

THE CHARACTERISTICS OF LEVERAGED BUYOUT FIRMS

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Abstract

This paper investigates the determinants of leveraged buyout (LBO) activity by comparing firms that have implemented LBOs to those that have not. The analysis considers sources of gains from LBOs as well as the costs that can arise from the large amount of debt included in their financial structures. Consistent with the free cash flow theory we find that firms that initiate LBOs can be characterized as having a combination of unfavorable investment opportunities (low Tobin's q) and relatively high cash flow. In addition, firms likely to have high costs of financial distress (e.g. firms with high R&D expenditures), are less likely to do LBOs.

1. Introduction

The American corporate sector experienced a dramatic increase in leveraged buyout activity in the 1980s. Between 1979 and 1989 there were over 2,000 leveraged buyouts (LBOs) valued in excess of \$250 billion. A number of possible motivations for these transactions have been advanced, most of which fall into one of the following categories:

- (1) *incentive realignment*, i.e. gains from operating improvements resulting from realigning the interests of stockholders and management,
- (2) *favorable inside information*, i.e. gains from acquiring undervalued assets,
- (3) *stakeholder wealth transfers*, i.e. gains from employee layoffs, union-busting or raising the risk of preexisting debt, and
- (4) *tax savings*, i.e. tax reductions from increasing leverage and stepping up asset basis.¹

Although each source of gains is likely to have motivated some LBOs, policy-makers wish to know which are most important since realigning incentives can create wealth while gains from favorable inside information, stakeholder wealth transfers and tax savings redistribute wealth, perhaps at significant cost. Most authors (e.g. Kaplan (1989a) and Marais, Schipper and Smith (1989)) agree that tax savings are a source of large gains; however, there is still significant disagreement about the magnitude of the other gains.

Much of the literature has attempted to draw inferences about the motives for LBOs by observing changes in the firm's operations after they go private. For example, Kaplan (1989b), Muscarella and Vetsuypens (1990) and Smith (1990) document increases in before-tax cash flows

¹Weston, Chung and Hoag (1990) review existing theories of LBOs in detail.

following LBOs.² The authors attribute these increases to incentive realignment and argue that it is unlikely that much of the increase is due to favorable inside information.³

This paper takes a second approach to study the motives for LBOs. This approach involves testing whether or not firms that do LBOs differ from those that do not in ways that are consistent with theories of the sources of gains from these transactions.⁴ Lehn and Poulsen (1989) previously used this approach and found support for Jensen's (1986) theory that firms with high free cash flow are most likely to go private. In a later comparison of LBO and dual class recapitalization firms, Lehn, Netter and Poulsen (1990) examined a wider set of variables and found important differences among the two types of firms; most importantly, they found that dual class recapitalization firms have greater growth opportunities.

A potential weakness of previous studies is their relative lack of attention to potential financial distress costs that may deter highly leveraged transactions. For example, Lehn and Poulsen's (1989) finding that LBO firms have high cash flow can be explained by the higher financial distress related costs of firms with lower current cash flows (and a higher expected

²Other studies which document operating changes after LBOs include Bull (1989), Kitching (1989), Liebeskind, Wiersema and Hansen (1991), Long and Ravenscraft (1991) and Opler (1990b).

³Kaplan (1989b) observes that many managers choose not to participate in LBOs and that earnings forecasts by managers are not significantly different from realized earnings. Though supportive of the hypothesis that LBOs are fairly priced, this evidence does not rule out the possibility that managers of undervalued firms might wish to do an LBO to immediately realize the higher value. The desire to immediately realize an increase in share value is especially strong when outsiders also have access to favorable information and wish to take over the firm themselves. For this reason, we also disagree with Smith's (1990) argument that observed increases in cash flow from defensive LBOs cannot be attributed to favorable inside information.

⁴We assume that unexploited gains from going private existed at the start of the 1980s. These potential gains may have resulted from financial and institutional innovations which lowered the costs of going private.

growth rate in cash flows).⁵ Another widely used measure of the severity of agency conflict is Tobin's q , the ratio of the firm's market value to the replacement value of its assets. This variable also proxies for the cost of taking on debt insofar as high q firms typically have less collateralizable assets and greater growth opportunities.⁶

The main purpose of this paper is to design and analyze variables that allow us to distinguish the cross-sectional implications of agency explanations of LBOs from the hypothesis that firms initiate LBOs for other reasons, (e.g., taxes), but are deterred if they have the potential to incur high costs in the event of financial distress. In addition to investigating differences between Tobin's q and cash flow for LBO and non-LBO firms we also examine a variable which interacts q and cash flow. While the financial distress hypothesis specifies that both q and cash flow are important determinants of leverage, it does not imply that the interaction between the two variables is important. In contrast, the free cash flow theory implies an important interaction effect. Unlike low q firms, high q firms are likely to have good investment opportunities and, therefore, not be subject to the free cash flow problem. A second variable that allows us to distinguish the agency and financial distress cost explanations of LBOs is R&D intensity. R&D intensive firms are likely to have greater agency problems insofar as they are more difficult to

⁵Lehn and Poulsen (1989) also note that their results cannot rule out the hypothesis that the benefits and costs of debt are key determinants of LBO activity.

⁶The incentive effects of debt might also bias the above cited studies of cash flow changes following LBOs. For example, increased debt provides an incentive for firms to increase current cash flows at the expense of future cash flows by investing less, (as in Myers (1977)), by spending less time maintaining long-term customer relationships or by cutting product quality (see Maksimovic and Titman (1991)). If observed increases in cash flows occur for these reasons, they are likely to be reversed later, implying a potential loss rather than a gain in productivity from the LBO.

monitor; however, they are also likely to have higher financial distress related costs since high R&D firms generally are high growth firms that produce relatively unique products (see Titman and Wessels (1988)).

The plan of this paper is as follows. The next section discusses the rationale for high leverage in LBOs. Section 3 discusses firm characteristics that are related to the costs of debt financing and describes financial variables that are likely to be related to the sources of gains from LBOs. Section 4 describes the sample. Section 5 compares the characteristics of LBO firms and non-LBO firms, before and after industry adjustment, using univariate comparisons as well as multinomial logit analysis. Section 6 concludes the paper.

2. Why Are Leveraged Buyout Firms so Highly Levered?

The high leverage seen in LBOs suggests that the LBO organizational form, in some way, increases the benefits and/or reduces the costs associated with debt financing. The most highly cited benefit of debt is its tax advantage (e.g. Lowenstein (1985)). Although realizing the tax gain does not require an LBO, several organizational aspects of LBOs may allow firms to realize the gain while avoiding many of the associated costs of financial distress.⁷ Even so, it is unlikely that LBO firms assume as much debt as they do for tax savings alone. A number of LBO firms took on much more debt than was necessary to eliminate their taxable earnings,

⁷These features include (1) an institutionalized debt workout process (or the privatization of bankruptcy) that may lower bankruptcy costs; (2) strip financing where debt and equity are owned by the same investors which decreases conflict between different classes of securityholders and (3) LBO sponsorship by specialist firms with reputational incentives to look out for debtholder interests (see DeAngelo and DeAngelo (1987), Jensen (1989), Opler (1990a) and Wruck (1990)).

suggesting there must also be non-tax related motives for using debt.⁸

Grossman and Hart (1982) and Jensen (1986, 1989) have argued that debt can induce management to act in the interests of investors in ways that cannot be duplicated with optimally designed compensation packages. This incentive effect is likely to be most important immediately following LBOs when tough restructuring decisions are made. In addition, the asymmetric information inherent in LBOs is likely to encourage the use of debt. Even if management has little private information that is useful in valuing a firm given its current operating strategies, they are likely to have an informational advantage in assessing the effects of the major changes that may take place as a result of an LBO. Signalling arguments made by Ross (1976), Leland and Pyle (1977) and others suggest that in the presence of substantial asymmetric information, managers with favorable information are likely to hold a large share of their firms' stock and obtain outside financing disproportionately with debt.

Although the LBO organizational form is designed to minimize the more direct costs of bankruptcy, LBO firms are probably still subject to many of the indirect financial distress costs discussed in the next section. A firm in a business where these financial distress costs are high will find it less attractive to take on the debt required to signal management's optimism, to align management incentives with those of investors, and to thus realize the gains from going private.⁹

⁸Forty percent of the 46 firms studied in Opler (1990b) paid no income taxes after going private.

⁹The view that the choice to do an LBO depends on the costs and benefits of leverage is open to the argument that leverage in buyouts is transitory. However, leverage need not be permanent for it to create value (see, particularly, Altman and Smith (1991)). In addition, firms which go public after LBOs have about 1/3 again as much leverage as they did before going private (Muscarella and Vetsuypens (1990)).

Such firms may have large gains associated with going private but may find it too costly to take on the debt required by the transaction. Thus, the magnitude of financial distress costs may be as important a factor in determining whether a firm chooses to do an LBO as the above-mentioned benefits.

3. Firm Characteristics and the Gains to Leveraged Buyouts

The previous discussion suggests that LBOs may be deterred by potential financial distress costs. As we mentioned in the introduction, motivations for LBOs include incentive realignment, exploitation of inside information, stakeholder wealth transfers and tax gains. The importance of these motives as well as financial distress related costs are likely to differ across firms in ways that depend on their characteristics. Hence, the relative importance of the various costs and benefits of LBOs can be indirectly assessed by comparing the characteristics of firms that implement LBOs with the characteristics of firms that remain public. The following subsections suggest a set of financial variables that are likely to be related to the proposed costs and benefits of LBOs.

3.1 Costs of Financial Distress

The firm characteristics used to identify financial distress costs include the variables previously examined in Titman and Wessels' (1988) cross-sectional study of capital structure choice. These variables serve as proxies for the uniqueness and durability of the firms' products, the collateralizability of their assets, their growth opportunities and volatility of their cash flows.

3.1.1 Product Uniqueness

Titman (1984) provides a model where a firm's customers, workers and suppliers suffer when

it goes out of business. As a result, these non-financial stakeholders will be reluctant to do business with a firm in or near financial distress. This cost of financial distress is likely to be highest among firms with relatively unique products that may require servicing in the future. Consistent with this prediction, Titman and Wessels (1988) find that several proxies for product uniqueness are negatively related to leverage ratios. We also use these proxies to predict LBO activity. They include (1) research and development divided by sales, (2) selling expenses to sales, and (3) a dummy variable for firms in the machinery and equipment industries (SIC codes between 3400 and 4000). These proxies characterize firms that are likely to sell products requiring extensive servicing and spare parts.

3.1.2 Collateral and Growth

Galai and Masulis (1976), Jensen and Meckling (1976) and Myers (1977) show that equityholders of levered firms have incentives to invest suboptimally to expropriate bondholders. To the extent that debt can be collateralized, creditors are less vulnerable to expropriation because funds may only be used for a particular project. In addition, the risk of creditor expropriation is likely to be higher for growing firms with more flexibility in their choice of future investments. Thus, expected future growth should be negatively related to long-term debt levels.

Because the market capitalizes growth opportunities not measured on the books, Tobin's q is an indicator of growth. Another indicator of expected growth is the ratio of the firm's cash flow to the market value of its assets.¹⁰ The ratio of research and development expense to sales which was previously mentioned as a proxy for product uniqueness is also likely to serve as a

¹⁰Since the market value of assets should equal the risk-adjusted sum of discounted cash flows, firms with relatively greater cash flow to market value ratio today will be expected to have relatively less cash flow growth in the future.

proxy for future growth opportunities.

3.1.3 Cash Flow Volatility

Firms with volatile cash flows may be poorly suited for high leverage because they are more likely to experience costly defaults on their debt obligations. Mackie-Mason (1990) finds that firms with high earnings volatility prefer debt over equity. We measure cash flow volatility as the standard deviation of operating income over assets and, in addition, estimate total risk as the variance of stock returns in a five year period before an LBO.

3.2 Incentive Realignment

Leveraged buyouts improve management incentives in many ways (see Jensen (1989)). LBO gains may arise from the elimination of free cash flow which managers would otherwise invest unwisely, from increased management effort motivated by large equity stakes and from the disciplinary effects of debt. In addition, LBO sponsors such as Kohlberg, Kravis and Roberts may better monitor management than the diffuse group of stockholders and debtholders present in most public corporations.

3.2.1 Reducing Free Cash Flow

We use several proxies for free cash flow. These include cash flow over the market value of assets and cash and marketable securities divided by the market value of assets. These variables are imperfect proxies for free cash flow in that they do not reflect the quality of a firm's investment opportunity set. One variable that has been previously used to measure the quality of a firm's investments is Tobin's q (see, for example, Lang and Litzenger (1989)). However, as we mentioned earlier, q may also proxy for the amount of collateralizable capital and growth opportunities which are related to the costs of debt. Similarly, as was noted earlier, the cash flow

variable is also related to the costs of debt financing. Consequently, interfirm differences in q and cash flow by themselves cannot distinguish agency and debt cost explanations of the LBO choice.

In order to distinguish the free cash flow explanation for LBOs from the debt cost theory we construct a dummy variable that identifies firms that *simultaneously* have low (lower than median) q and high (higher than median) cash flow. We interpret the free cash flow theory to imply that only those high cash flow firms with unfavorable investment opportunities are good LBO candidates. While the financial distress cost and the free cash flow theories both predict that low q and high cash flow firms are unlikely to go private, the theories are distinguishable insofar as the financial distress cost theory does not predict that this interaction variable is important. Lang, Stulz and Walkling (1990) also create a variable that measures free cash flow by interacting cash flow and q .

3.2.2 Firm Integration and Focus

Several studies suggest that diversified firms are more likely to suffer from agency problems (e.g. Morck, Shleifer and Vishny (1990) and Kaplan and Weisbach (1990)). For example, diversified firms may cross-subsidize poorly performing divisions with the proceeds of strongly performing divisions (see Jensen (1989)). Evidence provided by Muscarella and Vetsuypens (1990) and Liebeskind, Wiersema and Hansen (1991) indicates that in many cases LBO firms often divest assets. In fact, Opler (1990a) observed that roughly 50% of the leveraged buyout firms in his sample committed to sell off assets before actually going private.

More diversified firms may also be more easily broken up without destroying value. Shleifer and Vishny (1991) argue that firms which can more easily be broken up will have lower

costs of financial distress and thus find leveraged buyouts less costly.

To measure diversity we construct a Herfindahl focus index which accounts for the distribution of the firm's employees across SIC codes (the index is defined in Appendix A). We also construct a Herfindahl integration index which accounts for the distribution of a firm's employees across plants. The second index will be higher for firms with employees concentrated in fewer plants.

Because the financial distress cost and the incentive realignment theories of LBOs both predict that diversified firms may gain by going private we cannot distinguish them solely by observing the relationship between diversity and LBO activity. However, we can distinguish the two theories with a dummy variable that identifies firms that are both more diversified than average and have low q . In contrast to the financial distress cost hypothesis, which does not specify an interaction effect between these variables, the agency hypothesis suggests that low q , high diversity firms, or firms that failed to create value with diversification strategies, are good candidates for LBOs.

3.2.2 Improved Monitoring

To the extent that LBOs are motivated by the need to create a more incentive-intensive operating environment they are more likely to occur when management is poorly monitored and when management compensation is less tied to performance. Thus, we measure undermonitoring using the percent of total shares held by management and the percent of shares held by non-management directors and owners of more than 5% of shares. Morck, Shleifer and Vishny (1988) and McConnell and Servaes (1990) present evidence that firm performance is positively related to ownership concentration.

3.3 Informational Asymmetry, Agency Conflict and Undervaluation

Another influence on leveraged buyout activity may be the extent of informational asymmetry between managers and shareholders. There are two reasons why informational asymmetry may induce a firm to go private:

- (i) informational asymmetry increases the chances that a firm is undervalued, creating opportunities for individuals with superior information (such as management) to gain from going private;¹¹
- (ii) informational asymmetry gives managers more latitude to implement their own agendas without sanction from public shareholders and thus increases gains from high ownership concentration.

The second reason is related to work by Demsetz and Lehn (1985) who argue that share ownership is likely to be more concentrated when there is more asymmetric information because of larger gains from monitoring. They argue that unsystematic risk is related to the uncertainty of the firm's operating environment and thus proxies for the degree of asymmetric information. They find that unsystematic risk is positively related to ownership concentration. Following Demsetz and Lehn, we investigate whether unsystematic risk predicts LBO activity. We also use the dispersion of analysts' earnings forecasts as a proxy for the extent of asymmetric information.

The diversity measures described previously may also proxy for the extent of asymmetric information about firm value in the sense that diverse firms may be more difficult for outsiders to value (see, for example, Stein (1989)). A final variable, the ratio of research and development

¹¹A series of articles by Benjamin Stein offer anecdotal support for the argument that LBOs are motivated by firm undervaluation (e.g. B. Stein (1989, 1990)). A case where this motivation may have been important was when SFN, a textbook publishing company, went private for \$450 million to be liquidated for nearly \$1.1 billion shortly thereafter. One piece of the firm alone was sold off for \$520 billion. In another case, Metromedia was liquidated for approximately 3 times the cost of taking it private within several years.

expenses to sales, which also proxies for financial distress related costs, is likely to be positively related to the extent of asymmetric information.

We emphasize that none of these variables can be used to distinguish the favorable inside information motive from the incentive realignment motive for LBOs. However, given that we have agency theories that do not rely on information asymmetries, (e.g. the free cash flow theory), there exist other variables mentioned previously that have the potential to independently corroborate the incentive realignment motive. Moreover, also that the agency and inside information motives and the financial distress hypothesis predict opposite relations between the R&D variable and the incidence of LBOs.

4. Data

Most of the variables discussed in the previous section were obtained from the NBER Manufacturing Firm Panel (described in Hall (1990)), which covers more than 2,500 large companies in the 1959-1987 period. This file is drawn primarily from the Industrial COMPUSTAT tapes. The sources of all data and definitions of variables are described in Appendix A.

We obtained a list of firms which were dropped from the NBER Manufacturing Firm Panel because of leveraged buyouts and acquisition by a private company from Bronwyn Hall. This list was supplemented and verified using the *ADP M&A database*, the *Wall Street Journal Index*, the *Standard and Poors News* and a list of restructurings in the 1980s from the Dow Jones Broad tape.¹² In total, we obtained a sample of 181 firms which were taken private in the 1980-1990

¹²This list was kindly provided by Mark Mitchell.

period. This sample is listed in Appendix B. Going private transactions were defined as those where the equity of a publicly traded firm was delisted while the firm was not merged into another firm. Cases where delisted firms were merged into shell organizations established by LBO sponsors were classified as going private transactions.

Table I describes basic features of the sample. The table shows the number of firms in the sample by year and the mean book value of their assets. The sample is most heavily concentrated in 1986-1988 and is very thin in 1989 and 1990. The non-LBO control sample consists of all firms on the Manufacturing Panel that are not in our LBO sample.

Because our dataset spans 11 years we report the subsequent analyses for two subsamples: 1980-84 and 1985-90. One advantage of breaking the sample in this way is that many theories of leveraged buyouts were developed with knowledge of transactions that took place before 1985 so the post-1985 sample offers a cleaner test. The later subsample also includes a greater proportion of defensive transactions and has more large buyouts. In addition, operating performance improvements following later buyouts have been less dramatic (see Long and Ravenscraft (1991) and Opler (1990b)). In the earlier (later) subsample the explanatory variables are measured using 1980 (1985) data.

5. Empirical Results

5.1 Univariate Comparisons

Table II compares the median values of the previously discussed characteristics for samples of LBO and non-LBO firms in the 1980-84 and 1985-90 subperiods. To test the hypothesis that a characteristic of our LBO and non-LBO samples is drawn from the same distribution, the

probability value for a Wilcoxon signed rank test is also included in each entry in the table.

These tests indicate that the distribution of characteristics that proxy for free cash flow and expected future growth (the ratio of operating income to the market value of assets and Tobin's q) are significantly different in LBO and non-LBO samples in the way predicted by the two theories.¹³ In addition, the ratio of cash and marketable securities to the market value of assets is significantly higher for LBO firms. The dummy variables specifically designed to test the free cash flow theory support it. These variables identify firms with above median cash flow and Tobin's q below the sample median. We find that LBO firms are much more likely to have this profile.¹⁴ After conditioning on the level of q (cash flow) we find that LBO firms are much more likely than other firms to have high cash flow (low q). We also find statistically and economically significant differences in the dummy variable which identifies low q firms that are also highly diversified in the 1985-90 period. This suggests that many firms which failed to generate value with a diversification strategy found LBOs to be an effective means of shedding unwanted divisions. We emphasize that our low q , high diversity and low q , high cash flow dummies may also simply identify firms with low costs of financial distress because q , cash flow

¹³Lang, Stulz and Walkling (1990) and Lehn and Poulsen (1989) suggest that unencumbered cash flow to book value of assets is a better proxy for free cash flow. We find that LBO firms also have greater cash flow using this definition. This definition includes an adjustment for current and deferred income taxes and common and preferred dividend payments.

¹⁴We also tested for differences in *stock returns* between LBO and non-LBO firms after conditioning on other variables including cash flow, the dividend payout ratio, operating income, investment growth and the level of investment. We did not find economically or statistically significant differences between the two groups. While apparently unresponsive of the free cash flow theory, dummy variables based on stock returns are likely to have low power because LBO firms may have established poor investment records prior to the time when we measured stock returns.

and diversity each measure the costs of bankruptcy. We will more definitively distinguish the financial distress cost and free cash flow theories with multivariate tests in Section 5.3 by testing whether these interactive dummy variables are good predictors of LBOs after controlling for the independent effects of q , cash flow and diversity.

Management and outsider ownership concentration, two other agency cost proxies that are unrelated to the costs of financial distress, are higher in LBO firms than in non-LBO firms which is inconsistent with the incentive realignment theory. There are no significant differences in outside ownership concentration for the two samples while management ownership concentration is actually higher in LBO firms which is the opposite of what we predicted. A possible explanation is that managers with large shareholdings find it safer to initiate LBOs because they are less likely to be outbid by another party.

The results also do not support the hypothesis that LBOs are motivated by asymmetry of information between shareholders and management. Proxies for asymmetric information including unsystematic risk and the dispersion of analysts forecasts are not significantly different in the LBO and non-LBO subsamples. The ratio of research and development to sales, which should be positively related to the degree of asymmetric information, is much lower for LBO firms than non-LBO firms. While this is inconsistent with our hypothesis regarding asymmetric information, it supports the hypothesis that firms with higher costs of financial distress are less likely to go private.

The results in Table II suggest that financial distress costs are important in explaining the incidence of LBO activity. The table shows that firms with more research and development expense, those in the machinery and equipment industries, and to a lesser extent, those with

greater selling expenses, were significantly less likely to do an LBO. This is consistent with Titman and Wessels (1988) who find that highly levered firms tend to have low R&D, low selling expenses and tend not to produce durable goods in need of future servicing.

The hypothesis that less focused firms are more likely to go private is weakly supported by the result that LBO firms had employees distributed among more SIC industries than non-LBO firms (this difference is statistically significant in the 1985-90 period at the 10 percent level). We also find that more integrated firms are less likely to go private.

5.2 Firm or Industry Effects?

In this subsection we investigate whether the differences between LBO and non-LBO firms reflect firm-specific or industry-specific characteristics. Although most debt-related costs are likely to be common to firms in an industry, many of the gains to realigning incentives are likely to be firm-specific since these gains relate to the historical composition of the Board of Directors, the large shareholders and the top management. At the same time, free cash flow may exist industry-wide (see Jensen (1986)).

Table III reports the industry-adjusted medians of the previously examined variables for the 1981-1984 and 1985-1990 subsamples.¹⁵ The results show that, after industry adjustment, LBO firms have greater cash flow and lower q than non-LBO firms. On the other hand, the free cash flow dummy variables cease to be significant. We also find that after industry adjustment there is no statistically significant difference in R&D, selling expenses and taxes in LBO and non-LBO firms. This suggests that financial distress costs that deter LBOs are determined at the industry

¹⁵Industry-adjustment was carried out by subtracting the 4-digit SIC median of a variable from that for a firm.

level.

5.3 Multivariate Comparisons

Many of the variables examined in the last section are highly correlated with each other. For example, high cash flow firms are likely to have both low q and low R&D expenditures. For this reason, the univariate tests are inconclusive. Tables IV and V report coefficients from several multivariate logit regressions. The independent variables in these regressions are those that had no more than a few missing observations (and a size proxy). Table IV gives logits for the 1980-84 period while Table V gives logits for 1985-90. The variables not included in these regressions were not significantly related to the incidence of LBOs in the univariate tests. Logit equation II in the tables should give more precise coefficient estimates by virtue of having more observations.

The results show that after controlling for other effects, firms with high cash flow were more likely to do LBOs in the 1985-90 period but not in the 1980-84 period. In contrast to the univariate results, firms with more cash and marketable securities to assets were *less* likely to go private in the 1985-90 period. After industry adjustment, the coefficient on cash flow is statistically insignificant in 1980-84 and marginally significant and positive in 1985-90. This suggests that cash flow influences LBO activity mainly at the industry level.

The other variables that can proxy for the financial distress cost as well as the agency cost hypothesis, Tobin's q , the integration index and the focus index, are statistically insignificant in all of the logit regressions. However, the coefficient on the dummy variable that interacts cash flow and q is positive in both subperiods, supporting the free cash flow theory, but is significant only in the first subperiod. The dummy that interacts q and diversification is significant in the

latter subperiod, providing further support for the free cash flow theory, but is not significant in the earlier subperiod.

The logit estimates also support the financial distress cost hypothesis. In both subperiods firms with low R&D expenditures were significantly more likely to go private than high R&D firms as were firms not in the machinery and equipment industries. This evidence is especially strong in the earlier subperiod. In contrast to the univariate results, the coefficient on selling expenses was positive and significant in the 1985-90 subperiod. One interpretation of this finding is that after controlling for product uniqueness in other ways, high selling expense firms have inflated overhead and thus have greater gains from realigning their incentive structure.

6. Conclusion

In this paper we have investigated the motives for LBOs by comparing firms that did LBOs in the 1980s to those that did not. The explanatory variables show some success in predicting LBOs in our panel of firms, but they have virtually no power in explaining the LBO choice within industries.

While not conclusive, the results suggest that both the magnitude of free cash flow problems and financial distress costs are important determinants of the LBO choice. Consistent with the free cash flow theory we find that firms that initiated LBOs in the 1980 to 1984 subperiod had both low Tobin's q and high cash flow while those that initiated LBOs in the 1985 to 1989 subperiod had low q 's and a high level of diversity. Consistent with the financial distress hypothesis we find that LBO firms in both time periods had relatively low R&D expenditures; in the earlier subperiod we find they were disproportionately in industries that do

not manufacture machines and equipment.

The fact that financial distress costs deter LBOs suggests that leverage is crucial for realizing the gains from going private. Otherwise, we should observe firms with high potential financial distress costs going private with less debt and more equity than the average LBO firm. A widely discussed advantage of debt financing is its tax treatment. However, as we mentioned earlier, a large percentage of LBO firms use more debt than needed to eliminate taxes, suggesting that debt plays other important roles in LBOs. In addition to its tax benefits, there are cash disbursement reasons, monitoring reasons, informational reasons, and perhaps legal reasons (e.g. the Glass-Steagall Act) that encourage debt financing in LBOs. To fully understand the LBO phenomenon, additional empirical work examining the determinants of the financial structures of these transactions is needed.

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Table I

Number of Going Private Transactions with Mean Book Value by Year.

Year	Number	Mean Book Value (\$000,000)
1980	4	95.0
1981	14	109.7
1982	17	80.3
1983	12	67.3
1984	30	162.2
1985	23	184.3
1986	29	228.0
1987	25	348.1
1988	19	208.3
1989	6	1047.5
1990	1	446.1

Table II

Medians of instruments for four theories of motivation for LBOs for LBO and non-LBO firms and the Wilcoxon p-value associated with a test for difference in rank scores between the groups. The 181 LBOs are divided into 1980-1984 and 1985-1990 subsamples. Variables denoted *** are statistically significant at the 0.01 level; those denoted ** are statistically significant at the 0.05 level and those denoted * are statistically significant at the 0.10 level.

	1980-1984	1985-1990	Sample Size 1980-1984	Sample Size 1985-1990
Panel A: Instruments for Incentive Realignment Theory				
OPERATING INCOME TO ASSETS				
NO LBO	0.207	0.146	2106	1754
LBO	0.293	0.195	76	104
P-VALUE	0.00***	0.00***		
OPERATING INCOME LESS TAXES AND DIVIDENDS TO ASSETS				
NO LBO	0.223	0.154	1189	869
LBO	0.305	0.206	45	68
P-VALUE	0.00***	0.00***		
CASH AND MARKETABLE SECURITIES TO ASSETS				
NO LBO	0.068	0.073	2112	1748
LBO	0.091	0.099	76	104
P-VALUE	0.02**	0.00***		
TOBIN'S Q				
NO LBO	1.179	1.466	2116	1756
LBO	0.737	1.097	76	104
P-VALUE	0.00***	0.00***		
PERCENT BELOW MEDIAN TOBIN'S Q CONDITIONED ON ABOVE MEDIAN CASH FLOW				
NO LBO	30.4%	30.6%	1917	1351
LBO	70.4%	68.0%	54	75
P-VALUE	0.00***	0.00***		

Table II continued

	1980-1984	1985-1990	Sample Size 1980-1984	Sample Size 1985-1990
PERCENT ABOVE MEDIAN CASH FLOW CONDITIONED ON BELOW MEDIAN TOBIN'S Q				
NO LBO	26.4%	28.6%	439	416
LBO	55.1%	56.0%	25	30
P-VALUE	0.00***	0.00***		
PERCENT ABOVE MEDIAN CASH FLOW, MORE DIVERSIFIED THAN AVERAGE				
NO LBO	20.9%	21.5%	2193	1787
LBO	35.1%	44.2%	77	107
P-VALUE	0.00***	0.00***		
PERCENT MORE DIVERSIFIED THAN AVERAGE CONDITIONED ON BELOW AVERAGE Q				
NO LBO	58.5%	51.0%	783	755
LBO	58.7%	71.9%	46	64
P-VALUE	0.94	0.00***		
MANAGEMENT OWNERSHIP CONCENTRATION				
NO LBO	0.037		1173	
LBO	0.074		52	
P-VALUE	0.06*			
OUTSIDER OWNERSHIP CONCENTRATION				
NO LBO	0.044		1173	
LBO	0.057		52	
P-VALUE	0.49			
Panel B: Instruments for Information Asymmetry				
UNSYSTEMATIC RISK				
NO LBO	0.024	0.022	1564	1347
LBO	0.025	0.021	58	64
P-VALUE	0.46	0.80		
DISPERSION OF ANALYSTS EARNINGS FORECASTS				
NO LBO	0.062	0.059	828	657
LBO	0.061	0.064	25	29
P-VALUE	0.95	0.24		

Table II continued

	1980-1984	1985-1990	Sample Size 1980-1984	Sample Size 1985-1990
Panel C: Instruments for Financial Distress Costs				
RESEARCH AND DEVELOPMENT EXPENSE TO SALES				
NO LBO	0.006	0.009	2190	1779
LBO	0.000	0.000	77	104
P-VALUE	0.00***	0.00***		
PROPORTION IN MACHINERY INDUSTRY SIC CODES				
NO LBO	0.518	0.528	2193	1787
LBO	0.247	0.365	77	104
P-VALUE	0.00***	0.00***		
SELLING EXPENSES DIVIDED BY SALES				
NO LBO	0.177	0.206	2171	1766
LBO	0.148	0.184	77	104
P-VALUE	0.10*	0.17		
INTEGRATION INDEX				
NO LBO	0.206	0.222	1706	1405
LBO	0.131	0.137	58	64
P-VALUE	0.01***	0.01***		
FOCUS (NON-DIVERSIFICATION) INDEX				
NO LBO	0.404	0.348	1706	1405
LBO	0.362	0.277	58	64
P-VALUE	0.46	0.09*		
COEFFICIENT OF VARIATION OF OPERATING INCOME TO ASSETS				
NO LBO	0.222	0.278	1839	1522
LBO	0.188	0.292	65	92
P-VALUE	0.16	0.58		
TOTAL RISK (STANDARD DEVIATION OF RETURNS ON EQUITY)				
NO LBO	0.025	0.023	1608	1347
LBO	0.025	0.023	59	64
P-VALUE	0.96	0.59		

When a variable is labeled as a proportion the reported median is the proportion of firms in a category. Data definitions and sources are described in Appendix A.

Table III

Industry-adjusted medians of instruments for four theories of motivation for LBOs for LBO and non-LBO firms and the Wilcoxon p-value associated with a test for difference in rank scores between the groups. The 181 LBOs are divided into 1980-1984 and 1985-1990 subsamples. Industry adjustment is carried out by subtracting the industry median of a variable for each firm. Variables denoted *** are statistically significant at the 0.01 level; those denoted ** are statistically significant at the 0.05 level and those denoted * are statistically significant at the 0.10 level.

	1980-1984	1985-1990	Sample Size 1980-1984	Sample Size 1985-1990
Panel A: Instruments for Incentive Realignment Theory				
OPERATING INCOME TO ASSETS				
NO LBO	0.000	0.000	2106	1754
LBO	0.008	0.005	76	104
P-VALUE	0.02**	0.00***		
TOBIN'S Q				
NO LBO	0.000	0.000	2116	1756
LBO	-0.033	0.000	76	104
P-VALUE	0.05**	0.05**		
PERCENT BELOW MEDIAN TOBIN'S Q CONDITIONED ON ABOVE MEDIAN CASH FLOW				
NO LBO	55.7%	44.3%	1145	975
LBO	50.0%	41.1%	52	73
P-VALUE	0.42	0.59		
PERCENT ABOVE MEDIAN CASH FLOW CONDITIONED ON BELOW MEDIAN TOBIN'S Q				
NO LBO	52.0%	42.9%	439	1007
LBO	55.1%	42.2%	25	71
P-VALUE	0.98	0.92		
PERCENT ABOVE MEDIAN CASH FLOW, ABOVE AVERAGE DIVERSIFICATION				
NO LBO	23.7%	19.5%	2193	1787
LBO	27.2%	18.3%	77	104
P-VALUE	0.73	0.75		
Panel B: Instruments for Asymmetric Information				
UNSYSTEMATIC RISK				
NO LBO	0.000	0.000	1564	1347
LBO	0.000	0.000	58	64
P-VALUE	0.65	0.88		

Table III continued

	1980-1984	1985-1990	Sample Size 1980-1984	Sample Size 1985-1990
DISPERSION OF ANALYSTS FORECASTS				
NO LBO	0.000	0.000	828	657
LBO	0.000	0.000	25	29
P-VALUE	0.34	0.65		
Panel C: Instruments for Financial Distress Costs				
RESEARCH AND DEVELOPMENT EXPENSE TO SALES				
NO LBO	0.000	0.000	2190	1779
LBO	0.000	0.000	77	104
P-VALUE	0.37	0.15		
SELLING EXPENSE TO SALES				
NO LBO	0.000	0.000	2171	1766
LBO	0.000	0.000	77	104
P-VALUE	0.70	0.76		
INTEGRATION INDEX				
NO LBO	0.000	0.000	1706	1405
LBO	-0.009	-0.002	58	64
P-VALUE	0.59	0.54		
FOCUS (NON-DIVERSIFICATION) INDEX				
NO LBO	0.000	0.000	1706	1405
LBO	-0.009	-0.007	58	64
P-VALUE	0.73	0.43		
TOTAL RISK				
NO LBO	0.000	0.000	1608	1347
LBO	0.000	0.000	59	64
P-VALUE	0.71	0.90		
COEFFICIENT OF VARIATION OF OPERATING INCOME				
NO LBO	0.000	0.000	1839	1522
LBO	-0.026	0.000	65	92
P-VALUE	0.31	0.39		

When a variable is labeled as a proportion the median is the proportion of firms in a category. Data definitions and sources are described in Appendix A.

Table IV

Logit regressions of the probability of going private from 1980-1984. Probability value associated with the asymptotic chi-square statistic that a coefficient is statistically different from zero is given in parentheses. Those coefficients which are statistically significant from zero at less than the 0.05 level are marked * while those significant at the 0.10 level are marked #.

Variable	I	II	Industry Adjusted
Operating income/assets	0.217 (0.73)	0.014 (0.97)	0.278 (0.68)
Cash/assets	-0.050 (0.76)	0.022 (0.88)	-0.028 (0.92)
Tobin's q	-0.046 (0.72)	-0.160 (0.25)	-0.101 (0.45)
Machinery Industry dummy	-0.626 (0.06)#	-0.697 (0.01)*	-----
R&D/sales	-48.26 (0.01)*	-50.04 (0.00)*	-3.606 (0.66)
Selling expenses/sales	1.841 (0.15)	0.813 (0.49)	-0.290 (0.87)
Integration Index	-1.187 (0.20)	-----	-0.208 (0.82)
Focus Index	-0.115 (0.90)	-----	0.337 (0.74)
Log of assets	-0.146 (0.20)	-0.069 (0.38)	-0.0131 (0.90)
High cash, low q	0.974 (0.02)*	0.566 (0.09)#	0.048 (0.90)
Diversified, low q	-0.114 (0.80)	0.224 (0.45)	0.250 (0.53)
Chi-square	55.1*	62.4*	8.0
Sample Size-no LBO	1673	2094	1673
Sample Size-LBO	57	76	57

Table V

Logit regressions of the probability of going private from 1985-1990. Probability value associated with the asymptotic chi-square statistic that a coefficient is statistically different from zero is given in parentheses. Those coefficients which are statistically significant from zero at less than the 0.05 level are marked * while those significant at the 0.10 level are marked #.

Variable	I	II	Industry Adjusted
Operating income/assets	1.353 (0.17)	1.752 (0.02)*	1.707 (0.09)#
Cash/assets	-0.305 (0.19)	-0.368 (0.04)*	-0.348 (0.14)
Tobin's q	-0.196 (0.18)	-0.198 (0.11)	-0.238 (0.13)
Machinery Industry dummy	-0.335 (0.25)	-0.268 (0.25)	-----
R&D/sales	-17.73 (0.01)*	-24.35 (0.00)*	-3.737 (0.39)
Selling expenses/sales	1.615 (0.12)	2.137 (0.01)*	1.210 (0.40)
Integration Index	-0.859 (0.41)	-----	1.060 (0.37)
Focus Index	0.851 (0.43)	-----	-1.052 (0.40)
Log of assets	0.023 (0.82)	0.076 (0.26)	0.034 (0.74)
High cash, low q	0.339 (0.34)	0.245 (0.41)	0.012 (0.97)
Diversified, low q	0.690 (0.07)#	0.631 (0.02)*	0.154 (0.68)
Chi-square	40.3*	76.8*	12.6
Sample Size-No LBO	1382	1735	1382
Sample Size-LBO	64	104	64

Appendix A: Data Sources and Definitions

Operating income, cash and marketable securities, capital investment, research and development expense, cost of goods sold, income taxes and book value of assets were all taken from the *NBER Manufacturing Firm Panel* described in Hall (1990). Variables deflated by assets in Tables II and III are deflated by the market value of equity plus the book value of all interest bearing debt. The stock returns were computed over a three year period using the Manufacturing Firm Panel. The standard deviation of operating income is computed over a 6 year period before the base date. Up to two years of missing data were allowed in this computation. Tobin's q was defined as the ratio of the market value of the firm's liabilities to the value of its gross capital stock adjusted for inflation. The latter two variables are from the Manufacturing Panel. Management ownership is defined as the proportion of shares outstanding held by officers and officer directors. Outsider ownership is defined as the proportion of shares outstanding held by non-officer members of the Board of Directors and by holders of more than 10% of shares. The latter two variables were computed using a 1989 version of the *SEC Ownership Reporting System Master Tape*. The number of establishments and SIC codes in which a firm is involved were computed using 1981 and 1985 versions of the *TRINET Large Establishment Data Base*. The industry focus index is computed as an employee-weighted Herfindahl index over 3-digit SIC codes. The Herfindahl index was computed as $\sum_{i=1} e_i^2 / (\sum_{i=1} e_i)^2$. Here i indexes SIC industries and e_i is the number of the firm's employees in each industry. This Herfindahl index may range between 0 and 1. The firm integration index is computed as an employee-weighted Herfindahl index over establishments. The dispersion of analysts forecasts was computed as the five year mean of the monthly standard deviation of analysts forecasts for earnings one year in advance. Forecast data were obtained from the *I/B/E/S Tape*, courtesy of Lynch, Jones and Ryan. Long term debt was taken from the Industrial Compustat. The percent of employees unionized is from Fallick and Hassett (1990). The proportion of firms in machinery industries is defined as the proportion of firms with SIC industry codes between 3400 and 3999. Firm selling expense is defined as sales less operating income less the costs of good sold.

Appendix B: List of LBO firms in the sample

ACF INDS
ACME GENERAL CORP
ADAMS-MILLIS CORP
AFG INDUSTRIES INC
AFTER SIX INC
ALBANY INTL CORP
ALLEGHENY INTERNATIONAL INC
ALPINE GROUP INC
AMERACE CORP
AMERICAN BAKERIES CO
AMERICAN STANDARD INC
AMERICAN STERILIZER CO
AMSTAR CORP
AMSTED INDUSTRIES
ANDERSON INDUSTRIES INC
APL CORP
ARCATA CORP
ARLEY MERCHANDISE CORP
AXIA INC
BARCO OF CALIFORNIA
BEATRICE CO
BECOR WESTERN INC
BEELINE INC
BELL & HOWELL CO
BEVERAGE MANAGEMENT INC
BILTRITE CORP
BLAIR (JOHN) & CO
BLUE BELL INC
BORG-WARNER CORP
BRISTOL CORP
BROCKWAY INC
BURLINGTON INDUSTRIES INC
CADENCE IND CORP
CARESSA INC
CCX INC
CECO CORP
CELLU-CRAFT INC
CLARK OIL & REFINING CORP
CLEVEPAK CORP
COCA-COLA BOTTLING CO OF NY
COCA-COLA BOTTLING OF MIAMI
COLEMAN CO INC
COLUMBUS MILLS INC
CONAIR CORP
CONE MILLS CORP
CONGOLEUM CORP
CONTINENTAL GROUP
CONWOOD CORP
COPELAND CORP
CRADDOCK-TERRY SHOE CORP
C.H.B. FOODS INC
DAN RIVER INC
DELLWOOD FOODS
DENTSPLY INTERNATIONAL INC
DIAMOND CRYSTAL SALT CO
DINNER BELL FOODS INC
DOESPUN INC
DR PEPPER CO
DURO-TEST CORP
EASCO CORP
ELIXIR INDUSTRIES
ENVIRODYNE INDUSTRIES INC
ERO INDUSTRIES INC
EXECUTIVE INDUSTRIES
FAIRFIELD-NOBLE CORP
FLORIDA STEEL CORP
FORT HOWARD PAPER
FRIONA INDUSTRIES INC
FRUEHAUF CORP
GAF CORP
GARLAND CORP
GATEWAY INDUSTRIES INC
GENERAL INSTRUMENT CORP
GENERAL NUTRITION INC
GIT INDUSTRIES INC
GOLDEN STATE FOODS CORP
GUARDIAN INDUSTRIES
HARTE-HANKS COMMUNICATIONS
HARVARD INDUSTRIES INC
HARWOOD COS INC
HIGH VOLTAGE ENGINEERING
HORIZONS RESEARCH INC
HOUSE OF RONNIE
IDLE WILD FOODS INC
INTELLIGENT SYSTEMS CORP
INTERCOLE INC
INTERSTATE BAKERIES CORP
JONES & VINING INC
JOY MFG CO
JUPITER INDUSTRIES
KAISER STEEL CORP
KANE-MILLER CORP
KAYSAM CORP OF AMERICA
KENNINGTON LTD
KETTERING INDUSTRIES INC
KNUDSEN CORP

KROY INC
LBY HOLDING CORP
LEAR SIEGLER INC
LEHIGH PRESS INC
LESLIE FAY INC
LEVI STRAUSS & CO
LILLI ANN CORP
LYON METAL PRODUCTS INC
MACANDREWS & FORBES GP INC
MARLEY CO
MARY KAY COSMETICS
MAUL TECHNOLOGY CORP
MIDLAND GLASS CO
MIDLAND-ROSS CORP
MILLER BROTHERS INDUSTRIES
MINSTAR INC
MOHASCO CORP
MOUNT VERNON MILLS INC
NATIONAL GYPSUM CO
NATIONAL SPINNING CO
NORRIS INDUSTRIES INC
NORTH AMERICAN ROYALTIES
NORTHWEST INDUSTRIES
NORTHWESTERN STEEL & WIRE CO
OAKITE PRODUCTS
OHIO MATTRESS CO
OWENS-ILLINOIS INC
PABST BREWING CO
PACESETTER CORP
PALM BEACH INC
PANDICK INC
PAPERCRAFT CORP
PARAMOUNT PACKAGING
PEERLESS CHAIN CO
PUREX INDUSTRIES INC
QUESTOR CORP
REDKEN LABORATORIES
REEVES BROTHERS INC
RESEARCH-COTTRELL
REVERE COPPER & BRASS INC
REVLON GROUP INC
RIBLET PRODUCTS CORP
RIVAL MFG CO
RJR NABISCO INC
ROSELON INDUSTRIES
ROYAL CROWN COS INC
RSR CORP
SCHERER (R.P.)
SCHOLASTIC INC
SERVO CORP OF AMERICA
SETON CO

SFN COS INC
SHELLER-GLOBE
SIERRACIN CORP
SIGNODE CORP
SPEX INDUSTRIES INC
SPLENTEX INC
STANADYNE INC
STANDARD COOSA-THATCHER
STANDUN INC
SWIFT INDEPENDENT CORP
SYBRON CORP
TANNETICS INC
THOMPSON MEDICAL CO INC
TI-CARO INC
TOPPS CHEWING GUM
TRANS UNION CORP
TRIANGLE PACIFIC CORP
UNION SPECIAL CORP
UNIROYAL INC
UNITED MC GILL CORP
UNITOG CO
UNIVERSAL CIGAR CORP
VERNITRON CORP
VINDALE CORP
WALCO NATIONAL CORP
WALTER (JIM) CORP
WARD FOODS INC
WARNACO INC
WELBILT CORP
WESTERN MARINE ELECTRS CO
WESTERN PACIFIC INDUSTRIES
WILLIAMHOUSE REGENCY INC
WOMETCO ENTERPRISES INC
WORK WEAR CORP INC