# GOVERNMENT INCENTIVES AND DEFINED BENEFIT PENSION INVESTMENT

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Abstract: This study investigates the association between government incentives and defined benefit pension funding. The government provides tax incentives to defined benefit plans to buoy pension funding. In addition, sponsors of these plans must pay insurance premiums to the Pension Benefit Guarantee Corporation (PBGC). This agency charges underfunded plans higher premiums, designed to encourage pension funding. While tax benefits provide positive reinforcement for pension contributions, PBGC premiums serve as negative reinforcement for firms that fail to fund their defined benefit plans. Since millions of beneficiaries and retirees rely on pension income, it is important to understand whether government incentives effectively motivate pension funding. I find tax benefits and PBGC premiums to be significantly positively associated with defined benefit pension contributions. This implies that firms contribute to their plans in order to achieve tax savings and that risk adjusted premiums effectively incentivize defined benefit investment. Finally, I find that plan sponsors make higher excess pension contributions following the election of President Trump. This suggests that firms boost pension contributions in anticipation of a decrease in corporate tax rates.

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# CHAPTER I

## INTRODUCTION

In March 2017 Delta Airlines Inc. issued $2 billion in unsecured notes in order to fund excess defined benefit pension plan contributions.[1] Delta had just disclosed in its 2016 10-K, filed in February 2017, that it planned to contribute a *total* of $700 million in excess contributions. The decision to issue the unsecured notes allowed Delta to nearly quadruple its excess pension contributions, from a planned $700 million to $2.7 billion. Delta did not provide explicit reasoning behind its decision to drastically increase discretionary contributions. What spurred the company to so dramatically boost its excess pension contributions in 2017? This paper examines how government incentives and changes to these incentives drive excess pension contribution decisions.

Although fewer companies offer defined benefit retirement plans to new employees than in the past, these plans still play a significant role in many companies' financial statements. For example, any firm with an underfunded defined benefit plan shows a liability on its balance sheet for the amount of underfunding. A firm sponsoring an overfunded plan shows an asset on its balance sheet for the amount of overfunding.

[1] Section 430 of the Internal Revenue Code outlines the amount of mandatory pension contributions that firms are required to make. Any voluntary contribution made in excess of this required amount is a discretionary or excess contribution.

In addition to the effect that defined benefit plans have on firms' financial statements, millions of people rely on defined benefit pension payouts as a significant source of income during retirement. The government provides certain incentives, such as tax deductions, for firms to fund their defined benefit plans, and it is important to understand how these incentives and changes to these incentives motivate firms' pension funding decisions.

In this paper, I examine how government incentives drive firm investment decisions. Specifically, I examine five research questions. First, are the tax benefits afforded to defined benefit plans associated with excess pension contributions? Second, I examine whether the association between these tax benefits and excess pension contributions is stronger for firms that are more tax savvy.[2] Additionally, I examine whether increased insurance premiums charged to firms with underfunded plans are associated with higher excess pension contributions, and I also examine whether this effect is independent of firms' tax benefits. Finally, I examine whether anticipation of U.S. tax reform is associated with higher excess contributions to defined benefit plans.

This topic is of interest not only to researchers, but also to regulators, investors, plan participants, and beneficiaries of defined benefit pension plans. The U.S. government provides certain tax advantages to defined benefit plans to encourage firms to offer these retirement plans and to fund existing plans.[3] The extent to which these tax incentives actually drive pension funding determines the effectiveness of such incentives. In addition, U.S. tax reform may have unintended consequences and may actually disincentivize future excess pension contributions because the decrease in the U.S. corporate tax rate under the Tax Cuts and Jobs Act (TCJA) of 2017 reduces the tax savings associated

[2] Prior theory work shows that firms should utilize the marginal tax rate when making incremental investment decisions. The marginal tax rate is the present value of the taxes paid on an additional dollar earned by the corporation (Scholes et al. 2014). Firms should use the marginal tax rate to calculate the tax benefits associated with pension investment. Instead, Graham, Hanlon, Shevlin, and Shroff (2017) find that tax executives at many firms utilize the effective or average tax rate to make incremental investment decisions. These firms do not appear to be tax savvy and Graham et al. (2017) find that they are not as responsive to investment opportunities as firms that utilize the theoretically correct marginal tax rate.

[3] Pension contributions are tax deductible, and the government does not tax pension investment growth.

with excess pension contributions. It is also important to examine the association between non-tax factors, such as insurance premiums, and pension contributions and to study how the interaction between tax and non-tax factors influences firm behavior. This paper helps regulators understand the effectiveness of existing incentives for pension funding.

Investors care about firm investment decisions because they desire to maximize their wealth. When firms decide to invest additional dollars in defined benefit plans, they may be sacrificing certain growth opportunities. Alternatively, discretionary pension contributions may provide a signal to investors about a lack of such opportunities. If firms lack growth opportunities, defined benefit contributions may be the best use of firm resources. Finally, employees who are plan participants, unions representing these employees, and plan beneficiaries care about the effectiveness of governmental incentives related to defined benefit pension plans, and these groups may lobby for more effective incentives so that plans are fully funded in the future.[4]

In order to empirically test my research questions, I regress excess pension contributions made by plan sponsors on government funding incentives and relevant control variables. The sample period for my main tests includes the years 2009 to 2016. I begin my sample in 2009 because the data for my dependent variable is available from the Department of Labor (DOL) beginning in 2009. Following Thomas (1988), I exclude defense contractors and public utilities from my sample since firms operating in these industries systematically overfund their defined benefit plans.[5] While prior literature often uses the pension funding ratio to examine the funding of defined benefit plans, I use excess pension contributions as my dependent variable. For my first research question, I proxy for the tax benefits associated with a defined benefit pension plan by using a firm's simulated marginal tax

[4] For the remainder of this paper, when I reference fully funded plans, I am referring to defined benefit pension plans that are either fully funded or overfunded according to the GAAP definition of funding. See footnote 2 for the GAAP definition of funding.
[5] Under cost-plus or reimbursable contracts, firms are reimbursed for their expenses. Defense contractors and public utilities typically operate under cost-plus or reimbursable contracts. These contracts incentivize firms to overfund their defined benefit plans, regardless of the pension funding incentives in place.

rate (Graham 1996 and Blouin et al. 2010). To test my second research question, I create a variable to capture firms that are tax savvy. These firms are able to sustain low average tax rates and a low variance in effective tax rates over a five-year period. I regress excess pension contributions on the interaction between a firm's marginal tax rate and an indicator variable for tax savvy firms. To test my third and fourth research questions, I calculate plan-year variable rate premiums using data from Form 5500 filings made publicly available by the DOL. Finally, I utilize a natural experiment, the expectation of a tax rate decrease following the election of President Trump, in an attempt to provide even stronger evidence than evidence provided in prior literature or the evidence provided in my first test regarding the association between pension funding and the tax benefits associated with defined benefit plans.

The market did not expect Donald J. Trump to win the U.S. presidential election, making his victory an exogenous shock. Polls leading up to the 2016 presidential election "consistently projected Hillary Clinton as defeating Donald Trump" (Mercer, Deane, and McGeeney 2016). The Wall Street Journal referred to Trump's win as a "stunning presidential victory that shook the political establishment to its core and sent shock waves through global markets" (Driebusch, Kantchev, and Krouse 2016). The U.S. futures market fell nearly 900 points overnight following Trump's victory before recovering and then soaring (Driebusch et al. 2016). Since his election came as a surprise, President Trump's tax policies had not been priced into the market. Therefore, President Trump's election provides a strong setting in which to study the impact of declining corporate tax rates on pension funding levels. I examine the change in firms' excess pension contributions after the election of President Trump. Following the election, firms anticipated that tax reform would reduce the tax benefits associated with making pension contributions. This setting allows me to examine an exogenous decrease in the tax benefits afforded to defined benefit plans and their association with pension contributions.

I document five main results. First, I find that a firm's tax benefits are significantly positively associated with excess pension contributions to its defined benefit plan(s). This suggests that firms invest in their defined benefit plans in excess of mandatory contribution amounts in order to receive additional tax savings. Second, I find that the association between a firm's tax benefits and its excess pension contributions is no stronger for tax savvy firms. This result implies that firms that successfully sustain low cash effective tax rates are no more likely to utilize excess pension contributions to obtain additional cash tax savings than less tax savvy firms. Next, I find the variable rate insurance premiums charged to sponsors of defined benefit pension plans to be significantly positively associated with excess pension contributions. This suggests that firms contribute more to their defined benefit plans in order to lower future risk adjusted premium charges. I find that the positive association between variable rate premiums and excess pension contributions is significantly stronger for plan-years with the highest and lowest tax benefits associated with defined benefit plans. This suggests that variable rate premiums effectively incentivize excess pension contributions for both high and low tax benefit sponsors. Finally, I find that firms made higher excess pension contributions following the election of President Trump. Since Trump's election was an exogenous shock to the market that increased the probability of corporate tax reform, my results imply that plan sponsors reacted to this shock by making higher contributions to their defined benefits in order to receive higher tax benefits before these tax benefits associated with pension contributions decreased under tax reform.

I make several contributions to the literature. First, I contribute to the literature on whether taxes matter. This stream of literature begins with the seminal paper by Modigliani and Miller (1958). These authors find that in a frictionless world, the source of a firm's financing is irrelevant. However, in the presence of taxes and other market frictions, a firm must consider its financing source. I provide evidence that tax benefits influence pension funding levels. Firms value the tax savings afforded to them by defined benefit plans, and I am able to provide strong evidence on the association between tax benefits and pension investments by utilizing a natural experiment. This contribution is significant because a recent paper by Ljunqgvist, Zhang, and Zuo (2017) acknowledges that prior empirical work finds very little evidence of the impact of taxes on firms' investment levels.

Next I contribute to the literature on pension investment. Prior theoretical and empirical literature examines which factors motivate pension investment (Sharpe 1976; Treynor 1977; Black 1980; Tepper 1981; Bodie, Light, Morck, and Taggart 1987; Francis and Reiter 1987; Thomas 1988; Asthana 1999; Campbell, Dhaliwal, and Schwartz 2010). Most empirical studies aggregate plans by plan sponsor and examine firm-year data. I utilize publicly available plan level data from the DOL and examine my research questions using plan-year data, controlling for plan sponsor characteristics. In addition, most prior studies utilize the funded status of a pension plan as a proxy for pension funding levels. This is a noisy measure of funding since market performance and management manipulation influence a firm's funded status (Bergstresser, Desai, and Rauh 2006). My measure of pension funding is less noisy because I examine excess pension contributions for each plan-year utilizing Form 5500 data. To my knowledge, I am also the first to examine the association between the variable rate premiums charged to plan sponsors and pension contributions.

The rest of my paper proceeds as follows. The second section provides institutional details and a review of the related literature. The third section provides my hypothesis development. The fourth section describes my sample selection process and research design. The fifth section discusses my results, and the final section concludes.

# CHAPTER II

# INSTITUTIONAL DETAILS AND PRIOR LITERATURE

## Institutional Details

Defined benefit pensions are a type of retirement plan offered by firms. Corporations sponsor defined benefit plans and pledge retirement benefits to their employees. These benefits are typically based upon the employee's age, tenure with the company, and earnings history. Sponsors of defined benefit plans (corporations) bear the investment risk of contributing financial assets to the retirement plan and hire a third party to invest and manage these dedicated pension assets. Section 430 of the Internal Revenue Code specifies the minimum amount of annual pension contributions that firms are required to make.[6] However, the government also institutes specific incentives to encourage excess pension contributions.

Tax incentives encourage pension contributions because contributions made to defined benefit plans are tax deductible, and pension investment growth remains untaxed.[7] Prior to the

[6] The Pension Protection Act of 2006 added Internal Revenue Code section 430. Previously, Code Section 412 provided the guidelines for minimum pension funding requirements. Section 303 of Employee Retirement Income Security Act parallels Internal Revenue Code section 430 and also specifies the rules for minimum funding. Plan sponsors that fail to contribute the minimum required contributions to their defined benefit plans must pay an excise tax.

[7] The Pension Protection Act of 2006 increased the tax benefits related to defined benefit retirement plans. Under this law, sponsors may deduct pension contributions that contribute to the overfunding of their plans rather than receiving deductions only up to the point where their plans are fully funded.

TCJA of 2017, the corporate tax rate was 35 percent, meaning every $1 million in pension contributions resulted in $350,000 of tax savings. However, the TCJA effectively lowers the corporate tax rate to 21 percent, meaning a $1 million pension contribution now results in only $210,000 in tax savings. While tax benefits provide positive reinforcement for pension contributions, risk adjusted insurance premiums charged to plan sponsors serve as negative reinforcement for firms that fail to fund their defined benefit plans.

In 1974, Congress passed the Employee Retirement Income Security Act (ERISA) in order to protect defined benefit plan participants and their beneficiaries. ERISA established the Pension Benefit Guarantee Corporation (PBGC). The PBGC provides insurance for defined benefit pension plans. Plan sponsors must pay premiums to the PBGC, and in return, the PBGC pays out pension benefits (subject to limitations) to participants or beneficiaries of failed defined benefit plans.[8] The PBGC charges two different types of premiums to plan sponsors. First, they charge a per participant flat rate premium to all sponsors of single-employer plans. In addition, the PBGC charges sponsors with unfunded vested benefits (UVBs) a variable rate premium, which is subject to a per participant cap. The variable rate premium has been nine dollars per $1,000 of UVB since 1991, but the PBGC began to increase the variable rate premium in 2014. The 2017 variable rate premium was $34 per $1,000 of UVB, subject to a $517 per participant cap.[9] This PBGC variable rate premium serves as a risk adjusted premium, which negatively reinforces the underfunding of pension benefits.

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[8] During bankruptcy proceedings for United Airlines in 2005, the PBGC agreed to pay out $6.6 billion of United Airline's total $9.8 billion in pension liabilities. The amount that the PBGC pays out when a pension plan terminates depends on the retiree ages and the amount of pension investment the plan had when it terminated.

[9] The variable rate premium will not be as strong of an incentive for plan sponsors that are subject to the per-participant cap because their variable rate premiums are limited. The per-participant cap in place biases against finding a significantly positive association between variable rate premiums and excess pension contributions.

**Prior Literature**

Prior literature proposes several theories to explain firms' pension investment decisions. One stream of literature demonstrates that the contract between defined benefit plan sponsors and the PBGC results in the creation of a put option (Sharpe 1976; Treynor 1977). This option becomes exercisable when the plan sponsor files for bankruptcy and the PBGC takes over the sponsor's pension assets and payment of benefits. To maximize the value of this put option firms engage in risk shifting (moral hazard), minimizing defined benefit contributions and maximizing the risk of pension assets. The PBGC's heavy historic reliance on a flat rate premium, which fails to adjust for pension underfunding exacerbates this moral hazard problem (Niehaus 1990). However, a constraint to risk shifting exists. Pension plan sponsors that have engaged in risk shifting and *avoid* bankruptcy must continue to make required minimum annual pension contributions using the corporation's resources. These required pension contributions limit firms' opportunities to make capital expenditures, pay dividends, or invest in positive net present value projects.

Bodie et al. (1987) find that firms facing higher risk are less likely to fully fund their pension plans. Hsieh, Chen, and Ferris (1994) examine 176 firms in 1989 and find that sponsors with underfunded plans are severely undercharged by the PBGC while sponsors with overfunded plans pay fair premiums. Firms being undercharged by the PBGC have incentives to engage in risk shifting. More recently, Guan and Lui (2016) document that financially distressed US sponsors with severely underfunded defined benefit plans do engage in risk shifting. They also find that risk-adjusted premiums implemented by the UK helped to curb this risk shifting behavior. While these results provide some support for risk shifting, the overall evidence is mixed.

Francis and Reiter (1987) regress a firm's pension funding ratio on a measure of firm risk. They predict the association between firm risk and a firm's funding status to be negative, consistent with the pension put theory and risk shifting behavior by firms. However, they actually find that firms with more risk have more fully funded pension plans, which is inconsistent with risk shifting. Rauh (2009) finds that firms facing potential bankruptcy engage in risk *management* rather than risk shifting, investing in safer pension assets in order to avoid future financial constraints. An, Huang, and Zhang (2013) also find that sponsors invest in safer pension assets when their plans are underfunded and when they face bankruptcy risk. However, they find that defined benefit sponsors who ultimately freeze their plans, terminate their plans, or convert their plans to defined contribution plans engage in risk shifting behavior. Anantharaman and Lee (2013) reconcile the mixed evidence on risk shifting and risk management by examining how compensation structures impact pension investment. They find that risk shifting is stronger when management compensation structures include incentives for risk taking.[10]

Another stream of literature focuses on how tax incentives motivate pension investment. Theory work in this area predicts that firms will fully fund their defined benefit plans and invest pension assets entirely in debt in order to take advantage of the tax benefits associated with these plans (Black 1980; Tepper 1981). Frank (2002) tests the asset allocation portion of the tax benefit hypothesis and finds that firms with higher marginal tax rates invest more heavily in bonds, providing evidence that explicit taxes impact decision making for defined benefit plans. Early work examining how firms fund their defined benefit plans provides weak evidence that tax incentives are associated with funding decisions. Bodie et al. (1987) provide evidence that pension decisions are integrated with a firm's overall corporate financial policy.[11] When they

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[10] Stock options provide an example of compensation that incentivizes risk taking. Stock options are more valuable when stock volatility increases because there is a higher chance of reaching the option price. Therefore, management is more likely to take more risks in order to increase stock volatility.

[11] Bodie et al. (1987) examine two primary theories on pension funding. The traditional perspective states that pension funds are completely separate from the corporation and its shareholders and that these funds

partition their already limited sample, they find evidence that firms with lower tax liabilities have significantly lower pension funding ratios.

Francis and Reiter (1987) test several theories of pension funding, including the tax benefit hypothesis. Using a tax benefit indicator variable equal to one if a firm has a tax loss carryforward and zero otherwise, they find that a firm's pension funding ratio is positively associated with a firm's tax benefit. Thomas (1988) modifies the tax benefit hypothesis proposed by Black (1980) and Tepper (1981) and allows tax rates to vary across firms and over time. He acknowledges that the tax variables used in prior empirical papers measure tax status with error. Thomas (1988) attempts to capture a firm's marginal tax rate by first classifying firms as high tax firms if they report positive federal tax payments. Firms that report federal tax losses are considered low tax firms and are further categorized based on whether they plan to carryforward or carry back these tax losses.[12] Firms that carryforward tax losses are expected to receive the lowest tax benefits from defined benefit contributions. Thomas (1988) provides stronger evidence that tax status is an important determinant of pension funding using these more sophisticated measures of a firm's tax status. However, Thomas (1988) states that his results on the relation between tax status and pension funding are exploratory. A contemporaneous working paper by Gaertner, Lynch, and Vernon (2018) extends Thomas (1998) by examining the impact of the TCJA on defined benefit pension contributions. Their paper aggregates plans by plan sponsor and examines firm-year data. My paper uses more detailed plan-year data, examining contributions that plan sponsors make to each defined benefit plan individually. In addition, their paper focuses mainly on the impact of the TCJA, while my paper focuses on both tax incentives and insurance premium incentives. While I also examine the impact of the TCJA on defined benefit pension

are managed without regard to a firm's corporate financial policy or the interests of shareholders. The corporate financial perspective holds the opposite view. This theory states that pension funding decisions are an important aspect of a firm's overall corporate financial policy and that firms do consider the interests of shareholders in making pension funding decisions.

[12] For tax years beginning after December 31, 2017. the TCJA no longer allows firms to carry back tax losses, but carry backs were allowed during my sample period.

contributions, this is an additional test used in my paper to provide stronger evidence on the association between tax benefits and pension contributions rather than the main focus of my paper.

Since the Thomas (1988) paper, several papers have examined how to simulate a firm's marginal tax rate. Theoretically, a firm should use its marginal tax rate to make pension funding decisions. Scholes et al. 2014 define marginal tax rate as the "present value of current and expected future taxes paid on an additional dollar of income earned today." Shevlin (1990) develops a way to simulate a firm's marginal tax rate by assuming that a firm's taxable income follows a random walk. This allows him to estimate taxable income 18 years into the future in order to incorporate the impact of tax loss carryforwards on a firm's marginal tax rate. Graham (1996a) extends this simulated marginal tax rate by incorporating the effect of investment tax credits (ITCs) and the alternative minimum tax (AMT). Graham (1996b) shows that the simulated tax rate is the best proxy for marginal tax rate, although he admits that proxies such as the one utilized by Thomas (1988) are easier to estimate and do a reasonable job. Blouin et al. (2010) improves upon Graham's simulated marginal tax rate by using a non-parametric approach to estimate a firm's future taxable income. This provides better estimates of future taxable income for simulating marginal tax rates since income is mean-reverting and does not follow a random walk (Brooks and Buckmaster 1976; Brown 1993).

Campbell, Dhaliwal, and Schwartz (2010) examine the market reaction to the Pension Protection Act (PPA) of 2006, which accelerated funding requirements and increased the tax deduction available for defined benefit plans. Using Graham's simulated marginal tax rate, the authors find that firms with higher marginal tax rates achieved higher cumulative abnormal returns following the PPA 2006. The positive market reaction indicates the increased level of pension contributions qualifying for tax deductibility most benefits firms with the highest marginal tax rates.

Even though marginal tax rates are the theoretically correct rate for firms to utilize when making capital structure choices or investment decisions, a survey paper finds that many tax executives fail to use the marginal tax rate for such decisions (Graham et al. 2017). Many tax executives instead utilize the statutory tax rate or the Generally Accepted Accounting Principles effective tax rate (GAAP ETR) to make investment decisions. If these rates are close to a firm's marginal tax rate, they may be acceptable for decision making. However, Graham et al. (2017) provides empirical evidence that firms utilizing the GAAP ETR for decision making have lower investment sensitivity for firm-years when the GAAP ETR differs from the firm's marginal tax rate.

# CHAPTER III

## HYPOTHESIS DEVELOPMENT

Black (1980) and Tepper (1981) predict that firms will maximize contributions to their pension plans and invest pension assets entirely in debt in order to take advantage of the tax benefits associated with defined benefit plans. The tax benefits associated with such plans are twofold. Pension contributions made by firm sponsors are tax deductible, and sponsors do not pay taxes on any gains achieved by pension assets. If sponsors borrow money in order to fund pension contributions, they receive an additional tax deduction on the interest associated with those borrowings. Frank (2002) tests the asset allocation portion of these theories and finds that firms with higher marginal tax rates invest more heavily in bonds. Thomas (1988) modifies the tax benefit hypothesis proposed by Black (1980) and Tepper (1981) by allowing tax rates to vary across firms and over time, and he provides evidence that as a firm's tax status declines, the firm's pension contributions decline. I test the tax benefit hypothesis theory using a more sophisticated measure of marginal tax rate. Shevlin (1990) develops a simulated marginal tax rate by assuming that a firm's taxable income follows a random walk. This allows him to estimate taxable income 18 years into the future in order to incorporate the effect of tax loss carryforwards on marginal tax rate. Graham (1996a) improves upon this simulated marginal tax rate by incorporating the effects of investment tax credits and alternative minimum tax on a firm's marginal tax rate. Blouin et al. (2010) improves the simulated marginal tax rate further by using a non-parametric procedure to forecast taxable income since prior literature shows that income fails to follow a random walk (Brooks and Buckmaster 1976; Brown 1993).[13] I use both the Graham (1996a) and Blouin et al. (2010) or BCG measures to estimate marginal tax rates for H1, and I predict that a firm's marginal tax rate will be significantly positively associated with its excess pension contributions.[14]

*H1: Excess pension contributions are positively associated with the tax benefits derived from making these contributions.*

According to theory in finance, firms use their marginal tax rates to make incremental financing and investing choices (Graham 1996a). Graham et al. (2017) survey tax executives and find that many of these executives fail to utilize marginal tax rates to make incremental investment and compensation decisions. Instead, nearly a third of these firms use effective (average) tax rates to make such decisions. Firms with high marginal tax rates may not utilize the benefits available to them via pension contributions if the tax executives of these firms are utilizing an average tax rate to make pension contribution decisions. Graham et al. (2017) finds that the association between investment opportunities and capital expenditures is weaker for firms claiming to use effective tax rates to make investment decisions when the absolute value of the difference between a firm's marginal tax rate and effective tax rate is larger. This provides evidence that firms that are more tax savvy make different investment decisions than less tax savvy firms. Since I do not have the proprietary survey data that reveals which firms claim to use effective tax rates for decision-making, I instead create a proxy for tax savvy firms. I use this proxy to test whether firms that are more tax savvy make different pension investment decisions than less tax savvy firms. Lisowsky, Robinson, and Schmidt (2012) provide a tax avoidance continuum that shows which commonly used proxies for tax avoidance are more likely to capture

[13] My primary measure of MTR is the Graham (1996a) measure because the Blouin et al (2010) or BCG measure is only available through 2016.
[14] Section 430 of the Internal Revenue Code outlines the amount of mandatory pension contributions that firms are required to make. Any voluntary contribution made in excess of this required amount is a discretionary or excess contribution.

tax planning activities and which proxies are more likely to capture tax aggressive behavior. Both the GAAP ETR and the Cash ETR fall on the less aggressive side of the continuum. Tax savvy firms are firms that wisely engage in tax planning in order to consistently reduce their cash tax payments. My proxy for tax savvy firms should not capture firms with aggressive tax behavior. My tax savvy observations are for plan-years in the lowest quintile of average cash ETR *and* the lowest quintile for standard deviation of cash ETR over a five-year period. I predict that the association between a firm's marginal tax rate and its excess pension contributions will be stronger for tax savvy firms.

*H2: The association between excess pension contributions and the tax benefits derived from these contributions is significantly higher for tax savvy firms.*

All sponsors of defined benefit pension plans pay the PBGC a flat rate premium, which is a fixed amount charged by the PBGC for each participant covered by the defined benefit plan. In addition, firms with unfunded vested benefits (UVBs) must pay an additional variable rate premium to the PBGC.[15] These variable rate premiums are designed to incentivize plan sponsors to increase contributions and fully fund (or overfund) their vested benefits.

While the tax benefits of defined benefit plans serve to positively reinforce plan contributions, these variable rate premiums charged by the PBGC serve as negative reinforcement. Prior literature examines how the existence of PBGC and its premium structure impacts pension contributions (Niehaus 1990). Theory work predicts that the contract between plan sponsors and the PBGC creates a put option (Sharpe 1976; Treynor 1977). This option is exercisable when the plan sponsor files for bankruptcy and the PBGC takes control of the

[15] The PBGC defines unfunded vested benefits as "the excess, if any, of the premium funding target over the fair market value of the plan assets." See https://www.pbgc.gov/prac/prem/help/instructions/2012/HowToDetermineUVB.htm). Firms calculate their funding target based on ERISA 303, which stipulates minimum funding requirements for defined benefit plans. The premium funding target refers to *vested* benefits under the plan rather than all benefits. For financial reporting purposes, a plan is underfunded when the projected benefit obligation (PBO) exceeds the fair market value of plan assets (FVPA). The PBO considers all pension benefits that will be owed to plan participants, rather than just vested benefits.

sponsor's pension assets and assumes responsibility for benefit payments (Sharpe 1976; Treynor 1977). To maximize the value of the put option, firms minimize contributions to their plans and maximize the risk of pension asset allocation, which creates a moral hazard problem. The PBGC has historically relied on a flat rate premium structure. The insurance agency introduced variable rate premiums in 1988, but these variable rate premiums have been relatively low until the PBGC began increasing them in 2014. The PBGC's variable rate premium was $9 per $1,000 of UVBs from 1991 through 2013. In 2014, the variable rate premium increased 56% to $14 per $1,000 of UVBs. Each year from 2014 to 2017, the PBGC hiked its variable rate premium even more. In 2018, the PBGC will charge a variable rate premium of $38 per $1,000 of UVBs, a 171% increase over the PBGC's 2014 variable rate premium. Historic heavy reliance by the PBGC on a flat rate premium, which fails to adjust for pension underfunding, exacerbates the moral hazard problem created by the pension put option (Niehaus 1990). Using a sample of firms from 2003-2011, Guan and Lui (2016) document that financially distressed US sponsors with severely underfunded defined benefit plans engage in risk shifting, meaning these firms invest plan assets in riskier equity securities. However, they also find that risk-adjusted premiums implemented by the UK helped to curb risk shifting behavior. Their results suggest that risk-adjusted (variable rate) premiums implemented by the PBGC could have a similar impact on the risk shifting behavior of US firms. If the higher variable rate premiums charged by the PBGC in recent years effectively incentivize sponsors of underfunded plans to contribute to their pension plans, I predict that excess pension contributions will be significantly positively associated with variable rate premiums for a sample of underfunded plans.

*H3: Excess pension contributions are positively associated with variable rate premiums.*

Shackelford and Shevlin (2001) note a lack of empirical evidence on the interaction of tax and non-tax factors that impact deferred compensation, such as defined benefit pension plans. After establishing that tax benefits and variable rate premiums charged by the PBGC are both associated with pension contributions, I examine how these governmental incentives interact to impact pension funding levels. I expect that the association between excess pension contributions and variable rate premiums to be driven by firms with low tax benefits associated with their defined benefit plans. Bodie, Light, Morck, and Taggart (1987) find evidence that firms with higher risk and lower tax liabilities underfund their pension obligations. If PBGC variable rate premiums have no effect on firms with high tax benefits because these firms contribute to their pension plans in order to receive the tax benefits, then I predict a weaker association between excess pension contributions and variable rate premiums for these firms.

*H4a: High tax benefits weaken the positive association between excess pension contributions and variable rate premiums.*

On the other hand, if firms with low tax benefits are not motivated by tax incentives for pension contribution but are motivated by the PBGC's variable rate premiums, then I predict a stronger positive association between excess pension contributions and variable rate premiums for firms with low tax benefits. In essence, firms that previously underfunded due to a lack of tax benefits, now contribute more to their pension plans in an attempt to avoid higher premium payments.

*H4b: Low tax benefits strengthen the positive association between excess pension contributions and variable rate premiums.*

If a firm's marginal tax rate is a significant determinant of its pension funding level, firms should react to a reduction in the corporate tax rate, which is expected to lower the marginal tax rate for most firms. The election of President Donald J. Trump in 2016 was an unexpected (exogenous) event that increased the probability of tax reform and a lower U.S. corporate tax rate. I predict that firms contributed an abnormal amount to their pension plans following the 2016 election in anticipation of a reduced corporate tax rate and lower tax benefits associated with defined benefit pension plans.

*H5: Plan sponsors make excess pension contributions after the 2016 presidential election in anticipation of lower corporate tax rates.*

# CHAPTER IV

# SAMPLE SELECTION AND RESEARCH DESIGN

## Sample Selection

I outline my sample selection in Table 1. I begin by collecting plan level data for defined benefit plans filed with the Department of Labor (DOL).[16] Every sponsor of an employee benefit plan with 100 or more participants at the beginning of the plan year must file a Form 5500 with the DOL. Sponsors of defined benefit plans must file a Form 5500 Schedule SB, which includes actuarial information regarding the defined benefit plan. I begin my sample by identifying all plans that filed a Form 5500 Schedule SB for plan years 2009 through 2016. Next, I match these plans with data for the plan sponsors available via Compustat. In order to obtain the maximum amount of matches between Form 5500 data and Compustat, I use guidance provided by Madrian and Gron (2004).[17] I first match on Employer Identification Number (EIN), which is the primary identifier collected by the DOL. Next, following Madrian and Gron (2004), I add additional observations to my sample by matching the first 15 characters of plan sponsor name and state to

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[16] The DOL compiles the information from Form 5500 filings by year. These datasets are available via the DOL's website at https://www.dol.gov/agencies/ebsa/about-ebsa/our-activities/public-disclosure/foia/form-5500-datasets. Beginning with 2009 plan years, the DOL requires that plan sponsors file the Form 5500 and related schedules electronically. Previously, the DOL accepted paper copies of the Form 5500 and related schedules.

[17] Madrian and Gron (2004) suggest matching on CUSIP, but the Form 5500 and related schedules do not require a CUSIP for my sample period. Therefore, I use EIN for my primary identifier.

firm name and state in Compustat.[18] Using these two matching criteria, I obtain 9,702 unique plan year observations from 2009 to 2016.

For my Graham sample used to test H1, I eliminate 1,040 of these plan year observations because I am unable to obtain a MTR for these observations.[19] I eliminate an additional 665 observations which are missing the relevant Compustat variables for my regressions. Following Thomas (1988) and Frank (2002), I eliminate defense contractors and public utilities because these firms have nontax incentives to overfund. Removing observations in these industries eliminates 1,262 plan years from my sample. Finally, I eliminate 9 plan years for which I cannot obtain excess pension contributions or variable rate premiums for these observations. This results in a total Graham sample for H1 of 6,726 plan year observations.

For H2, I create a tax savvy variable, which requires me to calculate ETR average and ETR volatility quintiles. My sample for this test is 4,643 plan year observations after eliminating observations for which I cannot calculate my tax savvy variable. For H3, I eliminate firms that did not pay variable rate premiums in order to run this test on underfunded firms only. This results in a total of 2,281 plan year observations. For H4, I interact variable rate premiums with MTR quintiles. My sample is 2,281 plan year observations after eliminating observations for which I cannot calculate MTR quintiles.

Finally, for H5, I begin with I obtain 10,553 unique plan year observations from 2009 to 2017. I eliminate 1,092 of these plan year observations because I am unable to obtain a MTR for these observations. I eliminate an additional 717 observations which are missing the relevant

[18] The first 15 characters of the name field and state match does produce some false positives. I manually identify false positives and remove them from my sample. For example, Intercontinental Hotels Group (Form 5500) in Georgia matches with Intercontinental Exchange Inc. in Georgia The Intercontinental Hotels Group is a hotel company, and Intercontinental Exchange Inc. is a financial markets company. I remove this match.

[19] For my BCG sample used to test H1, I eliminate 1,452 observations because I am unable to obtain a MTR. I eliminate 642 observations missing relevant Compustat variables, 1,302 observations for defense contractors or public utilities, and 11 observations for which I cannot obtain my dependent variable or my variable rate premium variable. This results in a total sample of 6,295 plan year observations.

Compustat variables for my regressions. Eliminating defense contractors and public utility observations reduces my sample by 1,396 plan years. Finally, I eliminate 9 plan years for which I cannot obtain excess pension contributions or variable rate premiums for these observations. This results in a total sample for H5 of 7,339 plan year observations.

**Research Design**

I use the following regression to test the association between marginal tax rate and excess pension contributions (H1).

$$EPC_{it} = \beta_0 + \beta_1 MTR_{it} + \beta_2 Profitability_{it} + \beta_3 Leverage_{it} + \beta_4 MTB_{it} + \beta_5 Volatility_{it} + \beta_6 Deficit_{it} + \beta_7 FundedStatus_{t} + \beta_8 PlanSize_{it} + \beta_9 VarPremium_{it} + \beta_{10} Assets_{it} + \text{Year Fixed Effects} + \text{Industry Fixed Effects} + \varepsilon_{it} \quad (1)$$

I measure my dependent variable, Excess Pension Contributions (*EPC*) as contributions made by employers in excess of minimum required contributions to defined benefit plans scaled by the number of plan participants. H1 predicts that excess pension contributions are positively associated with the tax benefits derived from making these contributions, so I expect $\beta_1 > 0$. I measure my variable of interest, marginal tax rate (*MTR*), using the methods employed by Graham (1996a) and Blouin et al. (2010).[20,21]

I include a variety of control variables. First, I control for variable rate premiums (*VarPremium*), which is my variable of interest in H3. I predict $\beta_9 > 0$. Results consistent with this prediction provide initial evidence consistent with H3. Firms with higher marginal tax rates are likely more profitable and employ less leverage than firms with lower marginal tax rates. The next control variable that I include is *Profitability.* I

[20] The Blouin et al. (2010) or BCG measure is only on Compustat available through 2016. I employ this measure for H1, but I use the Graham (1996a) measure throughout the paper as my primary measure of MTR.
[21] Appendix A includes all variable definitions.

measure *Profitability* as a firm's average return on assets, scaled by total assets, and I expect $\beta_2 > 0$. I measure *Leverage* as total long-term debt scaled by total assets, and I expect $\beta_3 < 0$. Controlling for *Profitability* and *Leverage* also helps to control for financially distressed firms with a higher likelihood of exercising the put option associated with their defined benefit plans. I use *Volatility* and *FundedStatus* as additional controls for a firm's likelihood to exercise its put option. I measure *Volatility* as the standard deviation of a firm's return on assets for the prior five years, and I expect $\beta_5 < 0$. *FundedStatus* is the fair value of a firm's pension assets less its projected benefit obligation scaled by the firm's market value of equity (Campbell et al. 2010). I expect $\beta_7 < 0$. I control for the possibility that firms' excess internal cash flow is driving excess pension contributions by adding a variable for financing deficit. Firms with a financing deficit are less likely to have the funds to make excess pension contributions. I measure my *Deficit* variable by following Frank and Goyal (2003). *Deficit* is calculated by taking cash dividends, net firm investment, and change in working capital and subtracting out cash flow after interest and taxes. Firms with a positive amount for the *Deficit* variable have a financing deficit and firms with a negative amount for *Deficit* have a financing surplus (excess internal cash flow). I predict $\beta_6 < 0$, indicating that firms with a financing surplus will make higher excess pension contributions. I control for a firm's growth opportunities using *MTB*, measured as a firm's market value scaled by its book value. I expect firms with larger growth opportunities to contribute less to their defined benefit plans and predict $\beta_4 < 0$. I control for a firm's defined benefit *PlanSize*, which I measure as the market value of plan assets scaled by total firm assets. I predict $\beta_8 > 0$ indicating that firms with large defined benefit plans make larger excess contributions to these plans. I also control for firm size with the variable *Assets*, representing the natural log of total assets held by the firm sponsoring the defined benefit plan. I predict $\beta_{10} > 0$

indicating that larger firms make larger excess contributions to their defined benefit plans.

Next I examine H2 and test whether the association between marginal tax rate and excess pension contributions is stronger for tax savvy firms.

$$EPC_{it} = \beta_0 + \beta_1 MTR_{it} + \beta_2 TaxSavvy_{it} + \beta_3 TaxSavvy{*}MTR_{it} + \beta_4 Profitability_{it} + \beta_5 Leverage_{it} + \beta_6 MTB_{it} + \beta_7 Volatility_{it} + \beta_8 Deficit_{it} + \beta_9 FundedStatus_{it} + \beta_{10} PlanSize_{it} + \beta_{11} VarPremium + \beta_{12} Assets + \text{Year Fixed Effects} + \text{Industry Fixed Effects} + \varepsilon_{it} \quad (2)$$

In order to perform this test, I create a *TaxSavvy* variable. I consider firms that are able to consistently sustain low cash effective tax rates to be tax savvy firms. I calculate cash ETR as taxes paid divided by pretax income less special items. I then calculate the average cash ETR for a consecutive five-year period. I also calculate the standard deviation of ETR for the same five-year period (t to t-4). *TaxSavvy* is an indicator variable equal to 1 when firms are in the lowest quintile of average cash ETR *and* the lowest quintile for standard deviation of cash ETR, zero otherwise. I expect $\beta_3 > 0$, indicating that the association between *MTR* and *EPC* is stronger for tax savvy firms.

In H3, I examine whether variable rate premiums are associated with excess pension contributions.

$$EPC_{it} = \beta_0 + \beta_1 VarPremium_{it} + \beta_2 Profitability_{it} + \beta_3 Leverage_{it} + \beta_4 MTB_{it} + \beta_5 Volatility_{it} + \beta_6 Deficit_{it} + \beta_7 FundedStatus_{t} + \beta_8 PlanSize_{it} + \beta_9 MTR_{it} + \beta_{10} Assets_{it} + \text{Year Fixed Effects} + \text{Industry Fixed Effects} + \varepsilon_{it} \quad (3)$$

H3 predicts that excess pension contributions are positively associated with variable rate premiums. I run this test only on plan year observations that incur variable rate premiums because this incentive should only affect underfunded plans that are charged an additional risk adjusted premium by the PBGC. *VarPremium* is a firm's variable rate premium charged by the PBGC. I obtain the data to calculate a firm's variable rate premium from Form 5500 schedule SB, and I scale a firm's variable rate premium by the number of plan participants.[22] My variable of interest is *VarPremium*, and I predict $\beta_1 > 0$. Firms will increase their discretionary pension contributions as their variable rate premiums increase.

To test whether the association between excess pension contributions and variable rate premiums is independent of a firm's tax status (H4a and H4b), I use the following regression.

$$
\begin{aligned}
EPC_{it} = \beta_0 + \beta_1 HighMTR_{it} + \beta_2 LowMTR_{it} + \beta_3 VarPremium_{it} + \\
\beta_4 HighMTR{*}VarPremium_{it} + \beta_5 LowMTR{*}VarPremium_{it} + \\
\beta_6 Profitability_{it} + \beta_7 Leverage_{it} + \beta_8 MTB_{it} + \beta_9 Volatility_{it} + \\
\beta_{10} Deficit_{it} + \beta_{11} FundedStatus_{it} + \beta_{12} PlanSize_{it} + \beta_{13} Assets_{it} + \\
Year\ Fixed\ Effects + Industry\ Fixed\ Effects + \varepsilon_{it}
\end{aligned}
\qquad (4)
$$

If firms with high tax benefits already make excess contributions to their plans in order to receive the associated tax benefits, PBGC premiums will be less effective for these firms. H4a predicts that high tax benefits weaken the positive association between excess pension contributions and variable rate premiums. On the other hand, firms with low tax benefits will be motivated by PBGC premiums. H4b predicts that low tax benefits will strengthen the positive association between excess pension contributions and variable rate premiums. In order to test my predictions, I create indicator variables for plans in the highest and lowest quintiles of *MTR*. *HighMTR* plans fall within the highest quintile of MTR for a given industry-year, and *LowMTR* plans fall within the lowest quintile of MTR for a given industry-year. I predict $\beta_4 < 0$, indicating that the association between *EPC* and *VarPremium* is significantly lower for *HighMTR* plans. I

[22] See Appendix A for a more detailed description of this variable.

predict $\beta_5 > 0$, indicating that the association between *EPC* and *VarPremium* is significantly higher for *LowMTR* plans.

To test whether pension contributions increased following the election of President Trump (H5), I use the following regression.

$$EPC_{it} = \beta_0 + \beta_1 Time_{it} + \beta_2 MTR_{it} + \beta_3 Time{*}MTR_{it} + \beta_4 Profitability_{it} + \beta_5 Leverage_{it} + \beta_6 MTB_{it} + \beta_7 Volatility_{it} + \beta_8 Deficit_{it} + \beta_9 FundedStatus_{it} + \beta_{10} VarPremium_{it} + \beta_{11} Assets_{it} + \text{Industry Fixed Effects} + \varepsilon_{it} \quad (5)$$

I create a *Time* variable equal to one if a plan year ends after November 2016, zero otherwise. My *Time* variable captures plan year observations that end after the election of President Trump. H5 predicts that excess pension contributions are higher following the election of President Trump because firms react to an anticipated reduction in their marginal tax rates. Therefore, I expect $\beta_1 > 0$. I also expect that firms with higher marginal tax rates will increase their excess pension contributions more than firms with lower marginal tax rates, $\beta_3 > 0$.

# CHAPTER V

## DESCRIPTIVE STATISTICS AND RESULTS

### Descriptive Statistics and Correlations

Table 2 reports the descriptive statistics for the sample. My continuous variables are winsorized at 1 and 99 percent. The average plan sponsor in both my Graham and BCG samples reports an underfunded pension plan on its balance sheet, meaning its projected benefit obligation is larger than the fair value of its pension assets. The average Graham (BCG) marginal tax rate for my sample is 16 percent (30 percent). The average plan in my sample incurs a variable rate premium charged by the PBGC and contributes to its plan in excess of the required amount.

I also compare my sample to the Compustat Universe.[23] Observations in my sample are more profitable, employ less leverage, have less growth opportunities, are less volatile than the Compustat universe. In addition, while the average firm in the Compustat universe has a financing deficit, the average observation in my sample has a financing surplus. Although plan-years in my sample are, on average, underfunded, they are better funded than the average firm in the Compustat universe. My sample contains plan-years with slightly larger plans but much smaller firms than the average Compustat firm. Finally, the average Graham marginal tax rate for my sample is almost identical to the average Graham marginal tax rate for the Compustat

[23] Descriptives for the Compustat Universe are not included in Table 2.

universe. However, the BCG marginal tax rate for my sample (30 percent) is higher than the average MTR for the Compustat universe (21 percent).

Table 3 reports the correlation matrix for the variables used in hypothesis testing. The positive association between excess pension contributions and marginal tax rate suggests that firms with higher marginal tax rates contribute more to their defined benefit plans. This univariate evidence supports my first hypothesis. I also find a positive association between variable rate premiums and excess pension contributions, providing preliminary support for my third hypothesis. Consistent with my control variable predictions, I find that excess pension contributions are positively associated with profitability and negatively associated with leverage and volatility. In my Graham MTR sample, I find that *FundedStatus* is negatively associated with excess pension contributions, consistent with my predictions. However, I do not find a univariate association between *FundedStatus* and *EPC* for my BCG sample in Panel B. I do not find a univariate association between my *Deficit* variable or *Assets* and *EPC*. Finally, I predict that larger plans will contribute more to their defined benefit plans, but my univariate results suggest that *PlanSize* is negatively associated with *EPC*.

**Results**

Table 4 reports the estimated coefficients from equation 1 used to test H1.[24] The dependent variable is excess pension contributions, and my variable of interest is marginal tax rate. When I use Graham's measure, the coefficient on *MTR* ($\beta_1$) is positive and significant (t-statistic = 2.50, p-value=.0001). Using the BCG measure, the coefficient on *MTR* ($\beta_1$) is also positive and significant (t-statistic = 2.68, p-value=.0073). This implies that firms with higher marginal tax rates have higher excess pension contributions. This is consistent with the theoretical predictions of Black (1980) and Tepper (1981) as well as the findings of Thomas (1988). I

[24] All of my results are based on two tailed tests.

provide stronger evidence for the association between tax rate and pension contributions by utilizing the sophisticated Graham (1996a) and Blouin et al. (2010) simulated marginal tax rates and a measure of excess pension contributions rather than total pension contributions.

For my controls, I find that *Profitability* is significantly positively associated with excess pension contributions. This implies that more profitable plan sponsors and sponsors of larger defined benefit plans have higher excess pension contributions. I also find firm size (*Assets*) to be significantly positively associated with *EPC*. This implies that larger firms are more likely to make discretionary pension contributions. I find that *VarPremium* ($\beta_9$) is significantly positively associated with *EPC.* Although, I only formally predict an association between these two variables for underfunded plans, it appears that this association holds in the broader sample of plan-years. Opposite of my predictions, I find that greater growth opportunities (*MTB*) are significantly positively associated with *EPC*. I do not find a significant association between my *Leverage* and *Volatility* variables and my *EPC* variable.

Table 5 reports the estimated coefficients from equation 2 used to test H2. I predict that the interaction of my *TaxSavvy* and *MTR* variables will be positive, indicating that the association between *MTR* and *EPC* is stronger for firms that are more tax savvy. I do not find results consistent with my predictions. The coefficient on *TaxSavvy*MTR* ($\beta_3$) is insignificant (t-statistic = 0.64, p-value=.5223).

Table 6 reports the estimate coefficients from equation 3 used to test H3. I run this test only on plan year observations that incur variable rate premiums because this incentive should only affect underfunded plans that are charged an additional risk adjusted premium by the PBGC. I find that variable rate premiums ($\beta_1$) are significantly positively associated with excess pension contributions (t-statistic = 5.84, p-value=<.0001). This implies that the premium structure utilized by the PBGC effectively combats the put option outlined by Sharpe (1976) and Treynor (1977) and the resulting moral hazard problem. This finding complements the finding by Guan and Lui (2016) who document that risk-adjusted premiums implemented by the UK helped to curb risk shifting behavior among defined benefit plan sponsors.

Table 7 reports the estimated coefficients from equation 4 used to test H4a and H4b. I predict that the interaction of my *HighMTR* and *VarPremium* ($\beta_4$) variables will be negative, but I find that this interaction to be significantly positive (t-statistic=2.10, p-value=.0355). This suggests that variable rate premiums are very effective in soliciting excess pension funding. Even firms that have the highest tax benefits associated with defined benefit contributions contribute to their plans in order to avoid additional premium payments to the PBGC. I predict that the interaction of my *LowMTR* and *VarPremium* ($\beta_5$) variables will be significantly positive, and I find results consistent with my expectations (t-statistic=2.11, p-value=.0353). These findings suggest that variable rate premiums tend to drive excess pension contributions, even for firms that receive higher tax benefits from contributing to their defined benefit pension plans.

Table 8 reports the estimated coefficients from equation 5 used to test H5. The dependent variable is excess pension contributions, and my variable of interest is time. The coefficient on *Time* ($\beta_1$) is positive and significant (t-statistic = 566.656, p-value= <.0001). This implies that firms made higher excess pension contributions to their defined benefit plans following the election of President Trump due to the anticipation of tax rate decreases. Plan sponsors made these contributions in anticipation of lower tax benefits associated with making excess pension contributions under a lower corporate tax rate. The coefficient on *Time*MTR* is insignificant (t-statistic = 778.497, p-value= 0.209). Although I expect the interaction to be significantly positive, the anticipation of such a drastic and seemingly permanent tax cut results in higher excess pension contributions on average for all plans and not just for plans with higher tax benefits associated with excess pension contributions.[25] My findings are consistent with the theoretical predictions of Black (1980) and Tepper (1981) as well as the findings of Thomas (1988). I provide strong evidence for the association between tax rate and pension contributions by utilizing Trump's election as an exogenous shock that lowers the marginal tax rate for most firms.

[25] I do test H5 on a sample of HighMTR and LowMTR plans. The Time variable is significant at the 1 percent level for the HighMTR plans and at the 10 percent level for the LowMTR plans. This provides some evidence that the anticipation of a tax decrease is more meaningful to plan sponsors with higher tax benefits associated with making excess defined benefit contributions.

# CHAPTER VI

# CONCLUSION

The government provides certain funding incentives to sponsors of defined benefit pension plans. Contributions to these plans are tax deductible and plan asset investment growth is not taxed. These tax incentives serve to encourage firms to make contributions to their defined benefit plans. In addition, sponsors of defined benefit plans must pay insurance premiums to the PBGC. The PBGC charges underfunded plans an additional variable rate premium designed to spur pension contributions. The tax benefits in place positively reinforce pension contributions, and PBGC premiums negatively reinforce funding by punishing sponsors with underfunded plans.. Since millions of employees, beneficiaries, and retirees rely or will rely on pension income, it is important to understand whether government incentives effectively motivate pension contributions.

In this study, I find that tax benefits are significantly positively associated with excess pension contributions. This suggests that plan sponsors value the tax savings associated with these benefit plans. I also find that variable rate premiums charged by the PBGC are also significantly positively associated with excess pension contributions. This implies that plan sponsors contribute more to their pension plans in order to avoid future variable rate premiums. I find that firms the positive association between variable rate premiums and excess pension contributions is significantly stronger for plan-years with the highest and lowest tax benefits associated with defined benefit plans. This implies that variable rate premiums effectively incentivize excess pension contributions for both high and low tax benefit sponsors. Finally, I find that firms made higher excess pension contributions following the election of President Trump. Since Trump's election was an exogenous shock to the market that increased the probability of corporate tax reform, my results imply that plan sponsors reacted to this shock by making higher contributions to their defined benefits in order to receive higher tax benefits before these tax benefits decreased under tax reform.

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# APPENDICES

## APPENDIX A

Variable Definitions

| | |
|---|---|
| *Deficit* | Financing Deficit = DIV + I + ΔW – C<br><br>DIV is cash dividends (DV).<br><br>• I is net investment and equals capital expenditures (CAPX) plus increase in investments (IVCH) plus acquisitions (AQC) plus other use of funds (FUSEO) less sale of property plant and equipment (SPPE) less sale of investment (SIV).<br>• ΔW is the change in operating working capital (WCAP) plus the change in cash and cash equivalents (CHECH) plus the change in current debt (DLCCH).<br>• C is cash flow after interest and taxes and equals income before extraordinary items (IB) plus depreciation and amortization (DPC) plus extraordinary items and discontinued operations (XIDOC) plus deferred taxes (TXDC) plus equity in net loss earnings (ESUBC) plus other funds from operations (FOPOX) plus gain (loss) from sale of property plant, and equipment and other investments (SPPIV). |
| *FundedStatus* | Fair value of pension assets (PPLAO + PPLAU) less the projected benefit obligation (PBPRO) scaled by market value of equity (CSHO*PRCC_F) |
| *HighMTR* | Observations that fall within the highest quintile of *MTR* for a given industry-year |
| *Leverage* | Total long-term debt (DLTT) scaled by total assets (AT) |
| *LowMTR* | Observations that fall within the lowest quintile of *MTR* for a given industry-year |
| *MTB* | Market value (PRCC_F*CSHO) scaled by book value (CEQ) |

| | |
|---|---|
| | Simulated marginal tax rate (after financing) obtained from John Graham's website (https://faculty.fuqua.duke.edu/~jgraham/taxform. html) or from WRDS for Blouin, Core, and Guay (2010) procedure |
| *EPC* | Obtained from the DOL (http://www.dol.gov/agencies/ebsa/about-ebsa/ our-activities/public-disclosure/foia/form-500-datasets) SB_PRESENT_VAL_EXCES_CONT_AMT for years 2011-2017 and SB_EXCES_CONTR_CURR_YR_TOT_AMT for years 2009-2010 scaled by SB_TOT_PARTCP_CNT |
| *PlanSize* | The market value of plan assets (PPLAO+PPLAU) scaled by total assets (AT) |
| *Profitability* | Average return on assets ($IB_t + IB_{t-1}$) scaled by total assets (AT) |
| *TaxSavvy* | First, I calculate cash ETR as taxes paid (TXPD) divided by the sum of pretax income (PI) less special items (SPI) during the same period. Set to missing if denominator < 0. I then calculate the average cash ETR for a consecutive five year period and the standard deviation of cash ETR for the same five year period (t to t-4). *TaxSavvy* is an indicator variable equal to 1 when firms are in the lowest quintile (for a given industry-year) of average cash ETR *and* the lowest quintile (for a given industry-year) for standard deviation of cash ETR, zero otherwise |
| *VarPremium* | Variable rate premium charged by the PBGC. Obtained from the DOL (http://www.dol.gov/agencies/ebsa/about-ebsa/ our-activities/public-disclosure/foia/form-500-datasets) SB_TOT_VSTD_FNDNG_TGT_AMT / SB_TOT_PARTCP_CNT (from Schedule SB) multiplied by the variable rate premium amount for that year (https://www.pbgc. Gov/prac/prem/premium-rates) |
| *Volatility* | Standard Deviation of ROA ($IB_t$ / AT) for prior 5 years |
| *Assets* | Natural log of AT |
| *Time* | Equal to one if a plan year ends (SB_TAX_PRD) after November 2016, zero otherwise |

APPENDIX B

Tables

**Table 1**

**Sample Selection and Distribution**

| | Graham MTR | BCG MTR |
|---|---|---|
| Defined Benefit Plans from 2009-2016 with data available from Compustat | 9,702 | 9,702 |
| Less: | | |
| Missing MTR Variable | 1,040 | 1,452 |
| Missing some necessary Compustat variable | 665 | 642 |
| Elimination of Defense Contractors (SIC 3720, 3721, 3728, 2730, and 3760) | 319 | 339 |
| Elimination of Utilities (SIC 4811, 4911, 4922, 4923, 4924, 4931, 4932, and 4940) | 943 | 963 |
| Missing some necessary DOL variable | 9 | 11 |
| **Sample Used to Test H1** | **6,726** | **6,295** |
| | | |
| **Sample Used to Test H1** | 6,726 | |
| Less: | | |
| Eliminate firms without 5-year ETR Average or ETR Volatility variables | 2,047 | |
| Elimination of industry-years without 5 observations needed to calculate ETR quintiles | 36 | |
| **Sample Used to Test H2** | **4,643** | |
| | | |
| **Sample Used to Test H1** | 6,726 | |
| Less: | | |
| Eliminate firms that are not subject to Variable Rate Premiums | 4,445 | |
| **Sample Used to Test H3** | **2,281** | |

| | Graham MTR |
|---|---|
| **Sample Used to Test H1** | |
| Less: | 6,726 |
| Elimination of industry-years without 5 observations needed to calculate MTR quintiles | 3 |
| Eliminate firms that are not subject to Variable Rate Premiums | 4,442 |
| **Sample Used to Test H4** | **2,281** |
| | |
| Defined Benefit Plans from 2009-2017 with data available from Compustat | 10,553 |
| Less: | |
| Missing MTR Variable | 1,092 |
| Missing some necessary Compustat variable | 717 |
| Elimination of Defense Contractors (SIC 3720, 3721, 3728, 2730, and 3760) | 353 |
| Elimination of Utilities (SIC 4811, 4911, 4922, 4923, 4924, 4931, 4932, and 4940) | 1,043 |
| Missing some necessary DOL variable | 9 |
| **Sample Used to Test H5** | **7,339** |

**Table 2**

**Descriptive Statistics**

*Panel A:*

| | N | Mean | Std Dev | Q1 | Median | Q3 |
|---|---|---|---|---|---|---|
| *EPC* | 6,726 | 1,529.170 | 2,971.570 | 0.000 | 4.722 | 1,706.820 |
| *Profitability* | 6,726 | 0.083 | 0.115 | 0.023 | 0.090 | 0.150 |
| *Leverage* | 6,726 | 0.227 | 0.164 | 0.099 | 0.209 | 0.322 |
| *MTB* | 6,726 | 2.951 | 3.738 | 1.319 | 2.152 | 3.544 |
| *Volatility* | 6,726 | 0.039 | 0.052 | 0.010 | 0.021 | 0.044 |
| *Deficit* | 6,726 | -35.571 | 1,258.010 | -153.000 | 0.000 | 34.614 |
| *FundedStatus* | 6,726 | -0.094 | 0.210 | -0.083 | -0.031 | -0.011 |
| *PlanSize* | 6,726 | 0.175 | 0.191 | 0.038 | 0.116 | 0.234 |
| *MTR* | 6,726 | 0.159 | 0.155 | 0.020 | 0.045 | 0.350 |
| *Varpremium* | 6,726 | 17.813 | 41.572 | 0.000 | 0.000 | 13.607 |
| *Assets* | 6,726 | 8.449 | 1.873 | 7.223 | 8.394 | 9.696 |

*Panel B:*

| | N | Mean | Std Dev | Q1 | Median | Q3 |
|---|---|---|---|---|---|---|
| *EPC* | 6,295 | 1,457.950 | 2850.710 | 0.000 | 3.758 | 1,626.920 |
| *Profitability* | 6,295 | 0.083 | 0.130 | 0.038 | 0.101 | 0.153 |
| *Leverage* | 6,295 | 0.249 | 0.166 | 0.136 | 0.232 | 0.335 |
| *MTB* | 6,295 | 3.025 | 4.019 | 1.396 | 2.224 | 3.585 |
| *Volatility* | 6,295 | 0.044 | 0.056 | 0.012 | 0.024 | 0.051 |
| *Deficit* | 6,295 | -50.487 | 1,355.190 | -231.000 | -0.364 | 56.510 |
| *FundedStatus* | 6,295 | -0.125 | 0.320 | -0.102 | -0.036 | -0.015 |
| *PlanSize* | 6,295 | 0.194 | 0.189 | 0.062 | 0.143 | 0.252 |
| *BCG_MTR* | 6,295 | 0.298 | 0.089 | 0.304 | 0.338 | 0.349 |
| *Varpremium* | 6,295 | 20.852 | 46.869 | 0.000 | 0.000 | 20.174 |
| *Assets* | 6,295 | 8.330 | 1.814 | 7.170 | 8.339 | 9.603 |

Table 2 Panel A presents the descriptive statistics for the Graham MTR sample, and Panel B presents descriptive statistics for the BCG MTR sample. All continuous variables are winsorized at the 1 and 99 percent level. See Appendix A for variable definitions.

## Table 3

## Correlation Matrix

*Panel A:*

| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | *EPC* | | ***0.112*** | ***-0.033*** | ***0.057*** | ***-0.049*** | -0.009 | ***0.058*** | ***-0.029*** | ***0.067*** | ***0.045*** | ***0.059*** |
| 2 | *Profitability* | ***0.110*** | | ***-0.088*** | ***0.285*** | ***-0.264*** | ***-0.063*** | ***0.301*** | ***0.064*** | ***0.092*** | ***-0.160*** | ***0.103*** |
| 3 | *Leverage* | ***-0.042*** | -0.003 | | ***0.175*** | ***0.161*** | ***0.026*** | ***-0.109*** | ***0.039*** | ***-0.189*** | ***0.076*** | 0.013 |
| 4 | *MTB* | ***0.055*** | ***0.509*** | ***0.290*** | | ***-0.042*** | ***-0.041*** | ***0.125*** | ***0.093*** | -0.006 | ***-0.069*** | ***0.031*** |
| 5 | *Volatility* | ***-0.039*** | ***-0.043*** | ***0.206*** | ***-0.021*** | | ***0.024*** | ***-0.270*** | ***0.153*** | ***-0.195*** | ***0.209*** | ***-0.254*** |
| 6 | *Deficit* | 0.006 | ***-0.123*** | 0.012 | ***-0.074*** | 0.006 | | 0.019 | ***-0.087*** | ***0.034*** | ***-0.031*** | -0.006 |
| 7 | *FundedStatus* | ***-0.029*** | ***0.229*** | ***-0.157*** | ***0.145*** | ***-0.302*** | ***0.046*** | | ***-0.380*** | ***0.151*** | ***-0.384*** | ***0.201*** |
| 8 | *PlanSize* | ***-0.034*** | ***0.232*** | ***0.169*** | ***0.309*** | ***0.282*** | ***-0.121*** | ***-0.538*** | | ***-0.114*** | ***0.074*** | ***-0.145*** |
| 9 | *MTR* | ***0.042*** | ***-0.046*** | ***-0.147*** | ***-0.069*** | ***-0.189*** | ***0.046*** | ***0.137*** | ***-0.117*** | | ***-0.127*** | ***0.086*** |
| 10 | *VarPremium* | ***0.085*** | ***-0.160*** | ***0.042*** | ***-0.137*** | ***0.260*** | ***0.045*** | ***-0.364*** | ***0.066*** | ***-0.094*** | | ***-0.151*** |
| 11 | *Assets* | -0.013 | ***0.074*** | ***0.064*** | ***0.108*** | ***-0.303*** | ***-0.099*** | ***0.212*** | ***-0.170*** | ***0.056*** | ***-0.244*** | |

*Panel B:*

| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | *EPC* | | ***0.133*** | ***-0.032*** | ***0.070*** | ***-0.055*** | -0.007 | ***0.067*** | ***-0.028*** | ***0.111*** | ***0.028*** | ***0.075*** |
| 2 | *Profitability* | ***0.119*** | | ***-0.179*** | ***0.240*** | ***-0.382*** | ***-0.060*** | ***0.329*** | -0.005 | ***0.564*** | ***-0.170*** | ***0.169*** |
| 3 | *Leverage* | ***-0.063*** | ***-0.178*** | | ***0.082*** | ***0.106*** | ***0.033*** | ***-0.069*** | ***-0.052*** | ***-0.251*** | ***0.057*** | ***0.087*** |
| 4 | *MTB* | ***0.056*** | ***0.454*** | ***0.159*** | | ***-0.074*** | ***-0.033*** | ***0.125*** | ***0.056*** | ***0.153*** | ***-0.087*** | ***0.061*** |
| 5 | *Volatility* | ***-0.065*** | ***-0.248*** | ***0.047*** | ***-0.188*** | | 0.0181 | ***-0.2330*** | ***0.0837*** | ***-0.4981*** | ***0.1702*** | ***-0.2403*** |
| 6 | *Deficit* | 0.008 | ***-0.114*** | ***0.028*** | ***-0.046*** | ***0.071*** | | 0.0175 | ***-0.0918*** | -0.0147 | ***-0.0316*** | -0.0128 |
| 7 | *FundedStatus* | 0.002 | ***0.371*** | ***-0.112*** | ***0.275*** | ***-0.210*** | ***0.057*** | | ***-0.336*** | ***0.458*** | ***-0.308*** | ***0.190*** |
| 8 | *PlanSize* | ***-0.059*** | ***0.075*** | -0.007 | ***0.188*** | ***0.075*** | ***-0.116*** | ***-0.494*** | | ***-0.106*** | ***0.044*** | ***-0.111*** |
| 9 | *BCG_MTR* | ***0.058*** | ***0.411*** | ***-0.104*** | ***0.284*** | ***-0.347*** | ***-0.116*** | ***0.264*** | -0.005 | | ***-0.256*** | ***0.330*** |
| 10 | *VarPremium* | ***0.074*** | ***-0.226*** | 0.003 | ***-0.207*** | ***0.225*** | ***0.043*** | ***-0.361*** | 0.001 | ***-0.275*** | | ***-0.1232*** |
| 11 | *Assets* | 0.013 | ***0.138*** | ***0.131*** | ***0.166*** | ***-0.302*** | ***-0.142*** | ***0.160*** | ***-0.114*** | ***0.423*** | ***-0.225*** | |

Table 3 presents the Pearson (Spearman) correlation coefficients below (above) the diagonal. Panel A presents the descriptive statistics for the Graham MTR sample, and Panel B presents descriptive statistics for the BCG MTR sample. All bold and italicized correlations are significant at the 10 percent level. See Appendix A for variable definitions.

**Table 4**

**Main Results**

| | Graham MTR Sample | | BCG MTR Sample | |
|---|---|---|---|---|
| | **Coefficients** | **t-statistic** | **Coefficients** | **t-statistic** |
| *Intercept* | 473.755 | 1.81** | 74.332 | 0.240 |
| *MTR* | 953.821 | 3.89*** | 1,610.223 | 2.68*** |
| *Profitability* | 2,649.895 | 7.2*** | 2,214.457 | 6.47*** |
| *Leverage* | -162.079 | -0.66 | -45.738 | -0.200 |
| *MTB* | 40.140 | 3.92*** | 39.256 | 4.28*** |
| *Volatility* | -85.672 | -0.11 | 646.091 | 0.850 |
| *Deficit* | -0.044 | -1.55 | -0.033 | -1.260 |
| *FundedStatus* | 406.043 | 1.92* | 111.860 | 0.820 |
| *PlanSize* | 106.374 | 0.48 | 59.861 | 0.290 |
| *VarPremium* | 4.945 | 5.17*** | 2.949 | 3.63*** |
| *Assets* | 37.114 | 1.74* | 44.136 | 1.97*** |
| | | | | |
| Year Fixed Effects | Included | | Included | |
| Industry Fixed Effects | Included | | Included | |
| N | 6,726 | | 6,295 | |
| Adjusted R Squared | 0.0685 | | 0.0743 | |

Table 4 presents the estimated coefficients from equation (1), which is also listed below. See Appendix A for variable definitions. *,**,*** denote significance at the .10, .05, and .01 levels, respectively in two-tailed tests.

$EPC_{it} = \beta_0 + \beta_1 MTR_{it} + \beta_2 Profitability_{it} + \beta_3 Leverage_{it} + \beta_4 MTB_{it} + \beta_5 Volatility_{it} + \beta_6 Deficit_{it} + \beta_7 FundedStatus_{it} + \beta_8 PlanSize_{it} + \beta_9 VarPremium_{it} + \beta_9 Assets_{it}$ + Year Fixed Effects + Industry Fixed Effects + $\varepsilon_{it}$

**Table 5**

**Tax Savvy Firms**

| | Graham MTR | |
|---|---|---|
| | **Coefficients** | **t-statistic** |
| *Intercept* | -34.346 | -0.100 |
| *MTR* | 578.545 | 2.00** |
| *TaxSavvy* | -27.371 | -0.110 |
| *MTR_TaxSavvy* | 805.446 | 0.640 |
| *Profitability* | 3,833.649 | 7.05*** |
| *Leverage* | -605.296 | -1.79* |
| *MTB* | 38.531 | 2.93*** |
| *Volatility* | 2675.860 | 2.05** |
| *Deficit* | -0.090 | -2.92*** |
| *FundedStatus* | 419.496 | 0.890 |
| *PlanSize* | -458.870 | -1.550 |
| *VarPremium* | 9.703 | 7.11*** |
| *Assets* | 90.559 | 3.34*** |
| | | |
| Year Fixed Effects | Included | |
| Industry Fixed Effects | Included | |
| N | 2,281 | |
| Adjusted R Squared | 0.1041 | |

Table 5 presents the estimated coefficients from equation (2), which is also listed below. See Appendix A for variable definitions. *,**,*** denote significance at the .10, .05, and .01 levels, respectively in two-tailed tests.

$EPC_{it} = \beta_0 + \beta_1 MTR_{it} + \beta_2 TaxSavvy_{it} + \beta 3 TaxSavvy{*}MTR_{it} + \beta_4 Profitability_{it} + \beta_5 Leverage_{it} + \beta_6 MTB_{it} + \beta_7 Volatility_{it} + \beta_8 Deficit_{it} + \beta_9 FundedStatus_{it} + \beta_{10} PlanSize_{it} + \beta_{11} VarPremium_{it} + \beta_{12} Assets_{it}$ + Year Fixed Effects + Industry Fixed Effects + $\varepsilon_{it}$

**Table 6**

**Variable Rate Premiums**

| | **Graham MTR** | |
|---|---|---|
| | **Coefficients** | **t-statistic** |
| *Intercept* | -612.242 | -1.29 |
| *VarPremium* | 7.277 | 5.84*** |
| *Profitability* | 835.073 | 1.51 |
| *Leverage* | 140.742 | 0.38 |
| *MTB* | -15.029 | -0.83 |
| *Volatility* | -3470.009 | -3.10*** |
| *Deficit* | 0.053 | 0.79 |
| *FundedStatus* | 1,183.399 | 4.36*** |
| *PlanSize* | 2,352.866 | 5.56*** |
| *MTR* | 263.046 | 0.58 |
| *Assets* | 197.821 | 5.22*** |
| | | |
| Year Fixed Effects | Included | |
| Industry Fixed Effects | Included | |
| N | 2,281 | |
| Adjusted R Squared | 0.1041 | |

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Table 6 presents the estimated coefficients from equation (3), which is also listed below. See Appendix A for variable definitions. *,**,*** denote significance at the .10, .05, and .01 levels, respectively in two-tailed tests.

$EPC_{it} = \beta_0 + \beta_1 VarPremium_{it} + \beta_2 Profitability_{it} + \beta_3 Leverage_{it} + \beta_4 MTB_{it} + \beta_5 Volatility_{it} + \beta_6 Deficit_{it} + \beta_7 FundedStatus_{it} + \beta_8 PlanSize_{it} + \beta_9 MTR_{it} + \beta_{10} Assets_{it}$ Year Fixed Effects + Industry Fixed Effects + $\varepsilon_{it}$

## Table 7

**Marginal Tax Rate and Variable Rate Premiums**

| | **Graham MTR** | |
|---|---|---|
| | **Coefficient** | **t-statistic** |
| *Intercept* | -590.82138 | -1.25 |
| *HighMTR* | -193.61988 | -0.82 |
| *LowMTR* | -107.80683 | -0.49 |
| *Varpremium* | 5.36209 | 3.73*** |
| *HighMTR_VarPremium* | 7.72187 | 2.1** |
| *LowMTR_VarPremium* | 6.29569 | 2.11** |
| *Profitability* | 862.95515 | 1.56 |
| *Leverage* | 95.71467 | 0.26 |
| *MTB* | -10.54137 | -0.58 |
| *Volatility* | -3,616.405 | -3.23*** |
| *Deficit* | 0.03499 | 0.52 |
| *FundedStatus* | 1,104.190 | 4.04*** |
| *PlanSize* | 2,324.729 | 5.48*** |
| *Assets* | 203.10057 | 5.33*** |
| Year Fixed Effects? | Included | |
| Industry Fixed Effects? | Included | |
| N | 2,281 | |
| Adjusted R Squared | 0.1066 | |

Table 7 presents the estimated coefficients from equation (4), which is also listed below. See Appendix A for variable definitions. *,**,*** denote significance at the .10, .05, and .01 levels, respectively in two-tailed tests.

$EPC_{it} = \beta_0 + \beta_1 HighMTR_{it} + \beta_2 LowMTR_{it} + \beta_3 VarPremium_{it} + \beta_4 HighMTR*VarPremium_{it} + \beta_5 LowMTR*VarPremium_{it} + \beta_6 Profitability_{it} + \beta_7 Leverage_{it} + \beta_8 MTB_{it} + \beta_9 Volatility_{it} + \beta_{10} Deficit_{it} + \beta_{11} FundedStatus_{it} + \beta_{12} PlanSize_{it} + \beta_{13} Assets_{it} + \text{Year Fixed Effects} + \text{Industry Fixed Effects} + \varepsilon_{it}$

**Table 8**

**Marginal Tax Rate Event Study**

**Full Sample**

| | Coefficients | t-statistic |
|---|---|---|
| *Intercept* | 181.684 | 0.740 |
| *MTR* | 948.272 | 3.49*** |
| *Time* | 566.656 | 4.45*** |
| *Time*MTR* | 778.497 | 1.260 |
| *Profitability* | 2,620.888 | 7.01*** |
| *Leverage* | -332.519 | -1.340 |
| *MTB* | 42.167 | 4.23*** |
| *Volatility* | -9.662 | -0.010 |
| *Deficit* | -0.012 | -0.440 |
| *FundedStatus* | 367.136 | 1.71* |
| *PlanSize* | 107.182 | 0.480 |
| *VarPremium* | 4.655 | 5.52*** |
| *Assets* | 32.578 | 1.490 |
| | | |
| Year Fixed Effects | Included | |
| Industry Fixed Effects | Included | |
| N | 7,339 | |
| Adjusted R Squared | 0.0652 | |

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Table 8 presents the estimated coefficients from equation (5), which is also listed below. See Appendix A for variable definitions. *,**,*** denote significance at the .10, .05, and .01 levels, respectively in two-tailed tests.

$EPC_{it} = \beta_0 + \beta_1 Time_{it} + \beta_2 MTR_{it} + \beta_3 Time{*}MTR_{it} + \beta_4 Profitability_{it} + \beta_5 Leverage_{it} + \beta_6 MTB_{it} + \beta_7 Volatility_{it} + \beta_8 Deficit_{it} + \beta_9 FundedStatus_{it} + \beta_{10} VarPremium_{it} + \beta_{11} Assets_{it} + \text{Industry Fixed Effects} + \varepsilon_{it}$

VITA

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