THE IMPACT OF FEDERAL TAXES ON THE USE OF DEBT BY CLOSELY HELD CORPORATIONS

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Abstract *– It is often asserted that the income tax encourages the use of debt because of the deductibility of interest expense. We examine this conjecture by analyzing the interest incurred by a large sample of small, closely held corporations. We estimate regressions of the level of interest on proxies for expected future tax rates, interactions between the tax rate proxies and nondebt tax shields, and other determinants of debt utilization. Our evidence is consistent with prior studies in that we find that firms with high tax rates pay more interest than firms with low tax rates. In addition, firms for which additional tax shields might reasonably lower tax rates exhibited significant substitution between nondebt tax shields and debt tax shields.*

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INTRODUCTION

The influence of income taxation on firms' capital structure decisions is a fundamental tax policy issue. 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 in any given year, 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 trade-off between the expected tax savings associated with interest deductions 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, TRA 86). The sample derives from the 1988–89 National Survey of Small Business Finances, a unique survey of small, closely held firms. Although prior studies have addressed this issue using samples of large, publicly held corporations (e.g., Dhaliwal, Trezevant, and Wang, 1992; Graham, 1996; MacKie-Mason, 1990), there has been virtually no empirical evidence pertaining to small firms. Moreover, the results of prior research based on samples of large firms may not generalize to smaller, 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 corporations may not have ready access to organized capital markets, and this may preclude them from achieving the optimal amount of debt in their capital structures. Finally, prior research (Cloyd, Pratt, and Stock, 1996) demonstrates that closely held firms respond to some tax incentives differently than publicly held firms.

All else equal, if taxes encourage debt utilization, firms that expect high future tax rates will make greater use of debt than firms that expect low future tax rates. We test this *tax hypothesis* by examining whether the relative amount of interest expense incurred is positively related to firms' expected future income tax rates. Because corporations with high levels of nondebt tax shields might receive reduced benefits from interest deductions, firms may substitute between nondebt tax shields and 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 substitution hypothesis* by examining whether the extent to which firms substitute debt tax shields for nondebt tax shields depends upon their expected future tax rates.

To control for the potential influence of double taxation on C corporation income, we divide our sample of closely held corporations into two subsamples: taxable corporations (C corporations) and electing Subchapter S corporations (S corporations).[1] Within each subsample, we categorize firms into three groups on the basis of expected future tax rates as represented by their current level of preinterest taxable income. Firms whose preinterest taxable income is negative, moderate, or high are classified as tax exhausted, tax sensitive, or tax insatiable, respectively. For each subsample, we regress the ratio of interest expense to gross margin on tax group indicators, interactions between the tax group indicators and nondebt tax shields, and other determinants of debt utilization.

The regression results support the tax hypothesis by providing evidence of a significant positive relation between tax rates and debt utilization. Moreover, consistent with the tax substitution hypothesis, our data indicate that the extent to which firms substitute between nondebt tax shields and debt tax shields depends substantially on their tax rates. That is, in our sample of closely held corporations, tax sensitive

firms (i.e., those for which additional tax shields might reasonably reduce expected tax rates) exhibited significantly greater substitution between nondebt tax shields and debt tax shields than tax exhausted firms (i.e., those for which additional tax shields would likely not reduce expected tax rates).

The remainder of this study is organized into four sections. The first section reviews prior research and describes the hypotheses. The second 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 (e.g., 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 did not generate consistent 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. Graham (1996) simulates marginal tax rates for a large sample of public firms and reports that high tax rate firms issue more debt than their low tax rate counterparts. 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 similar evidence from a relatively homogeneous sample of firms in the commercial banking industry.

Rather than focus on the decision to issue debt versus 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 between nondebt tax shields and debt tax shields created by the interest deduction. We extend the work of MacKie-Mason (1990), Graham (1996), and Dhaliwal, Trezevant, and Wang (1992), all of which investigate this substitution effect using samples of large, public corporations. As such, this study represents 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.

The Tax Hypothesis

The value of the debt tax shield is directly and positively related to the

effective tax rate on interest expense. Our tax hypothesis is that debt utilization, as reflected by interest payments, will be positively related to the firm's tax rate. In addition, by analyzing C and S corporations separately, we allow for the possibility that the relation between debt utilization and tax rates may depend upon organizational form. In the case of C corporations, the effective tax rate is the corporation's tax rate plus some fraction of the shareholders' effective tax rate on shares (Scholes and Wolfson, 1992), depending on the corporation's dividend policies. On the other hand, under a Subchapter S election, the income of the corporation is not subject to the corporate tax, but is taxed directly to the shareholders (regardless of whether it is distributed). Therefore, in the case of S corporations, the value of the debt tax shield is determined by the shareholders' effective tax rate regardless of the corporation's dividend policies.

It is important to distinguish our tax hypothesis from the tax incentives for issuing *inside* debt (i.e., shareholder debt). The C corporation shareholders can use inside debt to avoid the corporate tax, and this incentive strengthens our prediction that the total amount of interest expense will be positively related to the corporate tax rate. On the other hand, because S corporations do not pay a corporate-level tax, inside debt does not generate any tax savings for S corporation shareholders. Indeed, inside debt for S corporations may be negatively associated with corporate income because such debt enables shareholders to deduct S corporation losses on their personal tax returns.[2] Hence, our tax hypothesis applies to *outside* debt (i.e., nonshareholder debt) for S corporations, and our tests for S corporations may be weakened because we cannot distinguish between the interest generated by inside and outside debt.[3]

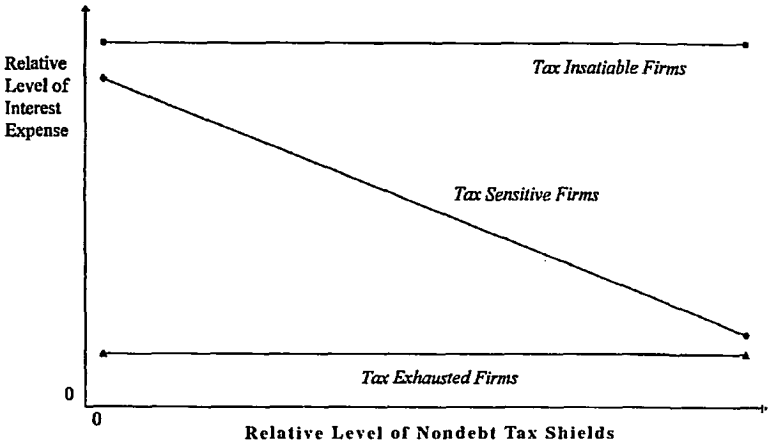
The Tax Substitution Hypothesis

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 TRA 86, 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.

The effective tax rate on interest expense is a function of the applicable income tax rate structures as defined by Congress, taxable income before interest expense, and, for some firms, the level of nondebt tax shields. The extent to which nondebt tax shields mitigate the benefit of debt tax shields 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. The expected relation between nondebt tax shields and the relative level of interest expense for these three groups of firms is illustrated in Figure 1.

Tax exhausted firms are those that expect very low levels of taxable income in the near future such that they expect very low tax rates even without using debt tax shields. For these firms, the effective tax subsidy on interest expense is very small and may approach zero.

FIGURE 1. Expected Relation Between Nondebt Tax Shield and Interest Expense for Tax Exhausted, Tax Sensitive, and Tax Insatiable Firms



Consequently, the use of debt by tax exhausted firms is likely to be primarily motivated by nontax factors and will be largely unrelated to the level of nondebt tax shields. In contrast, *tax insatiable* firms are those that expect very high future levels of taxable income such that they expect very high tax rates. Consequently, tax insatiable firms have tremendous capacities to fully utilize additional tax shields of any type. For these firms, the effective tax subsidy on interest expense is high and, again, largely unrelated to the expected level of nondebt tax shields. Because tax exhausted and tax insatiable firms expect future tax rates that are either extremely low (in the case of tax exhausted firms) or extremely high (in the case of tax insatiable firms), variation in future levels of nondebt tax shields is unlikely to affect their expected tax rates. The hypothesized weak relation between nondebt tax shields and interest expense for tax exhausted and tax insatiable firms is illustrated in Figure 1 by lines with flat slopes.

In terms of the spectrum of expected tax rates, *tax sensitive* firms fall between tax exhausted firms and tax insatiable firms. Tax sensitive firms are those firms for which additional tax shields could substantially lower expected future tax rates. The greater the level of nondebt tax shields relative to income, the greater the likelihood that changes in the level of nondebt tax shields will reduce the effective tax rate on interest expense for tax sensitive firms. As a result, tax sensitive firms must be careful not to create excess tax shields of either the debt or nondebt variety, lest they become tax exhausted and lose some or all of the tax benefits associated with these deductions. As illustrated by the negatively sloped line for tax sensitive firms in Figure 1, our tax substitution hypothesis is that debt utilization will be

negatively related to the level of nondebt tax shields for tax sensitive firms.

RESEARCH DESIGN

Sample Selection

Our sample is comprised of corporations from the National Survey of Small Business Finances conducted in 1988–9 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. Only one year of financial and tax information was collected in the survey, and 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.[4] 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 (324 firms), and
(4) Firms with extreme ratios (greater than three or less than zero) of noninterest deductions to gross profit (34 firms).

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 including these firms may not be generalizable. The third criterion eliminates firms with missing information. Information necessary for the calculation of noninterest deductions was missing for 275 firms, and information regarding property, plant, and equipment was missing for 49 firms. The fourth and final criterion eliminates 34 firms with extreme observations. The application of these criteria produces a sample of 1,330 firms.[5]

Prior studies have examined the effect of corporate income taxes on debt utilization. Because we have information on the filing status of each firm in our sample, we are able to examine the effect of individual income tax as well as the corporate income tax by dividing our sample into a C corporation subsample and an S corporation subsample. Table 1 reflects the distribution of sample firms by filing status as either C corporations or Subchapter S electing corporations. Panels A and B show that the relative frequencies of industry representation and ownership levels are fairly similar across the C and S corporation subsamples.[6] The distribution of firms by level of taxable income before interest expense is presented in Panel C, and again, the distribution of firms across income levels is comparable across the C and S corporation subsamples.

MacKie-Mason (1990), Givoly et al. (1992), and Graham (1996) analyze the incremental effect of taxes on changes in debt utilization. However, because our data are limited to one year of information, we are unable to conduct

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	13	(1)	2	(1)	15	(1)
Construction	112	(11)	42	(13)	154	(12)
Manufacturing	185	(18)	55	(17)	240	(18)
Utilities	45	(4)	15	(5)	60	(4)
Wholesale	150	(15)	34	(11)	184	(14)
Retail	237	(24)	88	(27)	325	(24)
Insurance	59	(6)	19	(6)	78	(6)
Services	208	(21)	66	(20)	274	(21)
Totals	1,009	(100)	321	(100)	1,330	(100)

Panel B: Distribution of firms (percent) across filing status and ownership

Number of Major Shareholders[b]	C Corporations		S Corporations		Entire Sample	
1	327	(32)	107	(33)	434	(33)
2	418	(41)	139	(43)	557	(42)
3 to 4	210	(21)	56	(17)	266	(20)
5 to 10	40	(4)	15	(5)	55	(4)
0	14	(1)	3	(1)	17	(1)
Totals	1,009	(100)	320	(100)	1,329	(100)

Panel C: Distribution of firms (percent) across income level

Income Level (in 000's)[c]	C Corporations		S Corporations		Entire Sample	
$0	199	(20)	60	(18)	259	(20)
$0 to $200	599	(59)	192	(60)	791	(59)
Over $200	211	(21)	69	(22)	280	(21)
Totals	1,009	(100)	321	(100)	1,330	(100)

[a]Industry groups were defined using two-digit SIC codes.
[b]Major shareholders are defined as those shareholders with at least ten percent of the voting power of the stock. One S corporation was coded as missing this variable.
[c]Income level is based upon taxable income before interest deductions. We refer to firms within these income groups as tax exhausted, tax sensitive, and tax insatiable, respectively.

an incremental analysis. Instead, we measure debt utilization as the ratio of interest expense to gross profit. As discussed by Dhaliwal, Trezevant, and Wang (1992), an interest ratio is an 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 (see also Berens and Cuny, 1995); 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).

Expected Tax Rate Proxy

Traditionally, studies estimate the marginal tax rate by employing either a interval-level variable based on estimated tax rates or a dichotomous variable indicating the existence of a tax carryforward. That is, high tax rate firms are distinguished from low tax rate firms on the basis of estimated tax rates or the existence of carryovers.[7] Although Graham (1996) utilizes a tax-code-consistent algorithm, tax measures are typically estimated using financial accounting income rather than taxable income.

We operationalize expected tax rates in two ways. First, 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 test these predictions for each firm type by classifying firms into one of three groups on the basis of their preinterest taxable income (for a distribution of the firms by preinterest taxable income, see Panel C of Table 1).[8] Second, we estimate an interval-level measure of marginal tax rates using taxable income and present these results as part of our sensitivity analyses.

Proxy for Nondebt Substitution

The tax substitution hypothesis predicts that nondebt- and debt-related tax shields will be negatively related for tax sensitive firms because additional tax shields substantially lower expected future tax rates for these firms. In other words, an increase in the level of nondebt tax shields, all else equal, should be associated with a reduction in debt levels for tax sensitive firms. Prior studies, such as Graham (1996) and MacKie-Mason (1990), identify tax sensitive firms by estimating the probability that the firms may become tax exhausted in the future. These studies test the substitution hypothesis by constructing an interaction variable in which the probability of losing tax benefits is multiplied by nondebt tax shields. Hence, nondebt substitution is expected to be exhibited by firms with high levels of nondebt tax shields that are also likely to lose tax benefits. We adopt a similar approach by creating an interaction variable between nondebt tax shields and those groups of firms that may exhibit substitution (tax sensitive and tax insatiable firms) relative to tax exhausted firms.

Measures of nondebt tax shields in prior studies, such as Graham (1996), are typically based on proxies for the deductions generated by the purchase of fixed assets, such as the amount of depreciation expense reported for financial accounting purposes. 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 (*ND*) 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, *ND* is the sum of all noninterest 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 because 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.).

Other Determinants of Debt Use

Although the primary focus of this paper is the influence of tax status on debt utilization, it is important to control for the nontax determinants of debt utilization. Auerbach (1985), MacKie-Mason (1990), and Dhaliwal, Trezevant, and Wang (1992) describe a number of nontax factors affecting financial choices, and we are able to employ several of these variables.[9] The amount of collateral is an important nontax factor that could influence the level of corporate debt because corporations with substantial collateral may be able to borrow at lower cost due to their ability to secure the loans. The effect of debt securability is discussed by Bradley,

Jarrell, and Kim (1984) and Dhaliwal, Trezevant, and Wang. 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).

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. In addition, as discussed by MacKie-Mason (1990), profitability and liquidity may also be inversely associated with the likelihood of financial distress. 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*).[10] Older firms may be considered less risky by lenders, which would also lower borrowing costs (Petersen and Rajan, 1994). Firm age (*LNA*) is captured by the natural log of the number of years (plus one) since the founding of the firm.

Regression Model

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

1

$$IGP_i = \alpha_0 + \alpha_1 INS_i + \alpha_2 SEN_i + \alpha_3 INS_i*ND_i + \alpha_4 SEN_i*ND_i + \beta_k X_{ki} + \varepsilon_i .$$

In this regression, the dependent variable, *IGP*, is the ratio of interest expense to gross profit. Two of the three groups of firms are represented by dichotomous variables. The insatiable firms are represented by *INS*, which is one if the preinterest taxable income of the firm exceeds $200,000 and zero otherwise. The tax sensitive firms are represented by *SEN*, which is one if the preinterest taxable income of the firm is between zero and $200,000 and zero otherwise.[11] We construct two interaction terms, *INS*ND* and *SEN*ND*, by multiplying both *INS* and *SEN* by *ND*. 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 (*ND*), debt securability (*FIX*), profitability (*ROA*), liquidity (*LIQ*), and firm age (*LNA*).

The tax hypothesis predicts that the slope coefficient for the insatiable firms and the tax sensitive firms will be positive. Hence, we expect the estimated regression coefficients for *INS* and *SEN*, α_1 and α_2, to be positive. On the other hand, the tax substitution hypothesis predicts that the level of nondebt tax shields will be negatively related to interest utilization for the tax sensitive firms. This hypothesis suggests that the regression coefficient for *SEN*ND*, α_4, should be negative but that the regression coefficient for *INS*ND*, α_3, should be zero.

RESULTS

Table 2 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 corporation subsample, firms in the S corporation subsample have, on average, higher values of *FIX* ($t = 3.41$, $p < 0.01$). The two subsamples are not significantly different with respect to the other measures reported in Table 2.[12]

TABLE 2
DESCRIPTIVE STATISTICS

Variables[a]	Mean	Standard Deviation	Minimum	Quartile 1	Median	Quartile 3	Maximum
Preinterest net income (in $ millions):							
Overall sample	0.242	1.073	–4.068	0.003	0.036	0.146	20.620
C Corps	0.218	1.024	–4.068	0.002	0.036	0.140	20.620
S Corps	0.317	1.215	–0.843	0.004	0.037	0.150	17.015
Ratio of interest deductions to gross profit (*IGP*):							
Overall sample	0.050	0.088	0.000	0.003	0.020	0.060	0.930
C Corps	0.051	0.091	0.000	0.004	0.020	0.058	0.930
S Corps	0.049	0.077	0.000	0.001	0.018	0.064	0.500
Ratio of noninterest operating expenses to gross profit (*ND*):							
Overall sample	0.843	0.316	0.000	0.722	0.899	0.987	2.970
C Corps	0.845	0.318	0.000	0.733	0.904	0.988	2.970
S Corps	0.837	0.312	0.000	0.700	0.877	0.979	2.721
Ratio of inventory plus PP&E to total assets (*FIX*):							
Overall sample	0.564	0.265	0.000	0.373	0.591	0.789	1.000
C Corps	0.551	0.265	0.000	0.359	0.574	0.767	1.000
S Corps	0.607	0.261	0.000	0.415	0.648	0.833	1.000
Ratio of net income before interest expense to total assets (*ROA*):							
Overall sample	0.139	0.348	–1.000	–0.004	0.062	0.235	1.000
C Corps	0.139	0.344	–1.000	–0.005	0.057	0.227	1.000
S Corps	0.138	0.362	–1.000	0.000	0.089	0.276	1.000
Cash to total assets ratio (*LIQ*):							
Overall sample	0.140	0.168	0.000	0.027	0.076	0.191	1.000
C Corps	0.139	0.169	0.000	0.026	0.075	0.191	1.000
S Corps	0.143	0.168	0.000	0.028	0.077	0.195	1.000
Age of firm (in years):							
Overall sample	23.003	21.797	1.000	8.000	16.000	32.000	145.000
C Corps	23.732	22.055	1.000	8.000	17.000	32.000	145.000
S Corps	20.710	20.834	1.000	5.000	13.000	30.000	107.000

[a]The values for both *ROA* and *FIX* were truncated at an absolute value of one.
(Sample size is 1,330 firms: 1,009 C Corporations and 321 S Corporations)

Tax Hypotheses

Table 3 presents regression results for the separate C and S corporation subsamples.[13] The estimated coefficients for *INS* and *SEN* are positive and significant in both subsamples. This result indicates that the groups of firms with relatively higher tax rates (tax insatiable and tax sensitive firms) incur more interest expense than tax exhausted firms. In addition, the estimated coefficients for *INS*ND* and *SEN*ND* are negative and significant in both subsamples. Although the tax substitution hypothesis predicts a negative estimated coefficient for *SEN*ND*, the hypothesis also predicts a zero estimated coefficient for *INS*ND*. We attribute this latter result to the low number of truly tax insatiable firms in our sample of small, closely held corporations. As reported in Table 1, only 21 percent of our sample has preinterest taxable income greater than $200,000. In addition, only six percent of our sample has preinterest taxable income greater than $1 million. Therefore, even the "high income" firms in our sample are likely to be sensitive to modest changes in nondebt tax shields.[14]

TABLE 3
REGRESSION RESULTS USING DICHOTOMOUS TAX VARIABLES
ESTIMATED COEFFICIENTS
(PROBABILITY COEFFICIENT EQUAL TO ZERO)

$$IGP_i = \alpha + \alpha_1 INS_i + \alpha_2 SEN_i + \alpha_3 INS_i{*}ND_i + \alpha_4 SEN_i{*}ND_i + \beta_k X_{ki} + \varepsilon_i$$

	C Corporations	S Corporations
Intercept	–0.130	0.062
	(0.0001)	(0.14)
Tax rate effect:		
Tax insatiable firms (*INS*)	0.288	0.084
	(0.0001)	(0.03)
Tax sensitive firms (*SEN*)	0.289	0.145
	(0.0001)	(0.0008)
Tax substitution effect:		
Tax insatiable firms (*INS***ND*)	–0.245	–0.070
	(0.0001)	(0.05)
Tax sensitive firms (*SEN***ND*)	–0.267	–0.146
	(0.0001)	(0.0002)
Control variables (X_k):		
Nondebt tax shields (*ND*)	0.139	–0.021
	(0.0001)	(0.49)
Debt securability (*FIX*)	0.046	0.024
	(0.0001)	(0.16)
Profitability (*ROA*)	–0.090	–0.091
	(0.0001)	(0.0001)
Liquidity (*LIQ*)	–0.067	–0.070
	(0.0001)	(0.01)
Age of the firm (*LNA*)	–0.004	–0.006
	(0.16)	(0.14)
Adjusted R^2	0.195	0.200
F statistic	28.16	9.91
Sample size	1,009	321

IGP is the ratio of interest deductions to gross profit. *INS* is a dichotomous variable representing tax insatiable firms, which equals one if the preinterest taxable income exceeds $200,000 and zero otherwise. *SEN* is a dichotomous variable representing tax sensitive firms which equals one if the preinterest taxable income exceeds zero and is less than or equal to $200,000 and zero otherwise. *INS***ND* is an interaction variable created by multiplying *INS* by *ND*. Likewise, *SEN***ND* is an interaction variable created by multiplying *SEN* by *ND*. *ND* is the ratio of noninterest 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. *LNA* is the natural log of the number of years (plus one) since the firm was founded.

Nontax Variables

Consistent with Graham (1996), the estimated coefficient for *ND* is positive and significant in the C corporation subsample. This result suggests that, independent of the tax substitution effect, the use of debt tax shields increases with the level of nondebt tax shields. One possible explanation for this result is that nondebt shields are comprised primarily of depreciation deductions, and these deductions are associated with increased levels of debt. The estimated coefficients for *ROA* and *LIQ* are significant and negative for both subsamples, suggesting that, as profitability and liquidity increase, firms incur less interest expense as a percentage of gross profit. These results are consistent with Graham's result that debt issuances are negatively related to free cash flows. The positive coefficient for *FIX*, which is significant in the C corporation subsample only, is consistent with the results presented in Graham and Dhaliwal, Trezevant, and Wang (1992). The positive coefficient for *FIX* indicates that C corporations incur more interest expense as their ability to provide collateral increases. The failure to generate a statistically significant coefficient estimate for *FIX* in the S

corporation subsample may be due to the smaller size of this subsample.

Sensitivity Analysis

We examine the sensitivity of our results by including in the regression analyses the following measures of borrowing costs and risk: (1) the longest lending relationship (in years) between the firm and a lender, which represents the strength of the lending relationship (Petersen and Rajan, 1994); (2) the percentage of trade payments made after the due date, which represents a high cost of borrowing; (3) the proportion of loans from shareholders, which represents the ability to obtain favorable financing from shareholders; and (4) the default risk for each firm's industry, measured as the estimated number of business failures per 10,000 firms in each two-digit SIC code during 1987–8 (Dun and Bradstreet's *Business Failure Record*, 1989). The inclusion of these additional variables reduces the size of the sample because of missing observations, but does not qualitatively affect the coefficient estimates reported in Table 3 or improve the explanatory power of the estimated regressions.

Finally, industry membership may affect debt use due to differences in production technologies (Dammon and Senbet, 1988), degree of regulation (Bradley, Jarrell, and Kim,1984), or some other unidentified factor. In our sensitivity analyses, we control for potential industry effects by including dummy variables to represent membership in eight separate industry groups and, alternatively, estimating separate regressions after excluding industry groups with small sample sizes or extreme values. The results of these procedures are qualitatively similar to those presented in Table 3.

Interval-Level Tax Rate Proxy

The results presented in Table 3 suggest that, because our sample consists of small, closely held corporations, many of the firms we had classified as tax insatiable may actually be tax sensitive. To avoid the possibility of misclassification, we construct an interval-level measure of the marginal tax rate (*TAX*) on interest deductions based upon preinterest taxable income. For firms in the C corporation subsample, we estimate this marginal tax rate measure by applying the appropriate corporate tax rate schedule to each firm's preinterest taxable income.[15] For each firm in the S corporation subsample, we estimate this marginal tax rate measure by applying the appropriate individual income tax rate to the share of preinterest taxable income accruing to the largest shareholder.[16]

Although we estimate the marginal tax rate using taxable income, these estimates are subject to qualification. For example, because we do not have information about other sources of shareholder income, we can only estimate the marginal tax rate for S corporations by assuming that shareholders' tax rates are not materially affected by other items of income and expense that might be included on their individual income tax returns. Another consideration is that TRA 86 altered the tax rate schedules for corporations and individuals and repealed the preferential treatment of long-term capital gains.[17] Consistent with the relative magnitude of the top marginal tax rates during this time period, the average estimated tax rate for the S corporation subsample is lower ($t = -2.77$, $p < 0.01$) than the average for firms in the C corporation subsample.

Using the interval-level measure of the expected tax rate in lieu of dichotomous variables, we estimate the following cross-sectional regression:

2

$$IGP_i = \alpha_0 + \alpha_1 TAX_i + \alpha_2 TAX_i{*}ND_i + \beta_k X_{ki} + \varepsilon_i .$$

Except for *TAX*, we measure all variables as in equation 1. We focus our attention on the regression coefficients for *TAX* and *TAX*ND*, an interaction term created by multiplying *TAX* by *ND*. The tax hypothesis predicts that the slope coefficient for *TAX*, α_1, will be positive. The tax substitution hypothesis predicts that the slope coefficient for *TAX*ND*, α_2, will be negative.

Table 4 presents regression results for the separate C and S corporation subsamples using an interval-level measure of marginal tax rates. The estimated coefficients for *TAX*, which are positive and significant in both subsamples, support the tax hypothesis that firms incur more interest expense as their tax rates increase. Also, the estimated coefficients for *TAX*ND* are negative and significant in both subsamples. This result indicates that the extent to which firms substitute between nondebt tax shields and debt tax shields depends upon their marginal tax rates, and is consistent with the tax substitution hypothesis given that our sample likely contains very few firms that are truly tax insatiable. The estimated coefficients for the control variables are consistent with the results reported using dichotomous tax variables (Table 3). Overall, the results using an interval-level measure of the tax rate are comparable to the results reported by Graham (1996) for a sample of large publicly held firms.

TABLE 4
REGRESSION RESULTS WITH AN INTERVAL-LEVEL TAX VARIABLE
ESTIMATED COEFFICIENTS (PROBABILITY)
$IGP_i = \alpha + \alpha_1 TAX_i + \alpha_2 TAX_i{*}ND_i + \beta_k X_{ki} + \varepsilon_i$

	C Corporations	S Corporations
Intercept	–0.027	0.119
	(0.19)	(0.0002)
Tax rate (*TAX*) [a]	0.465	0.177
	(0.0001)	(0.02)
Tax substitution (*TAX*ND*)	–0.440	–0.186
	(0.0001)	(0.02)
Control variables (X_k):		
Nondebt tax shields (*ND*)	0.061	–0.064
	(0.0002)	(0.01)
Debt securability (*FIX*)	0.052	0.026
	(0.0001)	(0.14)
Profitability (*ROA*)	–0.078	–0.092
	(0.0001)	(0.0001)
Liquidity (*LIQ*)	–0.060	–0.068
	(0.0008)	(0.02)
Age of the firm (*LNA*)	–0.006	–0.007
	(0.07)	(0.06)
Adjusted R^2	0.155	0.179
F statistic	27.41	10.94
Sample size	1,009	320

[a] For C corporations, *TAX* is the corporate marginal tax rate on the preinterest taxable income. For S corporations, *TAX* is the individual marginal tax rate on the largest shareholder's portion of preinterest taxable income. *TAX*ND* is an interaction variable created by multiplying *TAX* by *ND*. See the notes to Table 3 for other variable definitions.

Conclusions

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 resulting riskiness of small corporations. Moreover, our regressions indicate that, after controlling for other variables that influence debt levels, there is a significant tax substitution effect in our sample of closely held corporations.

This study extends the existing literature by testing the tax substitution hypothesis in a small business sample, which differs in important ways from samples used in prior research. Specifically, samples of large, publicly held corporations used in prior studies (e.g., Graham, 1996; Dhaliwal, Trezevant, and Wang, 1992; MacKie-Mason, 1990) 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 with very high levels of taxable income 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. Despite these differences, our results are consistent with prior studies in that firms with a reasonable likelihood of becoming tax exhausted (i.e., firms which we categorize as tax sensitive) are most likely to exhibit substitution between debt and nondebt tax shields.

ENDNOTES

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[1] We assume the choice between operating as a C corporation or a Subchapter S corporation is exogeneous to the interest expense utilization decision examined in this study. See Ayers, Cloyd, and Robinson (1996) for an examination of the organizational form decision.

[2] Under IRC section 1366(d)(1), shareholder debt can be used by S corporation shareholders to claim deductions for corporate losses in excess of the adjusted basis of their stock.

[3] A more refined tax hypothesis for S corporations is that the level of outside debt is positively associated with tax rates, while the level of inside debt is negatively associated with S corporation income. Consistent with this hypothesis, our sample S corporations with losses were more likely to report inside debt than profitable S corporations. To investigate the possibility that the tests reported in the tables are influenced by the existence of inside debt, we re-estimated our regressions based upon a sample excluding those firms reporting inside debt. The results of these regressions are not qualitatively different from those presented in the tables.

[4] This sample of 1,748 firms also excludes two firms with complete income information. 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.

[5] Income statement information was collected exclusively from tax returns for 544 firms in our

sample. Although income statement information for the remaining 786 firms was collected from a combination of sources (see Cox, Elliehausen, and Wolken, 1989), the regression results are not qualitatively different from the results for the firms with information collected strictly from tax returns. Approximately 60 percent of the firms in the sample reported information for a year ending in 1987 with the remainder reporting information for a year ending in 1988. The results of estimating regressions for subsamples based upon year-end are not qualitatively different from those presented in the tables. In addition, the results of estimating regressions based upon a sample that excludes influential observations, as identified using the criterion described by Belsley, Kuh, and Welsch (1980), are not qualitatively different from those presented in the tables.

[6] Chi-square tests for differences in proportions between S and C corporations are not statistically significant.

[7] See Scholes and Wolfson (1992) for a discussion of why large firms with tax carryovers are not likely to have zero expected marginal tax rates and Altshuler and Auerbach (1990) for a description of the difficulties of deriving marginal rates for carryover firms. Auerbach and Poterba (1987) report that loss carryovers are highly persistent over time so that firms with negative taxable income in one year are also very likely to experience losses in other years.

[8] Preinterest taxable income was used to reduce the endogeneity of the interest deduction, but similar results were obtained by using taxable income to classify the firms.

[9] Titman and Wessels (1988) and Auerbach (1985) provide a more complete discussion of the theory and literature regarding the nontax determinants of debt utilization. Although our data restrict the nontax variables we can employ, we tested a number of nontax variables in the regressions (e.g., size and industry membership), which did not result in significant coefficient estimates or improvements in the explanatory power of the regressions. We describe these variables in the sensitivity analysis.

[10] In order to reduce the effect of extreme observations, we truncated return on assets (*ROA*) and fixed assets (*FIX*) to values not exceeding the absolute value of one.

[11] We choose the $200,000 and zero levels of preinterest income in order to result in three groups of relatively equal size. However, the test results were not sensitive to moderate changes in the level of preinterest income used to define the three classes. Graham (1996) and Dhaliwal, Trezevant, and Wang (1992) report that a classification based upon the existence of tax carryovers also produces a reasonable proxy for tax status. Unfortunately, our data do not include tax carryover information.

[12] Similar results were obtained using the nonparametric Wilcoxon Rank Sum test. In addition to the variables shown in Table 2, on average, firms in the S corporation subsample have lower values of *LNA* ($t = -3.78$, $p < 0.01$) than those in the C corporation subsample. This result was also obtained using the nonparametric Wilcoxon Rank Sum test.

[13] We performed the diagnostic tests suggested by Belsley, Kuh, and Welsch (1980). Neither the condition indexes nor the variance inflation factors indicate that high levels of collinearity are responsible for the results.

[14] Similar results were obtained after deleting tax insatiable firms and re-estimating regressions with only one binary variable and one interaction variable representing tax sensitive firms.

[15] 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 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 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 preinterest taxable income.

[16] Where there was more than one major shareholder, we used the average ownership percentage to determine the proportionate share of preinterest taxable income for the average major shareholder. Because filing status information for individual shareholders was not available, 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.

[17] Scholes and Wolfson (1992) argue that, because of the changes in the relative levels of the corporate and individual tax rate schedules, TRA 86 may prompt many C corporations to elect subchapter S status. To the extent a large number of S firms recently elected S status, they may not have had a sufficient opportunity to adjust their debt levels.

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