An Essay on the Effects of Taxation on the Corporate Financial Policy

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The taxation of corporate profits in the United States has been one of the most widely discussed issues in the area of public finance. Corporate revenues are currently subject to double taxation. Profits are taxed first at the corporate level and then, when distributed as dividends or when capital gains are realized, taxed a second time at the individual level. The share of tax revenues from corporate profits has been decreasing steadily over the past four decades. In 1962, corporate tax receipts accounted for 21 percent of all tax revenues, but, by 2003, their share dropped to 7.5 percent.[1] In 2003, a proposal by the Bush Administration brought corporate tax integration back to the front pages. The final legislation, the Jobs and Growth Tax Relief Reconciliation Act of 2003, did not eliminate double taxation, but it did reduce the taxation of corporate profits at the individual level.[2] Double taxation is still a reality; so, the discussion for corporate integration is clearly not over.

In understanding why corporate taxation is such a highly contested issue, critics argue that the current tax system discourages business entities from organizing as taxable corporations and encourages corporations to veer from socially efficient decisions (Scholes et al. (2005), p. 336). Those critics believe that the losses to the U.S. economy caused by the current tax system far exceed the gains from the revenues raised. They call for a neutral tax system that does not enter into the decisionmaking process of firms and does not distort economic efficiency. Supporters of corporate taxation reply to those allegations by saying that corporations are distinct entities and should be taxed separately from their shareholders; that corporations should pay a fee, tax, for the special privileges they enjoy; and that corporate taxation prevents the sheltering of individual income from taxation (Rosen (2002), p. 399).

A large body of research has tested for the effects of corporate taxation. Although the results of empirical models vary significantly, all models agree that, to some degree, corporate taxation affects a broad range of the decisions made by taxable corporations. The magnitude of those effects and their overall impact on the economy are still under debate. Jane Gravelle (1995) divides the debate on corporate taxation into three key issues. "First who carries the burden of corporate tax--capital, labor, or consumers, and does it play a role in a progressive tax system? Second, how significant are the distortions caused by the excess corporate tax? And third, how can the revenues raised from corporate tax be replaced?" This paper focuses on the second question and more specifically on how the deductibility of interest affects the capital structure of taxable corporations. I test the hypothesis that taxable corporations have a tax incentive to use debt financing versus equity financing because interest paid is tax-deductible while dividends paid to shareholders are not. Measuring the excess debt that corporations carry due to the tax incentive is important because the excessive use of debt may lead to financial distress and even bankruptcy.

This paper extends the work of Gordon and Lee (2001). They use an aggregate data time-series, Tax Years 1950 to 1995, to test for the effects of corporate taxation on the financial policy of firms of different sizes. They found that taxes have a large effect on the use of debt for the smallest and the largest firms. In this paper, I first estimated the Gordon and Lee (G&L) model using the same aggregate Statistics of Income (SOI) data but for a different time period, Tax Years 1993 to 2000, and my findings were qualitatively similar to those of G&L. Next, I introduced a confidential SOI firm-level dataset for the 8-year period, and found an unexpected negative relation between tax rates and debt. However, using a marginal tax rate constructed from taxable income before the interest deduction and the panel dataset, I found, as expected, a positive relation between tax rates and debt. Finally, I divided my panel dataset into small, intermediate, and large size firms, and I found a positive relationship between tax rates and debt for all three firm sizes.

▶ Corporate Taxation

Before discussing existing research on how taxes affect the corporate capital structure, it is useful to review how double taxation affects the decisionmaking process of firms. Business entities have a financial incentive to organize as "C corporations," where the term C corporation comes from the subchapter of the Tax Code defining their structure. Corporations are legal entities that can have multiple owners and separate management. The ability to attract multiple investors through the sale of shares or bonds gives corporations broad access to capital and greater potential for growth. The shares of corporations can be easily transferred to other investors without disrupting the operations of the companies. The owners of corporations also enjoy limited liability since, in case of default, their liability is limited to the amount they have invested. Because, in the United States, corporate profits are subject to double taxation, corporations in essence pay a fee for the right to incorporate. Corporate revenues are taxed first on the corporate level and then, when distributed as dividends or when capital gains are realized, taxed a second time on the individual level. Business entities can avoid double taxation but in the process lose some of the special privileges mentioned earlier, if they organize as passthrough entities. Passthrough entities, such as sole proprietorships, partnerships, and subchapter S corporations, avoid double taxation by passing all profits and losses onto their shareholders (Brealey and Myers, 2000).

The firm can finance its investments using equity or debt. Equity is either cash available to the firm or funds raised by issuing stock, primarily common stock. Dividends paid to stockholders are not tax- deductible; thus, dividends are paid from after-tax income. A firm raises debt by borrowing from its shareholders, from financial institutions, or from the public. All interest paid by a corporation to its lenders is tax-deductible, thus generating a tax shield. Clearly, there is a tax incentive for a taxable corporation to use debt instead of equity. So, double taxation directly affects the corporate capital structure.

Since all interest paid is tax-deductible, one would expect that taxable corporations would rely heavily on debt to finance their investments, but empirical evidence shows that they use significant amounts of equity capital.[3] Why is this so? There can be significant nontax costs involved with debt financing. These costs include both the standard costs of borrowing and risks of financial distress that fixed liabilities imply. Firms fall into financial distress when they have difficulty making their debt payments. Extended periods of financial distress can lead to bankruptcy. The higher the debt payment levels, the higher the probability that the firm could fall into financial distress. As the probability of distress increases the risk for the firm's debtor increases, so they demand higher return for their investments. Consequently, the value of debt tax shields decreases as these forms of nontax costs increase.

The value of tax shields also depends on the marginal tax rate of the firm, and the availability of nondebt tax shields[4] and tax credits. The marginal tax rate is the tax liability generated, today and in the future, by an additional dollar of income earned today. Estimating the marginal tax rate is not straightforward because of the uncertainty of future earnings, the carryback and the carryforward provisions of the tax law, and the alternative minimum tax (AMT). Corporations can "carry back" and "carry forward" operating losses and tax credits--meaning they can apply them to reduce tax liabilities incurred in past or future years. As Graham (1996) explains, the relationship among operating losses, marginal tax rates, and the value of tax shields is not always obvious. For example, tax shields have very low, if no, value to corporations that expect operating losses in the future. Such firms will have very low marginal tax rates because they can use those net operating loss deductions (NOL's) in the future to refund any taxes paid today. Firms that experienced losses in the past and expect moderate profits in the future can also use NOL's to reduce future tax liabilities. However, if that same firm carries back its current-year NOL and the NOL is less than or equal to is past liabilities, then the marginal tax rate of any additional income earned today will be equal to the applicable statutory tax rate. From these examples, it is easy to see that the NOL deduction makes estimating the marginal tax rate of a corporation complex.

The value of debt tax shields also depends on the availability of nondebt tax shields[4] and tax credits. As

DeAngelo and Masulis (1980) explain, one can make the case of a tax shield substitution effect since the availability of nondebt tax shields may crowd out debt tax shields. Finally, it has been shown that the foreign tax credit limitations do not just reduce the value of debt tax shields, but actually influence U.S. multinationals to decrease their domestic debts by substituting them with equity financing.

In this paper, the corporate marginal tax rate proxies are constructed by selecting the marginal statutory rate that applies to the highest dollar of the current-year taxable income, or taxable income before interest deduction, reported on the tax return. Such proxies have been used successfully in earlier research and can be applied to both the aggregate and firm-level datasets used. Upcoming research by the author explores the effects of the NOL deduction and the various tax credits on the corporate capital structure.

▶ Prior Empirical Research

Modigliani and Miller (1963) were the first to introduce the idea that corporate taxation affects the capital structure of firms. As Scholes et. al. (2005) discuss, Modigliani and Miller showed that if the only imperfection of the capital markets is corporate taxation, the deductibility of interest generates a debt tax shield that increases the value of corporations. When comparing debt and equity financing, Modigliani and Miller explain that borrowing is beneficial to corporations because the cost of debt, interest paid, is tax-deductible while the cost of equity, dividends, is not. In a later paper, Miller (1977) pointed out that, if one takes into account the tax status of corporate investors, equity financing can be a competitive alternative to debt financing. If the interest earned by the debt holders is taxed at a higher rate than the dividends paid to stockholders, then the corporation's tax incentive is the difference between the sum of the corporate tax rate plus the dividend rate, and the individual tax rate of the bondholders. The work of Modigliani and Miller was advanced by DeAngelo and Masulis (1980), who introduced the idea of tax shield substitution. Firms can substitute nondebt tax shields, like the depreciation deduction, for debt tax shields. The work of DeAngelo and Masulis is important because it led to a hypothesis that can be empirically tested; firms with large amounts of nondebt tax shields will have lower levels of debt than firms with small amounts of nondebt tax shields (Scholes et al. (2005) p. 344).

Since the works of Modigliani and Miller (1963) and DeAngelo and Masulis (1980), a number of empirical studies have examined the impact taxes have on the financial structure of corporations. As Ayers, Cloyd, and Robinson (2001) explain, the capital structure literature can be divided into two streams. The first stream of works compares taxable corporations that have different tax incentives, hypothesizing that firms with greater tax incentives will have higher levels of debt. The second stream of works compares taxable corporations to passthrough entities that are not subject to corporate taxation because, by law, they have to pass all income to their shareholders. Their hypothesis is that taxable corporations will have higher levels of debt than passthrough entities.

The earlier articles of the first stream do cross-section analysis of taxable corporations but do not find convincing evidence that taxation affects the financial policy of firms (Bradley, Jarrell, and Kim, 1984; and Gaver and Gaver, 1985). The more recent articles of the first stream are more successful in finding evidence of a significant positive relationship between debt financing and marginal tax rates. These articles introduce several improvements over earlier work: They examine incremental financing decisions instead of debt levels (MacKie-Mason (1990); Graham (1996); Gropp (1997)); they develop better proxies for marginal tax rates (Graham (1996); Graham, Lemmon, and Schallheim (1998)); they use the ratio of interest expense to gross profit rather than the debt-to-equity ratio as the dependent variable (Cloyd, Limberg, and Robinson (1997); and they research the debt policies of corporations of different sizes (Gordon and Lee (1999)). Here, I briefly present an overview of this work, focusing on the data, the marginal tax rate proxies used, and their key findings.

Bradley, Jarrell, and Kim (1984) use data from 851 large firms to estimate a general equilibrium model. Although they have multiyear data for each firm, in order to avoid business cycle variations or different

adjustment periods, they calculate a 20-year average or "permanent" leverage ratio for each firm. They examine how these ratios vary with the industry of the firm, the volatility in the firm's earnings, the availability of nondebt tax shields, and the expenditures on research and development and advertising. They do not find concrete evidence that taxation affects the firm's leverage ratios, but they find evidence that the leverage ratios are strongly influenced by the firm's industry. They also find that firms with volatile earnings have lower levels of debt, suggesting that the risk of bankruptcy has a negative effect on the amount a firm borrows. Finally, they find that firms with higher levels of nondebt tax shields borrow more, a finding that contradicts the findings of the earlier literature. Bradley, Jarrell, and Kim offer as a possible explanation for this last finding that firms with large amounts of assets have more collateral and thus can borrow more.

The Gaver and Gaver (1985) article does not test directly for the relationship between taxes and debt ratios but rather tests the hypothesis that there is a systematic relationship between the firm's investment opportunity set and its corporate policy decisions. Using longitudinal data from 237 new and 237 established firms, they find evidence that growth firms have significantly lower debt-to-equity ratios than established firms. This is an interesting result that could explain the differences in the debt levels across firms.

The MacKie-Mason (1990) article uses the Compustat data on large publicly traded companies to examine the relationship between nondebt and debt tax shields to measure the firm's tax incentive, using a dummy variable for the net operating loss deduction. Instead of using the aggregate debt over total assets ratio as the dependent variable, he uses the annual change in the total debt levels scaled by the firm's total assets. He finds evidence of substantial tax effects on the choice between issuing debt or equity; that firms with net operating loss carry-forwards are much less likely to use debt; and that the existence of investment tax credits reduces the probability of debt issues only when the firm's marginal tax rate is near zero. His findings support a significant relationship between corporate taxation and the financial decisions of a firm.

Graham (1996) follows MacKie-Mason's incremental choice approach, using a simulated firm-specific marginal tax rate as a proxy for the firm's tax incentives. The data used are a pooled cross-section of differenced time series from about 10,000 Compustat firms from 1980 to 1992. Although he finds a strong positive relation between tax status and incremental debt policy, he is puzzled by the low R-squared of about 5 percent that his regressions produce. He states that "future researchers should study why, given the strong tax incentives firms have to issue debt, taxes do not explain a larger portion of debt policy." Finally, he tests the effectiveness of the tax status proxies used by earlier papers and finds that only the net operating loss dummy variable is a reasonable proxy.[5]

Gropp's (1997) paper builds on the work done by MacKie-Mason and Graham, but, instead of using proxies for expected marginal tax rates, he uses a simple rational expectations approach to estimate the expected effective corporate tax rates of firms. He finds "that current average effective tax rates have substantial predictive power for the estimation of expected corporate tax rates." Controlling for other theories of capital structure choices, he finds that corporate taxation affects the financial policy of firms using a balanced panel from Compustat of 929 publicly traded manufacturing U. S. firms from 1979 to 1991.

Graham, Lemmon, and Schallheim (1998) is the first paper to find a positive relationship between the tax incentive and debt financing using debt levels. They provide evidence that the corporate tax status is endogenous to financing decisions, producing a spurious relationship between the debt ratio and the marginal tax rate of the firm; in other words, the estimated effects of tax status on the debt levels will be biased because companies that have high levels of debt also have low marginal tax rates. To solve this problem, they propose a direct measure of the corporate marginal tax rate using taxable income before the interest deduction as a measure of the firm profits. Using a balance panel from Compustat of 18,193 observations from 1981 to 1992, they find a positive relationship between tax rates and the usage of debt.

Gordon and Lee (2001) is the first paper to research the debt policies of corporations of all sizes and to find a positive relationship between debt levels and after-financing tax rates. They create a dataset from the aggregate data on corporations published by SOI and test for the effects of taxation by comparing the ratios of debt-to-assets of firms in different asset size-classes. Over the 46-year period covered by their data, the corporate tax rates varied significantly,[6] giving them adequate variation both across time and across firms for a difference-in-difference procedure. This procedure compares the changes in the debt-to-assets ratios for small versus large firms with the changes in the relative tax rates they face. They find that taxes have a large effect on the use of debt for the smallest and the largest firms. For intermediate-sized firms, they estimate a much lower effect, but they provide indirect evidence that this finding is a result of measurement error in the tax variable. Since the SOI data are grouped in asset classes, they only have information on the average rate of return for firms in each asset class, taxable income divided by assets; so, they calculate the average marginal tax rate for firms in each asset class. Due to this limitation, "they are not able to capture the effects of heterogeneity in rates of return across firms on the expected marginal tax rate, arising from the nonlinearity in the tax structure." The effects of heterogeneity in rates of return are more important for intermediate firms since their "taxable incomes are near the point where tax rates change dramatically."

To avoid such problems, I introduced a confidential firm-level dataset of taxable corporations of all sizes, for Tax Years 1993 to 2000. This dataset allowed studying the effects of taxation on firms of all sizes, while capturing the heterogeneity in rates of return across firms. I found an unexpected negative relation between tax rates and debt. However, using a marginal tax rate constructed from taxable income before the interest deduction, I found the expected positive relation between tax rates and debt. Next, I took advantage of the panel aspects of the microdataset; by using fixed effects models, I controlled for the unobserved firm-specific effects and found again a positive relation between taxation and debt. Finally, I divided the panel dataset into small, intermediate, and large size firms, and I found a positive relationship between tax rates and debt for all three firm sizes.

▶ Empirical Research

The data sample

The data used for this study are the firm-level data collected by SOI and published on an aggregate basis in the annual Corporate Source Book.[7] The data come from the tax returns of domestic corporations and foreign corporations with U.S. business activities.[8] The firm-level data are confidential, although SOI employees--like my self--can conduct analyses of the data and share the results with outsiders subject to disclosure review by the Internal Revenue Service (IRS).

I began my analysis with Tax Year 1993 since it is the first year that three new tax brackets, for returns with taxable income greater than 10 million dollars, came into effect. The three brackets were introduced by the Tax Relief Act of 1993 and give my time series additional variation across firms compared to earlier years. I ended my analysis with Tax Year 2000 because it is the last full year before the recession that started in March of 2001.[9] Tax receipts in Tax Year 2001 decreased significantly; so, including these data would complicate the analysis of my findings.[10] During the 1993 to 2000 time period, the corporate tax schedule remained unchanged; so, the dataset provides significant variation across firms but limited variation across time.

To create the panel, I limited my sample to companies that filed tax returns under the same Employer Identification Number (EIN) and were selected by the SOI sampling process every tax year from 1993 to 2000.[11] To confine the data to nonfinancial firms with appreciable business operations, I excluded all financial returns because they follow different tax rules: 1120F filers because SOI does not collect balance sheet information from them; part-year returns which have tax periods of 6 months or less; and all returns with total assets of $10,000 or less because such firms are too small to help the explanatory power of the empirical model. After these exclusions, the panel consisted of 10,552 firms.

Constructing a “true” balanced panel of corporations is complicated by the need to account and adjust for mergers, acquisitions, and other changes to the structure

of each corporation in the sample. Given the difficulty of this undertaking, and of analyzing firms undergoing major changes, I decided to exclude from the panel all companies for which total assets increased by more than tenfold in a single year and all companies for which total assets decreased by more than 90 percent between 1999 and 2000. The first criterion eliminates from the panel corporations that have merged with or acquired another business entity. The second criterion eliminates from the panel corporations that are in financial distress and will be going out of business in the near future.[12] A total of 60 records were dropped for these reasons, leaving a "final" panel of 10,492 firms.

Apart from the large number of observations, the SOI data offer several advantages over the financial data used in the prior literature. The data collected by SOI are reported by firms to the IRS when financial (book) data are reported by corporations to their shareholders.[13] As George Plesko (2004) points out, "differences in accounting rules for book and tax reporting purposes can lead to differences in the amount of income reported to shareholders and to the IRS." Mills, Newberry, and Trautman (2002) find that book-tax income differences grew throughout the 1990's so that tax rates estimated from book income will be wrong.[14]

Financial and tax data may also differ when a parent corporation reports with its subsidiaries. For financial purposes, a parent company must include in the consolidation all domestic and foreign subsidiaries which it owns by 50 percent or more. Under tax rules, however, domestic subsidiaries must be 80-percent or more owned to be included in the parent's tax return, and foreign subsidiaries cannot be consolidated. Since the Compustat dataset reports financial consolidations and does not separate foreign and domestic income, taxable income could be inflated. The amount of debt reported by some companies in their tax returns could be inflated because they do not eliminate intercompany payables and receivables. Mills, Newberry, and Trautman (2002) report anecdotal feedback of such reporting, but, since the dependent and the control variables of the empirical model are ratios, the effects should be minimal.

Finally, another reason financial and tax data may differ is off-balance sheet financing. Firms in the 1990's used special purpose entities to keep debt outside their consolidated financial statements. Mills and Newberry (2004) find "that these financial reporting effects occurred primarily during 1994-1999." So the financial statements of large firms for that period could underreport both interest expense and debt and inflate taxable income. I believe that, overall, the use of tax data improves the accuracy of my empirical work.

▶ Summary Statistics

In order to be able to compare my results using the firm-level data with G&L results based on aggregate data, I first present summary information of all variables from the G&L sample and the present sample. As shown in Table 1, the summary statistics of the two samples match very well. The mean total debt-to-assets ratio is about four percentage points higher in the present sample compared to that of G&L, reflecting greater long-term borrowing over prior decades. Looking at the asset side of their balance sheets, firms in the two samples own comparable amounts of depreciable property and land, but firms in the present sample have higher amounts of intangible assets.[15] Finally, although the ratio of accounts receivable to assets dropped by a little bit more than 3 percentage points, cash holdings increased by about 2 percentage points. In comparing the mean marginal rates of the two datasets, it is obvious that, in recent years, corporations have faced significantly lower statutory corporate tax rates: Companies in the 1950 to 1995 period faced higher tax scales with top statutory rates as high as 52 percent, while those in the 1993 to 2000 period faced significantly lower tax scales that topped at 39 percent. The mean marginal tax rate (**mrt**) has decreased from 37.6 percent to 26.5 percent.[16] In contrast, the average yearly individual tax rate on interest faced by individual taxpayers (**ifmr**) in the same two periods was much more stable, slipping from 24.5 to 22.3.[17] It is clear that firms in the 1993 to 2000 period have considerably lower tax incentive (**dmr**) than firms in the 1950 to 1995 period.[18]

▶ Empirical Findings and Sensitivity Analysis

I begin my empirical analysis by regressing the present aggregate sample. The first equation of the Gordon

Table 1

Aggregate Data [1]

Sample Means and Standard Deviations of Variables

		Gordon & Lee 1950 - 1995 [2]		Present Study 1993 – 2000 [3]	
Variables	Notation	Mean	Standard Deviation	Mean	Standard Deviation
Corporate debt-asset ratios					
Total debt-to-assets	Tdr	25.18	8.05	29.12	6.83
Short-term debt-to-assets	Sdr	9.45	4.07	10.33	3.22
Long-term debt-to-assets	Ldr	15.73	4.36	18.78	4.62
Tax rates					
Marginal tax rate-taxable income	Mrt	37.57	13.15	26.48	9.74
Marginal tax rate-taxable income plus interest paid	Mrtint	37.97	12.81	27.80	9.86
Individual tax rate	Ifmr	24.49	2.36	22.26	1.00
Marginal tax rate minus individual tax rate	Dmr	13.04	12.72	4.22	9.75
Corporate assets					
Depreciable assets-to-assets	Dprr	20.79	6.32	21.17	7.09
Land-to-assets	Landr	3.66	2.46	3.51	2.06
Cash-to-assets	Car	9.5	4.00	11.37	6.58
Intangible assets-to-assets	Intr	1.12	1.08	2.45	0.84
Accounts receivable -to-assets	Arr	22.83	4.53	19.01	4.70

[1] Source: SOI Source Book, amounts are in dollars.

[2] From Gordon and Lee (1999)

[3] Author's tabulations

and Lee empirical model measures the effects of tax incentive (**dmr**), nontax factors, firm unique characteristics, and the business environment on the firm's total debt-to-assets ratios.[19] To simplify the model, G&L assume that all nontax factors that affect the corporate financial policy do not change over time or change in a way that is uncorrelated with relative tax rates. To account for those nontax factors, they use an "arbitrary function that measures desired debt-to-assets ratios ignoring tax incentives." In estimation, this arbitrary function is a seventh-order polynomial function of logged real assets.[20] The unique characteristics of the firms in each asset class are measured by the composition of the assets of those firms. Finally, the business environment is captured by a set of Tax Year dummies. Thus, the equation estimated is:

$$tdr_{st} = \sum_{i=1}^{n} \alpha_i \log(rassts_{st})^i + \beta dmr_{st} + \gamma X_{st} + \sum_{t=1}^{7} \delta_t d_t + \varepsilon_{st} \quad (1)$$

where **tdr** is the debt over asset ratio for firms in asset class s at year t, $\mathbf{rassts}_{st}$ are the inflation- adjusted total assets of firms in asset class s at year t , $\mathbf{log(rassts)}^i$ is the ith order polynomial function of logged rassts, **dmr** is the tax incentive of firms in asset class s at year t, $\mathbf{X}_{st}$ is a matrix of the composition of the assets of firms in asset class s at year t, and $\mathbf{d}_t$ are Tax Year dummies. The main hypothesis is that the coefficient of the tax incentive is positive. For the asset composition variables, I expect that firms with higher depreciable assets, land, and intangibles asset ratios will have higher debt-to-asset ratios when firms with higher cash balances and trade notes and accounts receivable will have lower debt-to-asset ratios. A complete listing of the variables is included in the appendix.

Gordon & Lee use OLS to estimate the first equation, finding the effects of taxes on debt to be modest. Because the marginal tax rate proxy is based on taxable income, they are concerned with possible endogeneity bias: a firm's debt levels through the interest deduction directly affect its taxable income. To correct this bias, they construct an exogenous instrument, based on the findings of Graham, Lemmon, and Schallheim (1998) and re-estimate the model using Instrumental Variable (IV). The instrument is the average tax rate faced by all firms in each time period if the interest deduction is added back to taxable income. Their IV coefficients are not significantly different from their OLS, which G&L attribute to high correlation of the instrument with the marginal tax rate proxy.

The results of the OLS regressions for the present and G&L samples are shown in Table 2. Like Gordon and Lee, I find an unexpected negative relation between tax rates and debt. I next controlled for the firms' size and asset composition by regressing the first equation, resulting as expected in a positive tax coefficient. The coefficients of the control variables, except for the ratio of land-to-assets, had the expected signs and are significant at the 1-percent level. So, I found that the 1990's aggregate data produce the same results as the aggregate data from 1950 to 1995.

G&L also estimate the effects on financial policy of any factors that change over time. These factors are the business cycle, the nominal interest rates, and the tax en-

Table 2

Aggregate Data

Regression Results

Variables	G&L Tdr	Present Tdr	G&L Tdr	Present Tdr	Present Sdr	Present Ldr
Dmr	-0.393** (0.020)	-0.384 (0.065)	0.079** (0.019)	0.078** (0.038)	0.127** (0.027)	-0.048** (0.028)
Log(rassts)			1.853** (0.355)	0.034** (0.007)	0.021** (0.005)	0.013** (0.005)
$Log(rassts)^2$			- 0.641** (0.135)	-0.015** (0.003)	-0.012** (0.002)	-0.003** (0.002)
$Log(rassts)^3$			-0.568** (0.068)	-0.002** (0.0002)	-0.002** (0.0002)	-0.0002** (0.0001)
$Log(rassts)^4$			0.085** (0.009)	0.0006** (0.0001)	0.0005** (0.00007)	0.0002 (0.00007)
$Log(rassts)^5$			0.019** (0.004)	-0.00003** (0.000009)	-0.00002* (0.00004)	-0.0002 (0.00004)
$Log(rassts)^6$			-0.004** (0.001)	-	-	-
$Log(rassts)^7$			0.002** (0.00038)	-	-	-
Dprr			0.320** (0.058)	0.663** (0.122)	0.096** (0.083)	0.567** (0.092)
Landr			0.317 (0.254)	-1.271** (0.307)	-1.606** (0.208)	-0.335* (0.231)
Car			-0.437** (0.087)	-0.223 (0.225)	-0.394** (0.152)	0.171 (0.169)
Intr			1.447** (0.341)	0.578* (0.409)	0.251 (0.276)	0.326* (0.307)
Arr			-0.027 (0.040)	-0.823** (0.166)	-0.630** (0.112)	-0.193** (0.124)
Constant	25.572** (1.289)	0.311 (0.018)	20.992** (2.187)	0.433** (0.062)	0.370** (0.042)	0.063** (0.047)
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	434	88	434	88	88	88
Adj R-squared	0.433	0.246	0.972	0.98	0.974	0.988

* and ** indicate significance levels at 5 percent and 1 percent. Standard errors in parenthesis.

Note: Following G&L, I stopped adding powers to the polynomial when the next higher power was statistically insignificant.

vironment. The dependent variable for the second equation is the coefficients of the time dummies estimated on the first equation. Having already controlled for the tax incentives, size of firm, and asset composition, the coefficients of the time dummies capture the effects on financial policy of these nontax factors. In addition, by including in the second equation a yearly measure of the tax incentive (**dmr**), G&L also test if they have adequately controlled for taxes on the first equation. If they have done so, then the coefficient of the tax incentive must be equal to zero. Thus, the equation estimated is:

$$\hat{\delta}_t = \alpha_0 + \alpha_1 ydmr_t + \alpha_2 tb_t + \alpha_3 dj_t + \alpha_4 d \succ 86 + v_t \qquad (2)$$

where $\hat{\delta}_t$ are the coefficients of the Tax Year dummies estimated by the first equation, **dmr** is the average tax incentive faced by corporations at year t, **tb** is the nominal interest rate measured by the 3-year Treasury bond rate, **dj** is a business cycle proxy equal to the ratio of the Dow Jones index over Gross Domestic Product, and **d ≻ 86** is a dummy capturing any omitted aspects of the Tax Reform Act of 1986.

Table 3 reports both the unexplained yearly variation reported by the G&L and the present samples. According to G&L, if the first equation fully accounts for the effects of taxation on the corporate financial policy, then the tax coefficient of the second equation should be zero; they find that the tax coefficient is positive, large in magnitude, and statistically significant. Because the dependent variable of the second equation is measured net of the estimated effects of taxes estimated in the first equation, to get the complete effect of taxation, they combine the two IV tax coefficients. They find that large firms in the 1970's would finance 9.2 percent of their assets with debt relative to the smaller firms. Using seven annual observations, my replication of the time-series aggregate model showed no unexplained yearly variation. So, for the present sample, the first equation seems to capture the tax incentive in its entirety. This is not totally unexpected since, in the 8 years of my time series, both business cycle and the nominal interest rate variables remained fairly constant when their sample

Table 3

Aggregate Data

Unexplained yearly variation

OLS Regression Results

Variables	G&L	Present
Dmrt	0.264** (0.094)	-0.232 (0.291)
Mrt		
Ifmr		
TB	0.504** (0.148)	0.001 (0.003)
DJ	-4.546** (1.485)	0.015 (0.020)
Dummy for post 1986	3.313** (0.692)	
Constant	0.191 (1.978)	-0.004 (0.044)
Obs.	37	7
Adj. R-squared	0.84	0.90

*and ** indicate significance levels at 5 percent and 1 percent. Standard errors in parenthesis.

period permits 37 annual observations and gains power from a structural change in 1986, as well as several economic cycle changes.

I now turn my attention to the balanced panel of firm-level microdata. I began by regressing the first equation on the final panel using OLS. The results of these regressions are reported in the first two columns of Table 4. The tax coefficient is significant at the 1-percent level but negative, and it stayed negative even after I controlled for the size of the firm and asset composition. The asset composition variables had the expected signs, and their magnitudes are consistent with my expectations and were statistically significant. Firms with higher depreciable or intangible asset ratios have higher debt-to-asset ratios, and firms with higher levels of cash at hand and accounts and trade notes receivable have lower debt-to-asset ratios. Finally, the land coefficient was again negative but significantly lower. The adjusted R-squared of the regression is 0.14 percent. So, my model provides a better fit than earlier firm-level studies but is still unexpectedly poor.

Table 4

OLS Regression Results

	Tdr	Tdr	Log(tdr)	Log(tdr)
Variables				
Dmr	-0.821**	-0.381**	-0.581**	-0.240**
	(0.009)	(0.008)	(0.006)	(0.005)
Log(rassts)		-8.079**		-4.417**
		(0.735)		(0.436)
Log(rassts)^2		0.960**		0.532**
		(0.093)		(0.055)
Log(rassts)^3		-0.055**		-0.031**
		(0.006)		(0.003)
Log(rassts)^4		0.002**		0.0009**
		(0.0001)		(0.0001)
Log(rassts)^5		-0.00002**		-0.000005
		(0.000002)		(0.000001)
Dprr		0.272**		0.263**
		(0.005)		(0.004)
Landr		-0.028**		-0.038**
		(0.010)		(0.007)
Car		-0.384**		-0.411**
		(0.008)		(0.006)
Intr		0.363**		0.304**
		(0.020)		(0.014)
Arr		-0.087**		-0.098**
		(0.006)		(0.005)
Constant		26.654**		14.353
		(2.294)		(1.362)
Year Dummies	No	Yes	No	Yes
Obs.	83,936	83,936	83,936	83,936
R-squared	0.09	0.14	0.09	0.20

*and ** indicate significance levels at 5 percent and 1 percent. Standard errors in parenthesis.

Note: The final panel includes 10,492 nonfinancial companies that filed tax returns under the same EIN and were selected by the SOI sampling process every tax year from 1993 to 2000 and their total assets did not increase by more than 10 times from one period to the next and did not file final returns in Tax Year 2000. Following G&L, I stopped adding powers to the polynomial when the next higher power was statistically insignificant.

Still not satisfied with the goodness of fit of the liner model, I estimated a log-linear model,[21] and the OLS regression results are shown in the two last columns of Table 4. The adjusted R-squared of the log-linear regression was higher than the linear model, while the sum of square errors was lower, suggesting a better fit. In particular, the adjusted R-squared was now 0.2 percent, considerably higher than the ones reported by similar firm-level studies. The tax coefficient was again negative, and the asset composition variables had the expected signs.

I next took advantage of the panel aspects of my dataset by using fixed effects.[22] Fixed effects allow us to isolate the unobserved firm-specific effects and get a better measure of the true effects of taxation on the financial policy of firms. By unobserved firm-specific effects, I refer to all those firm-unique characteristics that do not change from year to year and help shape the firm's financial policy and capital structure. As shown in Table 5, the relationship between the tax incentive and debt-to-asset ratios is again negative. The tax coefficient when total debt is the dependent variable was –0.115, while the coefficients of the asset composition variables have the expected signs and, except for the ratio of land-to-assets, were statistically significant. The tax coefficient was negative even when I divided debt into short-term and long-term, –0.057 and –0.065, respectively. The overall R-squared of the total, short, and long-term debt regressions were 0.14 percent, 0.016 percent, and .2 percent, respectively.

To test whether the tax coefficients are driven by the presence in my sample of a significant number of firms with no taxable income, I regressed the first equation using two subsets of the final panel. In the first, the sample was limited to 8,900 firms that had a positive marginal tax rate for at least 1 year. Here again, the fixed effects tax coefficient was negative and significant. Next, the sample is further restricted to the 3,100 companies that had a positive marginal tax rate every year; the coefficient remained negative and significant. Both datasets produced the expected signs for all control variables,

Table 5

Fixed Effects Regression Results

	Log(tdr)	Log(sdr)	Log(ldr)
Variables			
Log(dmr)	-0.115**	-0.057**	-0.065**
	(0.004)	(0.003)	(0.003)
Log(rassts)	-2.432**	-2.202**	-0.503**
	(0.526)	(0.409)	(0.474)
Log(rassts)^2	0.285**	0.242**	0.073**
	(0.067)	(0.052)	(0.060)
Log(rassts)^3	-0.016**	-0.013**	-0.005*
	(0.004)	(0.003)	(0.004)
Log(rassts)^4	0.0005**	0.0003**	0.0002*
	(0.0002)	(0.0001)	(0.0002)
Log(rassts)^5	-0.00001**	-0.00001**	-0.000003*
	(0.000003)	(0.000002)	(0.000002)
Log(dprr)	0.267**	0.034**	0.251**
	(0.007)	(0.005)	(0.006)
Log(landr)	0.145**	-0.005	0.154**
	(0.013)	(0.011)	(0.012)
Log(car)	-0.108**	-0.076**	-0.038**
	(0.006)	(0.005)	(0.005)
Log(intr)	0.310**	-0.018**	0.344**
	(0.015)	(0.012)	(0.014)
Log(arr)	-0.058**	-0.021**	-0.040**
	(0.007)	(0.005)	(0.005)
Constant	8.148**	7.850**	1.249
	(1.621)	(1.260)	(1.461)
Year Dummies	Yes	Yes	Yes
Obs.	83,936	83,936	83,936
R-squared	0.14	0.014	0.20

*and ** indicate significance levels at 5 percent and 1 percent.
Standard errors in parenthesis.
Note: The final panel includes 10,492 nonfinancial companies that filed tax returns under the same EIN and were selected by the SOI sampling process every tax year from 1993 to 2000 and their total assets did not increase by more than 10 times from one period to the next and did not file final returns in Tax Year 2000.
Following G&L, I stopped adding powers to the polynomial when the next higher power was statistically insignificant.

and the same or higher overall R-squared as the final panel did.[23]

To test whether the negative tax coefficient related to the companies with extreme observations, I excluded from my sample firms that had total debt greater than 80 percent of total assets or firms that had any single asset equal to or greater than total assets. After these restrictions, my sample was reduced down to about 9,000 records. The tax coefficient was again negative and significant, with the rest of the control variables having the expected signs. Excluding those extreme observations reduced significantly the unobserved firm-specific error and raised the overall R-squared to 0.2 percent.

Since the negative relationship between taxes and capital structure seemed to be independent of the dependent variable and the sample, I turned my attention to the possibility of endogeneity bias between the dependent variable and the main regressor.[24]To correct the possible bias, I constructed an exogenous instrument. The instrument is the average tax rate faced by all firms in each time period if the interest deduction is added back to taxable income but the instrumental variable tax coefficient is again negative.

Since the instrument does not seem to correct the bias, I followed the example of Graham, Lemmon, and Schallheim and generated a second marginal tax rate proxy (**mrtint**) using taxable income before the interest deduction as a measure of the profits. I proceeded to estimate the log-linear models using fixed effects. Table 6 reports the results of these regressions. The fixed effects tax coefficients of all three regressions are positive and significant at the 1-percent level. The tax coefficient, for the total debt regression, was equal to 0.06. So, after using a modified measure of revenue, one that includes the interest deduction, I found a significant distortion on the corporate financial policy caused by taxation. I estimated that firms in the 39-percent tax bracket are

Table 6

Fixed Effects Regression Results

	Log(tdr)	Log(sdr)	Log(ldr)
Variables			
Log(dmrtint)	0.058**	0.014**	0.049**
	(0.006)	(0.004)	(0.005)
Log(rassts)	-1.831**	-1.974**	-0.344*
	(0.530)	(0.410)	(0.116)
Log(rassts)2	0.213**	0.215**	-0.032*
	(0.067)	(0.052)	(0.011)
Log(rassts)3	-0.012**	-0.011**	0.001*
	(0.004)	(0.003)	(0.0004)
Log(rassts)4	0.0003**	0.0003**	-0.00002*
	(0.0001)	(0.00009)	(0.000007)
Log(rassts)5	-0.000003	-0.000003	-
	(0.000002)	(0.000002)	
Log(dprr)	0.274**	0.038**	0.256**
	(0.007)	(0.005)	(0.006)
Log(landr)	0.156**	0.010*	0.160**
	(0.014)	(0.011)	(0.013)
Log(car)	-0.130**	-0.086**	-0.051**
	(0.006)	(0.005)	(0.005)
Log(intr)	0.320**	-0.013**	0.350**
	(0.016)	(0.012)	(0.014)
Log(arr)	-0.069**	-0.027**	-0.047**
	(0.007)	(0.005)	(0.006)
Constant	6.269**	7.139**	-0.043
	(1.633)	(1.265)	(1.467)
Year Dummies	Yes	Yes	Yes
Obs.	83,936	83,936	83,936
R-squared	0.13	0.01	0.20

*and ** indicate significance levels at 5 percent and 1 percent.
Standard errors in parenthesis.
Note: The final panel includes 10,492 nonfinancial companies that filed tax returns under the same EIN and were selected by the SOI sampling process every tax year from 1993 to 2000 and their total assets did not increase by more than 10 times from one period to the next and did not file final returns in Tax Year 2000.
Following G&L, I stopped adding powers to the polynomial when the next higher power was statistically insignificant.

forecasted to finance 1.5 percent more of their assets with debt than firms in the 15-percent tax bracket. Firms in the top tax bracket, large firms, are forecasted to finance 1.2 percent more of their assets with debt than small firms. The coefficients of the asset composition variables have the expected signs and are significant at the 1-percent level.

Dividing debt into short-term and long-term also produces very interesting results. The tax coefficient of the long-term debt regression is greater than the tax coefficient of the short-term regression, 0.049 compared to 0.013. These coefficients are drastically different from the aggregate data coefficients presented in Table 2. The coefficients of the asset composition variables for both the short-term and long-term regressions have the expected signs and are statistically significant, except for the land and intangible assets coefficients of the short-term regression that are statistically insignificant.[25] Firms with higher depreciable assets have higher long-term debt-to-assets ratios compared to their short-term debt ratios. Firms with higher ratios of cash-to-assets have higher short-term debt-to-assets ratios compared to their long-term debt ratios.

To get a better understanding of the effects of taxation on the financial policy of firms of different size, I divide my sample into small, intermediate, and large firms.[26] Small firms have lower debt-to-asset ratios than the rest of the firms, 26 percent of total assets compared to 31 percent for intermediate and large firms. The majority of that debt for all three categories is long-term debt, but, for small firms, long-term debt is a lower percentage of total debt. Large firms have the highest combined ratio of depreciable and intangible assets, with intermediate firms being a close second. The amount of cash firms hold is inversely related to their sizes. Firms in the lowest asset class hold more than one fifth of their assets in cash, while firms in the highest asset class hold only about 6 percent of their assets in cash. The progressiveness of the tax system is evident in both marginal tax rate proxies. The average marginal tax rates, for both proxies, increase as the asset classes rise. An additional dollar of taxable income increases the tax liability of large firms by more than 7 cents, 22.7 percent, whereas an additional dollar of taxable income increases that of small firms by 15.8 percent. The interest paid deduction has the highest impact on the tax liability of the larger firms. If interest paid was not tax-deductible, then the 7 cents of additional tax liability for large firms would have been 10 cents. These findings are not surprising, since large firms hold more debt, but they give us a measure of the importance of the interest deduction as a tax shield.

The fixed effects regression results of the log-linear model for separate asset-sized classes are reported in Table 7. The dependent variable for the fixed effects regression is the marginal tax rate based on taxable income before the interest deduction (**mrtint**).[27] The estimated tax coefficients are: 0.057 for small firms, 0.055 for intermediate firms, and 0.085 for large firms. So, I found evidence of a positive relationship between taxation and corporate debt for all three types of firms. Contrary to the G&L findings, taxes had the largest effect on the use of debt for the largest firms, and the tax effect for intermediate firms is comparable to the tax effect for small firms. The coefficients of the majority of the control variables had the anticipated sign and were statistically significant.

Table 7

Fixed Effects Regression Results

	$1 under $10,000,000	**$10,000,000 under $100,000,000**	**$100,000,000 or more**
	Log(tdr)	**Log(tdr)**	**Log(tdr)**
Variables			
Log(drtint)	0.057**	0.055**	0.085**
	(0.007)	(0.014)	(0.036)
Log(rassts)	-0.422**	-2.807**	-0.826**
	(0.101)	(0.514)	(0.159)
Log(rassts)^2	0.029**	0.158**	0.042**
	(0.007)	(0.031)	(0.009)
Log(rassts)^3	-0.0006**	-0.003**	-0.0007**
	(0.0002)	(0.0006)	(0.0001)
Log(dprr)	0.292**	0.268**	0.144**
	(0.008)	(0.013)	(0.021)
Log(landr)	0.156**	0.192**	0.118**
	(0.016)	(0.031)	(0.058)
Log(car)	-0.134**	-0.108**	-0.190**
	(0.007)	(0.012)	(0.022)
Log(intr)	0.378**	0.307**	0.232**
	(0.024)	(0.026)	(0.027)
Log(arr)	-0.095**	0.037**	-0.050**
	(0.008)	(0.014)	(0.021)
Constant	2.113	16.564**	-5.479**
	(0.444)	(2.883)	(1.008)
Obs.	54,024	21,360	8,552
R-squared	0.17	0.09	0.10

*and ** indicate significance levels at 5 percent and 1 percent. Standard errors in parenthesis.

Note: Following G&L, I stopped adding powers to the polynomial when the next higher power was statistically insignificant.

Next, I divided debt into short-term and long-term, and I re-estimated the model. All tax coefficients were positive and statistically significant. The effect of taxation on the long-term debt of small firms was large when the effect on short-term debt was very small. The opposite was true for large firms, where the effect of taxation on short-term debt was approximately two times the effect on long-term debt. Finally, the effects of taxation on short-term and long-term debt for intermediate firms were approximately the same. I believe that these finding can be supported by intuition. Although small firms have relatively less long-term debt than intermediate and large firms, this debt doubles as debt tax shield. Large firms have more mature capital structures; they follow debt target level for their long-term borrowing and use short-term borrowing to create tax shields as needed. Summarizing my findings, I found evidence of a positive relationship between corporate taxation and the total debt ratios of small, intermediate, and large firms.

▶ Conclusion

Past empirical research on the effects of taxation on corporate financial policy has been limited, due to lack of data, to large publicly-traded firms or small closely-held partnerships. The more recent studies of the capital structure literature find a positive relationship between taxation and the debt levels of those firms. The only work that looks at the entire corporate population is a study by Gordon and Lee. They utilized an aggregate time-series dataset from 1950 to 1995 to find evidence that taxation increases the use of debt. In this study, I used the SOI aggregate and microdata files to research the effects of taxation on the corporate financial policy from Tax Years 1993 to 2000.

When using the aggregate dataset, my findings suggest that taxation in the 1990's still affected the financial policy of firms but to a somewhat lesser extent. I found that large firms in the 1990's finance 1.4 percent more of their assets with debt relative to the smaller firms. That it is a significant decrease compared to the 9.2 percent estimated by G&L. I believe that this decrease is in its entirety due to the lower tax rates faced by all firms and by the reduction in the gap between the tax rates faced by small versus large firms.

When using a firm-level dataset, and after isolating the unobserved firm-specific effects and using a modified measure of revenue, my findings suggest that there is a positive relationship between taxation and the use of corporate debt. Contrary to the G&L findings, taxes have the largest effect on the use of debt for the largest firms and a positive effect on the use of debt for intermediate firms.

Appendix

Definitions of Variables and Expected Signs

Dependent Variables

Tdr Ratio of total debt to total assets. Measures total debt as a percentage of total assets. Total debt is equal to the sum of mortgages, notes, bonds payable (Form 1120, page 4 balance sheet, lines 17 and 20).

Sdr Ratio of short-term to total assets. Measures short-term debt as a percentage of total assets. Short- term debt is equal to the sum of mortgages, notes, bonds payable in less than 1 year (Form 1120, page 4 balance sheet, line 17).

Ldr Ratio of long-term to total assets. Measures long-term debt as a percentage of total assets. Long-term debt is equal to the sum of mortgages, notes, bonds payable in 1 year or more (Form 1120, page 4 balance sheet, line 20).

Tax Variables

Dmr Equal to mrt minus ifmr. Measures the tax incentive the firm has to use debt. (+)

Mrt Proxy for marginal rate using taxable income. The rate is set equal to the marginal statutory rate that applies to the highest dollar of taxable income (Form 1120, page 1, line 30). The rate is set to zero when taxable income is zero. (+)

Dmrtint Equal to mrtint minus ifmr. Measures the tax incentive the firm has to use debt. (+)

Mrtint Proxy for marginal rate using taxable income before the interest deduction. The rate is set equal to the marginal statutory rate that applies to the highest dollar of taxable income before interest deduction (Form 1120, page 1, lines 30 and 18). The rate is set to zero when taxable income before interest deduction is zero. (+)

Ifmr Proxy for yearly individual tax rate on interest income multiplied by the fraction of household assets held outside of pensions and life insurance. The yearly rate is the weighted average marginal tax rate reported in the SOI individual returns publication. (-)

Control Variables

Rassts Total assts (Form 1120, page 4 balance sheet, line 15d) deflated by CPI. Real total assets.

Dprr Ratio of net depreciable assets to total assets. Net depreciable assets are equal to buildings and other depreciable assets less accumulated depreciation (Form 1120, page 4 balance sheet, lines 10 a (c) and b (c)). (+)

Landr Ratio of land to total assets. Land is equal to land net of any amortization (Form 1120, page 4 balance sheet, line 12). (+)

Car Ratio of cash to total assets (Form 1120, page 4 balance sheet, line 1(d)). (-)

Arr Ratio of trade notes and accounts receivable to total assets. Trade notes and accounts receivable are equal to trade notes and accounts receivable less allowance for bad debts (Form 1120, page 4 balance sheet, lines 2 a (c) and b (c)). (-)

Intr Ratio of intangible assets to total assets. Intangible assets are equal to intangible assets (amortizable only) less accumulated amortization (Form 1120, page 4 balance sheet, lines 13 a (c) and b (c)). (+)

Yearly Variables

Ydmr Yearly average of dmr.

Imr Proxy personal marginal tax rate.

Tb Three-year Treasury Bill rate. Proxy for nominal interest rate.

Dj Average Dow Jones index deflated by GDP. Proxy for the business cycle.

▶ Endnotes

1 Source: Congressional Budget Office Web site; Table 3 Revenues by Major Source, 1962-2003.

2 Beginning in 2003, the maximum tax rates on qualified dividends have been lowered to 15 percent from 39.6 percent. For sales and other dispositions of property after May 5, 2003, the maximum tax rates on net capital gains have been lowered to 15 percent from 20 percent.

3 Although the ratios fluctuate from year to year, firms relay primarily on internal generated cash (retained earning plus depreciation) to finance new investments. Industry averages show that the ratio can range from 40 percent to 85 percent (Brealey and Myers, 2000).

4 The most widely used nondebt tax shields in Tax Year 2000 were: depreciation, compensation of officers, employee benefit programs, advertising, and contributions to pensions and profit-sharing plans.

5 In a later paper (1996), he adds two more acceptable marginal tax rate proxies, a trichotomous variable and the statutory marginal tax rate.

6 The top corporate tax rate for that time period ranged from a high of 52 percent, from 1952 to 1963, to a low of 34 percent, from 1988 to 1992.

7 The data are aggregated based on the end-of-year total assets reported in the balance sheet by each firm. For the studies used by Gordon and Lee, the number of asset classes ranged between ten and fourteen. For my dataset, there are eleven asset classes. The breakdown of the asset classes is: (1 under 0.1m), (0.1m under 0.25m), (0.25m under 0.5m), (0.5m under 1m), (1m under 5m), (5m under 10m), (10m under 25m), (25m under 50m), (50m under 100m), (100m under 250m), (250m or more), and (zero assets). The last asset class groups returns that had no ending assets, and was not used in my analysis.

8 The term domestic corporation refers to companies incorporated in the United States but does not necessarily imply that all their activities are domestic. For foreign corporations engaged in trade or business in the United States, only income that was considered effectively connected with the conduct of a trade or business in the United States was included in the statistics.

9 The Business Cycle Dating Committee of the National Bureau of Economic Research, November 26, 2001, reports that the longest expansion in the NBER chronology reached its peak in March of 2001.

10 Tax receipts are total income tax after credits reported on Table 1 of the Corporate Income Tax Returns Publication..

11 The sample selection process is set up in such a manner that any firms selected into the sample in a given year will be selected again the next year, providing that the firm files a return using the same employer identification number (EIN) in the two years and that it falls into a stratum with the same or higher sampling rate. Note that a firm will usually change its EIN when it merges with another firm. For more detailed explanation of the sampling process, see Section 3 of the Corporate Income Tax Returns Publication.

12 Such firms have unusually large amounts of debt and no taxable income.

13 Financial reporting usually follows the generally accepted accounting principles (GAAP) rules issued by the Financial Accounting Standards Board (FASB).

14 The use of book data is an issue for all prior literature, Auerbach and Poterba (1987) review pre TRA86 data and they report that the differences between the tax and book amounts reported by firms can be significant.

15 The intangible assets number maybe inflated by the Internet bubble.

16 My findings are in line with the historical marginal tax rates reported at the Tax Policy Center's Web site.

17 Proxy for yearly individual tax rate multiplied by the fraction of household assets held outside of pensions and life insurance. The yearly rate is the weighted average marginal tax rate reported in the SOI individual returns publication.

18 I set the tax incentive as the simple difference between the corporate marginal tax rate and the individual tax rate on interest income. Other literature is investigating the tradeoff and how the individual tax rate differences (dividends versus interest versus capital gain rates) are affecting capital structure, but this issue is beyond the scope of this paper.

19 The total debt is the sum of mortgages, notes bonds payable in less than 1 year and mortgages, notes bonds payable in 1 year or more.

20 This is the only variable deflated using the Consumer Price Index (CPI); the rest of variables are in current dollars.

21 To estimate the model, following the work of Gentry (1994), I transformed all dependent, tax, and control variables by adding one to all observations. I did so because those variables have observations that are equal to zero. I also tried another model with the log of the total debt ratio as the dependent variable, but the log-liner model consistently produced the highest adjusted R-squared.

22 Originally, I thought that, due to the large number of observations in our panel, random effects may be the better choice than fixed effects, but the Hausman test rejected the random coefficients as inconsistent.

23 Because for these regressions I dropped observations based on the magnitude of the dependent variable, these results may be spuriously induced.

24 I also allowed for the possibility of dynamics of adjustment of the debt-over-asset ratio by including in the right-hand side of the empirical model a one-period lag of the ratios and estimating the model using the method of Arellano and Bond. The one-period lag coefficient was both positive and significant with the tax incentive still having a negative effect, but I found that the instrument variables, dmr and dprr, were correlated to some set of residuals and are not acceptable, and the model failed the Sargan test of overidentifying restrictions.

25 The time dummy coefficients for these regressions were statistically insignificant; so, I did not estimate the second equation.

26 I decided against using the thirteen SOI asset classes because their breakouts were too detailed. My breakouts, based on yearend total assets are: small firms, less than $10,000,000; intermediate firms, $10,000,000 less than $100,000,000; and large firms, $100,000,000 or more.

27 In order to retain the panel aspects of my datasets and because firms over the eight years time-series moved in and out of asset classes I assigned to all eight observation of each firm the same asset class based on the firms' 1996 year-end total assets.

▶ References

Ayers, Benjamin C.; Cloyd, C. Bryan; and Robinson, John R. (2001), "The Influence of Income Taxes on the Use of Inside and Outside Debt By Small Businesses," National Tax Journal, Volume 54, Number 1, pp. 27-55.

Auerbach, A. (1985), "Real Determinants of Corporate Leverage," in Corporate Capital Structures in the United States, edited by B. Friedman, University of Chicago Press, Chicago, pp. 125-143.

Auerbach, A. and Poterba, J. (1987), "Tax Loss Carryforwards and Corporate Tax Incentives," in The Effects of Taxation on Capital Accumulation, edited by Martin S. Feldstein, University of Chicago Press, Chicago, pp. 305-337.

Bradley, M.; Jarrell, G.; and Kim, E. (1984), "On the Existence of an Optimal Capital Structure: Theory and Evidence," Journal of Finance, Volume 39, pp. 857-878.

Brealey, Richard A. and Myers, Stewart C. (2000), "Principles of Corporate Finance, Sixth Edition," McGraw-Hill Irwin.

Carroll, Robert; Hassett, Kevin; Mackie III, James B., "The Effect of Dividend Tax Relief on Investment Incentives," National Tax Journal, Volume 56, Number 3, pp. 629-651.

Cloyd, C. Bryan; Limberg, Steven T.; Robinson, John R. (1997), The Impact of Federal Taxes on the Debt-Equity Structure of Closely-Held Corporations, National Tax Journal, Volume 50, Number 2, pp. 261-277.

DeAngelo, Harry and Masulis, Ronald W. (1980), "Optimal Capital Structure Under Corporate and Personal Taxation," Journal of Financial Economics, Volume 8, Number 1, pp. 3-29.

Feldstein, M. (1995), "The Effect of Marginal Tax Rates on Taxable Income: A Panel Study of the 1986 Tax Reform Act," The Journal of Political Economy, Volume 103, Number 3, pp. 551-572.

Gaver, Jennifer J. and Gaver, Kenneth M. (1993), "Additional Evidence on the Association between the Investment Opportunity Set and Corporate Financing, Dividend, and Compensation Policies," Journal of Accounting and Economics, Volume 16, Number 1/2/3, pp. 125-160.

Gentry, William M. (1994), "Taxes, Financial Decisions and Organizational Form," Journal of Public Economics, Volume 53, Number 2, pp. 223-244.

Gordon, Roger H., and Young Lee (2001), "Do Taxes Affect Corporate Debt Policy? Evidence from U.S. Corporate Tax Return Data," Journal of Public Economics, Volume 82, pp. 195-224.

Graham, John R. (1996), "Debt and the Marginal Tax Rate," Journal of Financial Economics, Volume 41, Number 1, pp. 41-73.

Graham, John R. (1996), "Proxies for the Corporate Marginal Tax Rate," Journal of Financial Economics, Volume 42, Number 1, pp. 187-221.

Graham, John R. (1998), "Do Personal Taxes affect Corporate Financing Decisions?"

Graham, John R. (2000), "How Big are the Tax Benefits of Debt," Journal of Financial Economics, Volume 55, Number 5, pp. 1901-1941.

Graham, John R.; Lemmon, Michael L.; Schallheim, James S. (1998), "Debt, Leases, Taxes, and the Endogeneity of Corporate Tax Status," The Journal of Finance, Volume 53, Number 1, pp. 131-162.

Gravelle, Jane and Kotlikoff, L. (1989), "The Incidence and Efficiency Costs of Corporate Taxation When Corporate and Noncorporate Firms Produce the Same Good," The Journal of Political Economy, Volume 97, Number 4, pp. 749-780.

Gravelle, Jane (1995), "The Corporate Income Tax: Economic Issues and Policy Options," The National Tax Journal, Volume 48, Number 2, pp. 267-277.

Gropp, Reint E. (1997), "The Effect of Expected Effective Corporate Tax Rates on Incremental Financing Decisions," International Monetary Fund Staff Paper, Volume 44, Number 4, pp. 485-509.

Hadi, Ali S. (1992), "Identifying Multiple Outliers in Multivariate Data," Journal of the Royal Statistical Society. Series B (Methological), Volume 54, Number 3, pp. 761-771.

Hinkins, Susan; Jones, Homer; and Scheuren, Fritz (1988), "Design Modifications for the SOI Corporate Sample: Balancing Multiple Objectives," 1988 Proceedings of the Survey Research Methods Section, American Statistical Association.

Internal Revenue Service, Statistics of Income, Corporate Source Book, Washington DC, various issues.

Internal Revenue Service, Statistics of Income, Corporation Income Tax Returns, Washington DC, various issues.

Internal Revenue Service, Statistics of Income, Individual Income Tax Returns, Washington DC, various issues.

MacKie-Mason, Jeffrey K. (1990), "Do Taxes Affect Corporate Financing Decisions?," The Journal of Finance, Volume 45, Number 5, pp. 1471-1493.

MacKie-Mason, Jeffrey K. and Gordon, Roger H. (1997), "How Much do Taxes Discourage Incorporation," The Journal of Finance, Volume 52, Number 2, pp. 477-505.

Miller, Merton H. (1977), "Debt and Taxes,'' Journal of Finance, Volume 32, pp. 261-275.

Mills, Lillian F.; Newberry, Kaye J.; Trautman, William B. (2002), "Trends in Book-Tax Income and Balance Sheet Differences," Tax Notes, August 19, pp. 1109-1124.

Mills, Lillian F. and Newberry, Kaye J. (2004), "Firms' Off-Balance Sheet Financing: Evidence from Their Book-Tax Reporting Differences," working paper.

Modigliani, Franco and Miller, Merton H. (1963), "Corporate Income Taxes and the Cost of Capital: A Correction," American Economic Review, Volume 53, Number 3, pp. 433-443.

Newberry, Kaye J. (1998), "Foreign Tax Credit Limitations and Capital Structure Decisions," Journal of Accounting Research Volume 36, Number 1, pp. 157-166.

Omer, Thomas C. and Terrando, William (1999), "The Effect of Risk and Tax Differences on Corporate and Limited Partnership Capital Structure," National Tax Journal, Volume 52, Number 4, pp. 699-715.

Plesko, George A. (2002), "Reconciling Corporate Book and Tax Net Income, Tax Years 1996-1998," *SOI Bulletin* (Spring 2002), pp.1-16.

Plesko, George A. (2004), "Reconciling Corporate Book and Tax Net Income, Tax Years 1995-2001," Data Release

Rosen, Harvey S. (2002), "Public Finance, Sixth Edition," McGraw-Hill Irwin.

Scholes, Myron S. and Wolfson, Mark A. (1992), "Taxes and Business Strategy," Prentice-Hall, Englewood Cliffs, NJ.

Scholes, Myron S.; Wolfson, Mark A.; Erickson, Merle; Maydew, Edward L.; and Shevlin, Terry (2005), "Taxes and Business Strategy, A Planning Approach," Prentice-Hall, Upper Saddle River, NJ.