

TAX-EFFICIENT WITHDRAWAL STRATEGIES

We consider an individual investor who holds a financial portfolio with funds in at least two of the following accounts: a taxable account, a tax-deferred account like a traditional IRA, and a tax-exempt account like a Roth IRA. We examine various strategies for withdrawing these funds in retirement. Conventional wisdom suggests that the investor should first withdraw funds from the taxable account, then the tax-deferred account, and finally the tax-exempt account. We provide the underlying intuition for more tax-efficient withdrawal strategies and demonstrate that these strategies can add more than four years to the longevity to the investor's financial portfolio relative to the strategy espoused by the conventional wisdom.

Keywords: tax-efficient investing, retirement savings, withdrawal strategies

JEL Codes: C63, G11

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I. INTRODUCTION

Suppose an individual investor has funds in at least two of the following accounts: a taxable account, a tax-deferred account (TDA) like a traditional IRA, and a tax-exempt account (TEA) like a Roth IRA. How should he withdraw funds from these accounts in retirement to maximize the longevity of his financial portfolio? Vanguard (2013) expresses the conventional wisdom: “Spend from your taxable account first. ... Next, consider withdrawing money from your tax-deferred accounts. ... Finally, withdraw money from tax-free accounts.” This conventional wisdom has been advocated elsewhere (e.g., Updegrave, 2013). In this paper, we demonstrate several facts. First, in the presence of a flat tax, the order of withdrawal between the TDA and TEA is irrelevant. Second, we identify withdrawal strategies that, in the presence of a progressive tax structure, can add years to the longevity of the financial portfolio; the additional longevity between the most tax-efficient withdrawal strategy and the most tax-inefficient withdrawal strategy can be about 7.5 years. Third, the additional longevity between the most tax-efficient strategy and the conventional-wisdom strategy can be more than 4 years. Finally, the optimal withdrawal strategy is substantially different than the strategy espoused by the conventional wisdom.

The remainder of this paper proceeds as follows: The next section explains that TDAs are best viewed as a partnership, where the individual investor effectively owns $1-t$ of that partnership, and the government effectively owns the remaining t of the partnership, where t is the marginal tax rate when the funds are withdrawn in retirement. Section II illustrates that the individual investor generally receives part of the return on assets held in taxable accounts, while the government receives the remainder. In contrast, properly viewed, the investor receives all of

the returns on assets held in TEAs *and* TDAs. Section III illustrates that, in the presence of a flat tax structure, the order of withdrawal from TDAs and TEAs is irrelevant. Section IV illustrates five withdrawal strategies in the presence of the progressive 2013 federal tax structure. We demonstrate that a tax-efficient withdrawal strategy can add about 7.5 years to the longevity of a financial portfolio. The final section presents a summary.

II. TDA AS A PARTNERSHIP

This section explains that a tax-deferred account is best viewed as a partnership. A TDA is like a limited partnership in which the individual investor is the general partner and owns $1-t$ of the partnership interest, where t is the marginal tax rate when the funds are withdrawn in retirement. The government is effectively a limited partner and owns the remaining t of the partnership. This concept is established in the finance literature (e.g., Reichenstein 2001, 2006a, 2006b, 2007a, 2007b; Reichenstein and Jennings, 2003; Dammon, Spatt, and Zhang, 2004; Horvitz, 2005; Horan 2005, 2007a, 2007b; and Reichenstein, Horan, and Jennings, 2012), but to the best of our knowledge it has not been embraced outside financial journals.

Conceptually, we can separate each dollar in a TDA into $1-t$ dollar of the investor's after-tax funds plus t dollar, which is the government's share of the current principal. The investor is in effect the general partner; he or she gets to decide where the funds are invested and when they are withdrawn, subject to required minimum distributions. The government is the limited partner. When funds are withdrawn, the government receives t of the withdrawal.

Prior research has examined the implications of this concept for several investment decisions. First, should someone save in a TEA like a Roth 401(k) or a TDA like a 401(k)? Prior research on this issue includes Horan (2005), Waltenberger, Rothermich, and Reichenstein (2006), Reichenstein (2007a, 2008), and Reichenstein, Jennings, and Horan (2012). For a

discussion of how this concept may affect the calculation of an individual investor's asset allocation, see Reichenstein and Jennings (2003), Reichenstein (2006a, 2008), and Horan (2007b). The asset-location literature examines the issue of whether individual investors should hold stocks in taxable accounts and bonds in retirement accounts (i.e., TEAs and TDAs) or vice versa, while attaining the target asset allocation. For more on this issue, see Brunel (2001), Reichenstein and Jennings (2003), Reichenstein (2006a, 2008), Horan (2007a), Horan and Al Zaman (2008), and Meyer and Reichenstein (2013b). This study examines the implications for withdrawal strategies in retirement. Prior work on this issue includes Horan (2006a, 2006b), Reichenstein (2006c, 2008), and Meyer and Reichenstein (2013a).

III. INDIVIDUAL INVESTOR'S RETURNS ACROSS SAVINGS VEHICLES

The conventional wisdom is based on the following idea: An individual investor generally pays a higher tax rate on returns on assets held in taxable accounts than on returns on assets held in tax-favored retirement accounts (i.e., TDAs or TEAs). Moreover, the conventional wisdom says funds in TEAs grow tax-exempt, while funds in TDAs only grow tax-deferred. According to the conventional wisdom, the individual investor receives all of returns on assets held in a TEA but only part of returns on assets held in a TDA. So, the individual investor should withdraw funds from the least tax-favored taxable account first, followed by the TDA, while preserving funds in the most tax-favored TEA until last. This section explains the flaw in this conventional wisdom. In particular, properly viewed, the after-tax value of funds in both the TEA and TDA grow tax-exempt.

In this section, we consider two assets – stocks and bonds (or any other fixed-income asset) – and three savings vehicles – TEA, TDA, and taxable account. We demonstrate that the

individual investor effectively receives all returns on assets held in both TEAs and TDAs, while he generally receives only part of returns on assets held in taxable accounts.

Suppose an investor holds a TEA with \$1 of after-tax funds, and these funds are invested in an asset earning r per year, where r is the pretax rate of return. The underlying asset can be bonds or stocks. After n years, the investor withdraws the funds from the TEA and spends them. The after-tax value grows at the pretax rate of return, from \$1 today to $(1+r)^n$ dollars at withdrawal n years hence. The individual investor receives all of the asset's returns, so the effective tax rate is zero.

Next, suppose an investor holds a TDA with \$1 of pretax funds. As explained earlier, conceptually this dollar can be separated into $1-t$ dollar of the investor's after-tax funds, with the government effectively owning the remaining t dollar. The underlying asset can be bonds or stocks, and these funds earn a geometric average return of r per year for n years. After n years, the investor withdraws the funds from the TDA and spends them. At withdrawal in n years, the pretax value of the TDA is $(1+r)^n$ dollars. The government takes t of this amount in taxes, and the investor receives $(1-t)(1+r)^n$ dollars after taxes. The investor's after-tax funds grow from $1-t$ today to $(1-t)(1+r)^n$ in n years. That is, the investor's after-tax funds grow effectively tax-exempt at the asset's pretax return. Properly viewed, the effective tax rate is zero.

Finally, consider a taxable account with a beginning market value and cost basis of \$1. If the underlying asset is a taxable bond (or other fixed-income asset), its after-tax value grows at $r(1-t_i)$ where t_i is the marginal tax rate for that year. The individual investor receives $(1-t_i)$ of the return, while the government receives the remainder.

The analysis for stocks held in a taxable account is more complex. Again, consider a taxable account with a beginning market value and cost basis of \$1. The pretax return of r

consists of dividend yield, *div*, plus capital gain, *cg*. The dividends are subject to taxes each year unless the taxpayer is in the 10% or 15% tax bracket. Thus, the investor generally receives only part of this return, while the government gets the remainder. Capital gains grow tax deferred until realized but, once realized, the government generally receives part of this return; that is, the individual investor generally does not receive all of this return.¹

In summary, properly viewed, individual investors receive all returns on assets held in a TEA and TDA, but they generally receive only part of the returns on assets held in taxable accounts. Thus, as a rule of thumb, withdrawals should come from the taxable account before either a TEA or TDA. So, contrary to the conventional wisdom, the TEA is not more tax-advantaged than the TDA. As we demonstrate in the next section, in the presence of a flat tax rate, the order of withdrawal between a TEA and TDA is irrelevant. Furthermore, as we demonstrate in Section V, a key to a tax-efficient withdrawal strategy is to withdraw funds from TDAs such that the investor minimizes the average of the marginal tax rates on these withdrawals.

IV. WITHDRAWAL STRATEGIES WITH A FLAT TAX RATE

This section shows that, in the presence of a flat tax rate, withdrawals should come from the taxable account first, but the withdrawal order between TDA and TEA does not matter. To hold everything else constant, we assume the underlying asset is the same in all accounts. The underlying asset is a bond earning a 4% pretax rate of return, and the flat tax rate is 25%. The investor spends \$45,000 each year, which requires after-tax funds. For simplicity, but without loss of generalization, we assume inflation is zero. We compare three pairs of withdrawal strategies.

¹ The capital gain can be tax-free if this taxpayer is 1) in the 10% or 15% tax bracket, 2) awaits the step-up in basis at death, or 3) donates the appreciated asset to a qualified charity. Nevertheless, in general, the individual investor receives only part of the return on stocks held in taxable accounts.

The first pair compares two withdrawal strategies: withdrawing funds from a TEA followed by a taxable account and the reverse order. At the commencement of his retirement, the investor has \$379,589.92 in a TEA and \$513,105.56 in a taxable account. In Strategy 1A in Table 1, he withdraws \$45,000 at the beginning of Year 1 from the TEA. The year-end value is thus \$347,973.52, $[(\$379,589.92 - \$45,000)(1.04)]$. He withdraws \$45,000 from the TEA at the beginning of each year until it is exhausted with the withdrawal of the remaining \$45,000 at the beginning of Year 10. The taxable account has grown at the 3% after-tax rate of return, $[4\%(1-0.25)]$, and is worth \$689,570.96, $[\$513,105.56(1.03)^{10}]$, at the end of Year 10. The investor withdraws \$45,000 from the taxable account at the beginning of Year 11 and each year thereafter until it is exhausted with the withdrawal of the remaining \$45,000 at the beginning of Year 30. Because taxes are paid on returns each year, the withdrawals are tax-free returns of principal. This withdrawal strategy lasts precisely 30 years.²

In Strategy 1B, the investor withdraws funds from the taxable account first, followed by the TEA. At the beginning of Year 1, he withdraws \$45,000 from the taxable account, and the remaining funds grow at the 3% after-tax rate of return. At the beginning of Year 14, he withdraws the remaining \$29,628.23 from the taxable account and \$15,371.77 from the TEA to meet his spending needs. Beginning in Year 15, he withdraws \$45,000 from the TEA. At the beginning of Year 35, he withdraws the remaining \$11,641.45 from the TEA, which meets 26% of that year's spending goal. In Strategy 1B, his portfolio lasts 34.26 years, which is 4.26 years longer than Strategy 1A. This additional longevity is due to the TEA's after-tax value growing at the 4% pretax rate of return instead of the taxable account's 3% after-tax rate of return.

² We set the retirement period at 30 years to correspond with the 30-year retirement period usually considered in the withdrawal rate literature.

The second pair compares two additional withdrawal strategies: withdrawing funds from a TDA followed by a taxable account and the reverse order. At the commencement of his retirement, the investor has \$506,119.89 in a TDA and \$513,105.56 in a taxable account, where the initial TDA balance is the initial TEA balance divided by $(1-t)$ or 0.75. In Strategy 2A, he withdraws \$60,000 of pretax funds at the beginning of Year 1 from the TDA, and the year-end value is \$463,964.69 $[(\$506,119.89 - \$60,000)(1.04)]$. The \$60,000 pretax withdrawal meets the \$45,000 after-tax spending goal. He withdraws \$60,000 from the TEA at the beginning of each year until it is exhausted with the withdrawal at the beginning of Year 10. Like Strategy 1A, the taxable account is worth \$689,570.96 at the end of Year 10. This investor withdraws \$45,000 from the taxable account at the beginning of Year 11 and each year thereafter until it is exhausted with the withdrawal at the beginning of Year 30.

In Strategy 2B, the investor withdraws funds from the taxable account first, followed by the TDA. At the beginning of Year 1, he withdraws \$45,000 from the taxable account, and the remaining funds grow at the 3% after-tax rate of return. Like Strategy 1B, at the beginning of Year 14, he withdraws the remaining \$29,628.23 from the taxable account and \$20,495.69 from the TDA, where the latter provides the remaining \$15,371.77 of after-tax funds to meet the spending needs, $[\$20,495.69(1-0.25) = \$15,371.77]$. Beginning in Year 15, he withdraws \$60,000 from the TDA, which meets the spending goal. At the beginning of Year 35, he withdraws the remaining \$15,521.94 of pretax funds from the TDA, which meets 26% of that year's spending goal. In Strategy 2B, his portfolio lasts 34.26 years, which is 4.26 years longer than Strategy 2A. This additional longevity is due to the TDA after-tax value growing at the 4% pretax rate of return instead of the taxable account's 3% rate of return. Comparing Strategies 1A and 2A and Strategies 1B and 2B reveals that, for someone with a 25% flat tax rate, a TDA

worth \$X is equivalent to a TEA worth $\$X(1 - 0.25)$. Stated differently, in the presence of a 25% flat tax rate, the TDA is like a TEA where the government effectively owns 25% of the partnership.

The third pair compares two additional withdrawal strategies: withdrawing funds from a TDA followed by the TEA and the reverse order. At the commencement of his retirement, the investor has \$506,119.89 in the TDA and \$379,589.92 in a TEA. In Strategy 3A, he withdraws \$60,000 of pretax funds from the TDA at the beginning of each year until it is exhausted with the withdrawal at the beginning of Year 10. This meets the annual spending goal. At the beginning of Years 11 through 26, he withdraws \$45,000 from the TEA. At the beginning of Year 27, he withdraws the remaining \$31,013.53 of after-tax funds, which satisfies 69% of that year's spending goal. This withdrawal strategy lasts 26.69 years.

In Strategy 3B, he withdraws \$45,000 from the TEA at the beginning of each year until it is exhausted with the withdrawal at the beginning of Year 10. This meets the annual spending goal. At the beginning of Years 11 through 26, he withdraws \$60,000 from the TDA. At the beginning of Year 27, he withdraws the remaining \$41,351.37 of pretax funds, which satisfies 69% of that year's spending goal. As with Strategy 3A, this withdrawal strategy lasts 26.69 years. Because the after-tax values of both the TEA and TDA grow at 4%, the order of withdrawal between the TDA and TEA does not matter.

This section demonstrated that, with a flat tax rate, the order of withdrawal between the TDA and TEA does not matter. *The conventional wisdom is indeed wrong!*

V. WITHDRAWAL STRATEGIES WITH A PROGRESSIVE TAX STRUCTURE

This section shows that it is possible to add years to the longevity of a financial portfolio by tax-efficiently withdrawing funds. The additional longevity is due to two principles. First, the

investor generally receives a smaller portion of the underlying asset's returns when the asset is held in a taxable account than in either a TDA or TEA. Second, the TDA is essentially a partnership, where the government effectively owns t of the principal, where t is the marginal tax rate at withdrawal. One objective of a tax-efficient withdrawal strategy is to identify opportunities to withdraw funds from TDAs when those funds would be taxed at unusually low tax rates for that retiree. For many retirees, these opportunities are likely to occur before required minimum distributions (RMDs) begin and in years with high medical expenses.

Suppose an investor retires at age 65 and has funds in a taxable account and TDA. If she follows the conventional wisdom, she would withdraw funds from her taxable account until it is exhausted. Since withdrawals from taxable accounts are usually mostly, if not entirely, tax-free withdrawals of principal, following the conventional wisdom often results in the retiree being in an unusually low tax bracket before RMDs begin. This retiree should not lose the opportunity to withdraw funds during such years if they will be taxed at an unusually low tax rate for her.

A second circumstance in which a retiree may be in an unusually low tax bracket is when she has high tax-deductible medical expenses. In those years, she will likely be in a low, if not zero, tax bracket. Although forecasting this circumstance presents a financial-planning problem (because no one knows for certain whether they will have such high medical-expense years), it is nevertheless desirable to try to save some TDA balances for this non-trivial possibility.

When withdrawing funds from the financial portfolio, one objective is to minimize the average of marginal tax rates on TDA withdrawals. With a progressive tax structure, this goal can be accomplished by withdrawing funds from the TDA each year as long as these withdrawals would be taxed at a low marginal tax rate for this investor and then taking additional withdrawals from the taxable account until it is exhausted. After the taxable account has been

exhausted, the retiree should withdraw funds from the TDA each year as long as these withdrawals would be taxed at a low marginal tax rate for this investor and then take additional withdrawals from the TEA. This strategy allows the investor to minimize t – the government’s take – and thus maximize the longevity of her financial portfolio.

We use the 2013 federal tax brackets for our analysis. For simplicity, we do not consider the Alternative Minimum Tax. In 2013, the personal exemption is \$3,900, and the standard deduction for someone age 65 or older at year end is \$7,600. Thus, the first \$11,500 of Adjusted Gross Income is tax free. The tops of the 10%, 15%, and 25% tax brackets for a single taxpayer are \$8,925, \$36,250, and \$87,850, respectively. So, a single retiree age 65 or older can withdraw up to \$47,750, [$\$11,500 + \$36,250$], from the TDA each year with these withdrawals taxed at 15% or less. Although we present an example for a single taxpayer, the same logic applies to married couples. For simplicity, but without loss of generalization, we assume the inflation rate is zero so the tax brackets remain constant and the reader can more easily follow the example. The investor begins retirement with \$904,453.85 in a TDA, \$244,809.83 in a TEA, and \$530,974.82 in a taxable account. The annual spending goal is \$81,400. In the first four strategies, we assume the asset is a taxable bond earning 4% interest. In the fifth strategy, we assume a 50% bond/50% stock asset allocation but set returns to produce at 4% geometric average return, the same as in the other strategies.

Table 2 presents the results from five withdrawal strategies. In Strategy 1, the retiree withdraws funds in the following order: TEA, TDA, and finally taxable account. This withdrawal strategy is the opposite of the strategy recommended by the conventional wisdom. By design, the portfolio lasts 30 years.

Strategy 2 presents the conventional wisdom. The retiree withdraws funds in the following order: taxable account, TDA, and finally the TEA. This strategy incorporates the principle that the taxable account grows least tax efficiently but does not incorporate the partnership principle. As we demonstrate subsequently, using this withdrawal strategy, the portfolio lasts 33.15 years.

In Strategy 3, in her early retirement years, the retiree withdraws funds each year from the TDA to the top of the 15% tax bracket and remaining funds to meet her spending goal from the taxable account. After the taxable account has been exhausted, she withdraws funds each year from the TDA to the top of the 15% tax bracket and remaining funds to meet the spending goal from the TEA. This strategy applies both principles, and the portfolio lasts 34.37 years.

In Strategy 4, the retiree converts \$47,750 at the beginning of each year from the TDA to a TEA (e.g., a conversion from a 401(k) to a Roth IRA), which takes her taxable income to the top of the 15% bracket. She then withdraws sufficient funds from her taxable account to meet the \$81,400 spending goal, plus funds to pay taxes on the \$47,750 conversion. It is instructive to compare Strategies 3 and 4 after the distribution at the beginning of Year 1. Strategy 4 has \$47,750 more in the TEA and \$47,750 less in the taxable account than Strategy 3. In this example, Strategy 4 converts \$47,750 to the TEA at the beginning of Years 1 through 6. After the Year 6 distribution, Strategy 4 has about \$392,000 more in the TEA than Strategy 3.³ Because the TEA grows tax free, while the taxable account grows at the after-tax rate of return, Strategy 4 allows the portfolio to last longer. In this example, her portfolio lasts 1.14 years longer than in Strategy 3.

³ After the Year 6 conversion, the TEA has \$602,551 in Strategy 4 (ending balance Year 5 of \$554,801 + \$47,750), but only \$210,150 in Strategy 3.

In Strategy 5, the retiree converts two separate \$47,750 amounts from the TDA to the TEA at the beginning of the first 25 years. In addition, at the beginning of each year she withdraws the spending goal of \$81,400 plus \$4,991.25, which is taxes due on one \$47,750 conversion, from the taxable account until it is exhausted. After the taxable account has been exhausted, at the beginning of each year through Year 25 she withdraws \$81,400 plus \$4,991.25 from the TEA. At the end of each of the first 25 years, she recharacterizes the lower valued Roth TEA. Thus taxes only need to be paid on one Roth conversion. Beginning in Year 26, the retiree withdraws funds from the TDA to fully use the 10% tax bracket and then withdraws additional funds from the TEA to meet the \$81,400 spending need. This strategy allows the portfolio to last 37.53 years.

A. Details of Strategy 1

In Strategy 1, the retiree withdraws \$81,400 from the TEA at the beginning of the first three years. The remaining TEA balance grows at the 4% pretax rate of return. We set the initial balance so that this account lasts precisely three years.

For Years 1 through 3, the TDA balance grows at 4%. At the beginning of Years 4 through 16, the retiree withdraws \$99,271.67 from this TDA, which provides the spending goal of \$81,400 after taxes.⁴ We set the initial TDA balance so that this account lasts precisely 16 years.

For simplicity, Table 2 assumes the 4% interest on her taxable account is tax-free for the first three years, taxed at 28% for Years 4 through 16, and tax-free after Year 16. In the first three years and in Year 17 and later, her adjusted gross income consists entirely of this taxable interest, so her taxable income would be low, perhaps zero. In Years 4 through 16, the TDA

⁴ The \$99,271.67 consists of \$11,500, \$8,925, \$27,325, and \$51,521.67, which are taxed at 0%, 10%, 15%, and 25%. The after-tax amounts total \$81,400.

withdrawal takes her taxable income to within a few dollars of the top of the 25% tax bracket. So, we assume the 4% interest earned in the taxable account is subject to the 28% tax bracket. Thus the after-tax return is 2.88%, $[4\% (1 - 0.28)]$. At the beginning of Years 17 through 30, she withdraws \$81,400 from her taxable account. Since she pays taxes each year on the interest, these withdrawals represent principal and are thus tax-free. We set the initial taxable account balance so that this account would last precisely 30 years.⁵

B. Details of Strategy 2

In this strategy, the retiree withdraws \$81,400 from the taxable account at the beginning of Years 1 through 7 with the remaining funds assumed to grow at the 4% pretax rate of return.⁶ In Year 8, she withdraws the remaining \$54,599.61 from the taxable account and \$28,975.46 from the TDA to meet her \$81,400 spending goal. In Years 9 through 24, she withdraws \$99,271.67 from the TDA, which meets her spending goal. In Year 25, she withdraws the remaining funds from the TDA and additional funds from the TEA to meet her spending goal. In Years 26 through 33, she withdraws \$81,400 from the TEA. In Year 34, she withdraws the remaining \$12,233.51 from the TEA, which meets 15% of that year's spending needs. With withdrawal Strategy 2, her portfolio lasts 33.15 years. This additional 3.15 years compared to Strategy 1 is due to withdrawing funds from the least tax-efficient taxable account before the more tax-efficient TDA and TEA.⁷

⁵ In a more detailed spreadsheet, we calculated her taxes in Years 1 to 3 and 17 to 30 on bonds held in her taxable account. In addition, we calculate her precise after-tax returns in Years 4-16 on this account. This more precise calculation reduced her portfolio's longevity to 29.66 years. Thus, our simplifying assumptions understate the additional longevity that is possible from a tax-efficient withdrawal strategy.

⁶ In Years 1 to 3, she would owe \$722.80, \$469.23, and \$206.52 in taxes on interest earned in taxable account. With these details, her portfolio provides funds for 33.09 years, a little less than suggested in Table 2.

⁷ In this example, she did not meet her required minimum distribution in Years 6 through 8. If we assume she begins retirement at age 62 then there would have been no violation of RMD rules. However, if she retired at 62 then her standard deduction amount would have been \$1,500 lower before than after age 65 due to the elderly deduction. This would have caused the tax-free withdrawal amount and withdrawal amount to the top of the 15% tax bracket to

C. Details of Strategy 3

At the beginning of Years 1 through 18, the retiree withdraws \$47,750 from the TDA and \$38,641.25 from the taxable account, which provides \$81,400 after taxes. In Year 19, she withdraws \$47,750 from her TDA, the remaining funds from her taxable account, and \$34,888.05 from her TEA to meet her spending goal. In Years 20 through 34, she withdraws \$47,750 from the TDA and \$38,641.25 from the TEA, which provides \$81,400 after taxes. At the beginning of Year 35, she withdraws the remaining funds, which meet her spending needs for 0.37 years. Strategy 3 allows her portfolio to last 34.37 years, which is 1.22 years longer than in Strategy 2. This additional longevity is due to withdrawing funds from the TDA in a manner such that none of these funds are taxed at a marginal tax rate above 15%. In contrast, in Strategy 2, in each year from Years 8 through 24, \$51,521.67 of TDA withdrawals were taxed at 25%.

D. Details of Strategy 4

At the beginning of Years 1 through 6, the retiree converts \$47,750 from the TDA to the TEA. In addition, she withdraws \$81,400 plus \$4,991.25, which pays the taxes on the \$47,750 TDA withdrawal, from her taxable account. This meets her spending needs. In Year 7, she withdraws – not converts – \$47,750 from the TDA, the remaining taxable account balance, plus sufficient funds from the TEA to meet her spending target. From Years 8 through 34, she withdraws \$47,750 of pretax funds from her TDA plus \$38,641.25 from her TEA to meet her needs. At the beginning of Year 36, she withdraws the remaining funds, which meet her spending needs for 0.51 year. Strategy 4 allows her portfolio to last 35.51 years or 1.14 year longer than in Strategy 3.

E. Details of Strategy 5

differ on each side of age 65. To keep the example simple for readers to follow, we avoided this complexity and assumed she retired at 65. It should be obvious that this minor “error,” inserted for simplicity sake, does not materially affect the longevity of Strategy 2 compared to the longevities of other strategies.

In Strategy 5, we consider the impact of a Roth conversion and recharacterization strategy on portfolio longevity. In the modeled version of this strategy, the retiree converts two separate \$47,750 amounts from a TDA to a TEA at the beginning of the first 25 years. One \$47,750 amount is held in stocks in one Roth IRA, while the other Roth IRA contains a one-year bond. At the end of the year, the retiree retains the higher Roth IRA and recharacterizes the lower amount, where a recharacterization undoes the Roth conversion and thus turns it back into a TDA. It is important to hold the stocks and bonds in separate Roth IRAs. If held in the same Roth IRA then the recharacterized funds would have to be based on the ratio of the market value of the two investments at the time of recharacterization.

This recharacterization option is valuable. Suppose stocks increase such that the \$47,750 converted to a Roth IRA at the beginning of year is worth \$60,000 at year end. The retiree would retain this Roth IRA, while recharacterizing the Roth TEA with the bond. This allows the retiree to avoid paying taxes on the \$12,250 market gain not only this year but also in future years since the funds are in a Roth TEA. In contrast, suppose stocks fall in value. Then the retiree would recharacterize the Roth IRA containing stocks and retain the Roth IRA with the bond. This allows the retiree to avoid paying taxes on \$47,750 – the conversion value of the stocks – that are now worth less than this amount. As we shall see, this Roth conversion and recharacterization option allows the portfolio to last two years longer.

To make these results easier to follow, we make some simplifying assumptions. We assume calendar-year stock returns follow a repeating three-year sequence of -10%, 26%, and 8%, and the retiree recharacterizes the lower Roth IRA amount at the end of the calendar year. Thus annual stock returns have an arithmetic mean of 8% and standard deviation of 18%. To make these results comparable to prior returns, we assume a stock-bond asset allocation of

50%/50% for all three account types, and an annual bond return of 1%. This sets the long-run geometric average pretax return at 4%, $[0.5\{((0.90)(1.26)(1.08))^{1/3} - 1\} + 0.5(0.01)]$, the same as in prior strategies. For the taxable account, we assume all stock returns are realized each year (technically, in one year and one day) and taxed at 15%, while the 1% bond return is taxed at 25%.

In this strategy, the retiree converts two separate \$47,750 amounts from the TDA to the TEA at the beginning of the first 25 years. In addition, at the beginning of each year she withdraws the spending goal of \$81,400 plus \$4,991.25, which is taxes due on one \$47,750 conversion, from the taxable account until it is exhausted. After the taxable account has been exhausted, at the beginning of each year through Year 25 she withdraws \$81,400 plus \$4,991.25 from the TEA. At the end of Years 1 through 25, if stock returns are positive then she retains the TEA containing stocks and recharacterizes the TEA containing the one-year bond. If stocks lose value then she recharacterizes the TEA containing stocks.

Beginning in Year 26, she changes her withdrawal strategy. Since the TDA is now relatively low, henceforth at the beginning of each year she withdraws (not converts) \$20,425 from the TDA, an amount that takes her taxable income to the 10% bracket. In addition, she withdraws \$61,867.50, [$\$81,400 - \$19,532.50$, where the \$19,532.50 is the after-tax amount of the TDA withdrawal], from the TEA to meet her spending goal. At the beginning of Year 38, she withdraws the remaining funds, which meet 53% of that year's spending needs. Her portfolio lasts 37.53 years, which is 2 years longer than with Strategy 4 and more than 4 years longer than with the conventional wisdom Strategy 2. This example indicates that the recharacterization option can be a valuable option that can extend the longevity of a portfolio by a couple of years.

The modeled version of this Roth recharacterization option understates its actual value for two reasons. First, in reality the retiree can convert more than two separate amounts into separate Roth IRAs in early January. For example, she could convert four separate amounts and hold U.S. stocks in one Roth IRA, international developed markets stocks in a second Roth IRA, emerging markets stocks in a third, and high-grade, short-term bonds in a fourth Roth IRA. At the recharacterization date, the retiree would keep the highest valued Roth IRA and recharacterize the rest. Second, the model assumes the recharacterization option expires after one year. In reality, the retiree could delay the recharacterization decision until October 15 of the next calendar year. So, the recharacterization option expires in 22.5 months. For more on the value of this recharacterization option, see Stowe, Fodor, and Stowe (2013).

VI. HIGH MEDICAL EXPENSES

A second circumstance when many retirees will be in an unusually low tax bracket is when they have large tax-deductible medical expenses. High medical-expense years often occur at the end of life. From a tax-planning perspective, it is useful to save some TDA balances to accommodate the non-trivial possibility that she will incur high medical expenses later in life. This section demonstrates that, if a retiree incurs high medical expenses, it is desirable to save some TDA balances to pay for these expenses. Using the partnership perspective, the government takes t of each dollar withdrawn from the TDA. Because the retiree's tax rate generally will be unusually low in high medical-expense years, it is desirable to save TDA balances for such expenses.

This section repeats the prior example but assumes the retiree becomes impaired at age 91 (i.e., at the beginning of Year 27), spends her last three years in an assisted living facility or nursing home, and dies at age 94 (i.e., at the end of Year 29). As before, she spends \$81,400 after

taxes per year in her last three years, Years 27 through 29. Her son inherits her remaining assets, and he is in a 25% tax bracket. Table 3 presents end-of-year balances for Strategies 1 through 5.

In Strategy 1, the retiree dies at age 94, and her beneficiary inherits \$81,400 held in a taxable account. Because the cost basis is also \$81,400, this is the after-tax amount inherited by her son. In Strategy 2, she dies at age 94, and her son inherits \$317,750 of Roth IRA assets tax-free. In Strategy 3, she withdraws \$81,400 from her 401(k) in Years 27 through 29 to pay expenses, while she does not withdraw any funds from her Roth IRA for these years. Although these pretax withdrawals from the 401(k) increase her taxable income, they are likely tax-free due to deductible medical expenses.⁸ At her death, her son inherits \$321,910 of TEA assets plus \$118,711 of TDA assets. Because her son is in the 25% tax bracket, Strategy 3 provides him \$410,943 after taxes [$\$321,910 + \$118,711(1 - 0.25)$]. In Strategy 4, she withdraws \$81,400 from her 401(k) in Years 27 through 29 and nothing from her Roth IRA. As before, her taxes would be, at most, trivial. Because her son is in the 25% tax bracket, Strategy 4 provides him \$486,280 after taxes. In Strategy 5, she withdraws \$81,400 from her 401(k) in Years 27 and 28 and nothing from her Roth IRA. In Year 29, she withdraws the remaining funds from her 401(k) and additional funds from her Roth IRA to meet her spending needs. To keep the assumed returns the same as in Strategies 1 through 4, we assume funds earn 4% pretax each year during these last three years. Strategy 5 provides her son with \$626,401 after taxes. This amount is approximately \$309,000 more than would be available from the conventional wisdom Strategy 2 and approximately \$140,000 more than would be available from Strategy 4.

⁸ Her Adjusted Gross Income and medical expenses would be \$81,400. Medical expenses exceeding 10% of AGI would be tax deductible. The \$8,140 of AGI after the deductible medical expenses would likely be less than her personal exemption and other itemized expenses including the deduction for begin over 65. So, her taxes would likely be zero. If not zero then her taxes would be trivial.

This example demonstrates that, because many retirees incur high medical expenses late in life, it is desirable to retain some funds in TDAs to pay for this likelihood. Using the partnership principle, the government effectively owns t of the TDA's principal. Due to the high medical expenses, the effective tax rate will probably be zero on these TDA withdrawals. Thus, this example is an application of the second principle: Withdraw funds from the TDA whenever those funds would be taxed at an unusually low tax rate for that retiree.

VII. SUMMARY

The conventional wisdom suggests that a retiree should withdraw funds from taxable accounts until they are exhausted, then from tax-deferred accounts like a 401(k) until they are exhausted, and finally from tax-exempt accounts like a Roth 401(k). We demonstrate that the conventional wisdom is wrong.

Properly viewed, a tax-deferred account (TDA) is like a partnership, where the investor effectively owns $1-t$ of the partnership's current principal, where t is the marginal tax rate when the funds are withdrawn in retirement. The government effectively owns the remaining t of the partnership. When viewed from this perspective, the after-tax value of the investor's portion of funds in the TDA grows tax-exempt. Thus, assuming a flat tax rate, a retiree's portfolio would last precisely the same length of time if the order of withdrawals is taxable account then TDA then TEA or taxable account then TEA then TDA.

The partnership principle is useful in devising tax-efficient withdrawal strategies in the presence of progressive tax rates. In particular, a key to tax-efficient withdrawal strategies is to time withdrawals from TDAs for times when those withdrawals would be subject to an unusually low tax rate for that investor. For example, if a taxpayer will usually be subject to a 25% marginal rate once required minimum distributions begin, she could withdraw funds each year

from her TDA as long as those withdrawals would be subject to a 15% or lower marginal tax rate and then withdraw additional funds from the taxable account. After the taxable account has been exhausted, so that the TDA and TEA remain, she could withdraw some funds from the TDA each year. At a minimum, this amount should be the tax-free amount that would be offset by the sum of her personal exemption and either standard deduction or itemized deductions. The optimal withdrawal may also be a higher amount such as withdrawals that would take the taxpayer to the top of the 10% or 15% tax rate for this investor. Additional amounts each year could be withdrawn from the TEA. The objective is to minimize the average of marginal tax rates on the TDA withdrawals.

We also present two tax-efficient withdrawal strategies that use Roth conversions. In the first, the taxpayer converts sufficient funds from the TDA to a Roth IRA to fully use the 15% tax bracket; she would have been in the 25% bracket if all withdrawals came from the TDA. Then, she withdraws additional funds as needed to meet her spending needs from the taxable account. Once the taxable account has been exhausted, she withdraws sufficient funds each year from the TDA to fully use the 15% bracket and then withdraw additional funds from the TEA. The advantage of this strategy compared to the prior strategy is that the taxpayer has more funds in the TEA growing tax-free but fewer funds in the taxable account growing at an after-tax rate of return.

In the second tax-efficient strategy that uses the Roth conversion, the taxpayer makes two separate Roth conversions at the beginning of the first 25 retirement years with each conversion amount begin sufficient to fully use the 15% tax bracket. At the end of the year, she retains the funds in the Roth TEA with the higher returns and recharacterizes the other Roth TEA. This

strategy allows her to avoid taxes on the returns earned in the year on the converted funds, and these funds henceforth will grow tax free in the TEA.

In a detailed example using the 2013 federal tax brackets, we demonstrated that the most tax-efficient withdrawal strategy can add about 7.5 years compared to a tax-inefficient strategy. In addition, the most tax-efficient withdrawal strategy added more than 4 years compared to the strategy advocated by the conventional wisdom.

Finally, we showed the advantage of holding some funds in TDAs to meet the possibility of high medical expenses, which often occur late in life. Although these TDA withdrawals are subject to taxes, the individual probably will be in the 0% tax bracket due to the medical expenses.

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Table 1: Longevity Comparisons for Withdrawal Strategies with Flat Tax Rate

Year	Str 1A		Str 1B		Str 2A		Str 2B		Str 3A		Str 3B	
	TEA	tax acct	TEA	tax acct	TDA	tax acct	TDA	tax acct	TDA	TEA	TDA	TEA
1	347974	528499	394774	482149	463965	528499	526365	482149	463965	394774	526365	347974
2	315092	544354	410564	450263	420123	544354	547419	450263	420123	410564	547419	315092
3	280896	560684	426987	417421	374528	560684	569316	417421	374528	426987	569316	280896
4	245332	577505	444067	383594	327109	577505	592089	383594	327109	444067	592089	245332
5	208345	594830	461829	348752	277794	594830	615772	348752	277794	461829	615772	208345
6	169879	612675	480302	312864	226505	612675	640403	312864	226505	480302	640403	169879
7	129874	631055	499514	275900	173166	631055	666019	275900	173166	499514	666019	129874
8	88269	649987	519495	237827	117692	649987	692660	237827	117692	519495	692660	88269
9	45000	669486	540275	198612	60000	669486	720366	198612	60000	540275	720366	45000
10	0	689571	561886	158220	0	689571	749181	158220	0	561885.81	749181	0
11		663908	584361	116617		663908	779148	116617		537561	716748	
12		637475	607736	73765		637475	810314	73765		512264	683018	
13		610250	632045	29628		610250	842727	29628		485954	647939	
14		582207	641340	0		582207	855120	0		458592	611457	
15		553323	620194			553323	826925			430136	573515	
16		523573	598202			523573	797602			400542	534055	
17		492930	575330			492930	767106			369763	493018	
18		461368	551543			461368	735391			337754	450338	
19		428859	526805			428859	702406			304464	405952	
20		395375	501077			395375	668102			269842	359790	
21		360886	474320			360886	632426			233836	311782	
22		325363	446493			325363	595324			196390	261853	
23		288774	417552			288774	556736			157445	209927	
24		251087	387454			251087	516606			116943	155924	
25		212269	356153			212269	474870			74821	99761	
26		172288	323599			172288	431465			31014	41351	
27		131106	289743			131106	386324					
28		88689	254532			88689	339377					
29		45000	217914			45000	290552					
30		0	179830			0	239774					
31			140223				186965					
32			99032				132043					
33			56194				74925					
34			11641				15522					
		30	34.26			30	34.26			26.69	26.69	

Year-end balances are rounded to the nearest dollar.

Table 2: Longevity Comparisons for Withdrawal Strategies with Progressive Tax Rates

Year	Strategy 1			Strategy 2			Strategy 3			Strategy 4			Strategy 5		
	TEA	TDA	tax acct	TEA	TDA	tax acct	TEA	TDA	tax acct	TEA	TDA	tax acct	TEA	TDA	tax acct
1	159669	953165	571585	244325	953165	486929	244325	903505	526289	293985	903505	477106	272584	827035	441786
2	81400	991292	594449	254098	991292	421750	254098	889986	502277	355405	889986	402436	369548	878520	415686
3	0	1030944	618227	264262	1030944	353964	264262	875925	477545	419281	875925	325527	437747	866483	341725
4		968939	636031	274833	1072181	283467	274833	861302	452071	485712	861302	246309	466276	779264	243525
5		904454	654349	285826	1115069	210150	285826	846094	425832	554801	846094	164716	589388	824299	185938
6		837389	673194	297259	1159671	133900	297259	830278	398807	626653	830278	80674	667481	809823	103304
7		767642	692582	309149	1206058	54600	309149	813829	370970	695433	813829		685672	725153	16131
8		695106	712529	321515	1224166		321515	796722	342299	683063	796722		758657	762884	
9		619667	733050	334376	1169890		334376	778931	312767	670199	778931		754088	745644	
10		541212	754161	347751	1113443		347751	760428	282350	656820	760428		685877	663862	
11		459617	775881	361661	1054738		361661	741185	251020	642906	741185		740582	693319	
12		374760	798227	376127	993685		376127	721173	218750	628435	721173		735199	672948	
13		286507	821216	391173	930190		391173	700360	185512	613386	700360		667839	594438	
14		194725	844867	406819	864155		406819	678714	151277	597734	678714		720108	614522	
15		99272	869199	423092	795479		423092	656203	116015	581457	656203		713804	590605	
16		0	894232	440016	724056		440016	632791	79695	564528	632791		647407	515801	
17			845345	457617	649775		457617	608442	42285	546922	608442		696918	525269	
18			794503	475921	572524		475921	583120	3753	528612	583120		689570	497336	
19			741627	494958	492182		458675	556785		509570	556785		624263	426728	
20			686636	514756	408627		436835	529396		489766	529396		670650	424172	
21			629445	535347	321730		414121	500912		469169	500912		662120	391689	
22			569967	556761	231356		390499	471289		447749	471289		598049	325836	
23			508110	579031	137368		365932	440480		425472	440480		640896	309659	
24			443778	602192	39620		340382	408439		402304	408439		631028	272023	
25			376873	578906	0		313811	375117		378210	375117		568355	211555	
26			307292	517406			286176	340462		353151	340462		574864	216932	
27			234928	453447			257437	304420		327090	304420		536081	205350	
28			159669	386929			227547	266937		299987	266937		452874	176604	
29			81400	317750			196462	227954		271799	227954		443792	177263	
30			0	245804			164134	187412		242485	187412		399111	163895	
31				170980			130512	145249		211997	145249		322068	137014	
32				93163			95546	101399		180290	101399		295327	132329	
33				12234			59181	55795		147315	55795		243966	116939	
34							21361	8367		113020	8367		173904	92171	
35										41586			127161	81432	
36													68232	63752	
37													6078	41378	
38															
			30			33.15			34.37			35.51			37.53

Year-end balances are rounded to the nearest dollar.

Table 3: Withdrawal Strategies with Progressive Tax Rates and High Medical Expenses

Year	Strategy 1			Strategy 2			Strategy 3			Strategy 4			Strategy 5		
	TEA	TDA	tax acct	TEA	TDA	tax acct	TEA	TDA	tax acct	TEA	TDA	tax acct	TEA	TDA	tax acct
26			307292	517406			286176	340462		353151	340462		574864	216932	0
27			234928	453447			297623	269424		367277	269424		597858	140954	0
28			159669	386929			309528	195545		381968	195545		621773	61936	0
29			81400	317750			321910	118711		397247	118711		626401	0	0

The taxpayer has \$81,400 of medical expenses from age 91 until her death at age 94, the end of Year 29. In Strategies 3 and 4, she withdraws \$81,400 from her TDA in her last three years and, due to her deductible medical expenses, pays no taxes these three years. In Strategy 5, she withdraws \$81,400 in Years 27 and 28 from her TDA. In Year 29, she withdraws the remaining TDA balances plus \$19,464.25 from her TEA to meet her spending needs. Year-end balances are rounded to the nearest dollar.