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The governance problem, asset specificity and corporate financing decisions

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Abstract

This paper illuminates the importance of comparative governance costs of debt and equity finance for a business firm. Managers of the firm must decide whether to operate or liquidate the firm and a governance structure is needed to enforce a decision in the interests of the firm's investors. In the presence of risk and some degree of asset specificity, an optimal debt/equity financing mix is derived that minimizes governance costs to investors. The resulting model yields predictions fully consistent with extant empirical evidence and calls into question the conventional view of how firms manage capital structure.

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1. Introduction

Oliver Williamson (1988) argued that economization of the costs of governance structures was central to the choice between debt and equity financing. He concluded that projects with non-specific assets should be financed with debt while projects containing highly specific assets should be financed with equity. He also suggested that his argument be extended to the multi-project context of the firm, with uncertainty to be explicitly incorporated into the analysis (p.584). That is the task carried out in this paper.

By incorporating governance costs of debt and equity financing and by emphasizing the importance of asset specificity, derivation of a new model of capital structure is made possible. Three specific predictions result from the model:

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1. High levels of debt financing should be associated with firms owing relatively non-specific and thus highly redeployable assets; firms with relatively specific assets will use little debt or, perhaps, none at all;
2. High levels of debt financing should be associated with firms experiencing relatively low levels of operating profitability;
3. When ownership of non-specific assets combines with low profitability to produce large quantities of outstanding debt, that debt will be of higher risk and thus of lower quality.

These predictions will be shown to be consistent with existing empirical evidence (to be cited later on). In addition, the model presents a markedly different view of how managers of a firm manage its capital structure. If the model is correct, then the conventional view of capital structure management is faulty, as are cost of capital estimates based upon it.

The structure and predictions of the asset specificity model differ from existing theories of capital structure. Among the latter, some assume a tax motivation for use of debt – see, for example, Modigliani and Miller (1963), Myers (1984, 1990). Others assume asymmetric information between investors and the firm's managers; use of debt financing then constitutes signalling behavior by managers. Harris and Raviv (1990), Myers and Majluf (1984), Ross (1977) are representative examples of this type of theory. Still others envision debt financing as a way of easing the costs of conflicts of interest between managers and the owners of the firm. Grossman and Hart (1982), Jensen (1986) are prominent within this agency cost framework. However, unlike the model presented here, the predictions of these alternative theories are not fully consistent with the empirical evidence.

The rest of the paper consists of five parts. Section 2 describes the activities of the firm and specifies the uncertain future payoffs to investors from the alternatives of liquidating the firm's assets or employing them in operations. Asset specificity is incorporated in the specification of liquidating payoffs. Section 3 introduces governance costs of debt and equity financing and derives the optimal capital structure for a firm in which investors seek to maximize future payoffs resulting from decisions to liquidate assets or employ them in operations. Predictions of the model are derived and compared to those of alternative theories of capital structure and to available empirical evidence in Section 4. In Section 5, the model's implications for the management of corporate capital structure are presented and compared to the conventional version. Section 6 contains a brief conclusion of the paper.

2. The firm

Prior to incorporating governance costs in the financing decision, it is necessary to establish the characteristics of the firm. These include: the sequence of activities taking place over time; the future payoffs confronting investors under the alternatives of operation or liquidation; and the losses stemming from asset specificity if liquidation is pursued.

2.1. Activities of the firm over time

The firm, a corporation, exists in a two-period world. Outside investors create the firm at time $t = 0$ by investing cash resources in the amount R, in exchange for which they receive a claim on uncertain future payoffs. These resources are entrusted to professional managers who immediately transform them into assets of forms exogenously dictated by an underlying production function. Then, at time $t = 1$, information arrives to resolve uncertainty about future payoffs available from operation or liquidation; the decision to operate or liquidate is then made by the firm's managers. Finally, the payoff from the time $t = 1$ decision to operate or liquidate is received by investors at time $t = 2$.

In order to distinguish the model to be derived from the alternative theories, three assumptions are made regarding other aspects of the environment in which the firm operates. First, there are no corporate income taxes and, thus, no tax motivation for the use of debt. Second, at any point in time, managers and investors share the same information, there being no issues raised by asymmetry in this matter. Third, if firms do use debt financing, there are no conflicts of interest between debtholders and shareholders that can give rise to costs of financial distress.

2.2. Risky future operating and liquidating payoffs

Incorporating uncertainty, the time $t = 0$ future payoffs given a decision to operate are

$$P(s) = \rho f(s)R, \tag{1}$$

where $P(s)$ is the operating payoff contingent on state of nature s, the latter being uncertain at $t = 0$ and continuously distributed from lower limit s_0 to upper limit s_u. Given resource commitment R, operating payoff $P(s)$ depends on $\rho > 0$, a parameter describing the rate of operating profitability characteristic of the firm, and $f(s)$, an increasing function of state s, where $f(s_0) = 0$. Thus, future operating payoffs $P(s)$ increase with state s as described in Fig. 1 by the line labelled $P(s)$ emanating from the origin.[1] But future operating payoffs increase across *all* states when operating profitability increases since, from Eq. (1), $\partial P(s)/\partial \rho > 0$. (The signs of this and other derivatives to be established are summarized for convenience in Table 1 at the end of Section 3 of the paper.) These operating payoffs assume a subsequent, time $t = 1$, decision to operate. However, there is the alternative of liquidation and the payoffs from such a decision must be specified. Here, care must be exercised because the decision to operate or liquidate is obviously sensitive to that specification. For this task, Williamson's concept of asset specificity is especially useful, yielding tractable liquidating payoffs that make economic sense.

The liquidating payoff is defined as the price assets fetch when sold in a secondary market. That price must depend on the degree to which assets are specific to the purposes of the liquidating firm. To see why, assume that time $t = 1$ has arrived and the obtaining state s has been revealed. Then assume an extreme case where the firm's assets are completely non-specific, possessing the characteristics of a fungible asset such as cash.

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[1]The operating payoff schedule is linear in Fig. 1 only for simplicity. The lower bound operating payoff magnitude of $P(s_0) = 0$ is assumed for this same reason. Subsequent results are not affected if either $P(s)$ is curvilinear or if $P(s_0) > 0$ is assumed.

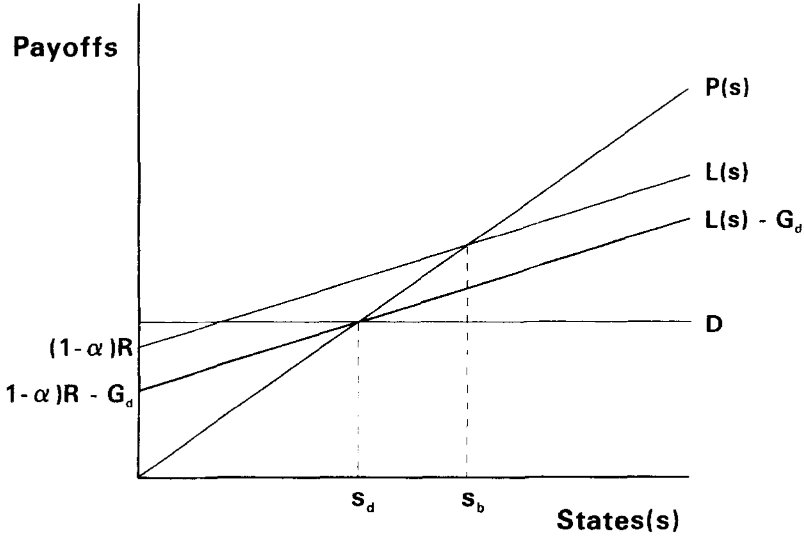

Fig. 1.

The market price of the assets must be R, the original cash resource commitment; because with complete fungibility, it is as if the resources had never been transformed into assets at $t = 0$. No buyer in the market would pay more than R in this case and the liquidating firm would certainly not accept less. Alternatively, assume the polar extreme in which the firm's assets are completely specific to the operations of the liquidating firm. In that case the market price of the assets must be $P(s)$, the operating payoff received if assets are employed in operations. The liquidating firm always has the operating alternative and would never accept less than $P(s)$. Since the assets are completely specific to the operations of the liquidating firm, a buyer of the assets could only employ them in identical fashion and would therefore pay no more than $P(s)$ for them. However, these extremes in specificity and liquidating payoffs are unlikely to describe the situation for the firm. The firm is a *collection* of projects, each capable of having a unique level of specificity. What is needed is a way of capturing the *degree* of specificity for that collection. Let α be an exogenously-determined parameter reflecting the extent to which the firm's assets are specific, where $0 < \alpha < 1.0$. As α approaches zero, assets become less specific and the liquidating payoff approaches R, the extreme case of completely fungible assets. But as α approaches 1.0, the liquidating payoff approaches $P(s)$, the extreme for completely specific assets. Reflecting this range of possibilities, the liquidating payoff is specified as a linear combination of R and $P(s)$:

$$L(s) = (1 - \alpha)R + \alpha P(s), \tag{2}$$

where $L(s)$ is the liquidating payoff. Given any degree of asset specificity within the range $0 < \alpha < 1.0$, the liquidating payoff at time $t = 0$ is effectively divided into two components: $(1 - \alpha)R$, the value of which is both state-independent and risk-free, and $\alpha P(s)$, which is state-dependent and risky. This time $t = 0$ schedule of future liquidating payoffs is described in Fig. 1 by the line labelled $L(s)$ emanating from intercept $(1-\alpha)R$ and increasing across states.

2.3. *Comparative payoffs and losses sustainable if liquidation occurs*

When the operating payoff $P(s)$ from Eq. (1) is set equal to liquidating payoff $L(s)$ from Eq. (2), the result is $P(s_b) = R$, where s_b defines the break-even state; operating and liquidating payoffs are the same when the operating payoff is sufficient to recover the original resource commitment.[2] It is then easily ascertained that operating payoffs exceed (are less than) liquidating payoffs when $P(s) - R > 0[P(s) - R < 0]$ for states $s > s_b[s < s_b]$. Thus, liquidation is in order for all states $s < s_b$, as shown by Fig. 1. Within this range of states, the size of the liquidating payoff and the influences upon it can now be determined. When Eq. (1) is substituted into Eq. (2), the effect of an increase in operating profitability is $\partial L(s)/\partial\rho = \alpha f(s)R > 0$ for states $s > s_0$; liquidating payoffs *increase* with profitability. This must be so because liquidating payoffs depend partly on operating payoffs in Eq. (2). In contrast, an increase in asset specificity *reduces* liquidating payoffs in all states $s < s_b$ over which the firm would fail to break even. This is clear since, using Eq. (2),

$$\frac{\partial L(s)}{\partial \alpha} = -[R - P(s)], \tag{3}$$

and, since $R > P(s)$ for $s < s_b$, it follows that $L(s)$ declines with increased asset specificity. Put another way, liquidation, if superior to operation, still entails losses, the size of which depends on the degree to which assets are specific and on the rate of operating profitability. Let the loss in liquidation be defined as the amount by which the original resource commitment exceeds the liquidating payoff, or $R - L(s) > 0$. Substituting Eq. (2) into the latter yields:

$$R - L(s) = \alpha[R - P(s)]. \tag{4}$$

With $R - P(s) > 0$ in states $s < s_b$, this loss clearly increases as asset specificity, α, increases. However, as would be expected, higher operating profitability reduces the loss in liquidation because, as shown earlier, $P(s)$ increases in ρ.

Given the future payoffs available from a decision to operate or liquidate, it is easy to define an optimal (for investors) time $t = 0$ policy: when the future obtaining state is revealed at $t = 1$, the decision to operate should be made if $P(s) > L(s)$, an outcome occurring if $s > s_b$. But if the obtaining state is $s < s_b$, then $L(s) > P(s)$ and a decision to liquidate should be made. Using Fig. 1, such an optimal policy would produce future payoffs indicated by schedule $L(s)$ for states $s < s_b$ and schedule $P(s)$ for states $s > s_b$.

[2] The equality of operating and liquidating payoffs at break-even state s_b results from asset specificity in that $L(s)$ in Eq. (2) is a weighed average, with weights $(1-\alpha)$ and α, of R and the function $P(s)$. With $P(s)$ increasing across states, there is only one state, s_b, where the operating payoff is sufficient to recover the initial resource commitment – that is, where $P(s_b) = R$. But from Eq. (2), if $P(s_b) = R$, then the condition $L(s_b) = R$ also holds.

3. The governance problem and the optimal quantity of debt

The governance problem can now be introduced. Investors seeking to minimize governance costs across states are led to employ an optimal promised debt payment which is a function of asset specificity, which results in an optimal capital structure.

3.1. The governance problem

The future payoffs identified as optimal in Fig. 1 are relevant only if managers are assumed to act in the interests of investors when making the decision to operate or liquidate. But such an assumption is questionable if managers wish to pursue their own goals. To capture such behavior, it is now assumed that managers enjoy perquisite consumption and possess non-redeployable investments in human capital, the value of which would be lost to them in the event of liquidation. Therefore, absent some governance structure, uncontrolled managers would *always* decide to operate rather than liquidate, regardless of which state obtains at $t = 1$. As a result, investors would confront an inferior set of future payoffs consisting *solely* of operating payoffs.[3] Using Fig. 1, it was earlier seen that the liquidating payoff would exceed the operating payoff for all states $s < s_b$. Thus, within that range of states, the reduction in future payoffs resulting from managerial pursuit of private goals is $L(s) - P(s) > 0$. This is the governance problem. To deal with it, some might argue for an ex ante system of financial incentives, with a mechanism for ex post settling up, to align incentives between managers and investors – see, for example, Ross (1977). However, apart from the fact that such a system can be costly, it is also clearly at variance with the spirit of Williamson's argument. He asserts that *no* amount of ex ante contracting can assure voluntary compliance by managers with investor desires. What is needed is a governance structure that, in the presence of incomplete contracting, can produce the desired result. This brings the financing decision into play, because both debt and equity finance represent distinct governance structures, each offering alternative ways, at differing costs, of obtaining proper managerial decisions. The problem for investors is to choose governance structures so as to minimize governance costs and therefore maximize future payoffs across states of nature.

In defining governance costs, Williamson (1988, p.851) included losses associated with liquidation. But in Eq. (4), it was shown that such losses took place *regardless* of which governance structure was chosen. Thus, governance costs are defined here more narrowly as the costs of *intervention* by investors to force a decision to liquidate, should that action be in their interests. These costs are assumed to be incurred *only* if intervention actually takes place, being otherwise equal to zero. Let G_e and G_d be the governance costs of, respectively, equity and debt finance, these costs being sustained by investors at time $t = 2$. Importantly, it is argued within the Williamson perspective that *for the purpose of*

[3] While a source of conflicts of interest between managers and investors, *excessive* perquisite consumption is not an important issue in this paper. Control of perquisite consumption is costly and it is assumed that investors minimize perquisites subject to these costs. However, some level of perquisite consumption necessarily remains and that is all that is needed to contribute to managerial reluctance to liquidate. Accordingly, operating and liquidating payoffs must be viewed as net of the costs of perquisite consumption and it is assumed that all possible owners of assets are equal insofar as their ability to economically control perquisite consumption.

intervening to force liquidation, $G_d < G_e$. Debt governance, when employed in optimal fashion, is simple and unambiguous since it relies on rules requiring borrower compliance with obligations agreed upon between borrower and lender. Violation of the rules by the borrower constitutes default, with debtholders intervening to exercise their pre-emptive claims through the legal system against the firm's assets. In contrast, equity governance is comparatively ambiguous, requiring intervention by the owners of the firm, through the governing board, in order to bring managers to heel in the matter of liquidation. In such a setting, there is opportunity for managerial guile and opportunistic behavior. Intervention may require negotiation and proxy fights as well as legal challenges in order to overcome recalcitrant managers. Compared to the simplicity of rule-bound debt governance, equity governance is both complex and likely to be costlier. If this is so, then debt governance is preferred in all states in which liquidation is in the investor interest. For the liquidating payoff *net* of debt governance costs, $L(s) - G_d$, necessarily exceeds the net payoff $L(s) - G_e$ available under equity governance. The question is, over which states of nature should debt governance be invoked in order to force liquidation? Answering that question leads to an optimal promised debt payment and an optimal capital structure for the firm.

3.2. An optimal promised future debt payment

If intervention to force liquidation occurs, investors receive the net liquidating payoff $L(s) - G_d$. If intervention does not occur, then predisposed managers will decide to operate with a payoff to investors of $P(s)$. From the viewpoint of investors at $t = 0$, it will pay to intervene at $t = 1$ if the state then revealed indicates $L(s) - G_d > P(s)$. Thus, to establish the time $t = 0$ range of states over which intervention and liquidation is preferable to operation, let s_d define the state at which the net liquidating payoff equals the operating payoff:

$$L(s_d) - G_d = P(s_d). \tag{5}$$

For all states $s < s_d (s > s_d)$, $L(s) - G_d > P(s)[L(s) - G_d < P(s)]$ holds, intervention (no intervention) with liquidation (operation) taking place. Therefore, invoking debt governance for states $s < s_d$ and allowing equity governance to remain for states $s > s_d$ clearly maximizes future payoffs to investors across all states. This is evident in Fig. 1, where state s_d is indicated by the intersection of the net liquidating payoff schedule labelled $L(s) - G_d$ with the operating payoff schedule $P(s)$. To the left (right) of that intersection $s < s_d (s > s_d)$ and net liquidating payoffs exceed (are less than) operating payoffs.[4]

What is needed now is a rule to be broken under debt governance such that default will be caused in all states $s < s_d$. That rule takes the form of a time $t = 0$ promise by the firm to make a specific time $t = 2$ payment, and no less, to purchasers of the firm's debt. This is optimal promised debt payment D, where

$$D = L(s_d) - G_d = P(s_d). \tag{6}$$

[4]It is also apparent that state s_d is $s_d < s_b$, the break-even state. Recall that at state s_b, $L(s_b) = P(s_b)$. But in Eq. (5) the *net* liquidating payoff at state s_b is the smaller $L(s_b) - G_d$; to preserve the equality in Eq. (5), $s_d < s_b$ must hold given that $P(s)$ in Eq. (1) increases in s.

The optimal payment is shown in Fig. 1 by the horizontal line labelled D extending through the intersecting payoff schedules at state s_d. If a state within the range $s < s_d$ is revealed at time $t = 1$, then default occurs since neither net liquidating payoff $L(s) - G_d$ nor operating payoff $P(s)$ will be sufficient to meet the promised payment D. Debtholders will intervene at $t = 1$, seize control of the firm and, since the net liquidating payoff exceeds that available from operations, choose to liquidate.[5] If the revealed state is $s > s_d$, there is no default; pre-disposed managers will choose to operate with a payoff to investors of $P(s) > D$. Use of debt financing with promised payment D thus causes a partitioning of future payoffs across states between those who purchase the firm's debt and holders of the residual equity claim. If the revealed state is $s < s_d$ such that default occurs, equityholders receive nothing and debtholders receive the net liquidating payoff $L(s) - G_d$. If the revealed state is $s > s_d$, then there is no default, the firm operates, with debtholders receiving the promised payment D and equityholders the residual payment $P(s) - D > 0$.

The behavior of the optimal promised debt payment is important for it reveals which firms will employ debt financing and, for those that do, variations in the magnitude of that payment *and* in the range of states over which default occurs. The underlying arguments of D can be found by first substituting $L(s)$ from Eq. (2) into Eq. (6) and then substituting Eq. (1) into the result to obtain

$$D = \rho f(s_d)R = \left(R - \frac{G_d}{(1-\alpha)}\right). \tag{7}$$

Interestingly, this specification of the promised debt payment suggests that some firms would never employ debt financing; for the right side of Eq. (7) is zero whenever the condition $G_d = (1 - \alpha)R$ holds. This makes sense when it is recalled from Eq. (2) that $(1 - \alpha)R$ is the state-independent component of the liquidating payoff; the more specific the assets, the smaller the magnitude of this component. If assets are sufficiently specific, the state-independent component will not be enough to recover costs of intervening with debt governance – that is, $G_d > (1 - \alpha)R$. Since the state-dependent component of the liquidating payoff in Eq. (2) is $\alpha P(s) < P(s)$, it follows that the liquidating payoff schedule is everywhere below the operating payoff schedule. Therefore, firms with highly specific assets will be financed exclusively with equity; intervention to force liquidation never pays for such firms and, in all states, managers would be left alone to employ assets in operations.

Now assume that assets are not so specific; $G_d < (1 - \alpha)R$ holds and $D > 0$ in Eq. (7); intervention and liquidation through debt governance is now desirable in all states $s < s_d$. The question is, how do the magnitude of optimal promised debt payment *and* the range of states $s < s_d$ over which default and liquidation will take place vary with asset specificity and operating profitability? By inspection, it is evident that the right side of

[5]It might be seem that default would not occur until time $t = 2$, when the firm actually fails to meet the promised debt payment. But this is too limited a view of default. In general, loan provisions include other rules, the breaking of which permit intervention by debtholders *prior* to failure to meet the promised payment – for example, debtholders may intervene when they "deem themselves insecure." In the state-preference methodology employed here, the revelation at time $t = 1$ that future default is certain and the resulting immediate intervention by debtholders is consistent with such provisions.

Eq. (7) declines with increased asset specificity; therefore, $\partial D/\partial\alpha < 0$; as asset specificity increases, firms promise a *smaller* future debt payment. Further, increased specificity *reduces* the range of states over which the firm will default. When increased specificity reduces the right side of Eq. (7), the necessary equality can be restored only if operating payoff $P(s) = \rho f(s)R$ in Eq. (1) declines. Since $f(s)$ increases in (s), equality is restored only at new and lower state (s_d). Therefore $\partial s_d/\partial\alpha < 0$. It is also evident from the right hand side of Eq. (7) that $\partial D/\partial\rho = 0$; the magnitude of promised debt payment is independent of operating profitability. However, increases in profitability do act to *reduce* the range of states over which default will take place – that is, $\partial s_d/\partial\rho < 0$. For while the right side of Eq. (7) is unchanged by an increase in profitability, the left side $\rho f(s_d)R$ will increase and the necessary equality is violated. Restoration of that equality, given that $f(s)$ increases in s, means that s_d moves to a lower state.

3.3. The optimal capital structure

With an optimal promised debt payment now specified, an optimal capital structure, together with the effects of asset specificity and operating profitability upon that structure, can be derived. Given optimal promised debt payment D, the corresponding optimal quantity of debt financing is the time $t = 0$ value that the market attaches to that promise. In the partitioning of payments across states that occurs when debt financing is employed, debtholders receive D in states $s > s_d$, where there is no default, and net liquidating payoff $L(s) - G_d$, in states $s < s_d$, where default occurs. Let B denote the total market at time $t = 0$ of these future payments to debtholders. Let $\phi(s)$ denote a set of time $t = 0$ state prices for future payments occurring at time $t = 2$, these prices being generated in a complete market. Given the future payments across states to debtholders, the total market value of debt issued at $t = 0$ is:

$$B = \int_{s_0}^{s_d} [L(s) - G_d]\phi(s)\mathrm{d}s + D\int_{s_d}^{s_u} \phi(s)\mathrm{d}s. \tag{8}$$

Since promised payment D is optimal, it follows that B is the optimal quantity of debt financing. Further, it is apparent by inspection that $\partial B/\partial\alpha < 0$: the total quantity of debt financing *declines* as asset specificity increases. In the event of default occurring in states $s < s_d$, debtholders will receive the net liquidating payoff $L(s) - G_d$. But the size of that payoff diminished with increased specificity in Eq. (3), where $\partial L(s)/\partial\alpha < 0$ held. Further, it was shown with Eq. (7) that $\partial D/\partial\alpha < 0$; the promised debt payment, met by the firm in the absence of default for states $s > s_d$, also declined with increasing specificity. Thus, increasing asset specificity reduces total payments to debtholders across *all* states. Consequently, the total market value of debt in Eq. (8) must be lower as specificity increases. In contrast, the total market value of the debt *increases* with operating profitability. While the promised payment D was invariant to operating profitability in Eq. (7), the range of states over which the firm would default was shown to narrow as profitability increased – that is, $\partial s_d/\partial\rho < 0$. Moreover, in the remaining range in which default *does* occur, net liquidating payoffs, $L(s) - G_d$, are higher. This is because liquidating payoffs are state-dependent in Eq. (2) and, as earlier shown,

$\partial L(s)/\partial \rho > 0$. Thus, with higher profitability, the firm does not change the promised debt payment but will keep its promise over a wider range of states. If default does occur, the payment to debtholders, the source of which is the liquidating payoff, is higher. Therefore, the total market value of the debt increases with ρ in Eq. (8).

If firms employ debt financing in optimal quantity B, there remains a residual equity claim. As the partitioning of payoffs earlier revealed, equityholders receive nothing if the firm defaults on its debt obligation. But if the promised debt payment is made, an outcome in all states $s > s_d$, equityholders receive the residual payment $P(s) - D > 0$. When the firm employs the optimal quantity of debt financing, the resulting time $t = 0$ market value of the equity claim, E, is:

$$E = \int_{s_d}^{s_u} [P(s) - D]\phi(s)\mathrm{d}s. \tag{9}$$

From Eq. (9) it is evident that $\partial E/\partial \alpha > 0$; the value of equity *increases* with asset specificity. With higher specificity, the firm relies less on debt financing by promising a smaller payment D in Eq. (7), thus increasing the residual $P(s) - D$. Moreover, the range of states $s < s_d$ over which the firm would default diminishes since Eq. (7) revealed that $\partial s_d/\partial \alpha < 0$. Thus, equityholders receive the larger residual $P(s) - D$ over a wider range of states. Therefore, E in Eq. (9) must increase with specificity. This same result extends to increases in operating profitability. An increase in ρ increased operating payoff $P(s)$ in Eq. (1) and, it will be recalled, left the promised payment D in Eq. (7) unchanged. Consequently, the residual payment $P(s) - D$ increases with profitability. Further, examination of Eq. (7) revealed that the firm would default in fewer states as profitability increased – that is, $\partial s_d/\partial \rho < 0$. Thus, equityholders receive a larger residual payment over a wider range of states. Accordingly, the value of equity in Eq. (9) increases with profitability.

A clear pattern of capital structure choices by firms now emerges. Given debt governance costs, there may be some firms having assets so specific that use of debt financing to cause intervention and liquidation never pays. Such firms will be financed solely by equity and, given the managerial pre-disposition to operate, will not be liquidated. But where assets are less specific, it pays to employ debt financing to force liquidation in some states. The less specific (and more fungible) the assets and the greater the operating profitability of the firm, the greater the optimal total quantity of debt financing employed and the smaller the residual equity claim.[6]

[6]Two additional aspects of debt financing, as driven by governance costs, are worth mentioning. First, an optimal debt-equity mix would never involve a promised payment *greater* than D in Eq. (7). Were this to occur, the possibility of default would then exist in some states $s > s_d$ where the condition $P(s) > L(s) - G_d$ holds. If default then occurs, debtholders would *reorganize* the firm rather than liquidate since the operating payoff is superior. But the resulting net operating payoff is reduced to $P(s) - G_d$ given the costs of intervention provoked by default. This is inferior to the operating payoff $P(s)$ obtainable for $s > s_d$ under equity governance, where no intervention would take place and, therefore, no costs would be sustained. Second, inspection of Eqs. (6) and (7) reveals that debt governance costs are borne by equityholders; for the promised debt payment declines with debt governance costs and, given Eq. (8), so does the total value of debt financing received by the firm. Equityholders still gain, however, because debt governance to force liquidation remains cheaper than equity governance so employed.

Table 1
Direction of effect of increases in asset specificity (α) and operating profitability (ρ) parameters upon debt and equity value and their components

Debt and equity values and their components	α	ρ
Liquidating payoff $L(s)$	Decrease	Increase
Operating payoff $P(s)$	0	Increase
Promised debt payment D	Decrease	0
Range of states in default $s < s_d$	Decrease	Decrease
Payoff to equityholders $P(s) - D$	Increase	Increase
Total market value of debt B	Decrease	Increase
Total market value of equity E	Increase	Increase

4. Predictions, evidence and comparisons to alternative theories

Predictions of the asset specificity model can now be developed and compared to extant empirical evidence and to the predictions of alternative theories of capital structure. To support construction of the model's predictions, the signs of earlier-established derivatives summarized in Table 1 will be relied upon.

4.1. Behavior of debt ratios

Inter-firm comparisons of capital structure choices necessarily rely upon debt ratios. Let the ratio of debt to equity financing for the firm, B/E in the notation here employed, describe the relative use of debt over equity in the capital structure. Given previously identified effects of asset specificity and operating profitability on the value of debt, B, and equity, E, it is easy to establish that debt ratios *decline* with increased asset specificity and with increased operating profitability. From the summary provided in Table 1, increases in asset specificity reduce the value of debt and increase the value of equity. Therefore, the debt/equity ratio B/E must decrease with increased specificity. As for operating profitability, it has been established that higher profitability increases the value of both debt *and* equity. However, it can be shown that increases in operating profitability increase the value of equity proportionately more than the value of debt. Consequently, debt/equity ratio B/E also declines with higher operating profitability.[7]

4.2. Debt risk

It is obvious that firms using debt financing will be issuing risky debt. The question is, how risky? The market value of debt, B in Eq. (8), is a *total* market value. What is needed to answer the question is the market value of *one dollar's* worth of promised debt payment, denoted as b. Clearly, $b = B/D$; given the total promised debt payment D, the

[7]As operating profitability increases, the promised payment is made over a wider range of states and, from Eq. (8), the value of debt increases. The upper limit on the value of debt, approached as ρ approaches infinity in Eq. (1), is the value of risk-free debt where the promised payment is made in *all* states. But the value of equity in Eq. (9) has no finite upper limit as profitability increases. Therefore, the debt ratio B/E falls as profitability increases across states.

lower the total market value B placed on it, the smaller the value per dollar of promised payment and the greater the risk of the debt. By dividing B in Eq. (8) by D, the value of one dollar of promised debt payment is:

$$b = \int_{s_0}^{s_d} \frac{[L(s) - G_d]}{D} \phi(s)\mathrm{d}s + \int_{s_d}^{s_u} \phi(s)\mathrm{d}s. \tag{10}$$

Evaluation of Eq. (10) indicates that b increases and risk *declines* with increases in either asset specificity *or* operating profitability. Liquidating payoffs received in default over states $s < s_d$ are all less than the one dollar promised payment – that is, $L(s) - G_d < D$. Also, recall from Table 1 that $\partial s_d/\partial \alpha < 0$; an increase in asset specificity reduces the range of states over which default occurs. This shifts the limits of integration in Eq. (10) in favor of the receipt of the one dollar promised payment across states. Therefore, risk declines as asset specificity increases. As for operating profitability, recall again that an increase in this parameter increases $L(s)$; with promised debt payment D invariant to operating profitability, the ratio $[L(s) - Gd]/D$ increases in Eq. (10). Further, the range of states over which default occurs is narrowed, since $\partial s_d/\partial \rho < 0$, thus acting to shift the limits of integration in Eq. (10) in favor of receipt of the one dollar promised payment. With more received in liquidation and with the promised one dollar payment received over a wider range of states, b in Eq. (10) must rise and debt risk must fall. This makes sense since higher operating profitability is better protection for the debt claim.

4.3. Empirical evidence

Myers (1990) has identified two strong empirical regularities that any theory of capital structure must explain.[8] First, corporate utilization of debt financing, as measured by debt ratios, is inversely related to operating profitability. This conclusion rests on a number of cross-sectional empirical studies, including Barton et al. (1989), Baskin (1989), Kester (1989), Titman and Wessels (1988). Second, debt ratios have been found to be positively related to measures of the tangibility of the firm's assets. Firms having large quantities of tangible assets, such as plant and equipment, tend to have relatively high debt ratios. Where assets are largely intangible, reflecting investments by firms in areas such as research and development or advertising, debt ratios tend to be low. Relevant empirical studies include Bradley et al. (1984), Crutchley and Hansen (1989), Friend and Lang (1988), Long and Malitz (1985).

The evidence is strikingly consistent with the asset specificity model. The latter predicted an inverse relationship between debt ratios and operating profitability and this is supported by the data. The model is also consistent with the evidence regarding asset tangibility. Tangibility is a proxy for specificity; highly tangible assets are likely to be relatively non-specific; intangible assets are likely to be more specific to the purposes of

[8]He also cited event study evidence (Smith, 1986) showing that announcements of debt-increasing (reducing) recapitalizations are associated with share price increases (decreases) and asserted that a capital structure model must explain this regularity as well. The asset specificity model developed here can also be shown to yield this prediction. However, the alternative models to be discussed uniformly see debt as adding value to the firm and would yield, in most cases, the same prediction. Since the model cannot be distinguished from alternatives on the basis of this prediction, further discussion of share price behavior is suppressed.

the firm.[9] Therefore, the evidence showing that debt ratios are positively related to asset tangibility supports the model's prediction that high debt ratios should be associated with assets of low specificity.

Apparently, there is no available empirical evidence that would *directly* test the model's remaining predictions that debt risk decreases in asset specificity and operating profitability. But by implication, the previously cited evidence regarding debt ratios is at least consistent with these predictions. High debt ratios were associated with high asset tangibility (low specificity) and low operating profitability, characteristics also associated with greater debt risk. Therefore, indirectly, this evidence supports the model's predictions regarding debt risk.

4.4. Comparisons with alternative theories

It is beyond the scope of this paper to review the inner workings of alternative theories in any depth. Moreover, such inquiry is not necessary. The validity of a theory lies in how well it explains capital structure behavior. It has already been shown that the asset specificity model yields predictions supported by the empirical evidence. The remaining question is, are the predictions associated with alternative theories also consistent with that body of evidence? The answer is in the negative. They either fail to predict part of the observed relationships or generate contrary predictions.

As originally advanced by Modigliani and Miller (1963), one body of theory assumes that tax savings resting upon deductibility of interest payments motivate the use of debt financing. However, as in Myers (1984, 1990), costs of financial distress limit the use of debt, these costs being directly affected by the degree to which assets are tangible. Tangible assets should support more debt than intangible assets. Such a prediction is consistent with the empirical finding that debt ratios are positively related to asset tangibility. But this sort of theory would also predict that highly profitable firms, being subject to the highest tax rates, would use more debt than less profitable firms because of their enhanced ability to enjoy the tax savings. This position is clearly contradicted by the empirical evidence showing that debt ratios and operating profitability are inversely related.

A second body of theory assumes asymmetric information between managers of firms and investors. The Pecking Order Theory, developed by Myers and Majluf (1984), concludes that firms prefer internal finance. But if internal cash flows are insufficient to fund investment opportunities, then external finance will be sought, with debt financing being the most desirable. Consistent with one part of the evidence, this theory predicts that high debt ratios will be associated with low profitability. However, the theory offers no role for asset specificity (tangibility) and, therefore, the Pecking Order Theory cannot explain that vital portion of the evidence. Harris and Raviv (1990) have managers using debt to signal the presence of higher earnings to investors. They conclude that high debt

[9] Asset tangibility is not a perfect proxy for asset specificity. For example, an asset might be tangible, yet so specific in its uses, that its value in liquidation would be limited – for example, injection molding equipment designed to produce hula hoops. An intangible asset such as a patent might be fungible and have a substantial value in liquidation. Nonetheless, one would expect intangible assets to be more specific, on average, than tangible assets.

ratios will be associated with high asset liquidation values. Since liquidation value is directly related to low specificity (highly tangible assets), this prediction may be said to be consistent with the evidence. However, the model is silent with regard to the influence of operating profitability on debt ratios.[10]

Finally, there are agency cost models in which conflicts of interest exist between managers and owners of firms. Grossman and Hart (1982) have managers using debt financing to produce increased efficiency of operations and so generate higher profits. In turn, higher profits enhance consumption of perquisites by managers. This model predicts a positive relation between use of debt and profitability, an outcome clearly at variance with the evidence. No role exists for asset specificity (tangibility). Jensen (1986) postulates that firms with large free cash flows (highly profitable firms with limited investment opportunities) present an agency problem in that managers are tempted to undertake inferior investments and otherwise operate the firm inefficiently. Debt is employed as a way of forcing managers to disgorge free cash flow to the owners. This suggests that firms with high operating profitability should employ more debt financing. But such a prediction is inconsistent with the evidence. There is no role afforded to asset specificity (tangibility).[11]

The list of competing theories just presented is not exhaustive, but it is representative. None of them are consistent with the evidence. In contrast, the asset specificity model is well supported by it.

5. Implications for management of capital structure

A common feature of corporate finance textbooks is the emphasis placed upon use of a target capital structure when estimating corporate cost of capital.[12] That target capital structure is expressed in terms of debt ratios upon *market* values of debt and equity and typically assumes a tax motivation for employing debt financing. When these target ratios are used to estimate the cost of capital, the assumption is that a firm's managers will act to align, at least approximately, the firm's actual and target debt ratios over time. Any disturbance in the market value of debt or equity that would cause the actual debt ratio to deviate from target would require managers to engage in appropriate recapitalizations in order to restore equivalence between actual and target ratios. However, Myers (1984) has noted that there is little empirical evidence to support this conventional notion of capital structure management. When market-based ratios for firms of similar characteristics are

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[10] In fact, it is impossible to make a distinction between the influence of liquidation value and operating profitability upon the quantity of debt employed by the firm in the Harris and Raviv model. This is because they specified that liquidation value was directly related to operating profitability, or $L=f(P)$ in the notation employed here. Thus their model could be interpreted to mean that high levels of debt should be associated with high levels of operating profitability, an outcome obviously at variance with the evidence.

[11] In an extension of the spirit of Jensen's model, Myers (1990) was able to generate the prediction that debt levels and operating profitability would be negatively correlated. This outcome is consistent with the evidence on operating profitability but the enhanced model is still silent regarding any role for asset specificity (tangibility).

[12] A typical presentation of the conventional view is contained in the text by Ross et al. (1996). An excellent discussion of the approach is contained in Taggert (1991).

compared, there is a bewildering array of observed debt ratios that suggests a considerable lack of managerial attention to discrepancies between actual and target capital structure. But this apparent managerial inertia is easy to understand if the asset specificity model has relevance. Given debt governance costs and the scale of resources in the firm, the *only* influence upon the firm's optimal promised debt payment in Eq. (7) is asset specificity. If the firm sets that payment accordingly, *no other action* by managers would be required unless the degree of asset specificity of the firm's assets were to change. The resulting market values of debt and equity, and the debt ratios observed for the firm, could change for any number of reasons, including changes in the prospects for the firm or aggregate changes in prices in debt or equity markets. But no reaction by managers, no adjustment of the actual debt ratio, would be required. Thus, much of the observed variation in debt ratios may be meaningless from the standpoint of managing capital structure.[13] Therefore, if asset specificity is at the core of the capital structure decision, then the conventional version of how managers act to maintain a target capital structure is flawed. Widely used estimates of cost of capital that assume a target capital structure then become questionable.

6. Conclusion

In presenting an asset specificity-based model of corporate capital structure, there is no suggestion that taxes, asymmetric or agency costs do not play a role. However, alternative theories resting on such constructions do not explain the available evidence as well as the model developed here. If the validity of a model rests on how well its predictions are supported by the evidence, then Williamson's insights offer an attractive approach to explaining corporate capital structure behavior.

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[13] Not all variation is meaningless. In an ideal test, firms would be grouped in similar conditions of specificity. Allowing for the role of operating profitability, the *average* observed debt ratios should differ between groups according to specificity. The earlier-cited evidence regarding debt ratios and asset tangibility is consistent with this expectation.

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