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The Impact of Federal Taxes on the Use of Debt by Closely-Held Corporations

November 1995

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C. Bryan Cloyd, Stephen T. Limberg, and John R. Robinson are Professors in the Department of Accounting at the College of Business Administration at the University of Texas at Austin.

The Tax Foundation would like to congratulate Professors Cloyd, Limberg, and Robinson for having been selected as Ernst & Young Visiting Professors for 1994.

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Preface: Purpose and Goals of the Study

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Introduction

Understanding the determinants of capital structure is a fundamental issue in tax policy and the subject of this study. It is often asserted that income taxes encourage firms to use debt in their capital structures because interest expense is tax deductible, thereby creating a tax subsidy on interest expense that is positively related to the tax rate. However, because firms' total deductible expenses are limited to income, the value of debt tax shields may be affected by the level of other nondebt expenditures that are also deductible (i.e., nondebt tax shields). Moreover, the decision to borrow involves making a tradeoff between the expected tax savings associated with debt and the economic costs associated with increased debt (e.g., greater risk of bankruptcy). Thus, the use of debt may be positively related to tax rates only after controlling for nondebt tax shields, as well as nontax determinants of debt utilization.

This study investigates the impact of federal income taxes on debt utilization by analyzing a sample of closely-held corporations after the Tax Reform Act of 1986 (hereafter, TRA86). The sample derives from a unique survey of small, closely-held firms. This contrasts with previous research which has examined the use of debt tax shields with samples of large, publicly-held corporations (e.g., Dhaliwal, Trezevant, and Wang 1992). The results of prior research, however, may not generalize to privately-held companies for several reasons. First, potential bankruptcy costs, as a percentage of firm value, may loom much larger in small firms than in large firms. Hence, smaller firms may have less propensity to use debt despite the apparent tax benefits. Second, unlike large, publicly-held corporations, many small corporations face a substantial probability of never becoming profitable and may face expected marginal tax rates that are near zero. Third, closely-held firms are likely to be more sensitive to the tax consequences of business decisions, and less sensitive to market-driven nontax considerations, than publicly-held corporations (Cloyd, Pratt, and Stock 1995). As a result, closely-held businesses may be more likely to arrange their capital structures to minimize the corporate income tax. Finally, if closely-held corporations do not have equal access to organized capital markets, they may be precluded from achieving the optimal amount of debt in their capital structures.

We test whether the use of debt by closely-held corporations, as reflected by the amount of interest expense incurred, varies with firms' marginal income tax rates and the level of nondebt tax shields. All else equal, firms with higher marginal tax rates are expected to make greater use of debt than firms with lower marginal tax rates. Because corporations with high levels of nondebt tax shields might receive reduced benefits from interest deductions, firms may substitute nondebt tax shields for debt tax shields. Mackie-Mason (1990) notes that this substitution effect will be strongest for firms that face a substantial probability of losing the tax benefits of their nondebt tax shields as a result of increasing their interest deductions. We test this *tax exhaustion hypothesis* by examining whether the extent to which firms substitute debt tax shields for nondebt tax shields depends upon their marginal income tax rates.

Prior studies of debt utilization employ dichotomous measures of marginal tax rates based on either average tax rates (computed with financial accounting numbers) or the existence of tax loss (or tax credit) carryforwards. Unlike prior research, we construct a continuous measure of marginal income tax rates

by applying the appropriate tax rate schedule to each firm's taxable income before interest deductions. To accomplish this, we divide our sample of closely-held corporations into two subsamples: taxable corporations (C corporations) and electing Subchapter S corporations (S corporations). For each subsample and for the combined sample, we regress the ratio of interest expense to gross margin on variables representing the theorized tax-related and nontax determinants of debt utilization.

The regression results provide evidence of a significant, positive relation between marginal tax rates and debt utilization. Moreover, consistent with the tax exhaustion hypothesis, our data indicate that the extent to which firms substitute nondebt tax shields for debt tax shields depends significantly on their marginal tax rates. That is, in our sample of closely-held corporations, higher tax rate firms exhibited a significantly greater substitution effect than lower tax rate firms. It should be noted that the direction of this interaction is opposite that reported in prior research (i.e., Dhaliwal *et al.* 1992). We attribute this result to fundamental differences between our sample of small, closely-held corporations and the large, publicly-held firms examined in prior studies.

The remainder of this study is organized into four sections. The first section reviews prior research and describes the hypotheses. The next section describes the research design and is followed by a section that presents the empirical results. The final section summarizes the research and presents concluding comments.

Background and Theory

Modigliani and Miller (1963) initially suggested that the deductibility of interest expense could give rise to a valuable debt tax shield that could affect firms' choices between debt and equity financing. This hypothesis fostered a substantial empirical literature on the effect of taxes on firms' capital structures (Marsh 1982; Bradley, Jarrell, and Kim 1984; Long and Malitz 1985; Ang and Peterson 1986; Fischer, Heinkel, and Zechner 1989; Titman and Wessels 1988). However, these cross-sectional studies generated very little empirical evidence of the effect of taxes on firms' financing decisions.

Scholes and Wolfson (1992) suggest that the lack of evidence that taxes affect firms' financing decisions may be due to weak research designs. They argue that the effect of interest deductions on capital structure is merely a small part of a more complex problem, the optimal design of organizations. They suggest that there are many ways to shield income from taxes and that industry-specific rules or other frictions result in firms choosing different methods to maximize firm value. This conjecture is supported by studies that examine specific financing decisions, such as new issuances of debt or equity. For example, MacKie-Mason (1990) investigates the decision to issue debt or equity by manufacturing firms, while Trezevant (1992, 1994) examines incremental financing decisions surrounding the enactment of tax legislation. Miller, Morris, and Scanlon (1994) also find evidence supporting a link between tax status and financing decisions with a sample of firms that make an initial public offering. Scholes, Wilson, and Wolfson (1990) derive their evidence from a relatively homogeneous sample of firms in the commercial banking industry.

Rather than focus on the tradeoff

between debt and equity, the present study examines a more fundamental question: the extent to which tax rates influence the level of firms' interest expense. In addition, we examine the extent to which closely-held corporations substitute nondebt tax shields for the debt tax shield created by the interest deduction. We extend the work of Dhaliwal *et al.* (1992) which investigates this substitution effect using a sample of large, public corporations. The results of this study represent an important step toward understanding the more complex question of how tax incentives affect the mix of debt and equity in a firm's capital structure.

1. The Tax Hypothesis

The value of the debt tax shield (e) is the effective tax subsidy on interest expense to the corporation's owners. As shown in equation (1), e is directly related to the corporate and shareholder tax rates and the timing of the shareholder level tax.

$$e = t_c + (1 - t_c)[dt_s + (1 - d)\, g a t_s] \quad (1)$$

where,

t_c = corporate tax rate,

d = fraction of corporate after-tax income currently distributed to shareholders as dividends,

g = fraction of capital gains subject to tax at rate t

a = present value operator capturing the benefits of deferring the shareholder's tax on capital gains until the shares are sold, and

t_s = shareholder's tax rate on ordinary income.

The effective tax subsidy on interest expense in equation (1) is positively related to the tax rate applied to the corporation's income. In the case of C corporations, the applicable tax rate is t_c plus some fraction of t_s, depending on the corporations' dividend policies. Under a Subchapter S election, the income of the corporation is not subject to the corporate tax, but is taxed directly to the shareholders (whether it is distributed or not). In the case of S corporations, therefore, the applicable tax rate is t_s regardless of dividend policies. Our tax hypothesis is that debt utilization will be positively related to the effective tax subsidy on interest expense.[1]

It should be noted that TRA86 changed the values of several of the parameters in equation (1). Both t_c and t_s were decreased, and g was made equal to one by repeal of the preferential treatment of long-term capital gains. Our sample was taken during the TRA86 transition period, which has both positive and negative implications for this study. On the positive side, our sample reflects a broader distribution of tax rates than would likely exist during a period in which tax rates are not changing. On the negative side, firms may not have fully adjusted their debt utilization to their new tax rates. An incomplete adjustment implies that our results may reflect a downward bias in the estimated relation between taxes and debt utilization.

2. The Tax Exhaustion Hypothesis

Although the deductibility of interest may create a tax shield, other deductible expenses and tax credits generate tax benefits that can substitute for debt tax shields (DeAngelo and Masulis 1980). For example, the purchase of depreciable assets generates depreciation deductions and, prior to TRA86, investment tax credits. The existence of nondebt tax shields provides an alternative (and perhaps less costly) means of reducing income taxes and may serve to mitigate the benefit of debt tax shields. As discussed above, the effective tax subsidy on interest expense is directly and positively related to tax rates. The extent to which nondebt tax shields

mitigate the benefit of debt tax shields, therefore, depends upon the marginal impact of additional nondebt tax shields on these tax rates (MacKie-Mason 1990). This concept can be made more concrete by considering three mutually exclusive types of firms which we describe as tax exhausted, tax sensitive, and tax insatiable.

Tax exhausted firms are those with so little taxable income that they face very low expected marginal tax rates even without using debt tax shields (MacKie-Mason 1990). For these firms, the effective tax subsidy on interest expense is very small and may approach zero. The use of debt by tax exhausted firms is likely to be motivated strictly by nontax factors and, consequently, will be unrelated to the level of nondebt tax shields. In contrast, *tax insatiable* firms have so much taxable income that they face very high expected marginal tax rates and have tremendous capacities to fully utilize additional tax shields of any type. For these firms, the effective tax subsidy on interest expense is large and unrelated to the level of nondebt tax shields.

In terms of the spectrum of expected marginal tax rates, *tax sensitive* firms fall between tax exhausted firms, which have very low expected marginal tax rates, and tax insatiable firms, which have very high expected marginal tax rates. Tax sensitive firms are those firms for which additional tax shields would lower expected marginal tax rates. As a result, tax sensitive firms must be careful not to create excess tax shields of either the debt or nondebt variety, lest they lose some or all of the tax benefits associated with these deductions. We hypothesize, therefore, that the effect of nondebt tax shields on the utilization of debt will depend upon firms' marginal tax rates. Furthermore, the direction of this interaction will depend upon the relative representation of the three types of firms within the sample.

Research Design

Sample Selection

Our sample is comprised of corporations from the National Survey of Small Business Finances conducted in 1988 and 1989 under the guidance of the Board of Governors of the Federal Reserve System and the Small Business Administration. This survey was a one-time inquiry of nonfinancial, nonfarm small businesses (i.e., fewer than 500 employees) in operation as of December 1987. The response rate was 70 to 80 percent, depending upon the portion of the questionnaire. Many of the financial characteristics of the businesses were checked against the data provided on tax returns (Cox, Elliehausen and Wolken 1989).

There are 3,404 firms in the sample, of which 1,875 are corporations. Of these firms, 1,748 corporations have income information for the previous 12 month fiscal year.[2] In our study, the following firms were also eliminated from the sample:

1. publicly held corporations (15 firms),
2. corporations acquired in the year of the sample (45 firms),
3. firms with missing observations for key variables (325 firms),
4. firms with extreme ratios (greater than three or less than zero) of non-interest deductions to gross profit (34 firms) and firms identified as outliers (26 firms) using the procedures developed by Belsley, Kuh, and Welsch (1980).[3]

The first criterion ensures that sample firms are closely-held corporations. The second criterion eliminates start-up firms or firms that may be undergoing changes in capital structure or tax status associated with new ownership. The capital structure of these firms may be in transition, and thus, conclusions from samples

Table 1
Distribution of Sample Firms Across Industry and Ownership

Panel A: Distribution of firms (percent) across filing status and industry[a]

SIC Industry Class	C Corporations		S Corporations		Combined	
Mining	12	(1)	2	(1)	14	(1)
Construction	109	(11)	41	(13)	150	(11)
Manufacturing	179	(18)	55	(17)	234	(18)
Utilities	45	(5)	15	(5)	60	(5)
Wholesale	147	(15)	32	(10)	179	(14)
Retail	234	(24)	86	(27)	320	(24)
Insurance	54	(5)	19	(6)	73	(6)
Services	207	(21)	66	(21)	273	(21)
Totals	987	(100)	316	(100)	1,303	(100)

Panel B: Frequency distribution of firms across filing status and ownership[b]

No. of Major Shareholders	C Corporations		S Corporations		Combined	
1	320	(32)	107	(34)	427	(33)
2	409	(42)	137	(43)	546	(42)
3 to 4	204	(21)	54	(17)	258	(20)
5 to 10	40	(4)	15	(5)	55	(4)
0	14	(1)	3	(1)	17	(1)
Totals	987	(100)	316	(100)	1,303	(100)

[a] Industry groups were defined using 2-digit SIC definitions.

[b] Major shareholders are defined as those shareholders with at least 10 percent of the voting power of the stock.

including these firms may not be generalizable. The third criterion eliminates firms with missing information. Information necessary for the calculation of non-interest deductions was missing for 275 firms, information regarding property, plant, and equipment was missing for 49 firms, and one firm was missing shareholder information necessary to estimate the firm's marginal tax rate. The fourth and final criterion eliminates firms considered to be outliers. The application of these criteria produces a sample of 1,303 firms.

Table 1 reflects the distribution of firms across industries and by number of major shareholders in Panels A and B, respectively. The relative frequencies of industry representation and ownership levels are fairly similar across the C and S corporation subsamples. Only one year of financial data is available for each firm in the sample. This data relates to the firms' most recently completed fiscal year as of the time the survey was performed. Of the 1,303 firms in the final sample, 772 (531) report financial data for a fiscal year that ended during 1987 (1988).

1. Tax Rate Proxy

An important issue in studies that attempt to establish an empirical link between taxes and debt utilization is how to estimate firms' marginal tax rates. Traditionally, studies employ a two-level marginal tax rate measure based on either the average tax rate or the existence of a tax carryforward. That is, a low tax rate firm is distinguished from a high tax rate firm on the basis of its average rate or the existence of carryovers. However, the average tax rate is typically calculated using financial accounting income which can differ considerably from taxable income. Moreover, although large corporations with tax carryovers are less likely

Table 2
Distribution of Estimated Marginal Tax Rates *(TAX)*

Panel A: Frequency distribution of *TAX* within the C corporation subsample[a]

Value of *TAX*(%)	No. of Firms	Relative Frequency (%)
0	193	19.5
15	275	27.9
15 to 18	86	8.7
30	73	7.4
34 to 36	64	6.5
36 to 38	61	6.2
38 to 40	66	6.7
40 to 42	75	7.6
42 to 51	94	9.5
Total	987	100.0

Panel B: Frequency distribution of *TAX* within the S corporation subsample[b]

Value of *TAX*(%)	No. of Firms	Relative Frequency (%)
0	59	18.7
11	21	6.6
15	107	33.9
28	45	14.2
33	7	2.2
35	21	6.7
38.5	56	17.7
Total	316	100.0

[a] For firms in the C corporation sample, *TAX* was determined by applying the appropriate corporate tax rate schedule to each firm's pre-interest taxable income. The broad range of *TAX* is due to the presence of both fiscal year and calendar year firms and to the transition in the corporate tax rate schedule due to TRA86.

[b] For firms in the S corporation sample, *TAX* was determined by applying the appropriate individual income tax rate to the share of pre-interest taxable income accruing to the largest shareholder.

to pay tax currently, their marginal tax rate may not be zero.[4]

Because our income data is based primarily upon taxable income, rather than financial income, we are able to construct a more accurate measure of the marginal tax rate (*TAX*).[5] To estimate firms' marginal tax rates, we divide the sample firms into two subsamples, C corporations and S corporations. For firms in the C corporation subsample, we estimate a continuous marginal tax rate measure by applying the appropriate corporate tax rate schedule to each firm's pre-interest taxable income.[6] An important assumption underlying the computation of *TAX* for C corporations is that the sample firms are not distributing dividends to their shareholders. For each firm in the S corporation subsample, we estimate a continuous marginal tax rate measure by applying the appropriate individual income tax rate to the share of pre-interest taxable income accruing to the largest shareholder.[7] An important assumption underlying the computation of *TAX* for S corporations is that the shareholders' tax rates are not materially affected by other items of income and expense that might be included on their individual income tax returns.

Table 2 presents the frequency distributions of *TAX* for both the C corporation subsample (panel A) and the S corporation subsample (panel B). The greater diversity of *TAX* values among C corporations is attributable to the variety of fiscal year ends and the related impact on computing corporate tax rates during the TRA86 transition period.

2. Nondebt Tax Shield Proxy

Measures of nondebt tax shields in prior studies, such as Dhaliwal *et al.* (1992), are typically based on the amount of depreciation expense reported for

financial accounting purposes, which proxies for the deductions generated by the purchase of fixed assets. Trezevant (1994) examines the substitution of specific types of deductions, such as research expenditures, surrounding the enactment of changes in the tax laws. We define nondebt tax shields (*NDTS*) as all expenses other than interest expense and cost of goods sold, primarily because more detailed information is not available for our sample firms. Specifically, *NDTS* is the sum of all non-interest operating expenses divided by gross profit. Theoretically, however, there is no reason for not using a broad definition of nondebt tax shields. Moreover, a broad definition may be particularly important when examining closely-held C corporations as these firms may create important nondebt tax shields by distributing earnings to their shareholders in ways that are deductible at the corporate level (e.g., salaries, rents, etc.).

3. Other Determinants of Debt Use

The amount of collateral is an important nontax factor that could influence the level of corporate debt and confound the examination of nondebt tax shields. Corporations with substantial collateral may be able to borrow at lower cost because the collateral serves to secure the loans. However, large amounts of collateral also suggest that the corporation may have high levels of nondebt tax shields such as depreciation. The effect of debt securability is discussed by Bradley *et al.* (1984) and Dhaliwal *et al.* (1992). We use the sum of inventory and property, plant and equipment divided by total assets (*FIX*) to represent the potential for debt securability. *FIX* may also proxy for the risk of moral hazard problems as managers of firms with more pre-committed, fixed assets have less flexibility to impose agency costs on lenders than managers of firms comprised largely of intangible assets (MacKie-Mason 1990).

Other potential determinants of debt use include profitability and liquidity. As profits and liquidity increase, firms may have less need for debt or be able to borrow at lower cost. Profitability is represented by net income before interest expense divided by total assets (*ROA*), and liquidity is represented by cash divided by total assets (*LIQ*). Larger firms may also be able to borrow at lower cost. Firm size effects are captured by the natural logarithm of net sales (*LNSALES*). Older firms may be considered less risky by lenders, which would also lower borrowing costs. Firm age (*LNAGE*) is captured by the natural log of the number of years (plus one) since the founding of the firm.

Conclusion

The analysis indicates that both C and S corporations incur more interest expense as their tax rates increase, supporting the general hypothesis that taxpayers will take on more debt as the value of the tax shield rises. The results also support the tax exhaustion hypothesis that the extent to which firms substitute nondebt tax shields for debt tax shields depends upon their marginal tax rates. Specifically, the analysis indicates that small, closely-held corporations with high tax rates substitute nondebt shields for debt shields at a higher rate than similar corporations with low tax rates.

The results also suggest that, independent of the tax exhaustion effect, the use of debt tax shields decreases as the level of nondebt tax shields increases, possibly implying that lenders are less willing to make loans to firms as the percentage of gross profit dedicated to covering non-interest operating expenses

increases. More detailed results are reported in the appendix.

The policy issue addressed in this research is the impact of taxation on the amount of interest expense incurred by small, closely-held corporations. Although other studies have addressed this issue using samples of large, publicly-held corporations, there has been virtually no empirical evidence pertaining to small firms. Our results provide evidence that taxes significantly influence the decision to use debt in these firms, and this result has important tax policy implications. Our evidence suggests that changes in individual or corporate tax rates will result in changes in the capital structures and riskiness of small corporations.

Moreover, our analysis indicates that, after controlling for other variables that influence debt levels, there is a significant tax exhaustion effect in our sample of closely-held corporations. Dhaliwal *et al.* (1992) also found this interaction to be significant using a sample of large, publicly-held corporations. Importantly, however, the direction of our interaction is opposite to that obtained with the large firm sample. We attribute this difference to a fundamental difference between our sample firms and the sample firms of prior studies. Specifically, samples of large, publicly-held corporations are unlikely to contain many tax exhausted firms (i.e., firms with expected marginal tax rates at or near zero), and are very likely to contain firms that are tax insatiable (i.e., firms at the top end of the corporate tax rate structure and for which additional tax shields would not lower their marginal tax rates). In contrast, our sample of small businesses contains many firms that are tax exhausted and very few firms that are tax insatiable. Overall, this result suggests caution in generalizing results from large-firm studies to the small business environment.

Appendix

Regression Model

To examine the tax-related determinants of firms' debt utilization, we estimate the following cross-sectional regression:

$$INT_i = a_0 + a_1 TAX_i + a_2 TAX_i * NDTS_i + B_k X_{ki} + E_i \quad (2)$$

We measure debt utilization as the ratio of interest expense to gross profit (*INT*). An alternative measure of debt utilization is the ratio of total debt to gross assets. As discussed by Dhaliwal *et al.* (1992, 2), *INT* is the more appropriate measure for testing the substitution effect because (1) interest expense is a direct measure of debt tax shields, whereas debt ratios provide only indirect measures, and (2) scaling by gross profit achieves the "holding before-tax earnings constant" assumption of the substitution hypothesis as put forth by DeAngelo and Masulis (1980).

We focus our attention on the regression coefficients for *TAX* and *TAX*NDTS*, an interaction term created by multiplying *TAX* by *NDTS*. The tax hypothesis predicts that the slope coefficient for $TAX, _1$, will be positive. The slope coefficient for $TAX*NDTS, _2$, represents the test of the tax exhaustion hypothesis. As discussed above, the sign of this coefficient will depend upon the relative representation of tax exhausted, tax sensitive, and tax insatiable firms within the sample. The k independent variables, X_{ki}, represent nontax attributes of firm i that may influence the level of leverage, as discussed above. Variables captured by X_{ki} include nondebt tax shields (*NDTS*), debt securability (*FIX*), profitability (*ROA*), liquidity (*LIQ*), firm size (*LNSALES*), and firm age (*LNAGE*).

Table 3
Model Variables–Descriptive Statistics

Variables	N	Mean	Std. Dev.	Quartile1	Median	Quartile 3
Pre-Interest Net Income (in $ millions):						
Overall sample	1,303	0.242	1.108	0.003	0.036	0.140
C Corps	987	0.217	1.032	0.002	0.035	0.140
S Corps	316	0.320	1.224	0.004	0.037	0.150
Ratio of Interest Deductions to Gross Profit (*INT*):						
Overall sample	1,303	0.042	0.057	0.003	0.018	0.054
C Corps	987	0.041	0.055	0.004	0.019	0.052
S Corps	316	0.044	0.062	0.001	0.018	0.061
Tax Rate (*TAX*)[a]:						
Overall sample	1,303	0.215	0.147	0.150	0.150	0.370
C Corps	987	0.221	0.151	0.150	0.165	0.370
S Corps	316	0.197	0.133	0.110	0.150	0.330
Ratio of Non-Interest Operating Expenses to Gross Profit (*NDTS*):						
Overall sample	1,303	0.842	0.308	0.728	0.900	0.987
C Corps	987	0.843	0.308	0.735	0.906	0.988
S Corps	316	0.839	0.309	0.704	0.877	0.980
Ratio of Inventory plus PP&E to Total Assets (*FIX*):						
Overall sample	1,303	0.562	0.266	0.369	0.588	0.787
C Corps	987	0.548	0.265	0.357	0.567	0.762
S Corps	316	0.606	0.261	0.411	0.644	0.831
Ratio of Net Income before Interest Expense to Total Assets (*ROA*):						
Overall sample	1,303	0.142	0.351	-0.001	0.064	0.238
C Corps	987	0.143	0.346	-0.001	0.059	0.232
S Corps	316	0.140	0.364	0.000	0.091	0.285
Cash to Total Assets Ratio (*LIQ*):						
Overall sample	1,303	0.142	0.169	0.027	0.077	0.196
C Corps	987	0.141	0.170	0.027	0.078	0.195
S Corps	316	0.143	0.169	0.028	0.077	0.196
Net Sales (in $ millions):						
Overall sample	1,303	4.503	11.388	0.300	1.000	3.800
C Corps	987	4.446	11.687	0.349	1.029	3.884
S Corps	316	4.682	10.416	0.244	0.796	3.500
Age of Firm (in years):						
Overall sample	1,303	22.954	21.743	8.000	16.000	31.000
C Corps	987					
23.637	21.963	8.000	17.000	32.000		
S Corps	316	20.820	20.932	5.000	13.000	31.000

[a] See the notes to Table 4 for a more complete definition of *TAX*.

Table 4
REGRESSION RESULTS

Estimated Coefficients (probability)

$$INT_i = a + a_1 TAX_i + a_2 TAX_i{*}NDTS_i + B_k X_{ki} + \varepsilon_i$$

	C Corporations	S Corporations	Combined Sample
Intercept	0.030	0.101	0.047
(.10)	(.00)	(.00)	
C corporations			
		0.171	
Tax Effect	0.173		0.171
(TAX)	(.00)		(.00)
Tax Exhaustion Effect	-0.167		-0.165
*(TAX*NDTS)*	(.00)		(.00)
S corporations			
Tax Effect		0.161	0.178
(TAX)		(.02)	(.00)
Tax Exhaustion Effect		-0.135	-0.161
*(TAX*NDTS)*		(.06)	(.00)
Control Variables (X_k)			
Non-debt tax shields	-0.022	-0.041	-0.027
(NDTS)	(.04)	(.05)	(.01)
Debt securability	0.035	0.016	0.030
(FIX)	(.00)	(.28)	(.00)
Profitability	-0.065	-0.075	-0.068
(ROA)	(.00)	(.00)	(.00)
Liquidity	-0.042	-0.074	-0.049
(LIQ)	(.00)	(.00)	(.00)
Size	0.002	-0.001	0.001
(LNSALES)	(.08)	(.70)	(.19)
Age of firm	-0.005	-0.005	-0.005
(LNAGE)	(.01)	(.14)	(.00)
Adjusted R^2	0.192	0.178	0.190
F-statistic	30.30	9.54	31.59
Sample size	987	316	1,303

Notation: *INT* is the ratio of interest deductions to gross profit. For C corporations, *TAX* is corporate marginal tax rate on the pre-interest taxable income. For S corporations, *TAX* is individual marginal tax rate on the largest shareholders portion of pre-interest taxable income. *NDTS* is the ratio of non-interest deductions to gross profit. *FIX* is property, plant, and equipment plus inventories divided by gross assets. Likewise, *ROA* (*LIQ*) is taxable income (cash) divided by gross assets. *LNSALES* is the natural log of sales, and *LNAGE* is the natural log of the number of years (plus one) since the firm was founded.

Results

Table 3 reports descriptive statistics for the variables used in the regression analyses. We tested whether the two subsamples differ with respect to each of these measures. In comparison to the C corporations subsample, firms in the S corporation subsample have, on average, lower values of *TAX* ($t = -2.77, p < .01$) and higher values of *FIX* ($t = 3.41, p < .01$). The two subsamples are not significantly different with respect to the other measures reported in Table 3.[8]

1. Regression Results

Table 4 presents regression results for the separate C and S corporation subsamples as well as the combined sample. The regression results for both the C and S corporation subsamples provide consistent support for both hypotheses. The estimated coefficients for *TAX* are positive and significant in both subsamples, which supports the tax hypothesis that firms incur more interest expense as their tax rates increase. The estimated coefficients for *TAX*NDTS* are negative and significant in both subsamples. This result supports the tax exhaustion hypothesis that the extent to which firms substitute nondebt tax shields for debt tax shields depends upon their marginal tax rates. Specifically, the negative coefficient indicates that small, closely-held corporations with high tax rates substitute nondebt shields for debt shields at a higher rate than similar corporations with low tax rates.

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Table 3
Model Variables–Descriptive Statistics

Variables	N	Mean	Std. Dev.	Quartile1	Median	Quartile 3
Pre-Interest Net Income (in $ millions):						
Overall sample	1,303	0.242	1.108	0.003	0.036	0.140
C Corps	987	0.217	1.032	0.002	0.035	0.140
S Corps	316	0.320	1.224	0.004	0.037	0.150
Ratio of Interest Deductions to Gross Profit (*INT*):						
Overall sample	1,303	0.042	0.057	0.003	0.018	0.054
C Corps	987	0.041	0.055	0.004	0.019	0.052
S Corps	316	0.044	0.062	0.001	0.018	0.061
Tax Rate (*TAX*)[a]:						
Overall sample	1,303	0.215	0.147	0.150	0.150	0.370
C Corps	987	0.221	0.151	0.150	0.165	0.370
S Corps	316	0.197	0.133	0.110	0.150	0.330
Ratio of Non-Interest Operating Expenses to Gross Profit (*NDTS*):						
Overall sample	1,303	0.842	0.308	0.728	0.900	0.987
C Corps	987	0.843	0.308	0.735	0.906	0.988
S Corps	316	0.839	0.309	0.704	0.877	0.980
Ratio of Inventory plus PP&E to Total Assets (*FIX*):						
Overall sample	1,303	0.562	0.266	0.369	0.588	0.787
C Corps	987	0.548	0.265	0.357	0.567	0.762
S Corps	316	0.606	0.261	0.411	0.644	0.831
Ratio of Net Income before Interest Expense to Total Assets (*ROA*):						
Overall sample	1,303	0.142	0.351	-0.001	0.064	0.238
C Corps	987	0.143	0.346	-0.001	0.059	0.232
S Corps	316	0.140	0.364	0.000	0.091	0.285
Cash to Total Assets Ratio (*LIQ*):						
Overall sample	1,303	0.142	0.169	0.027	0.077	0.196
C Corps	987	0.141	0.170	0.027	0.078	0.195
S Corps	316	0.143	0.169	0.028	0.077	0.196
Net Sales (in $ millions):						
Overall sample	1,303	4.503	11.388	0.300	1.000	3.800
C Corps	987	4.446	11.687	0.349	1.029	3.884
S Corps	316	4.682	10.416	0.244	0.796	3.500
Age of Firm (in years):						
Overall sample	1,303	22.954	21.743	8.000	16.000	31.000
C Corps	987					
23.637	21.963	8.000	17.000	32.000		
S Corps	316	20.820	20.932	5.000	13.000	31.000

[a] See the notes to Table 4 for a more complete definition of *TAX*.

Table 4
REGRESSION RESULTS

Estimated Coefficients (probability)

$$INT_i = a + a_1 TAX_i + a_2 TAX_i{*}NDTS_i + B_k X_{ki} + E_i$$

	C Corporations	S Corporations	Combined Sample
Intercept	0.030	0.101	0.047
(.10)	(.00)	(.00)	
C corporations			
		0.171	
Tax Effect	0.173		0.171
(TAX)	(.00)		(.00)
Tax Exhaustion Effect	-0.167		-0.165
*(TAX*NDTS)*	(.00)		(.00)
S corporations			
Tax Effect		0.161	0.178
(TAX)		(.02)	(.00)
Tax Exhaustion Effect		-0.135	-0.161
*(TAX*NDTS)*		(.06)	(.00)
Control Variables (X_k)			
Non-debt tax shields	-0.022	-0.041	-0.027
(NDTS)	(.04)	(.05)	(.01)
Debt securability	0.035	0.016	0.030
(FIX)	(.00)	(.28)	(.00)
Profitability	-0.065	-0.075	-0.068
(ROA)	(.00)	(.00)	(.00)
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the percentage of gross profit dedicated to covering non-interest operating expenses increases. The positive coefficient for *FIX*, which is significant in the C corporation subsample only, indicates that firms incur more interest expense as their ability to provide collateral increases. The estimated coefficients for *ROA* and *LIQ* are significant and negative for both subsamples, suggesting that as profitability and liquidity increases, firms incur less interest expense as a percentage of gross profit. The negative coefficient for *LNAGE*, which is significant in the C corporation subsample only, suggests that firms incur less interest expense relative to gross profits as they grow older. The insignificance of the coefficients for *FIX* and *LNAGE* in the S corporation subsample may be due to the smaller size of this sample.

The last column of Table 4 presents regression results for the combined sample. This analysis is motivated by two concerns. First, it enables better control for the nontax determinants of debt utilization (to the extent that the insignificant results for some of the control variables in the S corporation subsample are due to the relatively small sample size). The most notable result for the combined sample is that the coefficients on *TAX* and *TAX*NDTS* for S corporations are slighter larger and more significant than in the separate regression analysis, which may be attributable to better control of the nontax factors.

The second motivation of the combined analysis is to determine whether the tax effect and tax exhaustion effect differ between C corporations and S corporations. Such differences might suggest that *TAX* is a better (or worse) measure of the effective tax subsidy on interest expense in one of the two subsamples, perhaps because of the shareholder tax rates assumptions that were necessary in defining this variable. However, neither the *TAX* coefficients for C and S corporations ($t = 0.20, p = .85$) or the *TAX*NDTS* coefficients ($t = 0.08, p = .94$) are significantly different from each other.

2. Sensitivity Analysis

Our earlier discussion of the tax exhaustion hypothesis identified three groups of firms (i.e., tax exhausted, tax sensitive, and tax insatiable firms) for which the effect of nondebt tax shields on debt utilization should differ. We attempted to test this more complex specification of the tax exhaustion hypothesis by classifying firms into one of three groups on the basis of their estimated tax rates (*TAX*). Firms with *TAX* values of zero were classified as tax exhausted firms (see Table 2). C corporations with *TAX* values greater than 0.42 (94 firms) and S corporations with *TAX* values of 0.385 (56 firms) were classified as tax insatiable. All remaining firms were classified as tax sensitive. The regression results using this three-level specification were almost identical to those reported in Table 4. The substitution effect was significantly more negative in both the tax sensitive and tax insatiable groups than in the tax exhausted group. However, there was no significant difference in the substitution effect between the tax sensitive and tax insatiable groups. We attribute this latter result to the low number of truly tax insatiable firms in our sample of small, closely-held corporations. As reported on Table 3, only 25 percent of our sample has pre-interest net income greater than $140,000. Therefore, the marginal tax rates of even the "high income" firms in our sample are likely to be sensitive to modest income fluctuations. On the other hand, the marginal tax rates of high income firms drawn from a sample of

large, publicly-traded corporations are likely to be insensitive to modest income fluctuations because such firms are well above the income threshold associated with the maximum tax bracket.

We also tested the sensitivity of our results by including in the regression analyses other measures of borrowing costs, *LENGTH*, *LATE*, and *SHP*. *LENGTH* is the longest lending relationship (in years) between the firm and a lender, and it represents the strength of the relationship between the firm and its lender. Petersen and Rajan (1994) demonstrate that stronger lending relationships lead to a lower cost of borrowing. *LATE* is the percentage of trade payments made after the due date, and it may represent a high cost of borrowing. Because some firms may be able to obtain favorable financing from shareholders, the proportion of loans from shareholders (*SHP*), was also included in the models. However, the inclusion of these additional variables in the regression models did not affect the coefficient estimates reported in Table 4 and did not substantially improve the explanatory power of the regression models.

Finally, industry membership may affect debt use due to differences in production technologies (Dammon and Senbet 1988), degree of regulation (Bradley *et al.* 1984), or some other unidentified factor. We controlled for potential industry effects by using dummy variables to represent membership in eight separate industry groups. Alternatively, we estimated separate regressions after excluding industry groups with small sample sizes or extreme values. The results of these procedures were qualitatively similar to those presented in Table 4

Despite the theoretical superiority of *INT* over debt ratio measures for testing the hypotheses examined in this study, we also estimated each of the regressions presented in Table 4 using the debt-to-asset ratio (*DAS*) as the dependent variable. Not surprisingly, the regression results using *DAS* are weaker and have less explanatory power than those presented in Table 4. For the C corporation subsample, the estimated coefficients for *TAX* and *TAX*NDTS* are similar to those reported in Table 4. However, neither coefficient is significantly different from zero in the S corporation subsample when *DAS* is used as the dependent variable.

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Endnotes

[1] The following example illustrates how the tax subsidy on interest expense can also be viewed as the difference between the before-tax cost of interest and the change in shareholders' after-tax cash flows as a result of the interest expenditure. Suppose a corporation distributes all of its after-tax earnings to shareholders each year (i.e., $d = 1$). Further suppose that the corporation's earnings before interest and taxes is \$100, potential interest expense is \$10, the corporate tax rate (t_c) is 30%, and the shareholders' tax rate (t_s) is 40%. If the corporation does not incur the interest expense, then the after-tax cash flow to the shareholders would be \$42 [i.e., \$100 $(1 - t_c)(1 - t_s)$]. If the corporation does incur the \$10 interest expense, then the after-tax cash flow to the shareholders would

be \$37.80 [i.e., (\$100 - \$10) (1 - t_c) (1 - t_s)]. Despite a \$10 decrease in before-tax cash flow to the corporation, the shareholders' after-tax cash flow decreases by only \$4.20 (i.e., \$42 - \$37.80). The remaining \$5.80 of the interest cost is offset by the value of the interest deduction at both the corporate level (i.e., \$10 t_c) and the shareholder level [i.e., \$10 (1 - t_c) t_s]. Alternatively, the effective tax subsidy on interest expense can be calculated using equation (1) as 58 percent [i.e., t_c + (1 - t_c) t_s].

Now suppose that the corporation does not pay annual dividends (i.e., d = 0), but retains its after-tax earnings indefinitely. In this case, the present value of the shareholder level tax (and the related tax benefit) approaches zero (i.e., _ = 0) and the effective tax subsidy becomes only 30 percent (i.e., t_c). A similar result occurs if the shareholders elect under Subchapter S to have corporate income taxed only at the shareholder level each year, regardless of whether such income is distributed. In this case, the effective tax subsidy on expenses incurred by the corporation would be 40 percent (i.e., t_s).

[2] One firm was dropped because it was coded as having 1984 (rather than 1987) information, and one firm was dropped because its gross margin was negative.

[3] The outlier analysis is based on the combined sample.

[4] See Scholes and Wolfson (1992, chapter 8) for a discussion of marginal tax rates for carryover firms.

[5] The income statement information was collected from tax returns for 530 firms in our sample. Although the income statement information for the remaining 773 firms was collected from several sources, the regression results are not qualitatively different from the results for the firms with information collected strictly from tax returns.

[6] To ascertain the appropriate tax rate, we use the rates effective for the fiscal year of each sample firm. For example, effective for tax years starting on or after July 1, 1987, C corporations were subject to tax rates ranging from 15 percent to 34 percent, plus a surtax of five percent on taxable income between \$100,000 and \$335,000 which phased-out the rate advantages of the first two tax brackets of 15 percent and 25 percent. For firms with fiscal year ends that included July 1, 1987, the tax rates were blended with the earlier tax rates. For an examination of the effect of this transition rule, see Scholes, Wilson, and Wolfson (1992). The data do not reveal the existence of carryovers, and for this reason we truncate the tax rates at zero for firms with negative pre-interest taxable income.

[7] The data include information about the number of shareholders owning ten percent or more of the common stock and the total ownership of the major shareholder group. Where there was more than one major shareholder, we used the average ownership percentage to determine the proportionate share of pre-interest taxable income for the average major shareholder. Since filing status information is unavailable, we used the married-joint rates for the calendar year which includes the corporate fiscal year end. The results using the individual rates for single filing status are not qualitatively different from those presented in the tables.