A New Measure for Non-debt Tax Shields and the Impact on Debt Policy

Madhuparna Kolay[*]
James Schallheim[**†]
Kyle Wells[***]

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Comments are welcome.

ABSTRACT

We provide new evidence on the relation between non-debt tax shields (NDTS) and debt tax shields. We define a simply proxy for NDTS called "tax spread" measured by the difference between tax expenses and taxes paid. Using our tax spread measure as a replacement for previous proxies of NDTS in models of capital structure, we find a negative relation between the NDTS and debt as predicted by theory. The tax spread is also significant in identifying companies that have been involved in tax shelter cases. Further, we also find that zero leverage firms have higher tax spreads indicating less need for debt tax shields. In sum, the tax spread is a robust proxy for NDTS in all of our tests.

"You can't underestimate how many of America's greatest minds are being devoted to what economists would all say is totally useless economic activity."
- Peter Cobb, former Deputy Chief of Staff of the Joint Committee on Taxation

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*Pamplin School of Business Administration, University of Portland, Portland, OR 97203
** David Eccles School of Business, University of Utah, Salt Lake City, UT 84112
*** Udvar-Hazy School of Business, Dixie State College of Utah, St. George, UT 84770
† Contact Author. Email addresses for the authors are m.kolay@utah.edu, finjs@business.utah.edu and kwells@dixie.edu. A previous version of this paper was circulated under the name Debt and Taxes: A New Measure of Tax Shields. We are responsible for all remaining errors.

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1. Introduction

Ever since Modigliani and Miller (1963) published their famous "correction" to the Modigliani and Miller (1958) irrelevance proposition, taxes have been of continuous interest to the academic examination of issues in corporate finance. MM proved that the interest deductions from debt in the capital structure provided substantial gains to the firm. De Angelo and Masulis (1980) furthered the theoretical examination of tax shields by noting that firms may have tax deductibles other than debt to reduce their corporate tax burden and therefore, debt and non-debt tax shields should be substitutes when earnings are limited. Examples of such non-debt tax shields include depreciation, investment tax credits, or net-loss carry forwards. Bradley, Jarrell and Kim (1984) were among the first to test for the tax effects suggested by DeAngelo and Masulis (1980). By regressing firm-specific debt-to-value ratios on non-debt tax shields they found that debt is positively related to non-debt tax shields as measured by depreciation and investment tax credits, in contrast to the prediction in De Angelo and Masulis (1980). Titman and Wessels (1988) find that their "results do not provide support for an effect on debt ratios arising from nondebt tax shields…." As Graham (2003) points out, if a firm invests heavily and borrows to invest, a positive relation between such proxies for non-debt tax shield and debt may result. A mechanical positive relation of this type overwhelms and renders unobservable any substitution effects between debt and non-debt tax shields (NDTS).

One problem that arises in the study of NDTS concerns the observability of the shields. Depreciation and tax credits are clearly reported in firm financial statements. However, we hypothesize that there are numerous NDTS that are not transparent and cannot be detected in the

financial statements.[1] Therefore, we divide NDTS into two groups: transparent and opaque NDTS. This study presents a new proxy for measuring the quantity of a firm's opaque NDTS. The measure is quite simple and we call it the *tax spread*: the difference between the provision for taxes on the firm's income statement and taxes actually paid as revealed in the footnotes to the accounting statements. Because the tax spread measures the difference between the accounting tax and the taxes paid in cash, it has the benefit of being a relative more comprehensive measure of NDTS in that it can potentially capture the effects of deductions such as accelerated depreciation, stock option deductions, foreign tax credits and much more. By capturing the effect of a wider variety of NDTS at the same time, the probability that this measure is correlated with the firm's investment is greatly reduced compared to measures such as depreciation. Moreover, the tax spread has an additional property not found in prior measures of NDTS, namely, that non-observable tax shields and tax shelters are captured by this proxy. Obviously, firms typically do not report these tax activities and directly indentifying these activities from publically reported statements is nearly impossible for most of our sample period.

As we explore the properties of the tax spread, several patterns became evident. First, the average annual tax spread has a generally positive trend over the period of 1993 to 2009. The exceptions are recession years. Our hypothesis that the tax spread is a valid proxy for NDTS does not apply to negative tax spreads. When cash taxes paid exceeds provision for taxes, it often indicates tax loss carryforwards or accounting adjustments to the deferred tax asset or liability accounts. In other words, a negative tax spread does not necessary imply less NDTS for the firm. Given this situation, most of our analysis is performed using non-negative tax spreads.

[1] Further support for the notion that many tax shelters are not transparent is evidenced by FASB Fin 48 which required public firms in the U.S. to disclose income tax risks effective in 2007.

In our first set of empirical tests, we attempt to find determinants of the tax spread based on observed accounting variables that may proxy for transparent and opaque tax shields. Manzon and Plesko (2002) examine the differences between book and taxable income and find that a relatively small set of variables explain a large percentage of the cross-sectional variation in the book-tax income spread across firms. Using the Manzon and Plesko (2002) set of variables (and adding supplemental variables to their list), we use regression analysis to empirically examine the determinants of tax spread. This serves dual purposes; first, we are able to identify the drivers behind our measure of NDTS. Our results are similar to Manzon and Plesko (2002) who identify four types of activities that are likely to affect book-tax income spread: 1) demand controls for tax favored investment and financing action, 2) direct sources of investment related timing differences, 3) permanent differences and 4) noise factors. The second purpose for indentifying the determinants of the tax spread is for use in a two-stage least squares methodology in order to address the simultaneous decisions of tax and capital structure policies. Our results using the Manzon and Plesko set of variables for predictors of the tax spread are reasonable with adjusted R-squares of 61 percent.

Our second set of analyses examine the effectiveness of transparent and opaque NDTS in empirical studies that examine corporate capital structure. Using firm-year data from 1988-2008, we estimate cross-sectional regression analyses for the firms' capital structures based on the variables found in recent capital structure empirical models.[2] While we confirm that most of the previous variables indentified as reliable determinants of capital structure remain significant in our regressions, the tax spread is also strongly significant with the predicted negative sign. We

[2] COMPUSTAT reports "taxes paid" (TXPD) for some firms beginning in 1987 with nearly all firms reporting by the following year, therefore our data is technically limited to firm-year observations after 1987.

conclude that the tax spread can serve as a significant and reliable proxy for opaque NDTS in capital structure regressions.

For our third set of empirical tests, we attempt to answer the following question: do the firms with the tax shelters identified in the Graham and Tucker (2006) and Wilson (2009) studies exhibit greater tax spreads when these tax shelters were in operation? If our measure of opaque NDTS does indeed pick up the type of tax shields exemplified by tax shelters then we would expect to significantly higher tax spreads during these periods. We replicate Graham and Tucker's methodology and compare our measures of spread for sheltering firms to a matched sample of firms which were not known to have tax shelters during the same time period. Doing so, we find that we are able to directly verify the validity of our measure of opaque NDTS.

Our final set of tests examines the tax spread with relation to the firms with leverage and with no (zero) leverage. Zero-leverage firms have been studied by Strebulaev and Yang (2012) who find that these firms "are more profitable, pay higher taxes, issue less equity, and have higher cash balances than their proxies chosen by industry and size." However, the taxes measured by Strebulaev and Yang (2012) are derived from the accounting tax expenses, and therefore the our measure of opaque tax shields may offer a partial explanation for these firms' appearing to have so much unused tax shields "left on the table." Our results indicate that the zero-leverage firms have significantly higher tax spreads than levered firms. Furthermore, the tax spread is a highly significant explanatory variable in logistic regressions on the zero-leverage firms in the presence of all the variables employed by Strebulaev and Yang (2012). These results indicate that these zero-leverage firms pay lower tax rates than indicated by the accounting tax expense and therefore are not leaving quite so much on the table.

Our results are complementary to others in the literature that examined NDTS. MacKie-Mason (1990) model incremental financial decisions and use tax loss carryforwards and investment tax credits as proxies for NDTS. Graham, Lang and Shackelford (2004) investigate whether corporate stock options are a form of NDTS and find that firms which have large deductions from options are indeed underleveraged. More recently, Shivdasani and Stefanescue (2010) show that pension assets and liabilities also act as tax shields and pension contributions are about a third of those from interest payments. In fact, in their sample leverage ratios for firms with pension plans are about 35% higher when pension assets and liabilities are incorporated into the capital structure. Graham and Tucker (2006) employ a novel identification strategy that directly examines tax shelters changed by the Internal Revenue Service: they find that in their paired-sample consisting of a total of 76 firms, 38 which use tax shelters, have debt ratios significantly lower than their matched peer firms. Thus, they find direct evidence that firms which have opaque NDTS in the form of tax shelters use significantly lower debt.

There are a whole host of tax shields, some observable and some not, that substitute for the debt tax shield. In all our tests, the tax spread is a robust proxy for opaque NDTS and consistent with theory. It is easily calculated and provides researchers with a useful estimate of a firm's NDTS when examining questions of tax policy and financing.

This paper is organized as follows. Section 2 introduces the tax spread measure and describes our dataset and summary statistics. Section 3 shows the results regarding the determinants of tax spread. In Section 4 we use tax spread as a proxy for NDTS in cross-sectional capital structure regressions to see if it works better than previous proxy variables. Section 5 contains tests of the relation between the tax spread and the tax shelter sample and the zero leverage firms. Section 6 concludes.

2. Defining and Measuring the Tax Spread

Why do firms prefer alternative tax shields to debt? First, many tax shields are less costly than debt. Debt usually requires costly interest payments. Many tax shields do not require additional cash outlays for the firm. Other tax shields have a much larger return per dollar invested (subject to the risk of disqualification by the IRS). Another reason for the preference of NDTS is the cost to the firm associated with debt covenants. Debt covenants are likely to cause high transaction costs for some firms. Finally, tax shields often exploit provisions in the accounting rules that allow the firm to reduce taxes without affecting the income statement. If accounting earnings matter, and there is a large literature claiming support for this notion, then these tax shields may be favored over debt tax shields. [3] Our measure of opaque NDTS called the tax spread is measured as the difference between provision for taxes on the firm's income statement and taxes actually paid as revealed in the footnotes to the accounting statements.

In his calculation of the marginal tax rate using the simulated interest-deduction benefit functions for individual firms, Graham (2000) accounts for tax favored investing activities in his calculation. However, firms have significant incentives to permanently defer or avoid taxes, usually without transparency. Bankman (1999) provides anecdotal evidence on several known tax sheltering schemes that have been or could be used to reduce taxable income while not affecting book income.[4] Plesko (2003) suggests that the relation between financial and tax reporting may be very weak. For example, GAAP requires foreign subsidiaries to consolidate under the parent company. These earnings are not recognized as taxable income until the income is transferred to the parent company. Companies may permanently defer income tax through

[3] See evidence by Beneish (1999), Dechow, Sloan and Sweeney (1995) and Kasznik (1999)
[4] As mentioned, Graham and Tucker (2006) show direct evidence that tax shelters indeed reduce taxable income and result in lower debt ratios than comparable firms with similar size and industry.

reinvestment abroad. Some evidence of this is found in the tax footnotes of Microsoft's 2009 annual report;

> *We have not provided deferred U.S. income taxes or foreign withholding taxes on temporary differences of approximately $18.0 billion resulting from earnings for certain non-U.S. subsidiaries which are permanently reinvested outside the United States. The unrecognized deferred tax liability associated with these temporary differences is approximately $5.4 billion.*

While a complete list of specific tax shields and deferrals is not available, factors that are likely to affect spread are categorized generally as: 1) tax favored investing activities (e.g. investment tax credits), 2) timing differences, such as depreciation schedules and retirement benefit expensing, and 3) permanent differences such as accounting for items of income or loss that bypass the income statement (e.g. exercised employee stock options, change in other comprehensive income, discontinued operations, extraordinary items, and the cumulative effect of change in accounting policies). One of the major difficulties of measuring NDTS is that most measures capture a certain type of NDTS (e.g. effects of stock options or depreciation tax shields). By covering a wider variety of tax shields, our measure of NDTS is a more comprehensive measure than the proxies for NDTS used in the extant literature.

In addition, an element of judgment is required in financial reporting that may be applied differently across firms. Accounting rules place emphasis on consistency within a firm over time and less weight on uniformity across firms. Such differences in discretion could confound the relation between tax and financial data series.

2.1 Measuring the Tax Spread

The tax spread is the difference between provision for taxes on the firm's income statement and taxes actually paid as revealed in the footnotes to the accounting statements. *(1)*

Tax Spread = Tax Expense – Taxes Paid

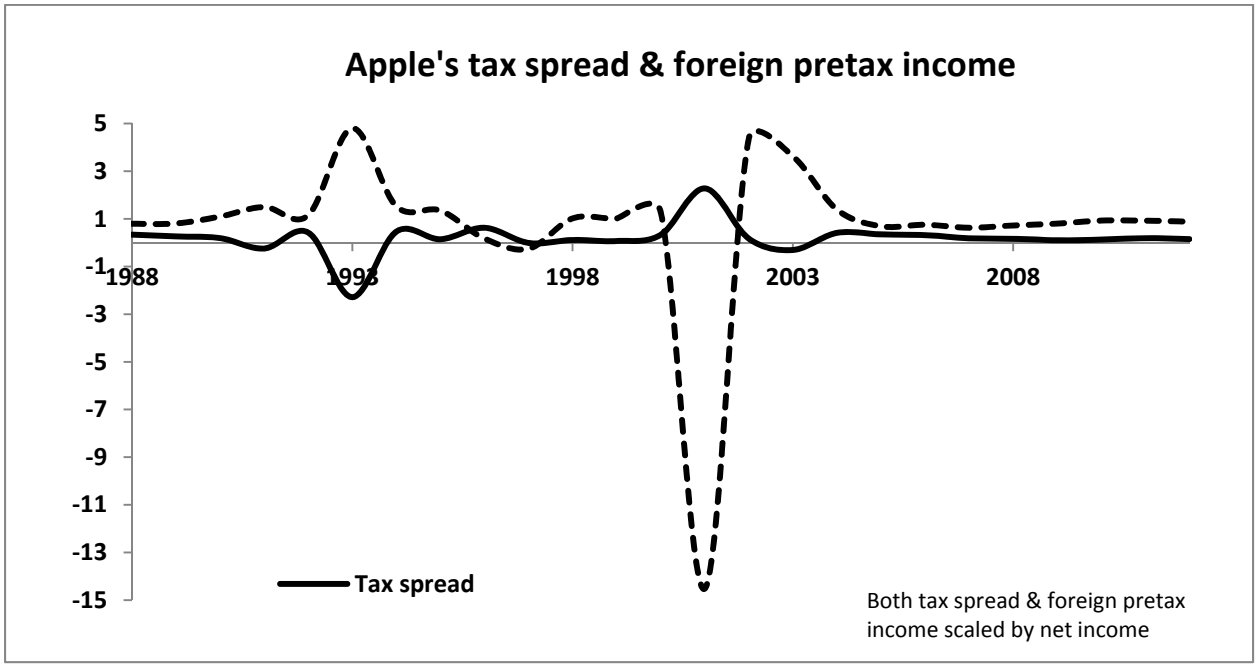
Our definition of the tax spread is subject to timing differences due to such deferrals as accelerated depreciation. In a "static world," timing effects would tend to reverse the tax spread so that positive tax spreads would be followed by negative spreads, resulting in an average zero tax spread over time. Our contention is that the tax spread will not "zero out" on average due to the opaque tax shields, many of which do not necessarily reverse over time. Nevertheless, the tax spread will be zero or negative in many cases.[5]

A recent example where opaque NDTS are especially important is at Apple Inc which has been under investigation for tax evasion to the amount of $74 billion.[6] Apple used subsidiaries in Ireland to channel income away from the U.S. The three units involved -- Apple Sales International, Apple Operations Europe and Apple Operations International -- were incorporated in Ireland but not tax resident anywhere. The structure allowed Apple to pay an effective tax rate of 2 percent or less since 2003. This is a direct example of using an opaque tax shield to lower income taxes. As discussed in Section 3, foreign income is one of the determinants of the tax spread—greater the non-repatriation of foreign income, the lower the tax spread. Following is a plot of Apple's foreign income and tax spread. As can be seen the tax spread is strongly negatively associated with foreign income. In addition, Apple has had no short or long term debt

[5] In earlier versions of this work, we included a definition of the tax spread, called the current tax spread, that excluded deferred taxes. While the current tax spread attempted to remove timing differences, in fact all of our major empirical results held for both definitions of the tax shield. For sake of clarity, we have chosen to only report the single tax shield as defined here.

[6] http://www.bloomberg.com/news/2013-05-26/apple-s-tax-dodge-should-prompt-rethink-in-ireland.html

in its capital structure since 2004.[7] This means that till 2012, Apple was a zero leverage firm. As we discuss in our last section, firms which have no debt which they can use to shield their income from taxes tend to substitute with non-debt tax shields.



We begin with Compustat firms with book value of assets over 1 million over the periods 1993 to 2009. We eliminate regulated firms (SICs 4900-4999) and financial firms (SICs 6000-6999). The variables from equation (1), tax expense and tax paid, are reported by Compustat as TXT and TXPD. After calculating tax spreads, we eliminate outliers by removing all firm-year Tax Spread observations outside of ±30 percent of book value of assets. These observations may be due to data mistakes or severely distressed firms. This eliminates less than 1 percent of our sample set. In addition, for our tests of capital structures, we focus on results for only those firm-years which have non-negative tax spreads. Firm years during which the provision for taxes is lower than taxes paid would imply that the firm has zero or negative taxable income. Therefore, it is unlikely that the spread measures NDTS in those firm-years. Desai and Dharmapala (2006)

[7] It issued bonds in 2013.

also point out that in this situation, the incentives of the firm to engage in tax sheltering is attenuated.

Other recent literature which links the size of the book-tax income gap and the presence of a tax shelter include Desai (2003) and Wilson (2009). Desai (2003) adjusts the book income and tax income gap for differential treatment of depreciation, foreign source income, and employee compensation and concludes that the growing difference in the years 1996-2000 is due to increasing levels of tax sheltering. Wilson (2009) uses a small sample of tax shelters (including those used in Graham and Tucker (2006)) and finds that the probability of a firm engaging in tax sheltering activity is related to the book-tax gap.

The possible sources of the tax spread involves three areas: tax favored investing activities, timing differences, and permanent differences. Differences between financial and tax income revenue and expense recognition policy give rise to timing differences. These timing differences create deferred tax account balances. For example, postretirement benefits expense funds often create tax-deferred assets while accelerated depreciation of new assets will likely increase tax-deferred liabilities. These deferred taxes are the net balance of tax-deferred assets and tax-deferred liabilities reported on the income statement. The firm benefits from deferred liabilities by the present value of the deferral.

Permanent deferrals arise when revenue or expense is recognized under one system but not the other. Items such as interest paid on municipal bonds and dividends received from other corporations are generally excluded from taxable income but are included for financial reporting purposes. Unlike deferred taxes, these permanent differences do not reverse.

Permanent differences also arise when items of income or loss by-pass the income statement during the year that goes directly to comprehensive income. Some examples of this are

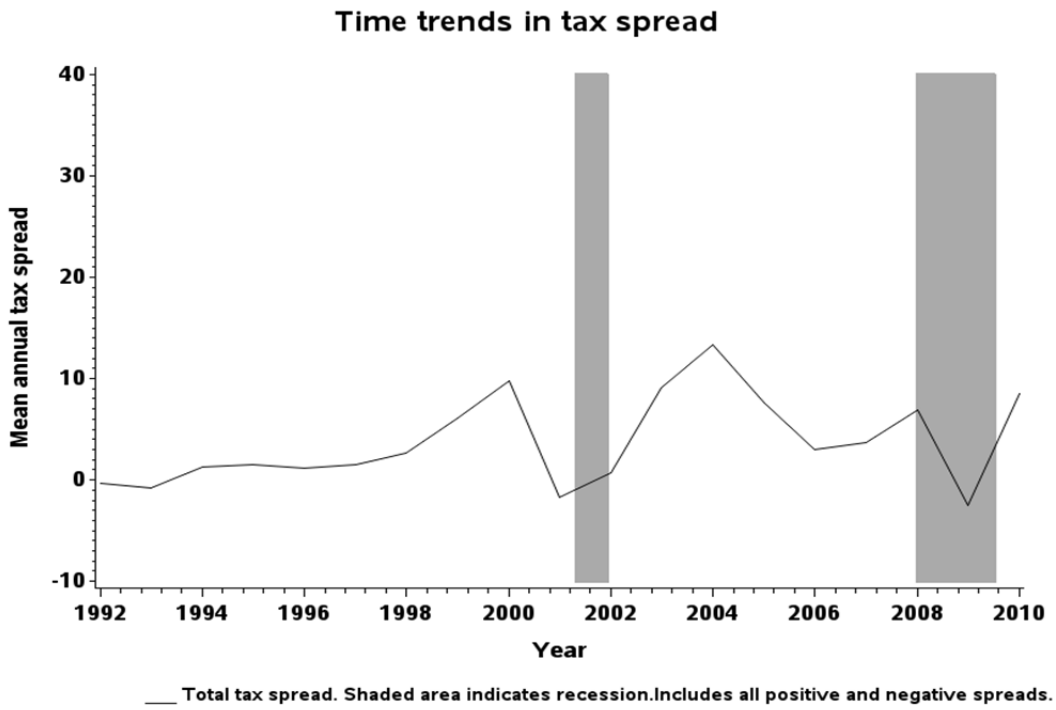
employee stock options that are exercised, the taxes on discontinued operations, extraordinary items, and cumulative effect of changes in accounting policy. When book income is greater (less) than tax income, a net tax induced gain (loss) occurs. Given the difference between financial and tax reporting incentives, well-designed shields are continually being created with the purpose to reduce taxable income often without affecting reported financial income.

Compustat defines taxes paid as cash payments for income taxes to federal, state, local, and foreign governments during the fiscal period. This variable by nature has a timing aspect that does not directly match that of tax expense reported on the income statement. For instance, fourth quarter taxes are not commonly paid until the following year and in rare cases - due to audits and/or disputes - tax expenses in one fiscal term may not be paid until several periods following. Pre-payment may also occur in rare occasions when firms anticipate future taxes or hold a tax credit. There is no way to match dollar to dollar the tax bill to the tax payment. In most cases, taxes are paid continuously with some lag; on average, these lags do not change significantly over time.

2.2 Time Series of the Tax Spread

Over our sample period from 1992 to 2010, there has been a general increase in the tax spreads. Figure 1 shows a growing trend for the Tax Spread with significant growth in the 1990's, a pronounced fall subsequent to the "dot-com" fall in 2001, and a return to highly positive tax spreads until the financial crisis that began in 2008. The grey areas in Figure 1 mark the official recession periods in the U.S.

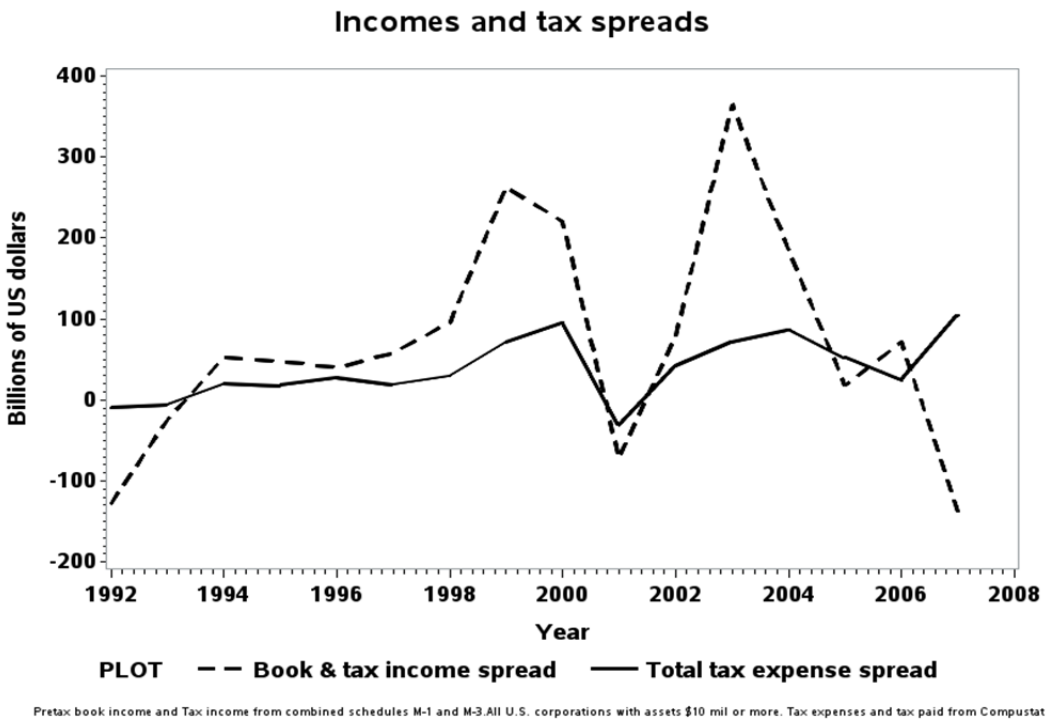
Figure 1



This study uses the tax spread as the proxy for opaque NDTS because the information is publicly available for the vast number of firms. Ideally, access to income tax information reported in schedule M-1 of Form 1120 for publicly traded corporations would provide the most accurate detail for comparison of book and tax income. A special report prepared for the IRS does show M-1 information for aggregate data for the period 1992-2007. Figure 2 shows the aggregate tax spread compared to the aggregate book and taxable income spread as reported by the U.S. Department of the Treasury (Boynton, DeFilippes, Legel and Reum, 2011).[8] Both exhibit a very similar trend. The income and tax spread is positively correlated—0.51 (p value: 0.05) but do show some opposite movements after 2005. Thus tax spread and the book-tax income spreads appear to be capturing different phenomenon at different times.

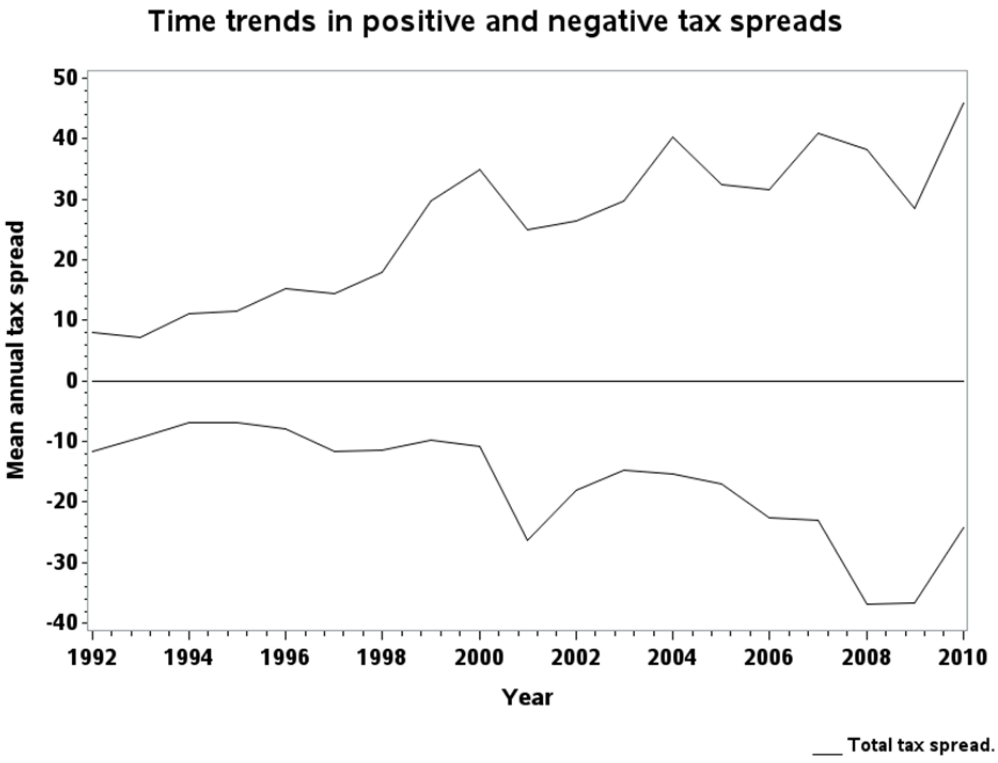
[8] 'A First Look at 2007 Schedule M-3 Reporting by Large Corporations' Charles Boynton, Portia DeFilippes, Ellen Legel, and Todd Reum; Tax Notes, August 15, 2011. http://www.irs.gov/pub/irs-utl/firstlook2007schedulem3.pdf

Figure 2



Figures 2 demonstrates that there are times when the average corporate taxes paid actually exceed the book income tax expense. The latter appears to happen mainly in economic downturns. Clearly these aggregate numbers indicate that the tax spread takes on both positive and negative values. The aggregate time series pattern of the positive and negative values of the tax spreads are shown in Figure 3.

Figure 3



This figure indicates a positive trend in all the tax spreads through most of the 1990s. After 2000, there is much more pronounced tax spreads in both the positive and negative categories.

[Insert Table 1 About Here]

Table 1, Panel A reports a statistical summary for Tax Spread by year from 1993 to 2009. The totals from this table are limited to public firms with no missing variables or extreme values as discussed above.[9] Over our sample period, the total difference between tax expense and tax paid is over 890 billion dollars. Panel B reports the distribution of firms by industry. In terms of the mean tax spreads, the telecommunication industry has the largest spreads followed by energy

[9] Table 1 excludes the negative tax spreads as we described below in our discussion of Table 2.

and consumer durables. For the median tax spreads, the order changes slightly to energy, telecommunications, and chemicals.

[Insert Table 2 About Here]

Table 2 reports individual US firms with the largest cumulative Tax Spread. The table is sorted by cumulative Tax Spread and therefore biased toward larger firms. If tax spread was only a factor of deferral tax payments, over time the tax spread for each firm would approach zero in the limit. While some firms did have alternating positive and negative spreads, the firms reported in this table either produced a positive or a negative tax spread consistently over our sample interval. Also, the individual firms do not appear to display any clustering by industry type. The firm reporting the largest positive spread, General Electric, is not surprising in that GE has been historically aggressive in its use of tax shields.[10]

Our examination of the tax spreads has shown a fairly consistent pattern of positive tax spreads over time. However, 41% of the overall sample of firm years shows negative spreads.[11] Our hypothesis that the tax spread is a valid proxy for opaque NDTS does not apply to negative tax spreads. When cash taxes paid exceeds provision for taxes, it often indicates tax loss carryforwards or accounting adjustments to the deferred tax asset or liability accounts. For example, Pfizer Inc., displaying the largest negative spread, reported large amounts of deferred tax assets in excess of deferred tax liabilities for several years during our sample period. In other words, a negative tax spread does not necessary imply less NDTS for the firm. Given this situation, our analysis in the following sections is limited on non-negative tax spreads.

3. Determinants of the Tax Spread

[10] As one example of GE's tax policy, see Stickney, Weil, and Wolfson (1983).
[11] 41percent of firm years have tax spread less than 0. For most of this study, we focus only on firms which have non-negative spreads. 48 percent of the total sample of firm-years has non-negative tax spreads.

Manzon and Plesko (MP) examine the differences between book and taxable income. They identify four types of activities that are likely to affect book-tax income spread: 1) demand controls for tax favored investment and financing action, 2) direct sources of investment related timing differences, 3) permanent differences and 4) noise factors. MP find that a relatively small set of variables explain a large percentage of the cross-sectional variation in the book-tax income spread across firms. We use the MP set of variables as determinants of tax spread, as well as adding variables to capture accounting changes and lease obligations.[12] A description of each variable (and Compustat Data Item) are summarized in the Appendix.[13]

Table 3 reports regression results for the Tax Spread. The first column reports the results of a multivariate OLS regression and the second column adds the tax benefit of options (but reduces the sample size by 40 percent). The reported adjusted R^2 and F-Statistic indicate that the model explains a significant portion of the variation in the Tax Spread in both specifications (adjusted R^2 of 61% to 62%).

[Insert Table 3 About Here]

The profitability variable, *Pretax Income*, is positive and highly significant in both the regression models. This is consistent with firms' increasing demand for tax-favored investments and financing actions, especially those that reduce taxable income but may not affect book income. The presence of NOLs *(I(Positive NOL Carryforward))* indicate that the firm is unable to make use of additional tax deductions and credits. However, the NOL variable is insignificant in and it appears that in this sample, if NOLs have any effect, it is more of a timing effect rather than a permanent impact on tax spread.

[12] In addition to the Manzon and Plesko variables, we have added the variables: *Accounting Change*, *Operating Lease Expense*, *Capital Lease Obligation*. Descriptions of each and how they are measured are reported in the appendix.

[13] For greater detail pertaining to these variables, see Manzon and Plesko (2001).

Change in Sales appears positive and significant in predicting Spread in one of the specifications. In relation to Current Tax Spread, growth firms may have more discretion in accounting procedures in comparison to a firm with stable revenue. Growth firms may be able to create a book-income tax spread through accrual methods used on financial accounting statements but reduce taxable income by using cash based methods. *Gross PP&E* and *Net to Gross PP&E*, represent timing differences. Gross PP&E is positive and significantly related to the Tax Spread. Firms with more PP&E assets are likely to have more discretion when accounting for the depreciation and the book value of assets. They also have more discretion in the use of one method for book value (such as straight-line depreciation) and different methods for tax accounting (such as accelerated depreciation). Curiously, we find that these differences appear to have both a timing effect and perhaps a more permanent effect on the tax spread given both the total and current spreads are significant. The ratio of Net to Gross PP&E measures the age of the firm's capital stock. The negative and significant sign for this variable in relation to the Current Tax Spread indicates that "newer" assets create more deferred taxes and removing that effect reduces the current tax spread.

The coefficient on *Change in Postretirement Benefits* is another explanatory variable that is significant in all the specifications. This is consistent with the MP prediction that year to year, firms that increase their post-employment obligation by an amount greater than the reduction in post-employment obligation will report a negative tax spread. Shivadasani and Stefanescu (2010) finds that the tax benefits of debt are 47 percent larger when pension debt is included.

The *Foreign Pretax Income*[14] is negative and significant related to both Total and Current Tax Spread , which is influenced by firms not expatriating income from lower-taxed foreign countries to U.S. operations.

While operating leases should be treated the same for tax and financial reporting, capital leases tend to be treated differently for each.[15] Capital leases result in depreciation and interest expenses. Depreciation usually results in timing differences as previously discussed. Interest expense for capital leases may result in a book-tax difference because the interest rate on capital leases is an imputed figure. Varying assumptions could easily lead to different interest expense. Leasing also has been employed in some tax shielding transactions (for example, the so-called lease-stripping transactions and the SILO, Sales-In, Lease-Out, transactions used for leasing to municipalities). It is unclear how these transactions are reported in financial statements, but it is likely that they could lead to deviations between tax and accounting reporting. Curiously, the operating lease variable is positive and significant, as predicted, in only one of the regression models. The capital lease variable shows up with a negative coefficient in all the regressions but without any significance.

The *Lag of Tax Spread* indicates the persistence of the tax spread relative to the past year. It is positive and significant in relation to both Total and Current Tax Spread indicating that timing related differences are persistent.

Employee stock options create a permanent tax spread as the exercise of these options is not reported on the income statement but do serve as major deductions for tax purposes. Tax

[14] Foreign Tax Expense and Foreign Tax Paid are included in the Tax Expense and Tax Paid, respectively. We can not separate foreign tax paid from tax paid therefore differentiating the portion of the tax spread attributed to the foreign taxes isn't possible using COMPUSTAT data. We attempt to circumvent this problem by eliminating all firms from our sample paying foreign taxes but find a sample bias is doing so.

[15] There are the exceptions such as the synthetic lease that is treated as debt for tax purposes but treated as an operating lease for financial disclosure.

benefit from option is the implied option expense taken directly from Compustat. We find a positive and significant relation between Current Tax Spread and Tax benefits from options.

In summary, the accounting variables suggested by MP for explaining the variance in the book-tax income spread, also help to explain the tax spread variance. Although the signs of the coefficients are not always as predicted by MP, the variables generally support the notion that demand controls, timing differences, and noise factors explain the tax shield motivations of corporations. Some of the variables that we add in addition to MP also support the NDTS activities by corporations leading to greater tax spread. The regression shown in the first two columns will be employed as instrumental variables in the next section when we examine capital structure determinants with a two-stage least squares model.

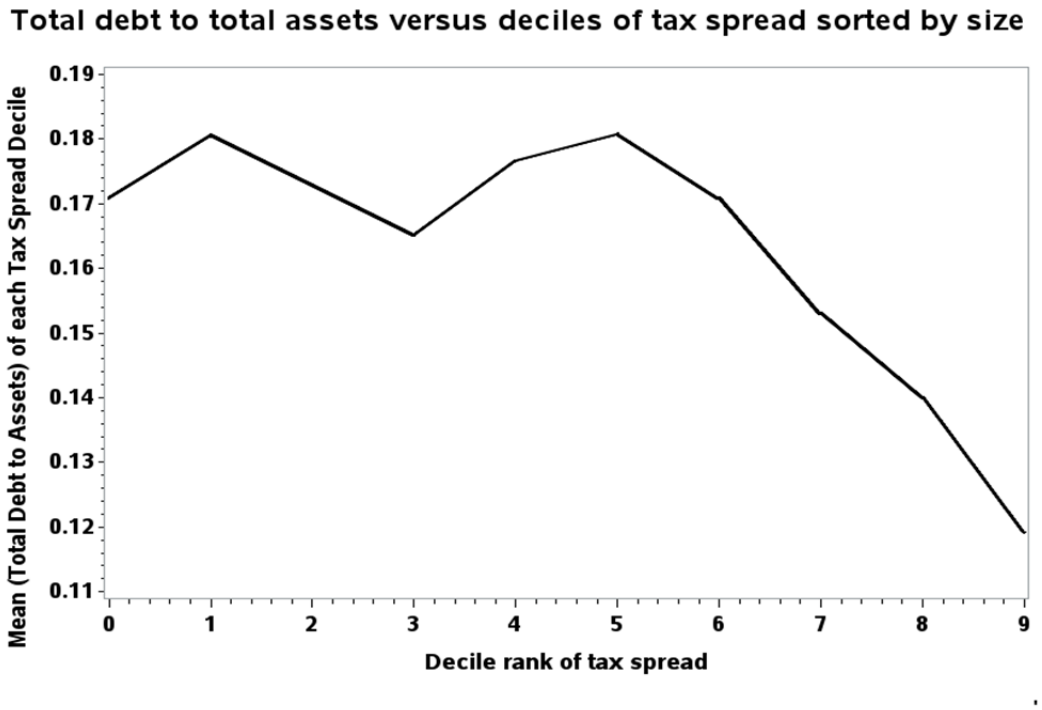
4. Capital Structure and the Tax Spread

Empirical tests of capital structure theories have been ongoing for decades. One of the puzzles resulting from early capital structure tests was the inability to demonstrate reliable and consistent tax results. This led Myers (1984) to issue a challenge to the profession to find a significant relation between taxes and debt policy as well as Myers and Majluf (1984) to suggest that taxes may be a second-order effect in the determination of debt policy. In this section we use the tax spread as proxy for NDTS in capital structure cross-sectional regressions**.**

We first take a look at leverage and the tax spreads divided into deciles. Figure 4 shows that the tax spreads display an almost monotonic decease in the debt ratio as the tax spread increases from deciles 1 to 10. Decile one represents the firms with the lowest total tax spread whereas decile ten includes those with the highest total tax spread. The y-axis in the figure is the mean value of the leverage for each decile. Leverage is measured relative to market values. It is interesting to note that the lowest decile of tax spread displays a lower debt than the second

decile. This group contains the zero (or near zero) tax spread cases in which the tax expense and the cash tax paid are the same (or nearly the same). For those firms, the tax spread is not indicative of NDTS as hypothesized for the positive tax spread. Figure 4 shows preliminary evidence that firms are substituting nondebt tax shields as measure by the tax spreads for debt tax shields.

Figure 4



Of course this bivariate look at leverage and tax spread is an insufficient examination of capital structure. We estimate a state of the literature capital structure model that incorporate the most reliable variables derived from recent studies. The model we have chosen is a variant of the estimation equation used Shivdasani and Stefanescu (2009).[16] The model is a follows:

$$(2) \qquad LEV = \beta_0 + \beta_1 IndLev_{it} + \beta_2 MTB_{it} + \beta_3 Collateral_{it} + \beta_4 OENEG_{\text{it}} +$$

[16] Although not tabulated, we have estimated regression equations using the capital structure models of Bradley, Jarrell, and Kim (1984), Graham, Lemmon, and Schallheim (1998), and Frank and Goyal (2009). The results of adding the tax spread to these models are very similar to the results presented here.

$$\beta_5 Zscore_{it} + \beta_6 ROA\,VOL_{it} + \beta_7\, Size_{it} + \beta_8\, PMTR_{it} + \varepsilon_{it}$$

LEV represents the dependent variable of leverage measured as the ratio of the book value of debt net of capital leases to market value of assets. Market value of assets is defined as the book value of total assets minus the book value of equity plus the market value of equity plus the present value of operating leases. *MTB* is market value of assets divided by the book value of assets. The *PMTR* is simulated based on income after depreciation but before interest expenses are deducted. *Zscore* is defined as 3.3*Pre-Tax Income + Sales + 1.4*Retained earnings + 1.2*(current assets – current liabilities)/book value of assets. *OENEG* is a dummy variable equal to one if the book value of common equity is negative. *IndLev* is the industry median book leverage where industry is defined at the four-digit SIC level. *Size* is defined as the natural log of the market value of assets. *ROA VOL* is the standard deviation of the historical operating income scaled by book assets based on the past five years.

We estimate the regression shown in equation (2) four ways. First, we use a two-stage least squares (2SLS) system. For the first-stage, we use the same variables used in Section 3 for estimating the determinants of the tax spread as our IVs.. The second estimation of equation 4 is an OLS equation using pooled panel regression and the results are presented in column 2 of Table 4. For this regression, we used lagged values of independent variables. For the third estimation of equation (2), we replace the intercept term with firm fixed effects.[17] Lemmon, Roberts, and Zender (2008) found that firms' capital structures were very stable through time and that firms with relatively high (low) leverage tend to maintain relatively high (low) leverage for over 20 years. They show that the firm fixed-effects dominate all the other capital structure determinants, suggesting that firm-specific but as-yet unidentified factors are more important for

[17] When we use lagged values of all variables including lagged tax spreads in a fixed effects regression similar to column 3 leads to similar qualitative results.

capital structure policies. For the fourth estimation of equation (2), we convert our panel into a cross-sectional regression by averaging the values of all variables across all years in the sample.

[Insert Table 4 About Here]

The results presented in Table 4 are consistent with past results and demonstrate the importance and reliability of the tax spread as a proxy for NDTS in capital structure regressions. The tax spread variable is highly significant in all the regression specifications. In column 1, we see the results of the 2SLS system. Since the first stage is used for determining the raw (unscaled) tax spread, the coefficients of the tax spread from the 2SLS model need to be interpreted accordingly. (The average tax spread for the entire sample is 0.015 (median: 0.009 million)). In columns 2-4, the independent variable is tax spread scaled by the book value of assets (the average scaled tax spread for the entire sample is 27.68 million (median: 2.19 million)). The tax spread is negative as predicted by the theory of NDTS substituting for debt.[18] The measure for transparent tax shield which is depreciation multiplied by the effective annual tax rate

Median industry leverage (*IndLev*) is a highly significant factor and positive determinant of capital structure. The market to book ratio (*MTB*) which is often used to proxy for growth opportunities is negatively related to leverage. Collateral is positively related to leverage, while measures of financial distress tend to correlate with the use of debt. That is, firms with negative equity (*OENEG*) are positively correlated with leverage while firms with less probability of bankruptcy (*Z-score*) are negatively correlated. Size, that can proxy for less information costs, is positively correlated with debt. Volatility of ROA (*ROA VOL*) is negatively related to leverage

[18] We estimated the regression equations found in the study by Bradley, Jarrell, and Kim (1984) who attempted to measure NDTS with depreciation and investment tax credits. They found the wrong sign on their measure. When repeating their estimation procedure but using the tax spreads instead, we found significant and negative relations between leverage and NDTS.

although it is not statistically significant in our 2SLS regression. Finally, the pre-financing marginal tax rate (*PMTR*) does not show up as statistically significant in all but one of the regressions show in Table 4. It also has the wrong sign. This result is probably due to the presence of the tax spread in the equation.

5. Tax Spread Relation to Tax Sheltering Firms and Zero Leverage Firms

In this section we examine two sets of firms that have particular relevance to the tax spread: firms that have been identified by the IRS as participating in questionable tax shelters and firms that are identified as have zero leverage. The first question we address is: does the tax spread detect known tax shelter activities by firms accused by the government of sheltering activity? A sample of 48 tax sheltering firms is used for this study: 43 of these are from the Graham and Tucker ((2006) study and 5 more are added from Wilson (2009).

Figure 5

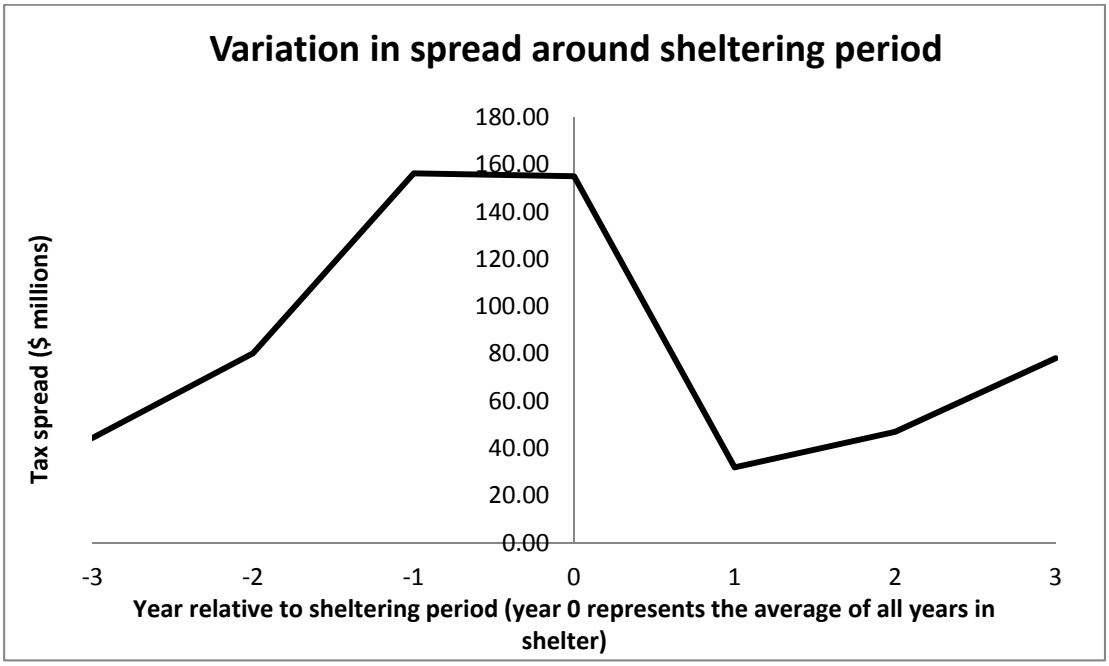


Figure 5 shows the tax spreads for the year(s) around which a known tax shelter was in operation. Year 0 in the figure represents the actual year(s) in which the shelter was in operation. If the number of years in shelter is greater than 1, the average spread over the entire sheltering period is labeled as the spread in year 0. We then compare the tax spreads for 3 years before Year 0 and for 3 years post tax shelter. The figure indicates a fairly substantial increase in the tax spread in Year 0 and Year -1. However, this graph only offers a limited picture of the relation between tax spread and tax shelters. We employ a matched firm methodology for a more complete picture that allows us to statistically test whether or not the tax spread is able to detect this tax-sheltering activity.

Following, Graham and Tucker (2006), we use a set of match-paired firms to compare the tax spread differences between the tax shelter firms and the matched sample. A few of the firms appear more than once if they have two different tax shelters operating for different periods of time. Our sample is reduced when missing data does not allow the computation of our variable of interest: the tax spread. The matched sample is created using firms from the same industry (2 digit SIC code) that have book assets within +/- 25 percent and profitability within +/- 50 percent of the tax shelter firm's ratios in the same year. Another four firms are lost due to unavailable matched firms. In the end, our sample of tax-shelter firms and matching firms consists of 24 unique tax shelters and 63 firm-year observations.

As expected, the Tax Spreads are much larger for the tax shelter firms than for the matched sample. The first row of Table 5 reports results for the 63 firm-year observations. The Tax Spread is approximately 2.5 times larger than the spread for the matched sample.

[Insert Table 5 About Here]

The second row of Table 5 examines the averages over the years of the identified tax shield of each firm, again, compared to the matching sample. For these observations, the Tax Spreads are significantly larger than the matched firms although the magnitude of the difference is a bit smaller. The Tax Spread for the tax shelter firms is 1.7 times larger than the matched firms. These results are consistent with the notion that the tax spread does indeed pick up opaque NDTS when they are otherwise unobservable.

The second question addressed: is the tax spread consistent with the special case of zero-leverage firms having more NDTS than levered firms? A recent paper by Strebulaev and Yang (2012) examines the zero-leverage firms which they label a mystery. Strebulaev and Yang suggest that zero-leverage firms are an interesting group to study for several reasons. First, to understand why firms are under-levered implies explaining why some firms have no leverage. Second, the factors that are important in explaining zero leverage should be easier to indentify in this limiting case. Third, approximately a third of the zero-leverage firms are paying a dividend and that the total payout (dividends and share repurchases) for zero-leverage firms are surprisingly close to the total payout for firms with interest and dividend payments. Strebulaev and Yang also show that in a matched-pair sample to the zero-leverage firms, size and industry do not appear to be the determining factors for the leverage decision. We would like to know if these zero-leverage firms have higher tax spreads than levered firm, thus suggesting that NDTS may play some role in explaining the puzzle.

Table 6 reports the comparison of the levered and zero-levered firms for our tax spread sample over the period 1993-2008. It is interesting to note that a little less than 20 percent of the sample is classified as zero levered, firms that do not report any long-term or short-term debt. Also, Table 6 breaks up the overall sample period into three subsamples. The percentage of

zero-levered firms increases from 14 percent in the 1993-98 period, to 16 percent in the 1994-2004 period, to 21 percent in 2005-2009. Table 6 reports the mean and median tax spreads for Levered and Zero-Leverage firms. The differences in the mean and median tax spreads are significant for the entire period and for almost all the sub-periods with only one exception (the median difference in the tax spread for 2005-9 is not significant). Also, in every case (except the one noted), the tax spreads are higher for the zero-levered firms than the levered firms indicating that NDTS are higher for those firms that do not chose to use debt in their capital structures.

[Insert Table 6 About Here]

We also repeat the logistic regression for the determinants of zero leverage policy as done in Strebulaev and Yang and the results are presented in Table 7. The dependent variable takes the value of 1 if the observation is a zero-leverage firm-year. Strebulaev and Yang specify 16 independent variables: size, market-to-book, profitability, tangibility, dividend payer, dividend payout, earnings volatility, initial zero leverage (did the firm have zero leverage when it first appeared in Compustat), industry fraction zero leverage, R&D, age, capital expenditures, abnormal capital expenditures, asset sale, operating leases, and pension liabilities. All variables are significant in Strebulaev and Yang except for the dividend payer (indicator variable) and operating leases. The pseudo r-square for their regression is around 27 percent.

[Insert Table 7 About Here]

In Table 7 we use all 16 variables as specified by Strebulaev and Yang. Our results find the following 9 variables to be significant: industry fraction zero leverage, initial zero leverage,

profitability, size, pension liabilities, asset sale, capital expenditures, and tangibility.[19] Most importantly for our study, the tax spreads are positive and highly significant, indicating that even controlling for the variables that Strebulaev and Yang consider important factors for zero-leverage firms, NDTS (proxied by tax spread) is an important contributor to the determination of zero-leverage firms.

6. Conclusion (draft)

This study introduces the tax spread as a measure of a firm's NDTS. We show:

- Tax spreads generally increase over time with the exception of recessionary periods
- Non-negative tax spreads are determined by the same factors used by others to explain the book/tax income spread
- Tax spreads are negatively correlated with leverage
- Tax spreads are significantly higher when IRS-identified tax shelters are in operation
- Zero-levered firms have higher tax spreads than levered firms

In conclusion, the tax spread is a good proxy for NDTS and has explanatory power in capital structure regressions.

[19] It should be noted that our sample period of 1993-2009 differs from Strebulaev and Yang's period of 1962-2009.

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Appendix A

In the following, we define the variables and how they were constructed. Compustat data names are included in the parenthesis.

Table 3

- *Total Tax Spread* is defined as the Total Foreign, Federal, State and other taxes minus taxes paid during the current period (TXT- TXPD).
- *Pretax* Income is directly collected from PI.
- *Positive NOL Carryforward* is a binary variable equal to one if the firm reports a NOL carryforward and zero otherwise (I(TLCF)).
- *Change in Net Sales* is the current year net sales minus less the prior year net sales (SALE-lag(SALE)).
- *Gross PP&E* is the cost of fixed property of a company used in the production of revenue before adjustments for accumulated depreciation, depletion, and amortization (PPEGT).
- *Net/Gross PP&E* is the cost of tangible fixed property used in the production of revenue, less accumulated depreciation divided by gross PP&E (PPENT/PPEGT).
- *Non-Goodwill Intangible Assets* are the difference between total intangible assets and goodwill (INTAN-GDWL).
- *Change in Post Retirement Benefit* is the current year company's obligation or prepaid cost for postretirement benefits that is reported on the Balance Sheet minus the previous year obligation (PRBA-lag(PRBA)). All missing data is set to zero.
- *Foreign Pretax Income* is the income of a company's foreign operations before taxes as reported by the company (PIFO).
- *Total Assets less net PP&E and Intangible*s is the company's total assets minus net PP&E minus intangible assets (AT-PPENT-INTAN).

- *Change in Accounting Policy* is the adjustments during the period in which an accounting change occurs (ACCHG). All missing data is set to zero.

- *Capital Lease Obligation* is the capitalized lease obligations in debt (DCLO).

- *Current Operating Lease Expense* is the rental expense for the current year (XRENT).

- *Tax benefit from option* is implied option expense (XINTOPT) from Compustat.

Table 4 & 5

- *LEV* (debt to value) is the ratio of the book value of debt net of capital leases to market value of assets. MVA is the book value of total assets minus the book value of equity plus the market value of equity plus the present value of operating leases

- *Tax spread (opaque NDTS)* is either predicted according to the two stage least squares procedure by using predicted values from Table 3 or are calculated directly as in Table 3. The spread is then standardized by dividing by total assets.

- *Transparent NDTS* is the scaled depreciation tax shield for the year found by multiplying the effective tax rate by the depreciation amount scaled by total assets. Effective tax rate is equal to the taxes paid divided by pretax income.

- *Size* is the natural log of market value which is calculated book value of total assets minus the book value of equity plus the market value of equity plus the present value of operating leases.

- *Zscore* is calculated as (3.3*EBIT + 1.0*Sales +1.4*Retained Earnings + 1.2*Working Capital)/Total assets.

- *OENEG* is a dummy variable equal to one if the book value of common equity is negative.

- *INDLEV* is the median kink value by two digit SIC code and year.

- *MTB* is the ratio of the firm's market value of assets to its book value. Market value is calculated as the book value of total assets minus the book value of equity plus the market value of equity plus the present value of operating leases.

- *ROA VOL* is the standard deviation of the historical operating income scaled by book assets based on the past five years.

Table 1—Sample statistics

Panel A: Yearly distribution of firms

This table shows the annual distribution of firms for which data to predict the opaque NDTS—total tax spread is available. Total tax spread is defined as the Total Foreign, Federal, State and other taxes minus taxes paid during the current period. Only firm-years with non-negative total spreads are included. All COMPUSTAT reporting firms are included except regulated (SICs 4900-4999) and financial firms (SICs 6000-6999) by the period 1993 through 2009.

Year	Number of firms	Percent of sample	Sum of Total tax spread	Mean Total tax spread	Median Total tax spread
1993	1578	4.69	11304.3	7.2	0.5
1994	1713	5.09	17508.2	10.2	0.7
1995	1728	5.14	20586.1	11.9	0.7
1996	2099	6.24	26354.0	12.6	0.8
1997	2044	6.08	21195.5	10.4	0.9
1998	1859	5.53	28499.7	15.3	0.8
1999	1804	5.36	43012.6	23.8	1.1
2000	1767	5.25	52476.4	29.7	1.5
2001	1788	5.32	37632.4	21.1	1.2
2002	2260	6.72	73416.8	32.5	2.2
2003	2485	7.39	83527.2	33.6	2.7
2004	2460	7.31	96300.8	39.2	3.0
2005	2288	6.8	87213.8	38.1	2.5
2006	2176	6.47	68767.4	31.6	2.3
2007	2018	6.00	89522.9	44.4	2.8
2008	1794	5.33	72908.2	40.6	2.6
2009	1775	5.28	60952.1	34.3	2.7
Full sample	33636	100.0	891178.4	26.5	1.46

Panel B: Industry distribution of firms

This table shows the industry distribution of firms for which data to predict the opaque NDTS—total tax spread is available. Total tax spread is defined as the Total Foreign, Federal, State and other taxes minus taxes paid during the current period. Only firm-years with non-negative total spreads are included. All COMPUSTAT reporting firms are included except regulated (SICs 4900-4999) and financial firms (SICs 6000-6999) by the period 1993 through 2009.

Industry	Number of firms	Percent of sample	Mean Total tax spread	Median Total tax spread
Energy	1675	5.0	88.4	7.6
Telecom	1366	4.1	93.8	5.1
Consumer Durables	975	2.9	36.6	1.4
Chemicals	853	2.5	28.2	3.5
Manufacturing	4324	12.9	22.8	2.1
Business equipment	8264	24.6	19.9	0.7
Consumer Non-Durables	2241	6.7	16.8	2.0
Shops	4842	14.4	15.1	2.2
Health	3402	10.1	11.8	0.4
Other	5694	16.9	24.9	1.5
Full sample	33636	100.0	26.5	1.46

Table 2—Firms with highest and lowest Opaque Non-debt Tax Shield

Panel A: Firms with maximum Total tax spread

This table shows the US firms with the maximum sum of total spread over the entire period during which they are available in the sample. Total tax spread is defined as the Total Foreign, Federal, State and other taxes minus taxes paid during the current period. All COMPUSTAT reporting firms are included except regulated (SICs 4900-4999) and financial firms (SICs 6000-6999) by the period 1993 through 2009.

	Firm	Sum of Total tax spread over all years in sample	Average Total tax spread over all years in sample	Average Total tax spread/Book assets over all years in sample	Average book assets over all years in sample
1	General Electric	24101	1418	0.0038	509548
2	IBM	16494	1178	0.0127	91035
3	Microsoft	16288	1357	0.0344	54933
4	AT&T	10254	1282	0.0081	191246
6	Verizon Communications	7807	976	0.0053	184111
7	Boeing Co	6566	597	0.0110	50623
8	Hewlett-Packard Co	4734	316	0.0058	56313
9	Andarko Petroleum Corp	4598	460	0.0169	32130
10	Chevron Corp	4587	510	0.0035	118071

Panel B: Firms with minimum Total tax spread

This table shows the US firms with the minimum sum of total spread over the entire period during which they are available in the sample. Total tax spread is defined as the Total Foreign, Federal, State and other taxes minus taxes paid during the current period. All COMPUSTAT reporting firms are included except regulated (SICs 4900-4999) and financial firms (SICs 6000-6999) by the period 1993 through 2009.

	Firm	Sum of Total tax spread over all years in sample	Average Total tax spread over all years in sample	Average Total tax spread/Book assets over all years in sample	Average book assets over all years in sample
1	Pfizer Inc	-7367	-818	-0.0025	110859
2	General Motor	-7273	-3636	-0.0105	306186
3	Coca Cola Enterprises	-3232	-248	-0.0151	22176
4	Corning Inc	-3214	-357	-0.0168	13871
5	Weyerhauser Company	-2827	-403	-0.0231	24135
6	Lennar Corp	-2171	-180	-0.0188	6913
7	Dex One Corp	-2159	-196	-0.0286	5661
8	Altria Group Limited	-1949	-278	-0.0033	75877
9	Devon Energy Group	-1888	-111	0.0031	15885
10	Gannett Company	-1869	-116	-0.0109	10179

Table 3—Regression Model of Factors Affecting Opaque Non-debt Tax Shield

This table shows OLS regressions and the first stage of 2SLS using the measure of opaque tax shield—total tax spread as the dependent variable. Total tax spread is defined as the Total Foreign, Federal, State and other taxes minus taxes paid during the current period. Only firms with non-negative total spreads are included. All COMPUSTAT reporting firms are included except regulated (SICs 4900-4999) and financial firms (SICs 6000-6999) by the period 1993 through 2009. Year dummies are used to control for time series variation but are not presented in this table. Pretax income is collected directly from COMPUSTAT and is the item called PI. I(Positive NOL Carryforward) is a binary variable equal to one if the firm reports a NOL carryforward and zero otherwise. Change in sales is the current year net sales minus less the prior year net sales. Gross PP&E the cost of fixed property of a company used in the production of revenue before adjustments for accumulated depreciation, depletion, and amortization. Net/Gross PP&E is the cost of tangible fixed property used in the production of revenue, less accumulated depreciation divided by gross PP&E. Non-Goodwill intangible asset is the difference between total intangible assets and goodwill. Change in postretirement benefits is the current year company's obligation or prepaid cost for postretirement benefits that is reported on the Balance Sheet minus the previous year obligation. All missing data is set to zero. Foreign pretax income is the income of a company's foreign operations before taxes as reported by the company. Total assets less PP&E and intangibles is the company's total assets minus net PP&E minus intangible assets. Change in accounting policy is the adjustments during the period in which an accounting change occurs. All missing data is set to zero. Capital lease obligation is the capitalized lease obligations in debt. Current operating lease expense is the rental expense for the current year. Tax benefit from option is taken from implied option expense from COMPUSTAT. Robust t statistics are presented in parentheses. "*","**", and "***" indicate significance at the 10%, 5%, and 1% levels, respectively. Results presented in Column 1 using 2SLS are multiplied for 1,000,000 for readability.

	Dependent variable:	
	Total tax spread	Total tax spread
	(OLS)	(OLS)
Intercept	4.8237	6.2066
	(1.60)	(2.11)**
Pretax Income	0.0480	0.0300
	(5.61)***	(4.39)***
I(Positive NOL Carryforward)	0.9656	0.4304
	(0.98)	(0.69)
Change in Sales	0.0063	-0.0038
	(2.07)**	(1.10)
Gross PP&E	0.0055	0.0062
	(5.62)***	(5.20)***
Net to Gross PP&E	1.4899	8.8968
	(0.65)	(3.10)***
Non-Goodwill Intangible asset	-0.0014	0.0032
	(-0.43)	(0.77)
Change in postretirement benefits	0.0962	0.0937
	(2.84)***	(2.38)**
Foreign pretax income	-0.0368	-0.0206
	(-2.76)***	(-1.56)
Total assets less PP&E and intangibles	0.0027	0.0026
	(3.58)***	(3.41)***
Change in accounting policy	-0.0464	-0.0361

	(-2.31)**	(-1.92)*
Current operating lease expense	0.0228	0.0638
	(0.68)	(2.38)**
Capital lease obligation	-0.0084	-0.0450
	(-0.22)	(-1.29)
Lag of tax spread	0.0463	0.0453
	(0.78)	(0.69)
Tax benefit from option		0.6473
		(4.50)***
Year fixed effects	yes	yes
Adj. R^2	0.619	0.614
p value of F statistic	<.0001	<.0001
Observations	33636	19527

Table 4—Relation between Leverage and Non-debt Tax Shields

This table presents results from regressing debt to market value on significant determinants of leverage. The dependent variable, LEV, is the ratio of the book value of debt net of capital leases to market value of assets (MVA). MVA is the book value of total assets minus the book value of equity plus the market value of equity plus the present value of operating leases. MTB is the market to book ratio calculated as MVA divided by the book value of assets. The PMTR is the pre-financing marginal tax rate is simulated based on income after depreciation but before interest expenses are deducted. ZSCORE is defined as 3.3*Pre-Tax Income + Sales + 1.4*Retained earnings + 1.2*(current assets – current liabilities)/book value of assets. OENEG is a dummy variable equal to one if the book value of common equity is negative. IndLev is the industry median book leverage where industry is defined at the four-digit SIC level. Size is defined as the natural log of MVA. Total tax spread is defined as the Total Foreign, Federal, State and other taxes minus taxes paid during the current period while the Current tax spread is defined as the Total Foreign, Federal, State and other taxes minus deferred taxes minus Income Tax Credits minus the taxes paid during the current period. ROA VOL is the standard deviation of the historical operating income scaled by book assets based on the past five years. Transparent NDTS is proxied by using the depreciation tax shield for the firm year. Column 1 presents results from using the 2SLS predicted value of total tax spread while column 2 uses lagged values of the spreads scaled by book assets. Column 3 uses spreads scaled by assets and includes firm fixed effects. Column 4 uses cross sectional average for each firm across all years. Robust t statistics are presented in parentheses. For, column 4, t stats control for clustering at the firm level. “*”,“**”, and “***” indicate significance at the 10%, 5%, and 1% levels, respectively.

	Dependent variable: LEV			
	2SLS	Pooled OLS	Firm fixed effects	Cross-sectional Avg.
Opaque NDTS	-0.0006	-0.2765	-0.2669	-0.3938
	(-5.96)***	(-5.19)***	(-6.74)***	(-3.39)***
Transparent NDTS	-0.0318	-0.0297	-0.0242	-0.0841
	(-2.53)***	(-1.12)**	(-2.61)***	(-1.25)
IndLev	0.3149	0.3028	0.1662	0.3165
	(43.18)***	(24.12)***	(18.33)***	(11.99)***
MTB	-0.0127	-0.0096	-0.0082	-0.0120
	(-24.52)***	(-10.49)***	(-14.56)***	(-4.98)***
Collateral	0.0761	0.0752	0.0667	0.0939
	(16.50)***	(11.87)***	(5.95)***	(8.39)***
OENEG	0.0811	0.0798	0.0305	0.0853
	(17.70)***	(8.15)***	(6.18)***	(6.66)***
Z score	-0.0017	-0.0031	-0.0012	-0.0011
	(-8.39)***	(-5.17)***	(-5.02)***	(-2.41)**
ROA VOL	-0.0001	-0.0001	-0.0321	-0.0002
	(-1.11)	(-1.47)	(-6.78)***	(-1.59)
Size	0.0060	0.0043	0.0004	0.0056
	(10.83)***	(7.83)***	(0.22)	(6.46)***
PMTR	0.0006	0.0314	-0.0095	0.0399
	(0.07)	(2.54)***	(-1.05)	(2.18)**
Intercept	0.0076	0.0079		0.0073
	(1.42)	(1.44)		(0.89)
Adj R squared	0.262	0.239		0.308
Year fixed effects	Yes	Yes	Yes	No
p value of F statistic	<.0001	<.0001	<.0001	<.0001
Firm-year Observations	15310	11534	15310	4091

Table 5—Opaque Tax Shield differences for years when tax shelter is active

This table presents the summary of differences between the measure of opaque tax shields—tax spreads of the firms which have a shelter and matched firms which do not have any shelter. Opaque tax shield is the Total tax spread is defined as the Total Foreign, Federal, State and other taxes minus taxes paid during the current period. If the shelter lasted multiple years, each year the shelter lasted is taken as a single observation in the first row. In the second row, the firm-year statistics are averaged across all of the years that the shelter was allegedly active. Matched firms are in the same industry as the shelter firm and have book assets within +/- 25% and profitability within +/- 50% of the shelter firm's ratios in the same year. All numbers are means. p values for the differences reported are calculated either on the basis of a t test for means and sign rank test for medians. *, **, *** imply significance at the 10%, 5%, and 1% respectively

Opaque NDTS	Number of Observations	Shelter firms	Match firms	Difference	p value for difference in median	p value for difference in mean
Total tax spread	63	180.54	73.01	107.52	0.09*	0.02**
Total tax spread	24	188.72	109.91	78.81	0.05**	0.04**

Table 6—Univariate relation between Opaque Non-debt Tax Shield and Zero Leverage firms

This table presents the univariate analysis of the relation between the measure of opaque tax shields—total tax spreads and the zero leverage firms. Total tax spread is defined as the Total Foreign, Federal, State and other taxes minus taxes paid during the current period scaled by book assets. Only firms with non-negative spreads are included. All COMPUSTAT firms are included except regulated (SICs 4900-4999) and financial firms (SICs 6000-6999) by the period 1993 through 2009. Zero leverage firm-years are defined as those firms which do not have any long or short term debt in that particular year. p values for the differences reported are calculated either on the basis of a t test for means and signed rank test for medians. *, **, *** imply significance at the 10%, 5%, and 1% respectively.

	Opaque NDTS		
	N	Mean	Median
	1993-2009		
Levered firms	28644	0.0137	0.0075
Zero leverage firms	5412	0.0173	0.0078
p value of difference		<.0001***	0.0002***
	1993-1998		
Levered firms	9857	0.0127	0.0070
Zero leverage firms	1494	0.0170	0.0090
p value of difference		<.0001***	<.0001***
	1999-2004		
Levered firms	10740	0.0150	0.0081
Zero leverage firms	1914	0.0194	0.0084
p value of difference		<.0001***	0.0382**
	2005-2009		
Levered firms	8047	0.0131	0.0071
Zero leverage firms	2004	0.0156	0.0065
p value of difference		<.0001***	0.7091

Table 7—Multivariate relation between Non-debt Tax Shields and Zero Leverage firms

This table presents the logit regression of the zero leverage firms on tax spreads. The dependent variable is an indicator which takes the value of 1 if the observation is a zero-leverage firm-year. Zero leverage firm-years are those firms which do not have any long or short term debt in that particular year. Total tax spread is defined as the Total Foreign, Federal, State and other taxes minus taxes paid scaled by book assets during the current period while the Current tax spread is defined as the Total Foreign, Federal, State and other taxes minus deferred taxes minus Income Tax Credits minus the taxes paid during the current period scaled by book assets. Operating profit is defined as operating income scaled by total assets. MVA is the book value of total assets minus the book value of equity plus the market value of equity plus the present value of operating leases. Market to book ratio is MVA divided by the book value of assets. Firm size is defined as the natural log of MVA. Volatility of ROA is the standard deviation of the operating income scaled by book assets based on the past five years. Payout ratio is the total dividend paid in that year scaled by total assets. Capital expenditure is scaled by assets. Dividend payer is defined as an indicator variable equaling 1 if dividends paid are greater than 0. Age is defined as the number of years since the firm's first record appeared in Compustat. Initial zero leverage is an indicator variable equaling 1 if the firm has 0 leverage when it first appears on Compustat. Industry fraction zero leverage is the fraction of zero leverage firms in the same industry, defined by 3-digit SIC, and the same year. Pension liabilities are the difference between pension obligations and pension assets (=0 if the result is negative). Operating leases are the sum of current rental payment and the discounted present value of future rental commitments (up to five years). R&D expense is the ratio of R&D expenses scaled by sales. Abnormal capital expenditure in the following year is as defined in Titman, Wei, and Xie (2004). Tangibility is the ratio of fixed to book assets. Asset sales are the ratio of asset sales to book assets. Only firms with non-negative total and current spreads are included. All COMPUSTAT firms are included except regulated (SICs 4900-4999) and financial firms (SICs 6000-6999) by the period 1993 through 2009. All independent variables are for the previous year. Z-statistics shown control for clustering at the firm level. "*","**", and "***" indicate significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable: indicator =1 for no leverage firm in year t		
	1	2
Opaque NDTS		4.7295
		(5.64)***
Transparent NDTS	-0.0060	-0.0125
	(-0.04)	(-0.10)
Log(Age)	-0.1009	-0.1033
	(-2.35)**	(-2.41)**
Industry fraction zero leverage	5.2929	5.2987
	(15.60)***	(15.62)***
Initially zero leverage	0.4351	0.4360
	(5.78)***	(5.78)***
Dividend payer	-0.0159	-0.0026
	(0.21)	(0.04)
Operating profit	0.9287	0.8582
	(5.74)***	(5.36)***
MTB	0.0696	0.0671
	(1.90)*	(1.87)*
Abnormal capital expenditure	-0.0065	-0.0054
	(-1.11)	(-0.97)
R&D expenses	0.0003	0.0000
	(0.48)	(0.50)
ROA VOL	-0.0314	-0.0299

	(-1.44)	(-1.40)
Firm size	-0.1684	-0.1697
	(-6.93)***	(-10.04)***
Payout ratio	0.4333	0.4132
	(1.62)	(1.57)
Pension liabilities	-0.1005	-0.0985
	(-1.85)*	(-1.85)*
Operating leases	-0.0005	-0.0005
	(-1.62)	(-1.60)
Asset sale	1.0675	1.0543
	(6.59)***	(6.54)***
Capital expenditure	3.8062	3.7609
	(7.95)***	(7.79)***
Tangibility	-3.9560	-3.9285
	(-12.60)***	(-12.45)***
Intercept	-1.3887	-1.4589
	(-6.64)***	(-6.96)***
Number of zero leverage firms	4391	4391
Pseudo R squared	0.157	0.159
Firm-Year Observations	27180	27180