CAPITAL STRUCTURE DECISIONS AND CORPORATE PENSION PLANS

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ABSTRACT

IRINA STEFANESCU: Capital Structure Decisions and Corporate Pension Plans

(Under the direction of Anil Shivdasani)

This paper examines the capital structure puzzle that many firms appear to be underlevered from a tax savings perspective. More specifically, this paper explores the capital structure implications of sponsoring corporate pension plans and finds that firms are significantly less underlevered once off balance sheet pension obligations are accounted for. I treat corporate pension plans as fully owned subsidiaries and I find that sponsoring companies are 35% more levered on consolidated accounts. I calculate marginal tax rates by explicitly taking into account the effect of pension contributions on taxable income and I find that the tax benefits of debt are 47% larger once pension debt is accounted for. I also estimate that the underleverage gap closes by 31% due to pension deductions. Additionally, I provide evidence that sponsoring companies use less debt on average than do comparable, non-sponsoring companies.

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My heartfelt thanks go to my parents and especially to my grandmother for believing in me during this incredible journey. To my husband, Catalin and to my son, Daniel for never letting me lose perspective of the really important things in life.

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"Investing in our pension as long as we get the tax deduction for it is a very good investment for us, Harry Stonecipher, president and chief executive officer of Boeing, told analysts in a third quarter conference call in October. Boeing's $3.6 billion contribution in 2004 will result in a tax benefit that year of between 1.1 billion and $1.3 billion, assuming a tax rate of 30% to 35%, according to Boeing spokesman John Dern."

Wall Street Journal (2005), "How companies make the most on pensions"

1. Introduction

This paper examines the capital structure puzzle that firms appear to be are underleveraged from a tax savings perspective. The tradeoff theory of capital structure predicts that firms will borrow up to the point where the marginal value of tax shields on additional debt is just offset by the increase in the costs of financial distress. There is a general consensus that significant tax incentives are associated with corporate borrowing. Nevertheless, many large and profitable companies with a low risk of financial distress have relatively low debt ratios. The perceived inefficiency of capital structure from a tax perspective is particularly surprising, since taxes seem to be "important" or "very important" to most of the CFOs surveyed by Graham and Harvey (2001).

Several studies have documented a negative relation between profitability and leverage, challenging the tradeoff theory, suggesting that firms do not fully exploit their tax shields and therefore, appear to be underleveraged (e.g., Miller (1977), Fama and French (2002) and Rajan and Zingales (1995) among others). Recently, Graham (2000) quantified the tax benefits by estimating marginal tax rates and concluded that "the firms that use debt

conservatively are large, profitable, liquid, in stable industries", and face low *ex ante* costs of distress. He estimates that the typical firm could add up to 15.7% (7.3%) to firm value, ignoring (considering) the personal tax penalty on debt financing.

The literature has advanced several explanations for the insufficient use of debt in capital structure. On the supply side, Faulkender and Petersen (2005) suggest that firms are rationed by lenders and have a limited ability to increase leverage. On the demand side, Molina (2005) and Almeida and Philipon (2006) re-estimate the *ex ante* probability of distress, accounting for endogeneity and default risk premium, and find a stronger impact on leverage. Another line of research investigates whether non-debt tax shields substitute for interest deductions for corporations, as suggested by DeAngelo and Masulis (1980). Bradley, Jarell and Kim (1984) and MacKie-Mason (1990) examine the role of depreciation and tax credits. While many of the non-debt tax shields can be easily detected on the income statement, many others are not disclosed at all, or at best, they are hidden in footnotes (ex. stock option deductions, tax shelters, pension contributions). Firms that appear highly profitable on their financial statements could, in fact, have very low taxable income. Graham, Lang, and Shackelford (2004) examine NASDAQ 100 and S&P 100 firms and find that option deductions are substitutes for interest deductions in corporate capital structure decisions. Graham and Tucker (2006) investigate 44 cases of tax sheltering and find that the average tax deduction produced by the shelters are about three times as large as interest deductions of comparable firms. In a recent working paper, Schallheim and Wells (2006) use an alternative measure for allnon -debt tax deductions -the tax spread- and find that it is positively related to Graham's measure of debt conservatism.

Departing from the existing literature, this paper addresses the underleverage issue by re-examining the structure of liabilities of the firm. Despite the noticeable size and high seniority of pension plan obligations, the role of corporate defined benefit pension plans is missing from the capital structure debate. The deferred compensation for employees arising from corporate pension plans constitutes another form of debt of the company. Pension contributions are tax deductible, similar to the interest payments on debt, and failure to make mandatory contributions ultimately leads to bankruptcy. Yet, most pension plan accounts are kept off balance sheet, and a very intricate pension accounting process often obscures their importance.

As the recent bear market has proven, understanding the role of corporate pension plans on the financial policy of sponsoring companies is very important. Most sponsoring companies were depleted of cash and their credit ratings were adversely affected by large levels of underfunding. G. B. Stewart comments on this subject in the *Harvard Business Review* (2003): "Pension liabilities have real teeth. Whether paid out of cash or bankruptcy proceeds, a company pension liability is senior even to its most senior lenders. It is a liability so binding it should be boldly printed on a company's balance sheet at the very top of its list of debts. The surest indication that the pension assets are (also) real is their direct effect on corporate cash flows, debt, earnings and market value."

A corporate pension plan has the features of a fully owned subsidiary, except for its separate legal status. In fact, the accounting literature has long concluded that pension fund property rights should lie with the firm and that pension plan assets and liabilities are valued by the securities markets as corporate assets and liabilities (e.g. Landsman (1986), Barth (1991), Barth, Beaver and Landsman (1992), Jin, Merton and Bodie (2006)). These studies

suggest that capital structure decisions should rely on consolidated accounts. I, therefore, proceed by integrating pension plan assets and liabilities onto the corporate balance sheet. The intricacy of pension accounting and elaborated funding rules combined with the opacity of pension disclosures complicates the adjustment.

This study covers all publicly traded firms available in the Compustat database from 1991 to 2003, well after the enactment of funding rules in the Pension Protection Act (1987) and immediately after data on pension costs became available. About one fourth of the firms in the sample have defined benefit plans, and for these firms, the aggregate ratio of plan assets to operating assets is on average 17.5%. Pension contributions are 3.9% of earnings before interest and taxes, while interest deductions account for 11.8%. For the subset of sponsoring companies, both book and market leverage is 35% larger based on consolidated accounts. Book leverage increases from 26% to 35%, while market leverage increases from 20% to 27%.

Pension liabilities are long term binding obligations towards employees, and have all the characteristics of debt. Pension contributions are, therefore, the equivalent of interest payments on debt and an important source of tax savings. Following the methodology described in Shevlin (1990) and Graham (1996a, 2000) I recalculate the tax benefits from debt and pensions as the area below the tax benefit function, which plots simulated marginal tax rates corresponding to different levels of the interest expense. Pension accounting introduces another divergence between accounting and taxable income, a feature that has not been previously examined. The accrued pension expense is an operating expense for financial purposes, but it is the pension contribution that is deductible for tax purposes. Any difference between the pension contribution and the pension cost weakens the link between

taxable and book income, but it is the pension contribution that ultimately affects marginal tax rates.

For the set of sponsoring companies with sufficient data to simulate marginal tax rates, pension contributions are, on average, 59% of the total interest expense. The tax benefits of all debt (pension and financial debt) increase by 47% once pensions are taken into account. The tax savings from pension contributions account for 2% of the market value of the company. A careful look at the characteristics of the firms sponsoring pension plans reveals that most of these companies operate on the flat segment of their tax benefit functions and far from the point where marginal tax benefits start declining. Graham (2000) defines this point as "the kink" and uses it as a measure of how aggressively firms use debt. I estimate that the integration of pensions into the capital structure analysis diminishes the underleverage gap by about 31%. Firms appear to adopt less conservative debt policies after pensions are taken into account.

In terms of dollar benefits, my analysis finds that the gross aggregate savings attributable to contributions deductibility amounts to $14 billion per year during the period 1991-2003. I find similar tax benefits of interest deductibility as reported in Graham (2000) for the period 1991-1995, the years for which our studies overlap. For the sample period, the yearly average of the gross benefits of debt amounts to $58 billion for firms without pensions and to $60 billion for firms with pensions.

Debt conservatism is pervasive among profitable companies in both high growth (e.g. technology) and low growth (e.g. manufacturing) sectors. Graham, Lang, and Shackelford's (2004) examine the effects of stock option deductions on marginal tax rates and debt policy. While they acknowledge important effects of option deductions on marginal tax rates on the

set of firms included in NASDAQ 100 firms (the most profitable and stable among the high growth technology firms), they do not find similar effects on the set of S&P100 firms (traditional and stable industries firms). It is important to note that most of the companies having corporate pension plans fall exactly into this last category (old, mature, unionized industries). These companies are also large, highly profitable, have a low expected cost of distress and low costs from debt financing. Therefore, this study directly complements their findings and evidence of significant tax benefits associated with pensions serves as the missing link in the capital structure debate.

The results on pension tax benefits are also consistent with those of Thomas (1988), who examines the link between tax status and corporate funding policy. He finds that pension contributions are positively correlated with the sponsor's tax status and that firms with a low tax status are less likely to adopt defined benefit plans. Petersen (1992) also finds that the decision to terminate the pension plan is driven in part by taxes, as terminations most often coincide with low tax years. Both papers emphasize an important role for taxes in managing corporate pension plans.

Although the institutional setting of pension assets and liabilities supports their integration into corporate assets and liabilities, the question remains whether, in practice, corporate managers integrate pension plans into their overall corporate financial policy. The tradeoff theory predicts that firms have target capital structures. To the extent that managers treat the pension liability as a substitute for debt, we should observe, *ceteris paribus*, large pension obligations associated with low leverage ratios. I find that a 1 percentage point increase in the pension liability to total assets ratio is associated with a 0.36 percentage point decrease of debt to total assets ratio. This result suggests that managers partially substitute pension

related deductions for interest deductions in capital structure decisions. The imperfect substitution could be attributable to either the measurement error in the disclosed pension liability measure or to the effect of the insurance provided by the Pension Benefit Guarantee Corporation during financial distress. An alternative possibility is that firms' marginal cost of issuing pension debt is lower. Sponsoring a defined benefit plan introduces another layer of liabilities to the corporate balance sheet, and also gives managers considerable discretion to manipulate earnings. Bergstresser, Desai, and Rauh (2005) argue that managers use pension assumptions to inflate earnings before acquisitions and stock option exercises. The same discretion potentially allows managers to issue equity on more favorable terms, diluting the effect of pension liabilities on the balance sheet debt.

The results of this study are consistent with the findings of several recent papers that examine the interdependence between corporate financial policy and pension plan investment policy. Rauh (2004) documents a negative relation between large required pension contributions and the level of corporate investment. Frank (2002) finds a positive relationship between defined benefit plan asset allocation and the firms' tax benefits. Jin, Merton and Bodie (2006) suggest that failure to take into account off balance sheet pension assets and liabilities biases upward the cost of capital and could result in suboptimal capital budgeting decisions and underinvestment. The partial substitutability I find is also in line with Graham and Tucker's (2006) finding that tax sheltering firms have leverage ratios that are about 500 basis points lower than non-sheltering firms.

The reminder of this paper is organized as follows. Section 2 introduces institutional features of pension plans. Section 3 develops testable hypotheses. Section 4 describes the data and consolidated balance sheet issues. Section 5 provides the refinement of the marginal

tax rates and the recalculation of tax benefits of debt. Section 6 examines the effect of pension debt on corporate financial policy. Section 7 reports some of the limitations of this study, and section 8 concludes.

2. Institutional features of pension plans

2.1. Description of pension plans

In the United States, employers can choose between two basic types of retirement plans: a defined contribution plan (DCP) or a defined benefit plan (DBP). Defined benefit plans provide a specific amount of benefits to employees at retirement, whereas defined contribution plans specify the amount of contributions to be made by the employer toward the employee's retirement account. Due to the differing contractual obligations, in these two types of plans the risk is shared differently between the two parties (employer and employee). In a DCP, beyond the contribution, the employer has no legal obligation on any deficit between funds available in the employee's account and the employee's expectations. In a DBP, the employer agrees to pay a certain level of benefits and therefore bears all the investment risk. Under the Employment Retirement Income Security Act (ERISA 1974), firms with defined benefit plans have a legal responsibility to fund the plan with assets sufficient to meet their pension obligations. This paper relies on these important characteristics, and henceforth any reference to pension plans in this paper refers to defined-benefits corporate pension plans (DBPs).

Recently, some employers have started to offer cash balance pension plans (CBPs). These plans share characteristics of both the defined benefit plans and defined contribution plans. A cash balance plan defines the promised benefit in terms of a stated account balance,

independent of expected future salary levels, age at retirement, etc. Because promised benefits do not depend on the value of plan assets, all risks and rewards from plan assets are borne by employers. Despite a different process for calculating promised benefits, CBPs have the same legal obligations for employees as DBPs. For this reason, I do not differentiate CBPs from DBPs in the subsequent analysis.

Why do companies sponsor defined benefit plans? Historically, the adoption of DBPs has been encouraged through important tax incentives. Contributions to pension plans are tax deductible, while employee income from the pension plans is tax deferred. This enables funds in pension plans to grow at a faster rate (compounded tax-free) than if they were held by firms or their employees. At retirement, employees pay taxes on pension benefits, but their marginal tax rates are usually lower than during their employment years. There is an additional tax benefit when plan assets are invested in bonds: since the full pre-tax return on plan assets is delivered to the corporation after payment of corporate taxes and then distributed to shareholders, interest income from bonds held by the plan is taxed at the lower, equity individual income rate.[1]

Several other benefits emanate from corporate pension plans. DBPs create strong incentives for workers to remain with the firm because they suffer wealth losses if they quit early (see e.g., Ippolito (1985)). Because firms have some degree of discretion over pension contributions, pension plans are also a source of financial slack (Ballester, Fried and Livnat (2002)). A minimum contribution is generally required if the value of plan assets is below the estimated value of pension liabilities, but the contribution is otherwise waived. Current

[1]Generally, investors demand higher risk-adjusted returns on bonds because the interest income tax rates are above long term capital gains tax rates, which are also tax deferred. This is referred to as the personal tax penalty. The arbitrage hypothesis arising from the investment of pension plan assets in bonds was initiated by two theoretical studies (Black 1980 and Tepper 1981) and has been tested empirically by several papers (e.g. Frank 2002).

and future contributions are affected by changes in actuarial assumptions, and discretion over assumptions has attracted the opportunistic behavior of managers. Bergstresser, Desai, and Rauh (2005) explore this issue and find that managers are more aggressive when assumptions have a greater impact on earnings, when they exercise stock options, and before acquiring firms.

From a historical perspective, defined benefit plans were considered an excellent compensation incentive at the time when most firms first adopted them. The conditions under which they were initially offered changed significantly. Fewer companies have adopted DBPs in the recent years and many healthy companies are freezing their pension plans[2] or even terminating them[3]. An intense global competition and a sophisticated work force requiring more portable compensation, lead to new incentive instruments (e.g. stock options, 401(k) plans). Executives have lost interest in these pension plans since their retirement plans became disconnected from those offered to rank and file employees[4]. Ultimately, the driving force behind the shift from DBPs to DCPs appears to be a sustained increased in the costs associated with DBPs[5]. Companies have reacted to the increased competition by decreasing total compensation with a preference on cutting fringe benefits

[2]The freeze of a pension plan means a discontinuation of future accruals. The plan is closed to new workers (soft freeze), whom are offered instead alternative arrangements (such as 401ks). Often, pension benefits of existing participants are locked at current salaries levels and tenure (hard freeze). PBGC estimates that most of the single-employer benefit plans that were frozen during 2003 were small plans -only about 2.5% of participants of DBPs were affected by the freezes.

[3]The number of qualified plans insured by PBGC has greatly decreased since the mid-1980s peak. However, the number of participants (active and inactive) has increased from 28 million to about 35 million.

[4]See, e.g. Munnell, Golub-Saas, Soto, Vitagliano (2006), Sundaram and Yermack (2006). While initially both high paid and low paid employees had a stake in the same pension plan, now the legislation limits the amounts of benefits one could receive on a tax favored basis. Given the dramatic rise in the CEOs compensation in the last decades, these qualified (tax favored) pension plans become insignificant for them. Companies now provide instead "non- qualified" supplemental executive retirement plans (SERPS).

[5]The contributions to DCPs are least twice smaller than those associated with a DBP according to Munnell and Soto (2004).

over cash wages. Similarly, companies have reacted to the enormous increase of health costs by decreasing pension benefits. Pension contributions have also increased due to a larger than anticipated life expectancy and lower mortality rates (embedded into the calculation of the pension obligation). In addition, changes in the pension accounting are expected to bring pension assets and liabilities on the balance sheet and "mark-to-market" pension expenses are expected to bring the much "undesired" earnings volatility on the income statement.

2.2. Pension accounting and funding requirements

Although sponsoring companies are liable for the benefits promised to their employees, pension assets and liabilities (the relevant pension items) are recorded off balance sheet. Pension assets (PA) are measured by their fair market value, while pension liabilities are calculated as the actuarial present value of the promised benefits outflows. This measure of the pension liability, also called the projected benefit obligation (PBO), takes into account the value at which the liability will ultimately be settled and views the company as a going concern. Funded status is calculated as the ratio between plan assets and plan liabilities (as measured by PBO). Companies are also required to calculate two other measures of the pension liability: the accumulated benefit obligation (ABO) as the present value of the future obligation based on current salaries, and the vested benefit obligation (VBO) as the amount of the benefit obligation that does not depend on future service. Both ABO and VBO reflect a shutdown perspective and serve, respectively, as a base for the calculation of the additional contribution when severe underfunding occurs and, as the basis for the calculation of the variable premium to be paid to the Pension Benefit Guarantee Corporation (PBGC).

ERISA (1974) requires all companies to fund their defined benefit plans. Funding rules for corporate pension plans are, however, mandated by both ERISA and Section 412 of the tax code. To qualify for favorable tax treatment of contributions under the Internal Revenue Code, sponsoring companies must meet certain minimum funding requirements.[6] Companies can fund their pension plans with cash, stock (own stock up to 10% of total plan assets) or debt investments as long as they are considered to be prudent.

The minimum contribution is contingent upon the funded status of the plan which is generally calculated under different assumptions than those used for financial reporting.[7] It is equal to the pension obligation earned by employees during the year plus the level of underfunding amortized over 30 years, with two exceptions. First, no contribution is required when the plan is overfunded. Second, severely underfunded plans must comply with an additional funding requirement to reduce the funding deficiency within 3 to 5 years.[8]

Penalties for inadequate funding out of ongoing cash flows are triggered by ERISA. When a company fails to fulfill minimum funding requirements, ERISA requires that the shortfall be covered by the Pension Benefit Guaranty Corporation (PBGC). PBGC is empowered to

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[6]Technically, there is also a maximum tax deductible contribution permitted by the IRS. This ceiling was established in response to a wave of pension plan terminations and pension plan assets reversions by sponsoring companies with overfunded plans. Companies with overfunded plans became very valuable targets in the takeover market. In 1990 an excise tax was imposed on any assets reversion or contribution exceeding the maximum allowed. The excise tax rate, which may be as high as 50 percent of the reversion, varies depending upon whether or not the employer maintains a replacement plan or makes certain benefit increases.

[7]Under SFAS 87, the high grade Corporate Bonds-Moody's Aa is used as the discount rate in the PBO calculation, whereas the expected return for assets is used as the discount rate to calculate the minimum contribution.

[8]For a plan that is less than 90% funded, ERISA requires an additional contribution to the plan in order to reduce the funding deficiency within three to five years. There are exceptions, however. If a plan is over 80% funded today and was more than 90% funded for the past two years, the additional contribution requirement is waived. Furthermore, companies may request a hardship waiver or an extension period to meet the normal and additional contribution requirements. The additional cost incurred by underfunding is the premium to be paid to the PBGC. This consists of a fixed cost of $19 per employee plus a variable cost equal to $9 per $1,000 of underfunding.

recover the pension deficit by filing a claim against the company's assets that can amount to up to 30% of the firm's net worth. Depending on the timing of the petition, this claim has either the status of a tax lien or of a secure claim on assets.[9] Not surprisingly, companies with large underfunded plans were concerned during the bear market of 2000-2003, when low interest rates resulted in high values for the pension liability while the value of plan assets sank with the stock market. On average, the ratio of the underfunding level to the market capitalization was about 21% over 1991-2003. The aggregate level of underfunding among all publicly traded companies totaled approximately $450 billion of dollars at the end of 2002 (figure 1).

While the contribution to the pension plan flows as a deductible amount through taxable income, it is the pension cost that runs through the income statement and affects reported earnings. Large book to tax differences can therefore be triggered by contributions below or above costs.

Companies have opposed expensing the underfunding level of their defined benefit plans because of the induced pension assets' volatility on earnings. Statement of Financial Accounting Standards No. 87 (SFAS 87) allows several pension costs smoothing mechanisms. Pension cost is calculated as the normal cost (attributable to services rendered by employees during the period), plus interest cost (increase of the pension obligation due to

[9]Pursuant to 29 U.S.C. §1342, the PBGC may initiate the termination of a pension plan if it determines that the plan has not met minimum finding requirements under §412 of the Internal Revenue Code, if the plan is unable to pay benefits when due or if the expected loss to PBGC is larger if the plan is not terminated. If the PBGC files and perfects a lien under 29 U.S.C. §1368(a) prior to the liable entity's filing for bankruptcy protection, then PBGC's claim is senior and must be satisfied in full before any distribution is made to unsecured creditors of the state. If, however, the liable entity has already filled for bankruptcy protection, PBGC asserts that the portion of its claim equal to the lien under 29 U.S.C. §1368 (a) is an administrative expense as a tax incurred by the estate under 11 U.S.C. §§503(b)(1)(B), 507(a)(1) and 29 U.S.C. §1368(a), (c)(2) and as a tax priority under 11 U.S.C. §507(a)(8). Any amount of PBGC's claim for unfunded benefit liabilities that is not entitled to priority is asserted as a general unsecured claim. I thank Mr. Krettek Joseph, attorney at PBGC, for clarifying these issues.

the passage of time), plus a transition asset amortization (at the date of the adoption of SFAS 87)[10], minus the expected returns on plan assets (instead of actual return). The last item is the major smoothing mechanism[11]. Any difference between actual and expected plan asset returns is transferred off balance sheet as unrecognized gains and losses, up to the point where it reaches a threshold (10% * max{PBO, Assets}), when it is allowed to be, again, amortized. This is referred to as "the corridor" in SFAS87.

Because of these provisions, it is not uncommon for companies to report pension income as part of their operating income when, in fact, their pension plan funding has deteriorated. As a simple example, Boeing Company reported in 2003 pension liabilities of $39,931million and pension assets of $33,209 million (17% underfunded) while reporting on the income statement pension income of $67 million (negative pension cost). During the year the company contributed $1,728 million to its pension plan and reported net income of 718 million. This example highlights how pension accounting deepens the book to tax income differences ($67 million plus $1,728 million, in this example).

In Figure 1 I provide an aggregate picture of the underfunding levels relative to the amounts being recognized and unrecognized on the balance sheet. It is interesting to note that over the last years of the bear market (2000-2002), when underfunding reached a record level, companies still continued to show prepaid pension assets on their balance sheets.

2.3. Disclosure

[10]This smoothing device allows amortizing benefits arising from the employee's past services (plan adoption or subsequent plan amendments). Unrecognized prior service cost is amortized into the pension expense over the service life of employees.

[11]Gold (2003) comments on using expected returns rather than actual returns in the pension cost calculation: "FAS 87 conveniently allows corporations whose pension plans are invested in equities to take advance credit for higher anticipated earnings without conceding that they bear additional risk – tantamount to allowing risky mutual funds to report what they expect to earn on average, instead of what they actually earn each year."

The Financial Accounting Standards Board mandates that pension accounts be disclosed only in the footnotes of annual financial statements. SFAS 87, subsequently amended in 1998 by SFAS 132, requires the disclosure of the major assumptions used for forecasting benefits (discount rate, rate of compensation increase) as well as assumptions on expected returns on plan assets. Firms are also required to provide a reconciliation of the beginning and ending balances for pension assets, pension liabilities, and plan status. Explicit disclosures of benefits paid and contributions made by employers became available starting with fiscal year 1999. Although not available in the Compustat database, pension contributions can be estimated from other pension items that are disclosed on balance sheet (prepaid or accrued pension liability) and the income statement (pension cost/income). PA and PBO are explicitly disclosed, but data on the other two measures for the pension liability (ABO and VBO) are released only in exceptional cases.[12]

3. Integration of the firm with the defined benefit plan

Despite the fact that the firm and its DBPs are separate legal entities, it is arguable whether the laws governing the interaction between the corporate sponsor and its DBP prevent the integration of the entities' balance sheets. In fact, the current legislation supports their integration, because firms are liable for all promised pension benefits. Whether paid out of cash flows or bankruptcy proceeds, the pension liability is senior to the claim of all lenders. Plan assets, although legally segregated and under the control of a trustee, also behave as corporate assets. Appreciations and depreciations in the value of the pension assets flow to the shareholders of the sponsoring company in the form of smaller or larger contributions.

[12]For example, SFAS 132 requires ABO to be reported by companies whose pension plan assets fall below ABO, i.e., companies that are required to report a minimum liability adjustment on the balance sheet.

Additional retirement benefits can be offered in exchange for lower current salary increases. The resulting financial slack can be used for reinvestment, dividends, share repurchases, or debt reduction. Companies also can access excess pension assets through plan terminations or conversions to cash balance plans[13]. In short, pension assets and pension liabilities behave as corporate assets and liabilities. Related to their governance, ERISA stipulates that the trustees of these plans be appointed by the plan sponsor. Trustees have a fiduciary duty to the plan participants, but their performance is subject to strong industry pressures. It is therefore clear to individual and institutional trustees that their continued employment is at the discretion of the plan sponsor. In other words, the corporate pension plan has many of the features of a fully owned financial subsidiary.

Several empirical studies support this economic view on pension plans. For example, Feldstein and Morck (1983), Landsman (1986), Barth (1991), and Barth, Beaver, and Landsman (1992) provide evidence that the market behaves as if pension assets and liabilities are corporate assets and liabilities. Barth (1991) examines which measure of the pension liability best reflects investors' expectations. She finds that the fair market value of assets and PBO exhibit significantly less measurement error than the amounts presently recognized on balance sheet. Barth, Beaver, and Landsman (1992) examine whether market participants assign different coefficients to pension cost components when determining security prices. They find that pension cost coefficients differ from one another and that the disclosure of separate components of costs is incrementally informative on the firm's permanent earnings potential. Franzoni and Marin (2006) provide more recent evidence that the market does not anticipate the implication of current underfunding for future earnings and cash flows. Mistaken

[13]See, for e.g., Petersen (1992).

Recognizing that pension plans are essentially financial subsidiaries of the firm has several capital structure implications. First, it would be inappropriate to account only for the net pension asset or liability, because nowhere else on the balance sheet assets and liabilities are netted against each other, independent of the degree of immunization of the liabilities[14]. Second, unless the pension plan has a ratio of pension liabilities to pension assets below the sponsoring company leverage ratio, consolidated leverage will always be larger than the reported leverage.[15] Third, the understatement of the leverage ratio increases with the size of the pension plan relative to its sponsor. Systematic differences in leverage ratios resulting from pension plans can potentially severely bias capital structure tests. Sponsoring companies are expected to be more leveraged on consolidated accounts, after the integration of corporate pension plans on their balance sheets as fully owned subsidiaries.

The tax treatment of pensions is directly linked to the capital structure debate on underleveraged capital structures. Sponsoring companies can use their discretion over the amounts of contributions to their pension plans, while simultaneously holding accounting earnings constant. By optimally timing their pension contributions companies can lower their marginal tax rates, therefore diminishing the tax incentives of debt. Pension contributions can be thought of as the equivalent of interest payments on debt[16].

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[14]Accounting only for the net position of the pension plan would also mask the company's pension exposure. Two companies, otherwise identical except the size of their pension plan, could report similar level of underfunding, and show an identical impact on the balance sheet. Nonetheless, the company with the large pension plans is definitely more exposed to market movements (even without accounting for any potential differences in the volatility of assets and liabilities of the pension plan).

[15](D+PL)/(A+PA)>D/A $\Leftrightarrow$ PL/PA>D/A where D=Reported Book Debt, PL=Pension Liabilities, A=Corporate Assets, PA=Pension Assets. For instance, a fully funded pension plan with PA=PL will always increase leverage.

[16]Contributions to a DBP are different from contributions to a DCP because they are paid towards an "obligation that leaves little or no discretion to avoid a future transfer of assets". A salary payment (or similarly, a contribution towards a 401k account), creates no liability according to FASB definition because there is no

The tax shield provided by pensions complements the tax shield provided by interest payments on debt, adding more support for the tradeoff theory. According to the static version of the tradeoff theory of capital structure, firms choose target debt ratios by trading off the tax benefits of debt against its costs. Whereas the benefits of debt are believed to be large due to the tax shield provided by interest deductions, there is no consensus on the size of the costs of debt, although they are believed to be small.[17] Graham (2000) estimated that the typical firm could double its tax benefits by leveraging up to the point where the marginal tax benefit begins to decline. The pension obligation is a binding, long term obligation towards the employees that has most of the characteristics of debt. Provided that defined benefit plans are large relative to their sponsors, important tax savings are potentially derived through the corporate pension plans. If pension liabilities are treated as long term debt and pension contributions as the interest paid on this debt, the underleverage gap is expected to diminish.

The tradeoff theory predicts that firms have optimal capital structures. If pension liabilities are substituting for debt, then, companies sponsoring larger pension plans should use less debt financing then similar companies sponsoring smaller pension plans.

Hypothesis: Relative to the set of non sponsoring companies, firms with large pension obligations undertake less debt.

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obligating event. If the employee leaves the company, the obligation to pay a salary disappears, while the pension obligation remains.

[17] See, e.g., Opler and Titman (1994), Andrade and Kaplan (1998).

While the institutional setting of pension liabilities supports their integration into corporate liabilities, it is less clear whether corporate managers treat the pension obligation as a perfect substitute for debt. Nevertheless, a negative relationship between pension debt and book debt would provide evidence that firms consider DBPs when making capital structure decisions. This would be consistent with Rauh (2004), who finds that large required contributions affect investment policy, and also with Frank (2002), who finds a positive relationship between DBPs' assets allocation in bonds and the firm's tax benefits.

4. Data and consolidated balance sheet issues

4.1 Data

The primary source of data in this analysis is Compustat's Industrial (INA), Full Coverage (FCA) and Research (RES) files. This study covers the period 1991-2003, beginning with the year data on the pension cost component became available in Compustat and continuing through to the last year of available data as of the commencement of this study. Sponsoring pension plans are identified depending on whether pension assets and pension liabilities are reported.[18] Since the focus of this paper is on capital structure ratios and taxes, I exclude utilities (SIC code 49), financial firms (SIC codes between 60 and 64), and all firms with insufficient information to calculate leverage ratios. The first sample has 17,191 firm-year observations for sponsoring companies and 60,127 firm-year observations for non sponsoring companies. Untabulated results show that defined benefit plans are sponsored by industrialized and large, unionized companies such as automobile and construction materials

[18]Until 1998, sponsoring companies were required to disclose information separately for underfunded and overfunded plans. The aggregate level of pension assets is calculated as the sum of Pension Plan Assets of Overfunded Plans (Data287) and Pension Plan Assets of Underfunded Plans (Data296). The expected pension liabilities are calculated as the sum of the Pension Projected Benefit Obligation of Overfunded Plans (Data286) and the Pension Projected Benefit Obligation of Underfunded Plans (Data294).

manufacturers, and DBPs are less prevalent in newer industries such as internet software and telecommunications services. Despite a general increase of standard and distressed plan terminations in the recent years relative to the number of adoptions, the number of pension sponsoring companies is still large. Almost two thirds of the S&P500 firms currently sponsor corporate pension plans.

The magnitude of corporate pension plans is significant relative to the size of the sponsoring companies (table 1). The aggregate ratio of plan assets to operating assets is on average 17.5% over the sample period. The number of sponsors decreases slightly over the period, from a peak of 1,430 sponsors in 1996 to 1,107 in 2003. Relative to total book debt, the pension liability is, on average, about 30%. Calculated as a percentage of adjusted operating income (EBIT plus pension cost), pension contributions account for 3.9%, while interest payments account for 11.8%. Another relevant ratio is the size of the contribution relative to the interest payment. Since some firms do not have long term debt on their balance sheet, I split the data depending on the availability of the interest on debt. The average ratio between the pension contribution and the interest on debt averages 81% for the subsample of interest paying firms.[19]

A second sample is used in the simulation of marginal tax rates (MTRs). The data are also extracted from Compustat, but different filters are applied. I require that sufficient current and past data exist in order to simulate taxable income. The second sample comprises 18,558 firm-year observations for sponsoring companies and 61,524 firm-year observations for non sponsoring companies and does not necessarily overlap with the first sample.

[19]Only companies with reported interest on debt greater than $10,000 are considered. When modifying this restriction to $100,000, the ratio between pension contribution and interest changes to 63%. Also, note that the reported ratio of the contribution to the interest is calculated as a cross sectional average of the ratio rather than the ratio of the cross sectional means of the contribution and interest expense.

4.2 Reported and consolidated leverage

I create consolidated balance sheets by integrating off balance sheet pension assets and liabilities with the reported corporate assets and liabilities. I proceed by identifying the few pension items already reflected on the balance sheet. The prepaid pension cost represents the cumulative employer contributions in excess over accrued net pension cost. The accrued pension cost represents cumulative pension cost in excess of employer's contributions.[20] If a company sponsors only one pension plan, one of these two items appears on the balance sheet. For severely underfunded plans, where ABO exceeds the fair value of assets, FASB mandates a minimum balance sheet liability (AML) equal to their difference. The increased liability is directly reflected in the accrued pension cost, and it is offset by an increase in intangible assets. However, if the unrecognized prior service cost is below the AML, the difference is directly charged to equity (as part of the comprehensive income).[21] The numbers shown in the pension footnote are pretax amounts. The actual charge to shareholders' equity is taken on an after tax basis, with the difference charged to deferred taxes. Where the AML data are available, I calculate the deferment as the disclosed AML times the maximum statutory rate and add this amount to total liabilities.

In panel C of table 1 I provide an example of how the adjustment process should be carried out (General Motors, 2001 year end balance sheet). GM sponsors a large pension plan, with pension assets that equal 23% of the company assets, and liabilities that equal approximately

[20]If prepaid pension cost (Data290) and accrued pension cost (Data300) were available for a firm, then both items are used separately to adjust the balance sheet. After 1998, only the net amount is reported, and consequently this was the amount used for adjustment.

[21]The presumption is that the serious underfunding resulted from "sweetened benefits" to maintain the employee morale.

28% of reported liabilities. The plan is severely underfunded, and consequently an AML adjustment takes place. While the balance sheet pension accounts show only a pension deficit of $3.30 billion (the net amount between prepaid and accrued pension cost), the pension plan is in fact underfunded by $12.6 billion.[22] The net worth of the company vanishes once GM acknowledges its pension liability towards its employees.[23] The book leverage ratio rises from 39% (unconsolidated) to 53% (consolidated) and a more leveraged company emerges from the consolidated balance sheet.

In this paper, leverage ratios are calculated on reported (balance sheet) and consolidated accounts. Book leverage is calculated as the ratio of long term debt to the book value of assets. Long term debt is calculated as the amount of obligations due more than one year from the company's balance sheet plus the current portion of the long term debt.[24] Market leverage is calculated as the ratio of long term debt to the market value of the company. Market value of assets is defined as the book value of assets, minus book equity plus the market value of equity On consolidated accounts, I treat the pension liability (PBO) as a

[22]According to current accounting rules, GM recognized on the balance sheet pension-related assets, of about $32.9 billion at the end of 2005, while other post-retirement benefits, such as health care expenses for retirees, of about $34.1 billion liability. These amounts do not correspond to the assets and liabilities in GM's plans - a disconnect that FASB plans to change starting with all fiscal years beginning after December 15, 2006. According to the new rules, GM will have to show on the balance sheet the current level of underfunding of $4.6 billion on its pension plans and $64.5 billion on its other post-retirement benefits.

[23]For expositional purposes the amounts are retrieved from year 2001 annual report. Compustat database provides only the net value of the recognized asset (liability) and the AML. Leverage ratios are similar when calculated based on netted amounts. The contention is that on aggregate, while small differences in leverage could occur due to differences in reporting between Compustat and the actual annual reports, no systematic error will be made.

[24]Relative to lease financing, the paper incorporates all capital leases as long term debt, as most of them are treated as true leases (i.e. debt) for tax purposes. With true leases the lessor purchases the asset and deducts both the depreciation and the interest from taxable income. While capital leases are already integrated onto the balance sheet, operating leases are off balance sheet items. This paper does not integrate operating leases because the issue of whether debt and operating leases are substitutes is still debatable.

long term liability. Book equity is redefined as consolidated assets minus consolidated total liabilities.

Reported and adjusted leverage ratios are reported in table 2. Both book and market leverage ratios increase after adjustment by about 35%. Book leverage increases from 0.26 to 0.35, while market leverage increases from 0.20 to 0.27. The differences between reported and consolidated leverage for the subset of sponsoring firms are shown in figure 2. Differences are always negative, because leverage increases almost by definition once a fully owned subsidiary is integrated (see footnote 16).There is a sharp increase in consolidated leverage over 2002-2003, when firms reported record levels of underfunding. Although on aggregate, pension plans were also underfunded in 1993 (see figure 1), they were probably less exposed to market movements because they had a smaller proportion of their portfolios weights invested in equities. Overall, while sponsoring companies derived important tax benefits from debt relative to non sponsoring companies, they also realized important tax savings from sponsoring corporate pension plans (table 2 and figure 2).

Sponsoring firms differ from non sponsoring firms on several other dimensions (table 3, panel A). Sponsoring companies are larger (as measured by book assets) and more profitable, with fewer investment opportunities (low market to book ratios), fewer intangible assets and more collateral, lower bankruptcy risk, and higher marginal tax rates. These are characteristics that are also shared by firms with large amounts of debt in their capital structure (table 3, panel B). This provides preliminary evidence that pension liabilities and debt are similar financial instruments. It is also relevant to note that although sponsoring companies appear to be more levered than the set of non-sponsoring companies (table 3,

panel A), their marginal tax rates (before and after financing) are larger, suggesting that these companies are more underlevered, and leave more tax benefits on the table than the rest.

5. Refinement of marginal tax rates and recalculation of the tax benefits of debt

5.1. Research design

Graham (2000) quantifies the tax advantage of debt at the firm level. He defines the tax benefit function as a series of marginal tax rates, each corresponding to a specific level of interest deductions. If firms balance the tax benefits of debt against the cost of financial distress, as predicted by the tradeoff theory, firms should operate on the downward sloping part of their tax benefit functions. Graham's study finds that firms use debt conservatively and that, during 1980-1994, the typical firm could add 15.7% to the firm value by leveraging up to the point where the tax benefit function starts declining. Extending the analysis several years into the future, he suggests that the typical firm could have added interest deductions with tax benefits equal to 10.4% of firm value, above their current level of tax benefits, during 1990-1999.[25]

I simulate marginal tax rates (MTRs) following the same methodology as in Shevlin (1990) and Graham (1996a, 1996b, 2000, 2004) but modified for the tax treatment of pensions. The marginal tax rate calculation relies on the simulation of taxable income, which is neither disclosed nor easily inferred. There are several reasons why taxable income does not equal financial accounting earnings, such as the impact of deferred taxes, stock options and tax credits. A good review of the book to tax income differences is provided in Hanlon

[25]In his survey paper, Graham (2003) extends his previous calculation of tax benefits of debt over 1995-1999 (footnote 12). When combined with the results in Graham (2000), the average value loss due to conservative debt policy amounts to approximatively 10.4% of firm value over the period 1990-1999.

(2003). Graham, Lang, and Shackelford (2004) examine the effects of expensing stock options on marginal tax rates on the subset of S&P100 and NASDAQ100 firms. Although options granted or to be granted are not considered debt-like instruments for a company because of their uncertain exercise, the pension liability is a long term commitment to the employees.[26] The subsequent analysis is based on the premise that sponsoring companies achieve tax benefits from two sources of debt: bondholders, and employees (through the pension contribution). The consolidated (aggregate) interest expense is therefore calculated as the sum of the regular interest expense and the pension contribution.

In addition, the accounting treatment of pensions introduces another divergence between accounting income and taxable income, a feature that has not been previously considered. Pension cost (or income) is included as an operating expense, and therefore is a component of income before interest and taxes. Despite its financial accounting treatment, it is not deductible for tax purposes. Only the pension contribution receives a favorable tax treatment. While differences between pension cost and pension contributions contribution deepen the difference between taxable and accounting income it is in fact the contribution that affects MTRs. Firm's discretion over pension contributions affects the timing of tax payments.

Appendix 1 explains in detail the simulation of MTRs. Marginal tax rates are defined as the present value of the tax obligation from earning an extra dollar today. Taxes are not paid in all states of nature, and given the possibility of carrying losses backward or forward, the probability that taxes will be paid in the future must also be considered. The dynamic nature of the tax code as well as the uncertainty about future earnings renders any current proxy for MTRs (such as taxes paid) ineffective. A forecasting model of earnings is required, and I

[26]Although the exercise of the stock options creates corporate income deductions, it is difficult to argue that stock options can be integrated into the balance sheet in the same manner pension plans can.

adopt the standard approach of assuming that earnings follow a random walk with drift. I calculate the adjusted operating income as the accounting earnings plus the reported pension cost, minus grossed up deferred taxes, plus interest expense, minus the contribution expense[27]. In general, EBIT as reported in the income statement overstates (understates) the true operating income when the pension expense is below (above) the pension contribution. Pension contributions are estimated as the pension expense (income) less the change in the balance sheet liability, where the change in the balance sheet is calculated as the closing balance addresses sheet liability (assets) minus the beginning balance sheet liability (asset).[28] An example of this calculation is provided in Appendix 2, for AMR Corporation (the parent of American Airlines).

I refine the marginal tax rate calculation using three different measures: MTR_{none} is calculated before aggregate financing (debt or pension), MTR_{int} is calculated after debt financing, and MTR_{all} is calculated after aggregate financing. Due to the book tax difference introduced by pension treatment, none of these measures is directly comparable with Graham's (1996a, 2000, and 2004).

I proceed by calculating the tax benefits of aggregate debt by integrating the area below the benefit function up to the point of the aggregate interest expense. The present value of tax benefits from current and future deductions is calculated under the assumption that tax shields are perpetual, using Moody's average bond yield as a discount rate. I also follow

[27]Relative to operating leases, I follow the same approach as in Graham, Lemmon and Schallheim (1998) and add back one third of the rental expense to earnings in order to account for the proportion of the rental payment that is not due to depreciation. Interest expense is calculated as data15 plus 1/3 of data47.

[28]More specifically, pension contributions are estimated as sum between Pension cost (Data295) plus the change in the Prepaid/Accrued Pension Cost (Data290). Where the calculated pension contribution appears to be negative, it is assumed to be zero. Note that Compustat reports the Balance Sheet Recognized Amount as Prepaid/Accrued Pension cost (the two items are generally different if an AML exist). An example is provided in Appendix 2 while section 7 describes potential biases.

Graham's (2000) convention of defining the point where the MTR function starts declining as the "kink". More specifically, the kink is defined as the ratio of the amount of interest required to make the tax function slope downward to actual interest expense. The kink increases with debt conservatism. A kink greater than one implies that the company could derive a tax shield equal to the statutory rate, for an additional dollar of interest deduction.

5.2. Simulation results

The importance of pensions in the MTR calculations is highlighted in the following example (figure 3). Pepsi Bottling Company sponsored a large pension plan that was severely underfunded at the end of 2002. Due to a large deficit reduction requirement, the pension contribution greatly exceeded pension cost in 2002 and was also expected to be large in the next few years. Its effect on current and expected future income is reflected in lower marginal tax rates. The consolidated interest expense (pension contribution plus interest expense) also shifts to the right, highlighting the additional tax benefits associated with pensions. The size of the tax benefit associated with the pension plan is calculated by integrating the area below the tax benefits function calculated with pensions and in between the debt interest expense and the aggregate interest expense. While Pepsi Bottling Group shows slightly smaller tax benefits of debt due to lower MTRs, the total tax savings from pensions are quite large. Similar to any voluntary deductions, there is a tradeoff between high deductions at low MTRs and low deductions at high MTRs.

It is important to note that the company operates on the downward part of the tax benefit function (point C), whereas before accounting for pensions the company was operating on

the flat segment of its tax benefit function (point A), which would have qualified it as conservative in its debt policy.

The aggregate effect of pension contribution deductibility on marginal tax rates is shown in table 4 and figure 4. The mean difference between MTR_{int} and MTR_{all} is economically small (less than 1%). There are two potential explanations for this finding. First, while taxable income will always be smaller than accounting income when firms disclose a pension income[29] or contributions above the pension expense, firms can contribute less than the reported cost, in which case the relation between taxable and accounting income reverses. On average, this can result in an insignificant change in MTRs. Second, sponsoring companies are large, industrialized companies with high historical return on assets. Their marginal tax rate curve is flat even for significant deductions, in which case pension contributions are not sufficient to decrease MTRs. These companies most likely still operate on the flat segment of their tax benefit functions even after taking pensions into account.

On aggregate, the tax benefits derived from pensions are important (table 5). The ratio of the present value of tax benefits from aggregate debt to balance sheet debt is 1.47, while the ratio of pension contributions to the interest expense is 1.59[30]. Firms appear to be less conservative with their debt policy once pension liabilities are accounted for. The capitalized tax benefits of debt, expressed as a percentage of firm value are reported in table 6. Tax savings associated with pensions amount to 3% of book assets and 2% of the market value of the firm. Pensions increase tax savings by 26% (see figure 5). Using the kink as a measure of

[29]Firms reporting high accounting earnings can in fact pay little taxes in this instance. Similarly, firms making large contributions to the pension plans, higher than the calculated pension cost, decrease their tax bills significantly.

[30]The ratio of 1.59 differs from 1.81 as reported in table 1 because of the differences in the two samples. The first sample focuses on leverage ratio and consolidated balance sheet issues, whereas the second sample relies on the availability of data required to simulate taxable income.

the level of underleverage, I find that the underleverage gap is reduced by31% [31] as measured by the change in kink (table 3 and 5). The higher level of the aggregate interest expense, combined with the effect of the pension contribution on MTRs, diminishes the potential tax benefits from the issuance of additional debt, narrowing the underleverage gap[32]. It is important also to contrast this result with the percentage change in the kink of about 20% that Graham, Lang and Shackelford (2004) attribute to stock option deductions. Pension contributions appear to be at least as important as stock options in explaining underleverage.

It is interesting that although the tax benefits for the average firm increase by 25% to 27% (table 5), the present value of the tax benefits adds 2% to 3% to the firm's value, which is about one fourth of the potential tax benefit of debt for a typical firm during the 1990s. A Pearson correlation matrix of the percentage change in tax benefits and several firm characteristics shows that among the group of firms with pension plans, the largest benefits are achieved by big firms with lower leverage.

6. Interdependence between the pension liability and the balance sheet debt

6.1. Econometric model

In this section I examine the relationship between the size of the pension liability and the amount of balance sheet debt. Treating corporate pension plans as wholly owned subsidiaries suggests some degree of substitutability between the two obligations. In the tradeoff theory framework, firms set target capital structures after balancing the costs against the benefits of their different debt obligations. Pension debt and balance sheet debt provide similar tax

[31]Underleverage is calculated as the kink minus 1. The change in underleverage is therefore calculated as [(2.0-1.0)-(1.7-1.0)]/(2.0-1.0).

[32]Note that the kink will always decrease after accounting for pension, because contributions are always positive.

incentives while having a similar impact on the probability of financial distress. Companies sponsoring relatively large defined benefit plans should therefore have lower balance sheet debt.

Nevertheless, prior research suggests that firms care about balance sheet treatment and very often structure transactions to keep liabilities off balance sheet. For example, Shevlin (1987) suggests that firms use off balance sheet financing (R&D limited partnerships) to avoid the possible cost of bond covenant violations. Engel, Erickson, and Maydew (1999) find that firms incur substantial costs in order to manage their balance sheets when they reclassify debt into trust preferred stock.[33] For similar reasons, managers of pension sponsoring companies might not treat contingent pension liabilities as a perfect substitute for contractual debt liabilities, and therefore they might undertake more debt in their capital structure than the theory would predict.

The decision to become or to remain a pension plan sponsor generally coincides with the choice of a balance sheet capital structure. Since not all companies have the potential to sustain current and future required contributions or to cope with the volatility of pension assets and liabilities, the self selection process needs to be integrated into the econometric framework. To test the importance of pension liabilities in capital structure decisions, I propose the following model:

$$DBP_{it}^{*} = a_0 + a_1 Z_{1t} + a_2 X_{1t} + \varepsilon_{it} \qquad \text{(Self selection equation)}$$

$$DBP_{it} = 1 \text{ if } DBP_{it}^{*} > 0 \text{ and } DBP_{it} = 0 \text{ if } DBP_{it}^{*} \le 0$$

$$DBP_{it}^{*} > 0 : PENSION_{it} = c_1 + c_2 * X_{2t} + \nu_{it} \qquad \text{(Pension benefits equation)}$$

[33]Trust preferred stock, first issued in 1993, was designed to be treated as preferred stock for financial purposes and as debt for tax purposes (i.e., payments on trust preferred stock are deductible by the issuer).

$$LEV_{it} = b_1 + b_2 * DBP_{it} + b_3 * DBP * PENSION_{it} + b_3 X_{3t} + \eta_{it} \qquad \text{(Capital structure equation)}$$

where the latent variable DBP_{it}^{*} is the expected net benefit from sponsoring the corporate pension plan, $PENSION_{it}$ is the expected pension obligation (normalized by consolidated assets), and LEV_{it} is the long term balance sheet debt (normalized by consolidated assets). The error terms ($\varepsilon_{it}, \nu_{it}, \eta_{it}$) are assumed to follow a multivariate normal distribution. While the capital structure equation is the focus of the analysis, the self selection equation eliminates any selectivity bias concern and the pension benefits equation controls for any endogeneity issues between the balance sheet debt and pension debt.

The net benefit of sponsoring a pension plan is unobservable, and therefore the selection equation cannot be directly estimated. However, firms become sponsors when the net benefit is positive and choose not to become sponsors when the net benefit is negative, a binary choice that is observable. Consequently, I define the binary variable DBP_{it} as equal to one when a pension plan is adopted and zero otherwise.

The structure of the model is common to many labor economics applications (see, for instance, Killingworth (1983), Killingworth and Heckman (1986), and Mroz (1987)).[34] The estimation procedure is summarized as follows. In the first stage, I jointly estimate the net benefit of sponsoring a DBP and the size of pension benefits in a *self selection model* framework, using a Heckman two-stage procedure (and alternatively maximum likelihood). The set of independent variables X_1 and Z_1 are separated out based on their inclusion in the pension benefit size equation. Z_1 is a vector of identification variables in the selection

[34]One classic application of this methodology in labor economics focuses on the estimation of the individual supply of hours of work, given their participation in the work force and the endogeneity of wages.

equation, whereas X_1 is a vector of independent variables being used in both the selection and the pension benefit size equation. Fitted values of pension benefits are, therefore, derived from a selectivity-bias corrected pension benefit equation. In the second stage, I jointly estimate the net benefits of being a pension plan sponsor and the amount of debt undertaken on the balance sheet in a *treatment effects model*, using predicted pension benefits instead of actual pension liability. The variable LEV_{it} is modeled as a function of the binary choice DBP_{it}, the predicted level of the pension obligation $PENSION_{it}$ and the observed variables X_3.

The methodology described above corresponds primarily to the two-stage least squares (2SLS) technique to correct for endogeneity, except for the self selection adjustment. As in the case of the 2SLS, this procedure generates incorrect estimates of the variance-covariance matrix because the estimate of the error term variance is computed using residuals calculated with estimated, rather than actual values of the endogenous variables. In order to correctly estimate standard errors, the entire system of equations is bootstrapped.

6.2. Empirical results

In this section, I describe the variables as well as the results of the estimation. Early work on the motivation to sponsor defined benefits plans focused on labor incentives. Ippolito (1985) found that defined benefit plans create strong incentives for workers to remain with the firm because they suffer wealth losses if they quit early. Mitchell (1982), and Shiller and Weiss (1979) found that sponsoring firms have low employee turnover. Industries that require more human capital investment in their employees that is not easily transferable are more likely to adopt a defined benefit plan. I use the sponsor's industry two-digit SIC code to control for the labor market characteristics faced by the firm. The number of employees also

plays an important role in both the selection of the plan and the size of benefits, because of the large fixed cost entailed by such a decision.

In a related study, Petersen (1994) examines the role of operating leverage in the firm's pension choice. He finds that financial characteristics of the sponsor influence the type of pension plan offered by the company. Although companies are more flexible in making payments towards their pension obligations, minimum required contributions still restrict their flexibility, similar to interest payments on debt. Therefore both the level and the volatility of the firm's profitability should influence the amount of retirement benefits offered to the employees. If the costs of financial distress resulting from the less flexible cost structure imposed by minimum pension payments are large, firms are more likely to substitute DBPs for DCPs. To address this issue, I include the market to book ratio (proxy for growth opportunities)as an explan atory variable in predicting pension plan choice and size.

Older plans are more likely to accumulate more pension benefits, and therefore I include in the pension size equation the age of the plan, as proxied by the number of years with available pension data on Compustat. To incorporate the aggregate shift from defined benefit plans to defined contribution plans, I also include in the estimation the year the firm adopted the plan.

While the identification of the system could be achieved through the nonlinearity introduced by the maximum likelihood estimation of the selection equation, exclusively relying on the functional form could lead to very imprecise estimators. The degree of unionization in the industry is an appealing instrument in the pension selection equation. An organized labor force has negotiation power over the adoption of a pension plan and can

hinder the termination of a corporate pension plan. However, the percentage of unionized workers should be uncorrelated to the size of pension benefits.

The results of the selection model estimation are presented in table 6, panel A. As expected, firms are more likely to adopt a pension plan when they come from more unionized industries and when they have a larger labor force. These firms also have larger returns on assets (ROA) and have less volatile cash flows. Surprisingly, the size of pension benefits is negatively related to profitability. Therefore, while sponsoring companies appear to be more profitable on average, large pension obligations negatively affect the profitability of the enterprise, possibly because large cash outflows are diverted from the main activity of the company. The age of the plan has the predicted sign and is significant; however the year of adoption does not affect the size of benefits. Predicted values for the pension liability size are calculated and used in table 6 panel B in order to correct for the potential endogeneity between book and pension debt.

The treatment effects model, which is estimated in table 6, panel B, is the main focus of this section. The model captures the effect pension obligations on the amount of debt issued by the sponsoring company. Besides the pension choice variable, *DBP*, and the predicted pension liability, $\hat{PENSION}$, several other factors that the literature has found important in capital structure decisions (Graham (1996a), and Rajan and Zingales (1995)) are used as explanatory variables: the marginal tax rate before financing, the size of the firm as proxied by book assets, the market to book ratio, the *ex-post* probability of distress as proxied by *ZSCORE*[35], the operating profit volatility, and the level of tangible assets.

[35]ZSCORE is a modified version of the Altman's (1968) Z-score. A high level indicated a low level of financial distress. It is calculated as (3.3*data170+data12+1.4*data36+1.2(data4-data5))/data6.

I find a negative and significant coefficient on pension liabilities equal to -0.36, suggesting that pension liabilities are important in capital structure decisions. However, the estimated coefficient is less than 1, implying that managers only partially substitute book debt for pension debt. There are several potential explanations for this finding. One possibility is that the disclosed measure of the pension liability is a very noisy measure of the true liability, and therefore the coefficient could be biased downward. Alternatively, it could be the effect of the insurance protection provided by the Pension Benefit Guarantee Corporation in case of financial distress, because a company in bankruptcy proceedings holds a put option on these liabilities. Pension accounting also gives managers considerable discretion to manipulate earnings and issue equity on more favorable terms, diluting the effect of pension liabilities on balance sheet debt. As previous research has suggested, firms care about balance sheet treatment and very often incur substantial costs structuring transactions that keep liabilities off balance sheet. For these reasons, managers of pension sponsoring companies might not treat contingent pension liabilities as a perfect substitute for contractual debt liabilities, and therefore they might undertake more debt in their capital structure than the theory would predict.

Pension items as disclosed in Compustat provide combined figures for both domestic and foreign pension plans. In most countries, pension plan contributions are deductible in the place where they are originated. However, differences in the tax code or in the legal environment could affect the weight that the parent company place on these pension obligations. This issue is not specific to pensions, but it is common to most financial disclosures of multinational companies (e.g. interest on debt[36]). While domestic and foreign

[36]Most studies assume that the total interest expense can be deducted from earnings, although tax rules require multinational firms to allocate a portion of interest expense to their foreign income.

subsidiaries are consolidated for financial reporting purposes, they are subject to different rules for tax purposes. To check whether foreign pension liabilities are treated differently for capital structure purposes, I separate companies that have at least 10% of their sales coming from their non-domestic geographical segment[37]. I interact Dummy (Foreign Income) with predicted pension liabilities. The results are presented in Table 5, panel B. The results confirm that pension liabilities for companies with both domestic and foreign pension plan have a lower impact on the debt policy of the parent (the coefficient is -0.412+0.137= -0.275).

7. Limitations

The interpretation of the results is conditional on a few caveats. First, measurement error in the pension liability limits the analysis on consolidated leverage ratios. Nonetheless, any capital structure test that relies on the use of book debt leverage ratios is subject to the same criticism. In addition, the few pension items being reflected on the corporate balance sheet (e.g., prepaid pension cost, accrued liability, and intangible assets) are very often disclosed as a net amount, impeding the accounts consolidation. Despite these limitations, the recalculation of the MTRs and of the tax benefits associated with pensions relies on the level of pension contributions and it is unaffected by the assumptions embedded into the projected benefit obligation. Second, as in all papers that rely on the estimation of taxable income, the calculation of MTRs is affected by unobservable deductions. Third, because the current pension disclosure is for the consolidated company, it is not possible to separate out foreign

[37]While this makes intuitive sense, I calculate the correlation between the ratio of foreign to domestic contributions and the ratio between foreign to domestic sales for the subset of companies from S&P100 that sponsor foreign pension plans. The Pearson correlation coefficient is 0.30 and statistically significant.

pension plans that are subject to foreign pension regulations and not ERISA. Finally, this paper does not address the personal tax penalty on holding bonds.[38] However, while investors might be tax disadvantaged when buying bonds, the before tax interest income from pension plan investment in bonds flows through the income statement of the sponsoring company and it is taxed at the equity income rate.

To address concerns related to the use of Compustat database for accounts consolidation or for the estimation of pension contributions, I compare Compustat with two alternative data sources. As a robustness check, data is hand collected for all companies included in S&P100 index in 2003. 85 companies out of 100 sponsor defined benefit plans and only 25 have foreign pension plans. The first alternative source is the 10-k footnote disclosure on defined benefit plans. SFAS 132 (1998) requires employers to explicitly disclose contributions made to all pension plans during the fiscal year, as well as a detailed description of the calculation of any balance sheet recognized amount. The same accounting standard requires that foreign plans not to be combined with any U.S plans.[39] Calculated on this more refined description of accounts, consolidated book leverage appears to be 100 basis points larger than when calculated using the condensed data in Compustat while the consolidated market leverage remains unchanged. Estimated contributions appear not to be significantly different from those that are hand collected[40]. The other alternative data source for pension contributions is

[38]Interest income is taxed as ordinary income, and therefore investors require higher returns for holding debt relative to equity. This provides a disincentive to issuing more debt at the corporate level and partially offsets the corporate tax advantage to debt.

[39]Unless the benefit obligations of foreign pension plans is insignificant relative to the total benefit obligation and those plans use significantly different assumptions.

[40]The largest differences between estimated contributions and 10-k disclosed contributions are due to coding errors in Compustat. AML (additional minimum liability) is often missing in Compustat. Also, three coding errors have been discovered on the recording of the prepaid/accrued pension cost during 2002. Other possible

Form 5500 which is filed by each sponsor with the Department of Labor for each plan individually. While contributions on these forms would provide the exact amounts that are tax deductible at plan level, identifying all pension plans corresponding to a consolidated entity (or the fiscal year contributions are applied to) is difficult[41]. On the subsample of firms for which the data is hand collected, only 58 companies out of 85 could be found, and for this subset the aggregated level of contributions is statistically different from that collected from 10-k statement. But more importantly, identifying the component of the pension cost (income) that would correspond to these plans is not disclosed in these forms and this is an important component in the MTRs' calculations.

8. Conclusion

This paper provides evidence that firms are less underleveraged once off balance sheet assets and liabilities are integrated into the balance sheet. Consistent with the pension literature that argues that property rights for pension assets and liabilities lie with the firm, I integrate pensions into the corporate balance sheet as fully leveraged subsidiaries. I regard the pension liability as a long term binding obligation of the firm, similar to long term debt. Pension contributions are also regarded as the equivalent of interest payments on debt from a tax perspective.

I examine the effect of pension contributions on marginal tax rates and the magnitude of tax benefits derived from pensions. Following the methodology described in Shevlin (1990)

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deviations from the actual amounts are due to foreign exchange rates or acquisitions, but these items are not disclosed.

[41]After 1998, Form 5500 can only be linked to Compustat through the EIN (employer identification number). The sponsoring entity could be a controlled subsidiary choosing to file taxes separately from the parent (therefore having a different EIN). Subsidiaries that are at least 80% owned by the parent have the option to file for taxes separately, while still consolidated with the parent company for financial purposes. Another complication arises when the plan year is different from the fiscal company.

and Graham (2000), I recalculate marginal tax rates, accounting for the tax treatment of pensions. Since pension cost is reported as a component of operating income but is not deductible for tax purposes, pension accounting introduces another source of divergence between accounting income and taxable income.

I find that firms are significantly more leveraged on consolidated financial statements, and that the size of pension plan contributions is 59% of the size of interest payments on debt. The tax benefits of debt increase by 47% once pensions are taken into account. Pension contributions account for 2% of the market value of the company, an increase of 26% from the amount accounted by interest deductions. I estimate that the underleverage gap closes by 31% once pension assets and liabilities are considered.

This study complements Graham, Lang, and Shackelford (2004), who find significant effects of stock option deductions on marginal tax rates for NASDAQ 100 firms, the most profitable and stable among the high growth technology firms. By contrast, this study examines pension plan sponsors, which are also large, profitable firms from stable industries, with fewer growth opportunities.

Finally, I examine whether corporate managers treat pension obligations as corporate liabilities. I find that a 1 percentage point increase in the pension liability to total assets ratio is associated with a 0.36 percentage point decrease of debt to total assets ratio. This finding provides evidence that firms integrate their pension plans into their corporate financial policy, and it is consistent with Rauh (2004) and Frank's (2002) empirical results.

Overall, the results contribute directly to the debate on corporate capital structure and imply that once pension obligations are taken into account, firms are significantly less underlevered than previous estimates suggest. Further, since pension obligations vary

systematically across companies and are prevalent among large and stable companies, failure to incorporate these off balance sheet liabilities can induce biases in tests of capital structure theories.

Appendix I:

Estimation of the corporate marginal tax rate

Marginal tax rates are simulated following the same methodology as in Shevlin (1990) and Graham (1996a, 1996b, 2000, 2004). Marginal tax rates (MTRs) are defined as the present value of the tax obligation from earning an extra dollar today. MTRs are affected by the uncertainty of future earnings, by certain provisions of the tax code (e.g., the possibility to carry losses back and forward) and by the progressive nature of the statutory tax code. The dynamic nature of the tax code as well as the uncertainty about future earnings renders any current proxy for MTRs (such as taxes paid) ineffective.

I adopt the standard approach and assume that earnings follow a random walk with drift.[42] Reported earnings before interest and taxes are adjusted for the tax treatment of pensions. I calculate the adjusted operating income as the accounting earnings plus the reported pension cost, minus grossed up deferred taxes, plus interest expense, minus contribution expense.[43]

The main model of earnings forecasting is:

$$\Delta EBIT^{*}_{it} = \mu_i + \varepsilon_{it} \ ,$$

[42]Whether earnings really follow a random walk with drift has been tested in the literature, with inconclusive results. Graham (1996b) examines this hypothesis by examining the tax status (positive or negative taxable income) persistence probabilities as a means of characterizing the time series pattern of data. He concludes that the hypothesis seems unreasonable for unprofitable firms due to the survivorship problem in the sample. He therefore proposes a pseudo random walk with drift, where the drift is constrained to be greater than or equal to zero, and shows that this model predicts the marginal tax rate better than a mean reverting process.

[43]Another alternative for calculating operating income would be to add back pension expense and subtract from it the service cost. The service cost is the only component of the expense related to the service rendered by employees during the current year. The other components, the expected return on assets for example, are a major component of pension expense, but represent market driven expectations rather than the cost of providing benefits. When the pension asset portfolio performs well, this component turns the pension expense into pension income, highly overstating the earnings. If this approach were used, the service cost would have to be subtracted back after earnings are simulated, because it is not tax deductible.

where $\Delta EBIT^*_{it}$ is the first difference in adjusted earnings, μ_i is the drift, and ε_{it} is distributed normally with mean zero and variance equal to that of $\Delta EBIT^*_{it}$. The means and variances are updated for every year on a "rolling historical basis". Current year taxable income is calculated as the adjusted earnings plus extraordinary or discontinued items, minus pension contribution, minus the deferred tax expense, with the latter term divided by the appropriate statutory tax rate so that it is expressed on a pre-tax basis. The net operating losses (NOLs), data item reported in Compustat (data42) has many missing observations. I assume the reported amount of carryforwards for 1980, if available, or carryforwards equal to zero if there is missing information, and start accumulating losses from that point forward.

The forecasting period is equal to the number of years the legislation allows for carrying forward any losses (currently 20 years). The dynamic feature of the tax code is incorporated only through the NOLs. Investment tax credits have been shown in Graham (1996a) to have a small effect on marginal tax rates and that alternative minimum tax (AMT) has been abolished in 2001. The approach undertaken in this paper is therefore closer to the one used in Shevlin (1990).

For losses incurred in tax years before 1997, a firm can carry losses back for 3 years and forward for 15 years. The legislation has subsequently changed, and the limits have been modified to (-2, +20) from 1997 to 2000, and to (-5, +20) from 2001 to 2003. Beginning in 2003, losses may again be carried back only for 2 years. Using the progressive nature of corporate tax schedule, I calculate the present value of the tax bill, having as a discount rate the average corporate bond yield. The past three years' losses are not discounted, provided that interest is not paid on any tax refunds. I then add $10000 to year t income, and I recalculate the new tax liability. The difference between the two tax bills represents the

present value of an additional dollar earned, which is the marginal tax rate. In order to incorporate income uncertainty, the simulation is repeated 50 times and averages of MTRs are calculated for every year and for every firm as long as sufficient past information exists to make an earnings forecast. Marginal tax rates are calculated for different levels of interest expense (0%-800%). Following Graham (2000), I assume that the interest coverage ratio, beyond year t, is constant at year t value in profitable states, but I maintain year t interest in unprofitable states.

I refine MTRs at three levels: MTR_{none} is calculated before aggregate financing (debt or pension), MTR_{int} is calculated after debt financing and MTR_{all} is calculated after aggregate financing. The above simulation procedure differs from Graham's in two respects. First, the taxable income is adjusted for tax treatment of pensions. Second, the pension contribution is added to the regular interest expense to form a consolidated interest expense.

Appendix II:

AMR Corporation: Extract from 10-k filling, 2002

Note 12: Retirement benefits

All regular employees of the Company are eligible to participate in pension plans. The defined benefit plans provide benefits for participating employees based on years of service and average compensation for a specified period of time before retirement.

The following table provides a reconciliation of the changes in the plans' benefit obligations and fair value of assets for the years ended December 31, 2002 and 2001, and a statement of funded status as of December 31, 2002 and 2001 (in millions):

	Pension Benefits	
	2002	2001
Reconciliation of benefit obligation		
Obligation at January 1	$ 7422	$ 6434
Service cost	352	260
Interest cost	569	515
Actuarial loss	820	416
Plan amendments	65	168
Acquisition of TWA	—	—
Benefit payments	(394)	(371)
Settlements	(77)	—
Obligation at December 31	$ 8757	$ 7422
Reconciliation of fair value of plan assets		
Fair value of plan assets at January 1	$ 5482	$ 5731
Actual return on plan assets	(16)	1
Employer contributions	328	121
Benefit payments	(394)	(371)
Settlements	(77)	—
Fair value of plan assets at December 31	$ 5323	$ 5482

Funded status		
Accumulated benefit obligation (ABO)	$ 7344	$ 6041
Projected benefit obligation (PBO)	8757	7422
Accumulated postretirement benefit obligation (APBO)	—	—
Fair value of assets	5323	5482
Funded status at December 31	(3434)	(1940)
Unrecognized loss (gain)	2709	1454
Unrecognized prior service cost	330	286
Unrecognized transition asset	(4)	(5)
Net amount recognized	**$ (399)**	**$ (205)**

As of December 31, 2002, the accumulated benefit obligation and the fair value of plan assets for pension plans with accumulated benefit obligations in excess of plan assets were approximately $7.3 billion and $5.3 billion, respectively. As of December 31, 2001, the accumulated benefit obligation and the fair value of plan assets for pension plans with accumulated benefit obligations in excess of plan assets were approximately $4.2 billion and $3.6 billion, respectively.

At December 31, 2002 and 2001, other benefits plan assets of approximately $98 million and $93 million, respectively, were invested in shares of mutual funds managed by a subsidiary of AMR.

The following tables provide the components of net periodic benefit cost for the years ended December 31, 2002, 2001 and 2000 (in millions):

	Pension Benefits		
	2002	**2001**	**2000**
Components of net periodic benefit cost			
Defined benefit plans:			
Service cost	$ 352	$ 260	$ 213
Interest cost	569	515	467
Expected return on assets	(501)	(539)	(490)
Amortization of:			
Transition asset	(1)	(1)	(1)
Prior service cost	21	11	10
Unrecognized net loss	49	22	17
Settlement loss	33	—	—
Net periodic benefit cost for defined benefit plans	**522**	**268**	**216**

The following table provides the amounts recognized in the consolidated balance sheets as of December 31, 2002 and 2001 (in millions):

	Pension benefits	
	2002	2001
Prepaid benefit cost	$ 54	$ 123
Accrued benefit liability	(453)	(328)
Additional minimum liability	(1623)	(335)
Intangible asset	330	163
Accumulated other comprehensive loss	1293	172
Net amount recognized	**$ (399)**	**$ (205)**

Note: Compustat discloses the net amount recognized (data290) as prepaid/ accrued pension benefit and pension cost (data295), but not the employer contribution. Also note that the accounts related to the AML adjustment cancel out in the calculation of the recognized amount).

Pension contribution=Data295+ΔData290 (i.e. $ 328 = $522+ (-399-(-205)).

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Figure 1
The aggregate level of pension funding

This figure shows the aggregate level of pension funding as the difference between aggregate pension assets and liabilities. The pension liability as measured by the projected benefit obligation (data286+data294) and the fair value of assets (data287+data296) are in the footnotes of the financial statements. Until 1998, sponsoring companies were required to disclose separately information for underfunded and overfunded plans. The amounts recognized on the balance sheet are calculated as the aggregate net amount of the accrued pension liability, prepaid pension liability, intangible asset and additional minimum liability (data290+data300-data298).

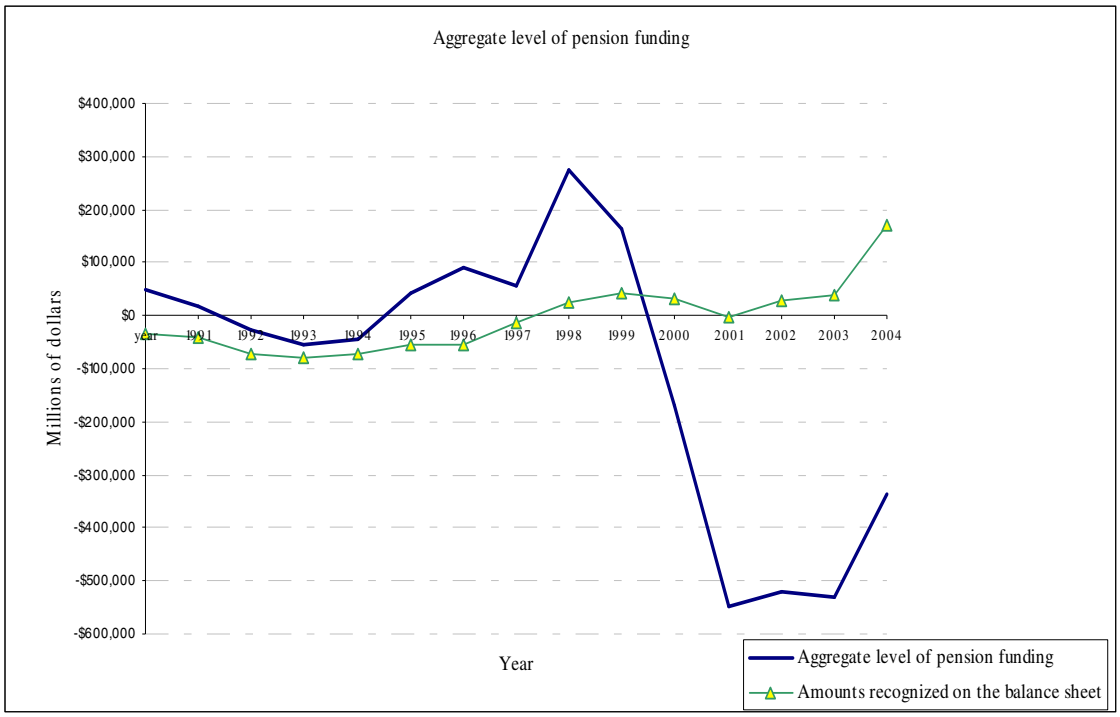


Figure 2
Differences between reported and consolidated leverage

The figure shows the difference between leverage calculated based on balance sheet items and leverage calculated on consolidated accounts. Reported book leverage is calculated based as the ratio between long term debt (data9+data44) and the value of assets (data6). Reported market leverage is calculated as the ratio between long term debt and the market value of the firm (data6-data216+data25*data199). Consolidated leverage is calculated by redefining assets as operating assets plus pension assets minus already recognized pension items. Similarly, long term debt is increased by the present value of the pension liabilities. Total liabilities are also adjusted for any deferred taxes resulting from the additional minimum liability adjustment.

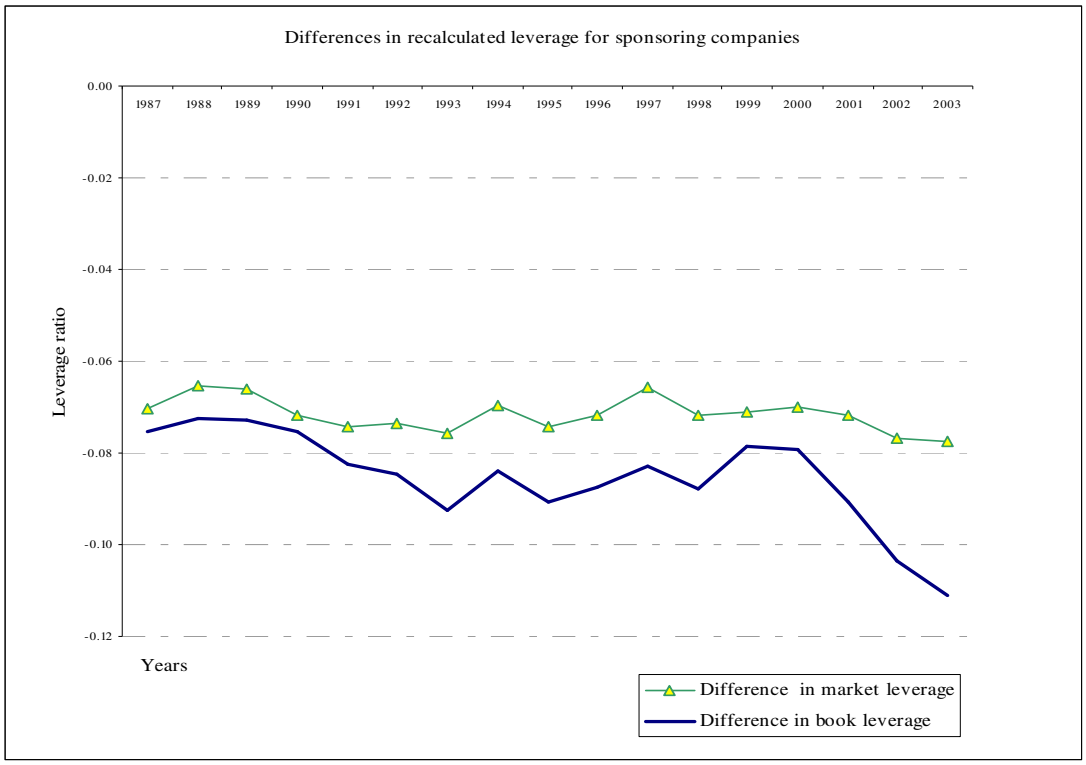
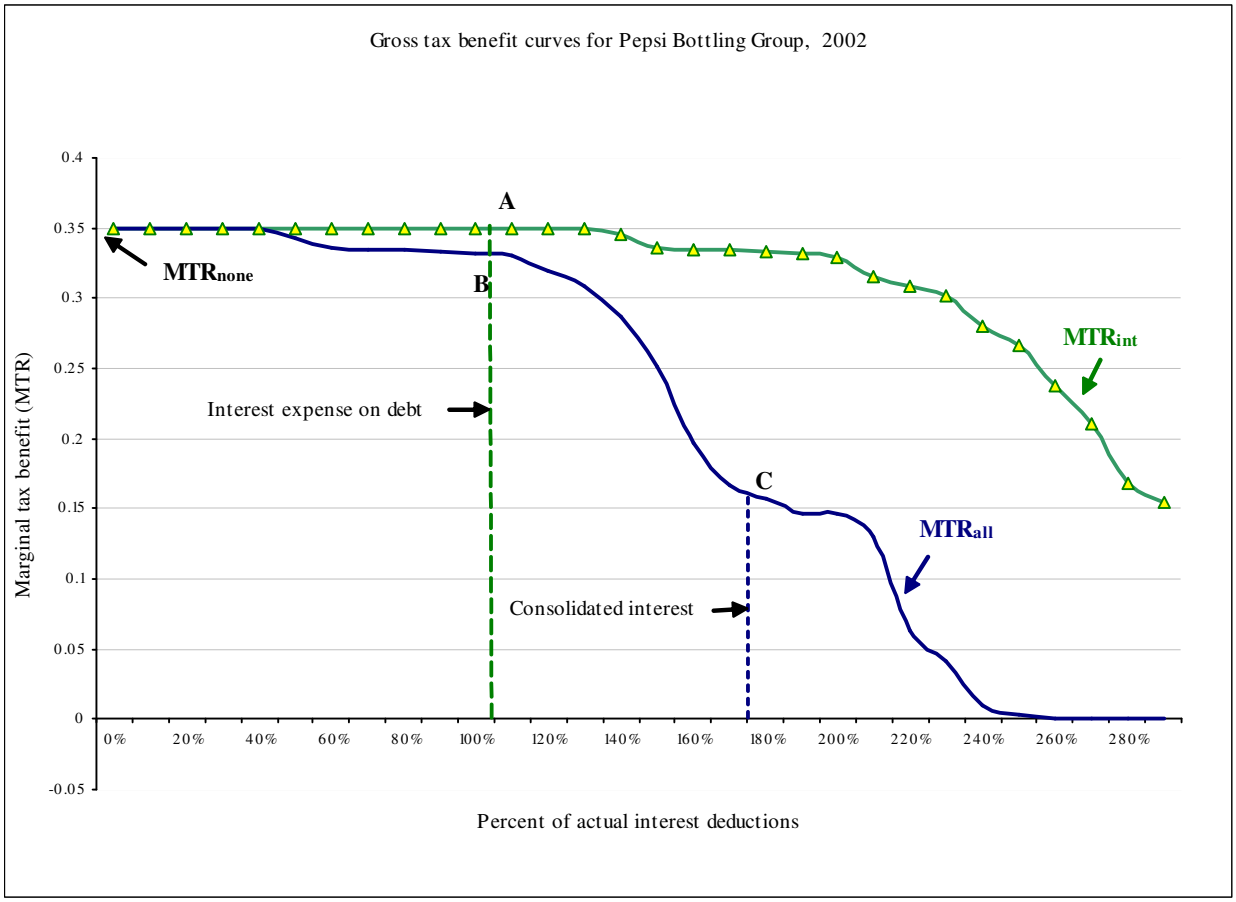


Figure 3
Effect of pension contributions on marginal tax rates
for Pepsi Bottling Group (2002)



Notes:

Notation	Definition
MTR_{none}	Marginal tax rate before all financing (the simulated tax rate is based on earnings before taxes, before interest expense and pension contribution).
MTR_{int}	Marginal tax rates after the interest expense is deducted.
MTR_{all}	Marginal tax rates after interest expense and pension contribution.

Figure 4
Aggregate effect of pension plan contributions on marginal tax rates

This figure shows the incremental effect of pension contributions on marginal tax rates, from 1991 to 2003. The number of the sponsoring companies in the sample changes during this period from 1,318 to 1,216, whereas the number of non-sponsoring companies changes from 3,551 to 3,652. Mean levels of the marginal tax rates are calculated for each percentage of interest deductions used in the simulation analysis.

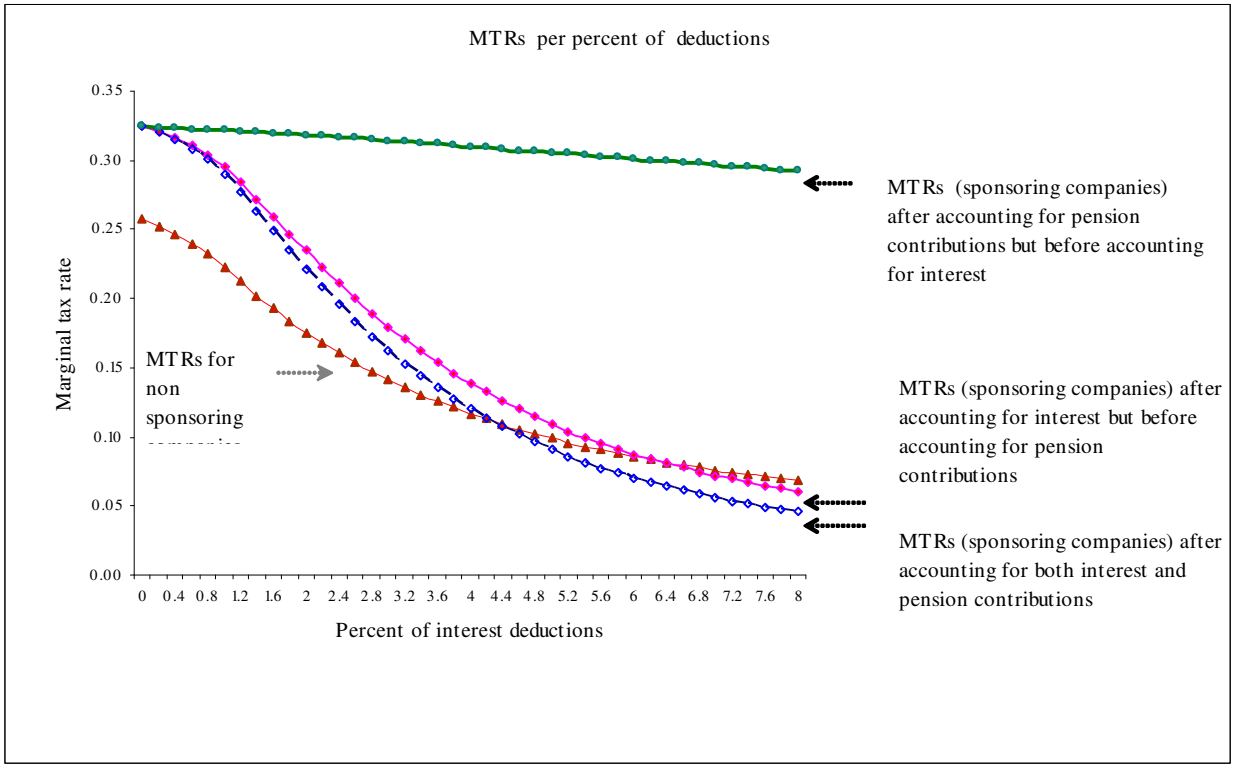


Figure 5
Tax benefits of debt

This figure shows the value of the gross tax benefits of debt, for both sponsoring and non-sponsoring companies. Gross tax benefits are calculated as the area under the benefit function (up to the point of the actual interest expense). The line marked with squares shows the total gross tax benefits from both reported debt and pension debt, whereas the line marked with diamonds shows only the tax benefits associated with interest deductions on debt.

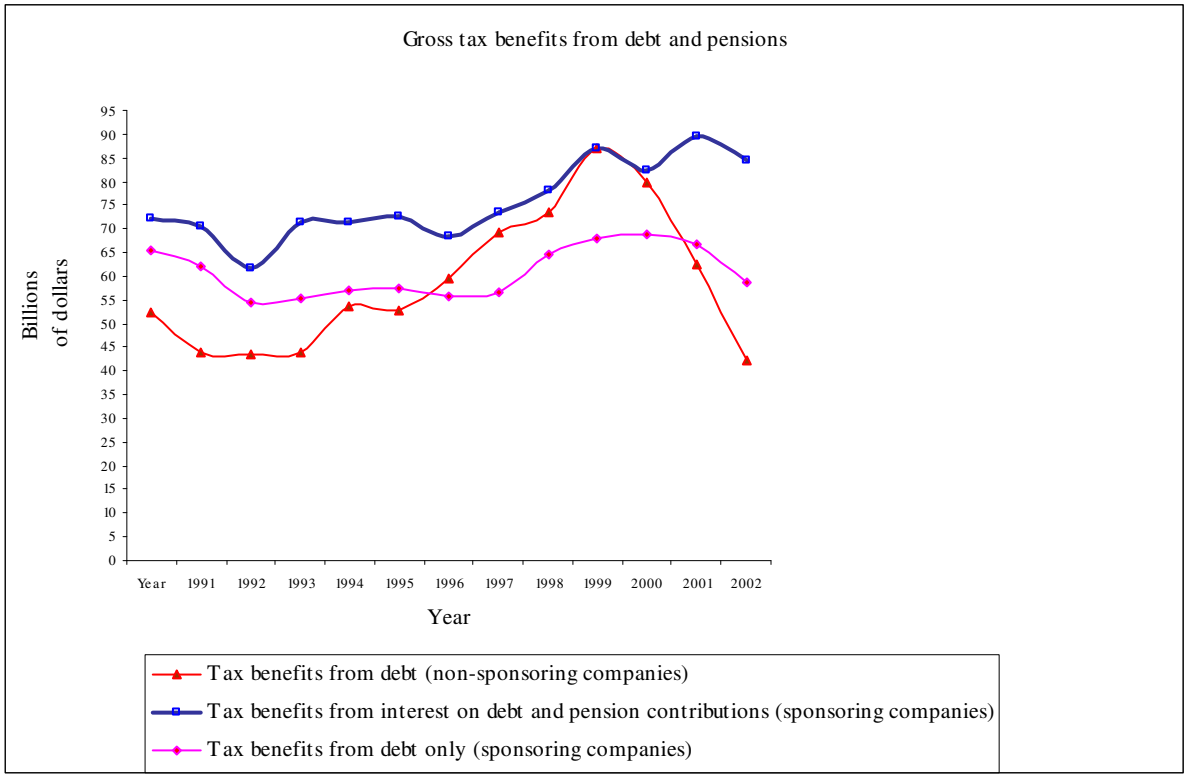


Table 1
Balance sheet pension plan exposure

The sample includes all Compustat firms reporting pension assets and liabilities, from 1991 to 2003, and for which sufficient information exists to calculate book and market leverage ratios. Plan assets are measured by their fair value (data287+data296) whereas pension liabilities are measured by the disclosed projected benefit obligation (data286+data294). Contributions are estimated by comparing the pension plan recognized balance sheet items with the disclosed pension cost (data295+Δdata290). Funding level is defined as pension assets minus pension liabilities. Long term debt is calculated as the amount of debt obligations due more than one year (data9) plus the current portion of the long term debt (data44). Total debt is calculated as assets (data6) minus book equity (data216). Adjusted operating income (EBIT) is calculated as earnings before interest and taxes (data13) plus pension cost (data295).

Panel A : Firms reporting pension assets and liabilities

Year	Nr. of firms	Ratio of plan assets to firm assets	Ratio of pension liability to total book debt	Contribution to EBIT (adjusted for pensions)	Interest to EBIT (adjusted for pensions)	Interest (millions)	Contributions (millions)	Reported pension cost (millions)
1991	1272	0.165	0.316	0.034	0.321	96.54	12.91	11.972
1992	1307	0.167	0.318	0.061	0.258	86.889	17.01	12.495
1993	1352	0.17	0.319	0.03	0.171	76.764	15.013	14.269
1994	1386	0.152	0.28	0.051	0.169	76.767	32.457	18.95
1995	1411	0.208	0.317	0.034	0.159	80.661	27.184	15.334
1996	1430	0.215	0.314	0.04	0.275	81.972	30.939	14.398
1997	1421	0.175	0.299	0.038	0.106	84.181	22.304	12.916
1998	1385	0.177	0.301	0.029	0.113	91.816	40.317	14.691
1999	1306	0.189	0.288	0.024	0.254	110.126	33.18	8.008
2000	1271	0.173	0.268	0.039	0.027	130.699	45.061	1.675
2001	1269	0.154	0.287	-0.01	-0.698	145.426	35.299	14.018
2002	1274	0.139	0.296	0.054	0.128	138.653	63.319	23.468
2003	1107	0.177	0.375	0.091	0.205	139.641	89.516	40.631
Firm year obs	17191	0.175	0.305	0.039	0.118	101.728	34.909	15.316

Panel B: Firms reporting long term debt and pension liabilities

Year	Number of firms with LT debt	Ratio Contribution to Interest	Ratio PBO to LT debt	Ratio funding to LT debt
1991	1232	0.495	3.075	0.058
1992	1256	0.680	3.623	0.127
1993	1300	0.684	7.581	0.452
1994	1330	0.921	2.916	-0.246
1995	1360	0.665	3.952	-0.438
1996	1373	1.124	4.392	0.113
1997	1364	0.803	3.318	0.092
1998	1331	0.874	2.718	0.070
1999	1251	0.590	2.569	0.247
2000	1218	0.729	2.772	0.108
2001	1218	0.596	3.939	-0.501
2002	1219	1.043	3.696	-0.982
2003	1058	1.431	7.553	-0.675
Total	16510	0.8141	3.965	-0.110

Panel C: Balance sheet exposure for GM, at the end of fiscal year 2001

This table compares reported assets and liabilities with the true assets and liabilities after all the off balance sheet assets and liabilities have been consolidated on the balance sheet. There are several pension items that are recognized on balance sheet. The prepaid pension cost represents the cumulative employer contributions in excess over accrued net pension cost. The accrued pension cost represents cumulative pension cost in excess of employer's contributions. If the company sponsors only one pension plan, one of the two items appears on balance sheet. For severely underfunded plans, where ABO exceeds the fair value of assets, FASB mandated a minimum balance sheet liability (AML) equal to their difference. The increased liability is directly reflected in the accrued pension cost and it is offset by an increased in intangible assets. However, if the unrecognized prior service cost is below the AML, the difference is directly charged to equity (as part of the comprehensive income). The amounts shown in the pension footnote are pretax. The actual charge to shareholder's equity is taken on an after tax basis with the difference charged to deferred taxes. Book (market) leverage is calculated as long term debt over book (market) value of assets. In order to calculate the actual leverage ratios, long term debt is adjusted for the pension liability.

	Reported on Balance Sheet ($billions)	Pension related adjustments ($billions)
Reported assets (in $ billions)	**$324.00**	
Less Prepaid Cost		($7.50)
Less intangible asset		($6.20)
Plus pension plan asset		$73.70
Adjusted assets		**$384.00**
Reported Liabilities (in $billions)	**$303.50**	
Less Accrued benefits		($10.80)
Plus AML tax deferment adjustment		$5.80
Plus pension liability		$86.30
Adjusted liabilities		**$384.80**
Net worth	**$20.50**	**($1.00)**
LT Debt	**$126.70**	**$213.00**
Book leverage	**0.39**	**0.53**
Market leverage	**0.38**	**0.52**

Table 2
Reported and consolidated leverage ratios

DBP = 1 if the firm is sponsoring a pension plan, DBP = 0 otherwise. The reported balance sheet leverage ratios are calculated as follows: Market leverage is the ratio of long term debt (data9+data44) to the market value of the company. Book leverage is the ratio between long term debt and book value of assets (data6). Market value is defined as book value of assets, minus book equity (data216) plus the market value of equity (data25 x data199). For the consolidated balance sheet, the book debt and book asset values are adjusted for pensions. All recognized pension items are removed from the balance sheet and the true pension assets and liabilities are being incorporated. Consolidated leverage is calculated by redefining assets as operating assets plus pension assets minus already recognized pension items (data6+ data287+data296-data290-data300). Similarly, long term debt is increased by the present value of the pension liabilities (data9+data44+data287+data296). When calculating the consolidated value of the firm, total liabilities are also adjusted for any deferred taxes resulting from the additional minimum liability adjustment (data298).

	Firm - year observations	Mean leverage	Mean leverage (after consolidation)	Difference (Wilcoxon statistic)
Debt/Assets ratio(MV)				
DBP=1	17,191	0.20	0.27	0.07*
		0.16	*0.17*	
DBP=0	60,127	0.14	0.14	
		0.27	*0.27*	
Total sample	77,318	0.21	0.23	
Debt/Assets ratio (BV)				
DBP=1	21231	0.26	0.35	0.09*
		0.21	*0.19*	
DBP=0	60127	0.20	0.20	
		0.18	*0.18*	
Total sample	77318	0.15	0.18	

***** Significant at 0.01 level
Notes: Standard deviations in italics

Table 3
Sample characteristics of pension sponsors/non-sponsors relative to debt issuers/ non-issuers

This table partitions the data into debt issuers/ non-issuers and pension sponsors/non-sponsors. Book leverage is calculated as the ratio of long term debt to book value of assets. Market leverage is calculated as the ratio of long term debt to the market value of the company. The company market value is defined as book value of assets, minus book equity plus market value of equity. Zscore is a modified version of Altman's (1968) Z-score. OENEG is a dummy variable equal to one if the book value of the common equity is negative. Collateral is equal to net property, plant and equipment normalized by book assets. The kink represents the level of deductions (normalized by actual deductions) required to make marginal tax rates decline.

Panel A: *Sample means of variables based on the adoption of a pension plan*

Variable	No Pension (Firm-year obs: 43,204)	Pension (Firm-year obs: 15,644)
Book leverage	0.202	0.256
Market leverage	0.155	0.202
Size (log of assets)	4.325	6.603
Market to book	2.047	1.572
Zscore	0.486	1.728
Collateral	0.427	0.513
Research and development	0.090	0.018
Return on assets	0.037	0.127
OENEG	0.046	0.045
Before financing marginal tax rate (MTR_{none})	0.259	0.324
After interest only marginal tax rate (MTR_{int})	0.227	0.297
After interest and pension marginal tax rate (MTR_{all})	0.227	0.293
Kink without pension	1.061	2.032
Kink with pension	1.061	1.722

Panel B: *Sample means of variables based on the usage of debt*

Variable	No debt (Firm-year obs:=8059)	With Debt (Firm-year obs:=50789)
Book leverage	0.000	0.250
Market leverage	0.000	0.194
Size (log of assets)	3.715	5.123
Market to book	2.629	1.808
Zscore	0.257	0.905
Collateral	0.301	0.474
Research and development	0.158	0.057
Return on assets	-0.006	0.072
OENEG	0.035	0.048
Before financing marginal tax rate (MTR_{none})	0.242	0.282
After interest only marginal tax rate (MTR_{int})	0.229	0.249
After interest and pension marginal tax rate (MTR_{all})	0.229	0.247
Kink without pension	1.475	1.295
Kink with pension	1.450	1.234

Table 4
Distribution of marginal tax rates per year and type of firm

DBP = 1 if the firm is sponsoring a pension plan, DBP = 0 otherwise.

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Average MTR
DBP = 0														
N	3,551	3,732	4,749	4,903	5,403	5,408	5,395	5,223	5,104	5,110	4,795	4,499	3,652	
MTR_{all}	0.206	0.214	0.235	0.243	0.245	0.247	0.23	0.223	0.22	0.209	0.201	0.205	0.2	**0.223**
MTR_{int}	0.206	0.214	0.235	0.243	0.245	0.247	0.23	0.224	0.22	0.209	0.201	0.205	0.201	**0.223**
MTR_{none}	0.248	0.253	0.274	0.278	0.281	0.277	0.262	0.256	0.256	0.245	0.235	0.238	0.232	**0.258**
DBP = 1														
N	1,318	1,339	1,491	1,530	1,519	1,587	1,548	1,448	1,406	1,384	1,396	1,376	1,216	
MTR_{all}	0.277	0.274	0.287	0.299	0.304	0.302	0.299	0.294	0.291	0.292	0.286	0.288	0.276	**0.288**
MTR_{int}	0.28	0.278	0.291	0.304	0.308	0.306	0.305	0.3	0.296	0.298	0.289	0.293	0.286	**0.296**
MTR_{none}	0.313	0.315	0.324	0.331	0.331	0.331	0.329	0.325	0.325	0.328	0.32	0.324	0.317	**0.325**
All firms														
N	4,869	5,071	6,240	6,433	6,922	6,995	6,943	6,671	6,510	6,494	6,191	5,875	4,868	
MTR_{all}	0.225	0.23	0.248	0.256	0.258	0.26	0.245	0.239	0.235	0.226	0.22	0.224	0.219	**0.238**
MTR_{int}	0.225	0.231	0.249	0.257	0.259	0.261	0.246	0.24	0.236	0.228	0.221	0.226	0.222	**0.240**
MTR_{none}	0.265	0.269	0.286	0.291	0.292	0.29	0.277	0.271	0.271	0.262	0.254	0.258	0.253	**0.273**

Notes:

Notation	Definition
MTR_{none}	Marginal tax rate before all financing (the simulated tax rate is based on earnings before taxes, before interest expense and pension contribution).
MTR_{int}	Marginal tax rates after the interest expense is deducted.
MTR_{all}	Marginal tax rates after interest expense and pension contribution.

Table 5
Tax benefits of debt

The total tax benefits (TB) from aggregate debt (including pensions) is equal to the area under each firm's gross tax benefit function, up to the actual aggregate interest expense. The aggregate (consolidated) interest expense is calculated as the sum of the regular interest expense and the pension contribution. TB from debt (excluding pensions) is calculated ignoring the tax deductibility of the pension contribution. The present value of tax benefits (PV of TB) from current and future deductions is calculated under the assumption that tax shields are perpetual, while using Moody's average bond yield as a discount rate. MV represents the market value of the firm and TA represents its book value of assets. The kink is the amount of interest where the marginal tax benefit function becomes downward sloping, expressed as a percentage of actual aggregate interest deductions.

Year	Nr. of firms	Consolidated interest /Interest expense	TB with pensions/TB without pensions	PV of TB without pensions/MV	PV of TB with pensions /MV	PV of TB without pensions/TA	PV of TB with pensions/TA	Change in kink due to pensions
1991	1,101	1.353	1.228	0.080	0.095	0.109	0.131	0.187
1992	1,127	1.55	1.421	0.082	0.097	0.115	0.139	0.228
1993	1,278	1.48	1.279	0.076	0.092	0.114	0.140	0.239
1994	1,302	1.609	1.522	0.071	0.089	0.102	0.130	0.279
1995	1,329	1.49	1.815	0.076	0.094	0.111	0.140	0.282
1996	1,352	1.705	1.542	0.078	0.099	0.116	0.153	0.326
1997	1,342	1.591	1.389	0.072	0.090	0.115	0.147	0.326
1998	1,272	1.61	1.414	0.089	0.113	0.131	0.170	0.323
1999	1,225	1.514	1.317	0.082	0.100	0.115	0.145	0.308
2000	1,208	1.4	1.335	0.085	0.102	0.117	0.143	0.316
2001	1,204	1.502	1.46	0.079	0.096	0.112	0.140	0.319
2002	1,184	1.817	1.818	0.079	0.104	0.109	0.150	0.389
2003	1,014	2.111	1.652	0.063	0.106	0.121	0.162	0.582
Total	15,938	1.591	1.477	0.078	0.098	0.114	0.145	0.313

Table 6
Relationship between reported and pension debt

This table reports the estimation results of the effect of the pension plan on the amount of debt firms carry on their balance sheets. The capital structure choice of the firm is modeled as a system of three decisions: (1) sponsoring a defined benefit plan (selectivity decision); (2) choosing the size of the pension liability (off balance sheet leverage decision); (3) choosing the size of the book debt (balance sheet leverage decision). The estimation is divided into two separate systems: panel A includes the results of a selectivity model that predicts the pension liability whereas panel B includes the results of a treatment effects model.

Panel A: Results of the selectivity model

Pension liability is calculated as the projected benefit obligation (PBO) and it is normalized by consolidated assets. DBP is set to 1 if the firm is sponsoring a defined benefit plan and 0 otherwise. The degree of unionization per industry is reported in the *Current Population* Survey for the year available at the Department of Labor. The number of employees is obtained from Compustat (data29). The age of the plan is number of years the firm has reported information on pensions on Compustat. The year of adoption refers to the year of the first disclosure of pension assets and liabilities on Compustat. Profitability is measured by ROA (data13) and its volatility is calculated on the last 10 years of available information. Market to Book is the market value of the firm (market equity plus book debt) divided by book assets.

Selection equation: $DBP_{it}^{*} = a_0 + a_1 Z_{1t} + a_2 X_{1t} + \varepsilon_{it}$

$DBP_{it} = 1$ if $DBP_{it}^{*} > 0$ and $DBP_{it} = 0$ if $DBP_{it}^{*} \leq 0$

Pension benefits size: $DBP_{it}^{*} > 0 : PENSION_{it} = c_1 + c_2 * X_{2t} + \nu_{it}$

	Pension Choice 1st stage			Pension Liability 2nd stage		
	Coef		z	Coef		z
Unionization	0.034	*	34.02			
No. of employees	0.004	*	17.53	0.000	***	1.59
Market to Book	-0.208	*	-32.48	0.014	*	7.35
Profitability (ROA)	2.133	*	38.44	-0.355	*	-15.65
ROA volatility	0.000	**	21.71	-0.001	*	-4.05
Age of the plan				0.004	*	5.69
Year of adoption				-0.001		-2.47
Year and industry fixed effects	Yes			Yes		
N	53,518			14,041		
Rho	-0.695					
sigma	0.127					
lambda	-0.084					

* Statistically significant at the 1% level, ** statistically significant at the 5% level, ** statistically significant at the 10% level.

Panel B: Results of a treatment effects model of capital structure decisions for firms with/ without pension plans

DBP is set to 1 if the firm is sponsoring a defined benefit plan and 0 otherwise. Fitted values of pension benefits, $\hat{PENSION}$ (normalized by consolidated assets), are derived from the selection-bias corrected pension benefit equation. LEV_{it} is long term balance sheet debt (normalized by consolidated assets). Pension benefits are equal to zero for non sponsoring companies. MTR_{none} is the simulated marginal tax rate before any interest or pension contributions are deducted. *ZSCORE* is a modified version of Altman's (1968) Z-score. *OENEG* is a dummy variable equal to 1 if the book value of the common equity is negative. *COLLATERAL* is equal to net property, plant and equipment normalized by book assets. Dummy (Foreign Income) is 1 if the reported sales on non domestic sales as disclosed by the geographical segment data is at least 10% of domestic sales.

Selection equation: $DBP_{it}^{*} = a_0 + a_1 Z_{1t} + a_2 X_{1t} + \varepsilon_{it}$

$$DBP_{it} = 1 \text{ if } DBP_{it}^{*} > 0 \text{ and } DBP_{it} = 0 \text{ if } DBP_{it}^{*} \leq 0$$

Leverage equation: $$LEV_{it} = b_1 + b_2 * DBP_{it} + b_3 * DBP * \hat{PENSION}_{it} + b_3 X_{3t} + \eta_{it} \quad (1)$$

(and alternatively)

$$LEV_{it} = b_1 + b_2 * DBP_{it} + b_3 * DBP * \hat{PENSION}_{it} + DBP * \hat{PENSION}_{it} * Dummy(ForeignIncome) b_3 X_{3t} + \eta_{it} \quad (2)$$

	Treatment regression (endogeneity and selectivity corrected)						Simple OLS (no correction)		
	(1)			(2)			(3)		
	Coef		z	Coef		z	Coef		z
Dummy (Foreign Income)				**-0.045**	*	-21.68			
DBP	-0.039		-0.54	-0.017	***	-1.64	0.025	*	10.44
DBP * Predicted Pension Liab	**-0.360**	*	-5.62	**-0.412**	*	-10.28	-0.440	*	-34.82
DBP * Predicted Pension Liab * Dummy (Foreign Income)				**0.137**	*	-21.68		*	
MTR_{none}	0.079	*	4.30	0.094	*	9.53	0.067	*	0.07
Log Assets (Consolidated)	0.022	**	3.13	0.025	**	48.24	0.019	*	45.23
Market to Book ratio	-0.020	*	-15.13	-0.021	*	-37.51	-0.020	*	-42.64
ZSCORE	-0.007	*	-12.50	-0.008	*	-26.69	-0.007	*	-27.40
OENEG	0.224	*	20.46	0.236	*	61.28	0.242	*	66.36
Operating profit volatility	-0.001	*	-13.70	0.000	*	-13.4	0.000	*	-18.58
COLLATERAL	0.219	*	21.32	0.210	*	55.99	0.212	*	60.66
Year and industry fixed effects	Yes			Yes			Yes		
N	53004			53004			53004		
R-squared							0.252		
Hazard lambda	0.015			0.021					
Rho	0.087			0.119					
Sigma	0.174			0.173					

* Statistically significant at the 1% level, ** statistically significant at the 5% level, ** statistically significant at the 10% level.