On the Capital Structure of Leveraged Buyouts

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■ In a leveraged buyout (LBO) transaction, a group of investors finance the acquisition of a corporation or division mainly by borrowing against the target's future cash flows. While not new, LBOs have grown in frequency and size in recent years and have been the object of academic research and public policy debate. The effect of LBO transactions on production efficiency and security-holder wealth are examined in a number of recent empirical studies.[1] In 1989, both Houses of Congress conducted hearings on the effects of LBOs on the U.S. economy [9]. The present paper develops a formal rationale for the choice of capital structure made by the organizers of the buyout, including the use of such arrangements as strip financing and equity kickers. This analysis seems a necessary complement to recent empirical studies and will hopefully contribute to the debate on the causes and consequences of LBOs. This paper uses signalling equilibrium concepts first applied to the capital structure question by Ross [26] and Leland and Pyle [19]. In Section II, the role of debt service as a signal of the level of future free cash flow[2] is examined. The signalling role assigned to leverage is consistent with Jensen's [13] view that the use of debt to finance the buyout of companies with substantial free cash flow reduces agency costs. The incentive to organize a buyout also follows from Jensen's argument since, when managers can spend cash flow at their discretion rather than in the interest of the owners of the firm, investors are likely to value equity at less than its attainable value and an opportunity to close the value gap via restructuring exists. The signalling model is also consistent with cases

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[1]See, for example, Amihud [1], Bull [4], Lowenstein [23], Lichtenberg and Siegel [20], Kaplan [16], Marais, Schipper and Smith [24], and Hite and Vetsuypens [12].

[2]That is, cash flow in excess of that required to fund all positive net present value projects.

in which management expects free cash flow to increase above the level expected by the market, even though it was not misallocated in the past, and cases in which managers buy business units in order to develop their full potential, free from the constraints imposed by headquarters.

The organizers of a buyout will be referred to as "the promoters." They effectively control the corporation and usually include active equity investors and management. For example, the general partners of LBO equity funds together with the top management of the LBO firms were the promoters of many of the LBOs undertaken in recent years. On the other hand, limited partners of LBO equity funds and lenders receiving equity participations are usually not members of the promotion group and are more appropriately considered outside investors. No distinction is made in this paper between leveraged buyouts (LBOs) undertaken by outsiders and management buyouts (MBOs) in which the existing management is part of the promotion group.

The model rationale is as follows: Promoters would want to organize an LBO only if they expect to reap a significant gain from the transaction. Such a gain would result from a disposition of free cash flow that produces value in excess of the buyout price. The promoters get the net present value of the transaction via their equity participation, which is an increasing function of the value placed on future cash flows by other investors. Hence the importance of a credible signal which unambiguously conveys the promoters' commitment to generate and distribute free cash flow to investors. Interest payments are one such signal. Together with a loss suffered by the promoters in the event of default, they produce the desired unambiguous signal that communicates the cash flows attainable by the buyout and induces a valuation of equity consistent with the promoters' expectations.

The model is expanded in Sections III and IV in order to allow for a positive probability of default in equilibrium and to examine the role of strip financing and equity kickers. This is done by adding states of nature which result in low cash flows. Strip financing is the practice of requiring bondholders to buy a share of the equity in order to reduce conflict among classes of security holders in low cash flow states. Kickers are equity participations given to bondholders in order to offset below-market returns offered on the debt instruments. Section V contains extensions of the analysis, and a discussion of some empirical implications and observed practices. In particular, it is shown that the properties of strip financing are held by a number of other common financial structures and instruments.

An alternative formulation of the model is considered in Part 4 of the Appendix, where the promoters' share of the equity signals the level of future cash flows to other investors. Debt still plays a crucial role in that it decreases the need for equity financing and permits promoters to own a larger share of the equity.

I. Financial Structure When All LBO Investors Hold Common Expectations

When promoters and their investors share the same expectations with respect to the LBO's future cash flows, promoters do not need to resort to a special commitment in order to capture the net present value of the buyout. A model of this simple case will provide a framework for dealing with the case in which promoters and other LBO investors do not hold common expectations.

Consider the following two-period model: At date 0, a group of promoters plan to acquire a firm for a price K. They expect that, under their management and after funding capital investments, the firm will produce an intermediate free cash flow c_1 at date 1 and a final free cash flow c_2 (from liquidation or going public) at date 2. The promoters invest an amount $W < K$ in the buyout. The rest must be financed by borrowing against the firm's future cash flows and/or selling equity to other investors. The promoters cannot finance $K - W$ by borrowing on their personal accounts.

Let the promoters' expectations about future cash flows be shared by other LBO equity investors. Denote the riskless interest rate by r. Then, the value of the firm, post-acquisition, is[3]

$$V = c_1(1+r)^{-1} + c_2(1+r)^{-2}. \qquad (1)$$

The buyout is assumed to have a positive net present value, that is, $V - K > 0$. This requires that promoters be able to increase cash flows above the level attainable by other potential acquirers or by current management if not part of the promotion group. (This assumption can be relaxed when, as in Section II, investors and potential promoters do not share common expectations. In that case, only those promoters able to obtain financing via a credible signal can acquire the firm, even if others could produce value in excess of the acquisition price.) In addition, for $V > K$, it is required that either the original owners do not know V

[3]All agents are assumed to be risk neutral. Although the main features of LBO financing can be examined under the simplifying assumption of risk neutrality, introduction of risk aversion would imply diversification and yield a natural limit to the wealth the promoters invest in the buyout.

or, if they do, cannot extract it from the promoters.[4] The LBO price is the outcome of a bilateral monopoly game between the owners of the firm and the promoters. The acquisition price K has to be above the value the firm is expected to attain if the promoters' bid is not accepted. Otherwise, shareholders will prefer to hold out at no cost in the expectation of extracting a higher bid (see Grossman and Hart [11] and DeAngelo and Rice [6]). On the other hand, the shareholders' ability to organize themselves in order to extract a higher price is, at best, imperfect, when the target shareholders are atomistic. A number of alternative assumptions lead to a purchase price lower than the value to the promoters. For example, shareholders may expect to get a price below K if they do not tender and become minority shareholders, and therefore face a prisoner's-dilemma incentive to tender (DeAngelo and Rice [6]). Alternatively, they may hold different beliefs about the value of the firm to the promoters and a sufficient number of them may not expect to elicit a higher bid by holding out or, simply, they are price takers who do not consider bargaining to be feasible, irrespective of their perception of the value of the firm to the promoters.

The buyout can be financed by borrowing an amount D and selling a fraction $1 - \alpha$ of the equity to other investors. The promoters retain α for themselves. Lenders require that the interest on the loan be paid at the end of each period and the principal be paid at the end of period 2. Equity investors pay the present value of their equity participation. The promoters will choose D and α to maximize the present value of their own equity participation. The value of equity is

$$S(D) = V - D, \tag{2}$$

and the promoters problem is maximizing $\alpha S(D)$ with respect to α and D, subject to the budget constraint,

$$W + D + (1 - \alpha)\, S(D) = K, \tag{3}$$

and $\alpha \in [0, 1]$. The solution to this problem is not unique because $\alpha S(D)$ is invariant to any feasible pair (α, D). This can be seen by rewriting Equation (3) to obtain

$$\alpha S(D) = V - K + W. \tag{4}$$

[4]Although the offers to purchase stock issued by the promoters typically contain details about the expected financing of the purchase and cash flow forecasts, the information provided is not sufficient to allow the sellers to infer the promoters' valuation of the company. However, see Kaplan [16].

Since bondholders and other equity investors receive a return r, the promoters keep the net present value of the buyout for themselves no matter what financial structure they choose.[5]

II. Information Asymmetry

It is now assumed that investors would make their own conservative cash flow forecasts in the absence of an unambiguous revelation of the promoters' expectations. Let the promoters expect the cash flows to be c_1 and c_2, and other investors expect them to be $\hat{c}_1$ and $\hat{c}_2$, with $\hat{c}_2$ being an increasing function $f(rD)$ of the cash flow committed to interest expense such that $f(rD) \leq c_2$ and $f(rD) > D(1 + r)$. Thus, other investors value equity as follows:

$$\hat{S}(D) = f(rD)(1 + r)^{-2} + \hat{c}_1(1 + r)^{-1} - D, \tag{5}$$

and the promoters face the following budget constraint:

$$W + D + (1 - \alpha)\, \hat{S}(D) = K. \tag{6}$$

In addition, assume that, if at time 1, $c_1 < rD$, the promoters will lose their credibility and will not be able to borrow the shortfall.[6] Lenders will then be able to take control of the firm and the promoters will suffer a loss L. Therefore, c_1/r is the buyout's debt capacity.

Under the stated assumptions, the promoters will use debt to reveal their expectations about future cash flows. They will borrow an amount D and other investors will expect $\hat{c}_1 = rD$. This assumption is justified because the promoters have an incentive to borrow no more than they can service at time 1 in order to avoid default, i.e., $D \leq c_1/r$. In addition, when $W + (c_1/r) < K$, the promoters have an incentive to borrow as much as possible without exposing the buyout to default. It is shown in Part 1 of the Appendix, that $D = c_1/r$ when $W + (c_1/r) < K$. This is so because equity financing is then required and the valuation of the firm by prospective equity investors depends on the cash flow committed to lenders.[7] Hence, the promoters

[5]This is so, even if the promoters decide to invest less than W in the buyout. The promoters' equity investment is assumed given in the present model. A model that determines their investment is formulated in Part 4 of the Appendix.

[6]That is, the future cash flow will be considered insufficient to pay accumulated debt.

[7]Note that long-run equilibrium in the LBO market requires that $f(rD) = c_2$. Otherwise, the promoters would be forced to sell undervalued equity and thus share the net present value of the buyout with outsiders. Underpricing at equilibrium of the equity offered to outsiders can be

find it not optimal to use any part of the intermediate cash flow c_1 to pay a dividend to equity holders. Instead, they allocate all of c_1 to debt service.

The signalling equilibrium just outlined is similar to that studied by Ross [26], but it differs from it in a number of respects, the most important being that the incentive schedule faced by the LBO promoters is naturally the value of their equity participation rather than an *ad hoc* construction.

In the less interesting case in which $W + (c_1/r) \geq K$, the promoters can keep all the equity of the buyout by borrowing $D = K - W \leq c_1/r$. Signalling is still at work in this case, in the sense that promoters tell bondholders that c_1 is at least as high as rD. But promoters have no need to raise equity and no incentive to use up the company's debt capacity in order to signal the maximum level of future cash flows.

It should be noted that, for the signal to be believable to investors, L has to be larger than $(1 - \alpha)[S(D) - S(D)]$, the amount the promoters could appropriate from equity investors by misrepresenting future cash flows.[8] This means that only promoters exposed to large losses can emit credible signals and use the debt capacity of the target to finance its buyout.

III. Strip Financing

In a strip financing arrangement, investors are required to purchase a mixture of debt and equity securities in order to reduce conflict among them in case of default.[9]

A meaningful role for strip financing requires a positive probability of default in equilibrium. Thus, the model of Section II is enlarged by introducing additional states of nature such that the firm could default on its debt service and bondholders would find it optimal to liquidate the firm at the expense of equity holders. Outside equity investors will factor such a possibility in the purchase price of their stake. The promoters, on the other hand, would suffer the expected cost of liquidation at the inception of the buyout and will have an incentive to choose a capital structure that avoids liquidation. Strip financing is one such capital structure. It requires bondholders to hold a large enough share of the equity so that, in the event of default, their equity loss from premature liquidation would more than offset their increased bond recovery.

In order to incorporate strip financing into the model it is assumed that the promoters view future cash flows as follows: The time 1 cash flow is either c_1 with probability p or 0 with probability $1 - p$.[10] In addition, the conditional cash flows for time 2 are c_2 if the time 1 cash flow is c_1, and c_3 and c_4 with probabilities q and $1 - q$, respectively, if the time 1 cash flow is 0. The other investors have the same probability beliefs and cash flow expectations as the promoters with the following exceptions: They interpret debt service commitment as a signal and assume that the time 1 cash flow will be iD with probability p or 0 with probability $1 - p$. They also assume that if the time 1 cash flow is iD, the time 2 cash flow will be $f(iD)$; f is an increasing function, and i is the promised interest rate on debt. It exceeds r by the default premium. A loss is incurred by the promoters in the event of default.

Let the bondholders' equity participation be β and their cash recovery from premature liquidation be Y. It is assumed that: (*i*) $Y > qD(1 + i)^2 + (1 - q)c_4$, such that bondholders gain by liquidating the firm, (*ii*) $Y < qc_3 + (1 - q)c_4$, which means that shareholders suffer a loss if the firm is liquidated and, for simplicity, (*iii*) nothing is left to shareholders in the event of liquidation. Under these circumstances and once default has occurred, the promoters can try to avoid liquidation by offering bondholders an equity participation sufficiently large to make them better off if no liquidation takes place. However, the promoters can do better for themselves by precluding liquidation at the inception of the buyout. They can do so by requiring bondholders to purchase an equity participation β such that

$$qD(1 + i)^2 + (1 - q)c_4 + \beta q\left[c_3 - D(1 + i)^2\right] > Y,$$

or

attained with a model in which underpricing itself acts as a signal, as in Grinblatt and Hwang's [10] model of new issue pricing.

[8]In practice, refinancing an LBO in default can result in a recapitalization that drastically dilutes the promoters' equity claim. Promoters will have no incentive to misrepresent the cash flows of the firm when they expect an unfavorable recapitalization to follow default.

[9]The practice of strip financing seems to have been initiated in 1979 by First Boston and Prudential for the financing of the Congoleum Corporation buyout. One of the participants in the transaction explained the idea as follows: "We wanted all the players to share the same incentives in order to reduce any intramural warfare if trouble developed. So we insisted that the institutional investors purchase 'strips,' or units, containing a mixture of senior notes, subordinated notes, preferred stock and common stock." Quote taken from Butters, et al [5]. Lenders usually do not get voting stock until exit time, when equity participations become regular shares to be sold, for example, in the secondary offering of an initial public offering. In this way, lenders avoid having their debt claims subordinated as equity in case of default.

[10]The assumption that one of the cash flows is zero is made in order to simplify notation. The following analysis applies as long as that cash flow is sufficiently small.

$$\beta > \beta_{min} = \frac{Y - \left[qD(1+i)^2 + (1-q)c_4\right]}{q\left[c_3 - D(1+i)^2\right]}. \quad (7)$$

Note that (*ii*) implies $\beta_{min} < 1$. Assume, for example, that each bondholder has to buy strips made up of equal proportions of bonds and of a β fraction of the equity. Under this arrangement, no bondholder has an incentive to force premature liquidation. The promoters' incentive to organize strip financing comes from their attempt to maximize the value of their own equity claim and does not depend on the other losses they would suffer if the company defaults. If Equation (7) is not satisfied, the lenders would prefer liquidation. They would ignore their equity participation and ascertain their debt claim in order to have priority over pure equity holders.

Let us recapitulate. The firm's performance is characterized by two basic states of nature. One state produces high cash flows at times 1 and 2, and a second state results in a negligible cash flow at time 1 and a low cash flow at time 2. The promoters signal the size of the high cash flows via a commitment to pay interest at an intermediate stage (time 1). The signal is credible because the promoters would suffer a loss in default as managers and/or controllers of the LBO. On the other hand, the promoters have an incentive to signal as high cash flows as possible because that determines how much equity they can keep for themselves. Default is unavoidable in the low cash flow state; however, promoters can preclude premature liquidation and maximize the value of their equity by arranging ownership of equity and debt according to a strip structure, such that bondholders would not prefer to liquidate the firm if it defaults.[11] The alternative of organizing an all-equity firm in order to avoid default in all states of nature is not available to the promoters if outside financing is needed. Investors, lacking a credible signal, would place a negligible value on the firm. Thus, financing would not be sufficient or the promoters would be forced to give away most of the net present value of the buyout and lose the incentive to undertake it.

Under strip financing, the promoters still have the incentive to signal a date 1 cash flow equal to, but not greater than, c_1, by committing to pay interest in the amount $iD = c_1$. It is shown in Part 2 of the Appendix that $\alpha(D)S(D)$ is increasing on $D \in [0, c_1/i]$ and attains its maximum at $D = c_1/i$.

A strip financing arrangement prevents bankruptcy as long as investors keep both components of the strip. Lack of secondary markets or contractual restrictions may prevent investors from detaching and selling the individual components, but there is also an economic incentive against unbundling the strip which operates even in the presence of secondary markets. The strip is likely to be more valuable than the sum of its components. This is in fact the case in the present model: The detached bonds become more valuable as bondholders find it optimal to force premature liquidation. On the other hand, it follows from Equation (7) that the increase in the value of the bonds would be more than offset by the decrease in the value of the detached equity. Hence, *the stripholders have no incentive to sell separately the components of the strip.* This is consistent with the practice followed by insurance companies, the main suppliers of strip financing.[12]

IV. Equity Kickers

There are cases in which debt financing at market rates may not be sufficient to finance the buyout. For example, the buyout initial cash flow may not be sufficiently high and the future cash flow may be risky. In those cases, the solution to $iD = c_1$ for the market interest rate i may result in too low a level of debt financing and equity investors may not be able to provide the rest. A common practice that circumvents this limitation is to issue debt paying below market interest. That is, i is fixed such that $D = c_1/i$ can finance the buyout. As compensation, lenders receive equity claims at favorable terms. The higher return on equity necessary to offset the lower return on debt is referred to as an "equity kicker." Let π be the value of equity transferred to bondholders. π needs to be such that

$$p\left[\frac{iD}{1+r} + \frac{D(1+i)}{(1+r)^2}\right] + (1-p)\left[\frac{qD(1+i)^2}{(1+r)^2} + \frac{(1-q)c_4}{(1+r)^2}\right] + \pi = D. \quad (8)$$

This transfer can be effected by selling undervalued equity to the lenders. Assume, for example, that all the equity capital is contributed by the promoters and the lenders.

[11]Moreover, the promoters may not suffer other losses in the low cash flow state if the lenders-owners consider that (*i*) the occurrence of the state is due to causes outside the promoters' control such as an industry or general economic downturn, and (*ii*) the promoters are deemed to be the most capable to control/manage the firm.

[12]It should be noted that, in the present cash flow model, strip financing does not lead promoters to increase the level of indebtedness. In order to obtain such a result, one would need to allow the time 1 probable cash flows to be closer to each other (to follow a continuous distribution, for example). Then, the promoters would balance the gain from the signal against the cost of default. The strip arrangement would reduce the latter and result in greater indebtedness.

Then, the budget constraint faced by the promoters becomes

$$W + D + \beta\hat{S}(D) - \pi = K, \quad \alpha + \beta = 1. \tag{9}$$

As before, the promoters find it optimal to signal the date 1 cash flow to be c_1 by committing the LBO to paying interest just in the amount $iD = c_1$. The signal does not depend on the composition of iD. On the other hand, the bondholders' minimum equity participation under strip financing is reduced with the lowering of i (see Part 3 of the Appendix). Therefore, with an equity kicker, a strip financing arrangement can be implemented with each lender holding a smaller fraction of the equity than when debt is correctly priced. This is so because more of the cash flow goes to equity when the interest rate on debt is below market and equity becomes more valuable.

V. Extensions and Implications

Strip financing, as defined in Section III, is rather restrictive. It is favored by insurance companies but not by investment bankers. Strips may not fit the portfolio needs of some institutional investors. In addition, marketing strips for billion dollar deals may not be possible given the need to attract many investors, some of which may be rather small and unsophisticated. A standardized bond with, perhaps, an attached warrant is a simpler product for bond salesmen to market. In addition, coordination in the event of default may be too costly when there are many stripholders. These might be the reasons why strips were not used in the large scale flotations of junk bonds that took place in the late eighties. While the development of the junk bond market allowed investment bankers to bypass insurance companies, the latter continued to use strip financing in deals requiring about half a billion dollars or less of financing (for transactions requiring less than $100 million, a single insurance company will normally provide all the financing).

It was argued in the previous section that strip financing is in the promoters' interest. A similar argument applies to other investors as well. Lenders accepting a below-market interest rate on their loans in exchange for equity kickers will find their interests aligned with promoters', if the kickers are sufficiently large. So will senior lenders whose claims are exposed to the threat of bankruptcy proceedings of unforeseen duration and consequences. These investors will prefer that all other investors have an incentive to avoid premature liquidation or protracted bankruptcy proceedings.

The strip concept extends beyond the case in which all outside investors hold equal proportions of debt and equity. Consider, for example, a case in which there are two classes of bondholders. Senior bondholders expect to get interest and principal under all states of nature and are not exposed to the risk of default. However, they may suffer a loss of value in a protracted bankruptcy proceeding triggered by other lenders. Subordinated bondholders expect to lose part of the value of their claim in low cash flow states of nature. They may have an incentive to initiate bankruptcy proceedings in order to protect their claims and increase their recovery, or they may withhold agreement to a reorganization plan in order to extract additional consideration from other investors. These possibilities would be contemplated by senior and junior investors alike, who would demand compensating premia. As a consequence, the promoters would suffer loss of value if they do not devise a structure that minimizes conflict in default. As with strips, equity claims can be attached to subordinated bonds in order to align their holders' interests with those of other investors. The capital structure will then contain senior debt, subordinated debt plus equity, and pure equity. While this structure will not look like a complete strip financing arrangement, it is based upon the same principle and has the same effects. As in Section III, a condition similar to Equation (7) must be satisfied. Otherwise, subordinated lenders will ignore their equity interest and behave like pure bondholders.

More generally, the desirable properties of strip financing are shared by other debt-equity hybrids, such as bonds convertible into common stock and bonds plus equity warrants.[13] Hence, highly leveraged firms other than LBOs may find it attractive to issue hybrid debt-equity securities in order to reduce conflicts among classes of security holders in the event of default.[14] Gertler and Hubbard [7] stress the desirability of linking creditors' compensation to industry and general economy cycles and note that a contract with mixed debt and equity features would do that.

It should be noted that in a number of actual transactions, mezzanine (subordinated) financing was provided by the same institutions participating in the equity fund which promoted the transaction. In addition, a number of LBO firms in the U.S. and in Europe manage both equity

[13]The argument given in Section III, concerning the higher value of bundled strips, applies to those bond plus warrant units with components in proportions such that premature liquidation under default is non-optimal to the holders and no other outstanding issue has an incentive to trigger liquidation.

[14]This reason for issuing convertibles is different but related to the argument that convertibles protect bondholders against the adverse consequences of unanticipated risks. See Brennan and Schwartz [3] on the latter.

partnerships and mezzanine financing partnerships, with the latter supplying subordinated debt to their buyouts. This form of financing was pioneered by Forstmann Little in the U.S. (see Little and Klinsky [22] for a discussion of actual financings). Captive mezzanine funds in Europe are run, among others, by Kleinwort Benson and a joint venture of Wasserstein Perella, Banque Paribas, Commerzbank and Amro Bank. In transactions financed by an equity fund and a captive mezzanine fund, the same investors hold both debt and equity claims and the capital structure resembles a strip arrangement. It is interesting to note that the buyouts jointly financed by equity funds and mezzanine funds are in the same dollar range as those financed via strip financing.

Strip-like financial structures pre-commit investors to avoid conflict in default. An alternative arrangement is one in which, once default has occurred, the party likely to hold up reorganization receives equity in exchange for a reduction in interest and/or principal. The package of claims received has to offer a higher expected return than either holding out for better terms or demanding liquidation. In the unlikely case that a recapitalization of this sort was to be expected by investors at the beginning of the buyout, it will have the same effect as when lenders hold strips from inception.

Another related development in post-default recapitalizations is the emergence of funds, sometimes called "vulture funds," that acquire both debt and equity claims of firms in distress. When a firm is worth more as a going concern than in liquidation, there is an incentive for investors to acquire debt and equity claims, if in so doing they can resolve claimholder conflicts and make a profit. These funds create "de facto" strips and are subject to similar incentives as stripholders.[15]

The theory of LBO capital structure developed in the present paper can contribute to the interpretation of empirical research on the causes of LBOs. According to the theory, the decision to organize a buyout depends on the promoters expecting to keep for themselves the net present value of the transaction. This means that a statistical model for predicting which firms may be subject to LBO should contain a proxy for the promoters' expectations. Historical variables, such as estimates of undistributed free cash flow prior to the buyout, are only imperfectly related to the promoters' expectations. They cannot account for buyout targets which, while not exhibiting undistributed free cash flow in the past, are expected to generate larger free cash flow in the future. These companies are likely to be included in the buyout sample and diminish the significance of a pre-buyout free cash flow variable. This is why we should not be surprised that the careful tests performed by Lehn and Poulsen [18] are weakly supportive of the free cash flow hypothesis. Controlling for prior production inefficiency may help, if the available data permits it, but it will not account for cases in which the promoters believe they have a distinctive managerial advantage. Assuming the promoters' expectations about future cash flows are predominantly correct, one can compare pre- and post-buyout performance in order to test whether expected value creation is a driving force of LBOs. Comparisons of pre- and post-buyout performances have been made by Bull [4], Kaplan [16], and Lichtenberg and Siegel [20]. Their results are consistent with the hypothesis that promoters' expectations about future cash flow are an important determinant of LBOs.

The cash flow signalling hypothesis modelled in this paper is consistent with the observed trend toward reduction of indebtedness after the buyout. Once the signal has been made and the proper valuation for financing the transaction has taken place, the promoters have no incentive to maintain high leverage, particularly if there are states of nature in which the firm may default. Similarly, recapitalizations under distress which replace debt with equity are consistent with the signalling hypothesis: The reorganizers hold revised expectations and signal a lower level of cash flow by proposing reduced debt services. The value of equity is then revised downward, if it was not done already, and new equity infusions are made in exchange for larger shares of the equity. The model also predicts buyouts with capital structures containing more equity and less debt when expectations about free cash flows are reduced because of either a general economic downturn or exhaustion of restructuring possibilities.

VI. Conclusion

This paper has examined the LBO capital structure as the outcome of a signalling equilibrium in which promoters, acting to maximize their wealth, signal to investors their true expectations about the free cash flow to be produced by the buyout. The truthfulness of their signal is validated by the loss they suffer in case of default. The signalling approach is shown to result in levels of debt which exhaust the free cash flow to be generated in the near term. A simple model was formulated in which the promoters signal cash flow via leverage and at the same time have the incentive to adopt a strip structure for financ-

[15]In some cases, the investor make take outright control of the company, as in the acquisition of Allegheny International Inc., by Japonica Partners (Light [21]).

ing the buyout. Strip financing is shown to be a stable arrangement in the sense that a strip is worth more than the sum of its detached components to all investors. Strip-like arrangements, which do not require investors to hold the same proportional mixture of all securities, were discussed and shown to have the same properties as strip financing.

Signalling free cash flow with debt can be made without taking the company private, as the number of leveraged recapitalizations undertaken in recent years has shown. In them, management uses leverage to signal its commitment to distribute free cash flow to investors and improve the valuation of the company (sometimes, in order to avoid the consequences of a hostile takeover). Committing cash flow to debt service is a credible signal in those cases because management exposes itself to job termination and capital losses in the event of default.

Why is the use of debt to signal higher free cash flow adopted by some firms and not others? The answer lies in the nature of the LBO transaction considered in this paper, which involves a firm whose value, in the view of the promoters, is below its potential. The promoters need to signal a significant increase in free cash flow in order to attain a proper valuation of the equity they need to sell to finance the buyout. On the other hand, companies which do not expect a significant increase in free cash flow will be unable to increase their valuation by issuing additional debt. The recapitalization of these companies will simply change the labelling of their payout from dividends to interest, or may require forgoing positive net present value projects in order to avoid default. These actions will not signal higher cash flow nor result in a higher value of equity.

An alternative model of LBO capital structure can be developed by relying on the corporate tax treatment of interest payments.[16] Debt-induced tax savings can provide another incentive for promoters to choose debt financing. Adding taxes to the signalling model would simply reinforce the incentive toward committing free cash flow to interest payment. In the absence of signal value in the promoters' cash commitment, the tax advantage of debt can independently result in a high level of debt. However, questions have been raised concerning the significance of corporate taxes as a determinant of capital structure in general (Jensen and Meckling [15]) and LBO financing in particular (Auerbach [2], Jensen [14]). If the main motivation for the change in capital structure is capturing additional tax savings, one has to explain why the capital structure change was not made before, without undertaking an LBO (Amihud [1], Gilson, Scholes and Wolfson [8]), and why high leverage is not more pervasive. Moreover, the tax savings hypothesis is inconsistent with firms drastically reducing their indebtedness following a leveraged buyout or recapitalization. The cash flow signalling hypothesis, on the other hand, is consistent with the observed partial adoption of high leverage. It implies that high leverage will be observed in the special case of firms undergoing restructuring, rather than generally throughout the economy, and is consistent with these firms reverting to more conventional financial policies afterwards.

Empirical research by Kaplan [17] shows that the market-adjusted premium paid to pre-buyout shareholders is significantly related to the buyout tax savings. Kaplan points out that, although tax savings may be a proxy for other buyout gains, the finding is consistent with investors anticipating the tax savings and forcing the promoters to pay for them in the purchase price. This result does not imply that taxes are the driving force of LBOs, because, if expected tax savings are captured by pre-buyout shareholders, the promoters would lack an incentive to undertake the buyout in the absence of other expected gains. Note that, under the cash flow signalling model, the promoters expect to produce higher pre-tax free cash flows, which in turn increase debt capacity and permit the promoters to borrow more and generate higher tax shields. Even if all the additional tax savings go to the purchase premium, the promoters still have an incentive to undertake the buyout. Tax savings can then be a significant factor in explaining the purchase premium, but only as a by-product of an LBO transaction driven by other forces.

[16]Even after accounting for personal taxes, corporate leverage can produce a net gain in value, particularly under the Tax Reform Act of 1986. See Miller [25].

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Appendix

1. Debt as a Signal

In order to verify that the promoters will choose $D = c_1/r$ on $D \in [0, c_1/r]$, solve Equation (6) for α and note that the promoters' wealth $\alpha(D)S(D)$ is an increasing function of D. Let $f(rD)$ be differentiable, then:

$$\frac{d(\alpha S)}{dD} = \frac{d\alpha}{dD} S - \alpha. \qquad (A1)$$

Furthermore, differentiating Equations (5) and (6) with respect to D, solving for $d\alpha/dD$ and substituting in (A1) yields:

$$\frac{d(\alpha S)}{dD} = \left[1 + (1+\alpha)\left(\frac{rf'(rD)}{(1+r)^2} + \frac{r}{(1+r)} - 1\right)\right]\frac{S}{\hat{S}} - \alpha, \qquad (A2)$$

where $f'(rD) = df(rD)/dD$. In order for Equation (A2) to be positive for all $D \le c_1/r$, it is required that

$$\frac{rf'(rD)}{(1+r)^2} + \frac{r}{1+r} > \frac{\alpha(\hat{S} - S)}{(1-\alpha)S}, \qquad (A3)$$

which is satisfied in the present model because $\hat{S} \le S$ for $D \le c_1/r$ and $f'(rD) > 0$.

2. Strip Financing

In order to show that $D = c_1/i$, proceed as in Part 1, taking into account that under a strip financing arrangement satisfying Equation (7) the promoters' valuation of equity is

$$S(D) = p\left[\frac{c_1 - iD}{1+r} + \frac{c_2 - D(1+i)}{(1+r)^2}\right] + (1-p)q\left[\frac{c_3 - D(1+i)^2}{(1+r)^2}\right], \qquad (A4)$$

while other investors' valuation of equity is

$$\hat{S}(D) = p\frac{f(iD) - D(1+i)}{(1+r)^2} + (1-p)q\frac{c_3 - D(1+i)^2}{(1+r)^2}. \qquad (A5)$$

In addition, note that, under strip financing, i is determined, such that

$$p\left[\frac{iD}{1+r} + \frac{D(1+i)}{(1+r)^2}\right] + (1-p)\left[\frac{qD(1+i)^2}{(1+r)^2} + \frac{(1-q)c_4}{(1+r)^2}\right] = D, \qquad (A6)$$

and that the value of the firm is

$$V = p\left[\frac{c_1}{1+r} + \frac{c_2}{(1+r)^2}\right] + (1-p)\left[\frac{qc_3}{(1+r)^2} + \frac{(1-q)c_4}{(1+r)^2}\right]. \quad (A7)$$

Substituting Equations (A6) and (A7) into each (A4) and (A5) yields

$$S(D) = V - D \quad (A8)$$

and

$$\hat{S}(D) = p\left[\frac{iD}{1+r} + \frac{f(iD)}{(1+r)^2}\right] + (1-p)\frac{qc_3 + (1-q)c_4}{(1+r)^2} - D. \quad (A9)$$

Differentiating Equations (A9) and (6) with respect to D, solving for $d\alpha/dD$, and substituting it into (A1) yields

$$\frac{d(\alpha S)}{dD} = \left\{1 + (1-\alpha)\left[p\left(\frac{if'(iD)}{(1+r)^2} + \frac{i}{1+r}\right) - 1\right]\right\}\frac{S}{\hat{S}} - \alpha. \quad (A10)$$

Equation (A10) is positive for all $D \leq c_1/r$, if

$$p\left(\frac{if'(iD)}{(1+r)^2} + \frac{i}{1+r}\right) > \frac{\alpha(\hat{S} - S)}{(1-\alpha)S}, \quad (A11)$$

which holds because $\hat{S} \leq S$ for $D \leq c_1/i$ and $f'(iD) > 0$.

3. Strip Financing With an Equity Kicker

That the bondholders' minimum equity participation under strip financing is lower in the presence of an equity kicker which permits a lower i follows from the fact that $\partial\beta_{\min} / \partial i > 0$ along $iD = c_1$. This can be verified by substituting $D = c_1/i$ into the right hand side of Equation (7) and differentiating it with respect to i to obtain:

$$\frac{\partial\beta_{\min}}{\partial i} = \frac{(1-\beta)D(1-i^2)}{i(c_3 - D(1+i)^2)}. \quad (A12)$$

(A12) is positive for $i < 1$ because $c_3 > D(1+i)^2$ and $\beta < 1$.

4. Equity Participation as a Signal

In the model of Section II, the promoters keep the net present value of the buyout for any positive equity participation. A more realistic model would be one in which the promoters' capital commitment is not arbitrary but signals the level of cash flows to outside investors. This type of signal has been proposed by Leland and Pyle [19]. In order to model it, let investors expect the date 1 and date 2 cash flows to be $\hat{c}_1$ and $\hat{c}_2$, respectively; $\hat{c}_2 = f(\alpha)$, f being an increasing function such that $f(\alpha^*) = c_2$, where α^* is the optimal equity participation of the promoters, and $\hat{c}_1$ is an outcome of the signalling equilibrium. As a consequence, investors value equity as follows:

$$\hat{S}(\alpha, D) = \frac{\hat{c}_1 - rD}{1+r} + \frac{f(\alpha) - D(1+r)}{(1+r)^2}. \quad (A13)$$

Let the promoters expect the cash flows to be c_1 at date 1 and c_2 at date 2. The value of equity to them is thus given by Equation (2). They can invest an amount $Z \leq W$ in the buyout and their decision problem can be expressed as follows: Maximize

$$\alpha S(D) + W - Z \quad (A14)$$

with respect to α, D and Z, subject to

$$D + Z + (1-\alpha)\hat{S}(\alpha, D) = K, \quad (A15)$$

$Z \leq W$, $\alpha \in [0, 1]$ and $D \leq c_1/r$. The promoters need to satisfy the last inequality in order to avoid costly default.

Consider the elasticity of the investors' equity valuation with respect to the equity participation offered by the promoters:

$$e = -\frac{\partial \log \hat{S}(\alpha, D)}{\partial \log(1-\alpha)}. \quad (A16)$$

It is assumed that $e < 1 \ \forall \ D$, which requires that the investors' valuation of equity does not fall too much as more equity is offered to them.

In order to examine the nature of the promoters' financing decision, substitute the solution for α from Equation (A15) into (A14) to obtain

$$U = \alpha(D, Z)S(D) - W - Z. \quad (A17)$$

U is an increasing function of D and Z. In fact,

$$\frac{\partial U}{\partial D} = \frac{\alpha}{1-e}\frac{S}{\hat{S}} - \alpha > 0$$

and

$$\frac{\partial U}{\partial Z} = \frac{1}{1-e}\frac{S}{\hat{S}} - 1 > 0,$$

since $S/\hat{S} \geq 1$ and $e < 1$. Therefore, the promoters choose D and Z at their maximum feasible values which are $D = c_1/r$ and $Z = W$, and outside investors expect $\hat{c}_1 = c_1$ and $\hat{c}_2 = f[\alpha(c_1/r, W)] = c_2$.

In this formulation, debt is required in order to diminish the need for outside equity capital and permit the promoters to have the largest share of equity allowed by their own capital endowment. The model determines both the amount of debt and the promoters' equity investment, but otherwise it leads to the same conclusions as the simpler model of Section II. As in Section III, the promoters will find it optimal to organize strip financing whenever there is a default state in which pure bondholders would prematurely liquidate the firm, and the minimum equity participation required from bondholders (β_{min}) is given by expression (7).