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Taxpayer wealth and federal tax revenue under a tax policy that shields retained earnings used for growth from taxes

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Abstract

This article addresses shortcomings in US tax policy: the interest tax shield (*ITS*) that favours debt over equity; the unfavourable tax treatment of retained earnings (*RE*) that is used for growth; and the inequalities in the taxing of ownership forms. Taxpayer wealth is calculated under the assumption that growth increases 0.78% with the enactment of the Tax Cuts and Jobs Act of 2017 (TCJA), which is an increase projected by tax experts. We discover that taxpayer wealth under TCJA with an *ITS* increases 15.69% beyond it pre-TCJA value; total federal tax revenue (*TFTR*) decreases 4.20%; and C corporations are no longer taxed more heavily than pass-throughs. If we replace an *ITS* with a 50% retained earnings tax shield (*½RTS*) where half of every dollar used for *RE* is shielded from taxes, we show that taxpayer wealth increases 4.51% and *TFTR* rises 3.15%. If we replace a *½RTS* with an *RTS* (where 100% of *RE* is shielded from taxes), we find that taxpayer wealth and *TFTR* together increase 5.53%. The switch to an *RTS* further serves to equalise the taxing of pass-throughs and C corporations. Finally, switching from an *ITS* to an *RTS* does not materially alter the optimal debt-to-firm value ratio.

Key words: Taxpayer wealth, federal tax revenue, business growth, federal debt, tax shields, Capital Structure Model

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1. INTRODUCTION

During December 2017, the US Congress passed the Tax Cuts and Jobs Act (TCJA) that lowered tax rates enabling individuals and businesses to keep more of their earnings. With larger earnings, greater consumer spending and business production would follow thereby boosting growth in real gross domestic product (GDP). The Tax Policy Center (TPC) (2018) reports that the estimated boost in growth per year will be about 0.8% for both 2018-2020 (average of six sources) and for 2018-2027 (average of five sources).[1] As reported by Page (2019), the Joint Committee on Taxation (JCT) expected (at the time of TCJA in December 2017) a USD 0.15 trillion decline per year in federal tax revenue for the next ten years. To put USD 0.15 trillion in perspective, it is 4.39% of the projected USD 3.42 trillion in US federal tax revenue for 2019. This estimate of 4.39% is consistent with the projection of 4.30% given by the Congressional Budget Office (CBO) (2019) as the average for 2020–2029.

Motivated by inefficiencies in US tax laws, we seek a solution to the growing US debt problem by exploring a tax law change where an interest tax shield (*ITS*) is replaced with a retained earnings tax shield (*RTS*) where retained earnings (*RE*) is a tax-deductible expense at the business level.[2] In essence, *RTS* is a direct tax subsidisation of growth that is superior to any growth-related depreciation or amortisation that might exist over time. The tax law change that we propose is a direct response to inefficiencies especially those related to the tax deduction on interest (*I*) that favours debt over equity and the taxation of funds used for growth.

To test this tax law change where an *RTS* replaces an *ITS*, we use the Capital Structure Model (CSM) developed by Hull (2014a, 2018, 2019). Prior to full development of the CSM, Hull (2005) utilised a framework similar to the CSM to provide an application using market and company data for the Australian Gas Light Company (now AGL Energy). The CSM equations as presented by Hull (2019) allow for the use of *ITS* and/or *RTS*. By including CSM equations where *RE* can be eligible for a tax shield with *I* being taxed, we address the distortion presented by *ITS* that favours debt over equity and the taxation of funds that too often makes growth unaffordable. Of importance, these CSM equations are capable of identifying which tax shield or combination of tax shields yields greater maximum firm value that, *ceteris paribus*, leads to a greater federal tax revenue. As required by this study that includes all for-profit organisations (FPOs), CSM equations cover the two main FPO forms of ownership: C corporations and pass-

[1] This article was updated May 2020 but the numbers cited are not changed.

[2] An *RTS* includes all expenses that are used to create growth in goods and services. These expenses bring about new or improved capital as well as a more efficient labour force. Examples of expenses that might qualify include the general areas of expansion and research and development (R&D). *First*, in terms of expansion, qualifying expenses can include: (i) capital expenditures for new land, buildings and equipment that cause growth; (ii) acquisition of assets (facilities, businesses, products, or technologies) that supply synergy and lead to growth; and, (iii) raising capital for investment (particularly by banks/real estate investment trusts (REITs)), new constructions (including expansion of subsidiaries); and (iv) increasing facilities to expand or develop land, properties, or resources that add new products and jobs. *Second*, in terms of R&D, qualifying expenses can include such items as product development, clinical tests, exploration, and accompanying R&D expenses such as sales, marketing, and commercialisation. In brief, any expense that is essential to growth would be a tax-deductible expense under an *RTS*. However, certain *RTS* expenses that cause double counting would be capped. For example, if a business already has a deduction from R&D expensing or depreciation of equipment, then there would be a limit on what could be deducted by an *RTS* tax policy. In fact, an *RTS* tax policy should be more comprehensive and supplant any prior growth-related tax deductions.

throughs (sole proprietors, partnerships, and S corporations). In this study, we apply the CSM pass-through equations to all personal taxpayers who, like pass-through owners, pay at the same personal tax rate level.

An *ITS* denotes that every dollar of *I* is a tax-deductible expense. Similarly, *RTS* signifies every dollar of *RE* is a tax-deductible expense. Besides utilising an *ITS* and *RTS*, this study also uses a *partial RTS* of one-half, which is called a ½*RTS* because one-half of every dollar of *RE* is a tax-deductible expense.[3] We follow the CSM's usage of *RE*, which is defined as those before-tax operational cash flows retained and used for growth purposes. Thus, any funds retained that are either idle or used for non-growth purposes (such as retiring debt) would not merit a tax deduction.

Our tests generate the following findings. *First*, when comparing pre-TCJA and TCJA results when an *ITS* is present, we find that taxpayer wealth (as captured by business wealth or firm value) increases 15.69% beyond its pre-TCJA value, total federal tax revenue (*TFTR*) falls 4.20%, and the weighted effective tax rate (*WETR*) drops 9.98%.[4] These findings assume that growth increases 0.78% under TCJA, which is consistent with the TPC (2018) and empirical research (Romer & Romer, 2010; Barro & Redlick, 2011; Mertens & Ravn, 2013). Our 4.20% independent assessment is the same as the 4.20% given by CBO (2019) for 2019 and close to the 4.30% that they predict as the average for 2020–2029. These results suggest that we explore a tax policy reform because the greater growth from TCJA does not prevent a fall in *TFTR*, thereby worsening the federal debt.

Second, we find that replacing *ITS* with a ½*RTS* causes *TFTR* to climb 3.15% to a level near that found prior to TCJA. This increase in *TFTR* occurs while taxpayer wealth increases 4.51%, and *WETR* rises 0.62%. The latter represents an absolute change of only 0.10%. Taxpayers are the clear winner because, for every USD 1 of increase in *TFTR*, their wealth increases USD 52.18. The increase in *TFTR* along with sharing the enhanced taxpayer wealth offer hope that the US federal government can be set on a long-run trajectory of getting its debt to a reasonable percent of GDP with less fear of an out-of-control rise in debt. It is noteworthy that the loss in federal tax revenue from not taxing *RE* is offset by greater growth that leads to greater taxable income and substantial tax revenue from taxing *I*. Our results using a ½*RTS* tax policy show that removing tax barriers on *RE* enables real GDP and thus taxpayer wealth to grow in an unimpeded manner with less government interference caused by overtaxing growth.

Third, if we replace a ½*RTS* with an *RTS* thereby doubling the tax shield on *RE*, we find that taxpayer wealth increases 5.99%, *TFTR* declines 11.57%, and *WETR* rises 0.15% (absolute change of only 0.02%). Because taxpayer wealth and *TFTR* together increase 5.53% beyond that attained with a ½*RTS*, an *RTS* offers the greatest potential to

[3] Alternative names for a ½*RTS* and an *RTS* would respectively be a 50%*RTS* and a 100%*RTS*.

[4] For this article's purposes, the term *TFTR* refers to total federal tax revenue from those three sources that are used to represent the total federal tax revenue from all sources. These three sources are corporate taxes as paid by C corporations and personal taxes as paid by pass-throughs and *other personal taxpayers*. As defined later, *other personal taxpayers* is a group of taxpayers who pay at the personal statutory tax rate as opposed to a pass-through group of pass-through owners who also pay at the same personal tax level. As will be seen in Figure 1, C corporations, pass-throughs, and *other personal taxpayers* make up 56% of federal tax revenue projected for 2019. These three sources of *TFTR* are directly associated with FPOs. Most of the remaining 44% also stems from FPOs because FPOs are largely responsible for social insurance taxes that make up 36% of the remaining 44%.

maximise taxpayer wealth and thus solve the problems involving excessive federal debt and social insurance insolvency. However, before these problems can be resolved, taxpayers would have to share their enhanced wealth achieved under an *RTS* tax policy. The increase in taxpayer wealth from an *RTS* has a monetary value that is 19.13 times greater than the drop in federal taxes paid, indicating there is plenty of wealth to increase *TFTR* if needed. The reason for the superiority of an *RTS* is that it provides a 100% tax subsidy on every dollar used for internal growth as captured by *RE*. Such a subsidy is a potent impetus to make growth affordable.[5]

Fourth, prior to TCJA, we discover that C corporations were at a tax disadvantage compared to pass-throughs where the *WETR* inequality gap was 4.138%. The gap not only dropped from 4.138% to 1.537% under TCJA with an *ITS* but the pass-through advantage was reversed as C corporations now have the advantage by paying 1.537% less in taxes. In absolute terms, the inequality gap dropped 2.601%. We find that replacing an *ITS* with a ½*RTS* further lowers the *WETR* inequality gap between pass-throughs and C corporations from 1.537% favouring C corporations to 0.848% favouring C corporations. This is a reduction of 0.689% in the tax gap. Finally, replacing a ½*RTS* with an *RTS* further lowers the *WETR* inequality gap between pass-throughs and C corporations from 0.848% favouring C corporations to 0.698% favouring C corporations. This is a further reduction of 0.150% in the *WETR* gap.

Fifth, a switch in the tax shield from *I* to *RE* does not notably alter the optimal debt-to-firm value ratio (*ODV*). The finding that leverage is not significantly influenced by tax policy is consistent with the claim that an *ITS* is an arbitrary tax deduction reflecting an inefficient tax policy that fails to properly subsidise growth. To illustrate the near irrelevance of *ITS* on debt choice, the *ODV* of 0.255 for an *ITS* under TCJA falls slightly to 0.246 with the switch to a ½*RTS*. It falls to 0.235 if we switch to an *RTS*. The relatively small changes in *ODVs* occur because the large jump in the credit spread, such as occurs when going from an investment grade rating to a speculative credit rating, is a major determinant of an *ODV*.[6]

To aid the reader in navigating the document with its many acronyms, we supply Exhibit 1 in the Appendices that contains the most common and key acronyms used in this article. Since acronyms (and the terms they identify) are described in detail in the article, Exhibit 1 focuses on providing a concise definition and/or meaning of the acronym associated with the term it represents. Common accounting acronyms are not included.[7]

The remainder of this article is set out as follows. Section 2 provides background information covering TCJA and tax inefficiencies, sources of US federal tax revenue, relation between tax rates and growth, and valuation models. Section 3 overviews the inputs we use when computing taxpayer wealth and federal tax revenue results. Section

[5] While not discussed in this article, we find that pre-TCJA non-growth FPOs have, on average, greater firm value than growth C corporations for an *ITS*. Such is not the case for a ½*RTS* and even less so for an *RTS* where growth is taxed less. Similarly, such is also not the case for TCJA tests where lower tax rates also exist making growth more affordable.

[6] Hull (2019) suggests *ODVs* will be above 0.3, while we find *ODVs* below 0.3 for most of our tests. However, Hull's research began at a time when only 2018 credit spreads were available. For 2018, Moody's Baa2 was the optimal credit rating as opposed to the higher Moody's rating of A3 that we find for 2019. A lower optimal credit rating means a greater *ODV*.

[7] Less common accounting acronyms are also not included because they are defined and used together in sections 4.1, 4.2 and 4.3.

4 reports results that support an *RTS* tax law. This law increases taxpayer wealth and federal tax revenue while also lowering the inequality gap when taxing different ownership forms. Section 5 covers key assumptions behind this article's results, robustness tests, a blueprint for countries to overcome their debt problems, and future research possibilities. Section 6 provides summary statements and conclusions. Five appendices are included that contain the more quantitative and technical details needed to generate this article's findings.

2. BACKGROUND

In this section, we discuss TCJA and tax inefficiencies; the sources of federal tax revenue; the literature on how changes in tax rates influence growth; and valuation models including the Capital Structure Model (CSM) that generates this article's results.

2.1 TCJA and tax inefficiencies

TCJA includes two major tax changes. *First*, TCJA drops the maximum statutory personal tax rate from 39.6% to 37%. This article categorises all personal taxpayers who are subject to ordinary personal income tax brackets as PTPs. This category includes two groups consisting of the pass-through group and the *other personal taxpayers* group where the latter group includes those employed by for-profits, non-profits, and government.[8] TCJA also alters personal income tax brackets in a way that lowers the effective personal tax rate paid by PTPs. Unless extended, the lower personal tax rates under TCJA will revert to their higher pre-TCJA values after 2025. Similarly, there is no guarantee that the TCJA business deduction of 20% for lower income pass-throughs will extend beyond 2025.

Second, TCJA lowers the maximum corporate tax rate paid by C corporations from 35% to a flat rate of 21%, which is a 40% decrease in the maximum. This decrease is considered permanent as there is no set date for this lower corporate tax rate to expire. Burke (2008) notes that C corporations accounted for 30% of federal tax revenue in 1953 but only 7% by 2003, which is the same percent estimated for the future (as seen later in the 2019 projections in Figure 1). The huge drop in the corporate tax rate raises a question of how C corporations will spend their tax savings. Matthews (2018) answers that historically firms repurchase shares when taxes fall as opposed to increasing wages for consumer spending. However, Knott (2019) notes that repurchasing shares is just another way of distributing cash to shareholders with repurchases occurring in greater numbers when companies already have healthy R&D investments. Thus, firms with unhealthy R&D investments would be more inclined to strengthen their R&D investments under TCJA where lower tax rates generate more cash flows for investments.

[8] Since PTP includes two groups, this article's use of PTP can refer to either the pass-through group or the *other personal taxpayers* group or both groups together. However, as seen later, we do *not* use the acronym PTP for pass-throughs when we are specifically discussing pass-throughs as a separate group. Examples include when testing the effects of TCJA on pass-throughs versus C corporations, referring to pass-through business taxes, or computing differences in tax rates between pass-throughs and C corporations. While the pass-through group is technically pass-through owners, for brevity, we just use the term pass-throughs.

2.1.1 Failure to abolish ITS

By lowering the maximum corporate tax rate by 40%, TCJA addresses the double tax on C corporations where their owners pay taxes on the same earnings at both the business and personal levels whereas pass-through owners only pay at the personal level (albeit the pass-through personal tax rate level is typically higher than that for a C corporation). Doran (2009) notes that the double taxation on C corporations is widely regarded as unfair and inefficient. Polito (2017) describes this double taxation as arbitrary and capricious. While TCJA addresses the baffling double taxation tax law for C corporations, it fails to address an equally perplexing tax law that allows an *ITS* to exist. This law is puzzling because there is no obvious reason that interest (*I*) should be a tax-deductible business expense for an FPO (be it a pass-through or C corporation). Despite any historical reasons that support its origins, there are longstanding and compelling reasons that the tax deduction on *I* serves no purpose and may even be detrimental.[9] Besides being at the centre of the distortion that favours debt over equity (Burke, 2008; Norbäck, Persson & Tåg, 2018), we offer five other reasons to justify that TCJA should have abolished the law allowing an *ITS*.[10]

First, capital structure theorists (Jensen & Meckling, 1976; Jensen 1986) posit that a reasonable amount of debt embodies net positive agency effects regardless of its tax deductibility. Consequently, there is no imperative supporting a tax law that creates an artificial positive effect by legalising *I* as a tax-deductible expense for an FPO. *Second*, the cost of debt is already below the cost of equity so that a tax deduction on *I* (that further lowers the cost of debt) alters the natural differential between the costs of debt and equity when one security type receives a tax benefit that the other does not receive. *Third*, debt already has a niche as it appeals to conservative investors who want safer returns regardless of its deductibility. *Fourth*, *ITS* has a negative effect on taxpayer wealth to the extent it usurps the ability of governments to give tax breaks for growth. *Fifth*, for our tests, the optimal debt-to-firm value ratio (*ODV*) for an average FPO displays a relatively narrow range of *ODV* values regardless of what financial cost variable (interest or retained earnings) provides a tax shield. This is because the jump in the credit spread when going from an investment grade bond to a speculative grade credit rating can be a dominant determinant of *ODV* for a typical FPO.

Under TCJA, many businesses can only deduct *I* up to 30% of its earnings before interest, tax, depreciation and amortisation (*EBITDA*). *EBIT* will replace *EBITDA* in 2022, which can cause problems for businesses with large annual depreciation and/or amortisation deductions. However, for the tests we conduct, an average company would fall well below a 30% level at least when *EBIT* is used. Thus, for the most part, *ITS* is effectively preserved under TCJA. However, there can be exceptions. For example, we find that *ITS* is not totally preserved for the financial services industry.[11]

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[9] See Bank (2014) for a discussion of *ITS* including its origins.

[10] See Hilling and Vilhelmsson (2015) for the problems in classifying financial instruments as debt and equity.

[11] As a group and using *EBIT*, we find that the financial service industry exceeds the 30% level with a pre-TCJA of 67.47% and a TCJA of 78.58%. These results come from separately testing the financial services (*FS*) firm category. As discussed in Appendix 3, *FS* firms represent 7.2% of US GDP according to Federal Reserve Economic Data (FRED) (2019b). In contrast, the *small* and *large* categories (that account for 92.8% of businesses) average 14.88% and 19.11%, respectively, and are below the 30% level.

2.1.2 Failure to promote RTS

Besides failing to effectively address the shortcomings of an *ITS*, TCJA also falls short in terms of directly promoting either an *RTS* or a similar mode of subsidising growth. While TCJA boosts growth through a temporary provision for immediate (and full) expensing of qualified short-lived investment, TCJA ignores implementing an *RTS*. As a permanent initiative applicable to all FPOs, an *RTS* would be a more widespread provision that is superior to any depreciation, depletion, and amortisation of qualified assets used for growth.

Two underlying sources of growth that would be affected by an across the board *RTS* are R&D and innovation. Whereas R&D turns invested funds into knowledge, innovation is the process of commercialising this knowledge. By reducing taxes, TCJA lowers the after-tax cost related to R&D and innovation and thus makes growth more affordable. However, while freeing up more after-tax funds for growth, TCJA does not directly aid growth through a reduction in taxes on funds used for growth. For example, consider the following illustration. A company retains 5% of its before-tax cash flows. These retained funds are listed as retained earnings (*RE*) in its balance sheet and can be used for multiple purposes over time. Suppose all of these funds are invested for growth purposes such as the development of new products for which other costs are incurred related to sales and marketing as well as new capital assets like new heavy-duty transportation equipment to ship the newly developed goods. Under an *RTS*, these expenditures (that use funds from the *RE* account) get an immediate tax deduction, which is a tax subsidy equal to the company's tax rate times the *RE* used.

Because a direct tax support for growth (such as an *RTS*) is not addressed by TCJA, TCJA appears to largely ignore the tax reform presented by researchers and tax experts (Noked, 2014; Nussim & Sorek, 2017; Pomerleau, 2017) whose writings are consistent with the notion that tax reform should be aimed more directly at the sources of growth. Noked examines optimal tax reform in regards to R&D and suggests a subsidy equal to the positive externality that R&D supplies. Nussim and Sorek discuss the value of government involvement in financing innovation and note that cash transfers and tax incentives can have the same effect if done correctly but also present an argument that non-tax cash transfers can be socially superior. Pomerleau contends that the high US tax code discourages investment and suggests immediate expensing as one permanent measure to decrease the cost of growth.

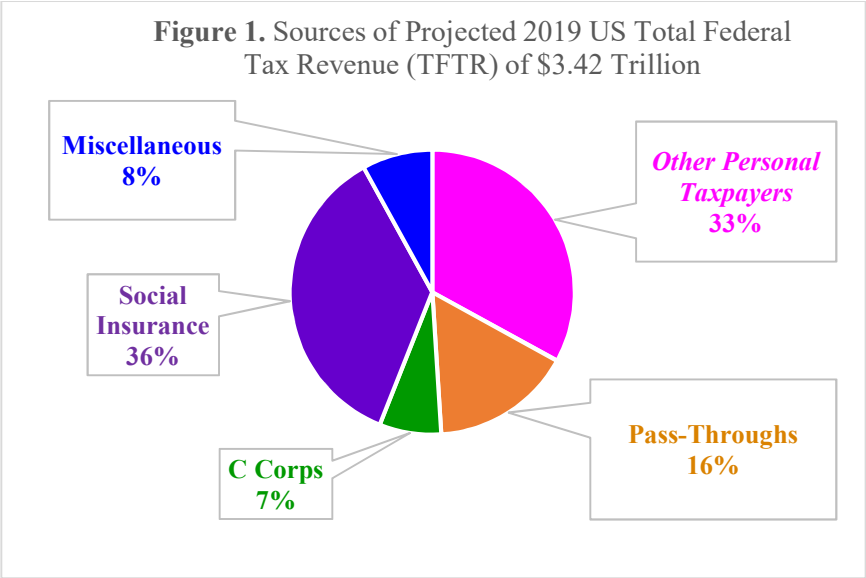
2.2 Sources of US federal tax revenue

Figure 1 shows the sources of US total federal tax revenue (*TFTR*) projected for 2019 at the time our research began. We form this Figure by borrowing from JCT (2018), Amadeo (2018), and Greenberg (2017). The use of multiple sources for forecasting *TFTR* serves a purpose. For example, PTPs (previously defined as all personal taxpayers who are subject to ordinary personal income tax brackets) are typically combined into one category but the use of multiple sources enables us to separate PTPs into the two groups of pass-throughs and *other personal taxpayers* both of which are seen in Figure 1. Separating out pass-throughs allows us to compare them to C corporations as well as combine them with C corporations to determine the impact of TCJA on FPOs together.

Figure 1 reveals that FPOs supply 23% of TFTR with 7% from C corporations and 16% for pass-throughs. Figure 1 also shows that *other personal taxpayers* provide 33% of federal tax revenue. The PTP group of *other personal taxpayers* works predominantly

for FPOs but some also work for non-profits and governments (at the local, state, and federal governmental levels). As seen in Figure 1, *other personal taxpayers* account for more than twice that of pass-throughs and nearly five times that of C corporations.

Fig. 1: Sources of US Federal Tax Revenue, 2019



Source: From JCT (2018), Amadeo (2018), and Greenberg (2017).

From Figure 1, we see that the largest source of projected TFTR in the US is from social insurance (FICA) that comprises 36% of TFTR for 2019 and for which FPOs can be credited with largely funding. Since pass-throughs hire the majority of employees according to Greenberg (2017), they account for the largest portion of this 36% when compared to C corporations, non-profits, and government agencies. Finally, the miscellaneous category (excise, estate, gift taxes, custom duties, and other taxes/fees) comprises 8% of the projected federal tax revenue for 2019.

For this article's tests, we use FPO wealth to represent taxpayer wealth. As seen in Figure 1, FPOs appear to only constitute 23% of federal tax revenue. However, there are two ways to incorporate the other three sources of federal revenue so that our tests can account for more than 23% of federal revenue.

First, we can just extrapolate from the C corporation and pass-through tests by assuming other sources of revenue are directly associated with their livelihood. Thus, instead of capturing only 23% of federal revenue, the percentage can range from 23% to 100%. One might even argue that the true percentage lies much closer to 100% than 23% given that *other personal taxpayers* and social insurance account for 69% and both stem largely (if not entirely) from FPOs. Thus, one might extrapolate and say C corporations account for 4(7%) = 28% and pass-throughs account for 4(16%) = 64% so that our tests using FPOs to proxy for taxpayer wealth account for 92% of federal tax revenue.

Second, we can assess if it is reasonable to add a source of revenue to either C corporations or pass-throughs or both. The most logical addition is to combine the *other personal taxpayer* source with the pass-through source. This addition is justified since both sources pay taxes at the personal tax level. Furthermore, as noted previously, pass-throughs are the largest employer of *other personal taxpayers*.

For this study, we choose the second alternative and so add *other personal taxpayers* to the pass-through source of revenue to form the group of personal taxpayers (PTP). The three categories of C corporations, pass-throughs, and *other personal taxpayers* are important for our tests because, as shown in Figure 1, they account for 56% of projected federal tax revenue in 2019. By using these three groups, our tests can also offer two comparisons based on two sets of weights found in Figure 1. *First*, the weights when combining C corporations and pass-throughs are 7/23 = 0.30435 for C corporations and 16/23 = 0.69565 for pass-throughs (roughly, 0.3 for C corporations versus 0.7 for pass-throughs). *Second*, the weights when combining C corporations and PTPs are 7/56 = 0.125 for C corporations and 49/56 = 0.875 for PTPs.

For our tests, the primary focus will be on the second set of weights as they have the greatest influence on federal tax revenue. If one assumes that both social insurance taxes and other minor miscellaneous sources of federal revenue are constant and/or extrapolated proportionally, then this second set of weights represents the total influence on taxpayer wealth and federal tax revenue.

2.3 Relation between tax rates and growth

McBride (2012) writes that 26 of 29 studies since 1983 find strong support for the notion that higher taxes have a negative effect on growth with the most harmful taxes being that paid at the business level. Romer and Romer (2010) find that a personal tax increase of 1% has a large negative effect on investment leading to a real GDP decrease of about 3% over the next three years. Barro and Redlick (2011) discover that a cut of 1% in the average marginal income tax rate raises per capita GDP in the US by 0.6% for the following year. Mertens and Ravn (2013) find that cuts in personal and corporate taxes increase investment.[12] They add that cuts in personal taxes lead to a fall in federal tax revenue while similar size cuts in corporate taxes have less of an impact. The latter is consistent with Figure 1 where C corporation revenue is a much smaller part of federal tax revenue compared to PTPs.

The research just cited offers evidence that increased tax rates are a deterrent to investment thus hindering GDP growth and taxpayer wealth. This finding is embodied in the Capital Structure Model (CSM) where the growth rate is negatively affected by business level taxes on retained earnings (*RE*) with larger tax rates having greater negative effects on growth. The CSM points out that the cost of using *RE* for growth comes with a price, which is the business level tax on *RE*. For C corporations, the business level tax is a corporate tax rate. For pass-throughs, the business level tax is a personal tax rate. The CSM's break-through concept of an equilibrating levered growth rate (g_L) ties together the plowback-payout decision with the debt-equity choice. Thus, any influence of a business tax rate on *RE* and interest (*I*) is factored into CSM outcomes as both variables are in the g_L equation (as seen in Appendix 1) where a smaller business

[12] See Freebairn (2017) for an assessment of the comparative effects of a lower corporate tax rate on investment decisions of small and large businesses.

level tax rate has a positive effect on g_L values. While *RE* and *I* have opposite effects on g_L, the positive effect from *RE* dominates the negative effect from *I* when the business level tax rate falls.

2.4 Valuation models

Valuation models compute wealth. Using these models to explore taxpayer wealth maximisation is the best way to insure there is ample federal tax revenue to supply the infrastructure and governmental services mandated by society. This is because, *ceteris paribus*, greater taxpayer wealth leads to greater tax revenue. Taxpayer wealth begins with FPO business wealth as taxpayers own these businesses and receive income from them. Taxpayers, even those employed by non-profits and governments (state, local, and federal), are linked to business wealth as non-profits and governments rely heavily on FPOs to supply their revenue streams.

In this article, the concept of maximum firm value ($max\ V_L$) captures maximum taxpayer wealth. $Max\ V_L$ consists of valuation from two general security ownership types that supply financing: equity and debt. The key to achieving $max\ V_L$ is to choose the optimal security mix to finance projects with a positive net present value. Capital structure models are valuation models that address the optimal equity-debt mix that coincides with $max\ V_L$. Thus, a starting point for maximising taxpayer wealth is a capital structure model that can correctly compute $max\ V_L$.

The tax-based capital structure models of Modigliani and Miller (1963), referred to as MM, and Miller (1977), offer valuation models based on an unlevered firm (which is a firm without any debt-like obligations) issuing debt to retire a proportion of its unlevered equity ownership.[13] Unlike tax-based models, agency-based models (Jensen & Meckling, 1976; Jensen, 1986) provide a financing framework for an optimal equity-debt choice that can exist independent of taxes. Pecking order models (Donaldson, 1961; Myers, 1977; Myers & Majluf, 1984) address issues related to the debt-equity choice when financing a firm's growth. Pecking order models do not specifically address an optimal debt-to-firm value ratio (*ODV*) or the dollars gained from replacing equity with debt. This is because they focus on a preferred financing order with retained earnings (*RE*) as the preferred choice for financing capital projects. Trade-off models (Baxter, 1967; DeAngelo & Masulis, 1980; Berk, Stanton & Zechner, 2010; Hull, 2018) balance the costs and benefits of debt revealing the existence of an *ODV* that coincides with $max\ V_L$. While trade-off models dominate the capital structure literature, these models can be very complex for non-academics making them generally unusable for practising managers.

The CSM is unique as it is the only model integrating growth and debt through a variable, the levered equity growth rate (g_L), that relates the plowback-payout and debt-equity choices.[14] Due to its uniqueness and applicability, this article uses the CSM to identify $max\ V_L$. We accomplish this after first computing a series of V_L values using a CSM equation that is adaptable to the taxing peculiarities of the ownership form tested. From these V_L values, we identify $max\ V_L$. As demonstrated in section 4.4, this article's

[13] Articles with more comprehensive literature reviews of capital structure model include Harris and Raviv (1991) and Graham and Leary (2011). Hull (2019) supplies a literature review that includes the CSM.
[14] For an introductory application of the non-growth CSM, see Hull (2008). For a growth application, see Hull (2011).

use of the CSM produces outcomes consistent with empirical research (Graham, 2000; Korteweg, 2010; Van Binsbergen, Graham & Yang, 2010).

3. INPUTS WHEN COMPUTING WEALTH AND TAX REVENUE RESULTS

This section often follows Hull (2019) and the process in that study to calculate outcomes for taxpayer wealth and federal tax revenue. We also supply our own details on how we determine values for CSM inputs, in particular, as relates to discount rates (costs of borrowing), debt ratios, tax rates, and growth rates. Given the disagreements over the extent of growth under TCJA, section 3.3 looks at historical growth in real US GDP when guiding the choice of growth rates for pre-TCJA and TCJA tests.

3.1 Perpetual cash flows and discount rates

To compute business wealth (and thus taxpayer wealth) in a perpetuity model like the CSM, two beginning variables are perpetual cash flows for equity and debt owners and corresponding equity and debt borrowing costs used as discount rates. We now describe these two variables.

First, we begin with a perpetual before-tax cash flow (CF_{BT}) of USD 1,000,000 that creates annual taxable perpetuities paid to equity and debt owners. Given this article's focus on federal taxes and a tax law that directly subsidises growth activities, we define CF_{BT} as cash flows available to the FPO before federal taxes are paid and before any applicable tax shield lowers business level taxes. Thus, CF_{BT} is an operational cash flow after all non-tax shield expenses. These expenses can include those related to non-federal taxes, replacement, depreciation, depletion, and amortisation. Thus, expenses can include items like state taxes and amortised R&D, albeit not all states have taxes and not all firms have amortised R&D. Restrictions may have to be put on items like R&D to prevent it from being used more than once as a tax deduction or exceeding specified limits related to its cost.[15] Since we begin with an unlevered firm, interest (I) only lowers CF_{BT} (for taxation purposes under an *ITS* tax law) after debt is issued. For an *RTS*, *RE* lowers the taxes on CF_{BT} where *RE* refers to retained earnings, which is internal equity used for growth purposes.

Second, we need borrowing costs to discount perpetual equity and debt cash flows. To gather these borrowing costs, we use the five-step procedure found in Appendix 2. As seen in this appendix, we base borrowing costs on credit spreads matched to credit ratings and interest coverage ratios (*ICRs*).

Finally, there is the task of matching credit ratings and credit spreads (and thus costs of borrowing) to debt-to-firm value ratios (DV) and, in the process, determining how much unlevered equity (E_U) must be retired by debt to maximise firm value at ODV.[16] Damodaran (2019) makes this task possible by matching credit ratings and credit spreads with *ICRs* where each *ICR* can be used to compute a corresponding DV.[17]

[15] While there is no exact comparison from an accounting standpoint, we equate CF_{BT} with *EBIT*. Thus, in this article, we use *EBIT* and CF_{BT} interchangeably.

[16] Since unlevered firm value (V_U) is unlevered equity value (E_U) plus debt (D) and D is zero when the firm is unlevered, we have $V_U = E_U + D = E_U + 0 = E_U$. Thus, $V_U = E_U$. For the most part, this article uses E_U instead of V_U.

[17] When we began our study, the most recent data available by Damodaran (2019) was for the year 2018. It should be pointed out that Damodaran not only updates his data each year but the details of the updated data can change such that his archived data can have differing degrees of details.

Damodaran supplies ICR for three categories: *large*, *small*, and *financial service* (*FS*). Damodaran reports *ICRs* in terms of ranges. For our tests, we use the average of each range for our tests except for endpoints where the range is extremely large so that we compute *ICR* as described by Hull and Van Dalsem (2021). They are the first researchers to use *ICRs* in conjunction with the CSM. We then weight these *ICRs* as described in Appendix 3 where we also provide an example of how we use an *ICR* (for a Moody's credit rating of A3) to identify *max* V_L and *ODV*.

3.2 Tax rates

For our tests, we allow the personal equity tax rate, the corporate tax rate, and personal debt tax rate to change in their predicted directions given by Hull (2014a) for each successive *P* choice where *P* refers to the proportion of unlevered equity retired with debt. Hull argues that the personal equity tax rate and corporate tax rate decrease and the personal debt tax rate increases with greater debt-for-equity transactions. While Hull's arguments had C corporations in mind, they are also applicable to pass-throughs. For our tests, we use a 3% change in a tax rate for each of the 15 increasing *P* values.[18] While disagreements about an effective tax rate exist and vary over time, our tax rates (described next) are consistent with the arguments and sources given by Hull (2019) as well as other sources (Frankel, 2017; Peter G Pederson Foundation, 2017; York, 2018).

For C corporations, the maximum corporate tax rate is 21% under TCJA and is also a flat rate. Prior to TCJA, the maximum was 35%. The personal equity tax rate for C corporations is based on tax laws governing dividends and capital gains tax laws.[19] The typical personal maximum tax rate is 20% if we ignore the extra 3.8% for the wealthiest few who have net investment income above applicable threshold amounts. This holds for both capital gains and qualified dividends that result if equity shares are owned for more than 60 days during the 121-day period that begins 60 days before the ex-dividend date. TCJA did not change these rates. For PTPs, the personal equity tax rate has a maximum of 37% under TCJA and 39.6% prior to TCJA. For both C corporations and PTPs, the tax rate paid on interest has the same tax rates of 37% and 39.6%. However, if debt is held three years, taxes on capital gains follow the same laws governing that for equity. Additionally, capital gains on debt can be further reduced by indexation. The above maximums for C corporation equity owners and FPO debt owners are rarely achieved for a number of reasons, one of which is the ability to defer tax payments for long periods.

For unlevered C corporations, we set the unlevered corporate tax rate (T_{C1}) at the maximum TCJA rate of 21% for TCJA tests and the maximum pre-TCJA rate of 35% for pre-TCJA tests where the subscript '1' denotes that the tax rate is an unlevered rate. At *ODV*, these two unlevered rates become the effective levered corporate tax rate (T_{C2}) of 18.03% for TCJA tests and 30.06% for pre-TCJA tests where the subscript '2' denotes that the tax rate is a levered rate. We use 11% as the unlevered C corporation personal tax rate on equity (T_{E1}). We set the personal debt tax rate (T_{D1}) at 14% as the

[18] The use of 3% best generates values for all of the effective levered tax rates identified in this subsection as occurring at *ODV*. Since the *ODV* for all of our tests occurs with a Moody's A3 credit rating, the cumulative change from an unlevered tax rate to a levered tax rate never fluctuates more than 1/6 of its initial unlevered value.

[19] See Steyn et al. (2019) and Vaillancourt and Kerkhoff (2019) for examples of recent reviews of the capital gains literature. See Hasseldine and Fatemi (2019) for a study on the distinction between ordinary income and capital gains.

starting point prior to debt being issued.[20] At *ODV*, these two tax rates become effective levered C corporation tax rates of T_{E2} = 9.45% and T_{D2} = 16.23%.[21] Since TCJA does not change the maximum tax laws governing these rates, they generally apply to both pre-TCJA and TCJA tests. An exception would a debt owner who would pay a slightly lower tax rate on interest income under TCJA. Finally, for PTP tests, we use T_{E1} = 37% for TCJA tests and T_{E1} = 39.6% for pre-TCJA tests. At *ODV*, these unlevered personal tax rates become effective levered personal tax rates of T_{E2} = 31.77% for TCJA tests and T_{E2} = 34.01% for pre-TCJA tests. Like our C corporation tests, T_{D1} = 14% for the PTP unlevered situation and T_{D2} = 16.23% at *ODV*.[22]

3.3 Growth rates

We use an annual growth rate of 3.12% for pre-TCJA tests and 3.90% for TCJA tests. The latter rate captures both the expected increase in growth of 0.78% under TCJA as given by the TPC (2018) and the rate found in the past 70 years of historical data for annual growth in real US GDP from US Bureau of Economic Analysis (2019). Because we find 3.12% for a 70-year period and 3.90% for shorter periods over the past 70 years (for example, 3.90% occurs for the 30 years from 1930 through 1959), we view the boost in growth of 0.78% as the difference in growth rates that are sustainable between longer periods and shorter periods. One can surmise that the difference of 3.90% – 3.12% = 0.78% represents enhanced growth for periods where the business environment is more conducive to growth due to more favourable tax legislation such as allowance for growth tax credits. Such a business environment can characterise what TCJA seeks to attain.

While C corporation tax rates are lowered by over five times more than pass-through tax rates under TCJA, Figure 1 shows that PTPs account for 49% of federal tax revenue (16% for pass-throughs and 33% for *other personal taxpayers*), which is seven times the federal tax revenue of 7% for C corporations. Thus, in terms of the impact on federal revenue, the five times greater drop in C corporation tax rates is more than offset by the fact PTPs provide seven times more of federal tax revenue. It follows that, all factors considered, changes in corporate and personal tax rates under TCJA have similar large impacts on growth in real GDP.

In the CSM, we capture growth by the levered equity growth rate g_L. Given that retained earnings (*RE*) equals $PBR(CF_{BT})$ where *PBR* is the before-tax plowback ratio as given by the growth CSM and g_L is defined in terms of *RE*, we are able to change *PBR* until our chosen g_L of 3.12% for pre-TCJA tests and 3.90% for TCJA tests are achieved for each target rating choice tested. Since our pre-TCJA versus TCJA results use a differential in growth of 0.78%, the growth rates of 3.12% and 3.90% are less important

[20] Since we need a starting point, the use of an unlevered debt is hypothetically since, by definition, an unlevered debt rate does not exist as unlevered means there is no debt. For this reason, the CSM research will typically use T_D for both T_{D1} and T_{D2} unless trying to distinguish between two debt choices as we do in this article. T_{D1} and T_{D2} are also used when modelling for wealth transfer such as found in Hull (2014b).
[21] Compared to Hull (2020), our personal tax rates for equity and debt income for C corporations are low. On the other hand, it can be argued that our personal equity tax rates for PTPs are high. If so, our finding that an *RTS* lowers the inequality in taxing ownership form would be strengthened.
[22] We do not use an estimate for T_{D2} that considers an imputed T_{D2} from municipal bonds and corporate bond yields because this estimated rate is a marginal rate instead of an effective rate and so would be expected to be higher. Earlier CSM research may not agree with this article's tax rates due to changes over time in credit spreads that generate different *ODVs* or due to different research goals. For example, Hull and Price (2015) are as much concerned with differentials between T_{D2} and T_{E2} as exact rates.

as long as the differential is reasonably close to 0.78%. In other words, 3.00% and 3.70% with a 0.70% differential would generate similar results as these percentages are all close to the percentages we use.

We call the increase in maximum firm value (*max* V_L) from enhancing growth by 0.78% as the firm size adjustment factor (*FSAF*). *FSAFs* are determined as shown in the four-step procedure in Appendix 4.

As displayed later in Table 2, *FSAF* values range from 1.054485 to 1.076333 for TCJA tests. Since pre-TCJA tests do not have the enhanced growth of 0.78%, *FSAF* is 1 for all pre-TCJA tests. The outcomes when using enhanced growth under TCJA are equivalent to multiplying the CF_{BT} of USD 1,000,000 by the applicable *FSAF*. In turn, multiplying CF_{BT} by *FSAF* while maintaining g_L = 3.90%, causes values for taxpayer wealth and federal tax revenue outcomes to be multiplied by the same *FSAF*. Using enhanced growth to increase real GDP (as measured by the increase in *max* V_L) is not only consistent with TPC (2018) but also consistent with empirical evidence cited in section 2.3 that finds GDP rises when tax rates fall.

4. TAXPAYER WEALTH AND FEDERAL TAX REVENUE RESULTS

This section presents results from applying the CSM equations overviewed in Appendix 1. We report results for taxpayer wealth and federal tax revenue outcomes in graphical and table formats. We find that a tax policy allowing for a retained earnings tax shield (*RTS*) is superior to the current tax policy that permits an interest tax shield (*ITS*). We also show that ownership forms are taxed more equitably under an *RTS* and that the choice of an *ITS* or *RTS* does not exercise an important influence on the optimal debt-to-firm value ratio (*ODV*).

4.1 Graphical results for C corporations and pass-throughs with an *ITS*

Using the CSM equations, we generate a series of firm values that corresponds to debt-to-firm value ratios (*DVs*). From this series, we identify *max* V_L, which in turn reveals *ODV*. From the cash flows for equity and debt based on *max* V_L, we compute values for ten tax-related variables. Outcomes for these ten variables are illustrated graphically in Figures 2–7 with the first four outcomes involving taxpayer wealth variables and the last six outcomes involving federal tax revenue variables. We normalise these variables by dividing by USD 1,000,000, which is amount of the before-tax cash flow, CF_{BT}, prior to any firm size adjustment based on enhanced growth.

We now define the ten variables illustrated in Figures 2-7 (using accounting acronyms to represent them) where the accounting variable *EBIT* replaces CF_{BT}.

(1) ***EBT*** *(Earnings before tax)*: $\boldsymbol{EBT_{ITS}} = EBIT - I$ for an *ITS* where *I* = interest; $\boldsymbol{EBT_{RTS}} = EBIT - RE$ for an *RTS* where *RE* is retained earnings used for growth purposes; $\boldsymbol{EBT_{½RTS}} = EBIT - 0.5(RE)$ for a ½*RTS*.

(2) ***NI*** (*Net income subject to equity personal tax*): $\boldsymbol{NI_{ITS}} = (1-T_{C2})EBT_{ITS}$ for an *ITS* where T_{C2} is the levered corporate tax rate at *ODV*; $\boldsymbol{NI_{RTS}} = (1-T_{C2})EBT_{RTS} - I$ for an *RTS*; $\boldsymbol{NI_{½RTS}} = (1-T_{C2})EBT_{½RTS} - I$ for a ½*RTS*; $T_{C2} = 0$ for PTPs. In essence, we define *NI* in terms of after-corporate tax cash flows.

(3) ***RE*** (*Capital gains portion of NI subject to equity personal tax*): $RE = PBR(EBIT)$ where *PBR* is the before-tax plowback ratio as given by the growth CSM and *RE* captures the extent of the price appreciation or capital gains.[23]

(4) ***EP*** (*Equity cash payout portion of NI subject to equity personal tax*): $\boldsymbol{EP_{ITS}} = NI_{ITS} - RE$ for an *ITS*; $\boldsymbol{EP_{RTS}} = NI_{RTS} - RE$ for an *RTS*; $\boldsymbol{EP_{½RTS}} = NI_{½RTS} - RE$ for a ½*RTS*.

(5) ***CR-RE*** (*Corporate tax revenue from RE and/or I*): $\boldsymbol{CR\text{-}RE_{ITS}} = T_{C2}(RE)$ under *ITS* and $\boldsymbol{CR\text{-}I_{RTS}} = T_{C2}(I)$ under *RTS*; $\boldsymbol{CR\text{-}RE/I_{½RTS}} = T_{C2}(0.5)RE + T_{C2}(I)$ under a ½*RTS*; $T_{C2} = 0$ for PTPs.

(6) ***CR-EP*** (*Corporate tax revenue from equity cash payout subject to equity personal tax*): $\boldsymbol{CR\text{-}EP_{ITS}} = T_{C2}(EBT_{ITS} - RE)$ under *ITS*; $\boldsymbol{CR\text{-}EP_{RTS}} = T_{C2}(EBT_{RTS} - I)$ under *RTS*; $\boldsymbol{CR\text{-}EP_{½RTS}} = T_{C2}(0.5)(EBT - RE) + T_{C2}(EBT - I)$ under a ½*RTS*; $T_{C2} = 0$ for PTPs.

(7) ***PR-I*** (*Personal tax revenue from interest*): $\boldsymbol{PR\text{-}I} = T_{D2}(I)$ for C corp for *ITS*, *RTS*, and ½*RTS* where T_{D2} is personal tax rate on debt at *ODV*; $\boldsymbol{PR\text{-}I} = T_{D2}(I) + T_{E2}(I)$ for PTPs for either an *RTS* or a ½*RTS* where T_{E2} is the levered personal tax rate paid by PTPs at *ODV*.

(8) ***PR-RE*** (*Personal tax revenue from capital gains subject to equity personal tax*); $\boldsymbol{PR\text{-}RE} = T_{E2}(RE)$ where PTPs typically pay at higher ordinary personal tax rates compared to C corporations that pay at the capital gains tax rate.

(9) ***PR-EP*** (*Personal tax revenue from equity cash payout subject to equity personal tax*): $\boldsymbol{PR\text{-}EP} = T_{E2}(NI - RE)$ where *NI* takes on one of its three definitions in **(2)** depending on the tax law and PTPs typically pay at higher ordinary personal tax rates compared to C corporations that pay at the same low rate as the capital gains tax rate for qualified dividends.

(10) ***TFTR*** (*Total Federal Tax Revenue*): ***TFTR*** = **(5)** + **(6)** + **(7)** + **(8)** + **(9)** for C corps; ***TFTR*** = **(7)** + **(8)** + **(9)** for PTPs as they do not pay corporate taxes so that **(5)** and **(6)** are zero because $T_{C2} = 0$.

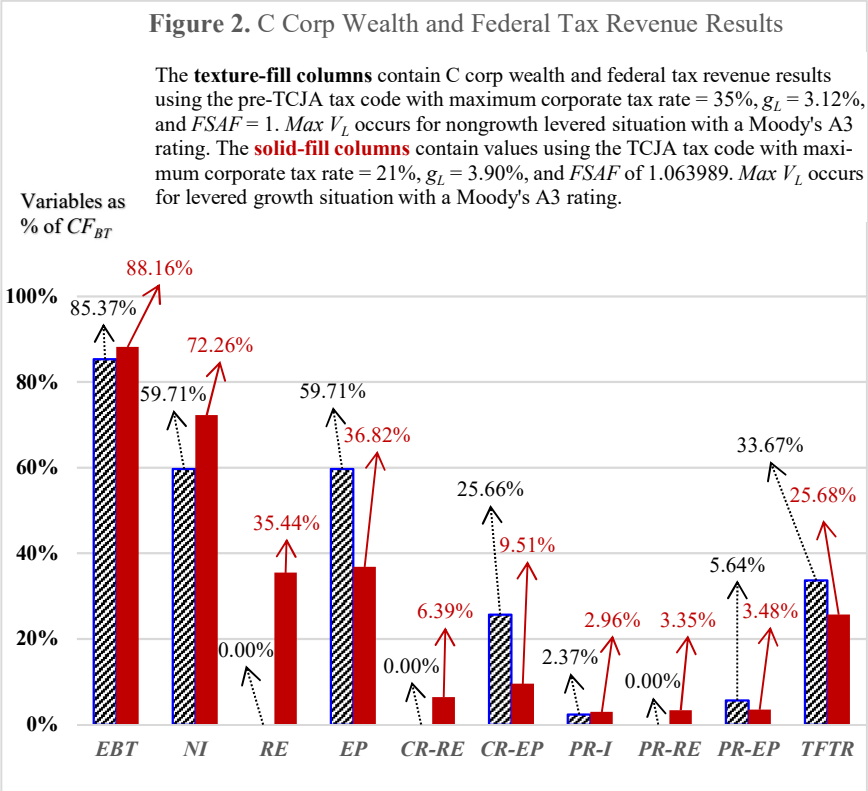
Figure 2 displays C corporation values for the ten tax-related variables when the C corporation is at its *ODV*. Values for these ten variables are all identified after first using (1), given in Appendix 1, to determines *max* V_L as it also maximises taxpayer wealth and *TFTR*. The texture-fill columns contain C corporation values for the pre-TCJA tax code with maximum corporate tax rate = 35%, g_L = 3.12%, and *FSAF* = 1. However, the pre-TCJA growth of 3.12% is not a factor as *max* V_L occurs for a levered non-growth

[23] Under CSM, the amount of *RE* (which is defined as retained earnings used for growth) is set aside for growth purposes before taxes are paid. This amount of *RE* is the best approximation we have for future taxable capital gains as they should, on average, be similar. Capital gain is the price appreciation from the time of buy to sell where price appreciation captures the expected perpetuity equity payout (*EP*). Thus, for a perpetuity model, like the CSM, all gains are technically *EP*. Regardless, capital gains and perpetuity *EP* (which are generally qualified dividends for C corporations) are taxed at the same rate for C corporations; similarly for PTPs, excepts PTPs have higher personal tax rates. In other words, it does not matter how much payout comes from *RE* or *EP* separately as both can be subject to the same tax rate and so the total taxes paid will be virtually the same. Thus, any errors in this study for individual *RE* and *EP* quantities that are taxed does not matter for our purposes given the same level of taxation.

situation. This is because higher taxes in the pre-TCJA world can make growth unaffordable due to its high taxation on *RE* before it can be used for growth. The solid-fill columns have C corporation values for the TCJA tax code with maximum corporate tax rate = 0.21, g_L = 3.90%, and *FSAF* = 1.063989 where *FSAF* captures the effect of enhanced growth, which causes *max* V_L to increase by 0.063989 or about 6.64%. The fact that *max* V_L goes from being a non-growth *max* V_L to a growth *max* V_L under TCJA reveals the capacity of lower tax rates to make growth affordable and enhance firm value.

The first two columns of Figure 2 contain values for earnings before taxes (*EBT*) where the texture-fill column provides a pre-TCJA value of 85.37%. The solid-fill column gives a TCJA value of 88.16% for *EBT*. These two columns reveal there is 88.16% – 85.37% = 2.79% more taxable income under TCJA. This reflects the fact that growth occurs under TCJA leading to greater maximum firm value (*max* V_L) that leads to larger values for earnings variables.

Fig. 2: C Corporation Wealth and Federal Tax Revenue Results



The texture-fill *NI* column is smaller because the corporate tax rate is higher in the pre-TCJA environment making net income smaller. The 0% for three capital gains values in the texture-fill columns of *RE*, *CR-RE*, and *PR-RE* reflect the result that *max* V_L occurs for a levered non-growth situation under a pre-TCJA tax scheme where higher

taxes are detrimental to growth. No growth also means no capital gains and this explains the greater equity cash payouts in the texture-fill columns for *EP*, *CR-EP*, and *PR-EP* that occur in the pre-TCJA world.[24]

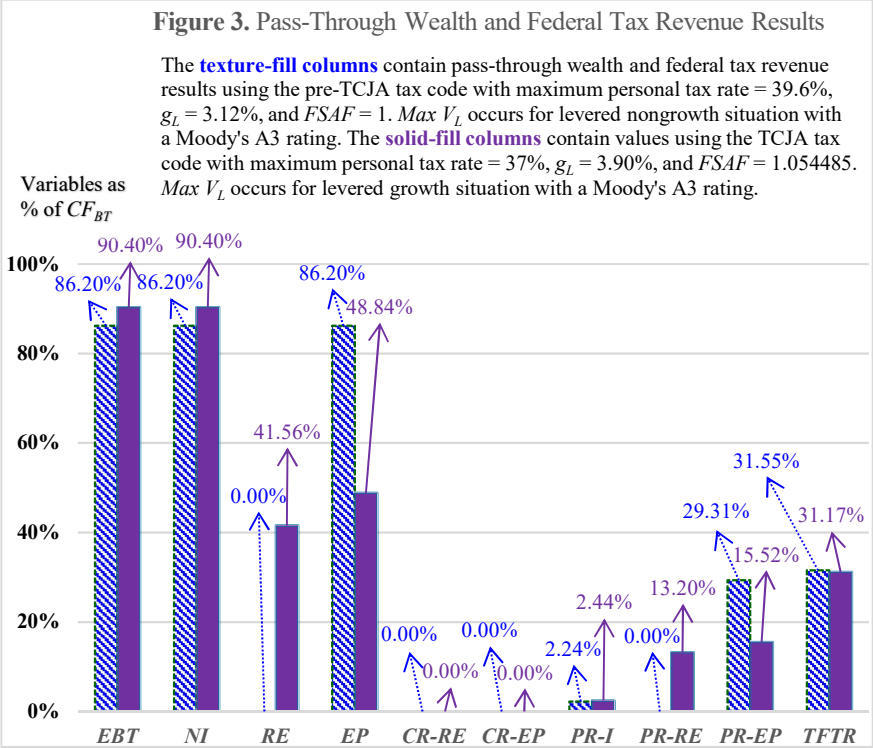
The last two columns provide two values for *TFTR* where the pre-TCJA value is 33.67% and the TCJA value is 25.68%. This indicates that *TFTR* for a C corporation falls 33.67% – 25.68% = 7.99% under TCJA. These *TFTR* results disclose that the enhanced growth of 0.78% from TCJA cannot make up for the effect from lowering taxes for C corporations. Thus, TCJA does not solve the federal debt problem in terms of C corporations. By running a deficit each year, the C corporation fall in *TFTR* adds to the federal debt, which is simply the accumulation of each year's deficit.

Figure 3 repeats Figure 2 but replaces C corporation results with pass-through results where the pass-through *FSAF* is 1.054485 for the TCJA test. Like C corporations, pass-throughs have a levered non-growth *max* V_L for its pre-TCJA test. In terms of the first two columns of this Figure, we find that the pre-TCJA *EBT* (texture-fill column) is 86.20% and the TCJA *EBT* (solid-fill column) is higher at 90.40%. Thus, like the C corporation results in Figure 2, *EBT* for pass-throughs increases under TCJA. The values in Figure 3 dealing with corporate tax revenue are zero because pass-throughs do not pay corporate taxes. This explains why *EBT* and *NI* are the same for pass-throughs. This outcome occurs because, as noted earlier, we define *NI* as net income after-corporate taxes.

As was true for C corporations, we explain values in the columns for the *RE* and *EP* by the fact *max* V_L occurs for a levered non-growth situation for a pre-TCJA world. The corporate revenue columns for *CR-RE* and *CR-EP* have zero values because pass-throughs do not pay corporate taxes. The pre-TCJA value for *CR-RE* is also zero because *max* V_L occurs for a levered non-growth situation. We would point out that *max* V_L for pass-throughs would occur for a levered non-growth situation even under TCJA if g_L remained at 3.12%. Thus, the increase of g_L to 3.90%, in addition to lower tax rates, is crucial (at least for a typical firm) for growth to take place.

[24] For the three personal tax revenue values in the solid fill columns of *PR-I*, *PR-RE*, and *PR-EP*, the sum is about 10%. As far as we can determine, this is similar to the TCJA projections indicated for 2018 and 2019 by JCT (2018, 2019). However, values for the three categories show more differences. As set out in previous footnotes, differences in both sources of equity income do not affect our results because both sources are taxed at the same rate.

Fig. 3: Pass-Through Wealth and Federal Tax Revenue Results



The last two columns of Figure 3 reveal that *TFTR* is 31.55% prior to TCJA and 31.17% under TCJA. This is a fall of only 0.39% (rounding off error of 0.01%). Unlike the C corporation results in Figure 2 where there is a decrease of 7.99%, *TFTR* for pass-throughs is not substantially affected by TCJA as the fall is only 0.39% (rounding off error of 0.01% when subtracting 31.55% from 31.17%). We attribute this not only to the smaller fall in the tax rates for pass-throughs compared to C corporations under TCJA but also the fact that pass-through taxable income (as represented by *EBT*) has a slightly greater increase compared to C corporations under TCJA. Thus, only for FPOs that are pass-throughs can we say that the enhanced growth of 0.78% comes close to making up for the fall in *TFTR* from the lowering of tax rates under TCJA.[25]

Figure 4 charts C corporation (solid-fill columns) and pass-through (no-fill column) differences that involve TCJA values minus pre-TCJA values. The C corporation differences are from the two sets of columns in Figure 2 and the pass-through differences are from the two sets of columns in Figure 3. A positive value in a column

[25] While not formally reported, there are tests that yield positive increases in *TFTR* under TCJA. For example, while the interest coverage ratios (*ICRs*) for the three firm categories are weighted for this article's figures and tables, the firm categories of *large* and *FS* when tested separately can yield positive increases in *TFTR* for C corporations or PTPs with an *ITS* or a ½*RTS* or an *RTS*. As will be seen in Table 2 when we report absolute dollar amounts, we will find that pass-throughs have a *TFTR* for a ½*RTS* that is greater than its pre-TCJA value.

indicates an increase caused by TCJA while a negative value signifies a decrease attributable to TCJA.

Fig. 4: C Corporation and Pass-Through Differences in Wealth and *TFTR*

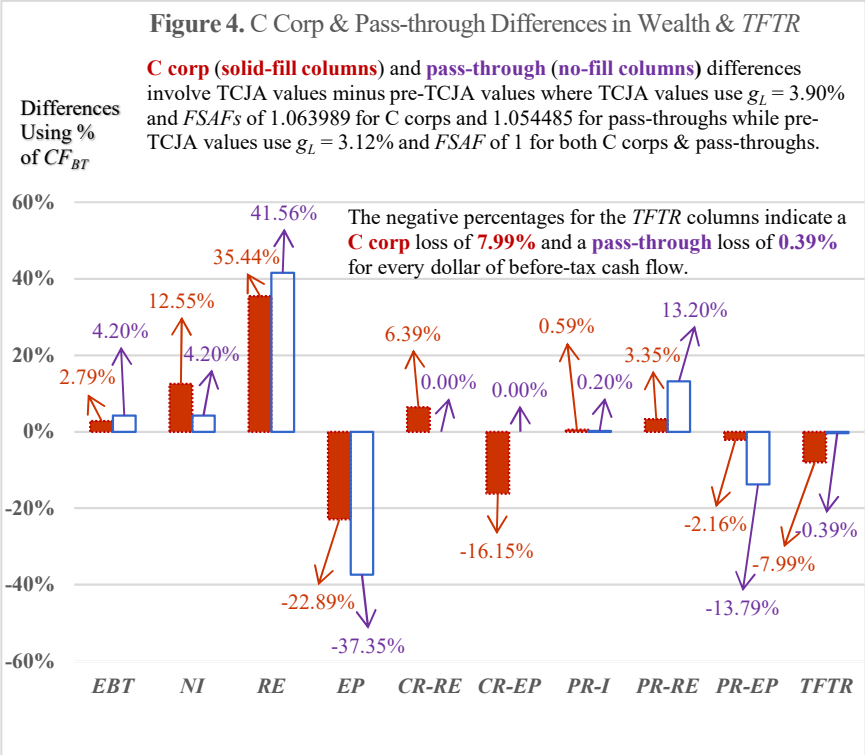


Figure 4 reveals the following C corporation results and pass-through results with the latter in parentheses. *First*, *EBT* rises 2.79% (4.20%). *Second*, *NI* increases 12.55% (4.20%). *EBT* and *NI* are the same at 4.20% for pass-throughs because they do not pay corporate taxes so that all of their *EBT* is subject to equity personal tax. *Third*, *RE* rises 35.44% (41.56%). The large rises reflect the fact that non-growth *max* V_L values occur prior to TCJA for both C corporations and pass-throughs. *Fourth*, *EP* decreases 22.89% (37.35%). With capital gains now present due to growth under TCJA, the cash payout to equity owners falls. From the last two results, we see that TCJA causes pass-throughs to experience greater increases in capital gains and greater decreases in equity payouts when compared to C corporations.

Fifth, *CR-RE* rises 6.39% (0%) where 0% reflects the fact pass-throughs do not pay corporate taxes. The positive value of 6.39% reflects the growth that occurs under TCJA. *Sixth*, *CR-EP* falls 16.15% (0%) where, once again, the pass-through value is 0% since they do not pay corporate taxes. The fall in equity payout for C corporations reflects the fact that funds for growth now occur under TCJA. *Seventh*, *PR-I* rises slightly 0.59% (0.20%). *Eighth*, *PR-RE* increases 3.35% (13.20%). The personal tax revenue from capital gains is greater for pass-throughs that pay at a higher personal tax

rate. *Ninth*, *PR-EP* falls 2.16% (13.79%). The personal tax revenue from equity cash payout is greater for pass-throughs as they pay at a higher personal tax rate.

Tenth and lastly, *TFTR* decreases 7.99% (0.39%). The two factors for the decrease in *TFTR* for C corporations are the decreases in corporate and personal tax revenues from equity cash payouts (*CR-EP* and *PR-EP*) as the three other sources of *TFTR* are positive. The factor responsible for the drop in *TFTR* for pass-throughs is the fall in the personal tax revenue from equity cash payout (*PR-EP*) as the four other sources of *TFTR* are non-negative. The largest factor (when both FPO types are considered) is the fall in business level taxes on equity payout (*CR-EP* for C corporations and *PR-EP* for pass-throughs). For C corporations, business taxes are the corporate taxes on equity cash payout and the fall is 16.15%. For pass-throughs, business taxes are the personal taxes on equity cash payout and the fall is 13.79%. We conclude that greater growth cannot make up for the drop in tax rates as *TFTR* falls for both FPOs with the main cause being the drop in taxes paid at the business level. We would also point out that all of these results occur under a tax law where *ITS* exists as TCJA did not change this law.

4.2 Graphical results including those with PTPs and a ½*RTS*

This section incorporates PTPs. This addition allows us to judge the impact of TCJA on federal tax revenue if we consider all personal taxpayers instead of just FPO owners. Figure 5 keeps the presence of an *ITS* when comparing pre-TCJA results with TCJA results while incorporating the two set of weights described in section 2.2. The first set is 0.30435 for C corporations and 0.69565 for pass-throughs. The second set is 0.125 for C corporations and 0.875 for PTPs.

In Figure 5, the weighted average C corporation and pass-through differences caused by TCJA are in the chequer-fill columns and the weighted average C corporation and PTP differences are in the no-fill columns. As before, we use g_L = 3.90% with *FSAF* values of 1.063989 for C corporations and 1.054485 for pass-throughs. Since PTPs include *other personal taxpayers* (as identified in Figure 1) who pay at the same personal tax rate as pass-throughs, PTP shares in the same tax cuts as pass-throughs where enhanced growth from TCJA is the product of both lower pass-through business taxes and lower personal consumer taxes. Of further importance, while *other personal taxpayers* work for C corporations, non-profits, and governments (local, state, and federal), Greenberg (2017) points out that most work as pass-through employees. Thus, we use the same *FSAF* of 1.054485 for PTPs as used for pass-throughs.

Fig. 5: C Corporation, Pass-Through and Personal Taxpayer Differences, *ITS*

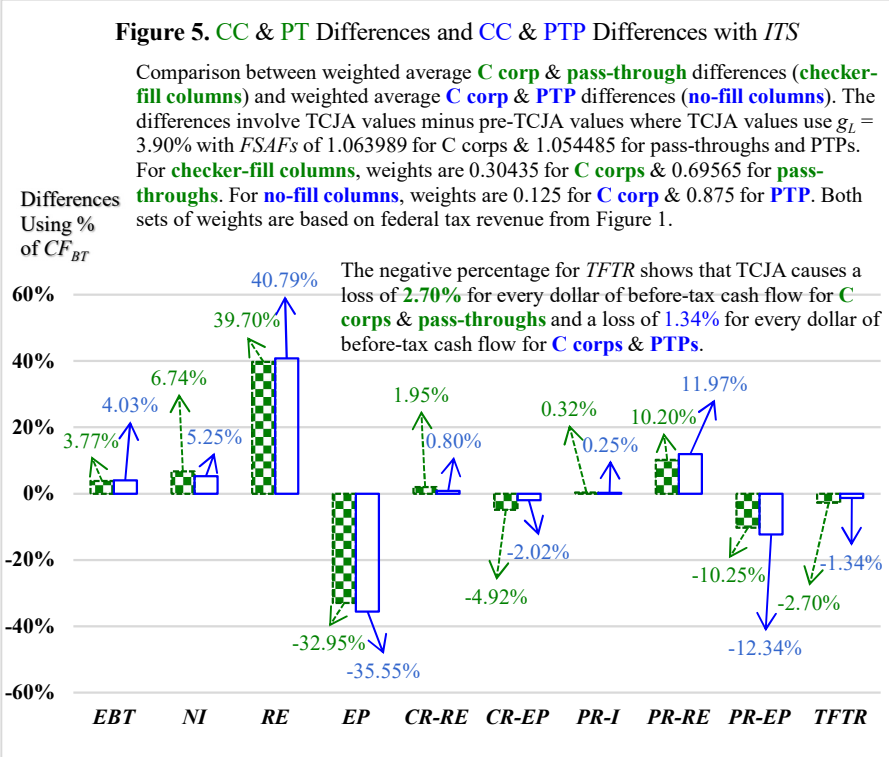


Figure 5 discloses the following when we compare the influence of TCJA on the weighted average C corporation and pass-through differences (chequer-fill columns) and the weighted average C corporation and PTP differences (no-fill columns). The latter results are in parentheses. *First*, *EBT* increases 3.77% (4.03%). *EBT* (or taxable income) increases slightly when we test PTPs. *Second*, *NI* rises 6.74% (5.25%). Net income does not rise as much when we consider PTPs. *Third*, *RE* increases 39.70% (40.79%). *Fourth*, *EP* falls 32.95% (35.55%). There is a somewhat greater drop in equity cash payout when we test PTPs. *Fifth*, *CR-RE* rises 1.95% (0.80%). Since PTPs do not pay corporate taxes, the greater rise in capital gains of 1.95% reflects less dilution from adding in *other personal taxpayers*.

Sixth, *CR-EP* falls 4.92% (2.02%). These two results, once again, reflect the dilution by adding in *other personal taxpayers*. *Seventh*, *PR-I* increases 0.32% (0.25%). *Eighth*, *PR-RE* rises 10.20% (11.97%). When we consider PTPs, capital gains manifest a greater increase. *Ninth*, *PR-EP* falls 10.25% (12.34%). When we consider PTPs, the equity payout manifests a greater decrease. *Tenth*, *TFTR* decreases 2.70% (1.34%). When we consider PTPs, the fall in *TFTR* is 2.70% – 1.34% = 1.36% less. Thus, the fall in *TFTR* of 2.70% falls by about a half when we add in *other personal taxpayers*.

As expected since Figure 5 is derived from Figures 2-4, the same factors hold in explaining the decrease in *TFTR* for both sets of columns. These factors are the drop in corporate and personal revenue from equity cash payout (*CR-EP* and *PR-EP*). Since PTPs do not pay corporate taxes, we explain their fall by the drop in personal tax

revenue from equity cash payout (*PR-EP*). The other two personal tax revenue factors (*PR-I* and *PR-RE*) are positive. Finally, because the fall of 2.70% for *TFTR* only includes C corporations and pass-throughs, the drop of 1.34% for *TFTR* that includes C corporations and PTPs is a better estimate on how TCJA influences *TFTR* as C corporations and PTPs include all taxpayers.[26]

Figure 6 repeats Figure 5 except we replace *ITS* with a ½*RTS*, which means that one-half of every dollar used for *RE* is not taxed at the business level while all of *I* is now taxed at the business level. This 50% tax deduction subsidises businesses for using *RE* where *RE* captures the use of internal equity funds utilised for growth-related activities. The chequer-fill columns in Figure 6 contain values that use the weights of 0.30435 for C corporations and 0.69565 for pass-throughs and the solid-fill columns use weights of 0.125 for C corporations and 0.875 for PTPs. The TCJA outcomes use g_L = 3.90% and have *FSAF* values of 1.069279 for C corporations and 1.065982 for pass-throughs or PTPs. These *FSAF* values are greater than those in Figure 5 for an *ITS*. This indicates that a ½*RTS* tax law leads to a greater change in *max* V_L when growth increases under TCJA.

For a ½*RTS*, the fifth set of columns in Figure 6 (that applies only to C corporations as PTPs do not pay corporate taxes) change from that used in Figures 2-5 so that the *CR-RE* column is now labelled *CR-RE*/*I*.[27] This is because all of *I* as well as one-half of *RE* are now taxed at the corporate level. For PTPs, the *PR-I* column is altered compared to Figures 2-5. This is because, under a ½*RTS*, the US federal government taxes *I* not only at the personal debt level but also at the personal business level since it is no longer a business tax deduction. Thus, like the cash equity payout, it is now taxed at the business and personal levels doing away with the tax distortion that favours interest over dividends under an *ITS* tax law. The column name of *PR-I* is kept since *I* is still the only source of federal tax revenue for FPOs.

[26] Both normalised values of 2.70% and 1.34% are less than the estimated 4.20% given by the CBO (2019) for 2019. However, as will be seen later in Table 2 when we look at the exact dollar amounts of *TFTR* before and after TCJA, we find a 4.20% drop for 2019. Robustness tests, described in section 5.2, also produce similar results. Although not reported in that section, the average of all of our robustness tests is 4.43%. This agrees more with 4.39% given by JCT, as cited by TPC (2019), and the 4.30% average given by CBO (2019) for 2020–2029.

[27] In section 4.1, we referred to *CR-RE*/*I* as $CR\text{-}RE/I_{½RTS}$ but since we are comparing TCJA results minus pre-TCJA results where the latter has no *I*, we use the more general label of *CR-RE*/*I*.

Fig. 6: C Corporation, Pass-Through and Personal Taxpayer Differences, ½*RTS*

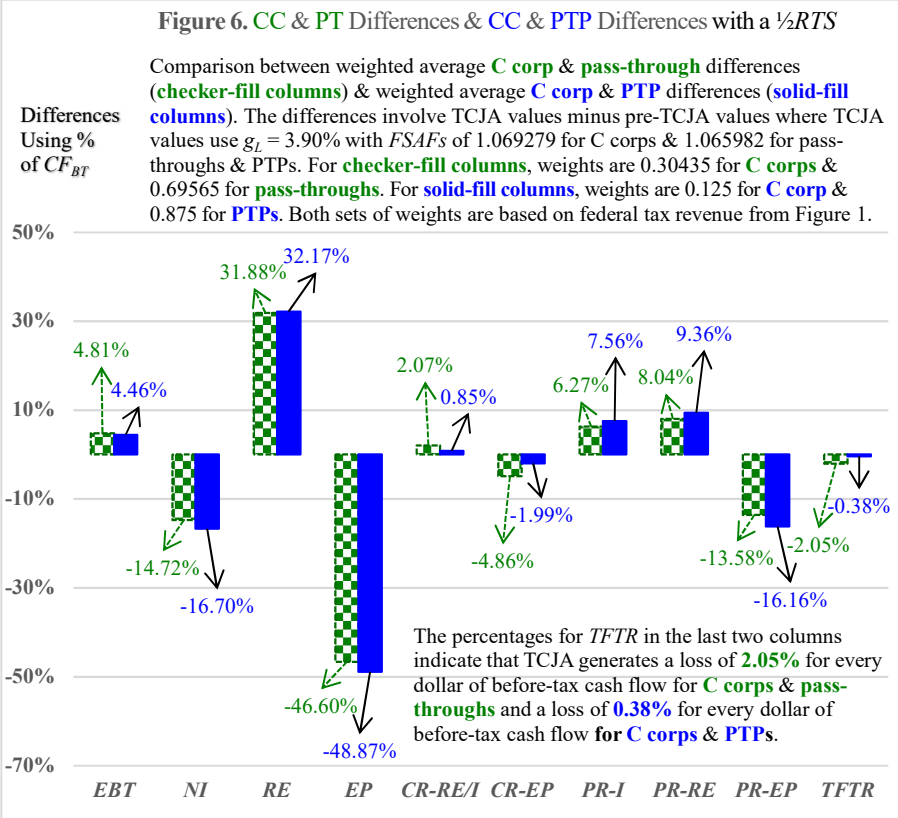


Figure 6 discloses the following when we compare the influence of TCJA between C corporations and pass-throughs with that between C corporations and PTPs with the latter results in parentheses. *First*, *EBT* increases 4.81% (4.46%). These values are higher than found in Figure 5 for an *ITS*. This indicates greater taxable income. As will be seen in Table 2, taxpayer wealth is 4.51% greater with a ½*RTS* compared to an *ITS* under TCJA. *Second*, *NI* falls 14.72% (16.70%). This contrasts with the rise found in Figure 5 where *I* is not subtracted out to lower income subject to equity personal tax. This fact helps explain the *RE* and *EP* columns presented next. *Third*, *RE* increases 31.88% (32.17%). These results under a ½*RTS* represent less of a rise compared to an *ITS*. *Fourth*, *EP* falls 46.60% (48.87%). The fall in values are more than found under an *ITS*. *Fifth*, *CR-RE/I* rises 2.07% (0.85%). These values are similar to Figure 5.

Sixth, *CR-EP* falls 4.86% (1.99%). These values are also similar to Figure 5. *Seventh*, *PR-I* increases 6.27% (7.56%). The values under a ½*RTS* are noticeably greater than found under an *ITS* as federal tax revenue is now collected on *I* at the business level. *Eighth*, *PR-RE* rises 8.04% (9.36%). These are somewhat less than occur under an *ITS*. *Ninth*, *PR-EP* falls 13.56% (16.16%). These are somewhat more negative than occur under an *ITS*. *Tenth*, *TFTR* decreases 2.05% (0.38%). These values are less than under an *ITS*. Thus, a ½*RTS* does a better job than an *ITS* in preventing an increase in the federal debt.

Figure 7 focuses on the weighted average C corporation and PTP differences from Figures 5 and 6, as these two groups are the most important as they account for 56% of projected 2019 tax federal revenue. Thus, Figure 7 repeats the no-fill columns in Figure 5 when an *ITS* occurs and the solid columns in Figure 6 when a ½*RTS* occurs. By allowing a visual comparison of an *ITS* tax law versus a ½*RTS* tax law under TCJA, we can better view the weighted average C corporation and PTP differences when *RE* is a tax deduction as opposed to *I*. As before, the weighted average C corporation and PTP differences represent TCJA values minus pre-TCJA values. In other words, both the *ITS* values and the ½*RTS* values subtract out the same pre-TCJA values where *max* V_L for the pre-TCJA tests involves a levered non-growth situation.

Fig. 7: C Corporation, Pass-Through and Personal Taxpayer Differences, *ITS* and ½*RTS*

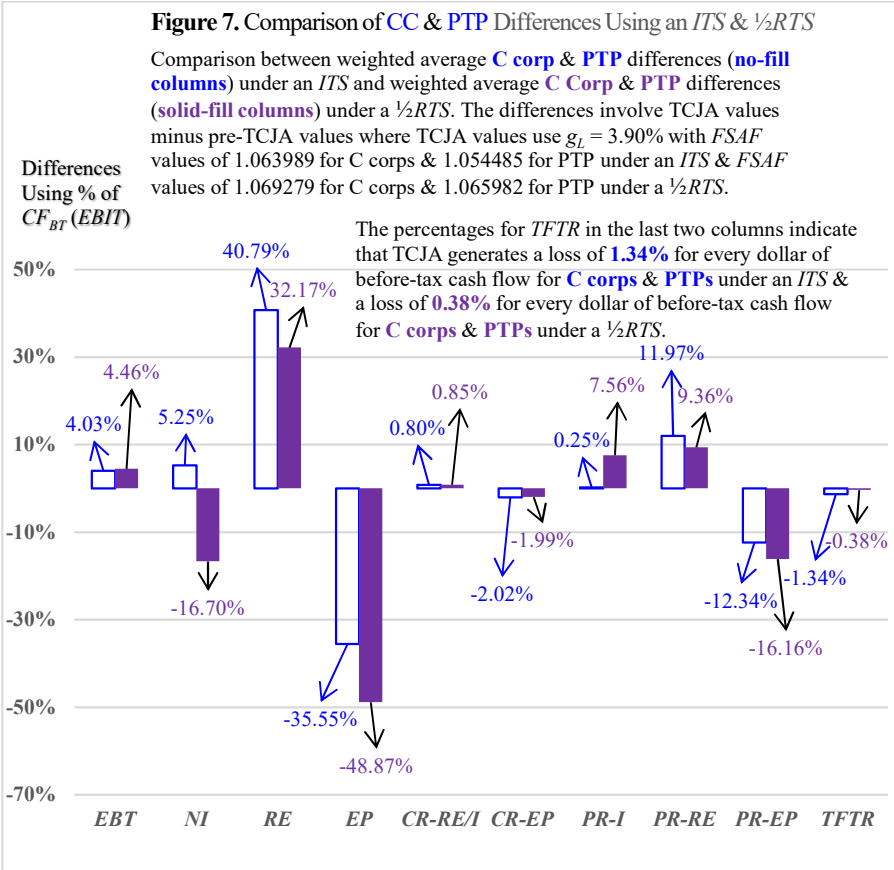


Figure 7 discloses the following when we compare the influence of TCJA on C corporations and PTPs using an *ITS* versus a ½*RTS* where the latter is given in parentheses. *First*, *EBT* rises 4.03% (4.46%). Using a ½*RTS* causes a 4.46% – 4.03% = 0.43% greater rise in taxable income compared to using an *ITS*. *Second*, *NI* rises 5.25% (falls 16.70%). We find that the use of an *ITS* leads to a rise in net income subject to

equity personal taxes while the use of a ½*RTS* causes a substantial fall. This latter fall occurs because *NI* for a ½*RTS* is computed by first lowering *EBT* by 50% of *RE* and then subtracting out all of *I* as *I* is not a tax deduction but subject to business taxes for a ½*RTS*. This explanation can also help account for the differences in *RE* and *EP* as described next. *Third*, *RE* rises 40.79% (32.17%). The switch to a ½*RTS* causes a smaller increase in the *RE*, which is the capital gains component of net income subject to personal equity tax. A reason for a smaller increase in *RE* for a ½*RTS* is that a dollar of *RE* goes further when taxes are only paid on 50% of *RE* used for growth. *Fourth*, *EP* decreases 35.55% (48.87%). The switch to a ½*RTS* causes a larger decrease in the equity cash payout component of net income subject to personal equity tax. A reason for the larger decrease is that *I* is not a deductible expense and so its lowers the equity cash payout causing *EP* to be less under TCJA when the tax law is a ½*RTS*.

Fifth, *CR-RE*/*I* rises 0.80% (0.85%). Replacing *ITS* with a ½*RTS* generates a similar small rise in corporate tax revenue even though the tax shields have been switched. *Sixth*, *CR-EP* falls 2.02% (1.99%). The tax policy change produces a similar fall in corporate tax revenue on the equity cash payout. *Seventh*, *PR-I* increases 0.25% (7.56%). As expected, there is greater increase in personal taxes collected on *I* under a ½*RTS* where the US federal government not only taxes *I* at the personal debt ownership level but also at the pass-through business level (which is also a personal level). *Eighth*, *PR-RE* rises 11.97% (9.36%). The presence of a ½*RTS* causes a smaller increase in personal taxes paid on equity capital gains. By not taxing *RE*, fewer funds for before-tax *RE* are needed lowering that taxed at the personal equity level. *Ninth*, *PR-EP* falls 12.34% (16.16%). Using a ½*RTS* results in greater fall on personal taxes collected on the equity cash payout. The lower payout reflects the fact that *I* is no longer deductible thus making *PR-EP* less under a ½*RTS*.

Tenth, *TFTR* decreases 1.34% (0.38%) when all corporate and personal taxes are considered. The 0.38% decrease in *TFTR* with the presence of a ½*RTS* differs from the decrease of 1.34% with an *ITS*. The largest factor for less fall in *TFTR*, when using a ½*RTS*, reflects the larger increase in personal taxes paid on *I*. As noted previously, a ½*RTS* creates both personal and business level taxes on *I*. While this holds for both C corporations and pass-throughs, the business level taxes for C corporations are lower with a maximum tax rate of 21% compared to a pass-through maximum of 37%.

Figure 7 offers two major findings when comparing the *ITS* results in Figure 5 with the ½*RTS* results in Figure 6. *First*, we find that replacing *ITS* with a ½*RTS* increases *EBT* (taxable income) as it generates a greater *EBT* when both an *ITS* and a ½*RTS* are compared to the *EBT* found under pre-TCJA. The incremental increase, compared to an *ITS* tax policy, is 0.43%. *Second*, not only does *EBT* increase but we also find that we have lowered the negative drop in *TFTR* by achieving a 0.38% fall beyond that under the pre-TCJA tax code. The incremental improvement in *TFTR* when going from an *ITS* to a ½*RTS* is 1.34% – 0.38% = 0.96%. These two results offer evidence that a change in tax policy is one major step to undertake in order to slow down the annual increase in the US deficit and thus thwart the rise in the US federal debt.

While not shown, we repeated Figure 7 but used an *RTS* instead of a ½*RTS*. We found that *TFTR* fell 4.01% instead of 0.38% under a ½*RTS*. Additionally, as will be seen in section 4.4 when we look at absolute dollar amounts, the increase in taxpayer wealth under an *RTS* increases beyond that found for a ½*RTS*. Of importance, taxpayer wealth and *TFTR* together under an *RTS* is 5.53% greater than that found under a ½*RTS*. Thus, there is greater potential for increased taxpayer wealth under an *RTS* policy as well as

greater potential for increased *TFTR* if there is sharing of the increase in taxpayer wealth. This creates a potential source of US revenue to reduce the federal debt and solve other problems such as those related to funding social security and Medicare.

Table 1: C Corporation, Pass-Through, and Personal Taxpayer Results, Pre-TCJA vs. TCJA

	C Corp	*Pass-through*	*C Corp & Pass-through*	*C Corp & PTP*
Panel A. TCJA with *ITS* minus pre-TCJA with *ITS*				
(1) *EBT*	2.79%	4.20%	3.77%	4.03%
(2) *NI*	12.55%	4.20%	6.74%	5.25%
(3) *RE*	35.44%	41.56%	39.70%	40.79%
(4) *EP*	-22.89%	-37.35%	-32.95%	-35.55%
(5) *CR-RE/I*	6.39%	0.00%	1.95%	0.80%
(6) *CR-EP*	-16.15%	0.00%	-4.92%	-2.02%
(7) *PR-I*	0.59%	0.20%	0.32%	0.25%
(8) *PR-RE*	3.35%	13.20%	10.20%	11.97%
(9) *PR-EP*	-2.16%	-13.79%	-10.25%	-12.34%
(10) *TFTR*	-7.99%	-0.39%	-2.70%	-1.34%
Panel B. TCJA with ½*RTS* minus Pre-TCJA with *ITS*				
(1) *EBT*	6.18%	4.22%	4.81%	4.46%
(2) *NI*	-7.04%	-18.08%	-14.72%	-16.70%
(3) *RE*	30.75%	32.37%	31.88%	32.17%
(4) *EP*	-37.79%	-50.46%	-46.60%	-48.87%
(5) *CR-RE/I*	6.81%	0.00%	2.07%	0.85%
(6) *CR-EP*	-15.95%	0.00%	-4.86%	-1.99%
(7) *PR-I*	1.26%	8.46%	6.27%	7.56%
(8) *PR-RE*	2.90%	10.29%	8.04%	9.36%
(9) *PR-EP*	-3.57%	-17.96%	-13.58%	-16.16%
(10) *TFTR*	-8.56%	0.79%	-2.05%	-0.38%

This Table summarises the results from Figures 2-7 for TCJA values minus pre-TCJA values. The variables (represented by acronyms) in the first column are described in subsection 4.1. Panel A reports results when both TCJA and pre-TCJA values are based on an *ITS*. Panel B reports results when TCJA values are based on a ½*RTS* and pre-TCJA values are based on an *ITS*. For a ½*RTS*, one-half of every dollar used for retained earnings (*RE*) is shielded from business level taxes. For C corporations, business level taxes involve paying taxes at the corporate tax rate. For pass-throughs, it involves paying taxes at the ordinary personal tax rate. Both sets of TCJA results have enhanced growth where g_L increases from 3.12% to 3.90%. This translates into greater taxpayer wealth that is captured by the firm size adjustment factor (*FSAF*) described in Appendix 4. For the TCJA tests with an *ITS*, the *FSAF* values are 1.063989 for C corporations and 1.054485 for pass-throughs. For the TCJA tests with a ½*RTS*, the *FSAF* values are 1.069279 for C corporations and 1.065982 for pass-throughs. Values in the *C Corp & Pass-through* column are computed by taking 0.30435 times the corresponding *C corp* column value and 0.69565 times the corresponding *Pass-through* column value. The results in the *C Corp & PTP* column are computed in the same way but use 0.125 for the *C corp* column and 0.875 for the *Pass-through* column. These weights are described in section 2.2.

4.3 Summarising and discussing the results of Figures 2-7

Table 1 summarises the results from Figures 2-7 for TCJA values minus pre-TCJA values. We normalise these results by dividing by USD 1,000,000 in before-tax cash flows. The results in Table 2 (to follow) for *max* V_L and *TFTR* focus on dollar amounts

when gauging taxpayer and wealth and federal tax revenue and so bring more accuracy in terms of comparing the exact dollar amounts under different tax laws governing tax shields.

Panel A of Table 1 reports results when both TCJA and pre-TCJA values are based on an *ITS*. Panel B reports results when TCJA values are based on a ½*RTS* and pre-TCJA values are based on an *ITS*. Both sets of TCJA results have enhanced growth from lower tax rates. We compute values in the *C Corp & Pass-through* column by taking 0.30435 times the corresponding *C corp* column value and 0.69565 times the corresponding *Pass-through* column value. We calculate the results in the *C Corp & PTP* column in the same way but use 0.125 for the *C Corp* column values and 0.875 for the *Pass-through* column values. The *C Corp & PTP* column is the most important column because, as discussed in section 2.2, it considers federal taxes paid by C corporations, pass-throughs and *other personal taxpayers*, which together are 56% of federal tax revenue expected for 2019. Below, we focus on the results in this column.

For the *ITS* results in Panel A, the value for *EBT* in the first row of the *C Corp & PTP* column is 4.03%. This indicates that compared to its pre-TCJA value, *EBT* (or taxable income) increases 4.03%. This compares to 4.46% in the corresponding cell of Panel B. Thus, replacing *ITS* with a ½*RTS* increases taxable income by 0.43%. For the *ITS* results in Panel A, the value for *TFTR* in the last row of the *C Corp & PTP* column is −1.34%. This compares to −0.38% in the corresponding cell of Panel B for the ½*RTS* results. Thus, replacing *ITS* with a ½*RTS* increases *TFTR* by 0.96%.

Of importance, under TCJA with a ½*RTS* tax policy, *EBT* and *TFTR* are on trajectories increasing 0.43% and 0.96% compared to current tax legislation that allows an *ITS*. Thus, taxpayers and the IRS are both winners under a ½*RTS* policy. However, the *TFTR* of −0.38% under a ½*RTS* indicates that federal revenue is still declining. As will be seen in the next section, there is hope if the substantial increase in taxpayer wealth when switching the tax shield from *I* to *RE* can be used to increase *TFTR*.

The *TFTR* values in Table 1 are all negative except for a ½*RTS* in the last row in Panel B for the *Pass-through* column. For the *C corp & PTP* column of this panel, the value is negative at −0.38%. This indicates a federal deficit for the year, which adds to the federal debt. However, one must keep in mind the following when discussing a country's debt problem and how to resolve it. *First*, debt must be compared with the country's GDP to get a relative perspective on its ability to pay down debt. According to Federal Reserve Economic Data (FRED) (2019c), US debt as a percentage of GDP is 104%. The bad news is that this percentage has risen steadily since 1981 when it was 30%. *Second*, debt is more likely to be a problem if a foreign country (as compared to its own citizens) holds most of the debt. Amadeo (2019) notes that foreign holdings of US debt has ballooned in the past decade reaching 30% of the US public debt. *Third*, a low rate of borrowing diminishes any debt problem because there is less cost in maintaining it. While interest rates on debt have been low, Peter G Pederson Foundation (2018) expects the total US interest payments as a percent of GDP to double in the next decade from 1.6% to 3.2%. *Fourth*, the ability to cut tax expenditures can be a key to lowering of the annual deficit and thus reducing federal debt.[28] The largest tax

[28] Tax expenditures refer to revenue losses attributable to provisions of the federal tax laws which allow a special exclusion, exemption, or deduction from gross income or which provide a special credit, a preferential rate of tax, or a deferral of tax liability.

expenditure in the US is the exclusion of employer contributions for medical insurance premiums and medical care.

The findings illustrated in Figures 6-7 and capsulised in Panel B of Table 1 for a ½*RTS* are not offered as the optimal findings as more research is needed. For example, as will be seen later in Table 2, much more taxpayer wealth can be created if an *RTS* is pursued where all of *RE* is used as a tax shield instead of one-half. However, since an *RTS* lowers *TFTR* even more than a ½*RTS*, it would require businesses sharing some of their increased wealth by raising taxes.

4.4 Results for five key variables

Table 2 reports results for five key variables defined as follows: *FSAF* is the firm size adjustment factor (described in Appendix 4); *max* V_L is maximum firm value that represents maximum taxpayer wealth; *TFTR* is the total federal tax revenue (described in detail in section 4.1); *WETR* is the weighted effective tax rate (described in Appendix 5); $\%\Delta E_U$ is the percent change in unlevered firm value caused by leverage and equals $maxG_L/E_U$ where *max* G_L is given by (1) and E_U is unlevered firm value; and, *ODV* is the optimal debt-to-firm value ratio that corresponds to *max* V_L.

Results for the first row of each of the four panels are associated with a pre-TCJA and an *ITS*. The second row of each panel covers *ITS* under TCJA. The third row of each panel reports with a ½*RTS* under TCJA. The last row of each panel provides results for an *RTS* under TCJA. Unlike an *ITS* that is either 100% (first two rows of each panel) or 0% (last two rows of each panel), an *RTS* takes on three different values of 0% (first two rows of each panel), 50% (third row of each panel), and 100% (last row of each panel). Weighted average interest coverage ratios (*ICRs*), as described in Appendix 3, are used to generate the C corporation results in Panel A and the pass-through results in Panel B. The C corporation and pass-through results in Panel C are computed by taking 0.30435 times the corresponding C corporation value in Panel A and 0.69565 times the corresponding value in Panel B. The C corporation and PTP results in Panel D are computed in the same way but use 0.125 for the corresponding row in Panel A and 0.875 for the corresponding row in Panel B. The two sets of weights used in Panels C and D are described in section 2.2.

4.4.1 FSAF results

Disregarding *FSAF* values of 1 that occur for pre-TCJA tests where there is no increase in growth, the *FSAF* column of Table 2 shows that the range of *FSAF* values are from 1.054485 to 1.076333. Each panel reveals that greater *FSAF* values occur as the tax shield on *RE* increases. Because *FSAF* values reflect the percentage increase in *max* V_L caused by an upsurge in growth from 3.12% to 3.90% under TCJA, the increasing *FSAF* values in each panel tell us that greater taxpayer wealth can be achieved as increasingly large amounts of *RE* are tax-deductible so that an *RTS* in the last row provides the greatest wealth.

To illustrate, the *FSAF* value of 1.057378 in the second row of Panel C tells us that *max* V_L increases 5.7378% for an *ITS* tax policy. If we replace an *ITS* with a ½*RTS*, *FSAF* becomes 1.066985 as seen in the third row of Panel C revealing an increase of 6.6985% in *max* V_L from enhanced growth. If we replace a ½*RTS* with an *RTS*, *FSAF* becomes 1.075814 as seen in the last row of Panel C revealing an increase of 7.5814% in *max* V_L.

Table 2: Results for Five Key Variables

	FSAF	*Max* V_L	*TFTR*	*WETR*	$\%\Delta E_U$	*ODV*
Panel A. C Corp						
Pre-TCJA, $g_L = 3.12\%$ & *ITS*	1.000000	$9,434,551	$336,732	21.084%	10.12%	0.285
TCJA, $g_L = 3.90\%$ & *ITS*	1.063989	$12,865,571	$256,840	14.376%	5.42%	0.260
TCJA, $g_L = 3.90\%$ & ½*RTS*	1.069279	$13,079,840	$251,157	15.076%	5.32%	0.257
TCJA, $g_L = 3.90\%$ & *RTS*	1.074629	$13,509,928	$217,844	15.231%	4.45%	0.250
Panel B. Pass-through						
Pre-TCJA, $g_L = 3.12\%$, *ITS*	1.000000	$9,633,968	$315,520	16.946%	8.10%	0.263
TCJA, $g_L = 3.90\%$ & *ITS*	1.054485	$10,866,591	$311,652	15.913%	7.60%	0.254
TCJA, $g_L = 3.90\%$ & ½*RTS*	1.065982	$11,409,424	$323,454	15.924%	6.19%	0.245
TCJA, $g_L = 3.90\%$ & *RTS*	1.076333	$12,143,586	$286,634	15.930%	4.60%	0.232
Panel C. C Corp & Pass-through						
Pre-TCJA, $g_L = 3.12\%$ & *ITS*	1.000000	$9,573,276	$321,976	18.205%	8.72%	0.270
TCJA, $g_L = 3.90\%$ & *ITS*	1.057378	$11,474,976	$294,970	15.445%	6.93%	0.256
TCJA, $g_L = 3.90\%$ & ½*RTS*	1.066985	$11,917,811	$301,450	15.666%	5.93%	0.249
TCJA, $g_L = 3.90\%$ & *RTS*	1.075814	$12,559,430	$265,698	15.717%	4.56%	0.238
Panel D. C Corp & PTP						
Pre-TCJA, $g_L = 3.12\%$ & *ITS*	1.000000	$9,609,041	$318,172	17.463%	8.35%	0.266
TCJA, $g_L = 3.90\%$ & *ITS*	1.055673	$11,116,464	$304,801	15.721%	7.32%	0.255
TCJA, $g_L = 3.90\%$ & ½*RTS*	1.066394	$11,618,226	$314,417	15.818%	6.08%	0.246
TCJA, $g_L = 3.90\%$ & *RTS*	1.076120	$12,314,379	$278,035	15.842%	4.58%	0.235

This Table presents results for five key variables when using the CSM described in Appendix 1. Variable values are created per USD 1,000,000 in before-tax cash flows (CF_{BT}). *FSAF* stands for firm size adjustment factor, discussed in Appendix 4, that increases CF_{BT} and thus all valuation outcomes including tax revenue variables. *Max* V_L is the maximum firm value that captures maximum taxpayer wealth. *TFTR* refers to total federal tax revenue and is discussed in section 4.1. *WETR* stands for weighted effective tax rate and its computation is described in Appendix 5. $\%\Delta E_U$ is the percent change in unlevered firm value caused by leverage and equals $max\, G_L / E_U$ where *max* G_L is given by (1) and E_U is unlevered firm value. *ODV* is the optimal debt-to-firm value ratio. Results for the first row of each of the four panels are associated with a pre-TCJA and an *ITS*. The second row of each panel covers *ITS* under TCJA. The third row of each panel reports with a ½*RTS* under TCJA. The last row of each panel provides results for an *RTS* under TCJA. Unlike an *ITS* that is either 100% (first two rows of each panel) or 0% (last two rows of each panel), an *RTS* takes on three different values of 0% (first two rows of each panel), 50% (third row of each panel), and 100% (last row of each panel). Weighted average interest coverage ratios (*ICRs*), as described in Appendix 3, are used to generate the results in Panels A and B. The C corporation and pass-through results in Panel C are computed by taking 0.30435 times the corresponding C corporation value in Panel A and 0.69565 times the corresponding value in Panel B. The C corporation and PTP results in Panel D are computed in the same way but use 0.125 for the corresponding row in Panel A and 0.875 for the corresponding row in Panel B. The two sets of weights used in Panels C and D are described in section 2.2 and PTPs consists of all taxpayers who pay at ordinary personal income tax rates (pass-throughs and *other personal taxpayers*).

4.4.2 Max V_L *results*

As seen in the *Max* V_L column, *max* V_L increases (just like *FSAF*) as the amount of *RE* that is a tax-deductible expense increases. Just like *FSAF*, the largest values for *max* V_L occur in the last row of each of the four panels where a 100% tax deduction occurs for each dollar of *RE*. The *max* V_L results in Table 2 confirm what many tax experts and

researchers have been arguing for years: tax policies that penalise growth are inefficient making business wealth (and thus taxpayer wealth) lower.

While the greatest *max* V_L of USD 12,559,430 occurs for an *RTS* in the last row of Panel C, the most important panel in Table 2 is Panel D as this panel contains the results for C corporations and PTP that provide for 56% of federal tax revenue. When analysing the first and second row of Panel D, we find that max V_L (that represents taxpayer wealth) rises from USD 9,609,041 to USD 11,116,464, which is 15.69% beyond pre-TCJA values. While *max* V_L rises 15.69%, total federal tax revenue (*TFTR*) falls 4.20% and the weighted effective tax rate (*WETR*) drops 9.98%. Our 4.20% independent assessment is the same as that projected for 2019 by CBO (2019). It is also close to the 4.30% projected by CBO for 2019–2029. Given the *TFTR* results, a tax policy reform should be explored because the greater growth from TCJA does not prevent a fall in *TFTR*, thereby worsening the federal debt. This exploration is carried out in rows 3 and 4.

When we compare the results with an *ITS* under TCJA (second row in Panel D), to a ½*RTS* under TCJA (third row in Panel D), we find that *max* V_L increases USD 501,762 from USD 11,116,464 to USD 11,618,226, which is an upsurge of 4.51%. While *max* V_L (and thus taxpayer wealth) surges 4.51%, *TFTR* climbs 3.15% and *WETR* rises 0.62%. For every USD 1 of increase in *TFTR*, *max* V_L increases USD 52.18.[29] Thus, sharing only part of the 4.51% increase in *max* V_L with the federal government could go a long way in helping resolve financial problems related to the federal debt and social insurance.

We just saw that *max* V_L goes up USD 501,762 when going from an *ITS* under *TCJA* in the second row to a ½*RTS* in the third row. Given the difference of USD 3,755 in *TFTR* from the pre-TCJA value in the first row and the TCJA value in the third row, sharing 1% of USD 501,762 (which is USD 5,018) can more than restore *TFTR* to its pre-TCJA level as USD 5,018 is greater than USD 3,755. Sharing 10% (which is USD 50,176) will increase *TFTR* by nearly 16% beyond its pre-TCJA level putting the US on a trajectory to lower its debt, albeit we estimate it will take over 40 years to reduce the debt to zero. An *RTS* offers the greater potential than a ½*RTS* to solve the US debt problem as the increase in *max* V_L is USD 1,197,916 when comparing the TCJA value with an *ITS* with the TCJA value for an *RTS*. This value is much greater than the USD 501,762 when going from an *ITS* to a ½*RTS*. With a 10% sharing (which is USD 119,792) we estimate it will take over 17 years to reduce the US debt to zero by using an *RTS*. A 10% sharing is, in essence, a 10% taxation, which is below the current *WETR* given in Panel D as 15.842%.

In further analysing the outcome from the third and fourth rows in Panel D (where we replace a ½*RTS* with an *RTS*), we find that taxpayer wealth surges 5.99%, *TFTR* drops 11.57%, and *WETR* increases 0.15%. The surge in wealth has a monetary value that is

[29] From Table 2, we can see that the change in *max* V_L and *TFTR* are USD 501,762 and USD 9,616, respectively, when going from an *ITS* to a ½*RTS* under TCJA. We have USD 501,762/9,616 = 52.18. Thus, for every USD 1 of increase in *TFTR*, taxpayer wealth increases USD 52.18. Similarly, as seen in the next paragraph, when going from a ½*RTS* to an *RTS*, we get USD 696,153/−36,382 = −19.13. The negative sign indicates that taxpayers need only give USD 1 for every USD 19.13 in their increased wealth to make up for the loss in *TFTR* from switching tax policies.

19.13 times greater than the fall in federal tax revenue suggesting there is plenty of wealth that could be used to increase *TFTR* if needed.

4.4.3 TFTR results

As seen in the *TFTR* column of Table 2, some of the larger *TFTR* values occur in the third row of each panel when a ½*RTS* occurs, which is where one-half of every dollar used for *RE* lowers taxes at the business level. The larger *TFTR* values for a ½*RTS* are especially evident in the pass-through results in Panel B where *TFTR* for a ½*RTS* is even greater than the pre-TCJA value in the first row. For all panels, the *max* V_L and *TFTR* results for 0% *RTS* in the second row, 50% *RTS* in the third row and 100% *RTS* in the last row suggest that we can reach a point where a wealth transfer from the federal government to businesses occurs as increasingly large amounts of *RE* are shielded from taxes. In conclusion, if the goal is to achieve a *TFTR* similar to its pre-TCJA value as given in the first row of each panel, then the third row is where that is best accomplished.

Focusing on Panel D (which is the only panel that factors in PTPs), the TCJA value of USD 314,417 in the third row of the *TFTR* column is the largest TCJA value as it is greater than the values of USD 304,801 and USD 278,035 in the second and fourth rows. In fact, the TCJA value of USD 314,417 for a ½*RTS* is close to the pre-TCJA value of USD 318,172 in the first row. Thus, we can judge the results in third row with a ½*RTS* to be superior in terms of TCJA values for *TFTR*. However, this judgment is short-sighted as we ignore values for *max* V_L as now explained.

To illustrate the short-sightedness, consider the third and fourth row of the *TFTR* and *Max* V_L columns in Panel D. When combined these rows show that taxpayer wealth (as proxied by *max* V_L) and *TFTR* together under an *RTS* is 5.53% greater than that found under a ½*RTS*. While this panel shows a decline of USD 36,382 in *TFTR* when going from a ½*RTS* to an *RTS*, it also shows a rise of USD 696,153 in *max* V_L. Taxpayers should be happy to pay an additional USD 36,382 in *TFTR* to achieve the net increase of USD 696,153 – USD 36,382 = USD 659,771 when going from a ½*RTS* to an *RTS*. If the last row's *WETR* of 15.818% is used on the increase in *max* V_L of USD 696,153, then *TFTR* rises by USD 696,153(0.15818) = USD 110,119. This addition puts *TFTR* for an *RTS* at USD 278,035 + USD 110,119 = USD 388,154 which is 22.00% greater than the pre-TCJA value of USD 318,172. This leaves taxpayer wealth at USD 12,314,379 – USD 110,119 = USD 12,204,260, which is much larger than USD 11,618,226 found in the third row for a ½*RTS*. In conclusion, we can see the wisdom of a tax law that decrees an *RTS* if the increased taxpayer wealth is distributed fairly in terms of not only maximising firm value but insuring that all necessary expenditures of the US government are achieved without fear of a harmful federal debt.

4.4.4 WETR results

As seen in the *WETR* column and first row of Panels A and B in Table 2, we find that the presence of *ITS* prior to TCJA generates a *WETR* of 21.084% for C corporations and 16.946% for pass-throughs, which is an inequality gap in ownership taxation of 21.084% – 16.946% = 4.138% favouring pass-throughs. From the second row, we find that the presence of *ITS* under TCJA leads to a *WETR* of 14.376% for C corporations and 15.913% for pass-throughs, which is an inequality gap of 15.913% – 14.376% = 1.537% favouring C corporations. Thus, TCJA has overcome the disadvantage of the double tax on C corporations enabling C corporations to now have a tax advantage over pass-throughs. With a change in tax policy where we do away with the *ITS* and install a

½*RTS*, we achieve higher tax rates for both C corporations and pass-throughs. This is seen in the third row of Panels A and B where we find a *WETR* of 15.067% for C corporations and 15.924% for pass-throughs, which is an inequality gap of 15.924% – 15.067% = 0.848% favouring C corporations. Thus, replacing *ITS* with a ½*RTS* reduces the inequality gap from 1.537% to 0.848%, which is a reduction of 0.689%. Similarly, by installing an *RTS*, it can be shown from the last rows in Panels A and B that the inequality gap would only be 0.698%. The two positive outcomes that result when switching from an *ITS* to a ½*RTS* or *RTS* tax law are larger *max* V_L and a lower inequality gap between two FPO ownership forms.

Focusing on Panel D, we find that the *WETR* of 15.818% in the third row is similar to the other two TCJA values of 15.721% in the second row for an *ITS* and 15.842% in the last row for an *RTS*. All three are below the *WETR* of 17.463% that occurs prior to TCJA. Besides generating a competitive *WETR*, the last row of Panel D also shows that an *RTS* generates the largest combination of wealth when *max* V_L and *TFTR* are both considered. This value is USD 12,592,414 and is greater than the corresponding values of USD 11,932,643 for a ½*RTS*, which in turn is greater than the USD 11,421,264 value for an *ITS*. If these numbers are correct, then one is left to ask:

> *Why does current legislation favour an ITS over an RTS when an RTS provides greater taxpayer wealth (as seen in the Max* V_L *column) and thus the potential to also increase federal tax revenue while achieving greater equality in the taxing of different ownership forms?*

4.4.5 Percent change in unlevered equity (%ΔE_U*) results*

The %ΔE_U column in Table 2 measures the percent increase in E_U by adding enough debt to maximise firm value. %ΔE_U averages 6.33%, 6.62%, 6.53%, and 6.59% for Panels A, B, C and D, respectively, with a range from 4.45% to 10.12%. These percentages are comparable with the pre-TCJA empirical research (Graham, 2000; Korteweg, 2010; Van Binsbergen et al., 2010) that finds firms can increase their wealth between 4% and 10% by using the optimal amount of debt. The larger values for %ΔE_U under an *ITS* can be explained by the fact firms have lower E_U values under an *ITS* compared to an *RTS* so that the same ΔE_U under an *ITS* produces a greater percentage change in E_U. While not shown in Table 2, the E_U values that would correspond to the values in Panel 3 are USD 8,897,631 (pre-TCJA value with an *ITS*), USD 10,362,551 (TCJA with an *ITS*); USD 10,953,677 (TCJA with a ½*RTS*); and USD 11,774,915 (TCJA with an *RTS*).

4.4.6 Optimal debt-to-firm value (ODV) results

The *ODV* column of Table 2 shows that there is not a lot of deviation in *ODVs* based on tax policy of *ITS* versus *RTS* or even pre-TCJA versus TCJA periods. For example, the *ODV* of 0.255 in the second row of Panel D for an *ITS* under TCJA falls slightly to 0.246 with the switch to a ½*RTS*. In percentage terms, this is only a 3.39% fall indicating that an *ITS* is a minor consideration when companies choose a target leverage ratio. Since slightly larger values occur in the first two rows, we can say there is a marginally greater *ODV* under an *ITS*. However, the narrow ranges in each panel suggest that tax laws are not of great importance in determining *ODV*. To illustrate, consider Panel D where the range from 0.235 to 0.266 indicates that *ITS* and *RTS* have similar influences on *ODV*. The narrow range may be seen as a by-product of our testing an average company using 2019 data from Damodaran (2019). Such a company, regardless of an

ITS or *RTS* tax law, will shoot for an investment grade bond and try to avoid a speculative grade bond where *ODV* would be higher. For our tests, the optimal credit rating is Moody's A3, which is also the most common rating for new issues during 2019.

In conclusion, the *ODV* column shows that doing away with an *ITS* does not materially alter *ODV* further supporting the claim that an *ITS* is an arbitrary tax deduction that has long outlived any useful purpose it may have originally had. The choice of either an *ITS* or *RTS* is important because more taxpayer wealth is associated with an *RTS* tax law than an *ITS* tax law.

5. ASSUMPTIONS, ROBUSTNESS TESTS, BLUEPRINT AND FUTURE RESEARCH

This section points out major assumptions, overviews robustness tests, offers a blueprint for countries with a debt problem, and suggests lines of study for future research.

5.1 Key assumptions

Like any research, this study makes assumptions including those for simplification purposes. Five assumptions worth calling attention to are as follows. *First*, we focus on federal tax revenue associated with taxes paid by C corporations and PTPs. Because these latter sources of federal revenue are only 56% of total federal tax revenue projected for 2019, we assume that 44% of federal tax revenue is constant and neutral when making conclusions about how our results affect the federal debt. However, as discussed in section 2.2, since most (if not all) of this 44% can be linked to FPOs, one can argue that all federal tax revenue changes have the same movements in value as that of FPOs. For example, if FPO business wealth increases, then those entities (like social insurance) that depend on this wealth also increase. Although social insurance is becoming an increasing burden, any increased business wealth from growth under TCJA and/or a change in tax policy (especially that under an *RTS*) may be considered a potential solution to this mounting burden.

Second, to incorporate personal taxpayers (called *other personal taxpayers* in Figure 1) who work for FPOs, non-profits, and governments, we group them with pass-throughs since they pay personal taxes like pass-throughs. This group is called personal taxpayers (PTPs). Including *other personal taxpayers* adds 33% in federal tax revenue to the 7% supplied by C corporations and the 16% supplied by pass-throughs. Besides paying at the same personal tax rates as pass-throughs, another justification for including *other personal taxpayers* with pass-throughs is that pass-throughs employ most of the taxpayers who are *other personal taxpayers*. However, potential problems can develop when treating *other personal taxpayers* like pass-throughs. For example, we assume that *other personal taxpayers* have their value increase in the same manner as pass-throughs through a firm size adjustment factor (*FSAF*). This implies that their increased capacity to purchase goods (from lower personal taxes) is a key to increasing growth under TCJA. This implication is reasonable since most *other personal taxpayers* are paid by pass-throughs and so their financial fortunes share that found for pass-throughs; similarly, if they work for C corporations where they share in the fortune of lower taxes.

Third, based on historical growth in real US GDP, we assume that TCJA increases growth from 3.12% to 3.90% and this increase of 0.78% occurs even if the tax policy changes from an *ITS* to an *RTS*. However, the latter assumption may hold better for an *RTS* since an *RTS* is pro-growth and so the odds of attaining 0.78% are more likely under an *RTS*. While there are mixed opinions on the success of increased growth at the

time of this writing, it is too early to know if an increase of 0.78% will be attained for the long haul. In conclusion, any assumption about a growth rate increase (such as 0.78%) is unknown.

Fourth, we had to make assumptions regarding the use of Damodaran's firm categories when computing debt-to-firm value ratios (*DV*) to match credit spreads and credit rating. The chosen path described in Appendix 3 was the simplest choice in terms of presenting the results. As shown in the next section (where robustness tests are overviewed) this path proved adequate as other weighting systems (that involve three times the number of computations than presented in this article) confirm the results presented in Figures 1-7 and Tables 1-2.

Fifth, there can be questions about the use of *FSAF* that assumes there is an immediate jump in business wealth with this jump determined by the increase in value when going from 3.12% to 3.90%. Thus, our use of *FSAF* is akin to treating our perpetuities like an annuity due where the first cash flow occurs at time zero instead of what happens when taxes are collected periodically throughout the year. This serves to inflate business and taxpayer wealth. To the extent federal tax revenue depends on business wealth, one can conclude *TFTR* is also inflated. However, our treatment of *TFTR* can be viewed as an end of year value since our *TFTR* values achieved with 3.90% growth are simply the *FSAF* factor multiplied by *TFTR* values achieved with 3.12% growth. Thus, our tests can be said to deflate *TFTR*. While our use of *FSAF* may inflate business wealth, we can also argue that some might believe we have deflated it. For example, as reported by TPC (2018), consider the two highest forecasts that come from CBO (2019) and the Tax Foundation Taxes and Growth model. Together their predictions posit an average increase in growth of 1.4% under TCJA. This suggests a rate of around 4.50% instead of 3.90%. Finally, the 3.90% was actually the lower value from the two choices discussed earlier where the longer run choice would be 3.98%. While details are omitted, we ran a series of robustness tests with different assumptions and, on average, these tests indicate that this article's results are an average representation of these tests. More robustness test results are discussed in the next section.

In conclusion, biases created by assumptions can cause taxpayer wealth and federal tax revenue outcomes to change. However, the direction of each of these biases is not fully known and they can even offset one another.

5.2 Robustness tests

Robustness tests are conducted to find out if our general findings and conclusions hold. We will now briefly overview these tests.

Instead of weighting interest coverage ratios (*ICRs*) for the three firm categories of Damodaran (2019) as described in Appendix 3, we conducted tests separately for each of these categories generating three separate results for the six variables in Table 2 (*FSAF*, *max* V_L, *TFTR*, *WETR*, $\%\Delta E_U$, and *ODV*). Thus, we produced results for the *large*, *small*, and *financial service* (*FS*) firm categories. We then weight these three separate results using the same weights as described in Appendix 3 where the *large*, *small*, and *FS* results have the respective weights of 0.116, 0.812, and 0.072. When analysing the results for this robustness test and comparing them to Panel D of Table 2, we find similarities. For example, the average deviation for *FSAF* values between the two sets of results is 0.24% while those for *max* V_L and *TFTR* are 1.07%, and –0.17%, respectively. As might be expected (given that all tax rates occur at a Moody's credit

rating of A3), the average deviation for *WETR* is virtually zero when we compare the two sets of results. While the average deviations for $\%\Delta E_U$ and *ODV* for the robustness test are greater at 22.71% and 12.74%, the same pattern of falling values for $\%\Delta E_U$ and *ODV* as growth increases are observed. Of further importance for this robustness test, we detect the same pattern of increasing values for *max* V_L, the favourable value for *TFTR* for a ½*RTS* and *ODV* values with a narrow range. In fact, the ½*RTS* value of USD 319,998 for *TFTR* is greater than the pre-TCJA value of USD 309,974 for this robustness test.

We also used other weights suggested by other sources. For example, we used the three weights suggested by Damodaran (2019) for his *large*, *small*, and *FS* firm categories, the weights suggested from Figure 1, equal weights, and combinations of weights based on multiple sources. In regards to Damodaran, his suggested weights for his categories are 0.7135 for *large*, 0.1202 for *small*, and 0.1663 for *FS*. While this weighting system assigns higher weights to the *large* and *FS* categories than given in Appendix 3, the results still generate the same pattern of increasing *max* V_L values seen in Table 2 when increasingly large amounts of *RE* are exempt from taxation. This weighting system also finds that the greatest *TFTR* value occurs for a ½*RTS*. The deviations from the results in Panel D of Table 2 are larger (than those given in the prior paragraph) except for *max* V_L where the deviation is smaller at 0.73% compared to 1.07%. Despite differences in weights used, we find the same general patterns and, most importantly, we find that a tax shield on *RE* is most conducive to maximising taxpayer wealth and thus offers the best chance to provide sufficient federal tax revenues.

To further illustrate, we also perform tests where the *large* and *small* categories were equally-weighted with and without the use of a weight of 0.072 for *FS*. Once again, we find the same pattern given in Table 2 including those for *max* V_L and *TFTR* values. While the *ODV* values are closer to 0.30 than to the 0.25 reported in Table 2, the narrow range of *ODVs* still hold and so support our conclusion that tax laws do not exercise an important influence on a firm's choice of leverage.

Finally, instead of allowing non-growth values to result when they are superior to growth values, we tested if using all growth values could change our findings. The results were similar for these robustness tests. In brief, the results for all of our robustness tests are consistent with our findings reported in Figures 2-7 and Tables 1 and 2. In particular, we confirm our findings about the overall advantages of a tax policy shift from an *ITS* to an *RTS* where taxpayer wealth can be increased, federal revenue problems can be resolved, and equality in taxing ownership forms can be achieved.

5.3 Blueprint for countries with debt problem

We now offer a blueprint for a tax policy reform that is designed to maximise taxpayer wealth, supply needed federal tax revenue, and achieve equality in the taxing of ownership forms.[30] This blueprint is especially needed for countries with a rising federal debt and should contain the following items.

To begin with, a blueprint should include conducting the necessary tests to find an optimal mix of tax shields that maximise taxpayer wealth while achieving an acceptable

[30] See Bird and Wilkie (2013) for a study on designing tax policy and Wilson-Rogers and Pinto (2009) for a framework for examining tax reform. See Clark (2007) for an investigation of a tax policy supportive of investment.

TFTR. While Table 2 only reports results when an *ITS* is 0% or 100% and an *RTS* is 0% or 50% or 100%, a more optimal and efficiency tax policy could be discovered if other tax shield percentages are tested. Part of any blueprint when seeking to identify the optimal tax shield percentages is to develop an algorithm to approximate optimal tax shield percentages. Without an algorithm, an unknown number of time-consuming tests might be necessary to achieve a satisfactory level of accuracy.

In regards to sharing taxpayer wealth or knowing how much of an *ITS* can be abandoned, an algorithm can pinpoint fair amounts of sharing as well as optimal values for a partial *ITS* and partial *RTS* within agreed parameters. These parameters would provide leeway in the use of tax shields because not all FPOs are like the average business used in our tests as these FPOs have differences in their effective tax rates, sustainable growth rates, and risks that affect the costs of borrowing and help determine a firm's credit rating. In regards to the latter, we cannot assume that all FPOs will find that a Moody's A3 credit rating is optimal as found in our tests where all FPOs face the same average risks. While tax laws need to be legislated that set limits governing *ITS* and *RTS*, laws also need to allow FPOs to choose their own allocations among tax shields within fixed limits. As illustrated next, limits would be based on a percentage of CF_{BT} (or *EBIT*).

For our tests using the weights of 0.125 for C corporations and 0.875 for PTPs, we find that *ITS* is 4.35% of *EBIT* under TCJA with growth of 3.90%. If we switch to a ½*RTS*, the tax shield is 4.53% of *EBIT*. For an *RTS*, we jump to 8.08%. For purposes of illustration, let us say the government sets the maximum tax shield limit at 6% of *EBIT* so that an FPO could choose something like ⅔ of this limit for an *RTS* and the remaining ⅓ for an *ITS*. We also recommend that a separate maximum limit on *ITS* such as 3%, instead of a maximum of 6%, because an *ITS* creates a distortion between equity and debt ownership by favouring debt. Thus, if the maximum tax shield limit is 6% of *EBIT*, no more than one-half of this 6% can be used for an *ITS*. By allowing companies the ability to choose both tax shields, they would be less likely to seek a tax deduction when growth or debt is not otherwise desirable.

Besides identifying optimal tax shield percentages that maximise taxpayer wealth and meet *TFTR* goals, the *WETR* inequality gap needs to be reduced thereby removing the current disparity in the taxing of different ownership forms. While this study offers a tax policy that reduces the *WETR* inequality gap to less than 1% in the taxing of the two FPO ownership forms, the challenge of future research is to find a tax policy that achieves a 0% *WETR* inequality gap. To achieve a goal of zero, modifications of C corporation corporate tax rate and/or the pass-through personal tax rate might be necessary. Due to reasonable disagreements about effective tax rates in an environment where TCJA is still relatively new, it could be difficult to reach a general consensus in the near term as to the accuracy of tests that claim to have achieved a 0% *WETR* inequality gap. Besides equality in taxing all business forms and types, FPOs also need to be sufficiently taxed in order to provide the federal tax revenue needed for countries plagued with debt problems as well as supply the common and essential expenditures such as infrastructure, hospitals, schools and national defence.

5.4 Future research

Tasks for future research include instructional research, exploration of various effective tax rate scenarios, and the role of debt in growth. A first task for future research involves instructional research. This type of research can develop exercises to use in the

classroom as well as those to help policy-makers understand the relation between tax shields and growth in GDP. These exercises are important for educators who are commissioned to properly teach the relation between business growth and tax laws especially those governing interest (*I*) and retained earnings (*RE*). Instructional exercises are also valuable to practitioners and policy-makers who need examples of tax policy applications to guide them in their decision-making so that businesses prosper without undue tax impediments that make growth unaffordable.

For a second task, we take into consideration disagreements over effective tax rates.[31] In this regard, future research can explore other effective tax rate scenarios including how tax rates change with leverage. These tests could cover a range of tax rates that include tax rate scenarios below and above the effective tax rates that we use in this article. Additionally, this study's tests assume that tax rates change in the direction argued by Hull (2014a) for debt-for-equity transactions. Because this argument was formulated to apply to firms and not *other personal taxpayers*, future research can also consider repeating this article's tests when tax rates are not allowed to change with leverage. In order words, the expected levered tax rate predicted by sources occurs for any leverage choice instead of the choice that achieves *ODV*. While we would not expect any major changes since an unlevered tax rate never fluctuated more than 1/6 from the unlevered tax rate, one never knows for sure until tests detailed tests are conducted.

For a third task, future research might consider exploring the role of debt in growth. This research could possibly shed light on a potential positive aspect of *ITS* that might justify debt as growth enhancing at least for some industries. If so, this research can help determine the limits placed on both an *ITS* and an *RTS*. For this study that uses the Capital Structure Model (CSM) equations, an unlevered firm sets its before-tax plowback ratio (*PBR*) before debt is undertaken and the firm's *RE* is the sole source of growth. For the CSM (see Hull, 2018), *PBR* must be greater than the business tax rate on *RE* for growth to add value at the unlevered level. This implies that even debt may not make growth valuable if the business tax is too high. If a firm is unlevered, the CSM posits that debt has no part in affecting the growth rate. However, if debt is issued, the unlevered growth rate (g_U) increases and becomes the levered growth rate (g_L). Since the retained earnings is already fixed, the issuance of debt causes the remaining shareholders to take on more risk for each dollar used for *RE*. Thus, increased growth from debt comes with a price. Suppose debt and equity should be viewed as fractional suppliers of funds for growth. The role of debt in growth can be construed as being part of cash flows available to the firm for its chosen usages be it dividends, *RE*, or *I*. While an *ITS* could be viewed as subsidising growth, the other (and more common) viewpoint is that debt simply performs a leveraging activity so that equity value per share can increase but at a risk captured by lower credit ratings and higher costs of borrowing on equity and debt.

6. SUMMARY AND CONCLUSIONS

This article's contributions to tax law research are aided by addressing three inefficiencies in historical and current tax laws and proposing changes based on these inefficiencies. The three inefficiencies are as follows. *First*, researchers question why

[31] Part of the disagreement can relate to the complexity of tax laws, especially in the US as discussed by Burton and Karlinsky (2016).

an interest tax shield (*ITS*) should exist given it distorts security ownership favouring debt over equity. *Second*, just as perplexing as an *ITS* is the tax treatment of retained earnings (*RE*) that is contrary to the research that advocates direct tax incentives for funds used for growth. *RE* is by far the largest source of growth, yet interest (*I*) is shielded from taxes while *RE* does not receive proper tax relief. *Third*, we address the inequality in the taxing of different ownership forms stemming from the double taxation of C corporation earnings, which tax policy researchers have characterised as unfair, inefficient, arbitrary and capricious. While the US Congress passed the Tax Cuts and Jobs Act (TCJA) in December 2017 that alleviated the tax burden on C corporations caused by their double taxation, inequitable taxing between C corporations and pass-throughs still exists only now pass-throughs, on average, are at a disadvantage.

This article's findings when addressing the three inefficiencies can be summarised as follows. Focusing on our tests that include all personal taxpayers (PTPs) so that conclusions can be based on 56% of federal tax revenue, we find that replacing an *ITS* with a ½*RTS* under TCJA expands taxpayer wealth by 4.51% beyond pre-TCJA wealth, where a ½*RTS* means that one-half of *RE* used for growth is a tax-deductible expense. This deductible expense amounts to a tax subsidy equal to the effective business level tax rate times the amount of *RE* used for growth. Of importance, this increase in wealth of 4.51% boosts *TFTR* so that it is 3.15% greater than that under TCJA with an *ITS*.

Next we find that replacing *ITS* with an *RTS* (instead of a ½*RTS*) increases the combined total of taxpayer wealth and *TFTR*. This makes both taxpayer wealth and federal revenues greater if the larger pie can be properly allocated. Additionally, we discover that the inequality gap in taxing ownership forms, as measured by the weighted effective tax rate (*WETR*), is reduced as increasingly large amounts of *RE* are shielded from taxation. Finally, we show that an *RTS* policy does not materially alter the optimal debt-to-firm value ratio (*ODV*) indicating that there is little, if any, impact on debt decision-making due to a tax deduction on interest. This is consistent with the notion that an *ITS* is not only an arbitrary tax deduction with little purpose but also has negative ramifications to the extent it deprives governments of funds that could support a tax law that directly subsidises growth.

Prior to TCJA, the US had one of the highest statutory tax rates and a spiralling debt. TCJA provides *new wine* in the form of lower tax rates that lead to greater growth. However, this *new wine* has been put in the *old wineskin* of an *ITS* tax law. Using the *old wineskin* assures that business wealth (and thus taxpayer wealth) will not increase in a manner that diminishes the rising federal debt. In fact, we document a 4.20% decrease in total federal tax revenue (*TFTR*) under TCJA and its current *ITS* policy, which agrees with that given by CBO (2019). Even here we have to assume no increase in spending including that for social insurance. The possibility of a spending reduction appears to be low given that federal expenditures have escalated during the first two years of TCJA (and before the current coronavirus crisis) causing the federal debt to rise about 10%. Furthermore, social insurance is also in trouble with outflows greater than inflows so that this adds to the federal debt. Thus, we conclude that a *new wineskin* is needed for the *new wine* of lower taxes and this *new wineskin* is provided by a retained earnings tax shield (*RTS*) policy that replaces the *old wineskin* of an *ITS*.

In conclusion, the switch from an *ITS* to an *RTS* is motivated by re-examining why we allow interest (*I*) to be tax-deductible and why we tax retained earnings (*RE*), which is the dominant source of growth used by companies. While *TFTR* can increase under an *RTS* policy, the key to creating a substantial increase in *TFTR* is to find a way to allow

the significant increase in taxpayer wealth to trickle down to the federal coffers. The conclusion about needing to switch tax shields is applicable to the many countries that share in US taxing characteristics and have been misguided by not replacing an *ITS* with an *RTS*.

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8. APPENDICES

Exhibit 1: Acronyms, Terms, Definitions and/or Meanings

Acronym: Term	Definition and/or Meaning *for this study's purpose*
FPO: for-profit organisation	A business whose earnings are subject to taxes because they fall within either the C corporation or pass-through ownership form.
I: interest	Payment to debt owners.
ITS: *I* tax shield	Tax-deductible expense on *I* that if given to an FPO serves to encourages debt financing over equity financing.
RE: retained earnings	Before-tax cash flows from operations used strictly for growth that leads to increased production of goods and/or services.
RTS: *RE* tax shield	Tax-deductible expense on *RE* that if given to an FPO serves to encourage growth by using internal funds.
½*RTS*: ½*RE* tax shield	Tax-deductible expense on one-half of *RE* that if given to an FPO serves to encourage growth by using internal funds.
TFTR: total federal tax revenue	Represents the federal tax revenue with chosen sources used to represent the total.
WETR: weighted effective tax rate	Weighted average that includes up to five effective tax rates with weights supplied by up to five different taxable amounts.
E_U : unlevered equity value	E_U is the same as unlevered firm value (V_U) because unlevered means no debt. Thus, value consists only of equity.
Max G_L: maximum gain to leverage	The greatest gain to leverage among all feasible leverage choices where each leverage choice targets a different credit rating.
V_L: firm value	$V_L = E_L + D$ where E_L is levered equity value and D is debt value. For our application of the CSM, V_L is also $E_U + G_L$.
DV: debt-to-firm value ratio	A leverage ratio computed as D/V_L where D is debt value and V_L is firm value.
Max V_L: maximum firm value	*Max* $V_L = E_U +$ *max* G_L where *max* V_L can also be identified by the greatest V_L among all feasible V_L outputs.
ODV: optimal debt-to-firm value ratio	The optimal *DV* associated with the greatest attainable firm value among feasible *DV* choices, which is *max* V_L.
CF_{BT}: cash flows before taxes	Cash flows available to the FPO before federal taxes are paid and before any applicable tax shield lowers business level taxes.
ICR: interest coverage ratio	Comes in three firm categories of *small*, *large*, and *financial service* and are used to compute leverage choices.
PTP: personal taxpayer	Refers to a taxpayer who pays at the personal statutory tax rate (includes pass-throughs and *other personal taxpayers*).
FSAF: firm size adjustment factor	Captures the increase in *max* V_L (and thus taxpayer wealth) under TCJA from the projected increase in growth.

APPENDIX 1: EQUATIONS USED TO GENERATE TAX LAW OUTCOMES

The Capital Structure Model (CSM) of Hull (2014a, 2018, 2019) derives gain to leverage (G_L) equations from the definition that G_L equals levered firm value (V_L) minus unlevered firm value (V_U) where V_U is the same as unlevered equity value (E_U). These G_L equations include non-growth and growth equations for C corporations and pass-throughs. They also contain equations for tax laws that govern an interest tax shield (*ITS*) and a retained earning tax shield (*RTS*). Besides the latter tax shields that can be called a *full* or a 100% tax shield, a partial tax shield (such as a 50% tax shield) is also covered by the CSM. The pass-through equations and *RTS* equations derived by Hull (2019) are extensions of their respective C corporation equations and *ITS* equations given by Hull (2014a, 2018).

As shown by Hull (2019), the CSM equations can all take the same general form (but with variables defined differently based on ownership form). This same general form is

$$G_L = (1 - \alpha_1 r_D/r_{Lg})D + (1 - \alpha_2 r_{Ug}/r_{Lg})E_U \quad (1)$$

where

$\alpha_1 = (1-T_{E2})(1-T_{C2})/(1-T_{D2})$ with T_{C2}, T_{E2} and T_{D2} as the levered effective tax rates on corporate, equity and debt incomes where T_{C2} is zero for pass-throughs and T_{E2} for C corporations is lower than T_{E2} for pass-throughs;

$\alpha_2 = (1-T_{E2})(1-T_{C2})/(1-T_{E1})(1-T_{C1})$ with T_{E1} and T_{C1} as the unlevered effective tax rates on equity and corporate incomes where T_{C2} and T_{C1} are zero for pass-throughs and T_{E1} for C corporations is lower than T_{E1} for pass-throughs;

r_D, r_{Lg}, and r_{Ug}, are, respectively, the cost of debt, the growth-adjusted cost of levered equity (which is the cost of levered equity, r_L, minus the levered growth rate, g_L), and the growth-adjusted cost of unlevered equity (which is the cost of unlevered equity, r_U, minus the unlevered growth rate, g_U);

$g_U = r_U(1-T_{BL1})RE/C$ where T_{BL1} is the unlevered business level tax rate, which is labelled as T_{C1} for C corporations and T_{E1} for pass-throughs, *RE* is retained earnings used for growth, and *C* is cash or cash-like distributions to equity owners;

$g_L = r_L(1-T_{BL2})RE/[C+G-(1-T_{BL2})I]$ with T_{BL2} as the levered business level tax rate (which is labelled as T_{C2} for C corporations and T_{E2} for pass-throughs), *G* is the perpetual before-tax cash flow from G_L with $G = r_{Lg}(G_L)/(1-T_{E2})(1-T_{C2})$ where T_{C2} is zero for pass-throughs, and *I* is the annual interest payment; and,

D is the amount of debt issued to retired E_U.

For a zero plowback ratio (*PBR*) where *RE* is zero, the growth variables (g_U and g_L) become zero and (1) becomes a non-growth equation. The exact definitions for variables used in deriving CSM growth equations can depend on the type of taxes (corporate or personal), the tax shield law (*ITS* or *RTS*), and whether the tax shield is zero, full, or partial where 0 < partial < 1. Values for the before-tax cash flows, effective tax rates, costs of borrowing and growth rates used in these equations to produce this article's results are described in section 3. When using the CSM equations to determine the maximum firm value (*max* V_L), tests are conducted for each *P* choice where *P* refers to

the proportion of E_U retired with debt with the highest firm value (V_L) identified as *max* V_L.

There are 15 possible P choices that correspond to the 15 credit ratings given in Appendix 2 yielding up to 15 V_L values where $V_L = E_U + G_L$. The *max* V_L is found from among all feasible V_L values where feasible refers to tests where there is no violation of the constraints given by Hull (2018, 2019). *Max* V_L determines the optimal P choice from which the optimal debt-to-firm value ratio (*ODV*) can be computed. Because *max* $V_L = E_U + max\ G_L$, both *max* G_L and *max* V_L identify *ODV*.

Plotting V_L values against P choices yields a concave shape. Thus, for increasing P choices, V_L values rise before *max* V_L is reached. Once *max* V_L is achieved, V_L values fall as P choices increase. There is one exception that occurs for a ½*RTS* test for PTPs where V_L increases slightly after *max* V_L is reached at g_L = 3.90% but that test involves an unsustainable g_L of 4.57% and so is considered unfeasible. For all tests, violation of constraints only takes place after *max* V_L is reached. Based on *max* V_L, all wealth and tax revenue outcomes given in Figures 2-7 and Tables 1 and 2 are determined.

APPENDIX 2: FIVE-STEP PROCEDURE TO COMPUTE BORROWING COSTS

We compute borrowing costs for debt and equity as follows.

Step 1: We get a long-term risk-free rate (r_F) of 3%. Adjusting for the downward trend, a rate of 3% is consistent with 30-year government bond returns over the past 10 to 15 years as given by Federal Reserve Economic Data (FRED) (2019a).

Step 2: We get an equity risk premium (*ERP*) using an estimate of 4.75% consistent with Damodaran (2019). Because our study involves looking at macroeconomic data that includes all firms that collectively produce GDP, the *ERP* of 4.75% is also the premium of the market portfolio over the risk-free rate, which we label as ERP_M.

Step 3: We base discount rates on credit spreads matched to credit ratings. This approach is consistent with researchers (Graham & Harvey, 2001; Kisgen, 2006) who find credit ratings rank higher than traditional factors in determining capital structure decision-making. We compute costs of debt as follows when using credit ratings. *First*, we gather credit spreads of 30-year corporate bonds over 30-year treasury bonds from Damodaran (2019) who supplies spreads for 15 credit ratings. Damodaran's Moody's/S&P credit ratings and corresponding spreads are: Aaa/AAA: 0.75%; Aa2/AA: 1%; A1/A+: 1.25%; A2/A: 1.375%; A3/A−: 1.5625%; Baa2/BBB: 2%; Ba1/BB+: 3%; Ba2/BB: 3.6%; B1/B+: 4.5%; B2/B: 5.4%; B3/B−: 6.6%; Caa/CCC: 9%; Ca2/CC: 11.08%; C2/C: 14.54%; and, D2/D: 19.38%.[32] The first large jump in credit spreads is that of 0.4375% between a Moody's A3 and Moody's Baa2. This jump of 0.4375% is over twice the prior four jumps. This indicates that A3 is a relatively good target rating as ratings after A3 have much more risk. *Second*, we compute 15 costs of debt (r_D) using the formula of $r_D = (r_F + spread)$. To illustrate using r_F = 3% from *Step 1* and the spreads, we have

[32] While we mention both S&P ratings and Moody's ratings in this paragraph, elsewhere we only mention Moody's ratings.

first r_D = (r_F + *first spread*) = 3% + 0.75% = 3.75% and *last or fifteenth* r_D = (r_F + *fifteenth spread*) = 3% + 19.38% = 22.38%.

Step 4: We compute the borrowing cost of levered equity (r_L) using the formula $r_L = r_D + EPB$ where *EPB* refers to an equity premium over an average bond return with *EPB* defined as the difference between the return on the equity market portfolio minus the return on a corporate bond portfolio. Damodaran (2019) suggests that *EPB* is near 3.1% while FRED (2018) indicates 3.5% to 4.1% with an average of 3.8%. Since the midpoint of 3.1% and 3.8% is 3.45%, we use *EPB* = 3.45%. By adding 3.45% to our 15 r_D values, we get 15 r_L values. To illustrate, *first* r_L = *first* r_D+*EPB* = 3.75% + 3.45% = 7.20% and *last* r_L = *last* r_D+*EPB* = 22.38% + 3.45% = 25.83%.

Step 5: We gather other variables needed when applying the CSM, namely, the market rate of return (r_M) and the unlevered cost of equity (r_U). The value for r_M is equal to $ERP_M + r_F$. Inserting our values from Steps 1 and 2, we have: r_M = 4.75% + 3% = 7.75%. We get r_U as follows. We begin by identifying an unlevered beta (β_U). We use the value of 0.79 consistent with Damodaran (2019). With r_F = 3%, r_M = 7.75%, and β_U = 0.79, the Capital Asset Pricing Model (CAPM) gives $r_U = r_F + \beta_U(r_M - r_F)$ = 3% + 0.79(7.75%–3%) = 6.7525%. Since r_U of 6.7525% is less than our first r_L value of 7.20%, the assignment of r_L values is consistent with what we know should be found, which is all costs of equity (like the all costs of debt) increase with debt.

APPENDIX 3: WEIGHTED AVERAGE INTEREST COVERAGE RATIOS (*ICRs*)

We compute the weighted average interest coverage ratios (*ICRs*) and provide an example of how we calculate the optimal debt-to-firm value ratio (*ODV*).

For our major tests that are reported in Table 2, we use weighted *ICRs* that are computed as follows. We begin by gathering the average *ICRs* as described by Hull (2020). The average *ICRs* in that study are derived from Damodaran (2019) who supplies *ICR* ranges for three firm categories of *large*, *small*, and *financial service* (*FS*). Damodaran's *large* firm category applies to firms with assets over USD 5 billion and so the large *ICRs* best apply to C corporations that compose 7% of federal tax revenue. Since pass-throughs consist largely of small firms with assets under USD 5 billion, Damodaran's small *ICRs* are best represented by PTPs that compose 49% of federal tax revenue. As shown in section 2.2, the sources of federal tax revenue suggest weights of 0.125 for Damodaran's *large* category and 0.875 for his *small* category. To incorporate the *FS* firm category while acknowledging the latter two weights, we assign the *FS* category a weight of 0.072 because financial service firms represent 7.2% of US GDP according to Federal Reserve Economic Data (FRED) (2019b) from 2005–2019. We next adjust the *large* and *small* weights of 0.125 and 0.875 by multiplying them by (1–0.072) so that our three respective weights for the *large*, *small* and *FS* firm categories are 0.116, 0.812, and 0.072 with these weights adding up to one. We then multiply these three respective weights by average *ICRs* for the *large*, *small*, and *FS* categories to get a weighted average *ICR*.

To illustrate a weighted average *ICR* using pre-TCJA tax rates, consider the three average *ICRs* that correspond to a credit spread for a Moody's credit rating of A3, which is the rating associated with maximum firm value (*max* V_L) and *ODV* for this pre-TCJA test (and all of our TCJA tests when g_L = 3.90%). These *ICRs* are: *large*: 3.625; *small*:

5.25; and, *FS*: 1.35. The weighted average *ICR* is 0.116(3.625) + 0.812(5.25) + 0.072(1.35) = **4.7807**. Since there are 15 *ICRs* for each of the three categories, we compute 15 weighted average *ICRs* that correspond to Damodaran's 15 credit spreads and credit ratings for the year 2018. Once we get these 15 weighted average *ICRs*, we can compute 15 annual interest (I) values, 15 debt (D) values, and 15 P choices where P refers to the proportion of unlevered equity (E_U) retired with debt (D). Below we show computations for I, D and P using a Moody's rating of A3 that is associated with weighted average *ICR* of 4.7807, *max* V_L, and *ODV*.

Noting that our tests assume similar risk classes exist for all FPOs, we apply the same process to all FPOs. For Damodaran, $ICR = (1-T_{BL})EBIT/I$ where T_{BL} is the average tax rate on business level income and *EBIT* is earning before interest and taxes.[33] In terms of equation (1) given in Appendix 1, T_{BL} is the same as the effective business tax rate described in section 3.2 (T_{C2} for a C corporation and T_{E2} for a pass-through) and *EBIT* is analogous to CF_{BT}. To compute I per USD 1,000,000 in perpetual CF_{BT} when applied to a C corporation, we rearrange the equation for *ICR* inserting T_{C2} for T_{BL} and CF_{BT} for *EBIT* to get $I = (1-T_{C2})CF_{BT}/ICR$. Using T_{D2} and r_D values corresponding to I values, we calculate D using $D = (1-T_{D2})I/r_D$ where T_{D2} is the effective tax rate on debt described in section 3.2 and r_D is the cost of debt described in Appendix 2. Given D, we compute P choices where $P = D/E_U$.

We now input values for variables in our three equations for I, D, and P. Using 4.7807 as the weighted average *ICR* for a Moody's rating of A3 when we focus on pre-TCJA values for a C corporation, we first compute I using ICR = 4.7807, T_{C2} (pre-TCJA) = 0.30055691 and CF_{BT} = USD 1,000,000. We have: $I = (1-T_{C2})CF_{BT}/ICR$ = (1–0.30055691)1,000,000/4.7807 = USD 146,305.58. Given I, we next compute D using T_{D2} = 0.16229837 and r_D = 0.045625. We have: $D = (1-T_{D2})I/r_D$ = (1–0.16229837)146,305.58/0.045625 = USD 2,686,256. Given D, we now compute P given E_U = USD 8,517,875. We have: $P = D/E_U$ = USD 2,686,256/8,517,875 = 0.3154.

To compute *ODV*, we first have to identify *max* V_L. To achieve this, we begin by using (1) to compute the maximum gain to leverage (*max* G_L). For a Moody's rating of A3, *max* G_L is USD 783,965 (e.g., it is the largest G_L from all GL computations). We now use the equation of $V_L = E_U + G_L$. We have $V_L = E_U + G_L$ = USD 8,517,875 + USD 783,965 = USD 9,301,841 (rounding off error of USD 1), which is *max* V_L. Using our value for D and *max* V_L, we have *ODV* = USD 2,686,256/9,301,841 = 0.289.

APPENDIX 4: FOUR-STEP PROCEDURE TO COMPUTE *FSAFs*

Firm size adjustment factors (*FSAFs*) capture the increase in maximum firm value (and thus taxpayer wealth and federal tax revenue) under TCJA when growth increases from 3.12% to 3.90%. We compute *FSAFs* as follows using TCJA tax rates.

Step 1: We set the CSM's before-tax plowback ratio (*PBR*) to zero and use the CSM non-growth equation to determine *max* V_L among all feasible levered P choices where P refers to the proportion of unlevered equity retired with debt. Each P choice is associated with one of the 15 credit ratings. From this test, we identify the greatest V_L

[33] A more common definition of *ICR* is *EBIT*/*I*.

value as *max* V_L. For all of our non-growth tests, the *max* V_L always occurs for the same *P* choice that corresponds to a Moody's credit rating of A3 where the latter is the most common credit rating. For example, from 12 June 2018 through 29 April 2019, Morningstar (2019) reports that nearly 30% of all new debt obligations have a medium investment grade (IG) credit rating of A3 even though there are 20 other possible ratings to choose from. Furthermore, 61 of the 75 newly rated debt obligations have medium IG credit ratings.[34] Thus, less than one-fifth of the ratings are either higher IG ratings or non-IG ratings.

Step 2: From our non-growth test, we identify A3 as the optimal credit rating to use for our growth tests. We run tests after setting *PBR*, as many times as needed through trial and error, until g_L = 3.12% at a rating of A3. As it turns out, the V_L value achieved with a rating of A3 is greater than V_L values found for other ratings. In other words, other credit ratings with lower and higher growth rates do not generate larger V_L values for these tests that set g_L = 3.12% for a rating of A3. Since the V_L achieved at a rating of A3 is the greatest V_L value, it is a candidate for *max* V_L.

Step 3: We check V_L for non-growth and unlevered situations. If a V_L value can be found that is greater than the growth *max* V_L using g_L = 3.12% identified in Step 2, then this V_L value becomes *max* V_L. We find that the growth *max* V_L for 3.12% given in Step 2 generates the greatest V_L except for a few incidences where the non-growth *max* V_L has the greatest V_L.[35]

Step 4: We set *PBR* (once again, through trial and error) so that g_L = 3.90% for a rating of A3 and identify the V_L associated with this rating as *max* V_L.[36] This *max* V_L with g_L = 3.90% is always greater than the *max* V_L identified in Step 3. We then compute the increase in *max* V_L caused by the increase in growth to 3.90%. This computation subtracts *max* V_L (Step 3) from *max* V_L (using g_L = 3.90%) and divides this quantity by *max* V_L (Step 3). This latter computation is added to one to get *FSAF*. The *FSAF* is important because it not only shows how firm value increases when growth increases from 3.12% to 3.90%, but it shows how federal tax revenue also is increased because federal tax revenue increases by the same *FSAF*. As seen in Table 2 where *FSAFs* are over 1.075, some tests can generate over a 7.50% increase in federal tax revenue if growth increases as predicted under TCJA.

APPENDIX 5: THREE-STEP PROCEDURE TO COMPUTE *WETR*

WETR is the weighted effective tax rate and is a weighted average that includes up to five effective tax rates with weights supplied by up to five different taxable amounts. Values for *WETR* are reported in Table 2. We calculate *WETR* as follows.

[34] Damodaran (2019) only lists four of the six medium IG credit ratings. These four contain 46 of 61 medium IG ratings given by Morningstar (2019).
[35] For TCJA tests where g_L = 3.90%, *max* V_L never occurs for a non-growth situation.
[36] As noted Appendix 1, for one g_L = 3.90% test, a greater V_L value occurs past *max* V_L but only with an unsustainable g_L of 4.57%. Only if we use the most optimistic estimates of growth under TCJA can we attain long-run growth near 4.57%.

Step 1: We compute the five taxable amounts on which corporate and/or personal taxes are paid. They consist of the following amounts (with the type of taxes noted for each amount):

(1) ***RE*** (for *ITS* tax law) or ***I*** (for *RTS* tax law) or $\boldsymbol{I} + \boldsymbol{RE_{partial}}$ (for *partial RTS* tax law): corporate taxes paid at T_{C2} on that portion of *EBT* (taxable income) that is capital gains (*RE*) with an *ITS* or interest (*I*) with an *RTS* or both *RE* and *I* with a partial *RTS*;[37]

(2) $\boldsymbol{EP} = \boldsymbol{EBIT} - \boldsymbol{RE}$ (for *ITS* tax law) or $\boldsymbol{EP} = \boldsymbol{EBIT} - \boldsymbol{I}$ (for *RTS* tax law) or $\boldsymbol{EP} = \boldsymbol{EBIT} - \boldsymbol{RE_{partial}} - \boldsymbol{I}$ (for *partial RTS* tax law); corporate taxes paid at T_{C2} on that portion of *EBT* that is distributed as an equity cash payout;

(3) ***I***: personal taxes paid on *I* at T_{D2} with an *ITS* by all FPOs and, for pass-through and PTP tests with an *RTS*, personal taxes are paid on *I* at T_{E2};

(4) ***RE***: personal taxes paid at T_{E2} on capital gains where T_{E2} is greater for pass-throughs; and,

(5) $\boldsymbol{EP} = [(\boldsymbol{1}-\boldsymbol{T_{C2}})(\boldsymbol{EBIT}-\boldsymbol{I})] - \boldsymbol{RE}$ for *ITS* tax law or $\boldsymbol{EP} = [(\boldsymbol{1}-\boldsymbol{T_{C2}})(\boldsymbol{EBIT}-\boldsymbol{RE}) - \boldsymbol{I}] - \boldsymbol{RE}$ for *RTS* tax law or $\boldsymbol{EP} = [(\boldsymbol{1}-\boldsymbol{T_{C2}})(\boldsymbol{EBIT}-\boldsymbol{RE_{partial}}) - \boldsymbol{I}] - \boldsymbol{RE}$ for *partial RTS* tax law; personal taxes paid at T_{E2} on equity cash payout where T_{E2} is greater for pass-throughs and $\boldsymbol{T_{C2}} = 0$ for pass-through and PTP tests.

The first two taxable amounts are applicable only for a C corporation and so are zero for pass-through and PTP tests. The last two amounts, when used with a C corporation, have lower personal tax rates as discussed in section 3.2. The same dollar of taxable income can be taxed more than once. For example, C corporations have double taxation where earnings are taxed at both corporate and personal level while pass-throughs can have *RE* or *I* taxed more than once depending on the tax shield and its nature (full or partial). Pass-throughs are taxed twice on *RE* under *ITS* and twice on *I* under *RTS*; pass-throughs are taxed twice on *I* and once plus partial on *RE* under *partial RTS*.

Step 2: Noting that the five taxable amounts on which corporate and/or personal taxes are paid represent the *total taxable income*, we divide each of these five taxable amounts by the *total taxable income* to get the five weights.

Step 3: We multiply these weights by their respective effective equity tax rates and add these sums to render a *WETR* value. As described in section 3.2, the levered effective tax rates (that occur at an interior *ODV* for all of our tests) are: T_{C2} (only applicable to C corporations), T_{E2}, and T_{D2}. T_{E2} varies based on the ownership form. In regards to the latter, while T_{E2} is based on tax laws governing dividends and capital gains for C corporations, such is not the case for PTPs who are typically taxed at the ordinary personal tax rates. FPOs are governed by the same tax law on *I* and so T_{D2} is the same for C corporations and PTPs.

[37] We use the subscript '2' instead of the unlevered subscript '1' since all of the *max* V_L values occur for a levered situation. These subscripts were presented in section 3.2.