of the EITC). For such households, this benefit alleviates borrowing constraints.

As table 8 shows, low- and high-earning 30 year-old households can raise their living standard immediately by contributing to a 401(k). Take singles earning $10,000. Their living standard rises by .9 percent prior to age 51 and by 3.7 percent thereafter if they contribute to a regular 401(k) and 2.7 percent thereafter, if they contribute to a Roth 401(k). Or consider 30 year-old married couples with $500,000 in combined earnings. If they contribute the maximum amount permitted (assumed 6 percent to a regular 401(k), they raise their living standard immediately and permanently by 9.9 percent. Contributing the maximum amount to the Roth delivers an immediate and permanent 8.4 percent living standard hike.

The pain-gain tradeoff is a bit more pronounced for most 45 year-old households. At age 45, the potential 401(k) contribution represents a larger share of spendable resources over the remaining years through age 51. Consider, for example, the 45-year-old $100,000 married household. Contributing 6 percent of earnings to a regular 401(k) comes at the price of an 11.8 percent living standard cut for six years, followed by a 6.1 percent living standard increase over the following 49 years, assuming the couple lives to 100 – its maximum age of life. Were the couple earning $500,000, the short-term reduction would be 4.0 percent, with a long-run gain of 6.0 percent.

Since their children have already graduated college, our 60 year olds no longer face the burden of paying college tuition bills and, thus, are not liquidity-constrained at any point in our analysis. These households all gain from participating in retirement saving plans, but to a much smaller extent (less than 1%) than younger families. The relatively small benefit is due to the proximity of these households to retirement when they start contributing to these accounts; this limits their ability to accumulate significant assets (on the margin) between age 60 and retirement at 65.

Finally, it should come as no surprise that households whose employers offer a 401(k) matching program end up much better off than their non-matched equivalents. Matching yields a standard of living increase of up to five percentage points above that without matching. In some cases (the wealthiest 30 year-old single households, for example), matching tips the balance of standard-of-living changes from negative to positive even during the period of liquidity constraint. Of course, after the liquidity constraints no longer bind, matching substantially raises the household's living standard relative to what it would otherwise have been.

5. Conclusion

Assuming existing tax provisions are retained through time, contributing to a regular 401(k) generates larger lifetime tax breaks for a majority of stylized working households than does contributing to a Roth 401(k). But both types of 401(k) offer a significant reduction in lifetime taxes and a significant increase in lifetime consumption. The regular 401(k) is particularly attractive when employers offer matching contributions. Households that are not currently liquidity-constrained and have little prospect of being constrained in the near term should surely save in tax-favored form; those who are constrained must weigh the often considerable short-term living standard reduction against the often major long-term living standard increase associated with contributing to these accounts.

Future changes in taxes, depending on their nature, can make Roth 401(k)s relatively more or less attractive than regular 401(k)s. A significant future income tax hike can tilt the scales in favor of Roth contributions for most households. On the other hand,

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assuming a future shift from income to consumption taxation generally makes a regular 401(k) a much better option than a Roth 401(k).

Given the considerable uncertainty facing American workers concerning the future nature of tax policy, the best option when it comes to choosing a retirement account vehicle is surely to diversify and allocate a sizeable share of one's tax-advantaged saving to each type of account.

References

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Table 1

Characteristics of Our Stylized Households

Single Households							
Total Household Income	Assets at 30	Annual College Expense	House Value	Mortgage	Monthly Mortgage Payment	Annual Property Taxes	Annual Home Maintenance
$10,000	$2,500	$2,500	$30,000	$24,000	$300	$300	$150
$15,000	$3,750	$3,750	$45,000	$36,000	$450	$450	$225
$25,000	$6,250	$6,250	$75,000	$60,000	$750	$750	$375
$35,000	$8,750	$8,750	$105,000	$84,000	$1,050	$1,050	$525
$50,000	$12,500	$12,500	$150,000	$120,000	$1,500	$1,500	$750
$100,000	$25,000	$25,000	$300,000	$240,000	$3,000	$3,000	$1,500
$250,000	$62,500	$50,000	$750,000	$600,000	$7,500	$7,500	$3,750
Married Households							
Total Household Income	Assets at 30	Annual College Expense	House Value	Mortgage	Monthly Mortgage Payment	Annual Property Taxes	Annual Home Maintenance
$20,000	$5,000	$5,000	$60,000	$48,000	$600	$600	$300
$30,000	$7,500	$7,500	$90,000	$72,000	$900	$900	$450
$50,000	$12,500	$12,500	$150,000	$120,000	$1,500	$1,500	$750
$70,000	$17,500	$17,500	$210,000	$168,000	$2,100	$2,100	$1,050
$100,000	$25,000	$25,000	$300,000	$240,000	$3,000	$3,000	$1,500
$200,000	$50,000	$50,000	$600,000	$480,000	$6,000	$6,000	$3,000
$500,000	$125,000	$50,000	$1,500,000	$1,200,000	$15,000	$15,000	$7,500

	Table 2								
	Net Change in Present Value of Consumption								
	Single Households, No Tax Change								

	Regular			Roth			Match		
Earnings	Age 30	Age 45	Age 60	Age 30	Age 45	Age 60	Age 30	Age 45	Age 60
$10,000	$3,776	$2,546	$733	$3,038	$1,844	$733	$9,975	$6,659	$1,736
$15,000	$5,048	$4,621	$1,051	$5,092	$2,557	$1,051	$13,844	$10,228	$2,347
$25,000	$7,628	$5,403	$880	$7,821	$4,132	$880	$20,929	$13,439	$3,007
$35,000	$6,887	$4,637	$929	$6,988	$6,995	$929	$24,708	$16,086	$3,618
$50,000	$11,790	$11,874	$2,689	$9,302	$11,151	$2,689	$37,275	$26,741	$5,891
$100,000	$27,289	$24,887	$6,453	$19,566	$17,272	$6,453	$72,372	$51,167	$11,660
$250,000	$138,430	$75,065	$14,960	$98,596	$48,277	$14,960	$233,051	$132,644	$27,892

Table assumes a 6 percent annual contribution to the regular 401(k) with contributions to the Roth of the size needed to achieve the same short-term living standard change.

	Table 3								
	Net Change in Present Value of Consumption								
	Married Households, No Tax Change								

	Regular			Roth			Match		
Earnings	Age 30	Age 45	Age 60	Age 30	Age 45	Age 60	Age 30	Age 45	Age 60
$20,000	$15,892	$5,862	$2,616	$15,829	$4,618	$2,591	$28,319	$14,086	$5,402
$30,000	$18,930	$9,084	$2,273	$16,306	$4,887	$2,273	$35,852	$20,133	$5,476
$50,000	$12,840	$8,976	$2,078	$10,041	$8,240	$2,078	$39,969	$26,383	$6,918
$70,000	$17,166	$12,152	$2,958	$13,896	$12,299	$2,958	$54,363	$36,212	$9,533
$100,000	$27,815	$44,233	$7,260	$21,081	$19,041	$7,260	$79,469	$55,486	$15,498
$200,000	$98,541	$66,467	$17,796	$65,936	$36,290	$17,771	$186,256	$114,790	$30,556
$500,000	$437,693	$162,761	$30,434	$373,932	$105,114	$30,434	$601,110	$281,457	$61,943

Table assumes a 6 percent annual contribution to the regular 401(k) with contributions to the Roth of the size needed to achieve the same short-term living standard change.

	Table 4								
	Net Change in Present Value of Consumption								
	Single Households, Income Tax Hike								
Earnings	**Regular**			**Roth**			**Match**		
	Age 30	Age 45	Age 60	Age 30	Age 45	Age 60	Age 30	Age 45	Age 60
$10,000	$3,897	$2,592	$733	$3,158	$1,889	$733	$10,095	$6,704	$1,736
$15,000	$5,027	$4,689	$1,051	$5,660	$2,625	$1,051	$13,750	$10,296	$2,347
$25,000	$7,302	$4,768	$758	$9,558	$5,016	$1,100	$20,500	$12,623	$2,836
$35,000	$5,664	$3,775	$660	$8,462	$9,216	$1,296	$23,309	$14,907	$3,178
$50,000	$9,889	$10,922	$2,347	$10,893	$14,256	$3,667	$35,183	$25,517	$5,353
$100,000	$21,116	$21,374	$4,767	$23,864	$21,895	$8,702	$65,639	$46,884	$10,389
$250,000	$137,232	$64,671	$12,296	$129,135	$62,836	$20,754	$230,330	$120,324	$24,860

Table assumes a 6 percent annual to the regular 401(k) with contributions to the Roth of the size needed to achieve the same short-term living standard change.

	Table 5								
	Net Change in Present Value of Consumption								
	Married Households, Income Tax Hike								
Earnings	**Regular**			**Roth**			**Match**		
	Age 30	Age 45	Age 60	Age 30	Age 45	Age 60	Age 30	Age 45	Age 60
$20,000	$17,294	$5,982	$2,616	$17,489	$5,342	$2,591	$29,540	$14,774	$5,402
$30,000	$20,055	$8,619	$2,176	$19,242	$5,112	$2,273	$36,887	$19,043	$5,353
$50,000	$12,465	$8,211	$1,662	$12,506	$10,476	$2,787	$39,374	$25,042	$14,471
$70,000	$16,678	$11,002	$2,616	$17,971	$15,542	$4,009	$53,578	$34,905	$8,825
$100,000	$27,523	$25,291	$6,600	$27,712	$20,800	$9,680	$78,781	$55,457	$14,447
$200,000	$100,464	$58,028	$15,254	$88,653	$42,031	$23,980	$187,074	$106,547	$27,085
$500,000	$389,177	$150,164	$23,369	$439,263	$184,353	$42,950	$543,316	$264,883	$51,725

Table assumes a 6 percent annual contribution to the regular 401(k) with contributions to the Roth of the size needed to achieve the same short-term living standard change.

Table 6

Net Change in Present Value of Consumption

Single Households, Consumption Tax at Age 65

Earnings	Regular			Roth			Match		
	Age 30	Age 45	Age 60	Age 30	Age 45	Age 60	Age 30	Age 45	Age 60
$10,000	$3,420	$1,873	$597	$2,779	$1,257	$597	$9,415	$5,675	$1,414
$15,000	$5,014	$3,558	$856	$3,646	$1,750	$856	$13,730	$8,757	$1,911
$25,000	$6,927	$5,434	$972	$1,843	$1,298	$192	$20,116	$13,251	$2,840
$35,000	$6,159	$5,095	$1,362	-$1,080	$1,294	$95	$23,696	$16,366	$3,966
$50,000	$10,538	$11,395	$3,046	-$752	$2,894	$278	$35,678	$25,825	$6,230
$100,000	$31,163	$26,635	$6,497	-$1,262	$5,185	$954	$76,217	$52,685	$12,269
$250,000	$147,009	$84,476	$17,481	$41,419	$17,408	$3,433	$242,108	$141,891	$30,831

Table assumes a 6 percent annual contribution to the regular 401(k) with contributions to the Roth of the size needed to achieve the same short-term living standard change.

Table 7

Net Change in Present Value of Consumption

Married Households, Consumption Tax at Age 65

Earnings	Regular			Roth			Match		
	Age 30	Age 45	Age 60	Age 30	Age 45	Age 60	Age 30	Age 45	Age 60
$20,000	$15,304	$4,612	$2,130	$15,282	$4,054	$2,110	$27,049	$12,678	$4,400
$30,000	$15,997	$8,421	$1,852	$14,514	$3,175	$1,852	$32,326	$18,519	$4,460
$50,000	$5,198	$8,218	$1,692	$4,042	$1,543	$1,692	$31,338	$24,929	$5,634
$70,000	$5,433	$11,370	$2,409	$4,604	$2,296	$2,409	$41,248	$34,798	$7,765
$100,000	$9,635	$40,731	$5,913	$6,814	$20,045	$5,913	$59,528	$70,298	$12,622
$200,000	$63,920	$69,671	$14,494	$44,762	$12,739	$14,474	$148,616	$118,730	$24,887
$500,000	$406,304	$186,180	$24,787	$365,817	$65,312	$24,787	$559,551	$310,285	$50,450

Table assumes a 6 percent annual contribution to the regular 401(k) with contributions to the Roth of the size needed to achieve the same short-term living standard change.

Table 8

Living Standard Gains From Retirement Account Contributions

Singles Age 30

Household Labor Earnings	Contributing	Percentage Living Standard Change				
		No Tax Change		Income Tax Increase		Consumption Tax
		Before 51	After 51	Before 51	After 51	Age 65
$10,000	Regular	0.9%	3.7%	1.1%	3.7%	2.5%
	Roth	0.9%	2.7%	1.1%	2.6%	1.8%
	Match	4.6%	6.0%	4.7%	5.9%	4.0%
$15,000	Regular	0.4%	4.5%	0.7%	4.0%	2.8%
	Roth	0.4%	4.5%	0.7%	4.6%	2.7%
	Match	4.2%	6.4%	4.5%	5.9%	4.6%
$25,000	Regular	-5.1%	15.0%	-4.4%	13.5%	13.7%
	Roth	-5.1%	15.1%	-4.4%	15.2%	4.8%
	Match	-1.0%	17.1%	-0.2%	15.6%	16.3%
$35,000	Regular	-9.0%	19.4%	-9.0%	19.2%	16.8%
	Roth	-9.0%	19.4%	-9.0%	20.8%	5.9%
	Match	-4.6%	21.9%	-4.6%	21.7%	19.2%
$50,000	Regular	-9.8%	20.8%	-9.8%	20.7%	17.9%
	Roth	-9.8%	19.8%	-9.8%	21.1%	8.2%
	Match	-4.8%	23.2%	-4.8%	23.0%	20.1%
$100,000	Regular	-9.9%	23.2%	-9.9%	22.3%	22.3%
	Roth	-9.9%	21.3%	-9.9%	23.0%	7.0%
	Match	-4.9%	25.6%	-4.9%	24.7%	25.1%
$250,000	Regular	-3.1%	20.8%	-0.6%	16.9%	19.4%
	Roth	-3.1%	16.3%	-0.6%	16.0%	-1.3%
	Match	1.7%	23.5%	4.4%	19.5%	22.4%

Table assumes a 6 percent annual contribution to the regular 401(k) with contributions to the Roth of the size needed to achieve the same short-term living standard change.

Table 9

Living Standard Gains From Retirement Account Contribution

Married Age 30

Household Labor Earnings	Contributing	Percentage Living Standard Change				
		No Tax Change		Income Tax Increase		Consumption Tax
		Before 51	After 51	Before 51	After 51	Age 65
$20,000	Regular	4.5%	4.5%	4.9%	4.9%	2.9%
	Roth	4.5%	4.5%	5.0%	5.0%	2.8%
	Match	8.1%	8.1%	8.4%	8.4%	5.2%
$30,000	Regular	-0.2%	10.7%	0.6%	10.3%	7.8%
	Roth	-0.2%	9.3%	0.6%	9.8%	6.5%
	Match	4.6%	13.1%	5.4%	12.6%	9.5%
$50,000	Regular	-8.3%	17.2%	-7.5%	15.9%	13.8%
	Roth	-8.3%	16.2%	-7.5%	15.9%	12.8%
	Match	-3.2%	19.8%	-2.3%	18.4%	15.9%
$70,000	Regular	-9.4%	18.9%	-8.3%	17.1%	16.0%
	Roth	-9.4%	17.9%	-8.3%	17.5%	15.0%
	Match	-4.2%	21.6%	-3.0%	19.8%	18.2%
$100,000	Regular	-10.2%	20.8%	-8.8%	18.8%	18.4%
	Roth	-10.2%	19.4%	-8.8%	18.8%	17.0%
	Match	-4.8%	23.3%	-3.3%	21.2%	20.6%
$200,000	Regular	-5.9%	20.1%	-3.7%	17.3%	18.7%
	Roth	-5.9%	16.3%	-3.7%	16.0%	15.1%
	Match	-0.6%	22.3%	1.7%	19.5%	20.8%
$500,000	Regular	9.9%	9.9%	9.1%	9.1%	9.5%
	Roth	8.4%[10]	8.4%	10.2%	10.2%	8.1%
	Match	13.6%	13.6%	12.7%	12.7%	13.1%

Table assumes a 6 percent annual contribution to the regular 401(k) with contributions to the Roth of the size needed to achieve the same short-term living standard change.

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[10] 401(k) contribution limits prevent this household, which is not liquidity constrained, from achieving the same living standard with a Roth that it can achieve with a regular 401(k).

Table 10

Living Standard Gains From Retirement Account Contributions

Singles Age 45

Household Labor Earnings	Contributing	Percentage Living Standard Change				
		No Tax Change		Income Tax Increase		Consumption Tax
		Before 51	After 51	Before 51	After 51	Age 65
$10,000	Regular	-5.4%	3.9%	-7.6%	4.4%	3.1%
	Roth	-5.4%	3.7%	-7.6%	3.8%	2.7%
	Match	-0.8%	6.2%	-3.3%	6.4%	4.5%
$15,000	Regular	-7.8%	4.6%	-7.5%	5.0%	3.8%
	Roth	-7.8%	3.4%	-7.5%	3.8%	2.9%
	Match	-3.1%	6.6%	-3.1%	6.9%	5.3%
$25,000	Regular	-11.8%	4.4%	-9.0%	4.2%	4.0%
	Roth	-11.8%	4.3%	-9.0%	4.3%	3.3%
	Match	-5.9%	6.4%	-3.9%	5.8%	5.8%
$35,000	Regular	-12.4%	4.5%	-12.2%	3.9%	3.9%
	Roth	-12.4%	4.5%	-12.2%	5.5%	3.8%
	Match	-6.2%	6.6%	-6.1%	5.7%	6.2%
$50,000	Regular	-11.8%	6.1%	-11.8%	5.1%	5.0%
	Roth	-11.8%	4.9%	-11.8%	5.9%	4.0%
	Match	-5.8%	8.2%	-5.9%	6.8%	7.0%
$100,000	Regular	-12.7%	7.2%	-12.8%	6.0%	5.9%
	Roth	-12.7%	5.2%	-12.8%	6.1%	4.1%
	Match	-6.2%	8.9%	-6.3%	7.8%	8.0%
$250,000	Regular	-4.0%	6.0%	-11.5%	7.2%	7.4%
	Roth	-4.0%	5.2%	-11.5%	7.1%	4.2%
	Match	2.4%	8.7%	-7.7%	11.0%	9.9%

Table assumes a 6 percent annual contribution to the regular 401(k) with contributions to the Roth of the size needed to achieve the same short-term living standard change.

Table 11

Living Standard Gains From Retirement Account Contributions

Married Age 45

Household Labor Earnings	Contributing	Percentage Living Standard Change				
		No Tax Change		Income Tax Increase		Consumption Tax
		Before 51	After 51	Before 51	After 51	Age 65
$20,000	Regular	-5.4%	3.9%	-5.2%	3.9%	3.2%
	Roth	-5.4%	3.7%	-5.2%	3.7%	2.7%
	Match	-0.8%	6.2%	-0.6%	6.2%	4.5%
$30,000	Regular	-7.8%	4.6%	-7.7%	4.5%	3.9%
	Roth	-7.8%	3.4%	-7.8%	3.5%	3.0%
	Match	-3.1%	6.6%	-3.1%	6.4%	5.3%
$50,000	Regular	-11.8%	4.4%	-11.7%	4.3%	3.8%
	Roth	-11.8%	4.3%	-11.8%	4.7%	2.9%
	Match	-5.9%	6.4%	-5.9%	6.2%	5.6%
$70,000	Regular	-12.4%	4.5%	-12.4%	4.4%	3.6%
	Roth	-12.4%	4.5%	-12.4%	5.1%	3.6%
	Match	-6.2%	6.6%	-6.2%	6.5%	5.8%
$100,000	Regular	-11.8%	6.1%	-11.8%	6.0%	4.4%
	Roth	-11.8%	4.9%	-11.8%	5.5%	4.0%
	Match	-5.8%	8.2%	-5.8%	8.1%	6.1%
$200,000	Regular	-12.7%	7.2%	-12.7%	6.9%	5.9%
	Roth	-12.7%	5.2%	-12.7%	5.9%	4.2%
	Match	-6.2%	8.9%	-6.2%	8.6%	8.0%
$500,000	Regular	-4.0%	6.0%	0.5%	5.0%	7.2%
	Roth	-4.0%	5.2%	0.5%	6.1%	3.3%
	Match	2.4%	8.7%	7.2%	7.6%	10.1%

Table assumes a 6 percent annual contribution to the regular 401(k) with contributions to the Roth of the size needed to achieve the same short-term living standard change.

Table 12

Living Standard Gains From Retirement Account Contributions

Singles Age 60

Household Labor Earnings	Contributing	Percentage Living Standard Change		
		No Tax Change	**Income Tax Increase**	**Consumption Tax (Age 65)**
$10,000	Regular	0.4%	0.4%	0.3%
	Roth	0.4%	0.4%	0.3%
	Match	0.9%	0.9%	0.7%
$15,000	Regular	0.4%	0.4%	0.3%
	Roth	0.4%	0.4%	0.3%
	Match	0.9%	0.9%	0.7%
$25,000	Regular	0.2%	0.2%	0.2%
	Roth	0.2%	0.3%	0.2%
	Match	0.8%	0.7%	0.7%
$35,000	Regular	0.2%	0.1%	0.1%
	Roth	0.2%	0.3%	0.1%
	Match	0.7%	0.6%	0.8%
$50,000	Regular	0.4%	0.4%	0.4%
	Roth	0.4%	0.6%	0.2%
	Match	0.9%	0.9%	1.1%
$100,000	Regular	0.7%	0.5%	0.6%
	Roth	0.7%	0.9%	0.2%
	Match	1.2%	1.1%	1.3%
$250,000	Regular	0.9%	0.8%	0.8%
	Roth	0.9%	1.3%	0.2%
	Match	1.6%	1.5%	1.7%

Table assumes a 6 percent annual contribution to the regular 401(k) with contributions to the Roth of the size needed to achieve the same short-term living standard change.

Table 13

Living Standard Gains From Retirement Account Contributions

Married Age 60

Household Labor Earnings	Contributing	Percentage Living Standard Change		
		No Tax Change	**Income Tax Increase**	**Consumption Tax (Age 65)**
$20,000	Regular	0.7%	0.7%	0.6%
	Roth	0.7%	0.7%	0.6%
	Match	1.5%	1.5%	1.1%
$30,000	Regular	0.4%	0.4%	0.4%
	Roth	0.4%	0.4%	0.4%
	Match	1.1%	1.0%	0.9%
$50,000	Regular	0.3%	0.2%	0.2%
	Roth	0.3%	0.4%	0.2%
	Match	0.9%	1.9%	0.8%
$70,000	Regular	0.3%	0.3%	0.3%
	Roth	0.3%	0.4%	0.3%
	Match	1.0%	0.9%	0.9%
$100,000	Regular	0.6%	0.5%	0.5%
	Roth	0.6%	0.8%	0.5%
	Match	1.2%	1.2%	1.1%
$200,000	Regular	0.9%	0.8%	0.9%
	Roth	0.9%	1.3%	0.9%
	Match	1.6%	1.5%	1.5%
$500,000	Regular	0.9%	0.8%	0.9%
	Roth	0.9%	1.4%	0.9%
	Match	1.8%	1.7%	1.8%

Table assumes a 6 percent annual contribution to the regular 401(k) with contributions to the Roth of the size needed to achieve same short-term living standard change.