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Tax Policy and Corporate Capital Structure

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In the past decade or so, corporations have been using debt increasingly to finance their activities. This is manifested both in a generally rising trend in corporate leverage and in the growing use of low-grade ("junk") bond financing. This article discusses the theory of the choice of corporate financial structure and the role that tax policy plays in that choice. The findings suggest that tax policy has contributed importantly to the observed trends and that recent changes in federal tax policy make it likely that the preference for debt financing will continue.

Corporations in the United States appear to be financing their activities increasingly through the use of debt (bonds, loans and other liabilities) rather than equity (corporate stock). Indeed, available data suggest that the ratio of corporate debt to equity outstanding has increased by two-and-one-half times since the 1960s.[1] In addition, the issuance of low-grade debt obligations by corporations ("junk" debt) has increased significantly in recent years. The quarterly issuance of corporate bonds with below investment-grade ratings has climbed from less than $1 billion in 1982 to over $32 billion in 1986.[2]

The growing use of debt financing by corporations may have a number of important implications. First, everything else being equal, highly leveraged finance makes the profitability and solvency of individual corporations more susceptible to fluctuations in income. Some observers have expressed concern for the welfare of investors in corporate bonds should the corporations involved suffer unexpectedly low earnings. Second, a widespread decline in corporate earnings might also be a destabilizing force for the financial system as a whole. The argument, made most cogently by Bernanke[3], is that when widespread defaults on indebtedness occur, certain conventional avenues of finance operate inefficiently "closing off" access to financial capital and depressing economic activity. This argument has been employed, in fact, to argue that the Great Depression was a phenomenon of a credit rather than monetary system failure.[4]

The purpose of this article is to explore the reasons behind the rise in the use of debt by U.S. nonfinancial corporations. In particular, theory suggests that personal and corporate income tax policy influence the corporate use of debt. Using historical data on corporate leverage, debt and equity issuance activity, and federal tax policy, we find that changes in tax policy are indeed related to the changes observed in corporate financial policy over the last century in a manner generally consistent with theory. Moreover, a review of the major features of the 1986 Tax Act reveals that it is an unusually strong potential source of stimulus to the corporate use of debt.

The remainder of the paper is structured as follows. First, the theory of corporate financial structure is reviewed briefly. Then, in Section II, a study designed to detect the influence of tax policy on financial structure is presented. In Section III, the data employed to test these notions is introduced and the empirical findings summarized. The paper concludes with a summary of the findings and a discussion of policy implications, focussing on recent Federal tax reforms.

I. Determinants of Corporate Financial Structure

Corporations finance their activities in two basic ways. First, they issue debt in the form of bonds, notes, and other primary securities, and take on liabilities in the form of loans from individuals and financial institutions. Bonds and other primary securities of the corporation may be sold into active, organized markets or placed directly with the ultimate investor. The second way they obtain funds is through the sale of shares in the equity of the corporation and the retention of earnings.

The theory of corporate financial structure — that is, the mixture of debt and equity finance — has been a subject of interest to finance economists for many years. Conventional theory of the firm assumes that the goal of management is to maximize the present value of the profits of the corporation, which is tantamount to maximization of the value of the firm's shareholder equity. It is assumed that this same goal motivates the selection of corporate financial structure.

The Notion of Irrelevance

In 1958, Franco Modigliani and Merton Miller first put forth the notion that, in fact, the value of the firm may be independent of its financial structure — at least in simple financial environments. This notion, known as the Modigliani-Miller (MM) or "irrelevance" theorem, can be motivated in a number of ways. The simplest is the argument that the value of the firm is determined fundamentally by the firm's assets and the cash flow generated by those assets. Partitioning those cash flows into payments to equityholders versus payments to debtholders does not have any obvious influence on the present value of the cash flows and, hence, does not change the value of the firm.[5] Put differently, the value of the firm is independent of its financial structure, and there is no optimal debt-equity ratio for an individual firm.

This fundamental point also can be demonstrated formally using the capital-asset pricing model (CAPM).[6] The key assumptions, however, are that the value of the partitioned cash flow is the same to each type of investor (investors in debt or investors in equity) and that the costs of borrowing (and hence the discount rate applied in computing the present value of the flows) are the same and constant for investors and the firm.

Effects of Taxes

Although there may not be an optimal debt-equity ratio for an individual firm in a perfect market, such may not be the case in a world in which taxes, transactions costs, and other "imperfections" exist. Moreover, financial structure for the corporate sector in the aggregate may be influenced by these imperfections even if individual firm conduct is not. Tax policy is a particularly likely source of influence on financial structure since there are important differences in the treatment of debt and equity securities in the U.S. tax structure.

Corporate Tax Treatment of Interest and Dividends

Let us turn first to the treatment of debt and equity under the corporate income tax system. Corporations have been subject to an income tax in the United States since 1908. The tax is paid on income net of deductible expenses. The interest paid by a corporation on its debt is one such deductible expense; the dividends it pays to equityholders are not deductible. Thus, everything else being equal, the income of a firm financed by debt is partly "shielded" from taxation whereas that of an all-equity firm is not.

The present value of the tax-saving represented by this shield is a potential source of additional value to the firm. The tax-saving varies in direct proportion to the corporate tax rate and the size of the debt shield. For perpetual debt, the value of the shield is t_cD where t_c is the corporate tax rate and D is the amount of debt outstanding.[7] Thus, the value of the shield rises with the tax rate and increased use of debt. Other influences aside, therefore, corporate tax policy biases financial structure toward an all-debt configuration.

Personal Taxation of Debt and Equity Income

Corporations make financing decisions not on their own behalf, but on behalf of investors. Seen

from this perspective, the objective of corporate finance decisions is to maximize the present value of the income of its investors after all taxes. If these investors face a personal income tax, the earlier conclusion that corporate taxes bias financial structure in favor of debt may not be unambiguous.

Personal income in fact has been taxed in the United States since 1913. In addition, for most of that time, income from equity has been taxed differently from so-called "ordinary income", including interest income. Income from equity is in the form of dividend payments and capital gains that accrue to equityholders as the result of earnings retention. Although dividends historically have been taxed at the same rate as ordinary income, the accrual of earnings in the form of capital gains is treated favorably. In particular, the gains typically are not taxed until they are realized (that is, until the appreciated equity is sold), and realized capital gains typically have been taxed at a favorable rate. The fact that the firm can elect to retain, rather than distribute, its net earnings, and that the tax obligation on the resultant capital gains is delayed, is one source of the preferential treatment afforded equity income. In addition, even *realized* capital gains have been taxed at a rate lower than ordinary income.[8]

If the tax rate applied to interest income is t_b and the perceived effective tax rate on equity income is t_e, the combined effects of corporate and personal income taxation policy can be described succinctly. A dollar of corporate income paid out as interest expense avoids corporate income taxation but is taxed at the personal level, yielding an after-tax income of $(1 - t_b)$ dollars for the investor. If paid out as equity income, in contrast, a dollar of corporate income implicitly must bear both the corporate and personal tax burdens, yielding $(1 - t_c)(1 - t_e)$ dollars to the investor.

Debt finance will be preferred, therefore, when it offers after-tax income to the investor that exceeds that offered by equity income, that is, if

$$(1 - t_b) > (1 - t_c)(1 - t_e).$$

Equity finance will be preferred when the opposite is true. Investors will be indifferent between the two modes of finance when their after-tax income is the same in both cases. Note that preference for debt financing increases with (a) lower tax rates on normal income, (b) higher tax rates on corporate income, and (c) higher tax rates on equity income. Note also that if the personal tax rate faced by debt and equity income were the same (that is, t_b equaled t_e), debt finance unambiguously would be preferred.

In essence, the effect of taxes is to make the value of the firm dependent upon how the cash flow from the firm is partitioned. That is, the conventional theory's assumption that the values of these flows are the same regardless of the way in which they are partitioned proves not to be false when tax policy is considered.

The Determinacy of Aggregate Leverage

This simplified view of corporate capital structure does not address important practical issues about corporate debt policy. Perhaps most important of these issues is the model's implication of an "either-or" nature to the corporate debt decision. That is, depending upon the tax structure, the model implies that investors are likely to prefer either an all-debt or all-equity structure. In reality, a mixture of debt and equity is observed both in the aggregate and among individual firms in our economy.

A number of explanations have been offered for the observation of a determinate amount of debt and equity in the aggregate. Two are particularly relevant to the analysis pursued in this paper. The first is the notion offered by Miller that debt and equity "clienteles" exist because of differences in the tax rates faced by individuals in the economy. That is, investors facing low personal marginal tax rates will tend to prefer debt, and those with sufficiently high tax rates will prefer equity. The relative wealth of these different "clienteles" thus makes the aggregate balance of debt and equity observed in the economy determinate. *Individual firms*, however, remain indifferent on the margin between the two avenues of finance because the equilibrium prices of debt and equity must satisfy all of these clienteles or the clienteles would continue to shift.[9]

A second explanation recognizes that a progressive income tax structure creates incentives to exchange corporate securities to achieve maximal after-tax income for investors. Individuals in high

tax brackets, for example, will tend to be willing to trade debt holdings for equity holdings to obtain the preferred tax treatment afforded income from the latter. This process of trading corporate securities affects both the equilibrium prices of debt and equity, and the equilibrium effective marginal tax rate. Indeed, it can be shown that in equilibrium, *effective* marginal tax rates will be equilibrated across households.[10] In such an instance there are no *clienteles* as such and firms are indifferent between debt and equity financing, but the aggregate amount of debt and equity in the economy remains determinate.

The Determinancy of Individual Firm Leverage

The observed variation in debt and equity held by individual firms also has a number of explanations. Miller has argued that since individual firms' financial structure is irrelevant, it is not costly for firms to pursue what they feel is a value-maximizing financial structure. This argument implies that the observed variation is serendipitous.

A second explanation recognizes the fact that firms enjoy shields against income taxation generated by sources other than debt. These "non-debt shields" include such things as depreciation and depletion allowances and the investment tax credit. If these shields were large enough relative to the income of the firm, the interest deduction could be completely redundant as a tax shield, and, in effect, make the marginal corporate tax rate (t_c) zero, reducing the incentive to prefer debt-financing. Even if the non-debt shields were not a complete offset to income, however, there is some probability that a debt shield will be redundant in a stochastic income environment.

Thus, the existence of non-debt shields reduces the expected shield benefit of additional debt. That is, the contribution to the value of the firm of an additional unit of debt is not constant, but declines with expanded debt usage because it increases the probability that the debt shield will be redundant for any given amount of non-debt shielding.

DeAngelo and Masulis have argued that, in the presence of these non-debt-related shields, individual firms can lose their indifference to financial structure.[11] The loss of indifference would make both the leverage of the individual firm and firms in the aggregate determinate.

The treatment of non-debt related shields in the U.S. Tax Code also can influence leverage. In particular, depletion and depreciation allowances are long-lived deductions whose value as a deduction for tax purposes is fixed at the time of the relevant investment. If the corporation subsequently is exposed to general price inflation (including inflation in the price of its own product) and its nominal income rises, the effectiveness of the depletion or depreciation shield implicitly declines. Thus, by inference, inflation can have the effect of increasing the attractiveness of additional *debt* shields, everything else being equal, and thereby increase the degree of leverage observed in the corporate sector.

Finally, restrictions on the ability of households to borrow also may influence observed levels of corporate leverage. This point relates to the notion that exchange of corporate securities is a strategy to achieve maximal after-tax income for households holding such securities. The strategy may require, however, that certain households borrow (issue personal debt) to acquire corporate equity.

If there were limits on short-selling and deductibility of interest expenses, or other limitations on borrowing by households, then the use of a corporation as a "tax intermediary" would become more important and may make corporate financial policy relevant. Say, for example, that interest expenses are deductible by corporations but not by households. If households were able to purchase shares in a highly leveraged corporation, they could possibly sidestep such restrictions on personal leverage and provide an incentive for an increased corporate use of debt. (In effect, the corporate securities would be used to arbitrage the differences in personal and corporate tax treatment of debt.) Models of the use of corporate securities in such "tax minimization" strategies show that household borrowing restrictions can influence corporate leverage.[12] This finding is relevant because, as we shall see in Section IV, recent tax reform limits personal borrowing.

In the long literature on optimal corporate financial structure, many other factors have been discussed as possible influences on the observed finan-

cial structure of corporations. Factors such as bankruptcy costs[13], differences between the preferences of managers ("inside equity holders") and other equity holders[14], and the influence of intangible assets, all have received some attention in the literature as sources of determinacy in the amount of leverage observed in the corporate sector.

While it may be likely that these and other non-tax considerations play some role in determining corporate financial structure, their influence is difficult to study empirically as these aspects of the economic environment are difficult to quantify.[15] The empirical work presented in this paper focuses, therefore, on the influence of tax policy on corporate financial structure. As we shall see, a significant fraction of the variation in observed corporate leverage over time appears to be associated with changes in tax policy.

Taxes, Leverage and Debt Quality

We turn now to the association between tax policy and the *quality* of corporate debt. Specifically, if a change in tax policy stimulates an increase in a corporation's leverage, it likely will result in the deterioration of the quality of its debt on the margin. One direct reason for this effect is that increased leverage simply reduces the capital buffer against default and thereby reduces the risk of a corporation's default on its debt. Debt-rating agencies and the marketplace in general would respond to increased default risk by downgrading the quality

assessment of new (and perhaps existing) debt.

Tax policy also may directly influence the preference for debt of low quality, however. A bond that is risky will contain a compensatory premium in its yield. The higher interest payments associated with risky debt implicitly provide a larger tax shield (for a given amount of debt) than less risky, lower yield debt. The higher default probability of the risky debt, of course, means that its tax shield effects have a higher probability of going unused. Zechner and Swoboda have argued, however, that because of peculiarities in the way in which tax law treats the obligations of corporations in a bankrupt state, the present value of the implied tax shield effects can nonetheless be greater for riskier debt.[16]

Another, possibly offsetting influence of tax policy on risky debt is the probability of a high-risk bond becoming a low-risk bond (as the corporation that issued the obligations evolves into a corporation with strong earnings and a growing net worth). Such an event would, in effect, confer a capital gain on the holders of the (formerly) risky debt that is treated favorably for tax purposes. Everything else being equal, had the corporation issued high-quality debt to begin with, there would be no prospect for such gains. (In essence, low-grade debt has some "equity-like" characteristics.) This suggests that, unlike debt in general, the issuance of high risk debt may be retarded by increases in the capital gains rate.[17]

II.   Corporate Financial Structure and Tax Policy: Measurement Issues

In this study, we examine empirically the influence of tax policy on the financial structure of corporations. We use aggregate data on the tax treatment of corporations and corporations' financing behavior over time. This longitudinal approach has a number of advantages over a study design that relies on examining the behavior of firms in the cross-section. For example, the considerable variation in tax policy and corporate financing behavior over time permits forging a statistical association between the two. There is less variation in the tax treatment *across* firms at a given point in time, and

much of that variation may be inherently endogenous.[18] In addition, using tests on aggregate time series data to determine the influence of taxes on leverage offers the opportunity to discover that influence whether it operates at the firm level or only at the level of the corporate economy overall.

Measuring Corporate Financial Structure

A major empirical issue in our analysis concerns the measurement of corporate financial structure. The theory discussed earlier suggests that the relative stocks of debt and equity outstanding in the

economy as a whole (and, perhaps, for individual firms) may be influenced by features of the tax system and other variables. Accurate measurement of these stocks (to create a leverage measurement or some other summary statistic) requires estimates of the market values of the debt and equity of all firms.

Unfortunately, a long time-series of such data is not available for the corporate sector as a whole and is difficult to construct from generalized indices. For equities, value-weighted indices of share prices such as the Standard and Poor's 400 and 500 exist, but their coverage is limited and has changed over time, and the indices themselves have been "rebased" at various times.[19] Also, these indices cover only companies with traded equity which, arguably, may behave differently from other corporations. An even more serious problem exists for ˙measurement of the market value of corporate debt in the aggregate, since no single value-weighted index exists. The result is that market value debt and equity estimates constructed from some indices are of questionable value to empirical work.

Book-value measures of total corporate assets and total corporate liabilities, in contrast, are available in a reasonably consistent form.[20] They have been reported to the Internal Revenue Service (for firms with and without tax liability) for about 50 of the 80 years that corporate income has been subject to tax in the United States. While not the ideal measures, they may nevertheless approximate market measures reasonably closely in the aggregate if corporate asset and liability portfolios turn over sufficiently rapidly.

The market values of net *issuance* of corporate debt and equity also are observable. Net issuance is the market value of new gross securities issued minus the value of retired securities. While net issuance activity is not ideal data for examining the leverage process directly, it can offer some assistance. Specifically, if a change in tax policy were likely to induce additional corporate leverage, relatively more debt than equity should be observed to be issued. For example, suppose that the ratio of debt (D) to equity (E) initially is

$$L = D/E$$

and that the reaction to a change in tax policy is to increase the desired degree of leverage to

$$L' = (D + dD)/(E + dE) > L,$$

where dD and dE are, respectively, the net issuance of debt and the net issuance of equity. If L' exceeds L,

$$(dD/D) > (dE/E).$$

That is, the percentage change in outstanding debt must exceed the percentage change in outstanding equity. Computing the percentage change accurately would require accurate measures of the stocks of debt and equity. However, as long as D is less than or equal to E (as it is for the aggregate of all U.S. nonfinancial corporations), net issuance of debt in excess of net issuance of equity will be associated with an increase in leverage.

In the empirical work in this paper, leverage measures and issuance activity are both employed to test the relationship between tax policy and corporate financial structure.

Measuring Tax Policy

Measurement of the tax policy environment also raises conceptual and practical issues. Miller's notion of debt and equity "clienteles" implicitly suggests that the degree of leverage observed in the economy as a whole will depend upon the wealth of groups in various tax brackets. This, in turn, suggests that wealth-weighted relationships between personal and corporate taxes might be an appropriate measure of ambient tax policy. The view of corporate securities as devices to arbitrage such tax differences, however, argues that such clienteles do not exist in equilibrium.

In either case, the outcome will be driven by the clientele with the highest individual wealth who, in turn, might be assumed to face the highest *ex ante* marginal tax rates on ordinary personal income. It is this rate that is used in our study, and it ranges from 7 percent (in 1913, the first year that personal income was subject to taxation) to a peak of 94 percent in 1944 and 1945.

The measurement of the tax rates applicable to income from equity also poses conceptual and empirical problems. Income from equity takes the form of dividends and capital gains. Given the
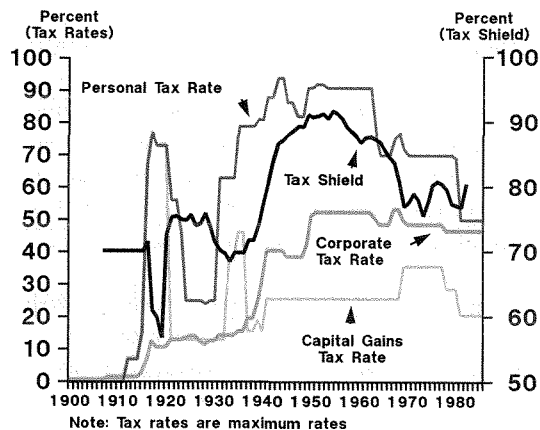
nondeductibility of dividend payments from gross income at the corporate level, it is something of a conundrum to financial economists that corporations pay dividends at all; it would appear preferable in all cases for firms to retain earnings and convert current income to capital gains for its security holders.[21] In addition, since the timing of the realization of capital gains can be controlled by the investor in most cases, the argument has been made that investor behavior will result in effective avoidance of the tax and thus that the effective capital gains rate is zero.[22]

This debate will not be resolved here, but it seems reasonable to assume that *some* differential treatment of income from holding corporate equity occurs and certainly that the *ex ante* rate of taxation of capital gains (which is what will influence security holding behavior) is nonzero and differs from the rate applied to ordinary income. Once again, we will measure changes in the taxation of capital gains using the *highest* statutory rate. Since no distinction was made between equity income and ordinary income until 1922, these two statutory rates correspond for the first 9 years of taxation of personal income.

Fewer problems exist in defining and measuring the corporate tax rate. Over most of its history, the corporate income tax in the United States has been a simple proportional tax. That is, a single tax rate, with exceptions to that rate only for very small corporations, has been employed. In the analyses that follow, therefore, the corporate tax rate has been measured as the primary (maximum) statutory rate on corporate income. The taxation of corporate income began in 1908 and the primary rate has ranged from 1 percent in that year to a peak of 52.8 percent in 1960.

The other feature of tax policy examined in this

Chart 1
Tax Rates and Shield

Percent
(Tax Rates)

Percent
(Tax Shield)

Personal Tax Rate

Tax Shield

Corporate
Tax Rate

Capital Gains
Tax Rate

1900 1910 1920 1930 1940 1950 1960 1970 1980
Note: Tax rates are maximum rates

research is the influence of nondebt-related tax shields. Depletion and depreciation allowances and the investment tax credit are the major nondebt sources of shields to net income. Unfortunately, it is not possible to measure these features of tax policy using a single parameter, making them difficult to characterize *ex ante* in a consistent empirical manner. In the analyses that follow, a measure of the actual use of these shields is used in lieu of a policy parameter. Specifically, the ratio of nondebt-related deductions to total deductions actually claimed by nonfinancial corporations is employed. This ratio can be interpreted as a measure of the likelihood that interest deductions would be redundant. In contrast to the other tax parameters examined, therefore, the nondebt-related tax shield is measured using realized (or *ex post*) data.[23]

Chart 1 presents the tax rate and shield values employed in this study and displays the considerable variation exhibited by these policy parameters over the last century.

III.   Data Description and Econometric Evidence

This section contains simple econometric evidence of the relationship between tax policy and (1) aggregate corporate leverage, (2) the aggregate net issuance of corporate debt and equity in the economy, and (3) the gross issuance of low quality debt. The study employs data, where possible, from 1900 to the present so that the maximum variation in tax

policy parameters and its association with corporate financial behavior can be studied. Financial corporations are excluded from the study on the grounds that special regulatory factors likely influence their behavior and would confound the effects of tax policy.

Tax Policy and Aggregate Corporate Leverage

The theoretical discussion above suggested that leverage may be positively associated with higher corporate tax rates, higher tax rates on equity income relative to ordinary income, lower personal tax rates, lower non-debt related shields, except in the instance that tax rates on ordinary and equity income were identical, in which case a pure preference for debt would be exhibited regardless of the level of tax rates.[24]

Chart 2 presents a measure of leverage derived from the book value of total liabilities and total assets reported to the Internal Revenue Service and its predecessor agencies. Only data for manufacturing corporations is represented to extend the data series back in time as far as possible while keeping consistent measures. A simple tax differential (the corporate tax rate minus the personal tax rate) also is presented in Chart 2. From the discussion above, leverage should be positively associated with this differential. From Chart 2, it is apparent that the association is, indeed, seemingly positive, and linear.

We examined the statistical association between leverage and the tax differential and other representations of the tax parameters using ordinary least squares regression techniques to create a linear representation of the relationship between contemporaneous measures of leverage and the tax parameters, measured in level terms. Two formulations were made with the first employing the individual tax parameters entered directly. The second uses the relative size of certain tax rates to others rather than the tax rates themselves. This procedure represents a simple attempt to recognize the notion that the relation of the corporate tax rate to the personal tax rate and the relation of the capital gains tax rate to the personal tax rate may be more relevant to leveraging decisions than the individual levels of tax rates.

In both formulations, a variety of other specifications involving both complete and incomplete sets of the tax variables and the use of lagged — as well as contemporaneous — measures of the independent variables also were employed.[25] The results of these complex variants are not reported here because the coefficients on the tax rate variables (the corporate, personal, and capital gains tax rates) appear quite insensitive to the model specification.

The parameters of the two basic regression formulations are presented in Table 1. In both cases, the signs on the tax parameters are those expected from the earlier theoretical discussion. Leverage appears to be positively associated with the corporate tax rate, the capital gains tax rate, and increases in the inflation rate; it is negatively related to the personal tax rate and the prevalence of use of nondebt-related tax shields. Consequently, as is indicated in the second regression, leverage is positively associated with increases in the difference between the corporate tax rate and the personal tax rate (the "tax differential") and with the difference between the maximum capital gains tax rate and the tax rate on ordinary personal income.

The Durbin-Watson statistics for both regressions suggest a moderate degree of correlation among the residuals of the regression and, hence, the possibility of imprecision in the estimates of the standard errors of the coefficient. Correcting this problem with simple techniques yields essentially similar results.[26] The consistency of the signs with that suggested by theory and the relative robustness of the finding with respect to specification of the regression is encouraging. The few tax variables (and the inflation rate variable) alone explain up to

Chart 2
Corporate Leverage and Tax Policy

Source: IRS data; manufacturing corporations only
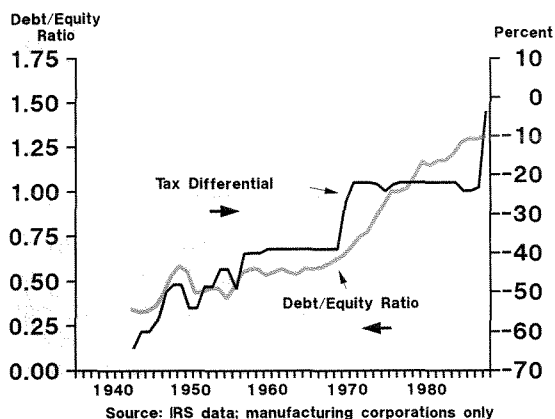
85 percent of the observed variation in aggregate leverage in the manufacturing sector over the last 50 years.

Tax Policy and the Issuance of Debt and Equity

The disadvantages of direct study of leverage are apparent from Chart 2. Conceptual problems of measurement aside, data are available consistently only from the 1930s. We are therefore unable to test the effects of the greater variation in tax policy that characterized the first part of this century. For the reasons stated earlier, however, the trend in the excess of debt over equity issuance also may provide information about leverage trends. In contrast to the leverage measure, data on net debt and equity issuance are available in market value terms from the first decade of the century to the present.

Chart 3 presents one measure of the excess of debt issuance over equity issuance along with the simple tax differential variable. Although there is considerable volatility in the measure of debt minus equity issuance, the pattern of corporate security issuance seems to be positively and quite consistently related to the tax parameters. In Table 2, regression results that relate the issuance measure to the complete set of tax parameters are presented. As might be expected given the much greater volatility of the issuance measure than the direct leverage measure (and the theoretically less straightforward link between issuance and tax policy), the empirical findings are less consistent than those using the leverage measure directly.

In particular, while the coefficients on the corporate and personal tax rates and the capital gains tax rate have the anticipated signs, the sign on the

TABLE 1

Leverage in Manufacturing Corporations, 1935-1982

Dependent Variable	Ratio of Liabilities to Equity for Manufacturing Corporations	
Regressions	1	2
Corporate Tax Rate	2.4* (10.5)	
Personal Tax Rate	-1.2* (4.8)	
Capital Gains Tax Rate Tax	0.3 (1.3)	
Nondebt Shield	-2.4* (4.8)	-1.4* (3.1)
Inflation Rate	1.4* (3.0)	1.3* (2.6)
Corporate minus Personal Tax Rate		1.9* (9.9)
Capital Gains minus Personal Tax Rate		0.2 (0.8)
N	48	48
R²	.87	.85
D.W.	1.67	1.78

Note: The regressions are based on annual data using contemporaneous observations on the dependent and independent variables. No attempt to correct for serial correlation in the error terms was made. All tax rate computations employ the highest tax rate in force during the year.
* Indicates that the estimated coefficient differs from zero at the 90 percent level of confidence or better.

"nondebt shield" variable is the opposite of what was expected. In addition, the sign on the inflation variable in the second regression is inconsistent with expectations, although both sets of coefficients are not statistically different from zero. The essential relationships between the issuance activity and the tax policy variables, however, have the signs predicted by the simple model of the leverage decision presented earlier.

Tax Policy and the Issuance of Low-Grade Debt

We turn now to an examination of the influence of tax policy on a particular type of debt: below-investment grade or "junk" debt. In recent years, the issuance of debt below investment-grade debt has increased sharply. This phenomenon usually has
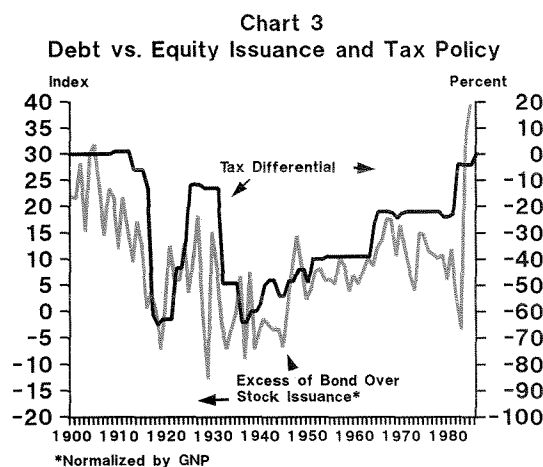
Chart 3
Debt vs. Equity Issuance and Tax Policy

*Normalized by GNP

TABLE 2

Net Issuance of Corporate Securities, 1908-1985

Dependent Variable	Net Debt Issuance minus Net Equity Issuance Current GNP	
Regressions	1	2
Corporate Tax Rate	-29.3*	
	(3.7)	
Personal Tax Rate	-32.9*	
	(6.5)	
Capital Gains Tax Rate Tax	16.1*	
	(2.3)	
Nondebt Shield	25.5	37.1*
	(1.4)	(2.2)
Inflation Rate	18.8	-9.6
	(1.4)	(0.8)
Corporate minus Personal Tax Rate		18.9*
		(3.7)
Capital Gains minus Personal Tax Rate		10.9*
		(2.7)
N	75	48
R²	.40	.85
D.W.	1.68	1.78

Note: The regressions are based on annual data using contemporaneous observations on the dependent and independent variables. No attempt to correct for serial correlation in the error terms was made. All tax rate computations employ the highest tax rate in force during the year.

* Indicates that the estimated coefficient differs from zero at the 90 percent level of confidence or better.

been ascribed to a variety of nontax factors. One explanation, for example, is that recent declines in interest rates have made investors generally more reluctant to seek high-risk investments to obtain the high yields to which they have become accustomed. Related to this explanation is the claim that investment bankers and brokers only recently have discovered untapped investor interest in high-yield, high-risk instruments. A second conventional explanation is that improvements in information technology now make it economical to evaluate investments in smaller and high-risk firms, whose debt typically would be of lower grade.

Combined with the growth of investment portfolios of sufficient scale to permit diversified holdings of low-rated debt, the factors cited are seen as making the issuance of junk bonds more feasible. Indeed, the factors may be contributing to the recent growth in the use of low grade debt by U.S. corporations, except that the first argument is *ad hoc* and difficult to verify empirically. The second explanation, emphasizing technological change, is at variance with the history of the use of low-grade debt. As we shall see, low-grade debt was used extensively early in this century. Indeed, the highest volumes of junk debt were issued in the "low-tech" decades of the century.

In this context, it is interesting to examine the influence of tax factors alone on junk debt activity. Unfortunately, a single continuous body of data on the outstanding volume of junk debt does not exist. All that is available is the data on the gross flow of new issues of debt that are below investment grade.[27] This is a biased estimate, of course, of *net* issuance of this type of debt, since neither retirements of outstanding low-grade debt nor the effects

TABLE 3

Issuance of Junk Bonds, 1908-1985

| Dependent Variable | Gross Par Value of Junk Bonds Issued | | | |
| | Current GNP | | | |
Regressions	1	2	3	4
Corporate Tax Rate	24.1*	16.1*		
	(1.8)	(2.2)		
Personal Tax Rate	-15.5*	-1.6		
	(4.5)	(0.4)		
Capital Gains Tax Rate Tax	-8.4*	-4.7		
	(1.8)	(-1.4)		
Nondebt Shield	-23.1	11.2	-23.6*	7.9
	(1.5)	(1.0)	(1.9)	(0.7)
Inflation Rate	8.2	2.2	9.7	0.6
	(0.9)	(0.4)	(1.0)	(0.1)
Corporate minus Personal Tax Rate			13.8*	4.1*
			(3.5)	(2.1)
Capital Gains minus Personal Tax Rate			4.4	-3.0
			(0.9)	(0.9)
N	71	71	71	71
R²	.69	.87	.47	.85
D.W.	.80	2.45	.45	2.57
Rho	-	0.74	-	0.84

Note: The regressions are based on annual data using contemporaneous observations on the dependent and independent variables. All tax rate computations employ the highest tax rate in force during the year.

* Indicates that the estimated coefficient differs from zero at the 90 percent level of confidence or better.

of changes in the rating of outstanding debt issues are incorporated in this data. Finally, there is a potential problem in the consistency of even the available data over time since there has been no single source for the data over the long time period of interest.

Although the various authors that have produced estimates of debt issuance have attempted to employ consistent standards and sources, there easily may be "drift" in effective debt rating criteria over time. Additionally, the rating of directly placed debt is usually not available, and analysts have had to apply proxies (such as the rating of publicly issued debt of a corporation) in making inferences about the quality of private placements.[28]

Despite these serious difficulties, the statistical relationship between tax policy and junk debt issuance activity displays rough correspondence with that suggested by the theories of issuance of high-risk debt. We used the same regression models employed in the analysis of aggregate debt issuance with a time series on junk debt issuance assembled from the available sources. As with the aggregate debt series, the issuance volume is expressed relative to current gross national product as a simple means of expressing the dimension of the activity relative to the aggregate "size" of the economy.[29]

The results of the regression analysis are presented in Table 3. Most of the signs on the tax parameters are the same as those found earlier in the analysis of aggregate corporate leverage relationships and the aggregate issuance of debt and equity.

There are some statistical problems with the estimates, however. In particular, the low Durbin-Watson statistics suggest that there is a strong serial correlation among the residuals. This problem likely follows from the exclusion of important explanatory variables and thus is not likely to be redressed by simple statistical treatment of the correlated residual problem. Nonetheless, in equations 2 and 4, the results of regressions employing a Cochran-Orcutt specification are reported for the two basic specifications of the model. Qualitatively, the effects of the corporate tax rate and the personal tax rate on ordinary income are unaffected by the specification and confirm the notion that junk bond issuance is positively related to the corporate tax rate and negatively related to the personal tax rate.

However, the possibility remains that the equations are misspecified in an important way.

From the results of regressions 1 and 2, the effect of the capital gains tax — which is potentially theoretically ambiguous for reasons cited earlier — appears to be such that an increase in this tax rate decreases junk bond issuance. However, this finding is not confirmed by the alternative specifications represented by regressions 3 and 4. Similarly, the sign on the nondebt-related shield variables in equations 1 and 3 is consistent with the theoretical expectation that increases in such shields decrease the use of debt generally and low-grade debt specifically; when the Cochran-Orcutt specification is employed, however, the coefficient is indistinguishable from zero, although it has a positive sign.

Despite these difficulties, the general concordance of these results with those found earlier provides at least weak confirmation of the notion that factors that increase leverage generally also tend to increase the use of "junk" debt. In Chart 4, the predicted and actual junk debt issuance volume is displayed. Changes in tax variables alone appear clearly to be associated not only with the high volumes of junk debt issuance early in the century, but also the recent resurgence in low-grade debt use.

Chart 4

Junk Bond Issuance

Note: issuance is par amount of offerings relative to GNP

*From Table 3, equation 1 .
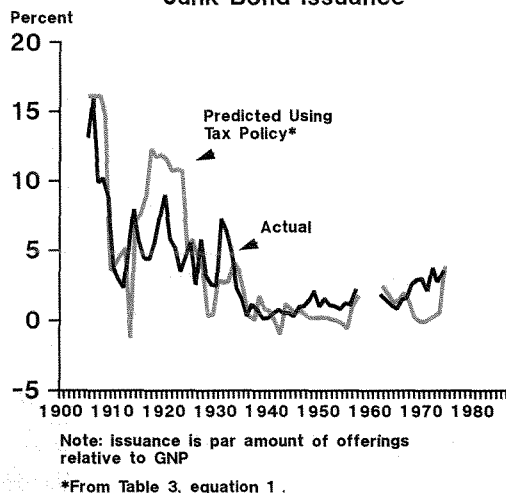
IV. Summary and Policy Implications

The theory of corporate financial structure was altered three decades ago by the notion that the mixture of debt and equity used by a firm to finance its assets was irrelevant to the value of the firm. The "irrelevance theorem", first advanced by Modigliani and Miller, stimulated a large literature that tries to explain the apparently contradictory *empirical* evidence of capital structure to firms. Several strands of this literature emphasize the role of the tax treatment of corporations and households as the mechanism by which the total amount of debt and equity in the economy — if not that of individual firms as well — becomes determinate. This paper has attempted to test for the influence of tax policy using long time series on various indicators of corporate financial structure.

Specifically, trends in the aggregate leverage displayed by U.S. manufacturing corporations, the relative volume of net debt and equity issuance, and the volume of low-grade debt issuance were studied. They were examined for evidence of a relationship to four important tax parameters: the marginal corporate tax rate, the marginal personal tax rate, the personal tax rate applied to capital gains, and the relative importance of nondebt related shields at the corporate level. Although such a study faces a number of theoretical and measurement problems, simple regression analyses reveal essential consistency between the relationships posited by a simple theoretical model of tax influence on corporate structure and actual behavior of these various measures.

Everything else being equal, an increase in the corporate marginal tax rate or the tax on capital gains increases the use of debt generally and low-grade (risky or "junk") debt specifically. In contrast, increases in the personal marginal tax rate, or the availability of nondebt related shields (such as depreciation and depletion allowances and the investment tax credit) appear to reduce debt use by corporations.

Implications of the 1986 Tax Act

With these findings, the changes in federal tax law made with the passage of the 1986 Tax Act take on special importance. Among other provisions, that tax reform legislation altered significantly the relationship between personal and corporate tax rates, the tax treatment of capital gains, and the availability of nondebt related tax shields for the corporation. The corporate tax rate, for example, will be 34 percent while the marginal personal tax rate paid by the highest income households will be only 28 percent.[30] The result is that, for the first time in almost 80 years, the corporate tax rate will exceed the personal marginal tax rate.

In addition, the tax preference afforded long-term capital gains is to be eliminated. In terms of the discussion above, the elimination is tantamount to an increase in the rate at which income from capital is taxed relative to ordinary income. The Tax Act alters the availability of nondebt-related shields in a significant way as well. The allowed period over which various assets may be depreciated is shortened significantly and the investment tax credit — that had been in existence in some form for most of the post-war period — is eliminated.[31] Finally, some restrictions have been imposed on household borrowing through the limitation of deductibility of consumer debt.

If the discussion and results of this paper were correct, all of these changes bias the balance between debt and equity toward increased use of debt. Using the estimated coefficients from the regression models presented earlier and the tax parameters implied by the 1986 tax reform, significant increases in the use of debt generally and junk debt in particular can be projected. For leverage in manufacturing corporations, for example, this projection implies an increase in the debt-equity ratio from the 1.3 observed in the last year for which data are available (1982) to a ratio of 1.9. Similarly, the excess of debt over equity issuance is projected to increase by 200 percent over its 1982 level, and junk bond issuance by 150 percent over its 1985 level.[32]

Policy Implications

From a broader policy viewpoint, these developments may have undesirable implications. Higher levels of corporate leverage make the corporate sector more susceptible to adverse changes in their income. Thus, an unanticipated economic downturn

would have a more deleterious effect on U.S. corporations.

This result is troublesome in and of itself to investors (including the banking sector) that hold debt and equity shares in American corporations. But even more serious is the prospect raised by Bernanke that widespread loss of confidence in the liabilities of U.S. corporations could have a depressing systemic on economic activity that exceeds the aggregate of the individual losses that might confront firms. Others have pointed out that precarious financial circumstances in the corporate sector make it more difficult for a nation's central bank to pursue a tight money policy, if that should be desired, for fear of precipitating a recession.

The tax treatment of corporations — specifically, the relatively high tax rates to which U.S. corporations are now exposed — long has been guided by a concern that corporations "pay their fair share" of federal government revenue requirements. If the links between tax policy and corporate leverage discussed in this paper were realistic, and the link between corporate leverage and economic fragility is as important as some have suggested, then requiring corporations to pay relatively high tax rates could prove to be a very costly political stance.

FOOTNOTES

1. The ratio of debt to equity in manufacturing firms was .55 in 1960 and 1:25 in 1982. The source of this data is the Internal Revenue Service, *Statistics of Income: Corporation Income Tax Returns*, annually, and its predecessor publications.

2. Data Source/IDD Information Services, Inc.

3. Ben S. Bernanke, "Nonmonetary Effects of the Financial Crisis in the Propagation of the Great Depression," *American Economic Review*, June 1983, pp. 257-276.

4. Bernanke, *ibid*, and Hyman Minsky, "A Theory of Systemic Fragility," in Altman and Sarnetz, eds, *Financial Crises: Institutions and Markets in a Fragile Environment*," New York: Wiley-International, 1977.

5. Another variant of the same argument is that any advantages of leverage achieved at the corporate level can be undone by investors. For leverage to cause corporate share values to be higher, investors must find it more costly to achieve leverage privately (that is, by issuing their own debt). If, in contrast, firms and households face the same borrowing and lending opportunities, such "homemade" leverage will be able to undo any effects of corporate leverage. Once again, therefore, leverage at the corporate level will be irrelevant, although the aggregate of corporate plus household debt and equity outstanding could be determinate. See, F. Modigliani and M. Miller, "The Cost of Capital, Corporation Finance and the Theory of Investment," *American Economic Review*, June 1958, pp. 261-297.

6. See, R. Bresley and S. Myers, *Principles of Corporate Finance*, McGraw-Hill, 1984, appendix to Chapter 17.

7. This follows from the fact that the periodic shield is the corporate tax rate times the debt coupon, or t_cDr, where r is the coupon interest rate on the perpetual debt. The present value of such a perpetual stream of shields is $(t_cDr)/r = t_cD$.

8. Income from equity consists of appreciation of capital shares and payment of dividends. Appreciation of capital shares is treated favorably because the tax liability can be postponed until the gains are realized and because these gains typically have been taxed at a lower rate than ordinary income. Dividend income, although nominally taxed at the same rate as ordinary income, can be converted easily into capital gains outside the firm if an investor borrows optimally to finance share ownership. See M. Miller and M. Scholes, "Dividends and Taxes," *Journal of Financial Economics*, December 1978, pp. 333-364. Indeed, if this were not the case, it is unclear why firms would ever pay dividends given the preferential treatment afforded capital gains.

9. See, M. Miller, "Debt and Taxes," *Journal of Finance*, May 1977, pp. 261-275.

10. A simple graphical presentation of this point is available in V. Aivazian and J. Callen, "Miller's Irrelevance Theorem: A Note," *Journal of Finance*, March 1987, pp. 169-179.

11. H. DeAngelo and R. Masulis, "Optimal Capital Structure under Corporate and Personal Taxation, "*Journal of Financial Economics*," March 1980, pp. 3-29.

12. Aivazian and Callen, *op cit*.

13. See, for example, N. Baxter, "Leverage, Risk of Ruin, and the Cost of Capital," *Journal of Finance*, March 1967, pp. 395-403.

14. M. Jensen and W. Meckling, "Theory of the Firm: Managerial Behavior, Agency Costs, and Ownership Structure," *Journal of Financial Economics*, October 1976, pp. 305-360.

15. The difficulties involved are typified by the study of bankruptcy cost by Warner. See, J. Warner, "Bankruptcy Costs: Some Evidence," *Journal of Finance*, May 1977, pp. 337-348.

16. Zechner and Swoboda, "The Critical Tax Rate and Capital Structure," *Journal of Banking and Finance*, (10) 1986, pp. 327-341.

17. I am indebted to Chris James for suggesting this effect.

18. Specifically, firms may have selected their industrial activities or their form of organization to obtain the most generous tax treatment. Conglomerate organization, for example, allows use of nondebt-related shields by firms whose other activities would not normally generate them, for example.

19. See Cohen, Zinbarg and Zeikel, *Investment Analysis and Portfolio Management*, Richard D. Irwin, Inc, 1977, p. 127 for a description of the construction of the Standard and Poor's value-weighted stock indices.

20. The aggregate of corporate liabilities and assets is reported annually by industry in Internal Revenue Services, *Statistics of Income: Corporation Tax Returns* and its predecessor publications. See also, L. Tambini, "Financial Policy and the Corporation Income Tax," in A. Harberger and M. Bailey, eds., *The Taxation of Income from Capital*, Brookings Institution, 1969, pp. 185-222.

To the author's knowledge, the IRS data is the only consistent source of data both on liabilities and assets of U.S. corporations that includes the pre-war period. However, the flow-of-funds data of the Board of Governors of the Federal Reserve System provides quarterly estimates of the book value of outstanding debt for the nonfinancial corporate sector from 1952 to the present, and annual balance sheets for nonfinancial corporations are available in "Balance Sheets For the U.S. Economy," Board of Governors of the Federal Reserve System, Washington, D.C., from 1947. An attempt is made in this publication to assign market values to debt and equity, but the estimates likely suffer the handicaps cited in the text. Regressions run with these measures, however, generally conform to those presented here.

21. At best, dividend policy is considered irrelevant by most economists. See, for example, F. Black and M. Scholes, "The Effects of Dividend Yield and Dividend Policy on Common Stock Prices and Returns," *Journal of Financial Economics*, May 1974, pp. 1-22.

22. M. Miller, *op cit.*

23. The tax shield variable is constructed as follows. Total deductions for depletion, depreciation and interest costs and total investment tax credits taken by all nonfinancial corporations is reported annually in the Internal Revenue, *Statistics on Income: Corporate Income Tax Returns* and its predecessor publications for the study period. The "deduction equivalent" of the investment tax credit (ITC) is computed using the current primary corporate income tax rate. A variable called "Nondebt Shield" is computed by taking the ratio of depletion, depreciation, and the deduction equivalent of the ITC to total deductions.

24. Since the ability to convert dividend income to capital gains and to delay payment of taxes on capital gains exists even if the statutory rate of tax on capital gains is the same as that on ordinary income, no attempt is made to imbed this condition in the regression analyses presented below.

25. A first differences formulation and various simple and polynomial distributed lag structures on the coefficients of the independent variables were examined as well. There was no evidence of significant lagged effects or qualitative differences among the performance of the simple regressions, the lagged representations, and first difference representations.

26. Both first differences and Cochran-Orcutt specifications were employed.

27. Data is available from Hickman for the period 1900-1943, Atkinson for the period 1944-1965, and Altman and Namacher and IDD Information Services, and the Board of Governors of the Federal Reserve System for 1970 to the present. Data permitting separation of public and private placements is not always available, so the regressions reported below are based on total (that is, public and privately placed) debt. Junk debt is considered debt issued with a Moody's rating below Baa or equivalent plus unrated corporate debt. Tests were conducted on sub-periods of the data to explore the sensitivity of the findings in this paper to the definition of junk debt.

See W. Hickman, *Statistical Measures of Corporate Bond Financing Since 1900*, Princeton University Press, 1960, T. Atkinson, *Trends in Corporate Bond Quality*, Columbia University Press, 1967, and E. Altman and S. Nammacher, *Investing in Junk Bonds: Inside the High-Yield Debt Market*, John Wiley and Sons, 1987, for additional discussion of the market in bonds of various quality ratings.

28. See the individual data sources cited in the previous note for details on the treatment of privately placed and unrated debt.

29. As was noted above, the conceptually appropriate treatment of these flow measures would require that the difference in the percentage changes of debt versus equity be studied. In the absence of accurate measures of outstanding stocks of debt and equity, expression of the issuance flow data relative to the gross national product may be justified as the basis that GNP may move in proportion to total corporate assets.

30. In fact, the effective marginal tax rate for middle income individuals can be as high as 33 percent because of a provision that phases out exemptions as gross income rises. In either case, however, the highest marginal personal income tax rate is lower than the corporate rate.

31. By lengthening the allowable life of depreciable assets for tax purposes and by eliminating the investment tax credit, the availability of nondebt shields relative to debt-related shields is reduced.

32. In these projections, a corporate tax rate of 34 percent and a personal tax rate of 28 percent are assumed. In addition, the difference between the capital gains tax rate and the tax rate on ordinary income is set equal to zero (that is, the tax on equity income is assumed equal to the tax on ordinary income) and the nondebt shield variable is set to 0.5. Finally, the three percent change in the inflation rate is assumed. The projections are generated by the first regression in Tables 1, 2 and 3; the numbers cited in the text are approximations derived from those simulations.