Tax Shield Choices: Pedagogical Application

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ABSTRACT

We offer a pedagogical application on the role of taxation on business decision-making that focuses on the value of a traditional interest tax shield (*ITS*) versus a retained earnings tax shield (*RTS*). This exercise demonstrates that an *RTS* serves to promote business growth, lower financial distress, and achieve greater equality in the taxation of different business ownership forms. A study of these two tax policies challenge students to understand the relevant tax shield factors that are essential in achieving optimal corporate finance and tax policy outcomes. In terms of maximizing firm value, students will learn that an *ITS* is inefficient and suboptimal compared to an *RTS* policy. Students also gain experiential knowledge and acquire skills on how to analyze an *RTS* in terms of understanding its role in maximizing firm value. By experiencing this exercise, students acquire important insights on how taxation policy can be detrimental or beneficial to business growth and what is needed to overcome barriers to achieve this growth. Finally, our instructional exercise supports teamwork learning and enables students to apply finance equations and enhance their Excel skills used in the business world.

Keywords: Tax shield policy, valuation models, pedagogy, finance classroom, advanced Excel

INTRODUCTION

Tax shields are a fundamental topic in business finance courses. They enable firms to lower taxes and so are useful in the areas of capital structure, capital budgeting, and costs of capital. Standard finance textbooks fail to discuss interest tax shields in terms of efficiency thereby ignoring how they are a detriment to business growth, cause of bankruptcy, and source of inequality in the taxation of ownership forms. The purpose of this paper is to supply a pedagogical application on an interest tax shield (*ITS*) and a retained earnings tax shield (*RTS*). The *ITS* represents a status quo tax policy criticized by scholars as inefficient. In contrast, an *RTS* is not standard although tax experts favor it.

Tax shields create inefficient behavior as they cause financial managers to make choices that would otherwise be suboptimal. For example, an *ITS* distorts capital structure decision-making by leading to the selection of debt over equity thereby creating greater financial distress concerns. Not only do legislative actions subsidize debt, but legislative inactions lead to failures in establishing long-run tax policies to support growth. Ongoing legislative efforts to promote business growth (especially during recessionary periods) include accelerated depreciation and tax credits for R&D expenditures. While the former simply speeds up the tax expense deduction, the latter tends to be temporary with monetary limits.

Consider a company that sets aside retained earnings (*RE*) for growth when their effective tax rate is 0.25. Because *RE* is taxable income from internal operations, it cost 25% on the dollar to plow these taxable funds back into the firm for growth purposes. The 25% cost is based on average tax rates historically experienced by C corporations (CCs) and pass-throughs (PTs). In contrast, issuing new funds have flotation costs that average around 5% and thus can be fives times lower than the costs of using *RE*.

To understand the high cost of using internal funds for growth compared to an *RTS*, consider the impact of accelerated depreciation and R&D tax credits. Suppose a company has $1,000,000 in depreciation that can be written off today instead of one year later when the cost of borrowing is 0.05. The present value of the early write-off is 0.05 × $1,000,000 = $50,000. If a company has $1,000,000 in R&D with a 0.1 limit on its tax credit, its savings is 0.1 × $1,000,000 = $100,000. If the effective tax rate is 0.25 and a company has $1,000,000 in *RE* to use for growth, its savings is 0.25 × $1,000,000 = $250,000. For every dollar spent on growth, a company is 2.5 to 5 times better off with an *RTS* compared to ongoing legislation.

In this paper's instructional exercise, we use the procedure applied by Hull and Hull (2021). This procedure provides instructors and practitioners with a tool that motivates legislative change through understanding the factors and processes that maximize total wealth as measured by firm value and federal tax revenue. This procedure addresses taxing inefficiencies by showing the value of replacing an *ITS* with an *RTS*.

This paper satisfies two goals of a business finance education as it addresses behavior changes and financial literacy. *First*, there are behavioral ramifications as we show the interconnected between enacting efficient tax shields and creating business wealth. A pedagogical exercise seeking to affect behavioral patterns is consistent with Brau, Neilson, and Sudweeks (2015) who advocate educators need to facilitate behavioral change by using a principles-based approach for motivation and an applications-based approach for execution. This paper takes a principles-based approach by studying the fundamental principles of business tax shields in a way that motivates business managers to lobby for an efficient tax policy. We take an applications-based approach to corporate finance decision-making by emphasizing hands-on learning with students actively engaged in creating outcomes to show which tax shield is superior. Besides

providing an exercise that allows teamwork, our student exercise directly promotes Excel skills. As noted by Zhang (2020), Excel skills are one of the most valued skills in the workplace but most business schools fail to integrate Excel into their business courses.

Second, this paper addresses financial literacy in terms of understanding the relation between firm value and efficient tax policy. The financial pedagogical research indicates ongoing work remains on financial literacy. For example, while financial education course requirements have improved over time, Crain (2013) discovered about a decade ago that only eleven percent of universities allow a course on financial literacy to fulfill a general education requirement. The lack of financial education requirement reflects the findings of BenDavid-Hadar (2015) who show that financial illiteracy extends to educators. More recently, Brau, Holmes, and Israelsen (2019) find that financial literacy in the college classroom is impacted by experiential learning. Consistent with this finding, this paper's pedagogical application is best conducted when students work in groups sharing their individual skills within a group learning environment.

Learning outcomes for students include understanding the efficiency of different tax shields and acquiring tools to determine an optimal tax policy to support business growth that affects wealth at both the business and government levels. Students will apply business finance equations in an exercise where they experience the intricacies of computing corporate finance and tax policy outcomes. The exercise is designed for upper level and graduate courses in business that cover corporate finance. Parts of the exercise can be used separately including undergraduate level business classes.

LITERATURE REVIEW

The Tax Cuts of Jobs Act (TCJA) became effective beginning January 2018 and included two major changes. *First*, TCJA lowered the personal income tax bracket for pass-throughs (PTs)

with the maximum statutory personal tax rate dropping from 0.396 to 0.37. While TCJA did not change the tax rates on qualified dividends or capital gains, it modified the personal income tax brackets so that the effective personal tax rate was, in essence, further lowered. Absent further legislation before 2026, current personal tax rates are to revert back to those rates that existed prior to TCJA. Similarly, there is no guarantee that the TCJA business deduction of 20% for lower income PTs will extend beyond 2025.

Second, TCJA decreased the corporate tax rate paid by C corporations (CCs) from a maximum of 0.35 to a flat rate of 0.21. Hull and Hull (2021) show that, prior to TCJA, PTs paid about 4.1 cents less in taxes per dollar earned compared to CCs. With the implementation of TCJA, Hull and Hull discovered that CCs now paid about 1.5 cents less per dollar. Thus, in net terms, TCJA lowered the gap by about 2.6 cents per dollar. Hull and Hull then showed that replacing an *ITS* with an *RTS* further lowered the gap by nearly one penny per dollar. Unlike TCJA, *RTS* achieved its drop without lowering either federal revenue or the tax rates for both ownership types.

With TCJA lowering the CC tax rate, opponents of double taxation on CCs (Doran, 2009; Polito, 2017) have somewhat weaker arguments given the double taxation no longer causes CCs to pay a greater tax rate than PTs. Hull and Hull (2021) point out that, while TCJA addresses double taxation, it fails to deal with the existing tax legislation that allows *ITS* to exist. This existence baffles researchers (Burke, 2008; Fatica, 2013; Norbäck, Persson and Tåg, 2018) because there is no justifiable reason that interest (*I*) should be a tax-deductible business expense for a country especially when that same country does not give a comparable deduction for equity payouts.

Hull and Hull (2021) write that TCJA largely ignores the tax reform presented by researchers and tax experts (Noked, 2014; Nussim and Sorek, 2017; Pomerleau, 2017) whose

writings are consistent with the notion that tax reform should be aimed more directly at the sources of growth. The Center on Budget and Policy Priorities (2021), a nonpartisan research and policy institute, argues that lowering taxes in itself does not guarantee increased growth as the enactment of TCJA has shown. Hull and Hull (2021) argue that *RTS* offers a solution to achieve tax reform that promotes business growth.

Consistent with TCJA's belief that lower tax rates lead to greater growth, empirical researchers find that a decrease in tax rates aid growth (Barro and Redlick, 2011; Freebairn, 2017; McBride, 2012; Mertens and Ravn, 2013; Romer and Romer, 2010). Findings from this research include: lower taxes increase per capita GDP; higher business level taxes decrease growth; and, tax cuts boost personal investment with a positive impact on federal tax revenue. In brief, the empirical evidence supports the concept that increased tax rates are a deterrent to investment thus impeding GDP growth and taxpayer wealth.

METHOD

This exercise uses the CSM methodology. The CSM embodies trade-off theory (Baxter, 1967; Berk, 2010; DeAngelo and Masulis, 1980). The CSM is employed in prior pedagogical applications (Hull 2008, 2011, 2014) and practical applications (Hull and Hull, 2021; Hull and Price 2015; Hull and Van Dalsem, 2021) on optimal capital structure decision-making and maximum firm valuation. As presented by these studies, maximum firm value ($max\ V_L$) is unlevered firm equity (V_U) plus the gain to leverage (G_L).

All equations associated with the methodology are provided in the pedagogical application. Due to its widespread availability and space constraints, additional details of the methodology are not given here but are available with the solutions on request.

PEDAGOGICAL APPLICATION

In this section, we offer our pedagogical exercise on the tax shield choice using the procedure of Hull and Hull (2021). We provide two major learning outcomes. *First*, students learn the difference between two tax shields: interest and retained earnings. *Second*, students learn how to compute corporate finance and tax policy outcomes.

The pedagogical application that follows consists of four parts with instructors free to choose which parts to use based on class level and course time allotted to corporate finance outcomes. Part 1 challenges students to do online research on tax shields. In Part 2, students learn how to use data to compute initial variables instrumental in the process to determine outcomes. Part 3 introduces the corporate finance outcomes and show the extent to which they depend on the two tax shield choices. Part 4 incorporates the tax policy outcomes. Each of the four parts has its own assignments with solutions (including spreadsheets) available on request.

Part 1. Two Tax Shield Choices: *ITS* and *RTS*

You work for an unlevered firm. Five years ago, your firm, AMZ Inc., was a pass-through (PT) business. PTs consist of various business ownership types including S corp, limited liability company (LLC), partnership, and sole proprietorship. Within three years after the Tax Cuts and Job Acts (TCJA) of December 2017 that substantially lowered taxes for CCs, your firm changed its ownership type from an LLC to a CC. Recently, you had an initial public offering (IPO) of equity shares but you have yet to have a public bond offering. Although AMZ has used seasonal lines of credit, its bank borrowings are currently zero. As a member of the Mathematics Finance Committee (MFC) of AMZ, you have been appointed by the chair of MFC to represent AMZ's

interests by serving on a U.S. Congress task force to recommend what tax shield would be best for firm value. Below is your assignment.

ASSIGNMENT 1: The congressional tax force wants information on tax shields with a focus on (i) an interest tax shield (*ITS*) that makes the cost of debt less expensive by shielding interest (*I*) from taxes and (ii) a retained earnings tax shield (*RTS*) that makes growth less expensive by shielding retained earnings (*RE*) used for growth from taxes. Complete the following two tasks.

Task 1.1: Write a report on your understanding of the historical reasons for an *ITS*. In your report, try to determine if there is proper justification for an *ITS*. HINT: Try googling such phrases as "historical perspective on the corporate interest deduction."

Task 1.2: Write a report on attempts of governments to subsidize growth (such as accelerated depreciation and tax credits for R&D expenditures). In your report, try to determine if these attempts fall short of an *RTS*. HINT: Try googling "tax policy options for boosting economic growth" or similar phrases.

Part 2. Computing Costs of Capital and Levered Tax Rates

Having finished your initial work on the congressional task force, you have now been chosen by the chair of MFC to be on its ad hoc cost of capital subcommittee (CCS) to estimate costs of capital for AMZ based on recent credit spreads. Below is your assignment.

ASSIGNMENT 2: You are given Exhibit 1 for an unlevered CC that issues debt to retire equity and uses pre-TCJA tax rates, a growth rate of 3.12%, and an *ITS*. The top of Exhibit 1 provides values for the following variables: before-tax cash flows (CF_{BT}) normalized per $1,000,000; before-tax plowback ratio (PBR_{BT}); unlevered equity beta (β_U); risk-free rate (r_F); return on the market (r_M); unlevered equity tax rate (T_{E1}); beginning debt tax rate (T_{D1}): unlevered corporate tax rate (T_{C1}); change in tax rate with each increasing debt choice (ΔT); equity risk premium over a corporate bond portfolio (*EPB*); unlevered equity return (r_U); unlevered growth rate (g_U); growth adjusted unlevered equity rate (r_{Ug}); amount of CF_{BT} earmarked for retained earnings (*RE*) used for growth; amount of CF_{BT} earmarked for equity (*C*); and, unlevered equity value (E_U). E_U is the same as unlevered firm value (V_U) since debt (*D*) is zero. Complete the following two tasks.

Task 2.1: Equations to compute values for missing cell are in the first column of Exhibit 1. Debt choice numbers are used in the tax rate formulas. *P* refers to the proportion of unlevered equity (E_U) retired with a new debt issue. *CS* refers to credit spread given by Damodaran (2022). The interest coverage ratio (*ICR*) is also supplied by Damodaran who matches *ICRs* to credit ratings and credit spreads. Each debt choice refer to a dollar amount of debt (*D*) issued to retire E_U. The levered equity tax rate (T_{E2}) falls with debt. The debt tax rate (T_{D2}) rises with debt. The levered corporate tax rate (T_{C2}) falls with debt. Miller's alpha (α_1) and Hull's alpha (α_2) both increase with debt as long as there is at least one non-zero tax rate. The cost of debt (r_D), cost of levered equity (r_L), and interest (*I*) increase with debt.

Using a spreadsheet, fill in the missing cells in Exhibit 1.

Exhibit 1: C Corporation (CC) with *ITS*, Growth of 3.12%, and Pre-TCJA Tax Rates

CF_{BT} = \$1,000,000	PBR_{BT} = 0.3367	β_U = 0.79	r_F = 0.03	r_M = 0.775	T_{E1} = 0.11 (pre-TCJA) 0.11 (TCJA)
T_{D1} = 0.15 pre-TCJA (0.14 TCJA)		T_{C1} = 0.35 pre-TCJA (0.21 TCJA)			ΔT = +0.03 for T_D & -0.03 for T_E & T_C
EPB = 0.0345		$r_U = r_F + \beta_U(r_M - r_F)$ = 0.067525			$g_U = r_U(1\text{-}T_{C1})RE/C$ = 0.02227979
$r_{Ug} = r_U - g_U$ = 0.04524521		$RE = PBR_{BT}(CF_{BT})$ = \$336,700			$C = (1\text{-}PBR_{BT})(CF_{BT})$ = \$663,300
r_L is set to r_U when unlevered (D = 0)		$E_U = V_U = (1\text{-}T_{E1})(1-T_{C1})C/r_{Ug}$ = \$8,480,876.76			

Moody's Credit Rating	Aa2	A1	A2	A3	Baa2	Ba1
Debt Choice Number (n)	n = 2	n = 3	n = 4	n = 5	n = 6	n = 7
P (proportion of E_U retired by D)	0.17603069	0.21677828	0.26731073	0.33583220	0.39328999	0.41922494
CS (Damodaran, 2022)	0.0082	0.0103	0.0114	0.0129	0.0159	0.0193
ICR (Damodaran, 2022)	9.8890	7.6800	6.1119	4.7290	3.7987	3.3369
Debt Choice (D) = $P(E_U)$	\$1,492,895					\$3,555,395
$T_{E2} = (1\text{-}T_{E1})(1\text{-}\Delta T)^n$ (ΔT = -0.3)	0.10349900					0.08887811
$T_{D2} = (1+T_{D1})(1\text{-}\Delta T)^n$ (ΔT = 0.3)	0.15913500					0.18448108
$T_{C2} = (1\text{-}T_{C1})(1\text{-}\Delta T)^n$ (ΔT = -0.3)	0.32931500					0.28279400
$\alpha_1 = (1\text{-}T_{E2})(1\text{-}T_{C2})/(1\text{-}T_{D2})$	0.71506101					0.80128380
$\alpha_2 = (1\text{-}T_{E2})(1\text{-}T_{C2})/(1\text{-}T_{E1})(1\text{-}T_{C1})$	1.03936002					1.12958011
$r_D = r_F + CS$	0.0382					0.0493
$r_L = r_D + EPB$	0.0727					0.0838
$I = (1\text{-}T_{C2})CF_{BT}/ICR$	\$67,821.32					\$214,931.82

Task 2.2: Recompute the values in Exhibit 1 for *P*, *ICR*, *D*, and *I* by using the following equations: $P = D/E_U$); $ICR = (1\text{-}T_{C2})CF_{BT}/I$; $D = (1\text{-}T_{D2})I/r_D$) and, $I = r_D(D)/(1\text{-}T_{D2})$.

Part 3. Computing Corporate Finance Outcomes

After finishing its two tasks, CCS reports its numbers to FMC who will use them as a starting point to compute corporate finance outcomes. At your FMC meeting, you are given Exhibit 2 and Exhibit 3. Below is your assignment.

Exhibit 2: C Corporation (CC) with *ITS*, Growth of 3.12%, and Pre-TCJA Tax Rates

CF_{BT} = \$1,000,000	PBR_{BT} = 0.3459	β_U = 0.79	r_F = 0.03	r_M = 0.775	T_{E1} = 0.11 (pre-TCJA) 0.11 (TCJA)
T_{D1} = 0.14 TCJA (0.15 pre-TCJA)		T_{C1} = 0.21 TCJA (0.35 pre-TCJA)			ΔT = +0.03 for T_D & -0.03 for T_E & T_C
EPB = 0.0345		$r_U = r_F + \beta_U(r_M - r_F)$ = 0.067525			$g_U = r_U(1\text{-}T_{C1})RE/C$ = 0.02820968
$r_{Ug} = r_U - g_U$ = 0.03931532		$RE = PBR_{BT}(CF_{BT})$ = \$345,900			$C = (1\text{-}PBR_{BT})(CF_{BT})$ = \$654,100
r_L is set to r_U when unlevered (D = 0)		$E_U = V_U = (1\text{-}T_{E1})(1-T_{C1})C/r_{Ug}$ = \$11,697,671.80			

Moody's Credit Rating	Aa2	A1	A2	A3	Baa2	Ba1
Debt Choice Number (n = 0,…,15)	2	3	4	5	6	7
P from Damodaran	0.15461554	0.18911260	0.23170150	0.28933449	0.33690277	0.35718447
Credit spread: from Damodaran	0.0082	0.0103	0.0114	0.0129	0.0159	0.0193
ICR from Damodaran	9.8890	7.6800	6.1119	4.7290	3.7987	3.3369
Debt choice (D) = $P(E_U)$	\$1,808,642					\$4,178,227
$T_{E2} = (1\text{-}T_{E1})(1\text{-}\Delta T)^n$ (ΔT = -0.3)	0.10349900					0.08887811
$T_{D2} = (1+T_{D1})(1\text{-}\Delta T)^n$ (ΔT = 0.3)	0.14852600					0.17218234
$T_{C2} = (1\text{-}T_{C1})(1\text{-}\Delta T)^n$ (ΔT = -0.3)	0.19758900					0.16967640
$\alpha_1 = (1\text{-}T_{E2})(1\text{-}T_{C2})/(1\text{-}T_{D2})$	0.84484349					0.91388001
$\alpha_2 = (1\text{-}T_{E2})(1\text{-}T_{C2})/(1\text{-}T_{E1})(1\text{-}T_{C1})$	1.02312938					1.07598636
$r_D = r_F$ + credit spread (CS)	0.0382					0.0493
$r_L = r_D + EPB$	0.0727					0.0838
$I = (1\text{-}T_{C2})CF_{BT}/ICR$	\$81,141.77					\$248,830.83
$G = r_{Lg}G_L / (1-T_{E2})(1-T_{C2})$	\$25,192.80	\$29,190.91	\$39,392.76	\$50,674.11	\$53,895.41	\$51,632.46
$g_L = r_L(1-T_{C2})RE/[C+G-(1\text{-}T_{C2})I]$	0.03285364					0.04822086
$r_{Lg} = r_L - g_L$	0.03984636					0.03557914
$G_L = (1\text{-}\alpha_1 r_D/r_{Lg})D + (1\text{-}\alpha_2 r_{Ug}/r_{Lg})E_U$	\$454,814					\$1,097,870
$V_L = E_U + G_L$	\$12,152,486					\$12,795,541
$E_L = V_L$ - D	\$10,343,844					\$8,617,315
$CRE = T_{C2}(RE)$	\$68,346					\$58,691
%CRE per \$1of $CF_{BT} = CRE/CF_{BT}$	6.83%					5.87%
$\%\Delta E_U = G_L/E_U$	3.89%					9.39%
$NB = G_L/D$	25.15%					26.28%
$ODV = D/V_L$	0.1488					0.3265

ASSIGNMENT 3: Exhibit 2 is for an unlevered CC that issues debt to retire equity and uses TCJA tax rates, a growth rate of 3.90%, and an *ITS*. The use of 3.90% is consistent with the average of five sources from the Tax Policy Center (2018) that estimates TCJA will increase the historical growth rate of 3.12% by about 0.78%. Complete the following two tasks.

Task 3.1: The top portion and the 14 rows of Exhibit 2 are like Exhibit 1 (albeit values for variables can be altered by the change in growth and tax rates). The last 11 rows of Exhibit 2 contains 11 new variables and equations. Descriptions for the new variables are as follows: G is the perpetual cash flow created when perpetual debt (D) is issued; g_L is the levered growth rate; r_{Lg} is the growth-adjusted cost of levered equity (which is akin to the Dividend Valuation Model where the perpetual dividend is divided by the growth-adjusted cost of equity); G_L is the gain to leverage derived from the definition of $G_L = V_L - V_U$ where V_L is levered firm value and V_U is unlevered firm value equal to E_U; E_L is levered equity

value; *CRE* is the cost of using retained earnings for growth; %*CRE* is the cost of growth as a percentage of before-tax cash flows; $\%\Delta E_U$ is the percentage gain in E_U from issuing *D*; *NB* is the net benefit from debt computed as percentage increase in E_U for every dollar of *D* issued; *DV* is the debt-to-firm value ratio.

Using a spreadsheet, fill in the missing cells in Exhibit 2 and comment on the feasibility of the growth rate computed for the column headed by Moody's rating Baa2. Based on the results in Exhibit 2, what should MFC recommend in terms of AMZ's capital structure? In your recommendations, include how much debt AMZ should issue and what credit rating should be targeted as the optimal credit rating (*OCR*). Provide support for your recommendation by pointing the dollar gain and percentage gain from issuing debt to retire equity as well as any major risk involved with your recommendation.

Exhibit 3: C Corporation (CC) with *RTS*, Growth of 3.90%, and TCJA Tax Rates

CF_{BT} = \$1,000,000	PBR_{BT} = 0.2804	β_U = 0.79	r_F = 0.03	r_M = 0.775	T_{E1} = 0.11 (TCJA) 0.11 (pre-TCJA)	
T_{D1} = 0.14 TCJA (0.15 pre-TCJA)		T_{C1} = 0.21 TCJA (0.35 pre-TCJA)			ΔT = +0.03 for T_D & -0.03 for T_E & T_C	
EPB = 0.0345		$r_U = r_F + \beta_U(r_M - r_F)$ = 0.067525			$g_U = r_U RE / C$ = 0.02631185	
$r_{Ug} = r_U - g_U$ = 0.04121315		$RE = PBR_{BT}(CF_{BT})$ = \$280,400			$C = (1\text{-}PBR_{BT})(CF_{BT})$ = \$719,600	
r_L is set to r_U when unlevered (D = 0)		$E_U = V_U = (1\text{-}T_{E1})(1-T_{C1})C/r_{Ug}$ = \$12,276,439.92				

Moody's Credit Rating	Aa2	A1	A2	A3	Baa2	Ba1
Debt Choice Number (n = 0,…,15)	n = 2	n = 3	n = 4	n = 5	n = 6	n = 7
P from Damodaran	0.14732622	0.18019692	0.22077798	0.27569387	0.32101955	0.34034508
Credit spread: from Damodaran	0.0082	0.0103	0.0114	0.0129	0.0159	0.0193
ICR from Damodaran	9.8890	7.6800	6.1119	4.7290	3.7987	3.3369
Debt choice (D) = $P(E_U)$	\$1,808,641					\$4,178,226
$T_{E2} = (1\text{-}T_{E1})(1\text{-}\Delta T)^n$ (ΔT = -0.3)	0.10349900					0.08887811
$T_{D2} = (1+T_{D1})(1\text{-}\Delta T)^n$ (ΔT = 0.3)	0.14852600					0.17218234
$T_{C2} = (1\text{-}T_{C1})(1\text{-}\Delta T)^n$ (ΔT = -0.3)	0.19758900					0.16967640
$\alpha_1 = (1\text{-}T_{E2})/(1\text{-}T_{D2})$	1.05288124					1.10063113
$\alpha_2 = (1\text{-}T_{E2})(1\text{-}T_{C2})/(1\text{-}T_{E1})(1\text{-}T_{C1})$	1.02312938					1.07598636
$r_D = r_F$ + credit spread (*CS*)	0.0382					0.0493
$r_L = r_D + EPB$	0.0727					0.0838
$I = CF_{BT}/ICR$	\$101,122.46					\$299,679.34
$G = r_{Lg}G_L / (1-T_{E2})(1-T_{C2})$	\$23,003.36	\$25,919.28	\$35,949.83	\$48,220.23	\$53,721.92	-\$950,858.51
$g_L = r_L(RE)/[C+G-I]$	0.03177816					-0.04425663
$r_{Lg} = r_L - g_L$	0.04092184					0.12805663
$G_L = (1\text{-}\alpha_1 r_D/r_{Lg})D + (1\text{-}\alpha_2 r_{Ug}/r_{Lg})E_U$	\$404,377					-\$5,617,429
$V_L = E_U + G_L$	\$12,680,817					\$6,659,011
$E_L = V_L - D$	\$10,872,175					\$2,480,785
$CRE = T_{C2}(RE)$ (T_{C2} = 0 for *RTS*)	\$0	\$0	\$0	\$0	\$0	\$0
%*CRE* per \$1of $CF_{BT} = CRE/CF_{BT}$	0%	0%	0%	0%	0%	0%
$\%\Delta E_U = G_L/E_U$	3.29%					-45.76%
$NB = G_L/D$	22.36%					-134.45%
$ODV = D/V_L$	0.1426					0.6275

Task 3.2: Exhibit 3 is like Exhibit 2 except it is for an *RTS* instead of an *ITS*. Switching tax shields causes a change in how the following variables are computed. *First*, the equations for g_U, α_1, *I*, and g_L,

are modified because (1-T_{C2}) falls out since *I* is no longer deductible under an *RTS*. Because *RE* is no longer taxed, the values for two variables, *CRE* and %*CRE*, are now zero. In brief, a company (that uses internally generated funds for growth, e.g., *RE*) can grow tax free under an *RTS*. One outcome from having lower tax rates is that a credit rating of a higher quality occurs when the maximum firm value (*max* V_L) is achieved. The last column (headed by a Ba1 Moody's rating) in Exhibit 3 is in gray shade indicating all values in that column are unfeasible because there is not enough cash flows to support the *RE* and *I* needed for both growth and debt. As a result, financial distress sets in for this debt choice.

Using a spreadsheet, fill in the missing cells in Exhibit 3 and comment on the feasibility of the growth rate computed for the column headed by Moody's rating Baa2. What recommendations would you now make in terms of AMZ's capital structure including how much debt AMZ should issue and what credit rating should be targeted as *OCR*. While an *RTS* is not currently the law of the land, offer an argument on why an *RTS* should replace an *ITS*? Your argument should include numbers found from comparing the results in Exhibit 2 with those in Exhibit 3.

Part 4. Computing Tax Policy Outcomes

Having produced exhibits detailing results for corporate finance outcomes, MFC was able to recommend how much debt to issue in order to maximize AMZ's firm value under both an *ITS* and *RTS*. Given your understanding of the value of choosing the correct tax policy, you present your findings to the congressional task force that is commissioned to find the best tax shield to maximize firm value and federal tax revenue. At the end of your presentation, you offer the following three proposals. *First*, you recommend that the task force use MFC's exhibits as a beginning blue print to reach its ultimate goal of maximizing total wealth of business and government sectors. *Second*, you propose that the remaining task is to add variables and equations to compute outcomes for ownership taxation and federal tax revenue. *Third*, you point out that the same CC computations should also be done for PTs as CCs and PTs are the two business ownership forms that supply wealth for both domestic and government sectors. Your proposals are accepted and a select group of the congressional task force members are commissioned to study the proposals. Below is your assignment based on the feedback from the select group.

ASSIGNMENT 4: You are given Exhibit 4 to complete. After completing Exhibit 4 for an *RTS*, the congressional task force will produce the same exhibit for an *ITS*. The task force will then produce the same *RTS* and *ITS* exhibits for scenarios that include TCJA versus pre-TCJA tax rates, nongrowth versus growth situations (focusing on 3.12% and 3.90% growth rates), and CCs versus PTs. From these exhibits, Exhibit 5 will be created that summarizes the results from all exhibits. Complete the following two tasks.

Task 4.1: Exhibit 4 resembles Exhibit 3 but incorporates federal tax revenue and ownership taxation outcomes. Since we normalize taxable income streams for all tests, the computation of federal tax revenue results need an adjustment when firm valuation with growth is greater than nongrowth firm valuation. This is done by using what is called the firm size adjustment factor (*FSAF*) which is simply the change in maximum firm value ($max\ V_L$) when going from nongrowth to growth. In equation form, we have: $FSAF = \Delta max V_L / max V_{L(nongrowth)}$ where $\Delta max V_L = max V_{L(growth)} - max V_{L(nongrowth)}$. If $max V_{L(nongrowth)} > max V_{L(growth)}$, then *FSAF* is one and the firm would not choose growth since it lowers value, e.g., it is too costly as can occur in a pre-TCJA tax environment where tax rates are higher. The need for this adjustment is best seen for *ITS* tests. Without an adjustment, all nongrowth and growth tests with an *ITS* generate the same federal tax revenue. To illustrate the computation of *FSAF* using the scenario for Exhibit 3 and Exhibit 4 (which is TCJA tax rates, growth rate of 3.90%, and an *RTS*), we have $\Delta max V_L$ = \$13,208,714 – \$10,946,358 = \$2,262,356 so that *FSAF* = \$2,262,356/\$10,946,358 = 1.20667659. Thus, to compute tax revenue results in Exhibit 4, we set CF_{BT} to 1.20667659(\$1,000,000) = \$1,206,677. This simple adjustment causes all relevant variables that affect federal tax revenue results to be automatically adjusted for the growth in firm value. The relevant variables affected are unlevered firm value (E_U), retained earnings before taxes (*RE*), and equity payout (e.g., dividends) before-taxes (*EP*). As in prior exhibits, equations to compute values are given in Exhibit 4. Once again, the gray shade in the last column indicates the values are not feasible due to a shortage of cash flow from operating assets to support *RE* and *I*. The new main variables in Exhibit 4 are as follow. *EBT* is earnings before taxes. RE_{Corp} refers to taxable *RE*. Under an *RTS*, *RE* is not taxed and so it takes on a value of zero. *NI* is net income or earnings after the tax shield deduction and after the business level taxes. EP_{DIV} and EP_{CG} are the respective equity payouts in dividends and capital gains. Together these two variables equal *NI*. We subtract out *RE* from *NI* when computing EP_{DIV} because *RE* represents EP_{CG}. *SATI* is the sum of all corporate and personal taxable incomes. *ACTR* is all tax revenue collected at the corporate tax level. *APTR* is all tax revenue collected at the personal tax level. Total federal tax revenue (*TFTR*) is *ACTR* plus *APTR*. As seen in the last eleven row, we create weights for taxable incomes, so we can

compute the weighted effective tax rate (*WETR*) based on the weights that that use the three effective tax rates (T_E, T_D, and T_C).

Using a spreadsheet, fill in the missing cells in Exhibit 4. Identify the values for *TFTR* and *WETR* that are aligned the optimal outcomes and describe how they change as credit ratings change by using Excel to plot *TFTR* against Moody's credit ratings and *WETR* against Moody's credit ratings. Also, comment on the general importance of *TFTR* and *WETR*.

Exhibit 4: C Corporation (CC) with *RTS*, Growth of 3.90%, TCJA Tax Rates Using *FSAF* of 1.20667659

CF_{BT} = \$1,206,677	PBR_{BT} = 0.2804	β_U = 0.79	r_F = 0.03	r_M = 0.775	T_{E1} = 0.11 (TCJA) 0.11 (pre-TCJA)
T_{D1} = 0.14 TCJA (0.15 pre-TCJA)		T_{C1} = 0.21 TCJA (0.35 pre-TCJA)			ΔT = +0.03 for T_D & -0.03 for T_E & T_C
$r_U = r_F + \beta_U(r_M - r_F)$ = 0.067525		$g_U = r_U RE/C$ = 0.02631185			$r_{Ug} = r_U - g_U$ = 0.04121315
$C = (1\text{-}PBR_{BT})(CF_{BT})$ = \$868,324.47		$RE = PBR_{BT}(CF_{BT})$ = \$338,352.12			$E_U = (1\text{-}T_{E1})(1\text{-}T_{C1})C/r_{Ug}$ = \$14,813,692.65

Moody's Credit Rating	Aa2	A1	A2	**A3**	Baa2	Ba1
Debt Choice Number (n = 0,…,15)	2	3	4	**5**	6	7
P from Damodaran (2022)	0.14732622	0.18019692	0.22077798	**0.27569387**	0.32101955	0.34034508
Credit Spread from Damodaran	0.0082	0.0103	0.0114	**0.0129**	0.0159	0.0193
ICR from Damodaran (2022):	9.8890	7.6800	6.1119	**4.7290**	3.7987	3.3369
Debt choice (D) = $P(E_U)$	\$2,182,445					\$5,041,767
$T_{E2} = (1\text{-}T_{E1})(1\text{-}\Delta T)^n$ (ΔT = -0.3)	0.10349900					0.08887811
$T_{D2} = (1+T_{D1})(1\text{-}\Delta T)^n$ (ΔT = +0.3)	0.14852600					0.17218234
$T_{C2} = (1\text{-}T_{C1})(1\text{-}\Delta T)^n$ (ΔT = -0.3)	0.19758900					0.16967640
$r_D = r_F + CS$	0.0382					0.0493
$EBT = CF_{BT}$ - *RE* (taxable at T_C)	\$868,324					\$868,324
RE_{Corp} (only taxable at T_C under *ITS*)	\$0	\$0	\$0	\$0	\$0	\$0
$I = CF_{BT}/ICR$: (taxable at T_D & T_C)	\$122,022					\$361,616
$NI = (1\text{-}T_{C2})(EBT)$ - I (taxable at T_E)	\$574,731					\$359,374
EP_{DIV} = *NI* - *RE* (taxable at T_E)	\$236,379					\$21,022
EP_{CG} = *RE* (taxable at T_E)	\$338,352					\$338,352
$SATI = EBT + RE_{Corp} + I + EP_{DIV} + EP_{CG}$	\$1,565,078					\$1,589,315
$ITS = T_{C2}(I)$ = 0 (No *ITS* under *RTS*)	\$0	\$0	\$0	\$0	\$0	\$0
$RTS = T_{C2}(RE)$	\$66,855					\$57,410
All CC tax revenue (*ACTR*): $T_{C2}(EBT)$:	\$171,571					\$147,334
CC tax revenue from *I*: $T_{C2}(I)$	\$24,110					\$61,358
CC tax rev from *EP*: $T_{C2}(EBT - I)$	\$147,461					\$85,976
All personal tax revenue from *I*: $T_D(I)$	\$18,123					\$62,264
All pers tax rev *CG* & *DIV* = $T_{E2}(NI)$+*RE*	\$59,484					\$31,941
Pers tax rev from *CG*: $T_{E2}(RE)$	\$35,019					\$30,072
Pers tax rev from DIV: $T_{E2}(NI\text{-}RE)$	\$24,465					\$1,868
All pers tax rev (*APTR*) on *I* + *CG* + *DIV*	\$77,608					\$94,204
TFTR = *ACTR* + *APTR*	\$249,179					\$241,539
Weight for *EBT*: $W_{EBT} = EBT / SATI$	0.55481242					0.54635148
Weight for $RE_{Corp} = W_{RECorp} / SATI$	0					0
Weight for *I* on $W_I = I / SATI$	0.07796553					0.22752953
Weight for $EP_{DIV} = W_{EPDIV} / SATI$	0.15103334					0.01322717
Weight for $EP_{CG} = W_{EPCG} / SATI$	0.21618872					0.21289182
(Weight for T_C on *EBT*): $W_{EBT}(T_C)$	0.10962483					0.09270295
(Wt for T_C on RE_{Corp}): $W_{RECorp}(T_C)$	0					0
(Weight for T_D on *I*): $W_I(T_D)$	0.01157991					0.03917657
(Wt for T_E on EP_{DIV}): $W_{EPDIV}(T_E)$	0.01563180					0.00117561
(Wt for T_E on EP_{CG}): $W_{EPCG}(T_E)$	0.02237532					0.01892142
WETR = Wted effective tax rate	0.15921185					0.15197655

Task 4.2: As planned, Exhibit 5 has been created to summarize the results from all exhibits (with dollar values in millions). Each cell is this exhibit is an average of five tests. As indicated by the column heading, these fives tests are for one ownership form under a specified tax policy. These five tests are: two nongrowth tests using TCJA and pre-TCJA values; two 3.12% growth tests using TCJA and pre-TJCA taxes; and, one 3.90% growth test using TCJA taxes. Pre-TCJA taxes are too high to achieve a 3.90% growth and so this test is not performed. The last two columns are weighted averages of the CC and PT columns for each of the two tax shield policies where we use the weights of 0.154104 for CCs and 0.845896 for PTs where PTs now proxy for all personal income taxpayers besides PT owners. These weights are largely based on federal tax revenue data supplied by Joint Committee on Taxation (2022). PTs and CCs are the major (if not the total) source of federal tax revenue. Not only do they create taxable income for their owners but they distribute earnings that pay salaries and payroll taxes for government, nonprofit, and for-profit workers. $TFTR_{maxV_L}$ refers to the total federal tax revenue value that occurs with *max* V_L. TW_{maxV_L} is *max* V_L plus $TFTR_{maxV_L}$.

In regard to the ownership gap, the task force reports that prior to TCJA, *WETR* under an *ITS* for CCs and PTs was 0.20515 and 0.17032, respectively. With TCJA, *WETR* under an *ITS* for CCs and PTs became 0.14379 and 0.15913, respectively. With a change in tax policy where we do away with the *ITS* and install an *RTS*, we find a *WETR* under an *RTS* for CCs and PTs of 0.15261 and 0.15931, respectively. As the person with the most experience in tax policy, the congressional task force authorizes you to write a summary report on Exhibit 5. In your report, you should do the following.

Overview each of the nine outcomes in Exhibit 5 while also providing a decisive conclusion as to the meaning of its values.

Exhibit 5: Summary Exhibit

	CC (*ITS*)	CC (*RTS*)	PT (*ITS*)	PT (*RTS*)	WT (*ITS*)	WT (*RTS*)
ODV	0.3078	0.2849	0.2711	0.2648	0.2768	0.2679
max V_L	$11.051	$11.201	$10.205	$10.502	$10.335	$10.609
max G_L	$1.016	$0.731	$1.006	$0.594	$1.007	$0.615
max $\%\Delta E_U$	10.47%	7.06%	10.94%	5.93%	10.87%	6.11%
PBR_{BT}	0.1965	0.1524	0.2271	0.1515	0.2224	0.1516
%CRE	22.48%	0.00%	32.67%	0.00%	31.10%	0.00%
$TFTR_{maxV_L}$	$0.282	$0.292	$0.306	$0.338	$0.303	$0.331
TW_{maxV_L}	$11.334	$11.493	$10.511	$10.839	$10.638	$10.940
WETR	0.1683	0.1817	0.1636	0.1637	0.1643	0.1665

NOTE: WT refers to weighted average based on weights of federal tax revenue for CCs and all personal income taxpayers including PT owners. Dollar values are in millions.

Supply arguments as to whether an *ITS* or *RTS* is the most efficient tax policy by explaining which policy is best for total wealth (*TW*) maximization, lowering financial distress, and achieving equality in the taxation of different ownership forms.

Provide insight on which tax shield helps solve the federal debt problem and how long it might take (in years) to give zero debt. You are given the following numbers to use as needed: federal debt is $32 trillion; total federal revenue per year is $4.7 trillion; a deficit free annual federal tax revenue is $0.323 million per $1,000,000 in before-tax cash flows; current maximum firm value of $10.7 million is needed to maintain a zero deficit. Since an *RTS* policy gives greatest weighted firm value (as seen in the *max* V_L row), up to 40% of the surplus can be shared with the government sector. In addition, an *RTS* policy also generates the current maximum weighted federal tax revenue (as seen in the $TFTR_{maxV_L}$ row).

CONCLUSION

Instructors should be able to adapt this paper's pedagogical exercise to the needs of their students by choosing among the questions supplied and instructing students on materials needed to answer those questions. For lower level classes with undergraduate students who have fewer finance skills, the task would be to focus more on Part 1 and Part 2 and selected questions from other parts such as Part 3 where students can apply perpetuity equations. For graduate classes, instructors can select more difficult questions such as those found in Parts 3 and 4 that contain more details and equations.

To enhance student interaction and group learning, teachers can conduct this paper's teaching application by assigning students to groups. A group activity enables students sharing of their expertises with ongoing dialog aiding communication skills. Instructors might also want to gather the most recent data on ratings, spreads, and *ICRs* from Damodaran at https://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/ratings.html. Each January, Damodaran updates his data for the prior year.

In conclusion, this paper offers educators a pedagogical application to instruct students on the interconnected of business growth and tax policy. By experiencing this paper's instructional exercise, students will have their behavioral patterns changed so they can be more equipped to

understand the relation between business growth and tax policy and how the choice of tax shield affects areas of business growth, bankruptcy, and ownership taxation.

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