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The Effect of the Tax Cuts and Jobs Act on the Choice between Traditional and Roth IRAs

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Abstract

This paper analyzes the impact of the tax cuts and jobs act on the income tax effectiveness of the Roth IRA versus the traditional IRA for investors who maximize their contributions prior to retirement. Since the tax cuts and jobs act reduced marginal income tax rates, the tax benefits gained from a traditional IRA decrease compared to a Roth IRA. Based on set investment parameters, an investor makes monthly payments to the IRAs for a specific period and the tax savings obtained from the traditional IRA are reinvested into a separate taxable account. The after-tax accumulation of wealth in each account is calculated to determine which IRA produces the largest available after-tax withdrawals after retirement. A break-even analysis is also constructed to determine the marginal income tax rate and investment return that makes an investor indifferent between the two IRAs. The results illustrate that the decision to invest in a traditional IRA versus a Roth IRA depends on both the rates of return and whether the marginal income tax rate is the same or different during the contribution and withdrawal periods.

Keywords: retirement planning, tax planning, tax cut and jobs act, and tax legislation.

I. INTRODUCTION

Of the many decisions individuals must make, some of the most difficult ones have connections with their financial well-being (Bayer et al., 2009). A few of these decisions include the choice concerning the most suitable retirement programs for investors' retirement income needs and the optimal distribution of assets among various investment vehicles. Although an increasing portion of the population is becoming more responsible in terms of their financial security after retirement (Lusardi, 2009), as retirement stage slowly creeps up for many, Miller and Mohr (2010) recognize that a major financial issue that still confronts them is whether they will have enough resources to sustain them after retirement. For this reason, retirement planning is one of the major focuses of individual investors and financial planners, and understanding the financial vehicles associated with this planning is important for optimal asset allocation.

Since the employee retirement income security act (ERISA) of 1974 (US Congress, 1974), eligible investors who wished to start saving for their retirement years were given the opportunity through the creation of the traditional individual retirement account (IRA). Eligible investors are defined as being under age 70½ by the end of the calendar year and having earned some sort of qualified compensation (wages, salaries, commissions or self-employment income). Accompanying the traditional IRA was the primary benefit of making tax-deductible contributions into an investment account and having them grow tax-deferred. The trade-off for this benefit was the restriction on when

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the investor could withdraw from the account. Only from age 59½ could a taxpayer begin withdrawing funds from this IRA type without any restrictions. Any amount to be withdrawn before this age imposed a 10 percent early withdrawal tax penalty. Furthermore, the contribution and earnings withdrawals were subject to ordinary income tax according the investor's current tax rate.

With the creation of the Roth IRA by the taxpayer relief act (TRA) of 1997 (US Congress, 1997), the eligibility requirements for income tax benefits and withdrawal restrictions that were otherwise present within the traditional IRA were relaxed. The main difference between the two IRAs is the time at which the investor receives the tax advantage. While owners of the traditional IRA save income taxes at the contribution phase and pay taxes upon withdrawal, Roth IRA owners pay income taxes at the contribution phase and save taxes at withdrawal. In other words, with the Roth IRA, once the initial contribution is taxed, it grows completely tax-free even when withdrawn.

This addition of another tax-advantaged vehicle inspired an abundance of research to determine for whom, and at what point, it was best to invest in a traditional IRA or a Roth IRA. Past researchers had also attempted to ascertain when it was most advantageous to convert from a traditional IRA to a Roth IRA, along with the factors that affected this sequitur (Crain & Austin, 1997; Knowles & Veliotis, 2010; Clayton et al., 2012; Horan & Zaman, 2013; and Welch, 2016).

The latest research describing the tax implications of the new tax reform legislation, commonly referred to as the tax cuts and jobs act (officially titled "reconciliation under titles II and V of the concurrent resolution on the budget for fiscal year 2018" (US Congress, 2018), has not fully examined the impact it has had on the choice between traditional and Roth IRAs. Gardner and Daff (2018) discusses the effect that the tax cuts and jobs act on converting a Roth to a traditional IRA, and Wenger (2018) mentions the impact the tax legislation has on types of earned income such as alimony, which affects IRA contributions. Herzberg (2019) details the changes in the IRA characteristics that were in the new legislation, such no required minimum distributions from a Roth IRA at age 70½ and the elimination of the deduction for some itemized expenses such as investment expenses, which affect tax savings. Franklin and Morrow (2019) have designed a curriculum for students that illustrates that a lower short-term tax liability may not be the optimal long-term tax strategy.

However, a quantitative analysis of the impact of the tax cuts and jobs act on the tax effectiveness between traditional and Roth IRAs has not been performed. This research addresses this gap in the existing literature. The first goal of this article is to investigate the influence of tax cuts and jobs act on the tax effectiveness and distributions of the traditional IRA against the Roth IRA using an after-tax cash flow analysis. The second goal is to compare these distributions under the tax cuts and jobs act (TCJA) with those of the prior tax plan (pre-TCJA) and analyze its marginal monetary effect. Third, to determine the ordinary income tax rate and the investment portfolio return at which an investor would be indifferent between the two IRAs using a break-even analysis.

II. LITERATURE REVIEW

To address the financial decision that involves the appropriation of retirement contributions between these two IRAs, it is important that an investor is familiar with the tax bracket effect—the effect of changing tax rates at a point in time (Adelman & Cross, 2010). Rate shifting, which is the process of moving from a higher to a lower tax bracket at retirement, has certain wealth benefits that accompany it. However, only the contributors to the traditional IRA will benefit from this shifting, while the Roth

contributors will not. On that account, the traditional IRA has generally been preferred to the Roth IRA (Butterfield et al., 2000; Hulse, 2003). Many studies have also indicated that to make comparable and equal comparisons between the two retirement accounts, it is equally necessary to make certain assumptions about investors' tax rates during and at the end of their working years.

For example, Crain and Austin (1997), who analyzed the traditional IRA, the Roth IRA, a non-deductible IRA, and a non-IRA investment, used a general marginal tax rate of 31% for ordinary income. They developed mathematical models to examine the investments in each and affirmed that the non-deductible IRA and the non-IRA investment choices were inferior to the Roth and the traditional IRA. Their results favored the traditional IRA especially when the tax rate at withdrawal was less than the tax rate at contribution (bracket effect). Horan et al. (1997), who expanded Crain and Austin's (1997) model while further developing their analysis, discovered very similar results. However, they allowed the investors in their study to decrease their tax rate at the withdrawal phase. They also explored the option of converting assets in a traditional IRA to a Roth IRA.

Butterfield et al. (2000) and Kutner et al. (2001) also highlighted the importance of the marginal tax rates (MTR) of the investors at the two phases (contribution and withdrawal) to ascertain the tax-favored IRA. Butterfield et al. (2000) conducted their study using three scenarios: MTR at the contribution period (herein MTRc) was greater than the MTR at the withdrawal phase (herein MTRw), MTRc was equal to the MTRw, and MTRc was less than the MTRw. Kutner et al. (2001) examined the optimal choice on an after-tax investment basis. Butterfield et al. (2000) illustrated that the Roth IRA was only superior to the traditional IRA in rare circumstances and should only be used by individuals who did not qualify to use a traditional IRA. Kutner et al. (2001) resolved that the comparison between the two IRAs was crucially dependent on the relationship between the two phases. Still, both results conclusively favored the traditional IRA based on the realization that the tax rate of an investor at withdrawal will most likely be less than the rate at contribution.

Horan and Peterson (2001) re-examined the appeal of the Roth and the traditional IRAs and made assumptions as to how the tax savings gained from a traditional IRA were reinvested. They explained that the optimal choice between the two IRAs was sensitive to these assumptions. Unlike Krishnan and Lawrence (2001), who assumed that the tax savings were re-invested in a fully taxable investment and were annually taxed as ordinary income, Horan and Peterson (2001) assumed that the tax savings were invested in a mutual fund with both capital gain and implicit tax-deferral benefits. Horan and Peterson (2001) did this study at the time of the EGTRRA (economic growth and tax relief reconciliation act)—the income tax cut of 2001. The Act reduced the marginal tax rates in all brackets by about three percentage points and increased the contribution limits for IRAs and 401(k)s. Yet, despite this notable tax changes, Horan and Peterson's results indicated that the traditional IRA was optimal for investors who: 1) had a short investment horizon and remained in the same tax bracket, and 2) invested their tax savings in mutual funds as opposed to ordinarily taxed investment vehicles.

Hulse (2003) noted that the imbedded option of rolling over a traditional IRA to a Roth IRA was very important in weighing the appeal of the two IRAs. It is possible for a taxpayer to underestimate the benefits of the traditional IRA and thereby incorrectly conclude that the Roth is more expedient when this option is ignored. Basing his model on unknown future tax rates, Hulse concluded that the traditional IRA was a better choice. Hrung (2007) looked at both the tax and non-tax factors that played a role in

determining the optimal IRA. He looked at determinants such as liquidity and taxpayer behavior and deduced that these variables were just as relevant in weighing the appeal of the two retirement accounts.

Later studies began to incorporate many other factors that were established to be important in the Roth versus traditional (RVT) decision. Horan and Zaman (2009), in their analogy, introduced income growth and progressive tax rates to the equation. They made use of simulations and constructed a model to examine the significance of these variables in determining the better investment vehicle. They concluded that the Roth IRA would be more beneficial for investors with higher rates of return, while the traditional IRA would better suit investors with lower investment returns. These results reinforced the earlier research of Stout and Baker (1998), who added that investors with the luxury of a longer investment period would be better off with a Roth IRA.

Meanwhile, Adelman and Cross (2010), Grossmann and Rose (2012), and Anderson and Hulse (2013) revisited the examination of the Roth IRA and the traditional IRA using an after-tax analysis. Adelman and Cross (2010) noted the importance of analyzing the theoretical and practical assumptions made about the behavior of a client. They utilized both assumptions in comparing the acquired after-tax wealth at the time of retirement in both the IRA accounts which led them to believe that the choice between one major types of IRA over the other highly depended on the actual behavior of the investor. Grossmann and Rose (2012) compared the after-tax returns for investors who maximized their contributions in both IRAs. They, like Krishnan and Lawrence (2001), assumed that the tax savings generated from the traditional IRA were re-invested in a separate taxable investment account. Anderson and Hulse (2013) re-introduced the option to rollover from a traditional to a Roth IRA while focusing on the then recent tax law changes that expanded this opportunity. Rather than expressly state which IRA was more profitable, they merely sought to provide guidance as to when to roll over to a Roth account.

From the literature noted above, it is evident that prior research has covered multiple pieces of this financial puzzle. The results from these analyses have collectively indicated that the Roth versus traditional IRA selection is shaped around the tax bracket effect and other theoretical assumptions made about the tax and income situations and the attitudes of the taxpayers themselves. However, with the enactment of the tax cuts and jobs act, investors are assured of at least eight years of the tax changes that accompany it, hence the relevance of additional research (the act is set to be in effect until at least 2025 unless changed; in this study it is assumed that these tax changes will become permanent).

The current empirical study extends the analysis of existing works on the comparison between the Roth versus the traditional IRA while paying particular attention to the tax cuts and jobs act. Considering the new tax brackets, and factoring in certain determinants, scenarios are created for hypothetical investors in different financial situations. Financial models are constructed to calculate the wealth accumulation at retirement and a 20-year annual annuity for withdrawals to determine which IRA is most tax effective for these investors. The results show that the marginal tax rate during the investor's time of contribution and withdrawal and the rate of return are both determinants of the more effective tax-advantaged retirement account.

If the investor's expected ordinary tax rate at the time of his contributions is higher than the ordinary tax rate at the time of his withdrawals, then investing in the traditional IRA as opposed to the Roth IRA will prove more profitable for most investors. On the other hand, if the ordinary tax rate is the same during both contributions and withdrawals,

the Roth IRA should be preferred. Additionally, at higher tax rates and rates of return, the Roth IRA is more effective than the traditional IRA even when an investor reinvests his tax savings into a separate account.

III. RESEARCH SAMPLE AND METHODOLOGY

3.1. Assumptions

To compare the accumulated wealth and after-tax returns in traditional IRAs and Roth IRAs, different investment parameters under each type of IRA are constructed for a hypothetical investor filing single status for income tax purposes. Three different marginal tax rates are used: under pre-TCJA, 15%/25%/28%, and under TCJA, 12%/22%/24%. These marginal tax rate brackets were selected because they are all below the IRA income contribution limit, which is set at $120,000 for single taxpayers ($189,000 for married taxpayers filing jointly).

In the analysis, the investor maximizes his or her contribution per year in the IRAs. This maximum amount is the smaller of $5,500 (for investors under age 50 at the end of the year) or $6,500 (for investors age 50 and above before the end of the year), and the amount of his taxable compensation for the year. This comes to $458.33 per month (for $5,500) and $541.67 per month (for $6,500). The tax-deferred structure of the traditional IRA allows investors the luxury of tax-free earnings growth until withdrawal at retirement. The Roth IRA, on the contrary, offers investors the benefit of tax-free distributions. As Roth contributions are made with after-tax dollars and traditional contributions with pre-tax dollars, the individuals who invest in the traditional IRA will always secure an initial tax savings. Like Krishnan and Lawrence's study (2001), the investors in this study re-invest these tax savings into a different taxable account at the same investment return as within the IRA account. It is assumed that the investor does not participate in any other retirement plans (such as the 401(k) or the 403(b)) and begins making yearly contributions at the age of 25. The investor's investment portfolios earn either 4%, 8% or 12% rates of return during the contribution years, and a 4% rate of return during the withdrawal years.

The investors contribute to the IRAs until the predetermined retirement age of 65. During the working years, the investors remain in the same tax bracket. After the investors reach retirement, the total contribution value and the tax savings account value (for the traditional IRA) at retirement and the total annuity in retirement are calculated based on whether their marginal tax bracket either stayed the same or lowered one level upon withdrawal. The change in tax brackets only affects the investors using a traditional IRA. For the investors utilizing the Roth IRA with tax-free withdrawals, the total value at retirement and an annuity value for each scenario were also calculated, again based on the three rates of returns earned on the portfolio during the contribution years.

3.2. Calculations

The accumulated investment values at retirement using are calculated using the tax rates under both the prior tax legislation and the tax cuts and jobs act, for each of the 3 potential returns and 3 marginal tax brackets for traditional IRAs. After retirement, for each scenario the monthly after-tax income amount is computed using an annuity to determine how much the investor can withdraw from the respective IRA per month for a span of 20 years. By comparing the after-tax income amounts for each investor scenario, the relative performance and impact of the tax cuts and jobs act on the tax-effectiveness of both IRAs can be illustrated.

The results from each calculation are put together in summary tables that collectively compare the annuity values that the investor would be able to withdraw during retirement under the pre-TCJA, the annuity value that the investor would be able to withdraw under the TCJA, and the annuity value that the investor can withdraw by making use of the two IRAs under different tax rates and different returns. The pre-TCJA traditional values were compared to the TCJA traditional values, and then the Roth values were compared with both the pre-TCJA traditional values and the TCJA traditional values. This was done to evaluate the change in the effectiveness of the Roth IRA with the tax cuts and jobs act in effect.

Break-even analysis of returns and tax rates in this study are the returns and the tax rates at which the total annuity in retirement for the traditional IRA equals the total annuity in retirement for the Roth IRA such that the difference between them is zero. This analysis was also performed to determine both the return that an investor investing in the traditional IRA would have to earn to make the pre-TCJA and the TCJA traditional IRA be equally as attractive as the Roth IRA, and the tax bracket that he or she would also have to be in during retirement to be indifferent between the traditional and the Roth IRA. Investors' tax brackets often increase throughout their earning years as their taxable income rises due to job advancement and merit pay increases. As investors try to decide which IRA will be the most beneficial, or when to convert from a Roth IRA to a traditional IRA, a break-even analysis of the returns and tax rates required to make the two IRAs equally attractive will help guide their decision.

IV. EMPIRICAL RESULTS

To study the effect of the tax cuts and jobs act on the tax effectiveness of the two main types of IRA, Roth and traditional, an after-tax investment scenario analysis is used. The empirical results from this analysis are examined to evaluate the marginal monetary impact of the tax cuts and jobs act on the two IRAs. Kutner et al. (2001) affirmed that an after-tax performance analysis is the most pertinent measure of an investment performance. This study, like theirs, illustrates that the more tax effective, and thus preferred, IRA depends on both the investor's marginal tax rate and the rate of return. This analysis seeks to identify the better IRA by finding the larger of a monthly income from a 20-year annuity. To find the definite effect of the tax cuts and jobs act on the traditional IRA, this analysis calculates and compares the annuity income for the traditional IRA under the old tax law (herein pre-TCJA traditional IRA) and the traditional IRA under the tax cuts and jobs act (herein TCJA traditional IRA).

4.1. IRA after-Tax Investment Return Example under Different Tax Bracket Assumptions

Table 1 provides a detailed analysis of one of the investor scenarios for both pre-TCJA and TCJA conditions. It assumes that an investor of age 25 makes a monthly contribution to the IRAs of $458.33 ($5,500 annually) until the age of 50 (where the monthly contribution increases to $541.67 or $6,500 annually) with an annual rate-of-return of 8%. The investor remains in the same tax bracket of 25% (pre-TCJA) or 22% (TCJA) during the contribution and withdrawal years, and the contribution value at retirement and the after-tax annuity value of the pre-TCJA traditional IRA as well as that of TCJA is computed. These results from this computation are then compared to the annuity amount an investor can withdraw from a Roth IRA.

The pre-TCJA traditional IRA provides an investor with a monthly after-tax savings of $114.58 ($1,375 annually) until the age of 50. Beyond the age of 50, he saves $135.42 ($1,625 annually). He invests these tax savings into a separate taxable investment

account that earns 6.40% after tax on the before tax return of 8% with a tax rate of 20%. The investment in the taxable investment account is assumed to be split equally between equity and fixed income securities. Returns from equities are taxed at the 15% capital gains tax rate, while returns from fixed income are taxed at the investor's 25% marginal tax rate, thus the average tax rate is 20%.

Table 1
Roth IRA versus Pre-TCJA and TCJA Traditional IRAs
(using the same tax bracket during contribution and withdrawals, assuming a 40-year contribution period at 8% annual return and a 20-year annuity at 4% annual return)

Assumptions	Pre-TCJA	TCJA
Years of contribution	40	40
Assumed tax bracket during contributions and withdrawals	25%	22%
Monthly contributions to Roth IRA & traditional IRA until age 50	$458.33	$458.33
Additional monthly investment from tax savings until age 50	$114.58	$100.83
Monthly contributions to Roth IRA & traditional IRA after age 50	$541.67	$541.67
Additional monthly investment from tax savings after age 50	$135.42	$119.17
Annual return during contribution years before tax	8%	8%
Annual after-tax return for tax savings (20% or 18.5% tax rate)	6.40%	6.52%
Annual return during withdrawal years before tax	4%	4%
Annual after-tax return for tax savings (20% or 18.5% tax rate)	3.20%	3.26%
Total account balance at retirement:		
Roth IRA	**$1,628,882**	**$1,628,88**
Traditional IRA	$1,628,882	$1,628,88
Investment account for tax savings	$260,819	$237,115
Total (traditional IRA+Investment account)	**$1,889,701**	**$1,865,99**
Monthly income from a 20-year annuity:		
Roth IRA	$9,871	$9,871
Traditional IRA	$7,403	$7,699
Investment account for tax savings	$1,473	$1,346
Total (traditional IRA+Investment account)	**$8,876**	**$9,045**
Difference Roth IRA vs traditional IRA	**$995**	**$826**

The TCJA traditional IRA provides the investor, who makes the same monthly contribution, with a monthly after-tax savings of $100.83 ($1,210 annually) before the age of 50 and $119.17 ($1,430 annually) after the age of 50. The reason these monthly savings are lower compared to those that could otherwise be obtained from the pre-TCJA traditional IRA is, under the TCJA, the income that would have put an investor in the 25% tax bracket previously would now place him in a lower tax bracket of 22% under the TCJA. (Notes: This is not the case with all the income amounts. The previous 25% taxable income bracket was $38,701-$93,700 whereas now, the width that is equivalent to this reduction (22%) is $38,701-$82,500. So, while an investor earning $92,000 per year would have been in the 25% tax bracket before the TCJA, now he will be in the 24% tax bracket (as opposed to the 22%)). The separate taxable investment account with an average tax rate of 18.5% (under the TCJA) earns 6.52%.

After 40 years of contribution (480 months), in both the pre-TCJA and TCJA periods, the investor has $1,628,882 in the traditional or Roth IRA accounts. Accompanying that, the investor also has $260,819 from the other taxable investment account from the pre-TCJA period or $237,115 from the TCJA period. Hence, after 40 years, the investor has a total amount of $1,889,701 in his investment accounts under

the pre-TCJA conditions, or a total of $1,865,997 in the TCJA period. This comes to a difference of $23,704. An investor using a Roth IRA also has a total amount of $1,628,882 in his account. Since the Roth IRA is a back-end-load tax benefit retirement account (meaning that the initial investment amount is taxed rather than any future earned income and the investors here enjoy the benefit of tax-free accumulation of wealth), the investor does not enjoy the tax savings from a traditional IRA. However, as the Roth and traditional retirement accounts are taxed differently, it would be unsuitable to decide based on only the accumulation of wealth in each investment vehicle.

For the next 20 years, the investor subsequently makes monthly withdrawals from the IRAs and earns a 4% rate of return before-tax for the Roth IRA and either an after-tax return of 3.20% from the pre-TCJA traditional IRA or 3.26% from the TCJA traditional IRA. The investor will be able to withdraw $9,871 from his Roth IRA in both scenarios, since all withdrawals from Roth IRA accounts are tax-free. After the investor pays taxes (based on his 25% tax bracket), he will be left with a monthly withdrawal amount of $7,403 ($9,871 x (1-0.25)) from the pre-TCJA traditional IRA. Additionally, he will receive an added monthly amount of $1,473 from the savings he obtained from the taxable account. This will come to a total monthly after-tax annuity income of $8,876. Under the TCJA traditional IRA, the investor (based on his 22% tax bracket) will be left with a monthly withdrawal amount of approximately $7,699 ($9,871 x (1-0.22)). With the added amount of $1,346 he obtains from the taxable investment account his total after-tax monthly annuity amount will come to $9,045.

From Table 1, one can see that when an investor remains in the same tax bracket at contribution and withdrawal, he is better off investing in the Roth IRA than in the traditional IRA even when the investor invests his tax savings in another taxable account. It can also be noted that, although the Roth IRA is preferable to both the pre-TCJA and TCJA traditional IRAs under these circumstances, the TCJA traditional IRA is actually preferable than the pre-TCJA traditional IRA. The reason for this is, with the same income, an investor investing in the TCJA traditional IRA must pay a lower percentage of taxes than an investor who invested in the pre-TCJA traditional IRA courtesy of the tax reform. Thus, the tax cuts and jobs act actually increased the profitability of the traditional IRA, though not enough to make it more effective than the Roth IRA.

On the basis of these accumulations, the Roth IRA may be identified as the better IRA. Table 1 also shows that the difference between the Roth IRA amount and the pre-TCJA traditional IRA was $995 and the difference between the Roth IRA and the TCJA traditional IRA decreased to $826. The TCJA traditional IRA is now more profitable than the pre-TCJA traditional IRA by $169, and thus closer to becoming equally as attractive as the Roth.

In Table 2, the same specifications as in Table 1 are used, except that the investors' tax brackets during withdrawals decrease by one tax bracket. Thus, in the pre-TCJA period the investor is in the 25% tax bracket during his contribution phase and in the 15% tax bracket during his withdrawal phase, while under the TCJA the investor is in the 22% tax bracket during his contribution years and in the 12% tax bracket during his withdrawal years. Still assuming a 20-year annuity with a portfolio that earns 4% before-tax, the total accumulation of wealth for the traditional IRAs, including the additional income earned from the taxable account remains the same as in Table 1. The investor's monthly annuity amount from the pre-TCJA traditional IRA increases to $8,390. When this amount is added to the amount of $1,540 from the taxable account, it comes to a total of $9,930. Under the TCJA traditional IRA, the investor's monthly annuity amount

is $8,686 with the additional income of $1,407 from the investment account, bringing his total to $10,083. Meanwhile, the Roth IRA still has the same monthly annuity of $9,871.

Table 2
Roth IRA versus Pre-TCJA and TCJA Traditional IRAs
(using a decreasing tax bracket during withdrawals, assuming a 40-year contribution period at 8% annual return and a 20-year annuity at 4% annual return)

Assumptions	pre-TCJA	TCJA
Years of contribution	40	40
Assumed tax bracket during contributions	25%	22%
Assumed tax bracket during withdrawals	15%	12%
Monthly contributions to Roth IRA & traditional IRA until age 50	$458.33	$458.33
Additional monthly investment from tax savings until age 50	$114.58	$100.83
Monthly contributions to Roth IRA & traditional IRA after age 50	$541.67	$541.67
Additional monthly investment from tax savings after age 50	$135.42	$119.17
Annual return during contribution years before tax	8%	8%
Annual after-tax return for tax savings (20% or 18.5% tax rate)	6.40%	6.52%
Annual return during withdrawal years before tax	4%	4%
Annual after-tax return for tax savings (7.5% or 6% tax rate)	3.70%	3.76%
Total account balance at retirement:		
Roth IRA	**$1,628,882**	**$1,628,88**
Traditional IRA	$1,628,882	$1,628,88
Investment account for tax savings	$260,819	$237,115
Total (traditional IRA+Investment account)	**$1,889,701**	**$1,865,99**
Monthly income from a 20-year annuity:		
Roth IRA	$9,871	$9,871
Traditional IRA	$8,390	$8,686
Investment account for tax savings	$1,540	$1,407
Total (traditional IRA+Investment account)	**$9,930**	**$10,093**
Difference in Roth IRA vs traditional IRA	**-$59**	**-$222**

Under these conditions, both the pre-TCJA and the TCJA traditional IRAs outperform the Roth IRA by generating a higher after-tax return annuity amount. Although both the pre-TCJA traditional IRA and the TCJA traditional IRA provide a higher after-tax return than the Roth, the TCJA traditional IRA is optimal.

By reducing the tax brackets and thereby making the investor subject to a lower tax percentage, the TCJA increases the tax-benefits of the traditional IRA. While the difference between the Roth IRA and the pre-TCJA traditional IRA was only ($59), the difference between the Roth IRA and the TCJA traditional IRA is ($222). These numbers show that under the previous tax law, when the tax bracket of the investor decreased at retirement, the traditional IRA provided $59 worth of marginal return, whereas under the tax cuts and jobs act, this amount increases to $222.

The traditional IRA had already been established to be the preferable IRA of the two, especially if an investor expected to be in a lower tax bracket at retirement than at contribution (Crain & Austin, 1997; Butterfield et al., 2000; Kutner et al., 2001; Adelman & Cross, 2010; and Hull & Hull, 2016). This outcome is in line with the general inference about the preference of the traditional IRA over the Roth IRA and the one that is very popular and most widely accepted. When an investor is more likely to be in a lower tax bracket at retirement than during the contribution years, previous literature states that the traditional IRA surpasses the Roth IRA (Grossmann & Rose, 2012).

4.2. IRA after-Tax Investment Returns under Different Tax Bracket and Return Assumptions

The next four tables are extensions of Tables 1 and 2. Tables 3 and 4 are a lengthened replication of Table 1, and Tables 5 and 6 are replications of Table 2. The Roth IRA and the traditional IRAs are again compared, but with the use three different consecutive tax brackets (15%, 25% and 28% for the pre-TCJA period, or 12%, 22%, and 24% during the TCJA period) and three different portfolio returns (4%, 8%, and 12%). The 40-year contribution, 20-year annuity and 4% annual return during withdrawals all remain the same.

Table 3 compares the Roth IRA to the pre-TCJA traditional IRA and Table 4 compares the Roth IRA to the TCJA traditional IRA. As expected, the monthly annuity amount increases as the return increases and decreases as the tax bracket increases. These results are consistent throughout Tables 1-4. The total investment amount for the traditional IRAs at the end of the contribution years is always higher than the Roth IRA when the traditional investor invests his tax savings into a different taxable investment account, but the annuity amount for the Roth IRA is always higher than the comparable amount for the traditional IRA.

Similar to the results in Table 1, when the tax bracket remains the same in contribution and retirement, an investor is better off contributing to the Roth IRA than to the traditional IRA. The Roth IRA outperforms the traditional IRA in both the pre-TCJA and TCJA periods, but by a lower amount after the TCJA. These results show that as long as the tax rates remain constant throughout the period (and after) of an investor's investment, the monthly annuity amount for the Roth IRA is always greater than that of the traditional IRA, and the monthly annuity amount for the TCJA traditional IRA is always greater than the monthly annuity amount for the pre-TCJA traditional IRA. While not reported, these calculations were also performed with contribution periods of 10, 20, and 30 years, and similar results were observed.

Table 3
Roth IRA versus Pre-TCJA Traditional IRA
(assuming a 40-year contribution period under different tax brackets and annual returns, same tax bracket during withdrawals, 20-year annuity at 4% annual return)

Tax bracket during contributions and withdrawals	15%	25%	28%
Monthly contributions until age 50	$458.33		
Monthly contributions after age 50	$541.67		
Additional tax savings monthly investment until age 50	$68.75	$114.58	$128.33
Additional tax savings monthly investment after age 50	$81.25	$135.42	$151.67
Annual return withdrawal years before tax	4%		
Annual after-tax return for tax savings	3.7%	3.2%	3.1%
Total account balance at retirement			
Roth IRA, contribution years annual return of:			
4%	$562,240	$562,24	$562,240
8%	$1,628,882	$1,628,8	$1,628,882
12%	$5,433,819	$5,433,8	$5,433,819
Traditional IRA+Investment account, contribution years annual before-tax return of:			
4%	$640,672	$678,35	$689,293
8%	$1,835,036	$1,889,7	$1,905,664
12%	$6,049,478	$6,084,0	$6,099,906

To be continued Table 3.

Monthly income from a 20-year annuity			
Roth IRA, contribution years annual return of:			
4%	$3,407	$3,407	$3,407
8%	$9,871	$9,871	$9,871
12%	$32,928	$32,928	$32,928
Traditional IRA, contribution annual before-tax return of:			
4%	$3,359	$3,211	$3,164
8%	$9,607	$8,876	$8,656
12%	$31,623	$28,368	$27,436
Difference in Roth IRA vs pre-TCJA traditional IRA, contribution years annual return of:			
4%	$48	$196	$243
8%	$264	$995	$1,215
12%	$1,305	$4,560	$5,492

Table 4
Roth IRA versus TCJA Traditional IRA
(assuming a 40-year contribution period under different tax brackets and annual returns, same tax bracket during withdrawals, 20-year annuity at 4% annual return)

Tax bracket during contributions and withdrawals	12%	22%	24%
Monthly contributions until age 50	$458.33		
Monthly contributions after age 50	$541.67		
Additional tax savings monthly investment until age 50	$55.00	$100.83	$110.00
Additional tax savings monthly investment after age 50	$65.00	$119.17	$130.00
Annual return withdrawal years before tax	4%		
Annual after-tax return for tax savings	3.76%	3.26%	3.22%
Total account balance at retirement			
Roth IRA, contribution years annual return of:			
4%	$562,240	$562,240	$562,240
8%	$1,628,882	$1,628,882	$1,628,882
12%	$5,433,819	$5,433,819	$5,433,819
Traditional IRA+Investment account, contribution years annual before-tax return of:			
4%	$625,898	$665,868	$674,234
8%	$1,799,461	$1,865,997	$1,881,996
12%	$5,954,574	$6,037,758	$6,069,388
Monthly income from a 20-year annuity			
Roth IRA, contribution years annual return of:			
4%	$3,407	$3,407	$3,407
8%	$9,871	$9,871	$9,871
12%	$32,928	$32,928	$32,928
Traditional IRA, contribution annual before-tax return of:			
4%	$3,376	$3,246	$3,223
8%	$9,698	$9,045	$8,934
12%	$32,067	$29,112	$28,620
Difference in Roth IRA vs TCJA traditional IRA, contribution years annual return of:			
4%	$31	$161	$184
8%	$173	$826	$937
12%	$861	$3,816	$4,308

To be continued Table 4.

Difference in difference Roth IRA vs pre-TCJA/TCJA traditional IRA, annual return of:			
4%	-$17	-$35	-$59
8%	-$91	-$169	-$278
12%	-$444	-$744	-$1,184

Tables 5 and 6, like Table 2, calculate the monthly annuity amounts under the assumption that the tax brackets decrease one level during the withdrawal period. Table 5 compares the Roth IRA to the pre-TCJA traditional IRA and Table 6 compares the Roth IRA to the TCJA traditional IRA. In Table 5, a one-level tax bracket reduction will go from 15% to 10%, 25% to 15%, or 28% to 25%, while in Table 6 a one level tax bracket reduction will go from 12% to 10%, 22% to 12%, or 24% to 22%. (Notes: The TCJA reduced the tax brackets from the second lowest and left the lowest unchanged at 10%).

Table 5
Roth IRA versus Pre-TCJA Traditional IRA
(assuming a 40-year contribution period under different tax brackets and annual returns, lower tax bracket during withdrawals, 20-year annuity at 4% annual return)

Tax bracket during contributions	15%	25%	28%
Tax bracket one level lower during withdrawals	10%	15%	25%
Monthly contributions until age 50	$458.33		
Monthly contributions after age 50	$541.67		
Additional tax savings monthly investment until age 50	$68.75	$114.58	$128.33
Additional tax savings monthly investment after age 50	$81.25	$135.42	$151.67
Annual return withdrawal years before tax	4%		
Annual after-tax return for tax savings	3.8%	3.7%	3.2%
Total account balance at retirement			
Roth IRA, contribution years annual return of:			
4%	$562,240	$562,240	$562,240
8%	$1,628,882	$1,628,882	$1,628,882
12%	$5,433,819	$5,433,819	$5,433,819
Traditional IRA+Investment account, contribution years annual before-tax return of:			
4%	$640,672	$678,356	$689,293
8%	$1,835,036	$1,889,701	$1,905,664
12%	$6,049,478	$6,084,097	$6,099,906
Monthly income from a 20-year annuity			
Roth IRA, contribution years annual return of:			
4%	$3,407	$3,407	$3,407
8%	$9,871	$9,871	$9,871
12%	$32,928	$32,928	$32,928
Traditional IRA, contribution annual before-tax return of:			
4%	$3,533	$3,581	$3,273
8%	$10,111	$9,930	$8,966
12%	$33,301	$31,827	$28,457
Difference in Roth IRA vs pre-TCJA traditional IRA, contribution years annual return of:			
4%	-$126	-$174	$134
8%	-$240	-$59	$905
12%	-$373	$1,101	$4,471

Table 6
Roth IRA versus TCJA Traditional IRA
(assuming a 40-year contribution period under different tax brackets and annual returns, lower tax bracket during withdrawals, 20-year annuity at 4% annual return)

Tax bracket during contributions	12%	22%	24%
Tax bracket one level lower during withdrawals	10%	12%	22%
Monthly contributions until age 50	$458.33		
Monthly contributions after age 50	$541.67		
Additional tax savings monthly investment until age 50	$55.00	$100.83	$110.00
Additional tax savings monthly investment after age 50	$65.00	$119.17	$130.00
Annual return withdrawals years before tax	4%		
Annual after-tax return for tax savings	3.80%	3.76%	3.26%
Total account balance at retirement			
Roth IRA, contribution years annual return of:			
4%	$562,240	$562,240	$562,240
8%	$1,628,882	$1,628,882	$1,628,882
12%	$5,433,819	$5,433,819	$5,433,819
Traditional IRA+Investment account, contribution years annual before-tax return of:			
4%	$625,898	$665,868	$674,234
8%	$1,799,461	$1,865,997	$1,881,996
12%	$5,954,574	$6,037,758	$6,069,388
Monthly income from a 20-year annuity			
Roth IRA, contribution years annual return of:			
4%	$3,407	$3,407	$3,407
8%	$9,871	$9,871	$9,871
12%	$32,928	$32,928	$32,928
Traditional IRA, contribution annual before-tax return of:			
4%	$3,445	$3,613	$3,293
8%	$9,899	$10,093	$9,136
12%	$32,736	$32,560	$29,292
Difference in Roth IRA vs TCJA traditional IRA, contribution years annual return of:			
4%	-$38	-$206	$114
8%	-$28	-$222	$735
12%	$192	$368	$3,636
Difference in difference Roth IRA vs pre-TCJA/TCJA traditional IRA, annual return of:			
4%	$88	-$32	-$20
8%	$212	-$163	-$170
12%	$565	-$733	-$835

The results from Tables 5 and 6 show that the traditional IRAs outperform the Roth IRA at lower tax brackets and lower returns, but the Roth IRA outperforms the traditional IRAs at higher tax brackets and returns. In Table 5, the Roth IRA provides a larger annuity amount if the investor is in the 28% tax bracket for all returns, and also in the 25% tax bracket if the investor can earn an average annual return of 12%. In Table 6, the Roth IRA is better in the 24% tax bracket, but also outperforms the traditional IRA in the other two tax brackets assuming a 12% return. The last section of Table 6 shows that the Roth IRA gains effectiveness on the traditional IRA in the lowest tax bracket but loses effectiveness in the other two tax brackets.

These results deviate from the prior literature, which concluded that a traditional IRA always outperforms a Roth IRA if an investor's tax bracket decreases during withdrawal years. In fact, both the tax bracket and rate of return are key determinants on which type of IRA provides a greater monthly income during retirement.

4.3. Break-Even Analysis

We expand our study by calculating the break-even withdrawal tax rates and portfolio returns that will make the traditional IRAs equally as effective as the Roth IRA, i.e. the return and tax rates that would make the investor indifferent between the two IRAs. This analysis helps an investor determine which IRA to use given their tax bracket and estimated returns, and when a conversion should be considered.

Definition of variables as follows:

BEr : break-even portfolio return during contribution
Pr : portfolio return
BEt : break-even tax rate during withdrawal
It : investor's tax rate
MTc : marginal Tax rate at contribution
MTw : marginal Tax rate at withdrawal

Table 7 displays the break-even tax rates during withdrawal (BEt) when the traditional IRA investor re-invests his tax savings in another taxable investment account. The model shows that the break-even tax rates have to be lower than the withdrawal tax rates for the traditional IRA to be as tax effective as the Roth IRA. For the TCJA IRA the break-even tax rates are lower than they have to be for the pre-TCJA IRA, but the tax cuts and jobs act decreased the tax rates, so the investor already starts out with a lower rate. Hence, as the tax rates lowered from the pre-TCJA to the TCJA periods, the break-even rates also lowered. In the lower two tax brackets for the pre-TCJA IRA, the break-even tax rate is between the tax brackets during the contribution and withdrawal years, but in the 28% tax bracket, the break-even tax rate has to decrease below the 25% tax bracket during withdrawal years in order for the traditional IRA to be equally attractive as the Roth IRA at all return levels. For the TCJA IRA, this result can also be seen for not only the 24% tax bracket, but also for the 12% and 22% tax brackets if the investor can earn a 12% return.

Insert Table 7 here.

Table 8 displays the break-even before-tax returns during the contribution years. For the purpose of comprehension, if BEr < Pr, then the traditional IRA is more effective than the Roth IRA because the traditional IRA portfolio would need to earn less than the set return to be equal to the Roth IRA. As shown in Panel A, in order for the traditional IRAs to be equally attractive as the Roth IRA to an investor, the investor's portfolio at retirement would have to earn a little over the set portfolio return (4%, 8%, and 12%) in all cases when the tax bracket remains the same during the withdrawal period. The TCJA traditional IRA would still have to earn more than the set return, but not as much as it would have had to under the previous tax law. This is good news for traditional IRA investors because, in terms of the return, the tax cuts and jobs act has brought the traditional IRA closer to the Roth IRA in terms of tax effectiveness and consequently attractiveness.

Table 7
Break-Even Tax Rates During Withdrawals, Roth versus Pre-TCJA and TCJA Traditional IRAs
(assuming a 40-year contribution period under different tax brackets and annual returns, 20-year annuity at 4% annual return)

Pre-TCJA tax bracket during contributions	15%	25%	28%
Tax bracket one level lower during withdrawals	10%	15%	25%
TCJA tax bracket during contributions	12%	22%	24%
Tax bracket one level lower during withdrawals	10%	12%	22%
Pre-TCJA break-even tax rates during withdrawals, annual return of:			
4%	13.59%	19.24%	21.06%
8%	12.44%	15.60%	15.83%
12%	11.13%	11.66%	11.42%
TCJA break-even tax rates during withdrawals, annual return of:			
4%	11.13%	18.05%	18.66%
8%	10.29%	14.25%	14.56%
12%	9.42%	10.88%	10.96%
Difference in break-even tax rates, annual return of:			
4%	-2.46%	-1.19%	-2.40%
8%	-2.15%	-1.35%	-1.27%
12%	-1.71%	-0.78%	-0.46%

Table 8
Break-even before-Tax Returns Roth versus pre-TCJA and TCJA Traditional IRAs
(assuming a 40-year contribution period under different tax brackets and annual returns, 20-year annuity at 4% annual return)

Panel A:			
Pre-TCJA tax bracket during contributions and withdrawals	15%	25%	28%
TCJA tax bracket during contributions and withdrawals	12%	22%	24%
Pre-TCJA break-even before-tax returns, same tax bracket in all years, annual return of:			
4%	4.06%	4.25%	4.32%
8%	8.10%	8.38%	8.48%
12%	12.13%	12.49%	12.60%
TCJA break-even before-tax returns, same tax bracket in all years, annual return of:			
4%	4.04%	4.21%	4.24%
8%	8.06%	8.31%	8.36%
12%	12.08%	12.40%	12.46%
Difference in break-even returns, contribution years annual return of:			
4%	-0.02%	-0.04%	-0.08%
8%	-0.04%	-0.07%	-0.12%
12%	-0.05%	-0.09%	-0.14%
Panel B:			
Pre-TCJA tax bracket one level lower during withdrawals	10%	15%	25%
TCJA tax bracket one level lower during withdrawals	10%	12%	22%

To be continued Table 8, Panel B

Pre-TCJA break-even before-tax returns, lower tax bracket in withdrawal years, annual return of:			
4%	3.85%	3.78%	4.17%
8%	7.91%	7.98%	8.35%
12%	11.96%	12.11%	12.48%
TCJA break-even before-tax returns, lower tax bracket in withdrawal years, annual return of:			
4%	3.95%	3.75%	4.15%
8%	7.99%	7.92%	8.28%
12%	12.02%	12.04%	12.38%
Difference in break-even returns, contribution years annual return of:			
4%	0.10%	-0.03%	-0.02%
8%	0.08%	-0.06%	-0.07%
12%	0.06%	-0.07%	-0.10%

If the tax bracket of the investor decreases by one level at retirement, as shown in Panel B of Table 8, then in some cases, BEr < Pr (the break-even return is lower than the investors' set return), which means that the traditional IRA is more effective than the Roth. At other times, BEr > Pr (the break-even return is greater than the set portfolio return), which indicates that the Roth IRA is the more effective IRA of the two. When an investor moves from the second lowest tax bracket (15% pre-TCJA; 12% TCJA) during the contribution period to the lowest tax bracket of 10% during withdrawals, the traditional IRA is better than the Roth IRA at the 4% and 8% returns.

However, the break-even return for the pre-TCJA traditional IRA when an investor moves to the lowest tax bracket is lower than the break-even return for the TCJA traditional IRA. With these rates, although the traditional IRA is better than the Roth IRA, the TCJA BEr is now closer to the set portfolio return (Pr). Still, as an investor moves into higher tax brackets, the break-even return for the pre-TCJA traditional IRA becomes higher than that of the TCJA traditional IRA, and the break-even return becomes higher than the portfolio return. Thus at higher tax rates, the investor is better off investing in the Roth IRA.

The break-even results in Tables 7 and 8 mirror the results from Tables 1-6. The Roth IRA is always better than the traditional IRA if the tax bracket of the investor stays the same during the contribution and withdrawal periods. The traditional IRA is more effective than the Roth IRA if the investor's tax bracket decreases during the withdrawal period at lower tax brackets and returns, but if an investor is in a high tax bracket or can earn higher returns, it is more lucrative to invest in the Roth IRA.

These results are consistent with the results of many other researchers (Crain & Austin, 1997; Butterfield et al., 2000; Kutner et al., 2001; Adelman & Cross, 2010; and Hull & Hull, 2016). However, concerning the effect of the tax cuts and jobs act on the traditional IRA, it can clearly be seen that the results for the traditional IRA are mixed. Only when an investor's MTc= MTw can the benefits of the tax cuts and jobs act on the traditional IRA be enjoyed. Otherwise, if MTc > MTw, then the traditional IRA drops in effectiveness.

V. CONCLUSION

Investors and financial planners face the decision associated with the optimal allocation of current funds as a function of maximum after-tax wealth accumulation. There already exists a myriad of research on the Roth versus traditional IRA topic that attempts to make the financial planning decision a little easier. There is also countless research that adds to existing studies focusing on other alternatives outside the main topic range, such as when to convert from a traditional IRA to a Roth IRA, or when to consider other retirement programs, like the 401k, the non-deductible IRA, or even a mutual fund, especially if one does not qualify for either of the tax-favored IRAs (Crain & Austin, 1997; Hull & Hull, 2016). These are options that an investor might consider, and it may be more beneficial for them to pick one of these other options rather than solely one IRA or the other.

The current research is very relevant, as the recently passed tax cuts and jobs act affects the tax brackets of income earners. Still, there are a number of areas where future research may provide additional knowledge. One would be to further extend this study to include the required minimum distributions (RMDs) which investors contributing to a traditional IRA have to start making at the age of 70½. The inclusion of this may change an investor's optimal withdrawal strategy and may affect the attractiveness of the traditional IRA. Another would be to go even further by examining the capital gains in addition to the ordinary income of the investor during the withdrawal years with the different tax rates that are allotted to them, since the after-tax performance of the investments may be affected by this difference. Still, as preparation for the end of one's working days may involve an uncertainty of the future, it is crucial for investors to understand all their available options and the benefits of the different investment opportunities to achieve their long-term goals.

5.1. Discussion and Implications

This study examines the tax effectiveness of the two individual retirement account types, while exploring the difference between the tax cuts and jobs act and the previous tax law. Many have acknowledged that as IRAs become increasingly popular, the questions that constantly arise are generally focused towards the comparison between the two, as well as when it is more profitable for an investor to invest in one over the other (Crain & Austin, 1997; Kutner et al., 2001). With the tax cuts and jobs act in effect, the widths of the tax brackets have been reduced. Considering this change, it was predicted that this reduction will reduce some of the tax benefits of the traditional IRA while increasing those of the Roth IRA. The current results strongly support the notion that the choice between IRAs is dependent on both the rates of return and the investor's tax rate during contribution and withdrawal years even with the change in tax laws. Hence, when making a decision to invest on one over the other, the relationship between returns and tax rates is very important.

Assuming that an investor sets aside the tax savings that he realizes from the traditional IRA and invests it in a separate non-IRA taxable account, as long as the tax rate during contribution is higher than the break-even tax rate during withdrawal, then the traditional IRA is the better investment choice. If one or both of these assumptions do not hold, then the Roth IRA would be the better choice. Therefore, the results are dependent on the investor's tax rates before and after retirement. In their panel study of income dynamics and the consumer expenditure survey (CEX) of 1997, Bernheim et al. (2001) implied that the marginal tax rates of pensioners were likely to fall during retirement or over the period of their investment. Kutner et al. (2001) also argued that

an investor's individual tax rate during the withdrawal phase will generally be less than his individual tax rate at the time of his investment.

In this study, the return-on-investment for the two IRAs is analyzed in the event of both unchanging and declining tax rates during withdrawal. If this is the case in theory, then for most investors, the traditional IRA should receive more investment dollars. However, previous research by Horan (2006), Horan et al. (2009) and Shynkevich (2013), demonstrate that in a progressive tax environment, a higher tax rate at retirement is actually expected. Then, more dollars should be apportioned to the Roth IRA. Outside the income tax rates and rates of return, other variables such as age, marriage status, etc. are somewhat irrelevant to an even comparison. Obviously, if an investor starts contributing at 25 instead of 35 then, coupled with the time value of money effect, the compounding effect says that he will secure more wealth. But in terms of deciding which IRA an investor should choose, the age of the investor at any point in time is insignificant. Results utilizing different investment periods provided similar results, and thus are not included.

The impact of the tax cuts and jobs act has implications for other parties as well. This act lowered the marginal tax rates, which at first glance may decrease federal income tax revenue, but if investors move some of their contributions from traditional IRAs, which are tax-deductible, into Roth IRAs, in which contributions are taxed, then some of this lost tax revenue may be recovered in the short-term. The current research will also help guide tax preparers to inform their clients of which IRA is the most tax-advantageous based on the current tax legislation, and when converting from one IRA type to the other may be beneficial.

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