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SECULAR PATTERNS IN CORPORATE FINANCE

Robert A. Taggart, Jr.

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Secular Patterns in Corporate Finance

ABSTRACT

Trends in the financing of the corporate sector have been widely

discussed in both business and academic circles. It is frequently argued, for

example, that corporations' use of debt financing has increased dramatically

in recent years. These discussions have been hampered, however, by the lack

of a unified theoretical framework. In this paper, an attempt is made to

develop such a framework using existing corporate finance theory and some

extensions thereof. This theory is then used to interpret available data on

aggregate corporate financing patterns over the course of the twentieth

century.

It is found that corporations' use of debt has undeniably increased in

the post-World War II period. Nevertheless, the relative corporate debt level

was unusually low in the 1940's and current debt levels are not unprecedented

when viewed in the context of the entire century. The tax system, in

conjunction with inflation, has probably played an important role in the

postwar increases in corporate debt, but these factors appear insufficient to

explain longer-term trends. It is argued, then, that supplies of competing

securities, such as federal government bonds, as well as the secular

development of the financial intermediary system, may also be important

determinants of long-run corporate financing patterns.

Robert A. Taggart, Jr.
J.L. Kellogg Graduate School of Management
Northwestern University
Evanston, Illinois 60201
(312) 492-3562

SECULAR PATTERNS IN CORPORATE FINANCE

For many years patterns in the corporate sector's sources of finance have been observed, discussed and sometimes decried.[1] Yet there is little consensus on how to interpret these patterns and even some disagreement over what the patterns have been. Some studies argue that corporate debt ratios exhibit a secular upward trend, for example, while others assert that the debt-equity mix has shown remarkable stability.[2]

Apart from differences in measurement techniques, a major contributor to this lack of consensus has been the absence of a theoretical framework. With few exceptions, the trends observed in previous studies have been discussed without reference to any detailed model of the determinants of corporate finance.[3] This state of affairs may seem odd in view of corporate capital structure's role as one of the central theoretical questions in finance.[4] However, a number of these empirical studies were completed before theoretical work had progressed very far, and in many cases these studies discussion of corporate financing patterns has been a by-product of some broader concern, such as capital formation, tax policy or the evolution of the financial system as a whole. More important, perhaps, most theoretical work has been aimed at the individual firm and, until very recently, little analysis has been explicitly devoted to the determinants of corporate finance at the aggregate level.[5]

This paper attempts to improve upon the existing literature by the first developing a detailed theory of capital structure for the corporate sector as a whole and then using that theory as a guide in interpreting

empirical regularities. Existing theory is culled and extended with a specific eye toward isolating those factors that should influence the aggregate corporate financing mix over time.

The paper consists of three sections the first of which develops the theory. The major aim of that theory is to identify the forces affecting aggregate supplies and demands for corporate securities relative to competing securities in the capital market. It is argued that previous theoretical work has tended to rely on extreme assumptions about supply curves, demand curves or both, and that these assumptions may not be appropriate when the aim is to understand secular patterns in corporate finance. The second section presents a variety of measures of corporate financing activities. Observations from a number of previous studies are gathered and updated in order to present the broadest possible perspective on capital structure trends from the beginning of this century to the present. The third section offers some preliminary explanations for these trends based on the theoretical considerations of Section I.

To preview some of the major conclusions, it is found that there has been an undeniable trend toward greater use of debt financing by corporations in the post-World War II period. Nevertheless, the relative level of corporate debt was unusually low around the time of World War II and current debt levels are not unprecedented when viewed in the context of the twentieth century as a whole. The tax system, in conjunction with inflation, has probably played an important role in the postwar increases in corporate debt, but these factors appear insufficient to explain the trends over longer periods of time. In

particular, it is argued that supplies of competing securities, such
as federal government bonds, as well as the secular development of the
financial intermediary system, may also be important determinants of
long-run corporate financing patterns.

I. A Theory of the Aggregate Corporate Capital Structure

    A. The Place of the Corporate Sector in the Overall Financial System

    One contention of the theory to be developed in this
section is that the corporate sector's financing activities
should be viewed in the context of the other sectors of the
economy. Accordingly, the paragraphs that follow offer some
prefatory remarks on the corporate sector's place in the over-
all financial system. The aim of this discussion is to develop
a general framework for understanding the determinants of the
supply and demand for corporate securities. In Section I.B.
some existing theoretical contributions are briefly surveyed
with an eye toward drawing out their implications for these
supply and demand curves, while in Section I.C. an attempt is
made to flesh out the theory and provide a more complete pic-
ture of how the supply and demand curves are conditioned by the
other sectors of the financial system.

    Let us begin by considering a stylized three-sector
economy consisting of households, nonfinancial corporations and
financial institutions. If we consolidated the balance sheets
of the three sectors all financial assets would cancel, as

they have both issuers and holders, and we would be left
with just tangible assets on the left-hand side and household
net worth on the right. We could thus conclude that the econo-
my's ultimate wealth is its tangible assets while the house-
hold sector is the ultimate wealthholder.

Nevertheless, this consolidation masks the role of the
financial system in reconciling the characteristics of the tan-
gible assets with households' planned consumption patterns.
That role emerges if we examine the separate balance sheets of
the three sectors, as shown in Figure 1.

Households accumulate assets because of discrepancies be-
tween their desired consumption plans and their patterns of
labor income. To some extent tangible assets, such as houses
and consumer durables, serve this purpose by producing streams
of services that households can consume directly and by act-
ing as inflation hedges. In other respects, however, tangible
assets may not be the ideal household savings vehicle.
Productive equipment, for instance, requires special expertise
to maximize the value of its return stream. Tangible assets are
rarely traded on organized markets and may not be easily con-
vertible into cash. Moreover, their pattern of returns may not
coincide with households' desired consumption patterns.
Tangible assets may provide riskier return patterns, for
example, than most households desire or may not yield suffi-
ciently high payoffs under contingencies that are important
to households, such as death or illness.

To help reconcile these desires by households with the
tangible asset characteristics, then, the economy develops a
financial structure, consisting of nonfinancial corporations,
securities markets and financial institutions. Corporations
specialize in holding and operating tangible assets and issue
claims against these assets in the form of debt and equity
securities. Households may prefer allocating some portion
of their wealth to such securities because they require less
management than tangibles, are more easily traded and can be
combined in varying proportions to transform and rearrange
the tangible assets' return streams. Even the degree of trans-
formation possibilities inherent in corporate securities may
not be fully adequate to match households' desired consumption
patterns, however, and this creates a role for financial
institutions. Banks, insurance companies, pension funds and
mutual funds, for example, hold corporate securities and in
turn issue their own claims having different liquidity charac-
teristics and different patterns of return. Furthermore, some
of these institutions purchase household debt securities as
well, thus affording individuals further transformation oppor-
tunities on their own account.

Viewing the financial system from this perspective em-
phasizes the idea that corporate capital structure in the
aggregate is ultimately a matter households' demands for asset
characteristics on the one hand and the corporate sector's

financial transformation technology on the other. On the
demand side, households' desires for various asset charac-
teristics will reflect such factors as their attitudes toward
risk, their expectations, their stage in the life cycle and
personal tax considerations. Moreover, the elasticities of
these demands depend on substitutability among assets, which
in turn depends on the degree of competition among corporations,
financial institutions and households themselves in performing
the desired transformations. The more highly developed the
financial intermediary system and the broader the range of
transformation opportunities possessed by households on their
own account, the less likely it is that corporate securities
will possess unique characteristics, and the more elastic the
demands for these securities will be. On the supply side,
the corporate sector's willingness to transform the return
streams from its real assets by issuing various combinations
of financial securities depends on the costs of doing so,
including transaction costs and tax considerations.

A theory of aggregate corporate capital structure, therefore,
should explain the interaction of both supply and demand factors
and should illuminate the ways in which the corporate sector
responds to changing household demands over time, in competition
with similar responses from financial institutuions and house-
holds themselves.[6] In Section I.B., it will be argued that
previous analyses of corporate capital structure have tended to

make extreme assumptions about either the supply or demand
side of the market or both. Although such assumptions have
proved useful in isolating the role of such factors as taxes
and agency costs, they may not be appropriate if what one
wishes to understand is the unfolding of corporate capital
structure over time.

B.   Implications of Existing Theory for the Determinants of
     Aggregate Corporate Capital Structure

Although much of previous theoretical work has examined
the financing decisions of individual firms, it nevertheless
contains implications for corporate finance in the aggregate.
The purpose of this section is to draw out those implications.
To provide a uniform framework, we will analyze the aggregate
supply and demand curves for corporate debt implied by a
number of previous contributions. In the diagrams that follow,
the aggregate amount of corporate debt, B, will be measured
along the horizontal axis, and since investment will be held
fixed, movements along this axis represent substitutions of
corporate debt for equity. On the vertical axis will be
measured the certainty equivalent yields on corporate debt,
r, and on corporate equity, r_e.[7]

Modigliani and Miller's (MM, 1958) analysis of corporate
capital structure is the logical place to begin, both because
it remains the most widely-cited paper on the topic, and because

it represents the furthest extreme in assumptions about the elasticities of supply and demand for corporate debt. As depicted in Figure 2, both elasticities are assumed to be infinite. Supply is perfectly elastic because corporations can costlessly transform their financing mixes from all-equity to any degree of leverage. Thus they are willing to freely substitute one form of financing for the other as long as both have the same certainty-equivalent cost. But demand is likewise perfectly elastic because households can costlessly perform the same transformations on their own account, and thus they will be unwilling to accept any yield differential between the two securities.

This configuration of supply and demand implies that corporate capital structure is indeterminate not only at the individual firm level but also at the level of the corporate sector as a whole, since corporate and household financial transformation are perfectly substitutable.[8] While this analysis emphasizes the important fact that corporations face competition from other sectors in their financial transformation activities, however, it also doesn't tell us much about factors that would cause the corporate financing mix to change over time. As long as equilibrium in the capital market were continuously maintained, such changes would be largely random events.

Following MM's (1963) correction, which took the effect of corporate taxes into account, a theory that gained

considerable support took the tradeoff between bankruptcy costs and tax savings from the deductibility of interest to be the primary determinant of corporate capital structure.[9] Under this theory the demand for corporate debt is still perfectly elastic, because investors are willing to freely substitute debt for equity as long as their certainty-equivalent yields are equal.[10] The supply of debt is no longer perfectly elastic however. Because of the tax-deductibility of interest, corporations would be willing to pay a certainty-equivalent yield on the first dollar of debt equal to $(1/1-t_c)$ times the certainty-equivalent yield on equity, where t_c is the corporate tax rate. As more debt is issued, the probability of bankruptcy increases, and if bankruptcy imposes costs on firms, the premium rate that they are willing to pay to issue debt decreases. Thus the supply curve for corporate debt is downward sloping, as depicted in Figure 3. Equilibrium is reached when the corporate sector has issued that amount of debt which drives the certainty-equivalent yields on debt and equity into equality. Furthermore, since bankruptcy costs are firm-specific, the optimal capital structure is determinate at the individual firm level as well as at the aggregate level.

According to this theory, the primary determinants of changing patterns in corporate finance would be changes in corporate tax rates and changing perceptions of bankruptcy costs. As corporate tax rates increase, the supply curve for

corporate debt shifts upward, and the equilibrium amount of debt increases. An unappealing implication, however, is that if the corporate tax rate goes to zero, the supply curve for debt will slope downward from the point r_e on the vertical axis and thus no corporate debt at all should be issued. This is clearly contrary to observed corporate capital structures in the U.S. prior to the imposition of the income tax in 1913. Changes in the impact of bankruptcy costs would also shift the supply curve for debt upward or downward. This might occur if the efficiency with which bankruptcies are resolved increases or decreases over time or even if the perceived risk of bankruptcies changes over, say, the course of the business cycle.

The agency theory of Jensen and Meckling (1976) is diagrammatically similar to the tax savings - bankruptcy costs theory, but some of its implications are different. Again the demand curve for corporate debt is perfectly elastic at the level r_e. Likewise the supply curve has its intercept at a point above r_e, because, starting from all-equity financing, the firm can reduce total agency costs associated with outside financing by substituting a dollar of debt for a dollar of outside equity. Thus the firm would be willing to pay a higher certainty equivalent yield on debt to reflect this advantage. As more debt is issued, however, its ability to reduce agency costs at the margin declines and eventually turns

negative, so the supply curve is downward-sloping, as depicted in Figure 4. The difference between this theory and the previous one is that the curves would look like this even in the absence of corporate taxes.[11] The primary determinants of changing patterns in corporate capital structure would be changes in relative agency costs of debt and equity.

The theory that contains perhaps the most implications for the aggregate corporate capital structure, and indeed the only one that is explicitly aimed at the capital structure of the corporate sector as a whole, is Miller's (1977) "Debt and Taxes" model. Here, the supply curve is horizontal since, apart from tax considerations, corporations can costlessly split their return streams into debt and equity portions. Furthermore, because of the tax-deductibility of interest they are willing to pay a premium yield $(r_e/1-t_c)$ to issue debt. Unlike the three theories discussed above, however, personal taxes are considered, and the demand curve is upward sloping, starting from r_e.[12] This is because investors are arrayed in groups subject to successively higher personal tax rates and because tax arbitrage restrictions make it costly for them to mitigate the differing tax consequences of different securities. Thus, since returns on corporate debt are taxed more heavily at the personal level than returns on corporate equity, investors in successively higher tax brackets must

be enticed with successively higher yields to buy these bonds. As depicted in Figure 5, equilibrium occurs when enough bonds have been issued to drive the corporate bond rate up to $r_e/1-t_c$.

In contrast to the tax savings-bankruptcy cost theory and the agency cost theory, however, corporate capital structure is determinate only at the aggregate level, not at the individual firm level. As in the original MM model, corporations and households compete with one another to perform financial transformations, but here they do not all compete on equal terms. Corporations that issue debt reap tax savings at the rate t_c per dollar of interest, and thus they have a comparative advantage in borrowing over those investors with personal tax rates lower than t_c. It will thus pay corporations to keep on borrowing until the marginal shareholder is just indifferent between buying levered shares and borrowing on his own account to buy unlevered shares. This will occur when the marginal shareholder's tax rate is just equal to t_c. Nevertheless, this comparative advantage applies to the corporate sector as a whole, but not to any individual firm. One corporation's debt is as good as any other's, and thus in equilibrium capital structure is of no consequence at the firm level.

One appealing feature of Miller's model is that the equilibrium condition, which may be written as

$$1 - \frac{r}{r_o} (1-t_c) = 0, \tag{1}$$

lends itself particulary well to comparative statics
exercises on the determinants of the aggregate amount of
corporate debt. The equilibrium condition itself can be
thought of as an implicit function, $H(B^*, f) = 0$, of the
optimal amount of corporate debt, B^*, and a variety of
exogenous factors, f, such as tax tates, the inflation rate
and supplies of competing securities. Implicit differen-
tiation can then be used to determine the effect of changes
in these factors on the equilibrium quantity of corporate
debt. Because of their usefulness in interpreting the
capital structure trends described in Section II, it is
worthwhile at this point to work through the details of a
few of these exercises.

The effect of a change in the corporate tax rate, t_c,
for example, holding all other factors constant, would be
given by

$$\frac{\partial B^*}{\partial t_c} = \frac{\partial H/\partial t_c}{\partial H/\partial B} = -\frac{\left[\frac{r}{r_o} - (1-t_c)\partial(\frac{r}{r_o})/\partial t_c\right]}{-(1-t_c)\partial(\frac{r}{r_o})/\partial B} \tag{2}$$

The denominator is negative, since an increase in D will
increase r relative to r_o. Thus the whole expression will
be positive if the numerator is positive. An increase in
t_c, holding all security supplies constant, decreases the

availability of tax-exempt income from shares, and this will
induce high-tax-bracket investors to bid down r_0 relative to r.
Nevertheless, if t_c is approximately equal to 0.5, r/r_0 would
have to rise by about twice its original magnitude for the
whole expression in (2) to be negative, and thus there is a
strong presumption that increase in t_c will be associated with
increases in corporate debt. This exercise is represented
diagrammatically in Figure 6. The increase in the corporate
tax rate from t_c to t_c' shifts the supply curve upward and
brings about a higher level of corporate debt, $B^{*'}$. Notice,
however, that the increase in debt is dampened by the slope of
the demand curve: the steeper is that slope, or, equivalently,
the larger is the change in relative interest rates that is
necessary to induce investors to absorb new bond issues into
their portfolios, the smaller will be the change in B^*.

If the increase in the corporate tax rate is accompanied by
an increase in personal tax rates, t_p, on the other hand, the
resulting change in corporate debt is given by

$$\frac{\partial B^*}{\partial t_c} = -\frac{\left[\frac{r}{r_0} - (1-t_c)\partial(\frac{r}{r_0})/\partial t_c + \frac{\partial(\frac{r}{r_0})}{\partial t_p}\frac{dt_p}{dt_c}\right]}{-(1-t_c)\frac{\partial(\frac{r}{r_0})}{\partial B}} \qquad (3)$$

Since increases in t_p increase the value of tax-exempt income
to investors, r/r_0 would be expected to increase with t_p and any

increase in B* would be smaller than in the previous case where only t_c increased. Diagrammatically, as shown in Figure 7, the increase in t_p rotates the demand curve upward from its intercept so that its slope is everywhere increased. If the increase in personal tax rates is of the same magnitude as the increase in corporate tax rates, it is even possible that the shifts in supply and demand will cancel one another out, leaving interest rates on bonds higher, but the equilibrium quantity of corporate debt roughly unchanged.[13]

Another exogenous factor affecting B^* is the inflation rate. Suppose the expected annual inflation rate suddenly jumps from zero to some positive amount, i. The nominal expected yields on taxable and tax-exempt securities, r_n and r_{on}, which were previously equal to the real yields, r_r and r_{or}, will now be given by

$$(1 + r_r)(1 + i) = 1 + r_n \tag{4}$$

and

$$(1 + r_{or})(1 + i) = 1 + r_{on}, \tag{5}$$

respectively. The effect of inflation on B^*, starting from an initial equilibrium in which there is no expected inflation, is given by

$$\frac{\partial B^*}{\partial i} = - \frac{\partial \left(\frac{r(1-t_c)}{r_o}\right) / \partial i}{-\partial \left(\frac{r(1-t_c)}{r_o}\right) / \partial B} \tag{6}$$

Using (4) and (5), this becomes

$$\frac{\partial B^*}{\partial i} = - \frac{\dfrac{-r_o(1-t_c)(1 + r_r) - r(1-t_c)(1+r_{or})}{(r_o)^2}}{\partial \left(\dfrac{r(1-t_c)}{r_o}\right) / \partial D}, \tag{7}$$

and using the equilibrium condition, $r(1-t_c) = r_o$, gives [14]

$$\frac{\partial B^*}{\partial i} = \frac{t_c/r_o}{\partial \left(\dfrac{r(1-t_c)}{r_o}\right) / \partial B} > 0. \tag{8}$$

Diagrammatically, as shown in Figure 8, the onset of inflation shifts the supply curve upward from $r_{or}/1-t_c$ to $r_{on}/1-t_c$, an upward shift of

$$\frac{r_{on} - r_{or}}{1-t_c} = \frac{i(1+r_{or})}{1-t_c} \tag{9}$$

The demand curve also makes a parallel upward shift from r_{or} to r_{on}, a difference of $i(1+r_{or})$.[15] Thus the supply curve shifts up by more than the demand curve resulting in an increase in B^*.[16]

In the preceding three cases, shifts in the amount of corporate debt outstanding have been ultimately tax-induced. Even in the case of inflation, it is not some sort of "debtor-creditor" hypothesis[17] that explains the increase in corporate debt, but rather the interaction between inflation and taxes. In effect, inflation-adjusted interest rates allow some of the real principal on corporate debt to be deducted for tax purposes, and this increases the tax advantage to debt.[18]

An additional feature of Miller's model is that exogenous changes in the supplies of other securities will also induce changes in B^*. An increase in the supply of tax-exempt bonds, B_o, for example, will result in the following change in corporate debt:

$$\frac{\partial B^*}{\partial B_o} = - \frac{-\partial\left(\frac{r(1-t_c)}{r_o}\right) / \partial B_o}{-\partial\left(\frac{r(1-t_c)}{r_o}\right) / \partial B} . \tag{10}$$

Since an increase in B_o increases r_o relative to r, expression (10) will be positive. From a personal tax standpoint, tax-

exempt bonds are substitutes for equity in Miller's model,
and thus an increase in the supply of tax-exempts encourages
corporations to shift their financing mix more toward debt.

An increase in the supply of (taxable) federal government
bonds, G, on the other hand, has the opposite effect on B^*:

$$\frac{\partial B^*}{\partial G} = -\frac{-\partial \left(\frac{r(1-t_c)}{r_o} \right)/\partial G}{-\partial \left(\frac{r(1-t_c)}{r_o} \right)/\partial B} < 0. \qquad (11)$$

Again, from a personal tax standpoint, taxable government bonds
are a corporate debt-substitute rather than an equity-substitute,
and an increase in the supply of debt-substitutes induces cor-
porations to shift their financing mix more toward equity.

These last two exercises emphasize the fact that the de-
mand curve for corporate debt plays a special role in Miller's
model. In the three other models discussed above, this demand
curve is perfectly elastic, and thus investors are willing
to freely substitute corporate debt for equity securities as long
as their certainty-equivalent yields are equal. In effect,
perfect elasticity stems from the perfect substitutes for cor-
porate securities that can be created either on investors' own
accounts or through financial intermediaries acting on their
behalf. As long as perfectly elastic demands prevail, exogenous
changes in the supplies of noncorporate securities will affect

neither relative yields nor corporate financing decisions. In Miller's model, by contrast, differing tax treatment implies that different types of securities are imperfect substitutes and that the terms on which investors are willing to substitute one type of security for another differ across investors. This implies that exogenous changes in supplies of other securities will cause changes in relative yields and will in turn induce changes in the corporate financing mix.

Taken together, the four theories reviewed in this section yield a number of possible determinants of changing patterns in the aggregate corporate capital structure. These include changes in corporate and personal tax rates and in the expected inflation rate, shifts in the perceived agency and bankruptcy costs associated with corporate securities, and exogenous changes in the supplies of noncorporate securities. In two respects, however, the picture seems incomplete.

First, these determinants of corporate financing patterns rely heavily on tax considerations. Apart from the tax rates themselves, the effect of inflation depends on its interaction with the tax system, and the effect of noncorporate security supplies rests on the fact that the tax system renders security demands less than perfectly elastic. While these tax-related determinants may have been important in recent years, they are incapable of explaining corporate financing patterns in the pre-1913 era. In the absence of taxes, we are left with only agency costs to explain these patterns, and while agency costs may be

an important determinant of cross-sectional variation in corporate capital structures, it is hard to imagine that these costs have shifted enough over time to cause major changes in the corporate financing mix.[19]

Second, all of the four theories reviewed above rely on extreme assumptions about the supply curve for corporate debt, the demand curve, or both. In the Modigliani-Miller, tax savings - bankruptcy costs, and agency cost models, the demand curve is perfectly elastic, while in the Modigliani-Miller and Miller models, the supply curve is perfectly elastic. This perfect elasticity implies that substitution of debt for equity securities is costless either on the part of corporations (perfectly elastic supply) or individual investors (perfectly elastic demand).

On the demand side, at least, perfect elasticity is indicative of a well-developed capital market: that is one in which trading is competitive, transaction costs are low, investors are not subject to trading restrictions, and a full range of securities is available.[20] While this vision of a well-developed capital market has proved to be a highly useful abstraction, however, it may be more appropriate when applied to short periods than to longer historical eras. Over long periods, economic forces would work toward making the capital market more perfect and more complete, and if one is interested in corporate financing trends over such periods, one is then

interested in understanding what role the corporate sector
has played in that process of capital market development.[21]
As argued in Section I.A., a theory of the aggregate corporate
capital structure should illuminate the interaction between the
corporate sector and the other sectors of the economy as they
respond to investors' demands for securities. Although perfectly
elastic demands might emerge as a limiting case toward which
forces tend over time, the theory seems incomplete if it does
not explain the evolving role of corporate finance as the capital
market develops.

C. Further Development of the Demand Side of Aggregate Capital
Structure Theory

   The effect of the security supplies and return-stream
transformation possibilities afforded by other sectors of the
economy will manifest itself primarily in the shapes and
positions of the demand curves for corporate securities. A
logical place to extend existing capital structure theories,
then, is to attempt a richer development of the demand side.
As we have seen above, demands for corporate securities are
perfectly elastic in a complete and frictionless capital market.
In Miller's (1977) model, on the other hand, the tax system
and concomitant tax arbitrage restrictions on investors'
portfolio choices cause the demand curve for corporate debt
to be upward-sloping. Since these restrictions represent a

kind of transaction cost, a natural extension of Miller's model
would be to explore the ways in which other types of transaction
costs would lead to upward-sloping demand curves.

In general, the presence of transaction costs implies that
return streams from corporate securities cannot be costlessly
transformed by individuals or financial intermediaries. To
take an extreme case for illustrative purposes, let us suppose
that return stream transformation (combining shareholdings with
personal borrowing or lending, for example) is prohibitively
costly at the individual investor level. Ignore for the time
being the possible existence of financial intermediaries and
assume that corporations start out relying solely on equity
financing. Individuals, i, have initial endowments of cash,
y_1^i, as well as initial fractional shareholdings, $\bar{\alpha}^i$, in the
aggregate market value of corporate equity, V. There is no
second-period endowment, so individuals must make a consumption-
saving decision that maximizes the expected utility, $E^i(U^i)$,
of first and second-period consumption, C_1^i and C_2^i. As
noted above, however, the only available savings vehicle is
holdings of corporate shares.

Firms in the aggregate are assumed to be subject to the
same uncertainty, and thus the shares of one firm are viewed
as perfect substitutes for those of any other firm. We will
ignore distinctions among firms, then, and simply think of the
corporate sector in the aggregate. The aggregate net income

of firms in the second period is $\tilde{\Theta}\bar{X}$, where $\tilde{\Theta}$ is a random variable. In general, individuals may differ in their views of the distribution of $\tilde{\Theta}$ and their subjective probability density functions will be denoted by $f^i(\tilde{\Theta})$.

A representative individual's consumption-saving problem is

$$\max_{\alpha^i} \int U^i(C_1^i, \tilde{C}_2^i)f^i(\Theta)d\Theta, \tag{12}$$

where

$$C_1^i = Y_1^i + (\bar{\alpha}^i - \alpha^i)V, \tag{13}$$

and

$$\tilde{C}_2^i = \alpha^i\tilde{\Theta}\bar{X}. \tag{14}$$

The first order condition is

$$\frac{\partial U^i}{\partial \alpha^i} = \bar{X}E^i(\tilde{U}_2^i \tilde{\Theta}) - VE^i(\tilde{U}_1^i) = 0, \tag{15}$$

where

$$E^i(U_2^i \tilde{\Theta}) = \int \tilde{\Theta}(\partial U^i/\partial C_2^i)f^i(\tilde{\Theta})d\Theta,$$

and

$$E^i(U_1^i) = (\partial U^i/\partial C_1^i)\, f^i(\tilde{\Theta})d\Theta \ .$$

Using the fact that $\text{cov}(\tilde{A}\tilde{B}) - E(\tilde{A}\tilde{B}) - E(\tilde{A})E(\tilde{B})$, where $\tilde{A}$ and $\tilde{B}$ are any two random variables, (15) may be written as

$$V = \bar{X}\left(\frac{E^i(\tilde{U}_2^i)\, E^i(\tilde{\Theta})}{E^i(\tilde{U}_1^i)} \ + \ \frac{\text{cov}(\tilde{U}_2^i\, \tilde{\Theta})}{E^i(\tilde{U}_1^i)} \right). \tag{16}$$

That is, each individual buys or sells shares until his personal valuation of corporate equity is exactly equal to the market's valuation, V.

As indicated by the right-hand side of (16), however, the individual's personal valuation has two components, which need not be equal separately for all individuals. If we assume away differences in expectations for the moment and let $E^i(\tilde{\Theta}) = 1$ for all individuals, the first component $E(U_2^i)/E(U_1^i)$, (hereafter, tildes will be dropped for convenience), can be thought of as a personal discount factor for certain prospects and the second component can be thought of as a personal risk-adjustment factor. From (16), those investors with higher certainty discount factors (that is, those who place a higher value on certain future consumption) must have correspondingly larger (i.e., more negative) risk-adjustment factors.[22]

If we aggregate by summing (16), weighted by individual shareholdings, over all individuals, the result is

$$\sum_i \alpha^i V = V = \bar{X}\left(\sum_i \alpha^i \frac{E(U_2^i)}{E(U_1^i)} + \sum_i \alpha^i \frac{cov(U_2^i \Theta)}{E(U_1^i)}\right) \qquad (17)$$

and the cost of equity financing to the corporate sector may be expressed as

$$\frac{\bar{X}}{V} = \frac{1}{\sum\limits_i \alpha^i \dfrac{E(U_2^i)}{E(U_2^i)} + \sum\limits_i \alpha^i \dfrac{cov(U_2^i)}{E(U_1^i)}} \qquad . \qquad (18)$$

That is, the cost of equity is determined by weighted averages of investors' certainty discount factors and risk-adjustment factors. Furthermore, since the second term in the denominator of (18) can be thought of as the overall market risk-adjustment factor, the market certainty-equivalent cost of equity, r_e, is given by

$$r_e = \frac{1}{\sum\limits_i \alpha^i \dfrac{E(U_2^i)}{E(U_1^i)}} \qquad . \qquad (19)$$

If firms were now to begin substituting some debt financing for equity,[23] those investors with highest certainty discount factors (that is, those placing the highest personal value on
. this debt), would be the first to buy it. Since these investors

would have higher-than-average certainty discount factors
relative to the market as a whole, (19) indicates that
firms could sell at least an initial increment of debt at a
lower certainty-equivalent cost than that on equity. In
effect, the corporate sector is able to gain by splitting
off part of its total return stream, packaging this part in
the form of riskless securities and selling them to the most
risk-averse segment of the investing population.

As more corporate debt were sold, it would be purchased by
investors requiring progressively higher certainty-equivalent
yields. Thus we would have an upward sloping demand curve
for corporate debt, just as in Miller (1977). In Miller's model,
the upward slope is attributable to tax arbitrage restrictions,
whereas here it is attributable to restrictions on individuals
creating their own bonds, so in both cases demand is less than
pefectly elastic because investors find it costly to transform
corporate return streams on their own account. The supply curve,
on the other hand, would be perfectly elastic at r_e, since
transformation by firms is costless and thus firms would be
willing to freely substitute debt for equity financing as long
as their certainty-equivalent yields were the same. The result-
ing equilibrium is depicted in Figure 9, with corporations
issuing that amount of debt, B^*, sufficient to drive the cost
of debt, r, into equality with r_e.

As in Miller's model, the aggregate amount of corporate debt
is determinate, but in equilibrium the capital structure decision

is irrelevant at the individual firm level. Because of trading restrictions on investors, there is a demand for transformation services on the part of the corporate sector, and firms compete with one another to supply these services. Since all firms compete on equal terms, however, profits from financial transformation are squeezed out, and the most risk-averse investors reap a "bond-holders' surplus," just as those investors in the lowest tax brackets do in Miller's model.

Differences in investor expectations would play a similar role to differences in their attitudes toward risk in this model. If we held risk-adjustment factors constant across all investors in equation (16) but allowed expectations to vary (as represented by differences in $E^i(\Theta)$), those investors who were most optimistic about the corporate sector's prospects (i.e., who had higher values of $E^i(\Theta)$) would have lower certainty discount factors. The most pessimistic investors, conversely, would be willing to accept the lowest return on corporate debt. The demand curve for corporate debt would thus be upward-sloping as before, and equilibrium would be reached when enough debt had been issued so that the marginal bondholder were exactly as optimistic about firm's prospects as the marginal shareholder.

In summary, then, it is investor characteristics such as risk-aversion and expectations, that drive the equilibrium corporate financing mix in this model. Loosely speaking, the

larger is the segment of the investing population exhibiting

high degrees of risk aversion and pessimistic expectations,

the greater will be the amount of corporate debt.[24] In models

with perfectly elastic demands for corporate securities,

differences in these investor characteristics are capable of

being exploited through financial transformations elsewhere

in the economy, and hence they play no role in the determination

of corporate capital structure. In the model presented in this

section, by contrast, the sole purpose of issuing a mix of corpor-

ate securities is to exploit those differences.

The transaction costs that impart positive slope to the de-

mand curve in this model are, of course, unrealistically severe.

In practice, one would expect firms to face competition in

their efforts to overcome transaction costs through financial

transformation. Overcoming such costs and helping to satisfy

divergent investor demands, in fact, is one of the primary ration-

ales given for the existence of financial intermediaries.

In general, then, not only the corporate sector but also

the financial intermediary and household sectors will have access

to financial transformation technologies. To the extent that

the corporate sector's technology exhibits cost advantages over

those of other sectors, the corporate sector will tailor its

financing mix to exploit these advantages. In this case, shifts

in such investor characteristics as expectations and attitudes

toward risk will be important determinants of changing patterns

in corporate finance. To the extent that financial intermediaries or investors themselves can transform return streams at relatively low cost, on the other hand, demand curves for corporate securities will be highly elastic, and divergent investor characteristics will have little role in determining the corporate sector's financing mix. Moreover, it might be reasonable to suppose that the progression from the first case to the second would bear some relationship to the development of the capital market over time. In earlier times, when investors faced a less plentiful array of financial transformation opportunities, one would expect the intermediation role of corporate finance to be relatively important. As the capital market develops, however, and as investors come to rely less on corporations for financial transformation, this role would be expected to diminish.

To draw together some of the threads of Section I as a whole, the most general representation of the supply and demand for corporate debt would be one in which both curves exhibited less than perfect elasticity. This is depicted in Figure 10.[25] The shape of the supply curve will reflect such aspects of the corporate sector's transformation technology as bankruptcy costs, agency costs and the costs of issuing and servicing securities. The less important are these costs, the more elastic the supply curve will be. Moreover, the level of the supply curve will be determined by such factors as corporate taxes and the expected inflation rate as well as the general level of

real interest rates in the economy. The shape of the demand
curve reflects the transformation technology available to
investors, either on their own account or through financial
intermediaries. The lower the costs of using this technology
the more elastic the demand curve will be. Conversely, the
higher the costs associated with this technology the less
willing investors will be to freely substitute one type of
corporate security for another. In this case investor expec-
tations and attitudes toward risk, personal tax considerations,
and supplies of competing securities (government bonds) will
all affect the shape and position of the demand curve for cor-
porate bonds.

This general representation of the supply and demand for
corporate securities contains each of the theories reviewed in
Section I.B. as a special case. It has the advantages that is
does not rely solely on tax considerations to explain the
corporate sector's financing patterns and that it is capable of
taking into account the evolving role of the corporate sector in
the financial system as a whole. Trends in the major determin-
ants of corporate finance implied by the theory will be compared
with the actual patterns in corporate financing over the course
of the twentieth century to see which factors may have been
most important. First, however, it is necessary to establish what
those financing patterns have been.

II. Measurement of Capital Structure Trends

Identification of the secular trends in corporate financing
is hampered by a variety of measurement problems. Comparable data
series often are not available over long periods of time. Accounting
conventions are subject to change, and fluctuations in economic
conditions, especially the rate of inflation, may destroy the com-
parability of accounting numbers between periods. Market value
numbers may be used in their stead, but these must be estimated with
some error, and it is unclear to what extent market values reflect
the actual financing decisions of corporations and to what extent
they reflect other exogenous factors.

The approach taken here will be to present a variety of different
measures of corporate financing trends and to then try to infer the
common patterns that emerge. Four different types of data have been
used in previous studies of corporate financing and all four will be
presented sequentially in the sections that follow. These include
book value, market value, replacement cost and flow-of-funds data.
Each type of measurement has its problems and advantages, and these
will be discussed as the data are presented.

A. Book Value Balance Sheet Data

Perhaps the simplest approach to assessing corporate finan-
cing patterns is to examine changes in the composition of the
liability side of the corporate balance sheet. This was the
approach adopted by Miller (1963), for example, in a study
undertaken for the Commission on Money and Credit. The In-
ternal Revenue Service compiles balance sheet data for both

U.S. corporations in the aggregate and for U.S. manufacturing
corporations, and Miller's study examined these data for the
period 1926-56. Using data through 1975, Table 1 presents a
variety of balance sheet ratios from this source.

As Miller pointed out in his study, the ratios of long-
term debt to total long-term capital remain impressively stable
through the mid-1950's. They fluctuate somewhat, but virtually
no trend is evident. The ratios of total debt (including lia-
bilities of all kinds) to total assets show some tendency to
rise in the late 1930's and early 1940's but exhibit no trend,
thereafter until at least the late '50's.[26] The use of preferred
stock, on the other hand, exhibits a steady secular decline
through the early 1960's.[27]

Data that was not available to Miller at the time of his
study, however, suggest that debt ratios have tended to drift
steadily upward since the late 1950's. This may indicate a
fundamental change in corporate financial policy, although Miller
(1977) has warned that at least some of this apparent trend may be
spurious. Liberalized depreciation allowance since the early
1960's, for example, would tend to depress reported equity values
and would automatically tend to increase debt ratios. By the same
token, inflation in the 1960's and 1970's may have caused reported
asset values to be understated, thus giving a misleading impression
of the size of corporate debt relative to assets.[28]

If capital markets are efficient, investors should see
through these accounting changes and should also adjust for the

effects of inflation.[29] In an attempt to circumvent these problems, then, we turn next to balance sheet ratios in market value terms.

B. Market Value Balance Sheet Data

Since market value data are not available for the nonfinancial corporate sector as a whole, they must be estimated. A variety of estimates using somewhat different techniques is presented in Table 2.

The most common approach is to take dividend and interest payments reported by corporations and to capitalize these at appropriate rates to obtain estimates of the market values of equity and debt respectively. This approach has been followed by Holland and Myers (1979), using the dividend yield on the Standard and Poor's Composite Index and Moody's Baa corporate bond rate as capitalization rates. Their estimates, updated through 1979, are shown in column (1) of Table 2. Like the accounting numbers in Table 1, these estimates suggest that there has been a considerable increase in corporate debt ratios since the late 1950's. A major portion of this increase has apparently occurred during the decade of the '70's. The increase is not nearly as smooth as the accounting numbers suggest, however, as dips occur in the early and late 1960's and again in the early and late '70's. Furthermore, although the 1930's and '40's might hardly be characterized as a normal period the estimates at least suggest that the debt ratios occurring in the 1970's are by no means unprecedented.

The estimates in columns 2 and 3 are from von Furstenberg (1977) and they differ in two respects. First, dividend payments for common and preferred stock have been separated and capitalized at different rates. Second, von Furstenberg argued that the weighted average rating of corporate bonds outstanding has tended to be A or slightly better. He thus capitalized interest payments using the A-rated bond yield and also attempted to take into account the maturity composition of corporate debt. His estimates give consistently higher values for corporate debt ratios than those of Holland and Myers, partly because of the lower capitalization rate for corporate debt and partly because the higher dividend yield on preferred stock gives a lower estimate for the combined market value of common and preferred stock. Nevertheless, the two series move in unison and von Furstenberg's estimates suggest a considerable rise in corporate debt ratios since the mid-1950's and the same higher plateau in the 1970's. The estimates also reveal ·that the relative value of preferred stock has remained low throughout and has generally tended to decline, with the exception of a modest comeback in the mid-1970's.

A third approach has been followed by Gordon and Malkiel (1981), who use the sample of nonfinancial corporations for which data is reported on the Standard and Poor's Compustat Tapes. Market values of common equity can be observed directly for these companies. Market values of debt and preferred stock have been

estimated using methods similar to von Furstenberg's but with

the estimates derived from bond and preferred stock prices

sampled at the two-digit industry level. Again, the estimated

debt ratios, shown in column 4 of Table 2, move in parallel

with the other two series, with their absolute magnitudes

generally falling between the other two. The estimates suggest

the same increase in debt ratios, particularly since the late

1950's. Since both the von Furstenberg and the Gordon and

Malkiel estimates range over a shorter period than those of

Holland and Myers, however, they may give the impression that

current debt ratios are higher by historical standards than is

really the case.

The last approach to estimating market values, followed

by Ciccolo (1981), uses observed market values for all securities

for samples of roughly fifty U.S. manufacturing firms. Ciccolo

has reported market value balance sheet ratios for the aggregate

of his sample firms for selected years, and these are shown in

the last two columns of Table 2. The debt ratios are generally

much lower than those in the other series and do not move in

parallel with the Holland and Myers estimates for the early

years. The fact that the debt ratios are so much lower for all

years suggests that the sample may not be representative of the

nonfinancial corporate sector as a whole. Nevertheless, Ciccolo's

figures reveal the same increase in debt ratios since the 1960's

that the other series do. Moreover, the preferred stock figures

confirm the secular decline in the importance of preferred

stock that appears in the accounting data of Table 1.

C. Replacement Cost Data

Another ratio that has been used in previous studies to

measure corporate leverage is that of the market value of

debt to the replacement value of total assets. On theoretical

grounds, this ratio may be a better measure than those in

Table 2 of how much debt firms have relative to their debt

capacity.[30] Furthermore, measuring assets at replacement cost

alleviates the overstatement in book value ratios during in-

flationary periods that results from the understatement of

corporate assets. In any case, estimates of the ratio of the

market value of debt to the replacement value of assets are

available over a long period.

Two series of these ratios are available. One is from

von Furstenberg's (1977) study and runs annually from 1952

to 1976, while the other is from Goldsmith's (1963) study of

national balance sheets. Goldsmith's estimates are available

for selected years from 1900 to 1945 and annually from 1945 to

1958. The two series are shown in Table 3. The figures from

Goldsmith suggest that nonfinancial corporations' use of debt

financing relative to the replacement value of their assets

was markedly lower in the decade following World War II than

it had been earlier in the century. The figures from von

Furstenberg indicate that, after remaining essentially flat for

much of the 1950's, corporate debt ratios began a gradual
but steady rise that carried through the late 1970's.

It can be seen from the years of overlap in the 1950's
that there are some discrepancies between the two series.
The ratios derived from Goldsmith's data, for example, are con-
sistently somewhat lower than von Furstenberg's.[31] Moreover,
Goldsmith's series itself may not give comparable data between
pre-war and postwar periods.   Balance sheets from the pre-war
period are from Goldsmith's A Study of Saving in the United
States (1958) while the annual data from 1945 to 1958 are from
his Studies in the National Balance Sheet of the United States
(1963). Some changes in sectoral definitions and estimation
methods occurred between these two studies, and the only year
of overlap, 1945, indicates that these changes may have caused
some differences in the debt ratios.

Nevertheless, some tentative conclusions can be drawn.
Between 1952 and 1958, Goldsmith's and von Furstenberg's series
move quite closely together, and it may be that they would exhibit
similar trends throughout the whole period 1900-1978. If so, it
appears that even though corporate debt ratios increased substan-
tially in the postwar period, particularly from the mid 1950's
to the mid 1960's, the debt ratios of recent years are not un-
usual by historical standards. Even if it is argued on the basis
of the two 1945 estimates that the pre-war figures are overstated
by a third, the debt ratios of the 1960's and 1970's would still

represent a return to roughly the levels that prevailed over

the pre-war period. The replacement value data, then, provides

some further support for the impression gained from market value

data that, while debt ratios have increased in recent decades,

after a relatively flat period in the 1940's and '50's, they are

nevertheless not unusual by prewar standards.

D. Flow of Funds Data

The final method for measuring corporate financing patterns

makes use of flows of funds over periods of time as opposed to

stocks at particular dates. While this method does not take into

account valuation changes, as market value and replacement value

estimates do, it may nevertheless come closest to recording the

actual decisions made by corporations. Furthermore, since capi-

tal consumption allowances are included as a component of in-

ternal equity financing, this method is not subject to Miller's

criticisms about understatement of equity financing in the wake

of changes in depreciation accounting.

Between Goldsmith's Study of Saving data, which run from

1900-45, and the Federal Reserve Flow of Funds Accounts which

cover the period 1946 to the present, it is possible to put to-

gether a fairly lengthy record of corporate financing flows.

The data are shown in Table 4. Since the emphasis of this

paper is on secular patterns in corporate finance, the flows

are divided into periods covering roughly a decade each.

The same data have previously been examined by Kuznets
(1961), Sametz (1964) and Friedman (1980). Kuznets and
Sametz were limited to the period 1900 through the late 1950's.
Both were struck by the sharp decline in the use of stock
issues as a financing source and both argued that internal funds,
disregarding the aberrant years of the Depression and World War II,
had shown at least a modest upward trend relative to other finan-
cing sources. Both authors also pointed out that, although
short-term liabilities fluctuated considerably, they generally
increased relative to both total financing sources and total debt
through the late 1950's. Finally, Sametz emphasized that des-
pite trends in internal funds and external equity and in short-
term and long-term debt, the use of total debt financing rela-
tive to total equity financing appeared to have remained roughly
constant over long periods of time.

Friedman, confining his attention to the postwar period,
pointed out that internal funds first increased relative to
total sources in the 1950's and then decreased in the '60's
and '70's. He also emphasized the continued decline in stock
issues, an increased use of debt, and in the late '60's and '70's
an increase in the use of short-term debt.

Looking at the whole period, as shown in the data in
Table 4, the trends discussed by all three authors are evident,
and at the same time some longer-run trends come into sharper
focus. It is clear, for example, that the use of debt finan-
cing has increased in the 1960's and 1970's after recovering in

the years following World War II to pre-Depression levels.

Use of long term debt, however, is by no means unusual, even

after steady postwar increases, relative to the levels pre-

vailing in the first decade of the century and in the 1920's.

The increased use of debt, then, seems largely attributable

to an increase in short-term liabilities. It should also be

noted that short-term liabilities have shown considerable

fluctuations over time, with substantial increases occurring

in the 1913-22 period and again during the World War II years.

Although it cannot be denied that short-term liabilities have

been much higher in the postwar period than in the pre-war

years, it is not clear if the recent surge represents a tem-

porary phenomenon or the continuation of a trend.

On the equity side, the greatly diminished use of stock

issues appears to be a long-term trend. Stock issues staged a

modest comeback in the 1970's, compared with the 1960's, but

they remain very low by pre-war standards. As has been widely

noted, internally generated funds have also declined relative

to total sources during the postwar period. The data indicate,

however, that the depressed levels of internal funds experienced

in the 1970's are not unusually low relative to the levels of

the first decade of the century and the 1920's. It might be

inferred, instead, that the use of internal funds was unusually

high during the period 1930-1960 and that the past two decades

have witnessed a return to roughly the levels experienced during

the pre-Depression era.

E. Common Trends

Viewing the different measures of corporate financing
patterns simultaneously, some common threads appear . First,
the use of debt financing has increased considerably in the
postwar period, particularly in the 1960's and '70's. This
trend emerges regardless of the method of measurement employed.
There is considerably more doubt, however, as to whether current
debt levels are unusually high relative to those of the pre-
war period. The accounting-based data of Tables 1 and 4
suggest that they are, but the measures that make some attempt
to correct for valuation changes, as shown in Tables 2 and 3,
indicate that this may not be true. At the very least, the
trend in corporate debt ratios has not been unindirectional.
Rather, these ratios appear to have been somewhat low in the 1920's
and especially in the years surrounding World War II. Thus the
postwar surge in corporate debt does not appear to be as dramatic
when viewed in the light of the whole century's experience as
it does when the postwar period is considered in isolation.

Second, some changes have occurred within the debt and equity
components of corporate finance. Although it is traceable only
in the sources and uses of funds data, there appears to be
little doubt that short-term liabilities have increased in im-
portance over time. Again, however, the trend is not unidirec-
tional. Within the equity component, there is no doubt that
issues of both preferred and common stock have declined con-
siderably in relative importance. Internally generated equity

on the other hand is currently low relative to the previous few
decades, but whether it is unusually low when a longer-run view is
taken is far less clear.

III. Interpretation of Capital Structure Trends

Having reviewed the secular patterns in various measures of cor-
porate financing activity, the remaining step is to interpret these
patterns in the light of the theory developed in Section I. This
interpretation will be drawn from a comparison of the trends in
corporate capital structure's determinants, as suggested by the theory,
with the capital structure trends themselves. The primary deter-
minants that can be readily traced are corporate and personal tax
rates, the rate of inflation, the relative supplies of substitutes
for corporate securities, and the extent of financial intermediation
in the economy. These will be examined in turn in the paragraphs
that follow.

This paper should be regarded as a preliminary attempt to link
theory and evidence, and this section does not contain a rigorous
empirical test of the theory. It is hoped, in fact, that the em-
pirical regularities discussed here will stimulate further refinement
of an aggregate corporate capital structure theory. Nevertheless,
existing theories are assessed in terms of their ability to explain
these regularities.

A. Corporate and Personal Tax Rates

As was seen in Section I, tax considerations are an important
element of capital structure determination in both the tax

savings-bankruptcy costs and Miller (1977) models. They would also play a role, though not necessarily the preeminent one, in the more general supply-and-demand model with which Section I concluded.

Movements in marginal corporate and personal tax rates from 1913 to the present are shown in Table 5. Personal tax rates for those investors in the lowest and highest marginal brackets are shown in columns (1) and (2), respectively, while the corporate tax rate is shown in column (3).

The implications of these rates for corporate financing decisions may perhaps be drawn more sharply if we compute what Grier and Strebel (1980) have referred to as the "net debt incentive tax ratios," δ, for investors in the lowest and highest tax brackets. This ratio is defined as

$$\delta = 1 - \frac{1-t_c}{1-t_{pB}} \quad , \tag{20}$$

where t_c is the corporate tax rate and t_{pB} is the personal tax rate on ordinary income.[33] Columns (4) and (5) of Table 5 give time series for δ_L, the debt incentive tax ratio for investors in lowest tax bracket, and δ_H, the ratio for investors in the highest bracket, respectively.

Expression (20) indicates that δ will be positive for investors in tax brackets lower than t_c and negative for investors in tax brackets higher than t_c. In effect, low tax-

bracket investors will prefer to borrow through corporations
so as to maximize the tax advantage of debt, and conversely,
high tax-bracket investors will prefer to borrow on their own
account.[34]   Looking at values of δ for investors in the
lowest and highest tax brackets, then, gives some idea of the
strength of the demand for corporate leverage from low tax-
bracket investors and of the aversion to corporate leverage on
the part of high tax-bracket investors.[35]   Inferences must be
limited, of course, without further knowledge of the distri-
bution of wealth generally and shareholdings in particular
among investors in different tax brackets. Nevertheless, one
would expect that if δ values tend to increase over time for
both high and low tax-bracket investors, the demand for cor-
porate leverage would also increase. In addition, during times
when δ values are small, even for low tax-bracket investors,
one would expect that any tax advantage to corporate debt would
be more easily offset by such factors as bankruptcy and agency
costs.

Turning to the values of δ in Table 5, the tax code
apparently gave little or no incentive for corporate leverage
in the early years of its existence. Until the early 1920's,
even investors in the lowest tax brackets had little incentive,
purely from a tax standpoint, to hold shares in levered firms,
while high tax-bracket investors often incurred a substantial
tax disadvantage from corporate leverage. During the 1920's
this tax disadvantage for high tax-bracket investors grew much

smaller, but at the same time the tax advantage for low tax-bracket investors remained small. It was not until the 1940's, when corporate tax rates rose dramatically, that the δ values grew very much for low tax bracket investors. From 1940 to 1954, these δ values for low tax-bracket investors approximately doubled, whereafter they have remained essentially unchanged to the present. Since top-bracket personal tax rates were very high in the 1940's and 1950's, the δ values for high-bracket investors were also very negative during this period. These δ values have become less negative in the 1960's and 1970's.

Overall, then, it can be inferred that the tax system should have given rise to a demand for corporate leverage on the part of at least a segment of the investing population. This demand should have shown particular growth, moreover, between the 1920's and the early 1950's. In addition, the less negative values of δ_H from the mid-1960's to the present may indicate an atmosphere more conducive to corporate debt in recent years.

Comparing these trends with those discussed in Section II, however, it is apparent that tax considerations are not the sole determinant of patterns in corporate sector financing. Although the values of δ_L were small immediately following the advent of the income tax system, they roughly doubled in the 1920's, again in the 1930's and again in the 1940's. Despite the apparent increase in the demand for corporate leverage, however, the tables in Section 2 indicate that corporate debt usage fell for at least the first two decades following 1913 and that

it remained low at least through World War II. The increases

in both δ_L and δ_H that have occurred since the 1940's are

broadly consistent with increased corporate leverage that has

occurred since that period, but the two trends are not closely

synchronized.[36] According to Tables 2 and 4, the largest

increases in corporate debt financing appear to have occurred

during the 1970's, for example, whereas the debt tax incentive

ratios have been relatively flat during that time.

B. Perceived Bankruptcy Costs

     If the tax system alone is not sufficient to explain the

patterns in corporate financing, some supplementary determinants

must be invoked. One possibility is perceived bankruptcy costs.

There is some plausibility, for example to the notion that in-

creased tax incentives for corporate debt in the late 1930's

and early '40's were overwhelmed by a tremendous increase in

perceptions of bankruptcy risk in the wake of the Depression.

In a similar vein, Gordon and Malkiel (1981) point to the

figures in Table 2 and argue that increased economic instability

since 1974 has again increased perceptions of bankruptcy risk,

causing corporations to retreat somewhat in their use of debt

financing. Bankruptcy costs have the disadvantage, however, that

they cannot ben measured with any precision, and the timing of

any shifts is especially hard to pin down. One might wonder why

bankruptcy fears would not have been allayed sooner following the

Depression, especially in view of the increased tax incentives

for debt. Moreover, one might ask why corporate debt financing

was apparently relatively small in the 1920's, even though tax

incentives increased and investors are generally believed to have

been unusually optimistic about firms' prospects.

C. Inflation

Another supplementary factor is the inflation rate. As dis-

cussed in Section I, inflation can enhance the real tax advantage

to debt, and thus the interaction between taxes and inflation

may produce an explanation of corporate financing patterns that

is superior to that of taxes alone.

Some idea of inflation trends can be gained from the yearly

percentage changes in the implicit GNP price deflator, shown in

Table 6 for the years 1901 to the present.[37] From these it might

be concluded that the relatively high inflation rates of the

late 1960's and the 1970's interacted with relatively high debt

tax incentive ratios to produce an increase in corporate debt

financing during this period. There was also a temporary in-

crease in corporate debt usage coinciding with both the increase

in debt tax incentive ratios and the inflationary burst of the

immediate post-World War II years.[38] Earlier, however, the

years surrounding World War I were also years of relatively high

inflation rates coupled with rising debt tax incentive ratios

(at least for investors in low tax brackets). The data in

Section II indicate, though, that corporate debt financing was

lower in that decade than in the one preceding it. Again,

therefore, although the interaction between taxes and inflation

probably contributed to increased debt usage in recent years,

it does not appear to be the sole determinant of corporate

financing patterns.

D. Supplies of Substitute Securities and the Evolution of the

Financial Intermediary System

It will be recalled from Section I that changes in relative

security supplies or in the extent of financial intermediation

played no role in models with perfectly elastic demands for

corporate securities. In the more general model with costly

financial transformation, however, these factors can affect

the portfolio opportunities available to investors and hence

the equilibrium yields and quantities of corporate securities.

Some idea of the relative position of corporate debt in the

economy may be gained from Table 7, which shows the total

liabilities of the nonfinancial corporate, federal government,

state and local government and financial institution sectors as

well as the mortgage liabilities of the household sector, all

expressed as percentages of total domestic liabilities

outstanding. Data are available from Goldsmith (1963) for selected

years from 1900 to 1945 and annually from 1945 to 1958. Annual

data are also available from the Federal Reserve Flow of Funds

Accounts for the years 1945-'78. The series for U.S. government

debt and household mortgage debt are intended to reflect supplies

of securities that might act as close substitutes for corporate

debt in investors' portfolios.[39]   As indicated in one of

the comparative statics exercises in Section I, the supply

of state and local government debt acts, from a tax standpoint

at least, as a substitute for corporate equity. Finally, the

series on financial institution liabilities is intended to

serve as a rough index of the strength of the financial inter-

mediary system. As indicated in Section I, the importance of

corporate finance as an intermediation device may be conditioned

by the development of this system.

The data suggest that in the post-World War II years, cor-

porate liabilities have been much smaller relative to total

liabilities than in the pre-Depression era. There has also

been little if any trend in the share of corporate liabilities

since the 1950's. While the data in Tables 1-4 indicate that

corporate debt financing has increased relative to equity

since that time, therefore, corporate debt has still only kept

pace with the postwar expansion in liabilities for the economy

as a whole. The share of corporate liabilities dropped sharply

during the Depression and World War II before recovering some-

what during the years 1945-'50. Since that time a modest up-

ward trend seems to have occurred through the mid-1970's

followed by a mild decline.

Liabilities of the federal government by contrast, were

quite small at the beginning of the century and remained so

until the Depression, even including the increase surrounding

World War I. During the Depression and especially during World

War II, however, federal government debt mushroomed relative

to that of the other sectors of the economy. Thereafter,

it declined steadily before reaching an apparent plateau around

1970.

On the whole, state and local government and household

mortgage liabilities have been smaller than those of the corpor-

ate and federal government sectors. State and local government

debt has remained relatively small throughout, with the highest

plateau being reached in 1960's and early '70's. Household

mortgage debt hovered around five percent of total liabilities

in the pre-Depression era, before falling somewhat by the end

of World War II.[40] Since then it has increased at a slow but

steady pace and in recent years household mortgage debt has been

larger than that of the federal government and only slightly

smaller than corporate liabilities.

Finally, the share of financial institution liabilities

appears to have followed a secular upward trend. An increase

seems to have occurred in the late 1930's, although there is

some conflict between the Goldsmith data and the Flow of Funds

data as to whether this represented a dramatic upward shift.

After remaining steady between 1945 and 1960, the share of fin-

ancial institution liabilities again appears to have begun

increasing in recent years, albeit at a relatively slow pace.

The theory in Section I suggests that if the demand curve

for corporate debt is not perfectly elastic, exogenous in-

creases in the supplies of substitute securities will reduce

the equilibrium amount of corporate debt. Broadly speaking,
this proposition appears to receive some support from the
data in Table 7. Particularly in the first half of this century,
the share of corporate liabilities has tended to move in the
opposite direction from that of federal government liabilities.
At the same time that federal government debt was taking its
great upward leap during the Depression and World War II, for
example, the share of corporate liabilities declined dramatically,
as did the share of debt in total corporate financing. Similarly,
in the immediate postwar years the share of corporate liabilities
staged a modest recovery, and corporate debt financing increased
relative to equity, at the same time that the share of government
liabilities was declining. Corporate debt financing generally
continued to increase relative to equity from the 1950's through
the present at the same time that the share of federal government
liabilities has continued to fall.

There are some points at which the data and the theory do
not coincide exactly. Little can be inferred, for example,
about the relationship between corporate financing patterns and
movements in state and local government liabilities or household
mortgage liabilities. If anything, the share of corporate
liabilities seems to have moved in the same direction as that
of household mortgages.[41] Moreover, corporate debt financing
has shown its largest increases of the postwar years during the
1970's, a time when the relative supply of government securities
has been essentially flat.

Nevertheless, the effect of relative security supplies shows at least enough promise to warrant further investigation in future work.[42] The potential explanatory power of this factor seems particularly great during the early decades of the century when tax considerations were non-existent or of lesser importance. In addition, substitution relationships may have some bearing on aspects of corporate finance, such as the maturity structure of debt, that are unrelated to tax considerations.[43]

It is more difficult to formulate precise hypotheses about the effect of financial intermediation on corporate finance. It seems clear that the development of the financial intermediary system facilitates corporate external financing by making it easier for new issues of corporate securities to be absorbed by the capital market. It is less obvious, however, whether the system's capacity to absorb these issues would favor debt financing over equity by corporations or vice versa.

To the extent that corporate securities themselves play the role of an intermediary between the characteristics of firms' real assets and investors' portfolio needs, the scope for that role would seem greatest when the system of financial intermediaries is less highly developed. In particular, investors may have limited access to relatively safe securities at such times and thus their demand for corporate debt may be high. A tentative interpretation of the data in Table 7 that is consistent with corporate securities playing an intermediary role, then, is as follows: In the earlier decades of the century, corporations

may have played a more substantial intermediary role than has

been true in recent decades. Investors' demands for relatively

safe, fixed-dollar claims were not met to such a degree in the

earlier decades by either the government or financial institu-

tions as has been the case in more recent times. These factors

may help account both for the relatively high proportion of

debt in total corporate financing and for the relatively high

proportion of corporate debt in total domestic liabilities in

the early part of the century. In the years following the

Depression, however, this intermediary role of corporate debt

has probably been reduced, both by increased relative supplies

of federal government and household mortgage debt and by the

increased extent of financial intermediation.[44]

By the present time, both the market for corporate debt and

for corporate stock have become heavily institutionalized and

it would be much more difficult to describe convincingly an overt

intermediary role played by these securities. Still, certain

shifts in corporate financial structure may at times be linked

to shifts in the costs of financial intermediation. It is

widely held, for example, that recent interest rate volatility

has made it increasingly dangerous for financial institutions

to intermediate between long-term financial assets and short-

term liabilities. This may account in part, then, for the shift

in corporate liabilities toward increasingly short maturities.[45]

E. Summary and Conclusions

Overall, it has been argued in this paper that in order to

explain the secular patterns in aggregate corporate financing,

it is necessary to employ a theory explicitly aimed at the
aggregate corporate capital structure. The outline for such a
theory has been developed here, building on previous theoretical
contributions, and containing those contributions as special
cases. The feature of this theory that is somewhat novel is
the emphasis on the costs of financial transformation and hence
on the role of corporations as intermediaries. It has been argued,
then, that in addition to such factors as taxes, inflation and
perceived bankruptcy costs, the supplies of substitute securities
and the development of the financial intermediary system may
exert an important influence on corporate financing behavior.

A preliminary examination of available data confirms the
trend cited in other studies toward greater use of debt financing
by corporations in the post-World War II period. Nevertheless,
the evidence suggests further that corporate reliance on debt
financing was unusually low around World War II and that current
debt proportions may not be entirely out of line with those exper-
ienced in the earlier decades of the century.

Since the study encompasses periods when the tax system was
non-existent, tax considerations alone seem incapable of ex-
plaining these overall trends. Rather, the explanation suggested
here is that nonfinancial corporations played a more substan-
tial intermediary role in the early decades of the century and
that corporate debt helped satisfy investors' demands for relatively
safe securities. That intermeidary role diminished by the end of
World War II in the face of rising federal government debt and
the continued development of financial institutions, and

corporations as a whole may now have relatively little comparative advantage in performing financial transformations. Nevertheless, tax rates and inflation in the postwar years have combined with the declining relative size of federal government debt to stimulate corporate debt financing again. Although corporate debt has never approached its earlier importance relative to total domestic liabilities, corporations' reliance on debt financing relative to equity has returned, by some measures at least, to roughly the proportions experienced in the early part of the century.

It is clear that many details remain to be filled in here. In particular, if the costs of financial transformation are an important element in the corporate sector's financing behavior, one would like a better understanding of these costs and of where, specifically, corporations might be expected to possess a comparative advantage over financial institutions and individual investors. In addition, hypotheses should be developed about the ways in which technological and regulatory changes affect these comparative advantages.[46] On the basis of the data examined in this paper, further development of an aggregate capital structure theory along the lines suggested here appears to offer some promise for explaining the secular patterns in corporate finance.

Nonfinancial Corporations

Plant and Equipment	Bank Loans
Inventories	Bonds
Bank Deposits	Equity Shares

Financial Institutions

Loans to Corporations	Deposits
Corporate Bonds	Insurance
Corporate Shares	Pension Obligations
Mortgages	Equity Shares
Consumer Credit	

Households

Houses	Consumer Debt
Consumer Durables	Mortgages
Corporate Bonds	Net Worth
Shares in Corporations and Financial Institutions	
Deposits	
Insurance	
Pension Obligations	

Figure 1

Balance Sheets of the Three Sectors in
a Hypothetical Economy

r

S,D

B
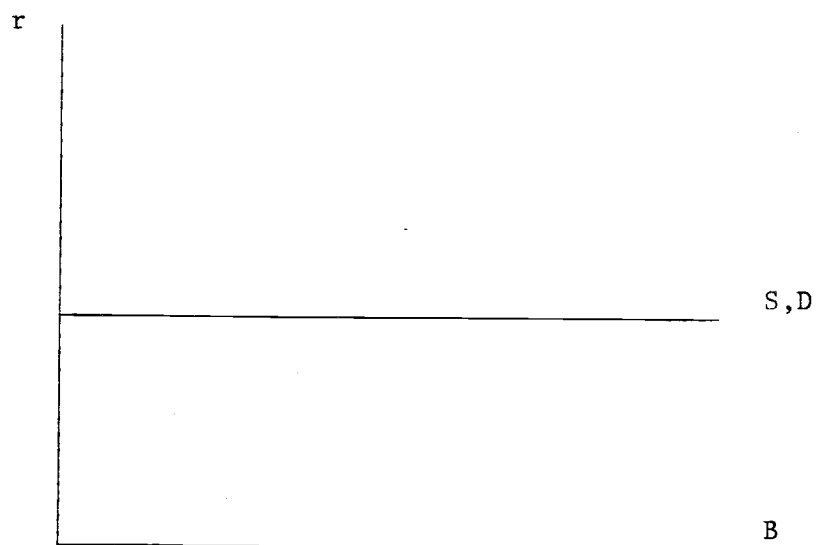
Figure 2

Supply, S, and Demand, D, for Corporate
Debt Implied by Modigliani and Miller (1958).
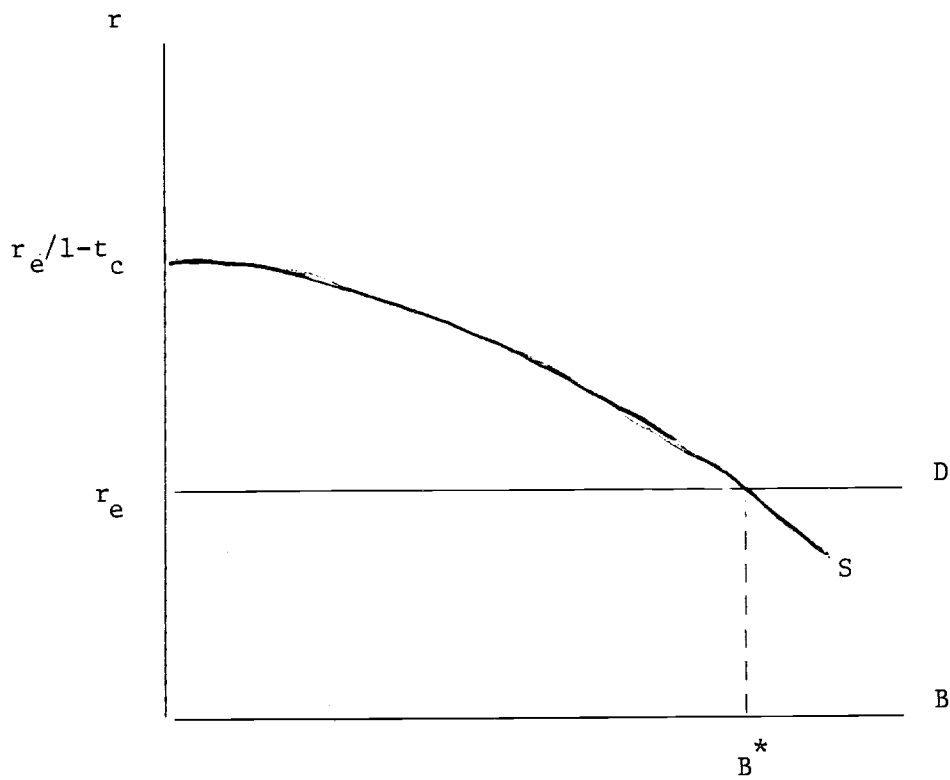
Figure 3

Supply and Demand for Corporate Debt
Implied by the Tax Saving-Bankruptcy
Cost Theory. Equilibrium Amount of
Corporate Debt is B^*.
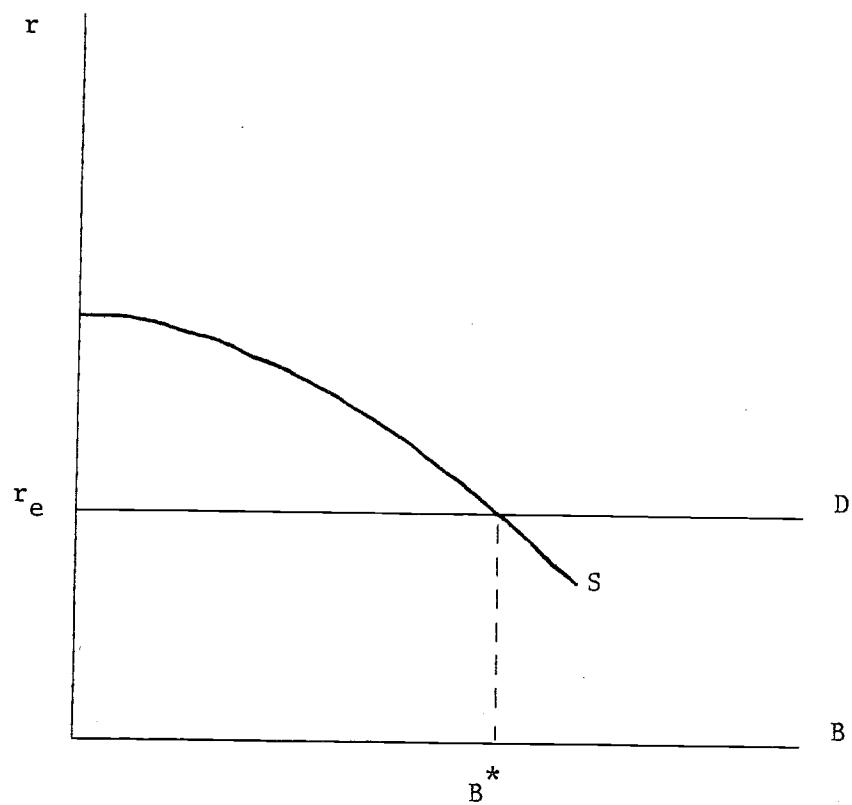
Figure 4

Supply and Demand Curves for Corporate Debt Implied by the
Agency Cost Theory of Jensen and Meckling (1976).
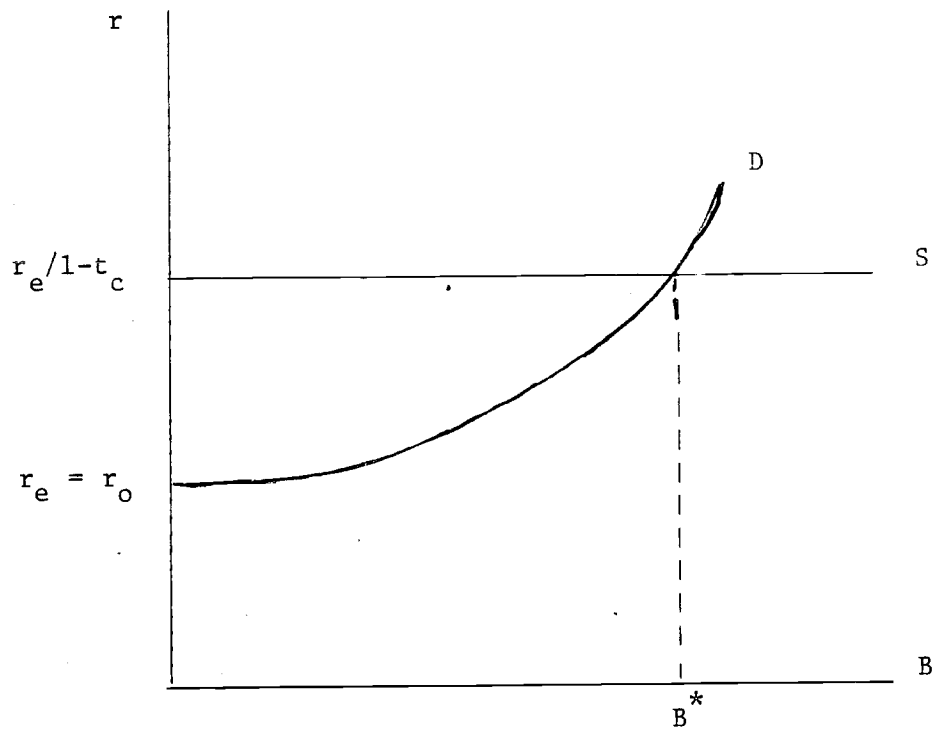
Figure 5

Supply and Demand for Corporate
Debt Implied by Miller (1977).
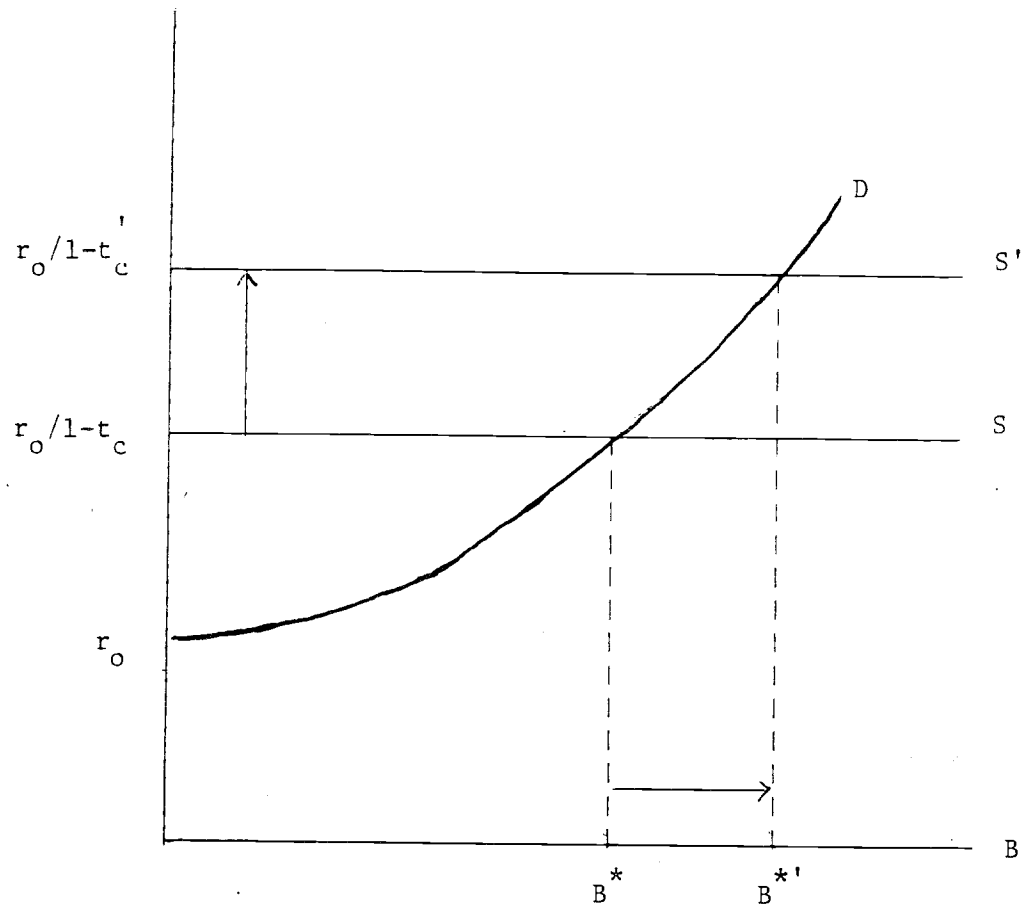
Figure 6

Change in Equilibrium Quantity of Corporate Debt
Caused By an Increase in the Corporate Tax Rate
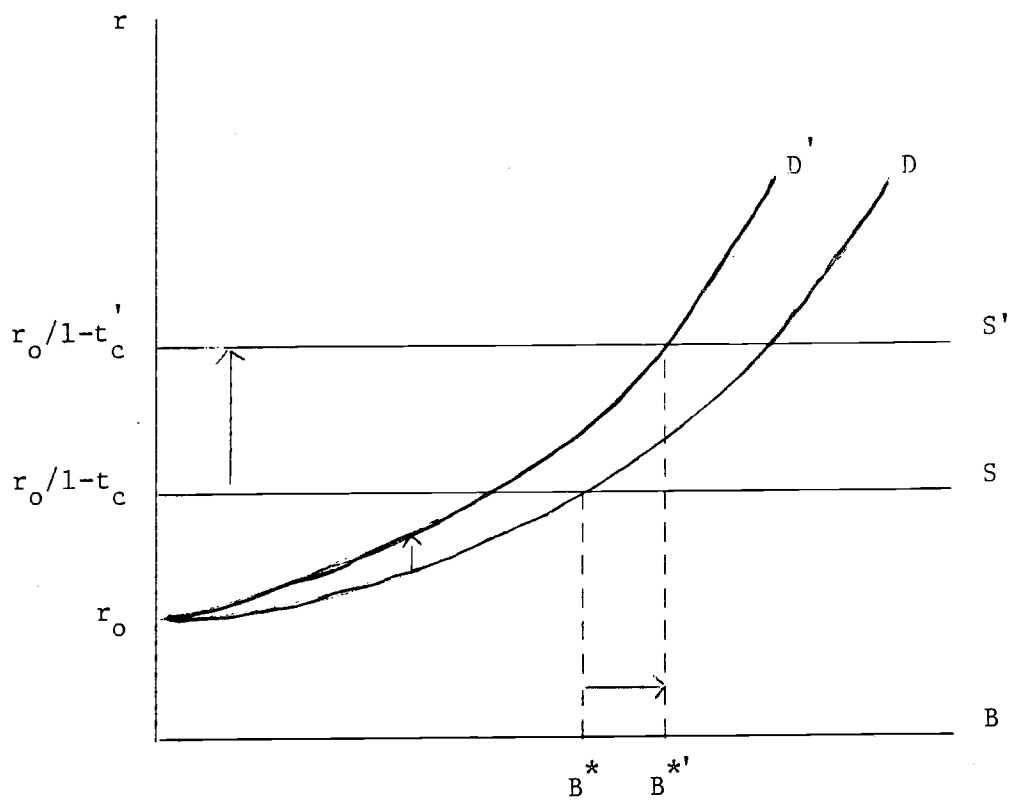
Figure 7

Change in Corporate Debt Caused By
Simultaneous Increases in Corporate
and Personal Tax Rates.
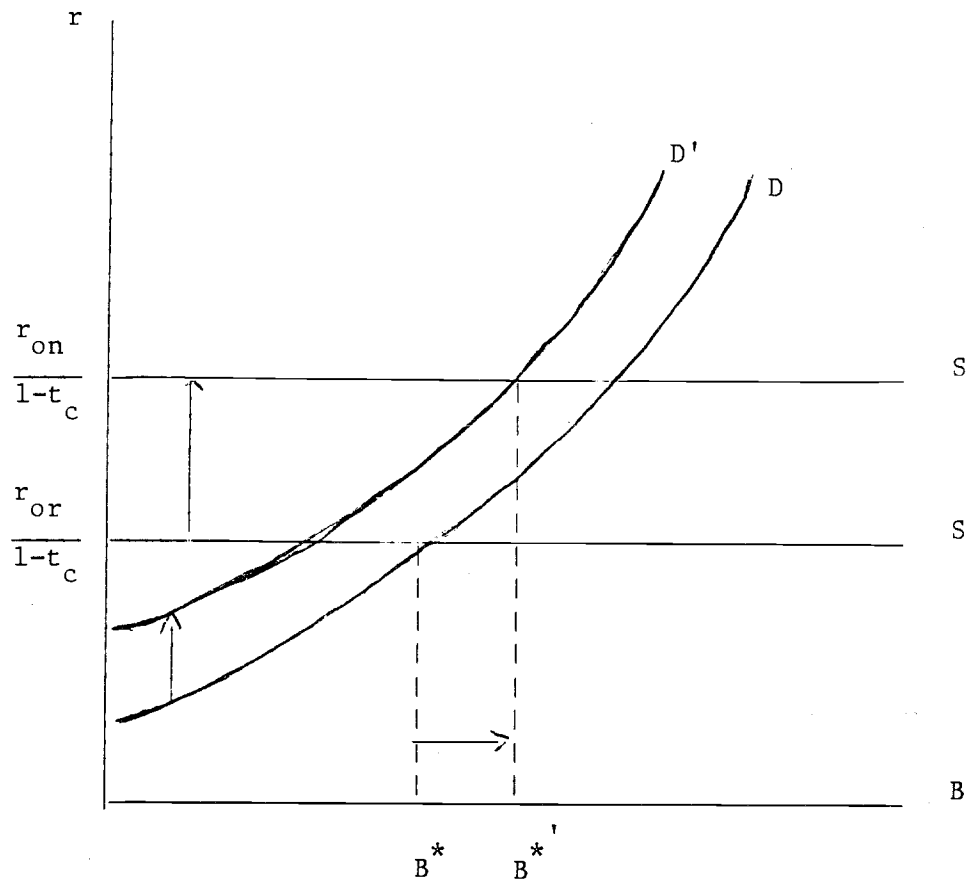
Figure 8

Change in Corporate Debt Caused By
an Increase in Expected Inflation
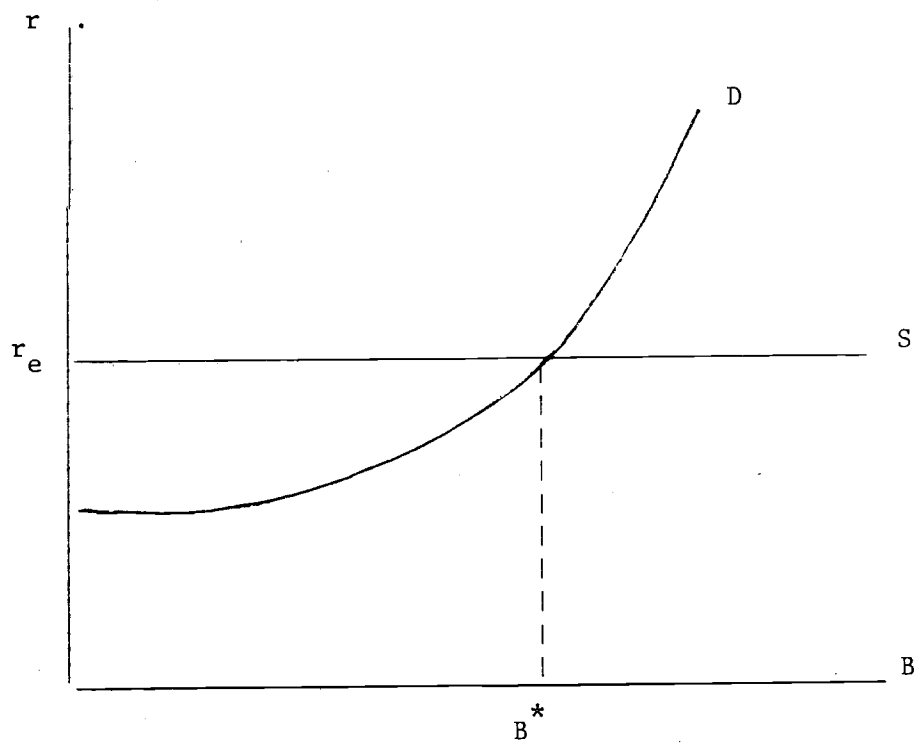
Figure 9

Equilibrium Amount of Corporate Debt When
Return-Stream Transformation is Costless
for Corporations But Not for Individuals

r

B^* B
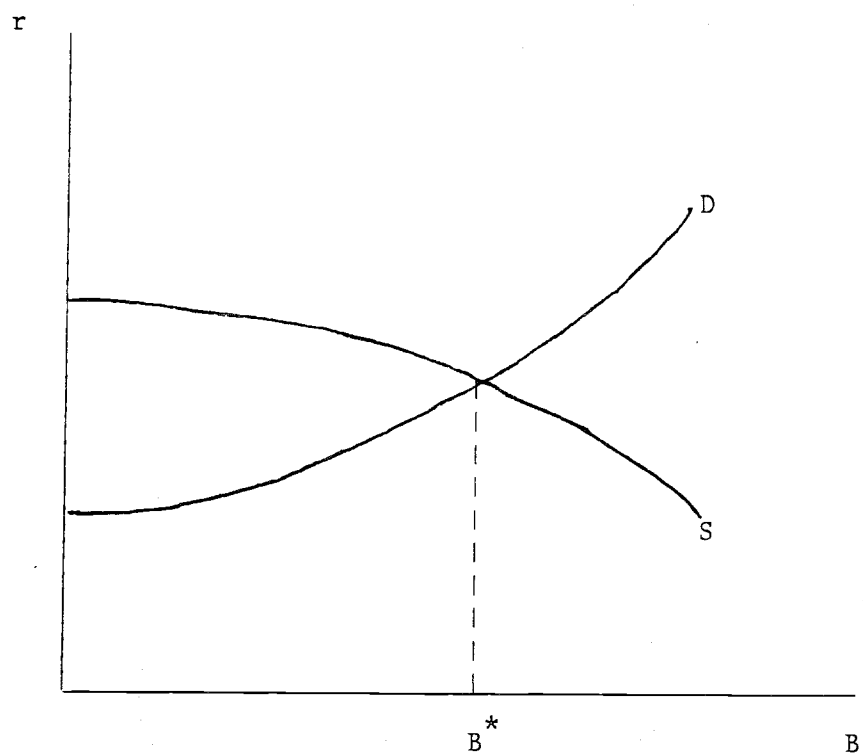
Figure 10

Supply and Demand for Corporate
Debt: the General Case

TABLE 1

Selected Book Value Balance Sheet Ratios,
All U.S. Corporations and U.S. Manufacturing Corporation

	All U.S. Corporations			Manufacturing Corporations		
	(1)	(2)	(3)	(4)	(5)	(6)
Year	LD/TC	P/TC	D/A	LD/TC	P/TC	D/A
1926	.21	.11		.09	.14	
7	.22	.11		.09	.14	
8	.23	.10		.10	.13	
9	.23	.09		.09	.12	
1930	.24	.09		.10	.12	
1	.25	.10		.10	.13	
2	.26	.11		.11	.13	
3	.26	.11		.10	.14	
4	.26	.10		.10	.14	
5	.26	.11		.10	.14	
6	.26	.10		.10	.13	
7	.26	.10	.53	.10	.12	.26
8	.27	.10	.54	.11	.13	.25
9	.27	.09	.55	.11	.12	.25
1940	.26	.09	.57	.11	.11	.27
1	.26	.08	.58	.11	.10	.31
2	.24	.08	.61	.10	.10	.35
3	.23	.08	.63	.09	.09	.36
4	.23	.08	.64	.09	.09	.34
5	.21	.08	.65	.09	.09	.30
6	.21	.07	.64	.10	.09	.30
7	.22	.07	.63	.11	.08	.31
8	.23	.06	.62	.12	.07	.31
9	.23	.06	.62	.12	.07	.28
1950	.23	.05	.63	.11	.06	.31
1	.23	.05	.63	.13	.06	.35
2	.24	.05	.65	.15	.05	.36
3	.25	.04	.65	.15	.05	.36
4	.25	.04	.65	.15	.05	.34
5	.24	.04	.66	.15	.04	.35
6	.25	.04	.65	.16	.04	.36
7	.26	.04	.65	.17		.38
8	.26	.03	.65	.17		.37
9	.27	.03	.66	.17		.38
1960	.27	.03	.66	.17	.03	.38
1	.28	.03	.66	.18	.03	.43
2						
3	.28		.68	.17		.38
4	.28		.68	.18		.39
5	.28		.69	.19		.40
6	.29	.02	.69	.21	.02	.43
7	.29		.69	.21		.42
8	.30		.70	.23		.45
9	.31		.70	.24		.47
1970	.32		.71	.26		.49
1	.33		.72	.27		.49
2	.33		.72	.26		.49
3	.34		.73	.26		.51
4	.34		.74	.27		.53
5	.34		.74			

Source: Internal Revenue Service, Statistics of Income
LD = Long-Term Bonds and Notes
 P = Preferred Stock
TC = Total Long-Term Capital = Long-Term Debt + Preferred Stock
    + Common Equity
 D = Total Debt
 A = Total Assets

Table 2
Market Value Balance Sheet Ratios

Year	(1) Holland & Myers $D/(D+P+E)$	(2) von Furstenberg $D/(D+P+E)$	(3) von Furstenberg $P/(D+P+E)$	(4) Gordon & Malkiel $D/(D+P+E)$	(5) Ciccolo $D/(D+P+E)$	(6) Ciccolo $P/(D+P+E)$
1926					.085	.102
7						
8						
9	.13					
1930	.18				.057	.097
1	.25					
2	.39					
3	.37					
4	.32					
5	.36				.042	.120
6	.24					
7	.27					
8	.41					
9	.32					
1940	.33					
1	.38				.069	.155
2	.44					
3	.28					
4	.28					
5	.25					
6	.16					
7	.17				.082	.091
8	.17					
9	.23					
1950	.18					
1	.19					
2	.21	.29	.04			
3	.21	.30	.04		.133	.058
4	.22	.26	.04			
5	.16	.22	.03			
6	.15	.24	.03			
7	.17	.28	.03	.21		
8	.17	.25	.03	.17		
9	.16	.23	.02	.16	.084	.016
1960	.18	.26	.02	.17		
1	.16	.23	.02	.16		
2	.21	.27	.02	.18		
3	.18	.24	.02	.17		
4	..17	.22	.02	.16		
5	.17	.22	.02	.16	.080	.018
6	.22	.28	.02	.19		
7	.19	.25	.02	.18		
8	.18	.23	.02	.18		
9	.22	.27	.02	.21		
1970	.27	.32	.02	.22		
1	.26	.32	.02	.23	.132	.017
2	.24	.30	.02	.23		
3	.31	.35	.02	.28		
4	.38	.45	.03	.36		
5	.32	.40	.03	.32		
6	.32	.38	.03	.29	.230	.015
7	.32			.32		
8	.35			.33		
9	.38					

Table 3

Balance Sheet Ratios with Debt and Preferred Stock
Measured at Market Value, Assets at Replacement Cost

	(1)	(2)	(3)
	Goldsmith	von Furstenberg	
Year	D/A	D/A	D/A
1900	.32		
1912	.42		
1922	.28		
1929	.28		
1933	.35		
1939	.33		
1945	(.15)[1].10		
6	.13		
7	.14		
8	.14		
9	.14		
1950	.13		
1	.14		
2	.15	.17	.02
3	.15	.17	.02
4	.15	.18	.03
5	.15	.17	.03
6	.16	.18	.03
7	.17	.19	.02
8	.17	.20	.02
9		.19	.02
1960		.21	.02
1		.22	.02
2		.23	.02
3		.24	.02
4		.24	.02
5		.25	.02
6		.25	.02
7		.24	.02
8		.23	.02
9		.23	.02
1970		.23	.02
1		.24	.02
2		.26	.02
3		.27	.02
4		.25	.02
5		.24	.02
6		.26	.02
7		.27[2]	
8		.28	

Sources: Cited in text

[1]Figure in parentheses is from Goldsmith (1956) Other figure is from
   Goldsmith (1963).

[2]Gordon and Malkiel (1981) update von Furstenberg's figures, using the
   same estimation method, through 1978. They do not report figures
   for preferred stock, however.

Table 4

Flow of Funds Data: Proportions of Total Financing
Accounted for by Particular Sources of Funds

	(1)	(2)	(3)	(4)	(5)
Period	Total Debt / Total Sources	Long-Term Debt / Total Sources	Short-Term Liabilities / Total Sources	Internal Funds / Total Sources	New Stock Issues / Total Sources
1901-12	.31	.23	.08	.55	.14
1913-22	.29	.12	.17	.60	.11
1923-29	.26	.22	.04	.55	.19
1930-39	negative	negative	negative	1.14	.19
1940-45	.15	negative	.20	.80	.05
1946-59	.30	.16	.14	.64	.05
1960-69	.36	.18	.18	.62	.02
1970-79	.45	.21	.24	.52	.03

Sources: Goldsmith (1963) and Federal Reserve Flow of Funds Accounts.

Table 5

Corporate and Personal Tax Rates and Debt Incentive Tax Ratios

	(1)	(2)	(3)	(4)	(5)
Year	Lowest Value of t_{pB}	Highest Value t_{pB}	t_c	δ_L	δ_H
1913-15	.010	.070	.010	0.00	-0.06
1916	.020	.150	.020	0.00	-0.15
1917	.020	.670	.060	.04	-1.85
1918	.060	.770	.120	.06	-2.83
1919-21	.040	.730	.100	.06	-2.33
1922	.040	.560	.125	.09	-0.99
1923	.030	.560	.125	.10	-0.99
1924	.015	.460	.125	.11	-0.62
1925	.011	.250	.130	.12	-0.16
1926-27	.011	.250	.135	.12	-0.15
1928	.011	.250	.120	.11	-0.15
1929	.004	.240	.110	.11	-0.17
1930-31	.011	.250	.120	.11	-0.17
1932-35	.040	.630	.138	.10	-1.33
1936-37	.040	.790	.150	.11	-3.05
1938-39	.040	.790	.190	.16	-3.86
1940	.044	.811	.240	.21	-3.02
1941	.100	.810	.310	.23	-2.63
1942-43	.190	.880	.400	.26	-2.47
1944-45	.230	.940	.400	.22	-9.00
1946-47	.190	.865	.380	.23	-3.60
1948-49	.166	.821	.380	.26	-2.47
1950	.174	.910	.420	.30	-5.44
1951	.204	.910	.508	.38	-4.47
1952-53	.222	.920	.520	.38	-5.00
1954-63	.200	.910	.520	.40	-4.33
1964	.160	.770	.500	.41	-1.17
1965-67	.140	.700	.480	.40	-0.73
1968	.140	.753	.480	.40	-1.10
1969	.140	.770	.480	.40	-1.26
1970	.140	.718	.480	.40	-0.84
1971-	.140	.700	.480	.40	-0.73

Source: Pechman (1977)

Table 6
Yearly Changes in Implicit GNP Price Deflator

Year	% Change in Deflator	Year	% Change in Deflator	Year	% Change in Deflator
1901	-0.8	1929		1957	3.4
2	3.3	1930		8	1.7
3	1.2	1	-2.1	9	2.4
4	1.2	2		1960	1.6
5	2.4	3		1	0.9
6	2.3	4		2	1.8
7	4.1	5		3	1.5
8	-0.7	6	-0.8	4	1.5
9	3.6	7		5	2.2
1910	2.8	8		6	3.2
1	-1.0	9		7	3.0
2	4.1	1940	2.2	8	4.4
3	-0.7	1	7.5	9	5.1
4	2.0	2	9.9	1970	5.4
5	4.6	3	5.3	1	5.0
6	12.1	4	2.4	2	4.2
7	24.2	5	2.4	3	5.7
8	12.5	6	15.7	4	8.7
9	14.1	7	12.9	5	9.3
1920	13.9	8	6.9	6	5.2
1	-16.7	9	-0.9	7	5.8
2	-8.1	1950	2.1	8	7.3
3	2.4	1	6.6	9	8.5
4	-0.2	2	1.4	1980	9.0
5	1.4	3	1.6		
6	-1.5	4	1.2		
7	-2.2	5	2.2		
8	1.6	6	3.2		

Source: Historical Statistics of the United States and
         Economic Report of the President.

Table 7
Ratios of Sectoral Liabilities Outstanding to
Total Domestic Liabilities Outstanding

Year	Nonfinancial Corporation Liabilities		Federal Govt. Liabilities		State and Local Govt. Liabilities		Household Mortgage Liabilities		Financial Institution Liabilities	
	Goldsmith	Flow of Funds	Goldsmith	Flow of Funds	Goldsmith	Flow of Funds	Goldsmith	Flow of Funds	Goldsmith	Flow of Funds
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1900	.34		.01		.02		.06		.31	
1912	.36		.01		.02		.04		.32	
1922	.30		.06		.02		.04		.33	
1929	.30		.03		.03		.06		.35	
1933	.29		.06		.04		.05		.35	
1939	.19		.11		.04		.04		.44	
1945	.11	.10	.38	.37	.02	.02	.02	.04	.42	.38
6	.12	.12	.34	.34	.03	.02	.03	.05	.43	.38
7	.13	.13	.32	.31	.03	.02	.03	.05	.43	.38
8	.14	.14	.31	.29	.03	.03	.04	.06	.43	.38
9	.14	.13	.30	.28	.03	.03	.04	.06	.43	.38
1950	.15	.15	.28	.26	.03	.03	.05	.07	.42	.37
1	.16	.16	.27	.24	.03	.03	.05	.07	.43	.37
2	.16	.15	.26	.23	.03	.03	.05	.08	.43	.37
3	.16	.15	.25	.23	.04	.04	.06	.08	.43	.37
4	.16	.15	.24	.22	.04	.04	.06	.09	.43	.38
5	.16	.15	.23	.20	.04	.04	.07	.09	.42	.37
6	.17	.16	.22	.19	.04	.04	.07	.10	.42	.37
7	.17	.16	.21	.18	.04	.04	.08	.10	.42	.38
8	.17	.15	.20	.17	.04	.04	.08	.11	.42	.38
9		.16		.16		.05		.11		.38
1960		.16		.15		.05		.11		.38
1		.15		.15		.05		.12		.39
2		.15		.14		.05		.12		.39
3		.15		.13		.05		.12		.39
4		.15		.13		.05		.12		.40
5		.16		.12		.05		.12		.40
6		.16		.11		.05		.12		.40
7		.16		.11		.05		.12		.40
8		.17		.10		.05		.12		.40
9		.17		.10		.05		.12		.40
1970		.18		.09		.05		.12		.41
1		.17		.09		.05		.12		.42
2		.17		.09		.05		.12		.41
3		.18		.08		.04		.13		.41
4		.18		.08		.04		.13		.41
5		.17		.09		.04		.13		.41
6		.16		.09		.04		.13		.41
7		.16		.09		.04		.13		.41
8		.16		.09		.04		.13		.41

Sources: Goldsmith (1963) and Federal Reserve Flow of Funds Accounts.

FOOTNOTES

1. Academic studies of aggregate corporate financing patterns include Kuznets (1961), Goldsmith (1958, 1963), Miller (1963), Sametz (1964), Friedman (1980) and Gordon and Malkiel (1981). Business journalists have also surveyed trends in corporate finance particularly in conjunction with the "capital shortage" discussions that were popular in the mid-1970's. See for example Business Week (1974).

2. Discussions that emphasize the postwar period fall primarily into the former category. Examples include Friedman (1980) and Gordon and Malkiel (1981). More popular discussions have also tended to emphasize deterioration in corporate balance sheets by pointing to increases in debt ratios. Business Week (1974) is a good example. Studies emphasizing stability in debt-equity proportions have tended to take a longer run view. These include Miller (1963) and Sametz (1964). Updated versions of these arguments also appear in Miller (1977) and Sametz and Keenan (1981).

3. An exception is Gordon and Malkiel (1981).

4. The literature on the topic is vast and no attempt will be made here to provide a complete list. Some of the more important contributions will be discussed in Section I below.

5. Miller's (1977) paper was perhaps the first to provide a theory explicitly aimed at the aggregate corporate capital structure.

6. Although a government sector is not included in this stylized economy, it will be seen in subsequent sections that securities issued by the government may also have an important impact on the demand for corporate securities.

7. In keeping with most previous literature, corporate capital structure will be taken to represent the mix of debt and common equity financing. The framework employed is more general than that, however, and could also be used to include preferred stock and a variety of other hybrid financing instruments.

8. The financial institution sector is introduced in Stiglitz's (1974) generalization of MM. Even if financial transformation were costly for households on their own account, their demand for corporate debt would still be perfectly elastic if financial intermediaries could costlessly perform these services.

9. Examples of this theory may be found in Robichek and Myers (1966) and Kraus and Litzenberger (1973).

10. Implicitly, there are no personal taxes, or at least corporate debt and equity securities are subject to identical tax treatment at the personal level.

11. The vertical intercept of the supply curve in Figure 4 thus cannot be identified precisely as it can be in Figure 3. Corporate tax considerations could of course be grafted onto the analysis, resulting in an upward shift of the supply curve. An example of work in this vein is Myers (1977), in which debt is subject to an agency cost but equity is not. In the absence of taxes, the supply curve for debt would slope downward starting from r_e and in equilibrium no debt would be issued (in Myers' simple example, at least). When corporate taxes are introduced, however, the supply curve shifts upward and there is a positive equilibrium quantity of debt.

12. In the simplest version of Miller's model, equity is assumed to be free from personal taxation. Thus r_e, the certainty-equivalent return on equity, is the same as the certainty equivalent return, r_0, on tax-exempt bonds.

13. Suppose, for example, that initially $r_0 = .05$ and $t_c = .5$. Corporations will be willing to freely substitute debt for equity financing at an interest rate $r = .10$. At this rate the marginal bondholders will be those for whom $t_p = .5$. If t_c then rises to .6, corporations will be indifferent between debt and equity financing at $r = .125$. If the personal tax rate of those formerly in the 50% bracket also rises to .6, however, investors may wish to hold roughly the same amount of debt that they did before, but now with $r = .125$. This ignores, however, any wealth effects on portfolio choice caused by the increase in personal tax rates. Asymmetric changes in personal tax rates may also yield extreme results. If all investors were suddenly pushed into tax brackets higher than t_c, for example, there would be no advantage to corporate debt for any investor and B^* would fall to zero.

14. Note that at the initial equilibrium, $r = r_r$, and $r_0 = r_{0r}$.

15. The assertion that the demand curve makes a parallel upward shift is contingent upon personal tax rates remaining the same in the face of inflation.

16. Inflation would have the same effect in the tax savings – bankruptcy costs model of capital structure. Referring to Figure 3, an increase in expected inflation would shift both the supply and demand curves upward, with the supply curve rising by more. This would result in an increase in B^*. The Gordon – Malkiel (1981) model, which is essentially a tax savings – bankruptcy costs model, reaches this same conclusion about the effects of inflation.

17. See Hong (1977) and the references therein for a discussion of this hypothesis.

18. See Modigliani and Cohn (1979) for an elaboration of this point. A somewhat related point has been made by DeAngelo and Masulis (1980) who argue that inflation reduces the real value of tax shields such as depreciation, and thus induces firms to issue more debt in order to further shelter their real income.

19. The Ross (1977) signalling model, not included among the theories reviewed, is another model of capital structure that does not rely on tax considerations. It is a kind of agency model, in that corporate capital structures are determined by a combination of information and managerial incentive problems. It is hard to see a definitive theory of the aggregate corporate capital structure emerging from the Ross model either, because, although firms would be continually trying to re-sort themselves in the eyes of investors, there seems to be no basis for linking this activity to changes in the aggregate mix of corporate securities.

20. The widely-used "complete" market model would be one in which these conditions are satisfied. Weaker conditions than market completeness (the "spanning" assumption, for example) would also be sufficient to generate perfectly elastic demands for securities if corporate financing choices were confined to traditional debt and equity securities.

21. A considerable literature exists, tracing this process of capital market development with particular emphasis on the role of financial institutions. See, for example, Davis and North (1971), Silber (1975) and James (1978).

22. A similar model of the firm valuation process is discussed in Senbet and Taggart (1981). It is shown there that the risk-adjustment factor,

$$\text{cov}(\tilde{u}_2^i \; \tilde{\theta})/E(\tilde{U}_1^i), \quad \text{is negative for risk-averse individuals.}$$

23. It will be assumed that this substitution is costless for firms.

24. Some qualification would be in order if corporate debt were subject to default risk or interest rate risk.

25. Barnea, Haugen and Senbet (1981) formulate a similar diagram to depict the equilibrium quantity of corporate debt. Their theory ultimately rests solely on tax considerations, however. In the absence of taxes, the agency costs associated with debt would dictate a zero-debt equilibrium in their model.

26. The total-debt-to-total-assets ratio was not examined by Miller.

27. After 1961, the I.R.S. generally stopped reporting separate figures for preferred stock.

28. Some factors would tend in the opposite direction, however. The run-up in interest rates accompanying inflation would depress the market value of corporate debt and book values may thus tend to overstate the burden of this debt. In addition book value debt ratios may be understated by the omission of such "off-balance-sheet" financing sources as leases and unfunded pension liabilities. The use of these sources is believed to have grown tremendously in the 1960's and 1970's. One indication of the possible magnitude of this understatement is given in Gordon and Malkiel (1981). They calculate the ratio of debt to debt plus equity for the aggregate of firms included on the Compustat tape. Since 1973 the data on the tape include lease and pension liabilities. The ratios with and without these liabilities are as follows:

	Debt Ratio Without Leases and Pensions	Debt Ratio Including Leases and Pensions
1973	.367	.497
1974	.381	.511
1975	.374	.499
1976	.362	.485
1977	.358	.473
1978	.358	.462

29. See Modigliani and Cohn (1979) for an argument that the market does not properly adjust for inflation in determining equity values. By their argument, market value debt ratios would be substantially overstated.

30. Myers (1977), for example, has argued that a firm's capacity to issue debt is closely related to its assets-in-place. The total market value of assets, on, the other hand, reflects not only assets-in-place but also future investment opportunities and Myers points out that firms may not find it advantageous to borrow against these opportunities. Thus the replacement value of assets, which reflects only assets-in-place, may be a better measure of debt capacity.

31. One problem is that von Furstenberg's measure of debt is different from Goldsmith's. In von Furstenberg, non-interest bearing liabilities have been netted out against the asset side of the balance sheet, while interest-bearing financial assets have been netted out against the liability side in computing this ratio. To make the figures as closely comparable as possible, the same procedure has been used in calculating debt ratios from Goldsmith's data. Nevertheless, the detail in Goldsmith's data is not the same as that in the Flow-of-Funds accounts, from which von Furstenberg worked, and thus ratios would not be expected to be identical.

32. To the extent that some investment expenditures, such as research and development, are expensed immediately, however, the extent of equity financing may still be understated somewhat. There are also other problems inherent in flow-of-funds data. Von Furstenberg and Malkiel (1977) argue that these data are misleading in inflationary times because they fail to recognize the reduction in the real value of previously outstanding debt caused by inflation. In addition the Flow-of Funds Accounts published by the Federal Reserve System lump preferred stock financing together with common equity financing.

33. In general, as discussed in Miller (1977), the expression should be $\delta = 1 - (1 - t_c)(1 - t_{ps})/(1 - t_{pB})$, where t_{ps} is the personal tax rate applicable to income from corporate stock. This latter rate should be some mixture of the ordinary income tax rate (for dividend income) and the capital gains rate. In keeping with Miller, t_{ps} is ignored here, on the argument that deferral of capital gains will make the effective tax rate on stock income quite small. To the extent that t_{ps} is positive, however, it will increase somewhat corporations' incentive to substitute debt for equity.

34. See Kim, Lewellen and McConnell (1980) and Taggart (1980) for discussions of how investors in different tax brackets sort themselves into clienteles with respect to their preferences for corporate leverage. At Miller's equilibrium, the marginal investor will have $t_{pB} = t_c$ and $\delta = 0$. Furthermore, this investor will be just indifferent between holding taxable and tax-exempt bonds, so for him $r(1 - t_{pB}) = r_0$. In equilibrium, then, $\delta = 1 - (1 - t_c)/(1 - t_{pB}) = 1 - r(1 - t_c)/r(1 - t_{pB}) = 1 - r(1 - t_c)/r_0 = 0$ and thus (20) is consistent with (1).

35. The presence of tax-exempt investors might also add to the demand for corporate leverage. Restrictions on the riskiness of individual securities in their portfolios, however, might limit the ability of tax-exempt institutions to purchase stock in highly-levered corporations.

36. The upward trend in corporate tax rates is also broadly consistent with the secular decline in preferred stock financing.

37. In principle, expected rates of inflation would be preferred. Over long periods, one might expect at least a rough correspondence between expected and realized inflation rates.

38. This increase in debt financing is particularly apparent if one examines yearly Flow of Funds data. In 1946 and 1947, for example, the years of greatest inflation around that period, total debt accounted for 52% and 49%, respectively, of total sources of funds for the corporate sector. In large part this increased debt financing was accounted for by heavy reliance on short term liabilities, which made up 33% and 29%, respectively, of total sources.

39. The supply of government debt might reasonably be viewed as exogenous to the system. Observed amounts of household mortgages, on the other hand, will presumably be more affected by prevailing capital market yields.

40. The decline is much more dramatic in Goldsmith's data than in the Flow of Funds data.

41. To the extent that tax considerations and inflation have affected corporate liabilities and household mortgages in the same direction, this may not be surprising.

42. Recent work by Friedman (1981) bears a relationship to this idea. Friedman observes that the ratio of total debt to GNP has been remarkably stable for the U.S. economy, even though the ratio of any one sector's liabilities to GNP may have shown considerable trends. There appears to be some sort of substitution relationship, then, between the liabilities of the economy's various sectors.

43. One cannot look to federal government securities on this score, however. The maturity structure of both federal government and corporate debt has generally been shortened over the postwar period, so it is difficult to make any broad argument that issues of long-term government debt have pushed corporations to the short end of the market. Since 1975, though, it is true that the average maturity of government debt has lengthened considerably. See Friedman (1980).

44. In the immediate post-Depression years, of course, investors may have become increasingly skeptical about the safety of corporate debt.

45. Ultimately, this involves a shift in the bearing of interest rate risk from shareholders and other owners of financial institutions and from liability insurance agencies to the shareholders of nonfinancial corporations. A more complete explanation would detail the mechanism by which such a shift might take place. In particular, the stance of financial institution regulators might be an important factor.

46. See Greenbaum and Haywood (1971) for a discussion of the role of technology and regulation in the intermediation possibilities open to financial institutions.

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