Market Imperfections, Agency Problems, and Capital Structure: A Review

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Introduction

Prediction of the effect of capital structure on the market value of the firm remains elusive despite much research over the past three decades. On the one hand, Modigliani and Miller [35] demonstrate that under perfect capital markets — free entry, equal access to information, and absence of transaction costs and taxes — the choice among various financial instruments is inconsequential to the value of the firm. This powerful result is reinforced by Stiglitz [45], who shows that financial policies are irrelevant even with risky debt, provided the investment opportunity set remains unchanged by financial policy. His proof further implies that corporate decisions relating to the maturity structure of debt as well as other complexities which characterize financial instruments do not affect firm value.[1] On the other hand, real world corporations engage in active financial management which manifests itself in the form of cross-sectional variations in debt ratios, differing debt maturity structures across industries, and complex financial contractual arrangements (*e.g.,* call provisions, convertibility features, sinking fund arrangements, warrants, or

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[1]Many apparent explanations of the observable complex structure of financial instruments are not consistent with the Stiglitz framework. For example, *call provisions* on corporate debt are commonly attributed to interest rate uncertainty, suggesting that since stockholders are able to reap the added value of the bond caused by a decrease in interest rates, they gain, and bondholders lose commensurately, in an *ex ante* sense. However, in the Stiglitz framework, when arbitrage profits are fully exploited, the value of a non-callable bond will always equal the value of a callable bond plus the value of the call privilege. That is, stockholders pay at issuance an amount which reflects the full value of the call privilege. Also the common explanation of the *maturity structure* of debt is a "habitat" argument, which implies that "optimal" debt maturity is achieved at the point where debt and asset maturities are matched so as to minimize the uncertainty associated with interest rate fluctuations [36]. Again, however, in the framework of perfect markets, there is no basis for an "optimal" maturity structure.

preferred stock).

There are two alternative explanations for the discrepancy between theory and reality. The first asserts that corporate reliance on complex financial instruments is merely an artifact of market equilibrium and by itself does not provide evidence for the relevance of the corporate financial policies. According to this argument, the multiplicity of financial instruments emerges from situations of disequilibrium in which (certainty equivalent) yield differentials temporarily exist. Corporations engage in activities that are aimed to capture arbitrage profits by providing more of the desired instrument. These supply adjustments continue until equilibrium is reached where the choice among financial arrangements no longer affects the market value of the firm. Still, at this point, corporations are financed by a variety of financial instruments so that complex financial structures may be observed. The second explanation of complex financial structures centers on imperfections in the functioning of the capital market. The link between specific types of market imperfections and corporate financial policies is the subject of this paper.

The introduction of imperfections to rationalize corporate decisions is not new. Finance texts provide criteria for optimal capital budgeting decisions. But such criteria can be justified only if the product and factor markets are imperfect in the sense that they are subject to barriers to entry, scale economies, information monopoly, and so on. Only then can positive net present values occur. By the same token, an explanation for the resources expended to identify optimal financial decisions must rely on market imperfections or frictions. One example of an imperfection is the tax code which, in recognizing interest as an allowable expense, favors debt over equity financing.[2] The focus of our paper is on *another* class of market imperfections, namely, agency problems stemming from the ownership structure of the firm.

Agency problems may exist when a principal, or group of principals, employs an agent to perform a service which necessitates delegating decision-making authority to the agent. These problems arise from conflicts of interests between the agent and the principal, or they can occur among the principals themselves. The analysis of the impact of these conflicts of interest on corporate decisions is based on two fundamental

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assumptions. First, owners and agents behave according to their own self-interest; and second, each of the participants in the activities of the firm is rational and capable of forming unbiased expectations regarding the future wealth. The agency literature identifies situations where conflicts of interest coupled with self interested behavior and rational expectations result in suboptimal business decisions. When this occurs, agency problems create "agency costs."

The agency problems considered in this paper arise from three sources. *First,* market imperfections may lead to an inability of management (the agent) to reveal the exact nature of the firm to debt and equity financiers (the principals) costlessly. This is a problem of informational asymmetry [20, 29, 39, 40, 44].

Second, the existence of debt financing under limited liability generates 1) stockholder incentives to accept suboptimal and high-risk projects which transfer wealth from bondholders to stockholders [15, 23], 2) stockholder incentives to forgo new profitable investments when previously issued debt is supported by the existing assets and the option to undertake these investments [8, 37], and 3) bankruptcy costs associated with resolving stockholder–bondholder disputes if insolvency occurs [5, 19, 23, 24, 27, 28, 42, 48].

Third, partial ownership of the firm by an owner–manager may provide him or her an incentive to consume non-pecuniary benefits or perquisites beyond that which a manager who is the sole owner of the firm would consume [21, 23].

Agency problems result in a reduction in market value *if* the markets for financial and human capital are unable to resolve the problems costlessly. One market mechanism that can mitigate agency problems is the takeover process. An impediment to this mechanism exists in the form of the "free rider" problem (see [16]). While we discuss the "free rider" problem in detail later, our analysis focuses on the agency problems that remain unresolved after natural market forces have operated to the full extent possible. Attempts to control these residual problems yield 1) complex contracts which may partially resolve them, 2) differential yields among various types of financial instruments, and 3) complex (and possibly optimal) capital structure.

The Nature of Agency Problems

Debtholders are assumed to be rational in anticipating agency problems and in pricing agency costs into the value of their financial claims. In this framework, it should come as no surprise that stockholders might bear the full consequences of all unresolved agency

problems.

The Agency Problem of Informational Asymmetry

Consider a management that seeks to finance a project by selling securities, while the true nature of the return distribution of the project is unknown to the outside market. Management possesses valuable information about the project which is unavailable to the market. If this information were revealed to the market without ambiguity, the market would value the project at V_A. Otherwise, the market is unable to distinguish this project from another *less* profitable project with a value of V_B. This is a problem of informational asymmetry. It does not imply that management has better or more information than the market, but that it possesses some information that is valuable but unavailable to the market, without which the market cannot identify the true nature of the project before it is undertaken.

This asymmetry may be resolved, at a cost, through various "signaling mechanisms." In the absence of an unambiguous signal, however, management will obtain less for securities sold than their "fair value" reflected in the true nature of project A. The difference between the "fair" price and the actual price is the agency cost associated with informational asymmetry, and it exists for the issuance of debt as well as new equity securities, provided that there is a differential probability of bankruptcy for the two projects.

It should perhaps be noted here that this particular agency problem is unique, because unlike the others, it cannot be resolved costlessly through arbitrage in the financial markets. Consequently, this problem may be more significant than the others in terms of inducing yield differentials between securities and optimal capital structure. We wish to emphasize that a going concern faces a continuing problem of informational asymmetry. The problem is not merely one of identifying the nature of new projects, but also one of identifying the nature of the current distribution of returns to the entire firm whenever additional financing is needed.

Agency Problems Associated With Debt Financing Under Limited Liability

The Incentive of Stockholders to Bear Unwarranted Risk

The fact that stockholders may benefit by investing in high-risk projects is best demonstrated by consider-

ing equity as a European-type call option to buy back the entire firm from the debtholders at maturity, at an exercise price equal to the face value of the debt. The debtholders can be viewed as buying the assets of the firm and issuing the call option (equity) on these assets. It is easy to understand this if the debt is in the form of pure discount bonds so that the time to expiration of the option (equity) is the maturity date of the bonds. As (in the framework of the option pricing model of Black and Scholes [7]) the value of this call option increases with the variance of the cash flows of the underlying assets, stockholders will increase the market value of equity, at the expense of debtholders, by selecting high-risk projects. For expositional purposes, suppose that two projects with differing risks are available to the firm. If both low- and high-risk projects available to the firm have the same market value, the choice does not affect the total value of the firm. It affects only the distribution of the value between bondholders and stockholders. Rational bondholders recognize the investment alternatives and stockholder risk incentives, and thus offer a price for the debt that reflects the distribution of wealth given adoption of the high-variance project. In any case, because both projects command the same value, no cost is incurred by either party.

The situation is more serious, however, if the high-variance project commands a lower market value, say $9 as opposed to $10 for the low-variance project. Suppose that for a given face value and coupon, the price of debt is $5 if priced in accordance with the adoption of the superior (but low-risk) project but $3 if priced with the presumption that the inferior (but high-risk) project is adopted. If bondholders have no means of neutralizing the stockholder incentive for risk shifting, they would presume that the inferior (but higher-risk) project will be adopted, and hence offer a price of $3. Unlike the previous case, the price reflects not only the higher-risk from which equityholders benefit but also the inferiority of the project in terms of current value. If stockholders wish to finance the superior project, they will lose, because the bond price will go up to $5 from $3, and commensurately the stock price will decline from $6 to $5. Thus, they are forced to adopt the inferior project with a value differential of $1. This differential is an agency cost which, on the surface, appears to be borne by stockholders.

The Incentive of Stockholders to Forgo Profitable Investments

This case considers a firm that holds an option on future investment opportunities [37]. Based on those

opportunities, the firm issues debt (at time t = 0) with a face value of D which matures (at t = 2) *after* the true market value of the investments is revealed (at t = 1). This debt is *entirely* supported by future investment opportunities. At t = 1 the firm faces a decision whether to exercise the option (*i.e.,* undertake the investment). In the absence of debt financing, the firm accepts any investment for which the market value net of the required dollar investment is positive. But given the outstanding debt, stockholders maximize their wealth by accepting an investment only if its *net* market value exceeds D. Otherwise, it is in their best interests to default. Thus, the presence of debt in the capital structure causes the firm to forgo any investments for which the (positive) net market value is lower than D. Obviously rational bondholders recognize the increased probability of default on their claims and discount it in the price they are willing to offer the firm for its bonds. Consequently, the stockholders, once again, are apparently forced to suffer the full burden of this agency cost.

Suboptimal future investments can also occur when the currently outstanding debt is issued against the currently held assets [8]. This is unlike the previous case in which debt is entirely supported by future investments. Stockholders, however, cannot capture the full benefits of future investment opportunities, because they partially accrue to bondholders in the form of a reduction in the probability of default. Consequently, investment incentives may be curtailed despite the possibility that these opportunities generate a positive net present value for the firm as a whole. As before, equityholders suffer the full burden of the associated agency cost, because bondholders are unwilling to pay for future benefits due to the moral hazard problem.

Bankruptcy Costs

It is well known that if the transfer of ownership from stockholders to bondholders under default is costless, the mere possibility of bankruptcy should have no impact on the capital structure decision [3, 4, 13, 18, 33, 45]. Since it is impossible, though, to write contracts which specify, clearly and unambiguously, the rights of claimholders under all contingencies, one or more of the parties may precipitate a dispute that may be resolved in the process of formal bankruptcy proceedings. These proceedings are not costless; they involve a legal process which itself consumes a portion of the remaining value of the firm's assets. Moreover, the formal process of transferring ownership may dis-

rupt the normal activities of the firm, precipitating a deterioration in long-standing customer and supplier relationships.

As significant as the costs associated with formal bankruptcy proceedings may be, they should not be confused with the costs associated with *liquidating* the firm's assets [19]. Bankruptcy and liquidation are best considered as distinct and independent events. Neither event is necessarily sufficient to trigger the other. The firm liquidates if and only if the market value of the firm as a going concern falls below its dismantled value under liquidation. Many authors have attributed the costs associated with distress sale of the assets of the firm to the event of bankruptcy [24, 27, 28, 42]. This is inappropriate, because while the proportion of debt in the capital structure affects the probability of bankruptcy, in no way does it affect the probability of liquidation. Liquidation is, in a complete sense, a mere capital budgeting decision. There is no *necessary* link between the decision to liquidate and the ability to pay off debt claims. A firm on the brink of bankruptcy should be liquidated only if the value of its assets as a going concern net of the reorganization costs is below the dismantled value under liquidation. By the same token, a non-bankrupt which fits this same test must be liquidated. At any rate, the expected value of bankruptcy costs, if any, can be said to be borne by equityholders if debt is sold to rational investors. Bankruptcy costs are identical to other agency costs in this respect.

The Agency Problem Associated with Partial Ownership with Controlling Interests

Consider an owner–manager who uses external equity financing but retains complete control of the firm [23]. The manager behaves so as to maximize his utility from 1) money wages (which are assumed to be fixed), 2) the market value of his firm, and 3) on-the-job perquisites (which are assumed to be *inseparable* from the firm).[a] *As sole owner,* the manager fully bears the cost associated with additional perquisite consumption, and he seeks a utility maximizing combination of the rewards described above. This balance is upset, however, once the manager sells a fraction of

[a] A good example of a "perk" of this type is expanding the owner–manager's span of control beyond the level that would maximize firm value. The manager may value the social prestige and power accompanying his position as chief executive officer and may be hesitant to delegate authority, even when it would increase the market value of the firm to do so.

his common shares to outsiders. This is the case, because, while he continues to enjoy the full benefit of additional perquisite consumption, he bears only *his* proportional ownership fraction of the associated reduction in the value of the firm's stock.

With rational expectations, outsiders are aware of the owner-manager's incentive to increase "perk" consumption. They make unbiased estimates of the costs associated with the increased perk consumption, and they pass these costs back to the owner-manager in full, in the form of a commensurate reduction in the price they are willing to pay for the securities he initially desires to sell. The manager is left with a combination of benefits in the form of dollar wealth and perquisites that is undesirable relative to his optimal combination as sole owner. Thus, in attempting to finance the firm through sale of common stock, he suffers a welfare loss that may be described as an agency cost. A similar problem occurs if the owner-manager seeks financing through debt securities. Given limited liability, if the probability of default on the debt increases with increased perk consumption, the manager bears only a (decreasing) fraction of the associated cost. Again, however, with symmetric rationality, that portion of the costs not borne directly will be incurred when the securities are issued in the form of lowered proceeds of sale.

Agency problems have been classified in this section by their origin. A related classification emphasizes the financial asset (equity or debt) which is subject to a particular agency problem. The agency problems of equity appear under informational asymmetry and under excessive perk consumption. The agency problems of debt are associated with these as well as with risk incentives and bankruptcy problems. The fixed nature of the debt claim in conjunction with limited liability is the prime source for the risk incentive and bankruptcy problems.

Market Solutions to Agency Problems

Here we will assess the role that well-functioning markets for capital and labor may play in reducing or eliminating the costs involved in specific agency problems. In essence, we argue that, if markets are well-functioning, sufficient pressures are present to force management to carry out decisions on the basis of the interests of all securityholders. Thus, costs arising from conflicts of interest are resolved.

The Market for Financial Capital

Agency problems associated with debt financing

under limited liability may be resolved by natural forces in the capital market. Assume management seeks to maximize stockholder welfare by switching to projects characterized by relatively high variance and relatively low value. In anticipation of these decisions, the total value of the firm declines as a net result of an increase in the value of the common stock and a more than proportionate decrease in the value of the outstanding debt. It is now in the interests of bondholders to acquire controlling interest in the common stock and to make decisions that maximize *firm* value [2, 13]. In doing so, they capture a pure benefit (an arbitrage profit) from increased value.

Existing common stockholders, of course, may also force management into a decision to maximize firm value. In fact, in view of possible impediments to "market pressure" that we shall discuss, stockholders seem to have a *comparative advantage* in carrying out the process. If each individual stockholder imputes rationality to other stockholders, it is in his interests to acquire debt in the firm (at a reduced price which reflects the impending *suboptimal* investment decision) in proportion to the fractional amount of debt contained in the firm's capital structure. Once a controlling majority of stockholders have done this, management must shift to an optimal investment decision, and these rational stockholders reap arbitrage profits.

When equityholders buy up the bonds of the firm on a *pro rata* basis, debt possibly loses its economic distinction and bondholders essentially become equityholders. However, for a firm with dispersed ownership, the Internal Revenue Code recognizes the debt as legitimate, and hence tax deduction of interest payments is still intact. Moreover, as far as an owner-manager is concerned, purchasing debt in proportion to his equity share has no impact on his propensity to consume perks if the debt is riskless, and it actually reduces the propensity if the probability of default on the debt is positive.[4]

A similar arbitrage argument can be evoked in the context of the agency cost associated with bankruptcy [19]. The argument states that if the costs of *formal* reorganization are indeed significant, it is in the interest of managers to adjust to an optimal capital structure by reorganizing the firm *informally* through purchase and sale of the bonds and the stock of the firm at prevailing capital market prices. If the

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[4]On the other hand, if investors are forced to hold fixed proportions of debt and equity, they may suffer diversification costs as their portfolios deviate from the desired, utility-maximizing, weights.

manager fails to do so and the market values of the securities of the firm are reduced to reflect the costs of formal bankruptcy, it is in the interests of outsiders to take over the firm and initiate an informal reorganization. This can be accomplished by buying the bonds and the stock at their discounted market values. By acquiring all the claims to the firm, the dispute can be avoided and the expected bankruptcy cost can be captured as an arbitrage profit.

The Market for Human Capital

Agency problems associated with informational asymmetry and managerial perk consumption may be resolved via the operation of well-functioning markets for human capital. Consider the problem of excessive perk consumption. This problem must be of no consequence if the managerial labor market is efficient in the sense that the managerial wage reflects an unbiased estimate of his expected marginal product. In this case, the present value of the manager's future wages adjusts fully to reflect "shirking" or excessive perk consumption. In such an efficient labor market, the adjustment in the manager's wage provides for a full *ex post* settling up, so that the manager is disciplined to behave in the optimal interests of the firm [12].

It doesn't seem to be widely recognized that discipline in this form by the labor market provides a solution to the problem of informational asymmetry as well. In this case, the manager has a problem of communicating the true nature of the firm without moral hazard. If the manager fully suffers the consequences of attempts to deceive the market through changes in the value of his human capital, the moral hazard problem disappears. This may explain why managers want the Board of Directors to verify their honesty. The Board may be viewed as improving the functioning of labor markets in resolving the problem of informational asymmetry. Therefore, in the presence of a well-functioning labor market, managers are motivated to tell the truth with or without a specific managerial incentive compensation scheme that is tied to bankruptcy such as discussed in [39]. Thus, the link between financial structure and informational asymmetry disappears.

Impediments to Spontaneous Market Solutions of Agency Problems

Impediments may exist which serve to block a natural and costless resolution to agency problems in the *capital* market. Consider first the agency problem associated with excessive perk consumption by an owner–manager. It would seem at first that outsiders are in a position to capture an arbitrage profit by purchasing all the securities of the firm and replacing the owner with a manager who will run the firm to maximize shareholder wealth. It must be remembered, however, that in order to surrender his controlling interest in the firm, the owner–manager demands compensation, over and above the fair market value of his securities, for his "managerial rights." Recall, that the manager derives utility from perk consumption as well as from the dollar wealth represented by his security holdings. Moreover, the combined utility from both exceeds the utility he can derive from reducing perk consumption to zero and maximizing the value of the firm. Consequently, he will not surrender the firm at a price that reflects this maximized value, and hence the natural capital market mechanism is impeded.

The nature of the personal income tax may also impede the market mechanism. Capital gains are taxed when realized and, if the market value of the stock has appreciated, a controlling majority of stockholders may be locked into their existing investment in the firm. By holding their shares they are in effect benefiting from an interest-free loan from the government (the capital gains tax they do not have to pay) and they will demand a price for their stock that is higher than the prevailing equilibrium market price in order to surrender this benefit. One may counter this argument with an assumption of unlimited short selling, but it is difficult to imagine how one can force a takeover of *controlling interest* in the shares of the firm even when the potential acquirer is aided by additional supply brought on by short selling.

This impediment is not as effective in blocking market mechanisms as solutions to the agency problems of debt associated with bankruptcy. The securityholders of a bankrupt firm are likely to have already suffered accrued capital losses, and hence they are not "locked in" in terms of taxes.

Still another impediment to the threat of takeover, which underlies many of the market solutions to agency problems, is implied by the "free rider" problem [16, 17]. In a standard definition, a free rider is one who benefits from actions or costs borne by others. In other words, a free rider gets a "free lunch," so to speak. In the context of this paper, a free rider is an individual who attempts to benefit at the expense of his fellow securityholders by blocking a process which is in the general interests of all parties. It is not surprising that free riders themselves are discouraged

through the legislative and judicial process. Consider the case where the takeover process is initiated by an outsider, say another firm. Suppose the target firm's bankruptcy is imminent and that the total value of all securities of the firm reflects the expected costs of formal bankruptcy. Corporate charters commonly provide for acceptance of merger bids by majority vote of existing stockholders. Free riders can be prevented from blocking the takeover process by tendering an offer to existing stockholders at a slight premium over the prevailing market price. A controlling majority of stockholders need only respond favorably to the offer in order to formally merge the two firms. In legal terms, minority stockholders may now be "cashed out" of the arrangement on the basis of the market value of the firm prior to merger. In fact, if one assumes that the capital market functions perfectly, it is in the interest of securityholders to write corporate charters that severely restrict the ability of shareholders to "free ride." By allowing successful raiders to "cash out" free riders at unfavorable terms, securityholders increase the probability of attempted takeovers, and motivate existing management to maximize the value of the firm and thus reduce agency costs.

On the other hand, if the market for takeovers is not perfectly competitive, such charters may not be optimal, as they may reduce the expected value of the takeover bid. The importance of the "free rider" problem thus hinges on the functioning of the capital market. It is worth noting that an unimpeded operation of the takeover mechanism is the cornerstone of all financial theories which produce valuation models based on the elimination of arbitrage profits. In this regard, the importance of the "free rider" problem as an impediment in the capital market extends beyond the issue of agency problems.

Impediments may also block managerial discipline arising from the market for *human capital*. For example, senior corporate officers are usually not individuals in the early stages of their career. If retirement is a relatively short period away, a *simple* contract which specifies the manager's wage as his expected marginal product may be inappropriate to ensure a complete *ex post* settling up. A more complex contract which makes the manager's retirement benefits a function of his *ex post* marginal products may be required. In addition, a complete *ex post* settling up for a wage readjustment depends on perfect and costless information in the labor market on past performance of each and every executive. If such information is not available, or if it is costly, firms may err in assessing managers,

and a complete *ex post* settling up is no longer achieved ·for managers who change employers. Finally, we note the difficulty in assessing top level management given the sweeping impact of their decisions on corporate performance. It is possible that the magnitude and variability of corporate performance measures may not allow for meaningful estimation of managers' excessive perk consumption. In this case, managers are able to consume perks without the threat of an accompanying loss in the value of their human capital.

In the face of these impediments, one must admit some possibility of a blockage to natural resolution of agency problems by markets.

Agency Problems and Optimal Capital Structure

Marginal agency costs of debt are commonly considered to be an increasing function of the amount of debt employed in the capital structure. This is true in the case of bankruptcy, as the expected marginal costs associated with bankruptcy depend on the probability of bankruptcy, which is an increasing function of the amount of debt relative to equity. In terms of the risk incentive and the forgone growth opportunities problems, *marginal* agency costs of debt depend on the investment opportunity set facing the firm. For the risk incentive problem [15] this is immediately observed by ordering projects according to their net market value and level of risk. The change in net market value which is associated with a shift to a higher risk project will determine the magnitude of marginal agency costs.

On the other hand, if debt is used to signal the true nature of the firm [39] an increase in the amount of debt may *reduce* the agency costs associated with informational asymmetry. The rate of reduction, *i.e.,* the marginal agency costs associated with informational asymmetry, depends on the distribution of capital structures among firms which remain undistinguished by the market. This distribution determines the signaling value of marginal units of debt which are used to identify the true value of the firm.

These relationships between the agency costs of debt and the amount of debt give rise to an optimal capital structure in three distinct ways. *First,* agency costs (in particular bankruptcy costs) may serve as an offset against the tax advantage of debt financing, and hence the corner solution (99.99 . . . % debt in capital structure) implied by the traditional Modigliani-Miller [34] tax-adjusted valuation model breaks down.

The interior optimum arises from the tradeoff between the tax subsidy which is an increasing function (at a decreasing rate) of the amount of debt employed and the agency costs which are also an increasing function (at an increasing rate) of the amount of debt. *Second,* an optimal capital structure can result from the tradeoff between agency costs of debt on the one hand and agency costs of equity on the other hand, even in a taxless world. *Third,* a positive theory of capital structure can emerge in the process of signaling to the market the true nature of the firm when there is informational asymmetry.

The Tradeoff Between Tax Savings and Bankruptcy Costs

For some 15 years, agency costs in the form of bankruptcy costs have been offered as a link between observed firm debt policies and the Modigliani–Miller theorem under corporate taxes. The MM theorem depicted in Exhibit 1 predicts that the value of the levered firm, V_L, increases linearly with debt, D, so as to exceed the value of the unlevered (but otherwise equivalent) firm by a tax subsidy, T_CD, where T_C is the marginal corporate tax rate uniform across all cor-

Exhibit 1. Firm Value and Optimal Capital Structure
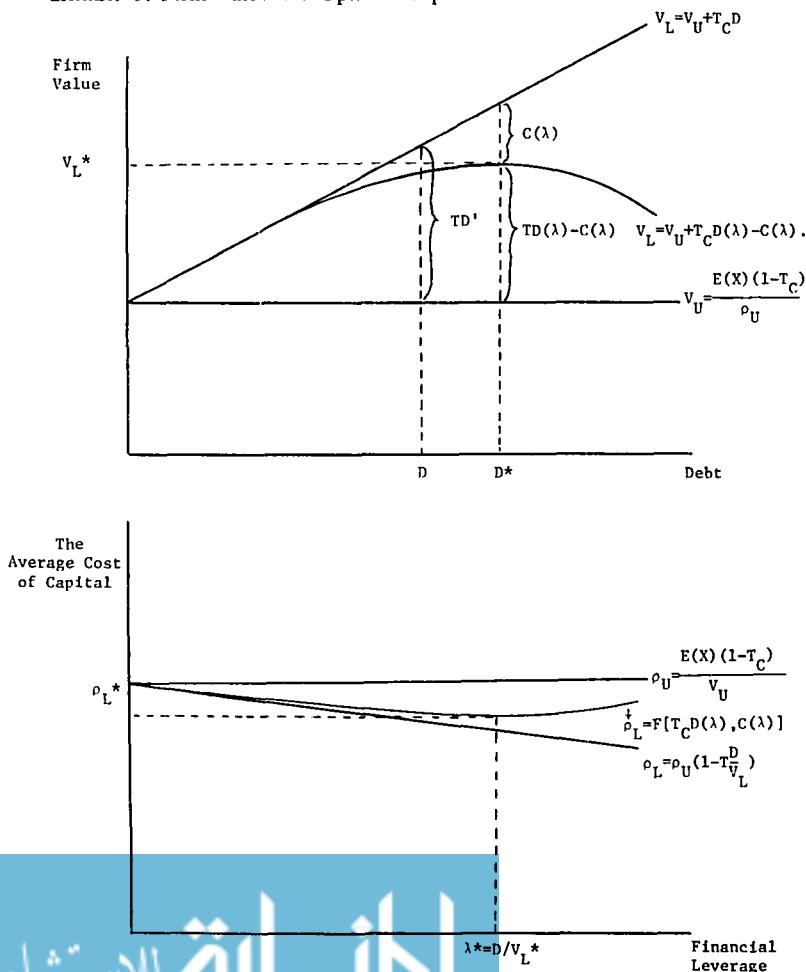
porations. Thus this theorem leads to a corner solution in which a nearly 100% debt/value ratio is desirable. Given possibility of costly bankruptcy, however, an optimal capital structure obtains when the present value of expected tax savings is offset at the margin by the present value of expected incremental bankruptcy costs [5, 25, 27, 42]. Assuming that bankruptcy costs exist, the value of the firm, V_L, is shown in Exhibit 1 as a concave function of the amount of debt employed. The present value of expected bankruptcy costs, C, is an increasing function (at an *increasing* rate) of the financial leverage, λ, while the tax subsidy $T_C D(\lambda)$ is also increasing with D. These phenomena manifest themselves in both the value and the cost of capital of the firm. At the optimum, the level of debt, D^*, maximizes the value of the firm (V^*) or equivalently minimizes the cost of capital (ρ_L^*).

It should be noted here that this tradeoff results in an (interior) optimal capital structure regardless of the magnitude of bankruptcy costs. This is true because, even if these costs are small, at some finite degree of leverage the present values of expected bankruptcy cost and the expected value of the tax subsidy may offset each other at the margin. However, the preceding arguments have been employed in order to reconcile existing financial theory with contemporary financial structures for observed firms. In the context of the actual probabilities of default, and the models employed by those advocating a bankruptcy cost–tax subsidy tradeoff, one must allege that the costs associated with bankruptcy are large. Limited efforts have been made to document their magnitude [48], but in any case the *traditional* arguments concerning bankruptcy costs and the tax subsidy rest on a significant breakdown of the arbitrage process described earlier. However, as we shall see below, if one evokes arguments pursuant to an equilibrium [31] in which bond yields are grossed up to reflect the tax advantage of debt at the corporate level, one *begins* from a position of indifference to debt *vis-à-vis* equity financing. This being the case, even an expected agency cost which is relatively small can result in an optimal capital structure, assuming that transaction costs associated with search for an optimal capital structure are negligible. However, it is still the case that agency costs of small magnitude have low impact on the *value of the firm*.

The Tradeoff Between Agency Costs of Debt and Agency Costs of Equity

It would seem that, in a taxless world with agency

problems of debt financing, we should have a corner solution to the capital structure decision in which equity financing dominates debt. This view is limited, because it ignores the possibility that equity financing may be characterized by significant agency costs. Agency problems of informational asymmetry and managerial perquisite consumption are endemic to equity financing as well. Capital structure policies that merely substitute equity for debt are trading off agency costs of debt against agency costs of equity [23].

The tradeoff is depicted in Exhibit 2 in which marginal agency costs of equity and debt are shown as rising functions of equity and debt, respectively. It is no longer necessary that debt financing have a tax advantage for an optimal capital structure. The advantage here is the reduction in the agency cost of equity. This advantage is offset at the margin by the incremental disadvantage of debt financing in the form of its own agency costs. In Exhibit 2 the optimum, λ^*, is reached when the present value of the sum of the expected agency costs of equity and debt is minimized. Thus, agency costs alone without tax considerations may give rise to an optimal capital structure.

Financial Signaling and Optimal Capital Structure

Various signaling mechanisms may be used to resolve the problem of informational asymmetry. The capital structure itself may be used as a signaling device to convey, without moral hazard, the true nature of the projects (firms). For instance, a proper

Exhibit 2. Optimal Capital Structure With Agency Costs of Equity and Debt
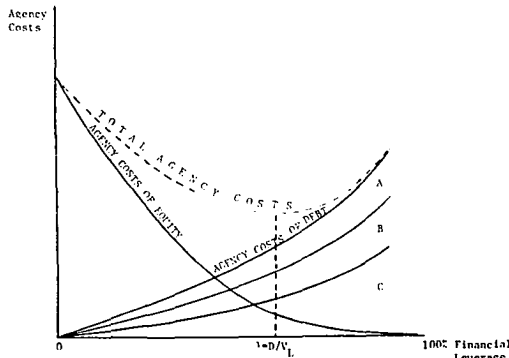
A Bankruptcy Costs
B Investment Incentive Costs
C Risk Incentive Costs

role of financial structure as a signal can be ensured through a managerial incentive schedule with an associated penalty tied to the occurrence of bankruptcy [39]. The "bankruptcy" penalty, which is built into the schedule, ensures a truthful signal by a manager who behaves rationally. The incentive problem associated with managerial announcements relating to firm profitability is resolved. In this framework, debt financing allows firms to signal the quality of their projects. For a firm with superior projects, additional debt financing is beneficial as it reduces the costs associated with informational asymmetry.

Another approach asserts that the entrepreneur's fractional equity ownership signals his personal evaluation of the project [29]. It is argued that there exists an optimal fractional ownership that correctly signals the true return stream of the project. This mechanism requires a prespecified schedule depicting the expected return on the project as a function of the entrepreneur's fractional ownership and an assumption that his utility function is known to the market.

While in the first two explanations of optimal capital structure the relationship between the capital structure and the value of the firm is *causal,* the signaling explanation suggests merely a *statistical* relationship. In the latter case, if financial structure serves as a signal, the value of the firm would respond to changes in financial structure caused by a change in the market's *perceptions* and not because of a *real* change in the return stream.

Complex Financial Contracts as Solutions to Agency Problems

The failure of markets to provide complete and costless solutions to agency problems suggests that a class of securityholders may require additional assurances against possible expropriation of their wealth by another class. Such assurances, and a commensurate reduction in agency costs, can be obtained through complex financial (and management compensation) contracts. Our discussion of the role of complex financial contracts in reducing agency costs covers call provisions, conversion privileges, income bonds, and the maturity structure of debt. By no means is this list exhaustive. For instance, we do not discuss avenues such as debt renegotiations or leasing arrangements which may be useful in resolving agency problems of debt financing.

The notion that complex contracts evolve in order to reduce agency problems has the potential to explain many real world contractual arrangements. The literature includes analyses of bond covenants (*e.g.*, contractual limitations on managers' incentive to take unwarranted risk) as a means of reducing the agency problems associated with risk incentives. Management compensation contracts are known as examples of arrangements that are beneficial in reducing agency problems when labor markets fail to provide appropriate solutions. Corporate bylaws include provisions that limit minority stockholders' options to block prospective takeovers or to act as "free riders" as discussed earlier.

Call Provisions in Corporate Debt

The call provision can be explained as a means of resolving the agency problems associated with informational asymmetry and risk incentives.[a] Consider first the case of informational asymmetry. Managers know that the firm is worth $V(A)$; the market, however, is uncertain about the firm's worth and hence is unable to distinguish it from the worth of an alternative firm, $V(B)$, where $V(B) < V(A)$. Management seeks to finance the firm with debt maturing in T periods. The true nature of the firm will be revealed to the market at some point prior to T. If the debt is risky, it must be sold in the market at less than its true value. The agency cost associated with the asymmetry is $V_D(A) - V_D(B)$, where $V_D(\cdot)$ is the market value of the debt, given the information set.

Management can mitigate the agency cost by attaching a call provision which provides the right to repurchase the bond at a specified price at a point in time immediately following the point at which the true nature of the firm is revealed. Thus, the stockholders of the firm take a long position in the call option and a short position in the debt. Note that the market undervalues both the call option and the debt, because they are both valued with the presumption that the value of firm is $V(B)$. The stockholders suffer a cost in amount $V_D(A) - V_D(B)$, but they recapture it, in part, through the undervaluation of the call option, $V_c(A) - V_c(B)$, where $V_c(A)$ and $V_c(B)$ are the values of call provisions associated with $V(A)$ and (B), respectively. The partial recapture is possible because of a lag in the revelation of the true nature of the firm. The call is effective in mitigating the transfer of wealth, however,

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[a]It should be pointed out that, with respect to all the agency problems discussed above, shortening the maturity of the debt accomplishes the same task as the call strategy does. The issues of debt maturity structure and call provisions belong to the same family in that both are alternative solutions to specific agency problems [2].

only to the extent that the true nature of the firm is revealed prior to the maturity date of the debt. If the maturity and revelation dates coincide, there will be no recapture of the agency cost.

The call provision can also be used to eliminate the incentive to shift to high-risk (but low-value) investments in order to transfer wealth from bondholders to stockholders. In the absence of a call provision, the shift to a high-risk investment may reduce the total value of the firm but may alter the relative values of debt and equity such that the value of equity is actually greater after the shift. The presence of a call option may eliminate the incentive entirely, because the value of this option declines with the value of the debt. Given that stockholders have a long position in this option, the option may be designed so that the decline in its value more than offsets the increase in the value of the stock that would take place. In this way, the risk incentive problem is neutralized, and the agency cost disappears.

The call provision may also be used to eliminate the incentive to forgo otherwise profitable investment opportunities. If the debt matures after the future investment decision is to be made, the benefits of the decision partly accrue to debtholders by a reduction in the probability of default and a corresponding increase in the value of the debt. This benefit may once again be recaptured by attaching a call provision to the debt, which gives management the right to recall the debt at a stated price at the time when the investment decision is made.

While callable debt may not restore the value of the firm to the value which exists under all equity financing, the issuance of callable debt can be shown to dominate the issuance of non-callable debt [8]. It should be noted that call provisions may also resolve the agency problems associated with forgone growth opportunities if the debt issued is supported entirely by these opportunities [2, 37].

Convertible Securities

Convertible securities may reduce agency problems associated with excessive perk consumption by an owner–manager. Suppose the manager sells a fraction $(1-\alpha)$ of the stock to outsiders, and he retains a fraction α of the stock for himself. The change in the manager's wealth, V_W, in response to a change in the value of the firm, V, is now given by $\frac{\partial V_W}{\partial V} = \alpha$, and the smaller α, the less the effect of his perk consumption on his own *monetary* wealth. The manager, though, can align his own interests with those of external securityholders if he raises capital by offering to outside capital contributors the following financial instruments.

The manager holds a positive position in a call option along with his positive position in $\alpha\%$ of the outstanding common stock. He holds a negative position in a put option which is to be held long by outsiders. If the manager increases consumption of perks, he will a) decrease the value of his common stock, b) decrease the value of his call option, and c) increase the value of the put option which can be viewed as the manager's liability. The options can be designed so that the following condition holds: $\partial V_W/\partial V = \alpha + \partial V_c/\partial V - \partial V_P/\partial V = 1$, where V_c and V_p are the values of the call and the put options, respectively. In this sense the manager's incentive to consume perks is restored to that of his original position as sole owner. Outsiders will recognize that the manager will consume perks at a level consistent with that of sole ownership, and hence price the securities accordingly. Once again the agency cost is reduced.

It should be apparent that if the contract is *continuously* readjusted, outside capital contributors end up holding a riskless position in the firm. However, the solution does not call for continuous readjustments. The contract may be viewed as a solution to the single-period world of Jensen and Meckling in which decisions relating to investment, financing, and the nature of the productive process are made simultaneously at the beginning of the period and are not altered throughout the productive period. Moreover, the contract is readily generalizable to a multiperiod framework where *discrete* time readjustments of contractual positions are feasible, given that the productive decisions and the corresponding incentive problems occur through discrete time.

While the issuance of stock options may be used to resolve the agency problem associated with the consumption of perquisites, stock options may create an incentive for the manager to engage in either high- or low-risk investment programs. This incentive problem is analogous to the wealth transfer problem associated with the existence of risky debt in the capital structure. It can be shown, however, that the stock options can be designed so as to simultaneously solve the problems associated with perk consumption and risk-taking [21].

The put–call financial package may seem unusual, but it actually represents a financial strategy that is often observed. The use of the call option is analogous to the actual use of executive stock options in mana-

gerial compensation. The put option, in combination with the fraction of the stock held by the outsiders, can be thought of as a surrogate for the convertible bond. If the terminal value of the firm exceeds the exercise price of the put, the put is worthless, and the outsiders remain as common stockholders holding a fractional interest in the common stock of the firm. This outcome represents conversion of the bond into a fractional interest in the firm's common stock. If, on the other hand, the firm value falls below the exercise price, the outsiders exercise their claim and sell the firm to the manager at the exercise price. This represents the case where conversion is unprofitable and bondholders exercise their fixed claim.

Income Bonds

The agency cost associated with bankruptcy may also call for the issuance of a complex debt instrument [31]. The obvious analogue of this complexity in the context of bankruptcy problems is the issuance of income bonds. Interest payments on these bonds are required only if earned. Income bonds can, however, trigger bankruptcy at maturity from the firm's failure to meet principal payments. Perpetual income bonds would seem to satisfy this deficiency, but, even prior to maturity, income bonds can trigger technical default if available cash is incommensurate with current earnings and hence is insufficient to meet current interest payments. Income bonds are rarely issued by firms, possibly because 1) they are unable to fully resolve bankruptcy problems, and 2) natural market mechanisms are relatively efficient in resolving these problems.

Unlike income bonds, interest on conventional coupon bonds is payable irrespective of the level of current earnings, or default would occur. Because each coupon payment can be regarded as a bond, there is a higher probability of bankruptcy with conventional bonds than with income bonds. Income bonds are similar to preferred stock, but, unlike the latter, they carry the tax benefit of interest payment deduction.

The Effect of Agency Problems on Equilibrium Pricing in Financial Markets

Miller [31] has extended the notion of tax-induced differential returns into a general equilibrium framework in which firms adjust the amount of bonds offered in response to differential yields on equity and debt. He shows that, in the presence of the corporate income tax subsidy on debt financing, yields on corporate debt are "grossed up" to reflect the tax subsidy in such a way as to cause individual firms to be indifferent between debt and equity financing. There is, nonetheless, an economy-wide optimal debt outstanding. As a direct result of the equilibrating process, the tax subsidy that is shifted away from the stockholders is captured by bondholders in the form of increased yields on corporate debt.

This equilibrium can be explained in terms of Exhibit 3, which plots *certainty equivalent* interest rates on the vertical axis and quantities of total corporate debt demanded and supplied on the horizontal axis. Assume two types of securities are available: common stock whose returns are tax-exempt and bonds whose returns are taxable at varying rates. The certainty equivalent return on common stock is given by r^*. Tax-exempt institutions may exist that are willing to demand corporate debt as an investment in aggregate amount D'' at a certainty equivalent rate equal to that available on common stock. Additional demand, stemming from investment by individual investors in progressively higher tax brackets, can be generated by offering progressively higher yields on corporate bonds. The upward sloping demand curve reflects the progressive nature of the personal income tax.

The supply curve for corporate debt is horizontal at a rate of interest equal to $r^* (1 - \tau_c)$ where τ_c is the corporate income tax rate, which is presumed to be uniform. The supply curve is horizontal, because corporations are assumed to be wealth maximizers, and because the corporate tax rate is uniform across all corporations. Consequently, if the yield on corporate debt falls slightly below $r^*/(1 - \tau_c)$, it is in the interest of all wealth maximizing firms to finance their investments entirely with debt. On the other hand, if the yield rises slightly above $r^*/(1 - \tau_c)$, corporate debt

Exhibit 3. Equilibrium in Corporate Bond Market
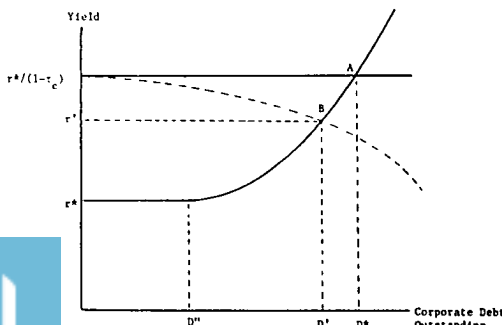
completely disappears from the market. The horizontal supply curve intersects the upward-sloping demand curve at A, and the equilibrium yield is given by $r^*/(1 - \tau_c)$. At this rate individual firms are indifferent between issuing debt or equity to finance their investments.

The Miller equilibrium follows only in the absence of agency problems associated with debt financing. If agency costs are not completely resolved by natural market forces, it can be shown [1, 10] that they will manifest themselves in yield differentials between securities which differ in terms of their inherent ability to resolve the problems. To illustrate this point, suppose that equity financing involves no agency cost, but that debt financing involves firm-specific agency costs which increase with the relative amount of debt in the capital structure. If firms face agency costs of this type, they are no longer indifferent between equity and debt financing when debt yields $r^*/(1 - \tau_c)$, and the supply curve is no longer horizontal. For each rate of interest on corporate debt, $r_c < \dfrac{r^*}{(1 - \tau_c)}$, firms increase the amount of debt in their capital structures until the agency cost as a percent of marginal debt financed, $\theta(D)$, is equal to $r^*/(1 - \tau_c) - r_c$. As long as rates are lower, it pays each firm to issue more debt so that aggregate supply is increased. Every point on the broken, downward-sloping supply curve of Exhibit 3 represents the quantity of debt supplied as firms optimize their capital structures. As the interest rate on corporate debt falls, there is a general increase across all firms in the optimal amount of debt in capital structures. Equilibrium occurs at B, the intersection of the upward-sloping demand curve with the downward-sloping supply curve.

Unlike the Miller equilibrium, optimal capital structures exist for individual firms as well as for the corporate sector as a whole as denoted by D'. While the analysis here is carried out in terms of pure debt and equity instruments, the analysis may be generalized to equilibrium yield differentials and optimal capital structure proportions involving a wide variety of financial contracts.

The expected value of the agency costs need not be large to induce complexity in financial contracts and optimal capital structure. In the absence of agency problems, management faces alternative contracts and capital structures with indifference. The presence of even minor residual costs associated with agency problems may serve to explain the complexity of capital structure, as managers attempt to balance these costs with yield differentials on alternative contracts. Thus, it is possible to observe corporations engaging in capital structure decisions even if markets are reasonably (but not strictly) proficient in disciplining managers to act in the interest of all security-holders. The effect of financial decisions on the value of the firm may be *insignificant* but still *sufficient* to explain a) why corporations engage in capital structure decision-making, b) complexities in financial contracts, and c) clustering of capital structure characteristics by industry so long as there are no costs involved in financial contracting.

Another property of our equilibrium relates to a sharing of the agency costs among the security-holders. It is apparent from Exhibit 3 that the agency costs associated with debt financing may be shifted to the bondholders in the form of reduced equilibrium yields on corporate debt. This conclusion stands in direct contradiction to the long held point of view that stockholders bear the agency costs of debt financing. The reader should recall that the belief that stockholders reap the tax subsidy associated with debt financing was also long held, until Miller's equilibrium analysis showed that the tax subsidy, like the agency cost, is shifted to bondholders.

We emphasize that this equilibrium analysis is still partial in the sense that the equity rate of return is taken as given. This is similar to the Jensen–Meckling [23] agency cost incidence analysis where the interest rate (state prices) for bond payoffs is taken as given. Obviously, any definite statement regarding the final incidence of agency costs and debt tax subsidy must rely on a general equilibrium analysis where the rate of return on equity is endogenously determined.

Policy Implications of the Shifting of Agency Costs

Agency costs are real factor costs that affect production decisions. Optimal resource allocation in the economy requires that firms act to reduce agency costs up to the level where the marginal costs associated with the reduction are equal to the marginal benefits. If the agency costs associated with debt financing are shifted to bondholders, what are the benefits associated with reducing agency costs to those who control production and financing decisions?

Consider Exhibit 4 which depicts the relationship between marginal and average agency costs as a function of the amount of debt in the capital structure of an individual firm. Given a particular (certainty-equivalent) rate of interest on corporate debt, one can compute the differential, θ^*, between this rate and the

rate required to induce debt financing in the absence of agency costs $r^*/(1 - \tau_c)$. The differential, θ^*, may be interpreted as the benefit of debt financing associated with the tax subsidy. The individual firm issues debt until the marginal agency cost associated with the last unit of debt issued is equal to this (constant) marginal benefit. The amount of debt issued is thus D^*, and the stockholders of the firm gain a surplus associated with debt financing which is represented by the shaded area of Exhibit 4.

Suppose that the firm now acts to reduce its agency costs by introducing some mechanism by which its management can be costlessly monitored by security-holders. Presume also that this mechanism cannot be imitated by other firms. In this case, the agency costs of debt financing are reduced, as represented in Exhibit 5, and the magnitude of the financiers' surplus is increased as long as the differential θ^* remains intact. In this case, stockholders have an incentive to institute the monitoring activity.

Suppose, instead, that the monitoring mechanism is easily imitated by other firms. Note that this represents a departure from our initial assumption that individual firms are price takers in the capital market. The adoption of the new mechanism by all firms will shift the supply curve of Exhibit 3 upward in the direction of the horizontal supply curve at $r^*/(1 - \tau_c)$. The equilibrium rate of interest on corporate debt rises to reflect the diminished importance of the agency problems. Consequently, the differential, θ^*, falls to some level θ'. The change in the magnitude of the financiers' surplus is determined by two offsetting effects: The reduction in agency costs, which increases the surplus, and the reduction in the yield differential, which decreases the surplus. As was shown in [1], the dollar change in the surplus depends on the elasticities of the demand and supply curves for corporate debt. It is possible that the surplus will fall below its initial level of Exhibit 5. In this special case, stockholders are actually penalized by introducing the costless monitoring mechanism.

It would seem that stockholder incentives to reduce agency problems are related to the speed at which other firms can imitate the financial innovation. Most financial innovations are easily imitated by other firms, which would seem to be true especially for modifications in generally accepted accounting principles. Accounting is one of many monitoring systems that may serve to reduce agency problems. It would appear that, as acceptance of modifications in this system is by definition widespread, improvements in accounting designed solely to increase its effective-

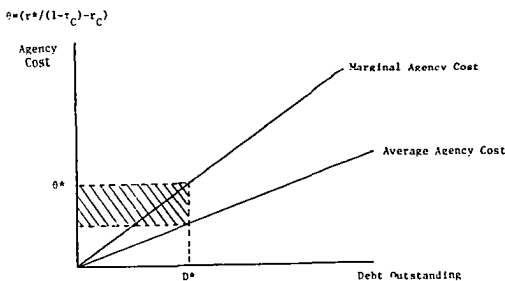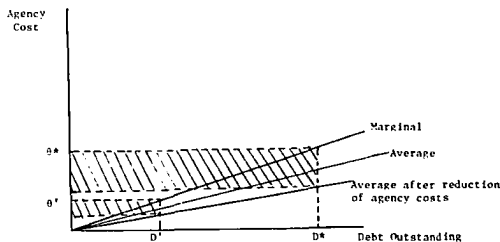**Exhibit 4.** Determination of the Financiers' Surplus

Exhibit 5. Determination of the Financiers' Surplus

ness in monitoring management may not be in the interest of managers attempting to maximize stockholder wealth, even if these modifications are *costless*. This same point would seem to hold for some government regulations of the securities markets such as prospectus requirements, full disclosure provisions, and mandatory provisions in indentures associated with debt financing. One may expect to see managerial opposition to these requirements even if such requirements are considered desirable on the basis of social costs and benefits.

Conclusion

Agency problems derive from conflicts of interest between individuals associated with the firm. Many of these conflicts can be resolved in a spontaneous and costless fashion by the markets for financial and human capital. If frictions exist in these markets, however, the agency problems may give rise to potential costs.

These costs can be minimized through complex contractual arrangements between the parties in conflict. Thus, agency problems may explain the evolution of complexities in capital structure such as conversion and call privileges in corporate debt. Financial con-

tracts which differ in terms of their inherent ability to resolve agency problems may sell at differential equilibrium prices or yields in the market place. The financial manager reaches an optimal capital structure when, at the margin for each class of contract, the costs associated with agency problems are balanced by the benefits associated with existing yield differentials and tax exposure.

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