Corporate Tax Aggressiveness and the Role of Debt

Akanksha Jalan
Indian Institute of Management, Bangalore
akanksha.jalan10@iimb.ernet.in

Jayant R. Kale
Georgia State University
jkale@gsu.edu

Costanza Meneghetti
West Virginia University
costanza.meneghetti@mail.wvu.edu

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Abstract

In this paper we study the impact of leverage on tax aggressiveness. We develop a simple two-date, one-period model to capture the manager's incentives to avoid income taxes to shelter and divert money from the taxable income. The model predicts a trade-off between the benefits of diversion and the increased risk of bankruptcy. Predictions from the model are tested on a panel of U.S. firms from 1986-2012. We find evidence of a negative relation between leverage and tax aggressiveness; additionally, we find that tax aggressiveness reduces firm value. We control for endogeneity by using changes in the U.S. Bankruptcy Code in 2005 as an exogenous shock.

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Over the last two decades, the role of tax departments of U.S. corporations has undergone a drastic change. They have become active profit centers with their own annual targets in the form of effective tax rates (ETRs) and cash taxes saved (Novack, 1998; Hollingsworth, 2002; Clark, Martire & Bartolomeo, Inc., 2000). This paradigm shift in attitude has created holes in the State's pockets due to the underreporting of corporate income[1] and new and ingenious methods to eliminate tax liability. The incentives to avoid payment of income taxes is understandable, given the fact that more than a third of the firm's hard-earned profits are taken away by the State through taxes. Judge Learned Hand once said, "Over and over again courts have said that there is nothing sinister in arranging one's affairs so as to keep taxes as low as possible. Everybody does so, rich or poor, and all do right, for nobody owes any public duty to pay more taxes than the law demands. Taxes are enforced exactions, not voluntary contributions." (Hand, 1947).

This paper looks at the effect of a firm's capital structure on its tax avoidance decisions with a simple two-date, single-period model that studies the payoff-maximization problem faced by the manager of a levered firm. Our model is based on the intuition that while bankruptcy is costly both for the manager and the firm, it is 'costlier' for the manager. Since she alone who observes the *true* payoff of the firm, she decides whether and how much of the pre-tax income to shelter from taxes. The manager must determine *ex ante* the optimal amount to shelter in the next period[2]. In the simple owner-manager case the manager gains directly from increased sheltering, and the trade-off is between those gains and the increased likelihood of bankruptcy that comes from sheltering.[3]

[1] The IRS measures the tax-gap as the total loss in tax revenue using the Tax Compliance Measurement Program (TCMP) data. This gap arises out of three sources- non-filing, underreporting and non-payment. Underreporting in 2001 is estimated at $29.9 billion, of which corporations with over $10 million in assets make up $25 billion.

[2] This is not unreasonable as shelters are sophisticated financial products and require considerable time to materialize and start generating benefits. Besides this, this assumption satisfies our requirement of imposing a threat of bankruptcy on the manager, which would not be possible if the sheltering levels were determined after observing the true cash flows.

[3] In the event of bankruptcy, all payments to the firm's executives become subject to the approval of the bankruptcy court. Also, since the IRS is also a claimant in the assets of the troubled firm, taxes shown to be 'evaded' must be

We also model the case of separation between ownership and control. In this framework the manger can divert part of the sheltered income. The trade-off is now more complex. Assuming that managerial diversion happens out of sheltered income only, on the one hand, the manager wants to shelter more in order to divert more, on the other hand the manager must shelter only up to where the risk of bankruptcy is not too high. Which one of the two effects dominates is an empirical question.

Predictions from our model are tested on a panel of U.S. firms over the period 1986-2012. Results indicate that leverage affects tax aggressiveness negatively. To control for endogeneity of leverage and tax aggressiveness, changes in the U.S. Bankruptcy Code in 2005 are used as an exogenous shock. We find that our preliminary results are robust to endogeneity. In another set of tests, we investigate whether tax avoidance activities indeed enhance market value, and find that it reduces firm value.

The dividing line between legal tax avoidance and illegal tax evasion is rather blurred. For the purpose of this paper, we rely on the definition of Hanlon and Heitzman (2010). They consider tax avoidance to be a continuum of activities that enable corporations to reduce taxes. On one extreme of this continuum lie perfectly legal activities such as the purchase of tax-exempt bonds, while on the other hand, lie egregiously abusive tax-saving transactions such as the use of prohibited tax-shelter products, transfer mispricing etc., that if detected by the IRS, will surely result in fines and penalties against the avoiding firm (often termed tax evasion). In the middle, however, lie activities that fall between perfectly legal and outright abusive activities. These generally, are based on a weaker set of facts and are often born out of a rigorous reading of the tax laws. Due to their nature, it is a priori unclear, whether these activities can be punished or even detected by the. Apart from reputational damages, uncertain tax positions create tax risk, which can affect the firm's liquidity via penalties and fines on detection. This set of activities has been termed 'tax aggressiveness' in prior literature. Similar to Rego and Wilson (2012), we focus on this set of activities in this paper. This enables us to avoid distinguishing between tax avoidance activities are legal

returned to the IRS, i.e. there can be no waiver of such dues. Anecdotal evidence indicates that bankrupt or financially troubled firms are subjected to greater scrutiny and is therefore, highly likely that tax avoidance activities, if any undertaken, will come to light (Example, Enron). All in all, it is difficult for the manager or for the firm to retain the benefits of sheltering in the state of bankruptcy.

and which are not, and focus on only those activities that carry a risk of penalized, which is absent in both perfectly legal (probability of penalties is zero) and abusive (probability of penalties is one) tax avoidance activities.

A perfect example of tax aggressiveness is the use of corporate tax shelters. The Government Accountability Office (GAO) of the U.S. defines abusive tax shelters as "very complicated transactions promoted to corporations and wealthy individuals to exploit tax loopholes and provide large, unintended tax benefits." Owing to the growing demand for tax-avoidance techniques among U.S. corporations, there was mushroom growth in the supply of tax shelters in the U.S. in the 1990s. Shelters would be meticulously designed by large accounting and consulting firms with the assistance of experts in accounting, taxation and law, based on detailed reading and understanding of the U.S. Tax Code. They would then be confidentially marketed to potential corporate users. Generally, only when a shelter has spread considerable and has helped its users save billions in taxes, it is detected and dealt with by the IRS.[4] [5] Due to the widespread use of tax shelters as a means of facilitating tax aggressiveness, we keep referring to tax aggressiveness as 'tax sheltering' throughout the paper.

While Slemrod (2004) was one of the first papers to highlight the agency problems inherent in the corporate tax avoidance decision, our paper extends the model of Desai, Dyck and Zingales (2007) (hereafter DDZ) and contributes to the growing literature on the cross-sectional variation in corporate tax avoidance. While DDZ (2007) consider a three-party game involving the shareholders, insiders/manager

[4] A very popular shelter that originated in the 1950s was the COLI shelter (Corporate-Owned Life Insurance), also known as the janitor's insurance or the dead peasants insurance. It exploited the preferential treatment accorded to insurance proceeds in the event of death of the insured, under the U.S. Tax Code. Though originally meant for key employees in a corporation, it gained popularity when firms began to insure hundreds of thousands of their employees under the COLI, sometimes even without their knowledge. Walmart, the American retail giant had insured about 3,60,000 of its employees under the COLI. Another interesting example of tax aggressiveness is that of the technology giant Apple, based in California in U.S.A. In order to avoid attracting income taxes on income earned overseas, it has retained about $76 billion in earnings offshore between 2009 and 2012. (http://www.nytimes.com/2013/05/21/business/apple-avoided-billions-in-taxes-congressional-panel-says.html?pagewanted=all&_r=0).

[5] The large-scale misuse of tax shelters led to the creation of a new Office of Tax Shelter Analysis (OTSA) by the IRS in the year 2001. Its sole task was to carefully monitor the tax activities of corporations and look for signs of use of tax shelters, so that they could be plugged without further damage. The use of shelters has led to undesirable tax litigation in the U.S. Recently, litigation against the audit firm KPMG resulted in the IRS challenging $2.5 billion in tax benefits, which had resulted to its clients out of tax shelters marketed and sold to them between 1996 and 2003 (Lisowsky, 2010).

and the State, this paper brings in a fourth party, namely the debt-holders who bring with themselves an inherent risk of bankruptcy. In addition to the two types of agency problems that DDZ (2007) highlight we introduce he conflict of interest between the manager and the shareholders on one side and the debt-holders on the other.

This study also contributes to the growing literature that examines the relationship between corporate governance and tax avoidance. Desai and Dharmapala (2009) investigate tax avoidance as a function of the efficacy of the firm's corporate governance. Following Slemrod (2004), there has been a recent surge in literature that examines the value-impact of tax avoidance (Desai and Hines, 2002; Hanlon and Slemrod, 2009; Desai and Dharmapala, 2009) and the interaction of firm-level corporate governance with the decision to avoid taxes (Desai and Dharmapala, 2006a; Desai, Dyck and Zingales, 2007; Blaylock, 2011; Rego and Wilson, 2012; Armstrong et al, 2012 among others). Citing examples from Enron, Parmalat and Tyco, papers have argued that strong complementarities exist between tax avoidance and managerial rent-seeking. The cost of indulging in one, reduces the cost of another (Desai, 2005; Desai and Dharmapala, 2006a; Desai, Dyck and Zingales, 2007). In the light of the growing literature on corporate tax avoidance, some researchers have argued that firms, like individuals differ in their preference for undertaking risky tax avoidance and have stressed the need for identification of determinants thereof (Shackelford and Shevlin, 2001; Slemrod, 2004; Hanlon and Heitzman, 2010). Our study contributes to this stream of literature by examining the role of leverage in influencing tax aggressive behavior.

The article is organised as follows: Section 1 reviews the literature, Section 2 discusses the model, Section 3 discusses the data sources, Section 4 presents univariate statistics, and Section 5 summarizes empirical results. Section 6 concludes the paper.

1. Literature Review

1.1. Tax aggressiveness and agency problems

The link between tax avoidance and corporate governance is not new as it dates back to the year 1909 when the first-ever corporate income tax was rolled out in the U.S. One of the key reasons for

introducing the new tax on corporate income was to address corporate governance issues. The early 20th century marked the absence of effective corporate governance mechanisms in the U.S. Keeping in mind the abuse of powers granted to managers and the free-rider problem faced by minority shareholders in monitoring, the corporate tax was introduced to provide an additional monitor of managerial actions- the State/ IRS. Since managerial diversion of the firm's resources reduces income reported to both the State and the shareholders, the corporate tax gave them a common goal- to verify the true income of the corporation. Since tax returns were to be filed with the State on a regular basis, verification of the firm's true income became much easier (it must be noted that at that time, tax returns were public documents). President William Taft, in his defence speech on the introduction of the tax on June 16, 1909, said "Another merit of this tax (the federal corporate excise tax) is the federal supervision which must be exercised in order to make the law effective over the annual accounts and business transactions of all corporations. While the faculty of assuming a corporate form has been of the utmost utility in the business world, it is also true that substantially all of the abuses and all of the evils which have aroused the public to the necessity of reform were made possible by the use of this very faculty. If now, by a perfectly legitimate and effective system of taxation, we are incidentally able to possess the Government and the stockholders and the public of the knowledge of the real business transactions and the gains and profits of every corporation in the country, we have made a long step toward that supervisory control of corporations which may prevent a further abuse of power."

Slemrod (2004) was one of the first papers to stress the need for a separate analysis of the dynamics of corporate tax avoidance decision owing to inherent differences in the taxpayer's risk preferences and civic sense and more so, the agency problems inherent in the tax avoidance decision of large corporations. Following Slemrod (2004), Chen and Chu (2005) and Crocker and Slemrod (2005) address the issue of optimal incentive compensation contracts to the tax manager in the light of agency problems in the corporate tax avoidance decision. Chen and Chu (2005) study corporate tax evasion in a standard principal-agent model (an extension of Holmstrom, 1979) and show that when avoidance is made costly for the manager (by way of penalty on detected evasion), the optimal wage contract turns out

to be inefficient. Crocker and Slemrod (2005) address the issue of whether penalties on detected tax evasion should be imposed on the firm or the manager directly, and, using a costly state falsification framework, demonstrate that penalties on tax evasion imposed directly on tax manager are more effective in curbing evasion that those on the firm.

Desai and Dharmapala (2006a) examine the relationship between equity incentives to managers and tax avoidance and find that higher incentive compensation reduces tax avoidance and that this relationship is driven primarily by poorly-governed firms. This is in contrast to the findings of Hanlon, Mills and Slemrod (2005) who find that the pay-for-performance sensitivities for the top 5 executives of firms are positively associated with proposed IRS deficiencies. Similarly, Rego and Wilson (2012) examine the link between equity risk incentives and tax aggressiveness and find a positive association between equity risk incentives and tax aggressiveness. This relationship, however, does not vary by firm-level corporate governance. Using quintile regressions of tax avoidance on corporate governance, Armstrong et al (2012) find evidence of relationship only at the upper and lower tails of the tax avoidance distribution. Specifically, they find that good corporate governance (in terms of more independent and financially sophisticated boards) encourage tax avoidance at the lower end and discourage it at the upper end of the tax avoidance distribution. They also find that the CEO's equity risk incentives are positively associated with tax avoidance, more so in the right tail of the tax avoidance distribution.

It is evident that while substantial literature on tax avoidance has relied on the complementarities between tax sheltering and minority expropriation, there is no direct evidence as to the phenomenon and the mechanism through which tax evaded income is used to divert rents (Armstrong et al, 2012). To our knowledge, there is only one paper which directly addresses this issue in the context of U.S. firms. Blaylock (2011) finds no evidence of a relation between tax avoidance and rent extraction in U.S. firms, on an average.

1.2. Tax aggressiveness and firm value

An important aspect of tax avoidance activities is the socialcost associated with them. Tax avoidance has been termed "selfishness" by Slemrod (2004). Such activities result in shifting the burden

of taxes from the shareholders of the avoiding firm to other taxpayers in society. Not only can this result in reputational damages but also deeper inquiries into the affairs of a firm that is publicly accused of engaging in tax shelters or other tax avoidance activities.

Examining the case of U.S. corporate inversions, Desai and Hines (2002) find a positive shareholder reaction to such arrangements. Hanlon and Slemrod (2009) show that the stock price decline consequent to a firm's news of being involved in a tax shelter is more negative for firms in the retail sector, suggesting that this could be in part, owing to consumer backlash. Chen et al. (2010) find family firms to be less tax aggressive compared to their non-family counterparts and attribute the difference to heightened reputational concerns and potential non-tax costs to family firms. Austin and Wilson (2013) find that while the tax avoidance levels of firms with more valuable consumer brands are not significantly different from the rest, managers of such firms certainly use the flexibility accorded by financial reporting standards to report such avoidance more conservatively. On the other end of the spectrum, Gallemore, Maydew and Thornock (2012) find no evidence of reputational costs acting as a deterrent to tax avoidance.

One of the first papers to directly address the issue of whether tax avoidance activities advance shareholders' interests is Desai and Dharmapala (2009). They argue that while tax avoidance is expected to enhance shareholder value by saving tax outflows, such savings may be offset by higher opportunities for managerial diversion of the firm's resources. Thus, they argue that better-governed firms are more likely to be able to retain the benefits of tax avoidance. Their empirical tests support the hypothesis that tax avoidance enhances firm value only in well-governed firms. This is consistent with Wilson (2009) who finds that the benefits of engaging in tax shelters accrue to shareholders of well-governed firms only.

DDZ (2007) develop a simple one-period model that links the two corporate tax system characteristics- tax rates and degree of tax enforcement to the manager's diversion decision. The manager optimises the amount diverted in the light of a trade-off between personal gains there from and penalties on both tax avoidance and diversion. Predictions from the model are tested on a sample of listed Russian oil firms. They find that following higher tax enforcement that came in the form of President Putin's

crackdown on tax evasion in oil firms, not only did the market values of targeted companies rise, they also experienced lower levels of diversion. They interpret it as evidence of significant organizational changes in targeted companies (though initially meant to reduce tax avoidance) that made managerial diversion more difficult. Similarly, Kim, Li and Zhang (2011) examine the relationship between corporate tax avoidance and the risk of a firm-level stock price crash. They find support for the intuition that tax avoidance facilitates managerial rent-seeking and therefore, increases stock price crash risk by hoarding of bad news for extended periods from shareholders. They also find that the positive relation between tax avoidance and stock price crash risk is weakened for well-governed firms.

1.3. The Role of Debt

Debt helps discipline management because default allows creditors the right to force the firm into bankruptcy (Harris and Raviv, 1990). Bankruptcy is a costly process (Ang, Chua and McConnell, 1982; Lawless and Ferris, 1997; Altman, 1984; Altman and Hotchkiss; 2006). But what is important for our purpose is the fact that bankruptcy does not affect the manager and the shareholders equally. It is 'costlier' to the manager. There is abundant literature on the non-pecuniary costs that the incumbent manager faces when the firm is in financial distress (Gilson, 1989; Gilson and Vetsuypens, 1993; Hotchkiss, 1995; Betker, 1995b; Ayotte and Morrison, 2007).

The role of monitoring in checking managerial opportunism is rather well-researched. Debt contracts usually contain detailed covenants and other restrictions that limit managerial flexibility in most operating decisions. Failing to meet all or any of these indentures can result in a "technical default" that may allow for creditors to take control of the firm. For instance, Cremers et al (2007) show that bond-holder and equity-holder conflicts are mitigated through bond covenants. Besides covenants, debt-holders usually actively monitor the activities of the management. They sit on Boards, involve themselves in management and policy-formulation, monitor managerial behaviour and possess the right to fire inefficient management. There is substantial literature that looks at the monitoring role of debt and its involvement in firm governance. Most early papers on creditor monitoring focused on distressed firms (Gilson, 1989; Gilson and Vestyupens, 1993). However, there now exist a host of papers that emphasize

the monitoring function of creditors even in healthy firms (Kroszner and Strahan, 2001; Byrd and Mizruchi, 2005; Nini et al, 2012).

Literature on the link between debt and tax aggressiveness/ avoidance has largely focused on two issues- tax aggressiveness as a determinant of leverage and the relationship between tax aggressiveness and the cost of debt. One of the first papers in this area is Schallheim and Wells (2004). They address the 'under-leverage puzzle' and the question of 'substitutability' of debt and non-debt tax shields (DeAngelo and Masulis, 1980). They attempt to capture non-debt tax shields (NDTS) using the difference between taxes paid and the tax expense reported in the financial statements, which they call the 'tax spread'. This is intended to capture the extent of unobservable 'off-balance-sheet deductions' such as stock option deductions, accelerated depreciation etc. They find that NDTS are negatively related to the use of debt in capital structure. Graham and Tucker (2006) address the same issue by using a different measure of non-debt tax shields. Instead of using an indirect measure, they look at a particular source of NDTS- tax shelters. By using a sample of 44 tax shelter cases based on Tax Court records and financial press stories from 1975-2000, they find that firms that used tax shelters had significantly lower debt ratios. They also find that an average shelter in their sample generates deductions of about 9% of asset value, compared to only 3% for a debt-ratio of 30% (assuming an interest rate of 10%). On a similar note, using the 'tax spreads' as defined in Schallheim and Wells (2004), Kolay, Schallheim and Wells (2011) find a negative relationship between NDTS and leverage.

The paper that most closely resembles our work is Joulfaian (2011). Instead of restricting its attention to tax aggressiveness as a determinant of leverage, the paper also looks at how leverage might affect tax aggressiveness. It should be noted that the paper focuses on tax evasion and not tax aggressiveness. It defines tax evasion as the underreporting of corporate income from income taxes in thoroughly audited corporate tax returns. The model differs from ours in the several ways: *(a)* Unlike in our case where only the tax aggressiveness decision is endogenous, their model endogenizes both debt and the decision to evade taxes, *(b)* By assuming that tax evasion happens after payment of interest, it ignores the threat of bankruptcy that could result from reckless tax evasion, and *(c)* It looks at an owner-

manager case and ignores agency considerations completely. On the other hand, we incorporate agency costs in tax aggressiveness by allowing for the possibility of managerial diversion out of tax-sheltered income. Their empirical evidence finds that firms with higher leverage ratios experience less tax evasion. These findings are similar to Graham and Tucker (2006).

*T*he focus of our research is the role of leverage as a determinant of tax aggressiveness. As mentioned earlier, to the best of our knowledge, this question has not been addressed directly, except in Joulfaian (2011). The paper, however, ignores agency considerations in the tax avoidance decision. There is however, indirect evidence in relation to how debt might impact tax aggressiveness. Most studies on tax avoidance/ aggressiveness have used leverage as a control variable in explaining its cross-sectional determinants. For instance, Gupta and Newberry (1997) and Rego and Wilson (2012) find that firms with high leverage ratios are associated with lower Effective Tax Rates (ETRs), implying higher tax avoidance. On the contrary, Wilson (2009) and Lisowsky (2010) in their study on the use of corporate tax shelters provide evidence that tax shelter firms are associated with lower leverage ratios. Based on a sample of firms that were shown to have participated in tax shelters, Wilson (2009) develops a profile of a firm that is most likely to use a tax shelter, based on financial statement information. He includes leverage as one of his explanatory variables in the tax shelter prediction model and documents a negative relationship with tax aggressiveness. Similarly, Lisowsky (2010) develops a tax shelter prediction model based on firm characteristics highlighted in the *U.S. Treasury Department (1999) White Paper on Tax Shelters*, using publicly available information. Utilizing confidential information from the Office of Tax Shelter Analysis (OTSA) of the IRS and publicly available financial statement data, he tests for cross-sectional determinants in a logistic framework for publicly traded U.S. firms. Contrary to prior evidence, the paper finds no significant relationship between leverage and tax shelter usage for its main sample.

2. The model

There is an unlevered corporation faced with a new investment opportunity requiring an investment of *I* at time t = 0. The full amount *I* must be raised through debt[6] which must be repaid at time t = 1, the end of the corporation's life. At time t = 1 the payoffs from the investment are realized, repayments to debt and equity are made, and the life of the corporation comes to an end. Assume that the face value of debt that must be repaid at time t = 1 is *D*. Let the payoff from investing *I* today be described by some stochastic variable *y* which has a cumulative distribution function *F (s + D)* and a density function *f (s + D)*. This payoff is observable to the manager alone.[7] The payoff *y* may or may not be sufficient to repay the debt in full, thus the firm faces some bankruptcy risk.[8] Investors in the firm, namely the shareholders and the creditors, are risk neutral and the expected return per dollar that can be obtained on an alternative investment in the economy is zero.

In the presence of taxes on corporate profits, a significant share of the firm's profits must be shared with the government, thus reducing the payoff to equity or earnings per share. This may create incentives to shelter some part of the firm's payoffs from the government. We assume that there are no costs to sheltering in the form of penalties on detection, and that debt-holders do not monitor the firm. These assumptions ensure that the only threat to the manager from sheltering income from taxes results from the increased probability of bankruptcy.[9]

The dollar amount *s* to be sheltered at time t = 1 must be determined by the manager in t = 0, and it is based on his expectations of the future cash flow *y* and the probability of bankruptcy. Once the payoff *y* is realized in t = 1 the manager shelters the amount *s* that had previously chosen in t = 0 and uses the remaining *y – s* to pay back the debt-holders. Bankruptcy may result if the payoff *y* is not large enough to

[6] This assumption is for the sake of simplicity only. Given that the firm already has some equity capital, this case can easily be generalized to one where new funds are to be raised through a mix of debt and equity.

[7] This assumption is necessary in order to ensure that the manager can shelter in any state of the world. Without this assumption, the probability of the manager being caught is 1. Refer to Grossman and Hart (1982). This assumption is also consistent with Desai and Dharmapala (2006a), Desai, Dyck and Zingales (2007) and Crocker and Slemrod (2005).

[8] For simplicity it is assumed that default leads to bankruptcy. Note that under this setup, bankruptcy must necessarily imply liquidation under Chapter 7 of the U.S. Bankruptcy Code. A reorganization under Chapter 11 is not reasonable since the life of the corporation comes to an end at time *t = 1*.

[9] The case can easily be extended to include the probability of detection and penalties.

fully repay the amount *D* after the manager has sheltered *s*. In other words, the firm goes bankrupt if and only if $y < s + D$.[10]

2.1. The owner-manager case

In this simplistic scenario, we assume that the manager is also the owner of the firm. We also assume that the manager is not able to recover the proceeds from her sheltering activities in case of bankruptcy. The assumption of zero gains in bankruptcy is necessary in order to impose an indirect cost of bankruptcy on the owner-manager and to allow for the benefits of sheltering in the non-bankrupt states only.[11] The maximization problem for the owner-manager becomes (at time t = 0):

$$\max_{s} V_0^{OM} = [(y - s - D)(1 - t) + s][1 - F(s + D)] \qquad (1)$$

In equation (1) we allow for tax shields on the entire amount of debt *D*, rather than on the interest component only. We also tried a different version of the model that disaggregates the payments to debt-holders into principal and interest components to restrict tax shields on interest alone. Unreported results, however, are qualitatively similar. Since our main objective is to highlight the risk of bankruptcy that could result from excessive sheltering in the presence of debt, this suffices for our purpose.

Next we define the hazard rate $h(s + D) = f(s + D)/[1 - F(s + d)]$ and assume that $h'(s + D) > 0$.[12] In the context of our model, the hazard rate captures the increase in the probability of firm bankruptcy for a $1 increase in tax sheltering, conditional on the fact that the firm is presently solvent. In order to solve for the optimal sheltering *s** we differentiate (1) with respect to *s* which results in the first order condition:

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[10] If s exceeds y the firm defaults. We also tried measuring *s* as a proportion of *y*. The results, however, were qualitatively similar.

[11] This is not unreasonable in the light of heightened inquiry into the state of affairs of corporations that file for bankruptcy. There is anecdotal evidence that tax avoidance activities of corporations in trouble have come to light due to increased investigations into their affairs. Enron and Tyco provide good examples. In fact, after the initiation of the process of bankruptcy, the IRS is also a claimant in the assets of the corporation. Most importantly, taxes that can be shown to be evaded can also be recovered in full.

[12] The assumption of an increasing hazard rate is satisfied for a host of distributions such as the uniform, exponential, the gamma and Weibull with degrees of freedom parameter less than 1 (Grossman and Hart, 1982).

$$t = h(s^* + D)[(y - D)(1 - t) + ts^*] \quad (2)$$

The first order condition is fairly intuitive. The LHS represents the benefit obtained by sheltering $1. The RHS captures the expected cost of sheltering: If sheltering an extra dollar of income forces the firm into bankruptcy, the payoff to the manager in the non-bankrupt state (given by the term in the square brackets) will be all lost, since the model assumes that the manager reaps no gains from sheltering in the bankrupt state.

Our interest lies in determining the relation between debt levels and tax aggressiveness. Assuming that *s* has an interior optimum, let the first order condition represent some implicit function of the optimal level of sheltering and debt given by $G(s^*, D)$, where debt is exogenous. The inclusion of debt in the capital structure tends to reduce the number of states in which the owner-manager can benefit from sheltering (the non-bankrupt states). Thus, the manager has the incentive to shelter more the non-bankrupt states. This suggests that higher levels of debt should increase the optimal level of sheltering for the owner-manager in a manner that just avoids bankruptcy. Alternatively, since higher debt also implies higher tax shields, leverage might reduce the manager's incentives to resort to costly tax avoidance activities (Graham and Tucker, 2005).

Using $G(s^*, D)$ and the Implicit Function Theorem we analyze the relation between the optimal level of sheltering s^* and the debt level *D*, and derive *Proposition 1* (all proofs are in Appendix A):

Proposition 1: the relation between the optimal level of sheltering *s** and the debt level *D* is negative if and only if $h'(s^* + D)[(y - D)(1 - t) + ts^*] > 0$ and $\frac{h'(s^* + D)}{h(s^* + D)} > \frac{1 - t}{[(y - D)(1 - t) + ts^*]}$.

It is actually difficult to determine the magnitude of $h'(s^* + D)/h(s^* + D)$. In the light of the two assumptions we have made about the hazard rate and its derivative, all we can say is that beyond a certain level of sheltering *s* the hazard rate increases as does its derivative. However, the fact that stands out is that leverage is ineffective in reducing the incentives to engage in tax aggressive activities unless the manager's perceived probability of the firm going bankrupt, captured by the term $h'(s^* + D)/h(s^* + D)$, is significantly high.[13] Thus, whether the relation between leverage and tax aggressiveness is positive or negative is an empirical question.

2.2. The separation between ownership and control

Moving away from the simplified owner-manager case, we now assume that the manager is a shareholder in the firm but not the sole owner. While the manager's interests are partly aligned with shareholders', the manager has now the opportunity and the incentive to divert a part of the sheltered income to her personal advantage and only share the remaining income with the outside shareholders. We assume that diversion takes place out of sheltered income only. This is a reasonable assumption since the non-sheltered cash flows are more observable to the equity and debt holders and, therefore, any diversion out of that amount makes detection relatively certain. Consistent with the extant literature, we also assume that in case of bankruptcy the manager incurs in a non-monetary cost *B*.[14]

Since the manager is also a shareholder in the firm, let $\lambda \in [0,1]$ represent her share in the equity capital of the firm. Let some value $B > 0$ represent the personal cost to the manager in bankruptcy and $k \in [0,1]$ represent the fraction of sheltered income that the manager chooses to divert.[15] Both *B* and *k* are assumed to be given and constant.

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[13] See Appendix A for the interpretation of the term $h'(s^* + D)/h(s^* + D)$.

[14] As in the case of Desai, Dyck and Zingales (2007), we also tried including a penalty on tax sheltering (and thus on diversion, thereby making both activities costly for the firm and manager respectively. The results obtained with respect to the level of sheltering are qualitatively similar. But in order to keep computation simple, these have been omitted from the model results reported above.

[15] Note here that our assumption about the sheltering decision differs from Desai, Dyck and Zingales (2007). They allow for the possibility of diversion out of the true payoff, which also has the impact of reducing taxable income. On the other hand, out of the true payoff, we allow for sheltering first. Diversion, if any, must happen out of sheltered income.

The manager maximizes the following function with respect to *s*:

$$\max_{s} V_0^M = \{\lambda[(y-s-D)(1-t)+s(1-k)]+sk\}[1-F(s+D)]-BF(s+D) \quad (3)$$

Differentiating with respect to *s* we obtain the first order condition:

$$\lambda(t-k)+k = h(s^*+D)\{\lambda[(y-s^*-D)(1-t)+s^*(1-k)]+s^*k\}+h(s^*+D)B \quad (4)$$

The LHS captures the marginal benefit of sheltering $1 of income. Since sheltering now also enables the manager to divert income, the marginal benefit is given by the savings in taxes less the amount diverted plus the amount diverted (which need not be shared with the other shareholders). The RHS captures the marginal cost of sheltering $1 of income. With every marginal increase in the probability of bankruptcy, brought about by the manager's decision to shelter, not only does she risk losing what she could have earned in the non-bankrupt state, but she also bears the risk of incurring the non-pecuniary costs *B* if the firm goes bankrupt.

Using $G(s^*, D)$ and the Implicit Function Theorem we analyze the relation between the optimal level of sheltering s^* and the debt level *D*, and derive *Proposition 2* (all proofs are in Appendix A):

Proposition 2: the relation between the optimal level of sheltering *s** and the debt level *D* is negative if and only if $\frac{h'(s*+D)}{h(s*+D)} > \frac{\lambda(1-t)}{[\lambda\{(y-s*-D)(1-t)+s*(1-k)\}+s*k+B]}$.

Once again, the relation between sheltering and debt levels is not very clear. However, as in the earlier case, one can see that debt has a diluting effect on tax aggressiveness only when the manager's

perception of the expected probability of bankruptcy is significantly high. Thus, whether the relation between tax aggressiveness and leverage is positive or negative is an empirical question.

2.3. Additional model propositions

The model allows us to make predictions on the relation between sheltering and the manager's share in the firm's equity, the manager's personal non-monetary bankruptcy cost, and the corporate tax rate. The proofs for the following three propositions are in Appendix A.

Proposition 3: the relation between the optimal level of sheltering s^* and the manager's share in the firm's equity λ is positive if and only if $h(s^* + D) < \frac{t-k}{[(y-s^*-D)(1-t)+s^*(1-k)]}$

The relation between the level of sheltering and manager's share in equity is expected to be positive since a higher share in ownership results in better alignment of the manager's and shareholders' interests, giving the manager incentives to enhance firm value by reducing total tax outflows. This relation, however, holds only if the hazard rate is not too high. If the manager perceives a higher probability of going bankrupt, she would still not choose to avoid taxes aggressively, despite high alignment of interests.

Proposition 4: the relation between the optimal level of sheltering s^* and the manager's non-monetary bankruptcy cost B is always negative.

Proposition 5: the relation between the optimal level of sheltering s^* and corporate tax rate t is always negative.

We next test some of the model's implications using a dataset of US firms for the period 1986 – 2012.

3. Sample and variable description

3.1. Sample description

Our initial sample consists of all U.S. firms listed in Compustat for the period 1986 – 2012. We obtain data on executive compensation from Execucomp and on institutional ownership from CDA/Spectrum. We exclude from the sample financial firms and utilities (SIC codes 4900 – 4999 and 6000 – 6999, respectively). Our main sample consists of 66,198 firm-years (9,648 unique firms) over the period 1986-2012. The subsample which includes the executive compensation variables consists of 16,621 firm-year observations and is available for the period 1993 – 2012. Detailed definitions of all variables are in Appendix B.

3.2. Tax aggressiveness measures

We define two variables to capture a firm's tax aggressiveness. First we use a measure initially suggested by Manzon and Plesko (2002) that attempts to capture the difference between the income that a firm reports to its shareholders based on Generally Accepted Accounting Principles (GAAP) and that it reports to the income tax authorities based on tax laws. Since income reported to tax authorities is not directly observable, it is imputed by dividing the tax expense reported by the firm in its financial statements by the top statutory corporate tax rate. Using 35% as the top statutory tax rate we compute the difference between the domestic pre-tax financial income and the imputed taxable income as $Unadjusted\ Spread = PI - PIFO - TXFED/0.35$ where the first two terms are PI = Pre-tax income and PIFO = Foreign pre-tax income, and represent the U.S. domestic pre-tax book income. Finally, we account for inherent differences between book and tax accounting that do not represent tax aggressive activities, and compute the variable $Adjusted\ Spread = Unadjusted\ Spread - TXS - TXO - ESUB$, where TXS = State income taxes, TXO = Other income taxes, and ESUB = Unremitted earnings in non-consolidated subsidiaries. The three items subtracted from *Unadjusted Spread* are either included in book income and not in tax income or vice-versa and, therefore, can affect the gap for reasons unrelated to tax aggressiveness. Finally we define our main tax aggressiveness variable as

$Book\ Tax\ Gap = Adjusted\ Spread\ /\ AT$, where AT = Total assets. [16] In order to avoid including firms with tax losses, which may have very different tax aggressiveness incentives compared to firms with a positive tax liability during the year, we only keep in the sample firms that report a positive current tax expense on a given year (Desai and Dharmapala, 2006a).

Our second measure of tax aggressiveness is designed to capture the percentage of a firm's true income that is sheltered. For this purpose, we compute the ratio *Unadjusted Spread* to pre-tax book income (PI in Compustat), and the ratio of *Adjusted Spread* to pre-tax book income. [17]

3.3. Main variables

The main variables of interests are a firm's leverage and value. We define *Leverage* as the book value of debt divided by the book value of assets minus the book value of common equity plus the market value of equity. We measure the firm's value with *Tobin's q*, computed as book value of debt plus market value of common equity divided by book value of assets.

3.4. Control variables

In our multivariate analysis we control for a variety of firm characteristics. *Size* is the firm's total book assets, while *Profitability* is a dummy that takes a value of 1 if the firm reports a positive domestic pre-tax book income for the year. We include the variable *ROA Volatility* to capture the risk associated with a firm's profitability. It is measured as the standard deviation of the firm's return on assets for the previous six years, and is computed with a minimum of 3 observations.

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[16] *Book Tax Gap* has been widely used and interpreted as evidence of tax avoidance/ sheltering behavior (Mills, 1998; Desai, 2003, 2005; Manzon and Plesko, 2001; Mills, Newberry and Trautman, 2002) and has been shown to be positively associated with tax aggressiveness (Desai and Dharmapala, 2009; Wilson, 2009; Lisowsky, 2010; Ayers, Laplante and McGuire, 2010). Similarly, the U.S. Department of Treasury White Paper titled 'The Problem of Corporate Tax Shelters' (1999) identified large and increasing book-tax gaps and interpreted them as evidence suggesting the increased use of tax shelters by corporations.

[17] The denominator in this measure is a noisy measure of the "true" pre-tax income since it is already reduced by what the manager has managed to 'divert'.There are several reasons for such noise. First, a firm's taxable income is not directly observable. Second, estimating it by grossing up the reported tax expense ignores the tax impact of the exercise of non-qualified stock options (ESOPs), resulting in an overestimation of imputed taxable income. This is made worse given the fact that tax deductions arising out of stock option exercises are significant. A Bear Sterns (2000) report estimates that for the 7 largest companies in the NASDAQ 100, tax benefits from SOs may exceed 10% of their cash flows from operations. For details on measurement errors arising out of estimating taxable income out of financial statement data, see McGill and Outslay (2002, 2004) and Hanlon (2003).

Our measure of tax aggressiveness, *Book Tax Gap*, could be affected by earnings management on the part of managers. Any upward smoothing of income could result in overstatement of our measure. In order to control for this unintended effect we include in our analysis the variable *Total Accruals*, computed as in Bergstresser and Phillipon (2006) (see Appendix B).[18]

Following Manzon and Plesko (2002) we also include as control variables the lagged *Book Tax Gap*, the pre and post 1993 values for goodwill, annual *Sales Growth*, the absolute value of the firm's foreign income, a dummy for Net Operating Losses (NOLs), change in NOL carry-forwards, change in post-retirement obligations and the ratio of net to gross property, plant and equipment and total assets. In order to test whether tax aggressiveness is associated with asset opacity we include the variable *Intangibles*, which is the dollar value of the firm's intangibles scaled by total assets. Since extant literature shows that firms that report high R&D expenses shelter more income from taxes and set up more tax haven operations (Desai, Foley and Hines, 2005), we also include the variable *R&D*, measured as the ratio of R&D expense to total assets.

Hanlon and Slemrod (2009) and Austin and Wilson (2013) among others argue that tax avoidance activities have a reputational cost. In order to capture potential reputational costs of tax aggressiveness arising out of being in public glare, we include the variable *Advertising*, computed as the ratio of advertising expense to total assets. We also capture a firm's prestige with the variable *Fort500 Dummy*, which takes a value of 1 for firms in the Fortune 500 list, and zero otherwise (Meneghetti and Williams, 2013).

Our main variable for firm governance is *%Institution*, measured as the percentage of the firm's outstanding shares held by a financial institution. The data come from the CDA/Spectrum database, and it is based on the Schedule 13F filings by large institutional investors. Finally, in order to capture the manager incentives alignment with the firm's shareholders we compute the variable *Stock Option Ratio*,

[18] We also compute discretionary accruals (Jones, 1991) but the (unreported) results do not change significantly,

defined as the ratio of the Black-Scholes value of stock options granted to the CEO and the sum of her salary, bonus and stock options.[19]

4. Descriptive statistics

Table 1 reports the descriptive statistics for the whole sample. The main independent variable, *Book-Tax Gap*, has a mean of -0.265 and a median of -0.006.[20] On average firm in our sample have a leverage of 15.9% and total assets of 1.234 billion. The size variable is skewed, so in the multivariate analysis we use the natural logarithm of firm size.

Table 2 presents the correlation matrix for the main regression variables. The relation between *Book-Tax Gap* and *Leverage* is weakly positive at 0.002. Column 1 suggests that firms with high institutional holdings, large size, lower ROA volatility, higher total accruals, high intangibles, low R&D and advertising expenditure and high stock option ratios have larger book-tax gaps

5. Leverage and tax aggressiveness

In this section we study the relation between *Leverage* and tax aggressiveness. We first estimate the baseline model and regress *Book Tax Gap* on *Leverage* and the control variables. We then control for the effect of CEO alignment and include the variable *Stock Option Ratio* in the regression. Next we measure tax aggressiveness as the proportion of the "true" income that is shelter by the manager. Finally, we investigate whether the relation between leverage and tax aggressiveness varies across firms with high leverage, institutional holdings, size, ROA volatility, accruals, intangibles, and advertising expenses. Industry dummies are at the 2-digit SIC code level, and in all regressions standard errors are robust to heteroscedasticity and are clustered by firm.

5.1. Baseline *Leverage – Book Tax Gap* relation

[19] Another possible measure of managerial incentive alignment could be managerial ownership in the firm. However, Morck, Shleifer and Vishny (1988) argue that such a measure is more likely to capture managerial entrenchment which is expected to reduce, rather than enhance the manager's alignment of interests with shareholders. Besides this, there is little time-series variation in the ownership measure. We, therefore, focus our attention on the stock option ratio only.

[20] These numbers are consistent with Desai and Dharmapala (2009). Their measure of tax gap is, however, what in this paper we call *Unadjusted Spread* and is computed as simple difference between domestic pre-tax book income and inferred taxable income, without making any adjustments for earnings in subsidiaries and state income taxes. Also, their sample size is 4,492, while ours is 66,198.

We first test the hypothesis that the relation between a form's leverage and its tax aggressiveness is negative (propositions 1 and 2). Table 3 reports the results of a multivariate regression of the *Book Tax Gap* on *Leverage* and other control. Columns 1 and 2 report the coefficients from a simple pooled OLS regression, while columns 2 and 4 report the coefficients from panel data estimation.

The main result from this table is that, consistent with propositions 1 and 2, the coefficient on *Leverage* is negative and significant at the 1% level across all columns. This is consistent with our intuition that higher debt levels deter tax aggressiveness. Including the *High Leverage Dummy* in columns 3 and 4 does not change the result.

The coefficient on *%Institution* is always negative and significant, suggesting that higher institutional ownership, construed to indicate better governance, deters tax aggressiveness. This reinforces the finding that tax aggressiveness may not necessarily be a value-enhancing activity for shareholders (Desai and Dharmapala, 2009). The coefficients on Log(*Size*) and *Profitability Dummy* are always positive and significant, consistent with the intuition that big and profitable firms face a lower risk of bankruptcy compared to smaller, less-profitable firms with similar debt ratios. The negative coefficient on *ROA Volatility* suggests, in the framework of our model, that since firms with riskier cash flows are more likely to default in the "low" states of the world, managers of such firms may choose to keep tax aggressiveness low ex-ante to avoid the risk of going bankrupt, which is personally costlier to them (Gilson, 1989).

The coefficient on *Advertising* is negative and significant in all specifications. This result is consistent with the intuition that managers of firms that are in the "public glare" have more to lose in terms of prestige and reputation and care more about the potential personal cost of tax aggressiveness (Hanlon and Slemrod, 2009). Similarly, the negative coefficient on *Fort500 Dummy*, our measure of firm prestige, suggests that firms that have more to lose in terms of reputation engage less in tax aggressive activities.

5.2. Tax aggressiveness and CEO incentive alignment

We now test the model's predictions that the optimal level of tax sheltering decreases with leverage (propositions 1 and 2) but increases in the CEO's incentive alignment with the shareholders (proposition 3). In table 4 we re-estimate the specification from columns 1 and 2 in Table 3 and include the variable *Stock Option Ratio* to capture the CEO alignment, and the interaction *Stock Option Ratio* * *Leverage* to investigate whether the effect of *Leverage* on tax aggressiveness differs across different levels of CEO incentive alignment. Manzon-Plesko controls are included in all regressions but omitted for brevity.

Coefficients in Table 4 show that the negative relation between *Leverage* and *Book Tax Gap* continues to hold even after controlling for CEO alignment. The coefficient on *Stock Option Ratio* is positive and significant in columns 1 and 2, indicating that managers with a higher equity stake in the company are more tax aggressive. The coefficient on the interaction terms from columns 3 and 4, however, are positive and significant (0.245 and 0.498 respectively) indicating that the positive effect of incentive alignment on tax aggressiveness mainly occurs in firms with higher debt levels.

5.3. Endogeneity of Leverage and Tax Aggressiveness: The Bankruptcy Abuse Prevention and Consumer Protection Act

In our analysis above, one difficulty in inferring the relation between leverage and tax aggressiveness is that both variables are endogenous. Both decisions, capital structure as well as tax aggressiveness, are in the hands of the firm's manager, who may choose them simultaneously. The documented negative relation between leverage and tax aggressiveness could therefore be a result of this simultaneous decision. For instance, it could very well be that firms that avoid more taxes take on less debt. This could be due to 'tax exhaustion' or the substitutability of debt and non-debt tax shields (Graham and Tucker, 2005; Kolay, Schallheim and Wells, 2011). To rule out such a possibility, we use the changes in the U.S. Bankruptcy law in 2005 as a natural experiment.

On April 20, 2005, the Bankruptcy Abuse Prevention and Consumer Protection Act (BAPCPA, 2005) was signed into law, with the objective to prevent the abuse of bankruptcy as a means of protecting reckless borrowers. While most of its provisions were meant to address consumer bankruptcy, some of its

provisions applied to corporations too. This Act had the impact of increasing creditors' power in bankruptcy (Hotchkiss, John, Mooradian and Thoburn , 2008; Alanis and Chava) through higher scrutiny of corporations filing for bankruptcy under Chapter 11 (reorganization) and greater restrictions on fraudulent transfer to insiders. We argue that such a change in creditor power increases the amount that creditors/ debt-holders expect to receive in default and therefore, acts as a negative shock to creditor monitoring. If the documented effect of leverage on tax aggressiveness is causal, the negative effect of leverage on tax aggressiveness should weaken after 2005. Also, if it is really the threat of bankruptcy associated with leverage that deters managers from acting tax aggressively, we expect to observe lower levels of tax aggressiveness generally, after the reform.

We create a *Post BAPCPA Dummy* that assumes a value of 1 for years after 2006 and 0 otherwise. We choose the year 2006 because most of the provisions of the BAPCPA 2005 were applicable from October 17, 2005 and therefore, we do not expect to observe its full impact by March 31, 2006. We also include the interaction term *Leverage * Post BAPCPA Dummy* to test for the change in the impact of leverage on tax aggressiveness for years after 2006. We estimate the model over three different event windows- 1,2 and 3 years before and after the BAPCPA was implemented, and treat 2006 as the year of reform. Results are reported in Table 5.

Results reinforce our basic result of a significantly negative sign on *Leverage*. As expected, the coefficient on the *Post BAPCPA Dummy* is consistently negative and significant at the 1% level, indicating that an increase in creditor power makes Chapter 11 bankruptcies costlier for firms' managers, who now choose to keep tax aggressiveness levels lower ex-ante. The coefficient on the interaction term is positive and significant at the 1% level across all columns, confirming our intuition that better expected recovery rates in default and increased creditor power resulted in a negative shock to creditor monitoring of tax aggressiveness, thereby worsening the effectiveness of leverage as a tool of mitigating tax aggressiveness.

5.4. Endogeneity of *Leverage* and tax aggressiveness: A counter-factual experiment

We next verify the robustness of our previous result with a counter-factual experiment. To ensure that the results of our tests are truly on account of the change in law in 2006 and not due to noise or accident, we choose a random year 1990 and replicate the test around this year, using three different event windows- 1, 2 and 3 years before and after 1990. We define the variable *Post-Confact Dummy*, which assumes a value of 1 for years after 1990 and 0 otherwise. The variable of interest is the interaction between *Post-Confact Dummy* and *Leverage*. If our interpretation of the coefficients from Table 5 is correct, we expect to find no significance on the interaction term or the *Post-Confact Dummy*. We conduct the test using the same specification as in Table 3 and regress *Book Tax Gap* on *Leverage* and other control variables. Results are reported in Table 6.

Just as in Tables 3 and 4, the coefficient on *Leverage* is significantly negative across all columns. As expected, there is no statistical significance on either the *Post-Confact Dummy* or its interaction with *Leverage*. To conclude, results show that the results reported in tables 3 and 4 are robust to concerns of endogeneity of leverage and tax aggressiveness.

5.5. *Leverage* and tax aggressiveness: Cross-sectional analysis

The objective of this analysis is to ascertain whether the negative relation between firm leverage and tax aggressiveness holds across high and low values of CEO incentive compensation, institutional ownership, size, profitability, volatility of returns, intangibles, and accruals, for firms with positive advertising and R&D expense, and for firms included in the Fortune 500 list. We create a dummy variable equal to 1 when the value of the variable of interest is above the median, and zero otherwise (for R&D and advertising expenditure, the dummy takes a value of 1 for positive values). We then compute the interaction term *Leverage*Dummy*, and re-estimate the specification from Table 3 (column 2) including the dummy variable and the interaction term in the regression. Table 7 reports the results. Control variables are omitted for brevity, but are included in all specifications.

We find that the coefficient on *Leverage* is consistently negative and significant. The interactions terms are mostly significant as well. The coefficient on the interaction term between the *High %Institution Dummy* and *Leverage* is positive and significant at 1% (coefficient 0.194, t-value 4.02)

indicating that in better governed firms the effect of firm leverage on tax aggressiveness is reduced. This finding is consistent with the role of leverage as a substitute corporate governance mechanism. Similarly, the negative impact of leverage on tax aggressiveness is lower for larger firms. This could suggest lower monitoring and diligence by creditors in larger firms, since such firms are often well-diversified and therefore, less likely to get into bankruptcy.

The negative impact of leverage on tax aggressiveness is reduced for firms with high advertising expense and for firms included in the Fortune 500 list. This result is consistent with the presence of higher reputational costs of tax aggressiveness for firms that are more popular and in public glare. In profitable firms the negative effect of leverage on Book Tax Gap is less pronounced, since profitable firms are less likely to file for bankruptcy. Further, *Leverage* impacts tax aggressiveness more negatively in firms with high *ROA Volatility*, suggesting that since firms with more volatile cash flows are more likely to default and thus have the incentive to reduce tax aggressiveness. Similarly, the negative effect of *Leverage* on tax aggressiveness is stronger for high R&D firms. This is not surprising as R&D expenditure is often associated with opacity and difficulty in verification of the firm's cash flows, creating a need for more credit monitoring that results in lower tax aggressiveness.

5.6. Tax aggressiveness as proportion of sheltered income

While leverage may reduce aggressiveness in terms of absolute dollars sheltered from the IRS, the manager's perceived difficulty in diverting cash flows in the state of bankruptcy may incentivize him to shelter larger proportions of the true income in the non-bankrupt states of the world. We test this hypothesis by using the ratios *Unadjusted Spread* / Pre-tax Book Income and *Adjusted Spread* / Pre-tax Book Income as measures of tax aggressiveness, and re-estimate the models from tables 3 and 4 (columns 2 and 4) with the new dependent variables. Results are reported in Table 8, and show that the coefficient on *Leverage* is always positive and significant in all but one case, supporting out intuition that high debt ratios motivate the manager to shelter a higher proportion of income from taxes in the non-bankrupt states of the world.

To summarize, results presented in tables 3 to 8 support our hypothesis that debt dissuades tax aggressive behaviour in terms of dollars sheltered from taxes, but encourages managers to shelter higher proportions of the corporation's true income, given their perceived difficulty in diverting resources to their personal advantage in the bankrupt states of the world.

5.7. Tax aggressiveness and firm value

We next investigate whether tax aggressiveness affects firm value. The independent variable is now *Tobin's q*, measured as the sum of the book value of current debt, long-term debt and market value of equity, divided by the book value of total assets. The main independent variable is tax aggressiveness as measured by *Book Tax Gap*. To address the collinearity between *Leverage* and *Book Tax Gap* and distinguish the effect of these two variables on firm's value, we estimate the residuals from the following regression: *Book Tax Gap* $= \alpha + \beta *$ *Leverage* $+ \varepsilon$. We call this variable *Res. Book Tax Gap* and use it as a measure of the firm's tax aggressiveness. Control variables include the Manzon and Plesko (2002) controls. All specifications include firm and year fixed effects. Results are reported in Table 9.

In Column 1, the coefficients on both *Leverage* and Res. *Book Tax Gap* are negative and significant at 1%. Column 2 reports the results of a specification that includes the interaction term *Leverage* Res. Book Tax Gap*. While both variables individually continue to be significantly and negatively related to firm value, the coefficient on the interaction is not significantly different from zero. The specification in Column 3 includes *Stock Option Ratio*. The coefficients on *Leverage* and *Res. Book Tax Gap* are negative and significant, while, consistent with our results in Table 4, the coefficient on *Stock Option Ratio* is positive and significant at 1% (coefficient 0.516, t-value 5.11). This result is also consistent with the findings in Desai and Dharmapala (2009) which suggest that managerial incentive alignment improves firm value. Finally, the specification in Column 4 also includes both the interactions *Leverage*Stock Option Ratio* and *Leverage* Res. Book Tax Gap*. The coefficients on *Leverage* and *Res. Book Tax Gap* are now not significantly different from 0.

5.8. Additional robustness tests

In order to ensure that our results are not sensitive to the variable definitions used in the tests, we repeat our tests using alternate definitions on some of our key variables. We use two additional measures, Frank, Lynch and Rego (2009) Permanent and Discretionary Permanent Book-tax differences. These measures have been shown to be positively associated with tax aggressiveness. Unreported results reveal that using these alternative measures of tax aggressiveness does not alter the negative relation between leverage and tax aggressiveness.

We employ three alternate definitions of leverage based on market and book values. For robustness, we define the market value leverage as the ratio of the book value of long-term debt to the sum of total debt and the market value of equity. Two definitions of *Book Leverage* are used. The first defines leverage as the ratio of long-term debt to the book value of total assets. The second defines leverage as total liabilities net of deferred taxes and equity, as a ratio of the book value of total assets. Results using all three alternate definitions are similar to the main results. In unreported results, we find that leverage is still negatively related to tax aggressiveness, significantly in all cases.

6. Conclusion

In the light of the intense debate on the value implications of tax aggressiveness and agency problems, we develop a simple two-date, single period model to capture the manager's choice of the optimal level of tax aggressiveness in the presence of debt. Higher ownership in the firm attenuates the manager's incentives to shelter higher income from taxes, as also the personal diversionary gains out of sheltered income. In addition, the existence of only few states of the world in which the benefits of tax avoidance can be realized (we assume that the manager loses all benefits of tax avoidance in the bankrupt state) is expected to exacerbate tax aggressiveness. However, aggressive tax sheltering in the presence of debt increases the likelihood of bankruptcy, which is personally costly to the manager. This, in addition to higher monitoring of the firm's affairs by debt-holders is expected to deter tax aggressiveness. This creates an interesting trade-off. Since leverage could both mitigate/ exacerbate tax aggressiveness, we leave the direction of its impact on our empirical results.

We test our predictions from the model on a panel of U.S. firms over the period 1986-2012. Consistent with the model's predictions, we find that leverage deters tax aggressiveness. We also find evidence that though leverage reduces tax aggressiveness in absolute value, it exacerbates it when the latter is measured as a proportion of the firm's pre-tax book income. This is consistent with our hypothesis that leverage may actually cause the manager to avoid more taxes in the non-bankrupt states of the world, when the perceived benefits there from are positive. Therefore, while he chooses to shelter less in dollar terms to avoid bankruptcy, he ends up sheltering higher proportions of the corporation's income to serve personal objectives. In our second set of tests, we find that tax aggressiveness reduces firm value. The relationship is weakened in the presence of leverage, consistent with agency problems in the corporate tax avoidance decision. This also highlights the role of leverage as an alternate corporate governance mechanism in checking tax aggressiveness. Our cross-sectional tests reveal that for firms with high institutional ownership, the relationship between leverage and tax aggressiveness is weaker. This reinforces our argument about the role of debt as an alternate corporate governance mechanism. For high R&D and high ROA volatility firms, the relationship is in fact stronger, pointing towards the opacity inherent in R&D expenditures and uncertain cash flows respectively, both of which are detrimental to the interest of the debt-holders. Interestingly, we find that the role of leverage in reducing tax aggressiveness is weakened in the presence of high advertising expenditure. This highlights the reputational costs associated with tax avoidance activities which appear to take a toll on the intensity of creditor monitoring of tax avoidance in such firms. Our results serve a useful policy-making purpose- under-leverage on tax returns can serve as an early-warning signal for the IRS, prompting an audit.

Our results open up interesting questions for future research. Recent papers on tax aggressiveness as a determinant of the cost of debt find mixed evidence in support of the fact that higher tax avoidance results in a higher cost of debt. In fact, some papers find that highly aggressive tax-avoiding firms face lower costs of debt and looser debt covenants. It becomes interesting to examine whether creditors in such situations comprehend the true impact of tax avoidance activities on the ability of the firm to timely service its debt. While they may believe that higher tax savings will result in higher cash flows to service

debt, the possibility of diverting out of sheltered income could result in tax-avoided income also being hidden from their view. This increases information asymmetry and should therefore result in a higher cost of debt. Another interesting area to explore would be to assess the impact of different categories of debt on levels of tax aggressiveness- bank debt, foreign debt, bank debt with bankers on board etc. This can throw light on how differential monitoring levels can check tax avoidance and managerial opportunism. Lastly, the role of debt in checking other forms of corporate social misbehaviour such as environmental pollution and employee exploitation can be examined. Investigation of these issues can help us better understand the dynamics of debt- its role, utility and contribution to firm governance.

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Appendix A

Proof of Proposition 1

In order to solve for the optimal sheltering s^* we differentiate (1) with respect to *s*:

$$\frac{\partial V_0^{OM}}{\partial s} = t - h(s+D)[(y-D)(1-t)+s] \tag{A1}$$

which results in the first order condition:

$$t = h(s^* + D)[(y-D)(1-t)+ts^*] \tag{A2}$$

Define $G(s^*, D) = t - h(s^* + D)[(y-D)(1-t)+ts^*]$, where debt is exogenous. In order to analyse the relation between the optimal level of sheltering $s*$ and the debt level *D*, we apply the Implicit Function Theorem. Thus, $ds^* / dD = -[(\partial G / \partial D)/(\partial G / \partial s^*)]$ where by virtue of the second order condition $(\partial G / \partial s*) < 0$. This implies that $ds* / dD$ has the same sign as $\partial G / \partial D$:

$$\partial G / \partial D = h(s^* + D)(1-t) - h'(s^* + D)[(y-D)(1-t)+ts^*] \tag{A3}$$

There are two possible scenarios:

$$\begin{aligned} &1. \quad h'(s^* + D)[(y-D)(1-t)+ts^*] < 0 \\ &\qquad\qquad \text{or} \\ &2. \quad h'(s^* + D)[(y-D)(1-t)+ts^*] > 0 \end{aligned} \tag{A4}$$

In case 1, $ds* / dD > 0$ always. In case 2 on the other hand:

$$ds^*/dD < 0 \leftrightarrow \frac{h'(s^*+D)}{h(s^*+D)} > \frac{1-t}{[(y-D)(1-t)+ts^*]} \tag{A5}$$

Proposition 1 follows.

The term $h'(s^*+D)/h(s^*+D)$ can be interpreted as the probability that the firm will go bankrupt:

$$\frac{h_s(s^*,D)}{h(s^*,D)} > \frac{1-t}{[(y-D)(1-t)+ts^*]}$$

$$\frac{d\{\log[h(s^*,D)]}{ds} > \frac{1-t}{[(y-D)(1-t)+ts^*]}$$

$$\int\left(\frac{d\{\log[h(s^*,D)]}{ds}\right)ds > \int\left(\frac{1-t}{[(y-D)(1-t)+ts^*]}\right)ds$$

$$\log[h(s^*,D)+C_1 > \frac{1-t}{t}\log\left[(y-D)(1-t)+ts^*\right]+C_2$$

where C_1 and C_2 are constants that can assume any value.

$$exp\{log[h(s^*,D)+C_1\} > \exp\{\frac{1-t}{t}\log\left[(y-D)(1-t)+ts^*\right]+C_2\}$$

$$exp\{log[h(s^*,D)\} * exp\{C_1\} > \exp\{\frac{1-t}{t}\log\left[(y-D)(1-t)+ts^*\right]\} * \exp\{C_2\}$$

$$h(s^*,D) > \frac{\exp\{\frac{1-t}{t}\log\left[(y-D)(1-t)+ts^*\right]\} * \exp\{C_2\}}{exp\{C_1\}}$$

$$h(s^*,D) > \exp\{\frac{1-t}{t}\log\left[(y-D)(1-t)+ts^*\right]\} * \exp\{C_2-C_1\}$$

QED.

Proof of Proposition 2

In order to solve for the optimal sheltering s^* we differentiate (3) with respect to *s*:

$$\frac{\partial V_0^{OM}}{\partial s} = \lambda(t-k) + k - h(s+D)\{\lambda[(y-s-D)(1-t) + s(1-k)] + sk\} - h(s+D)B \qquad \text{(A6)}$$

Which results in the first order condition:

$$\lambda(t-k) + k = h(s^* + D)\{\lambda[(y-s^*-D)(1-t) + s^*(1-k)] + s^*k\} + h(s^*+D)B \qquad \text{(A7)}$$

The FOC represents the following implicit function $G(s^*, D)$ where:

$$G(s^*, D) = \lambda(t-k) + k - h(s^* + D)\{\lambda[(y-s^*-D)(1-t) + s^*(1-k)] + s^*k\} - h(s^*+D)B \qquad \text{(A8)}$$

Using the Implicit Function Theorem, $ds^* / dD = -[(\partial G / \partial D) / (\partial G / \partial s^*)]$ where by virtue of the second order condition $(\partial G / \partial s*) < 0$. This implies that $ds* / dD$ has the same sign as $\partial G / \partial D$:

$$\partial G \big/ \partial D = -h(s^* + D)[-\lambda(1-t)] - [\lambda\{(y-s^*-D)(1-t) + s^*(1-k)\} + s^*k + B]h'(s^* + D) \qquad \text{(A9)}$$

Proposition 2 follows. QED.

Proof of Proposition 3

The proof is straightforward. Since $\partial G / \partial \lambda = (t-k) - h(s^* + D)[(y-s^*-D)(1-t) + s^*(1-k)]$ Proposition 3 must hold. QED.

Proof of Proposition 4

The proof is straightforward. Since $\partial G / \partial B = -h(s^* + D)$ and the hazard rate is increasing in *(s + D)*, then $\partial G / \partial B < 0$ which implies that $ds^* / dB < 0$. The intuition is that as *B* increases, the manager has much more to lose if the firm goes bankrupt, thus is more likely to play safe and shelter less. QED.

Proof of Proposition 5

The proof is straightforward. Since $\partial G / \partial t = \lambda + h(s^* + D)[\lambda(y - s^* - D)]$ and the hazard rate is increasing in *(s + D)*, then $\partial G / \partial t > 0$ which implies that $ds^* / dt > 0$. QED.

Appendix B
Variable Construction

Variable	*Description*	*Calculation based on Compustat / CDA Spectrum/Execucomp data items*
Dependent Variables		
Book Tax Gap	Tax aggressiveness.	*(PI-PIFO-TXFED/0.35-TXS-TXO-ESUB)/AT*
Unadjusted Spread/Pre-tax Income	Proportion of sheltered income.	*(PI-PIFO-TXFED/0.35)/PI*
Adjusted Spread/Pre-tax Income	Proportion of sheltered income.	*(PI-PIFO-TXFED/0.35-TXS-TXO-ESUB)/PI*
Tobin's Q	Ratio of firm's market value of assets to book value of assets.	*(DLTT+DLC+CSHO*PRCC_F)/AT*
Control Variables – Firm Characteristics		
Leverage	Firm market leverage.	*(DLTT+DLC)/(AT-CEQ+CSHO*PRCC_F)*
Size	Total assets (in millions).	*AT*
Fort500 Dummy	Dummy equal to 1 if the firm is the the Fortune 500 list	
Profitability Dummy	Dummy equal to 1 if the pre-tax income (PI) is positive	
ROA	Firm's operating income to assets.	*OIBDP/AT*
ROA Volatility	Standard deviation of *ROA* over previous six years.	
Total accruals	Computes as in Berstresser and Phillipon (2006)	$[(ACT_t-ACT_{t-1})-(LCT_t-LCT_{t-1})-(CHE-CHE_{t-1})+(DLC_t-DLC_{-1})-DP_t]/AT_{t-1}$
Intangibles	Ratio of intangible assets to total assets	*INTAN/AT*

(Continued)

Appendix (continued)

Variable	*Description*	*Calculation based on Compustat / CDA Spectrum/Execucomp data items*
R&D	Ratio of R&D expenses to total assets (0 if missing).	*XRD/AT*
Advertising	Ratio of R&D expenses to total assets (0 if missing).	*XAD/AT*
%Institution	% of shares held by institutional investors.	
Control variables – CEO compensation		
Stock Option Ratio	Ratio of value of CEO option grants to the sum of salary, bonus, and option grants.	*Black-Scholes Value of Option Grants/(SALARY+BONUS+ Black-Scholes Value of Option Grants)*
Manzon and Plesko (2002) controls		
NOL	Dummy equal to 1 if the firm reports a NOL carry forward *(TLCF)* on its balance sheet.	
ΔNOL	Change in NOL carry forward.	NOL_t-NOL_{t-1}
Sales Growth	Sales growth rate.	$(SALE_t$-$SALE_{t-1})/SALE_{t-1}$
PP Ratio	Ratio of net to gross fixed assets	*PPENT / PPEGT*
ΔPost-retirement Obligations	Change in post-retirement obligations	$PRBA_t$-$PRBA_{t-1}$
Pre-1993 goodwill	Goodwill before or in 1993	*GDWL*
Post 1993 goodwill	Goodwill after 1993	*GDWL*
Other Intangibles	Other intangible assets	*INTAN-GDWL*
Foreign Operations	Absolute value of firm's foreign pre-tax income	*|PIFO|*

Table 1
Summary Statistics
The sample consists of firm-years with available data in the period 1986—2008. All variables are defined in Appendix B. All continuous variables are winsorized at the 1st and 99th percentile. The table reports univariate statistics for the whole sample.

	N	Mean	Median	Minimum	Maximum
Book Tax Gap	66,198	-0.265	-0.006	-10.868	0.224
Leverage	66,198	0.158	0.100	0.000	0.742
%Institution	66,198	0.269	0.077	0.000	1.028
Firm Size ($m)	66,198	1214.78	109.475	0.099	24581
ROA Volatility	66,198	0.216	0.051	0.006	7.435
Total Accruals	66,198	-0.050	-0.042	-1.382	0.887
Intangibles	66,198	0.112	0.025	0.000	0.735
R&D	66,198	0.075	0.001	0.000	1.149
Advertising.	66,198	0.014	0.000	0.000	0.261
Stock Option Ratio	16,621	0.730	0.838	0.000	0.996
Adjusted Gap/ Pre-tax Book Income	66,184	0.150	0.002	-0.047	10.526
Unadjusted Gap/ Pre-tax Book Income	66,184	0.511	0.575	-2.606	2.814

Table 2
Correlations among Variables of Interest
The sample consists of firm-years with available data in the period 1986—2008. All variables are defined in Appendix B. All continuous variables are winsorized at the 1st and 99th percentile. The table reports pairwise correlations among the variables of interest.

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
1 - Book Tax Gap	1								
2 - Leverage	0.002	1							
3- %Institution	0.174	-0.108	1						
4 - Size	0.076	0.025	0.215	1					
5 - ROA Volatility	-0.683	-0.042	-0.164	-0.076	1				
6 - Total Accruals	0.316	-0.034	0.063	0.006	-0.181	1			
7 - Intangibles	0.036	0.100	0.187	0.135	-0.016	-0.026	1		
8 - R&D	-0.447	-0.183	-0.120	-0.093	0.321	-0.121	-0.097	1	
9- Advertising	-0.047	-0.033	-0.028	0.006	0.032	-0.024	-0.019	-0.038	1
10- Stock Option Ratio	0.035	-0.075	0.124	0.127	-0.003	-0.004	0.103	0.126	-0.025

Table 3
Leverage* and *Book Tax Gap
The sample consists of firm-years with available data in the period 1986—2008. *High Leverage Dummy* is a dummy variable that takes a value of 1 when *Leverage* is above the sample median. All other variables are defined in Appendix B. Year fixed effects are included in all regressions. All continuous variables are winsorized at the 1st and 99th percentile. Standard errors used to compute *t*-statistics (in parentheses) are robust and clustered by firm. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% level respectively.

	Book Tax Gap			
	(1)	(2)	(3)	(4)
Leverage	-0.296***	-0.461***	-0.192***	-0.425***
	(-10.55)	(-10.10)	(-5.83)	(-8.57)
High Leverage Dummy			-0.049***	-0.018*
			(-5.47)	(-1.77)
%Institution	-0.154***	-0.256***	-0.154***	-0.256***
	(-13.96)	(-11.86)	(-13.95)	(-11.85)
Log(*Size*)	0.071***	0.256***	0.072***	0.256***
	(17.31)	(16.32)	(17.40)	(16.33)
Fort500 Dummy	-0.114***	-0.077***	-0.114***	-0.077***
	(-12.82)	(-8.80)	(-12.79)	(-8.85)
Profitability	0.085***	0.125***	0.088***	0.125***
	(9.38)	(12.89)	(9.64)	(12.92)
ROA Volatility	-0.533***	-0.542***	-0.533***	-0.542***
	(-16.55)	(-11.20)	(-16.55)	(-11.20)
Total Accruals	0.789***	0.654***	0.787***	0.654***
	(14.86)	(11.65)	(14.84)	(11.65)
Intangibles	0.031	0.107*	0.037	0.109*
	(0.91)	(1.81)	(1.10)	(1.85)
R&D	-1.259***	-1.916***	-1.262***	-1.915***
	(-18.50)	(-19.84)	(-18.53)	(-19.85)
Advertising	-0.922***	-1.647***	-0.927***	-1.647***
	(-5.97)	(-4.84)	(-6.01)	(-4.84)
Lagged Book Tax Gap	0.318***	0.055**	0.318***	0.055**
	(13.59)	(2.55)	(13.56)	(2.55)
Additional Manzon-Plesko				
NOL	0.038***	0.040***	0.039***	0.040***
	(4.89)	(3.98)	(4.98)	(3.98)
ΔNOL	-0.000***	-0.000***	-0.000***	-0.000***
	(-6.24)	(-5.88)	(-6.28)	(-5.88)
Sales Growth	0.077***	0.045***	0.076***	0.045***
	(9.40)	(6.02)	(9.37)	(6.01)
PP Ratio	-0.109***	-0.095**	-0.111***	-0.095**
	(-3.94)	(-1.99)	(-4.00)	(-1.98)

(Continued)

Table 3 (continued)

	Book Tax Gap			
	(1)	(2)	(3)	(4)
ΔPost-Retirement Benefits	-0.001***	-0.001***	-0.001***	-0.001***
	(-6.63)	(-4.30)	(-6.46)	(-4.27)
Foreign Pre-Tax Income	-0.000***	-0.000***	-0.000***	-0.000***
	(-9.89)	(-6.66)	(-10.22)	(-6.69)
Pre 1993 Goodwill	-0.000***	-0.000**	-0.000***	-0.000**
	(-8.44)	(-2.06)	(-8.17)	(-2.05)
Post 1993 Goodwill	-0.000***	-0.000***	-0.000***	-0.000***
	(-8.64)	(-5.79)	(-8.42)	(-5.76)
Other Intangibles	-0.000***	-0.000***	-0.000***	-0.000***
	(-5.73)	(-6.00)	(-5.64)	(-5.99)
Intercept	-0.369***	-0.887***	-0.383***	-1.022
	(-4.45)	(-12.88)	(-4.35)	(-0.00)
Industry Fixed Effects	Yes	No	Yes	No
Firm Fixed Effects	No	Yes	No	Yes
N	66,198	66,194	66,198	66,198
R^2	0.621	0.355	0.621	0.355
# of firms		9,648		9,648

Table 4

***Leverage, Book Tax Gap* and CEO incentive alignment**

The sample consists of firm-years with available data in the period 1986—2008. All variables are defined in Appendix B. Manzon-Plesko controls (see Appendix B) and year fixed effects are included in all regressions. All continuous variables are winsorized at the 1st and 99th percentile. Standard errors used to compute *t*-statistics (in parentheses) are robust and clustered by firm. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% level respectively.

	Book Tax Gap			
	(1)	(1)	(1)	(1)
Leverage	-0.120**	-0.206***	-0.278**	-0.530**
	(-2.38)	(-2.88)	(-2.08)	(-2.39)
Stock Option Ratio	0.036***	0.037**	0.008	-0.024
	(3.60)	(2.38)	(0.75)	(-0.80)
*Stock Option Ratio * Leverage*			0.245*	0.498**
			(1.80)	(2.05)
%Institution	0.006	0.007	0.006	0.006
	(1.53)	(0.74)	(1.53)	(0.59)
Log(*Size*)	0.003	0.018	0.003	0.017
	(1.15)	(1.45)	(1.02)	(1.44)
Fort500 Dummy	-0.010**	-0.005	-0.010**	-0.004
	(-2.42)	(-1.12)	(-2.42)	(-1.01)
Profitability	0.070***	0.086***	0.070***	0.086***
	(3.73)	(5.44)	(3.78)	(5.46)
ROA Volatility	-0.711***	-0.818***	-0.706***	-0.804***
	(-3.37)	(-3.26)	(-3.40)	(-3.30)
Total Accruals	0.237**	0.234**	0.233**	0.232**
	(2.27)	(2.06)	(2.27)	(2.08)
Intangibles	-0.092***	-0.043	-0.094***	-0.050
	(-3.05)	(-1.47)	(-3.06)	(-1.64)
R&D	-0.856***	-1.833***	-0.847***	-1.824***
	(-3.99)	(-4.05)	(-4.02)	(-4.10)
Advertising	-0.051	-0.109	-0.061	-0.108
	(-1.09)	(-1.38)	(-1.32)	(-1.37)
Lagged Book Tax Gap	0.381***	0.179***	0.382***	0.180***
	(3.55)	(2.68)	(3.56)	(2.70)
Intercept	0.049	-0.019	0.075	0.031
	(1.08)	(-0.38)	(1.33)	(0.61)
Industry Fixed Effects	Yes	No	Yes	No
Firm Fixed Effects	No	Yes	No	Yes
N	16,621	16,621	16,621	16,621
R^2	0.500	0.360	0.501	0.366
# of firms		2,322		2,322

Table 5
***Leverage* and *Book Tax Gap* around the BAPCPA**

The sample consists of firm-years with available data in the period 1986—2008. *Post BAPCPA Dummy* takes a value of 1 for years after 2006, zero otherwise. All other variables are defined in Appendix B. Manzon-Plesko controls (see Appendix B), and firm and year fixed effects are included in all regressions. All continuous variables are winsorized at the 1st and 99th percentile Standard errors used to compute *t*-statistics (in parentheses) are robust and clustered by firm. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% level respectively.

	Book Tax Gap		
	Pre: Yr. 2005 Post: Yrs. 2007	Pre: Yrs. 2004-5 Post: Yrs. 2007-8	Pre: Yrs. 2003-5 Post: Yrs. 2007-9
Leverage	-0.731**	-0.757***	-0.905***
	(-2.53)	(-4.27)	(-5.61)
Post BAPCPA Dummy	-0.249***	-0.280***	-0.251***
	(-6.22)	(-7.57)	(-7.44)
Post BAPCPA Dummy x *Leverage*	0.544***	0.353***	0.375***
	(3.22)	(2.77)	(3.20)
%Institution	-0.309***	-0.330***	-0.352***
	(-2.78)	(-4.85)	(-6.03)
Log(*Size*)	0.945***	0.803***	0.733***
	(6.97)	(10.96)	(12.77)
Fort500 Dummy	-0.143***	-0.131***	-0.163***
	(-2.65)	(-6.02)	(-7.73)
Profitability	0.280***	0.205***	0.194***
	(4.42)	(5.76)	(7.13)
ROA Volatility	-0.266	-0.329***	-0.468***
	(-1.52)	(-3.83)	(-6.21)
Total Accruals	0.866***	0.791***	0.766***
	(3.89)	(5.98)	(7.50)
Intangibles	-0.313	-0.289	-0.203
	(-0.82)	(-1.49)	(-1.31)
R&D	-0.747	-1.426***	-1.425***
	(-1.52)	(-5.20)	(-7.10)
Advertising	-0.162	-5.183***	-3.633***
	(-0.07)	(-3.95)	(-3.20)
Lagged Book Tax Gap	0.124	-0.010	-0.012
	(1.57)	(-0.23)	(-0.35)
Intercept	-4.227***	-3.518***	-3.264***
	(-6.47)	(-10.55)	(-12.57)
N	5,766	11,282	16,226
R^2	0.394	0.388	0.391
# of firms	3,699	4,329	4,868

Table 6
***Leverage* and *Book Tax Gap*, a counter-factual experiment**
The sample consists of firm-years with available data in the period 1986—2008. Post-Confact is a dummy variable equal to 1 if for years after 1990, and zero otherwise. All other variables are defined in Appendix B. Manzon-Plesko controls (see Appendix B), and firm and year fixed effects are included in all regressions. All continuous variables are winsorized at the 1st and 99th percentile. Standard errors used to compute *t*-statistics (in parentheses) are robust and clustered by firm. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% level respectively.

	Book Tax Gap		
	Pre: Yr. 1989 Post: Yrs. 1991	Pre: Yr. 1989 Post: Yrs. 1991	Pre: Yr. 1989 Post: Yrs. 1991
Leverage	-0.259***	-0.199***	-0.149***
	(-3.06)	(-3.20)	(-2.80)
Post-Confact Dummy	-0.006		-0.015
	(-0.37)		(-1.23)
Post-Confact Dummy x Leverage	-0.054	-0.043	-0.028
	(-0.74)	(-0.71)	(-0.50)
%Institution	-0.229***	-0.242***	-0.159***
	(-3.50)	(-5.20)	(-4.84)
Log(*Size*)	0.185***	0.199***	0.152***
	(3.08)	(6.16)	(5.95)
Fort500 Dummy	0.018*	0.011	0.012
	(1.76)	(1.26)	(1.56)
Profitability	0.137***	0.155***	0.152***
	(8.18)	(10.49)	(14.01)
ROA Volatility	-1.069***	-1.432***	-1.478***
	(-10.88)	(-7.61)	(-8.02)
Total Accruals	0.126	0.157**	0.151***
	(1.38)	(2.31)	(3.30)
Intangibles	0.181	-0.153	-0.126
	(0.93)	(-0.82)	(-0.85)
R&D	-1.404***	-1.499***	-1.354***
	(-3.94)	(-5.48)	(-7.32)
Advertising	-0.249	-0.089	-0.305
	(-0.56)	(-0.27)	(-0.97)
Lagged Book Tax Gap	0.156	-0.403**	-0.354***
	(0.91)	(-2.41)	(-2.66)
Intercept	-0.656***	-0.804***	-0.641***
	(-3.17)	(-6.73)	(-6.24)
N	4,669	7,259	9,969
R^2	0.604	0.569	0.537
# of firms	3,173	3,514	3,945

Table 7

Cross-sectional differences in the relation *Leverage* and *Book Tax Gap*

The sample consists of firm-years with available data in the period 1986—2008. *Dummy* is an indicator variable that takes a value of one when the variable of interest assumes a value greater than its median or 0. All other variables are defined in Appendix B. Control variables are omitted for brevity but included in all regressions. All continuous variables are winsorized at the 1st and 99th percentile. Manzon-Plesko controls (see Appendix B), and firm and year fixed effects are included in all regressions. Standard errors used to compute *t*-statistics (in parentheses) are robust and clustered by firm. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% level respectively.

	Book Tax Gap				
	Dummy=1 if *Stock Option Ratio*> Median	*Dummy*=1 if *%Institution*> Median	*Dummy*=1 if *Size*> Median	*Dummy*=1 if *Fort500 Dummy*=1	*Dummy*=1 if *Advertising*> Median
Leverage	-0.400***	-0.501***	-0.488***	-0.465***	-0.505***
	(-5.90)	(-8.86)	(-7.39)	(-10.09)	(-9.73)
Dummy	0.014	-0.095***	-0.106***	-0.099***	-0.023
	(1.46)	(-6.82)	(-9.26)	(-8.61)	(-1.51)
*Leverage*Dummy*	-0.068	0.194***	0.391***	0.139***	0.148**
	(-1.08)	(4.02)	(6.84)	(3.39)	(2.51)
N	66,194	66,194	66,194	66,194	66,194
R^2	0.355	0.353	0.324	0.355	0.353
# of firms	9,648	9,648	9,648	9,648	9,648

	Book Tax Gap				
	Dummy=1 if *Profitability*> 0	*Dummy*=1 if *ROA Volatility*> Median	*Dummy*=1 if *Intangibles*> Median	*Dummy*=1 if *R&D*> 0	*Dummy*=1 if *Total Accruals*> Median
Leverage	-0.512***	-0.373***	-0.600***	-0.471***	-0.480***
	(-8.49)	(-10.04)	(-8.95)	(-8.97)	(-8.59)
Dummy	0.103***	0.083***	-0.043***	-0.063*	0.100***
	(6.98)	(8.70)	(-3.03)	(-1.79)	(10.34)
*Leverage*Dumm*	0.118**	-0.217***	0.216***	-0.147*	-0.100**
	(2.52)	(-4.07)	(3.66)	(-1.74)	(-2.35)
N	66,194	66,194	66,194	66,194	66,194
R^2	0.355	0.291	0.291	0.229	0.194
# of firms	9,648	9,648	9,648	9,648	9,648

Table 8
***Leverage* and proportion of income sheltered from taxes**
The sample consists of firm-years with available data in the period 1986—2008. All variables are defined in Appendix B. All continuous variables are winsorized at the 1st and 99th percentile. Manzon-Plesko controls (see Appendix B), and year and firm fixed effects are included in all regressions. Standard errors used to compute *t*-statistics (in parentheses) are robust and clustered by firm. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% level respectively.

	Adjusted Gap/ Pre-tax Book Income	*Unadjusted Gap*/ Pre-tax Book Income	*Adjusted Gap*/ Pre-tax Book Income	*Unadjusted Gap*/ Pre-tax Book Income
	(1)	(2)	(3)	(4)
Leverage	0.274***	0.052**	0.072*	0.042
	(7.95)	(2.08)	(1.67)	(0.49)
Stock Option Ratio			0.002	-0.027
			(0.63)	(-0.86)
%Institution	0.247***	-0.050**	0.005	-0.080*
	(12.74)	(-2.51)	(1.14)	(-1.93)
Log(*Size*)	-0.242***	-0.048***	-0.018	-0.051***
	(-15.81)	(-9.85)	(-1.50)	(-3.01)
Fort500 Dummy	0.068***	0.023	0.008	0.028
	(9.56)	(1.37)	(1.64)	(1.19)
Profitability	0.036***	-0.490***	0.010	-0.510***
	(4.49)	(-34.02)	(1.28)	(-11.52)
ROA Volatility	0.241***	-0.003	0.377***	0.048
	(7.08)	(-1.08)	(3.72)	(0.58)
Total Accruals	-0.200***	0.046***	-0.095	0.022
	(-4.77)	(5.26)	(-1.43)	(0.32)
Intangibles	-0.012	-0.019	0.019*	0.007
	(-0.26)	(-0.70)	(1.88)	(0.08)
R&D	0.187**	-0.099***	0.241	-0.282*
	(2.35)	(-6.95)	(1.41)	(-1.78)
Advertising	0.433*	0.001	-0.013	0.696**
	(1.69)	(0.01)	(-0.57)	(2.00)
Lagged Book Tax Gap	0.383***		0.451	
	(10.99)		(0.80)	
Intercept	1.164***	1.106***	0.038	0.967***
	(14.87)	(30.28)	(1.10)	(8.62)
N	66,172	66,273	16,621	16,633
R^2	0.323	0.094	0.226	0.068
# of firms	9,645	9,655	2,322	2,323

Table 9
***Book Tax Gap* and firm value**
The sample consists of firm-years with available data in the period 1986—2008. All variables are defined in Appendix B. All continuous variables are winsorized at the 1st and 99th percentile. Manzon-Plesko controls (see Appendix B), and year and firm fixed effects are included in all regressions. Standard errors used to compute *t*-statistics (in parentheses) are robust and clustered by firm. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% level respectively.

	Tobin's Q			
	(1)	(2)	(3)	(4)
Leverage	-2.958***	-2.841***	-2.884***	0.097
	(-13.14)	(-15.65)	(-12.39)	(0.16)
Res. Book Tax Gap	-1.979***	-2.072***	-2.003**	0.958
	(-16.07)	(-13.74)	(-2.44)	(1.10)
Res. Book Tax Gap Leverage*		0.533		-6.470***
		(1.01)		(-2.74)
Stock Option Ratio			0.516***	0.819***
			(5.11)	(6.69)
*Stock Option Ratio*Leverage*				-2.770***
				(-5.27)
%Institution	1.221***	1.235***	0.399***	0.402***
	(11.63)	(11.79)	(4.08)	(4.17)
Log(*Size*)	-0.872***	-0.882***	-0.522***	-0.426***
	(-12.10)	(-12.26)	(-4.60)	(-5.71)
Fort500 Dummy	0.168***	0.175***	0.146**	0.103**
	(3.33)	(3.45)	(2.44)	(2.17)
Profitability	0.581***	0.597***	0.583***	0.319***
	(11.78)	(12.59)	(4.49)	(3.70)
ROA Volatility	1.868***	1.876***	2.769***	1.436
	(8.56)	(8.52)	(2.75)	(0.92)
Total Accruals	0.914***	0.902***	0.492	0.647*
	(4.05)	(4.04)	(1.12)	(1.93)
Intangibles	-0.810***	-0.842***	-1.089***	-1.001***
	(-2.62)	(-2.71)	(-4.52)	(-4.16)
R&D	0.778	0.679	1.801	3.963***
	(1.27)	(1.10)	(1.28)	(3.20)
Advertising	-2.107	-2.149	-0.163	0.147
	(-1.39)	(-1.42)	(-0.15)	(0.14)
Lagged Book Tax Gap	5.605***	5.663***	4.214***	2.911***
	(14.78)	(14.85)	(6.25)	(6.38)
N	66,198	66,198	16,621	16,621
R^2	0.302	0.302	0.234	0.287
# of firms	9,648	9,648	2,322	2,322