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LBO'S, REVERSE LBO'S, AND THE REDUCTION OF AGENCY PROBLEMS

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ABSTRACT

LBOs, Reverse LBOs,
and the Reduction of Agency Problems

Sandy Klasa

Jensen (1986, 1989) claims that the LBO (Leveraged Buyout) process is a mechanism to decrease agency problems and improve efficiency in firms where managers' interests are not properly aligned with those of the corporation. Characteristics of LBOs such as high levels of financial leverage and management ownership of equity are thought to align the interests of owners and managers and lead to value maximization.

Whereas other studies have limited their examination of the pre-IPO period to the year before the IPO, our study examines operating performance during the four years preceding the IPO. We document that during the last four years prior to their IPO, reverse LBO firms more than triple their operating performance relative to their same industry counterparts. Operating performance during the three years leading up to the IPO is shown to be positively associated with both high levels of financial leverage and management ownership of equity.

Additionally, we find that reverse LBO underpricing is significantly negatively related to changes in operating performance occurring before the IPOs, to the length of time between the buyout and the IPO, and to the size of reverse LBO firms prior to their IPO. As well, we document a significantly positive relationship between underpricing and both the decrease in the leverage ratio at the time of the IPO and post-IPO stock price volatility. Finally, our study does not find an association between underpricing and managerial levels of equity ownership before or after the IPO.

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SUMMARY OF TABLES

1. INTRODUCTION

Public corporations and divisions of corporations are often bought out by consortiums of individuals or by other corporations. When these transactions are financed using large amounts of debt they are termed leveraged buyouts (LBOs). Although some LBOs may stay private indefinitely, Holthausen and Larcker (1996), Mian and Rosenfield (1993), Kaplan (1991), Muscarella and Vetsuypens (1990) have shown that most LBO firms make a transition to public status, in what is termed a reverse leveraged buyout, 2 to 5 years after the buyout.

The LBO and reverse LBO process has been explained as a mechanism to solve problems of inefficiency in firms which have businesses centered in nongrowth sectors of the economy or in which management incentives are not properly aligned with value maximization. Jensen (1986,1989) states that characteristics of LBOs, such as high levels of financial leverage and management ownership of equity, help to align the interests of managers and owners. Managers are forced to use free cash flows to make interest payments instead of investing in negative net present value projects. Also, if managers become significant owners of their companies, owner-manager conflicts of interest should be markedly reduced.

Hence, LBOs are a relevant topic to study to study in light of agency and corporate governance theory. They provide a unique opportunity to see whether the combination of managerial disciplining mechanisms and incentives, such as high levels of financial leverage and equity ownership, will lead to efficiency and productivity gains. Finally, since after their IPO, reverse LBO firms tend to have lower levels of financial leverage and equity owned by management, the study of LBOs and reverse LBOs assists in

determining whether a reduction in these disciplining mechanisms and managerial incentives lead to a stagnation or even to a drop in performance.

One proposed method of studying the performance levels of companies is to measure their operating cash flows before interest, taxes, and depreciation deflated by total assets. Holthausen and Larcker (1996) use this method to study the effects of changes in equity ownership structure and financial leverage on the changes in the operating performances of reverse LBO firms from the year before their IPO to the point in time four years after the IPO. Mikkelson, Partch and Shah (1997) use the same method to study how changes in managerial incentives of firms that have an initial equity offering affect the operating performances of these companies between the years one year before the IPO and ten years after the IPO.

Our study utilizes this method to calculate the operating performance of LBO firms during the last four years prior to their IPO using information collected from IPO prospecti distributed at the time of the reverse LBO. We also measure operating performance for up to three years after the IPO. This study also examines the relationship between managerial disciplining and incentive variables, such as financial leverage and the equity ownership of directors and officers of the firm, to performance variables such as the operating performance and changes in operating performance of LBOs during the last four years prior to the IPO. We also examine the relationship between underpricing at the time of the IPO, which is assumed to proxy investor uncertainty concerning the issue and asymmetric information problems, and operating performance variables, equity ownership structure, and financial leverage. Finally, we examine how the length of time between the leveraged buyouts and the subsequent IPOs is related to underpricing, post-IPO stock return volatility and pre-IPO reverse LBO firm size.

This study provides several contributions to the literature. First, while other reverse LBO studies [Holthausen and Larcker (1996), Degeorge and Zeckhauser (1992) and Muscarella and Vetsuypens (1990)] used the year prior to the IPO as their only estimate of performance during the private period, we examine the four years leading to the IPO. The opportunity to analyze performance during the LBO years for which we have collected data, provides a unique chance to view efficiency gains made during a much longer and more representative portion of LBO life. This information should provide valuable insight about the extent to which agency problems are resolved during the LBO period. Second, we compare operating performance during the four years before the IPO with the operating performance of reverse LBO firms during the year of their IPO and the years following the IPO. Third, we provide evidence on how operating performance and changes in operating performance during the years preceding the IPOs are related to management ownership of equity and to financial leverage. Fourth, we study how capital structure changes during the last three years preceding the IPOs may be related to operating performance. Fifth, we test to see if certain LBO firm variables are related to underpricing. While studies such as Muscarella and Vetsuypens (1989), Ainina and Mohan (1991), and DeGeorge and Zeckhauser (1993) have documented the magnitudes of reverse LBO underpricing, the determinants of this underpricing are not investigated. Jalilvand, Switzer, and Stewart (1996) have found that investment banker prestige cannot significantly predict the underpricing of reverse LBO equity offerings. This study seeks to investigate the issue of whether underpricing at the time of the reverse LBO equity offerings may be related to equity ownership structure, financial leverage, or to operating performance during the years preceding the IPOs. Finally, our study is also unique in that no other study has tried to determine the relationships between the length of

time between the leveraged buyouts and the IPOs and reverse LBO underpricing, post-IPO stock price return, and reverse LBO firm size.

Our study supports the claims of Jensen (1986,1989) that substantial improvements in efficiency take place during the LBO period which are the result of high levels of financial leverage and management ownership of equity. We find that operating performance significantly increases during the last four years of the private period. We also find that levels of managerial ownership of equity, financial leverage, and changes in financial leverage are significantly positively related to operating performance. This study also documents significantly less underpricing for firms which reduce their financial leverage to a lesser extent at the time of their IPO, or who show greater improvements in operating performance during the two years leading to their IPO. Finally, our study shows that the length of private LBO firm life is significantly negatively related to underpricing and post-IPO stock return volatility and is significantly positively related to the size of reverse LBO firms prior to their IPOs.

The remainder of this study is organized as follows. Section 2 discusses the background concerning leveraged buyouts and why they are thought to reduce agency problems. In addition, underpricing is also discussed. Section 3 presents 9 hypotheses which are tested in this study. Section 4 discusses data collection and empirical methods used in the analysis. Section 5 provides descriptive statistics concerning our variables. Section 6 discusses the results of the regression models. Finally, section 7 provides a conclusion and summary of the results found in this study.

2. BACKGROUND

2.1 LBOs as a Mechanism to Reduce Agency Problems

The literature on leveraged buyouts states that LBOs reduce agency problems and conflicts of interest between the managers and the owners of a corporation. Two important characteristics of LBOs differentiate them from more traditional corporate organizations, and may help lead to value maximization. First, there is a concentration of equity ownership, and managers and executives become major owners of the firm. Therefore, managers should be more motivated to act in the best interests of shareholders. Second, debt is used to finance going-private transactions and the acquired firm usually finds itself in a highly leveraged position. Hence, the risk of bankruptcy due to the higher degree of leverage forces managers to operate the firm in a more efficient manner.[1]

2.1.1. Management Equity Ownership

Jensen and Meckling (1976) claim that, with management owning a higher percentage of stock in a corporation, the interests of the owners and managers will become more closely reconciled and agency costs will be reduced. In the case of some LBOs where managers become virtually the sole owners of the corporation, owner-manager conflicts of interest should almost completely disappear. Jensen (1989) demonstrates that the salary of the CEO in the median LBO firm will be at least 20 times

[1] Bruner and Eades (1992), in a case analysis of the failure of the Revco Leveraged Buyout, claim that Revco was so leveraged that it had a probability of between 5 and 30 percent of successfully meeting its financial obligations in its first three years after going private. Although they also say that this was not the only reason for the failure of the buyout, their study helps to show how the probability of bankruptcy can be a powerful motive for managers to operate their firms more efficiently.

more sensitive to corporate performance than the salary of the CEO of a similar public firm[2]. Hence, it is not difficult to comprehend why agency costs and manager-owner conflicts should decrease when a firm undergoes a leveraged buyout.

Empirical studies of the relationships between management ownership and corporate value [Stutz (1988), Morck, Shleifer and Vishny (1988), and McConnel and Servaes (1990)] found that, at levels of up to 5 % insider ownership, firm value increases with the percentage of insider ownership. Generally, these studies have regressed levels of inside ownership on Tobin's Q. One problem with this type of study is that there may be a dilemma insofar as stating that management ownership predicts Tobin's Q when, in fact, the nature of the causality between the two variables is uncertain. It is possible that when firm value rises, managers will exercise stock options and perhaps will also be rewarded with additional forms of stock ownership. Thus, in these studies, management ownership could in fact be caused by firm value.

At higher levels of ownership of between 5 and 25 percent studies such as Morck, Shleifer and Vishny (1988), and McConnel and Servaies (1990) have generally shown that Tobin's Q decreases. This is perhaps due to management becoming entrenched and not subject anymore to the managerial labor market. Demsetz (1983), Fama and Jensen (1983), and Demsetz and Lehn (1985) contend that when a manager controls a significant

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[2] Jensen (1989) compares the effect of a $1000 increase in shareholder wealth in the personal wealth of top managers. He finds that in the median public corporation where CEOs typically hold only .25% of their company's equity, a $1000 increase in shareholder wealth will result in an increase in the wealth of the CEO of $3.25 when all corporate performance bonuses are considered. However, in the LBO firm where business unit chiefs typically hold median equity positions of approximately 6.4 % in their units, the same $1000 increase in shareholder wealth will result in a personal gain in wealth of $64 plus the further increase in wealth gotten from performance bonuses. Thus, the CEO in an LBO firm will have a salary at least 20 times more sensitive to corporate performance than the salary of a CEO of a similar public firm.

percent of the firm's equity, he may have enough voting power or influence to guarantee his employment at an attractive salary.

Empirical studies of ownership structure in LBOs [Muscarella and Vetsuypens (1989) and Kaplan (1991)] have shown that management ownership is usually higher for LBOs than for public companies, and that operating performance is also usually higher for LBOs. Holthausen and Larcker (1996) investigated the relationship between management ownership and operating performance for a sample of reverse LBOs. They reported that post-IPO operating performance is significantly positively related to changes in the percentage of equity owned by management occurring at the time of the IPOs. They also showed that, as the percentage equity ownership of non-management insiders such as board members increases, the operating performance of reverse LBO firms increases significantly.

2.1.2 Financial Leverage

Jensen (1986,1989) contends that the high levels of debt undertaken by LBO companies help to decrease agency costs by forcing managers to use excess free cash flows to make interest payments instead of using these cash flows for non-value-maximizing investments. Studies by Lehn and Poulsen (1989) and Lehn, Netter, and Poulsen (1990) find evidence in support of Jensen. They report a significantly positive relationship between a firm with excess free cash flows and the probability that this firm will be acquired in a leveraged buyout. They also show that the level of the premiums received by stockholders is significantly positively related to the amount of excess undistributed cash flows of the acquired firm.

Jensen (1986, 1989) also mentions that high levels of financial leverage are consistent with the incentive-intensity hypothesis for LBOs. He claims that excessive growth is a major source of inefficiency and waste in corporations and that the cash needs for making the high interest payments associated with LBOs help to curb this non-value maximizing corporate behavior. Liebeskind, Wiersema and Hansen (1992) find support for the incentive-intensity hypothesis as a motive for LBOs by finding that managers of LBO firms are more effectively induced to forego unnecessary growth than managers of public firms.

Other studies [Hayne (1989), and Kaplan (1989a, 1989b)] have cited tax incentives as a major reason for the use of high debt in reverse LBOs. They point to the tax shield from large interest payments as significantly enhancing corporate financial performance. However, Newbould, Chatfield, and Anderson (1992) find that the Tax Reform Act of 1986 has significantly lowered the tax advantages previously gained from highly leveraged buyout transactions.

2.2 Reverse LBOs, LBOs and Performance

Several studies have shown that firms which undergo leveraged buyouts experience improvements in operating performance. Kaplan (1989) finds that, for a sample of 34 LBOs, operating cash flow as a percentage of sales rose by 11.9 percent in the two years following the LBO. Opler (1992) finds that the same value increased by 16.5 percent for a sample of 42 LBOs. Similarly, Kitching (1989) finds that, for a sample of 110 LBOs, this ratio increased by 55 percent. It has also been found that reverse LBO firms perform better than their same industry counterparts. Degeorge and Zeckhauser

(1993) find that, in the year before LBO firms go public, these firms outperform their public industry counterparts. Holthhausen and Larcker (1996) find that reverse LBOs show higher returns on assets and operating cash flows than their same industry counterparts for the four years following their IPO.

The possibility that timing considerations determine when LBO firms return to public status has also been studied. Degeorge and Zeckhauser (1993) find that reverse LBO firms make significant increases in operating performance during the year prior to their IPO. Yet, they also show that, during the year after the IPO, operating performance decreases significantly. Therefore, they propose that the IPO may be timed to follow years of peak operating performance.

2.3 Underpricing

Privately owned corporations commonly raise capital through the use of an Initial Public Offering (IPO), in which equity is issued and sold to the public. A common occurrence during IPOs is that the offering price is set below the true market value of the stock. This is known as underpricing. Ritter (1984), reports that, for approximately 5000 firms that went public during the period from 1960 to 1982, the average IPO traded at a price 18.8% higher than the offering price soon after public trading began. The most commonly cited explanation for this underpricing has been the existence of asymmetric information problems. Rock (1986) developed an equilibrium model showing that uninformed investors face a winner's curse when they submit an order to buy IPO shares. Since investors who are well informed will retire from the market if the issue is overpriced, and will flood the market with orders if the issue is priced below its value,

uninformed investors have a greater probability of receiving a full allocation of shares if an IPO is overpriced and a much smaller probability of receiving a full allotment if shares are underpriced. Therefore, private corporations are forced to underprice their IPOs in order to offer compensation to uninformed investors for their disadvantaged position. Hence, the greater the problem of informational asymmetry concerning an IPO, and the larger the resulting disparity of knowledge between informed and uninformed investors, the greater will be the resulting underpricing of the IPO. Baron (1982) proposed that better informed investment bankers may help decrease the adverse selection problems caused by informational asymmetry. Beatty and Ritter (1986) and Ruud (1993) have tested this by comparing IPOs with more uncertainty about their value with IPOs having less uncertainty about their value. They found that, when the reputational capital of the investment banker is used as a proxy for the amount of uncertainty surrounding an issue, underpricing is higher for corporations with more uncertainty about their value.

2.4 Reverse LBO Underpricing

The phenomenon of IPO underpricing has not been limited to privately owned corporations going public for the first time, but has also been apparent in the initial public offerings of reverse LBO companies. However, reverse LBOs tend to have lower levels of underpricing than typical IPOs. Underpricing for reverse LBOs has been found by Muscarella and Vetsuypens (1989), Ainina and Mohan (1991) and DeGeorge and Zeckhauser (1993) to be between 2 and 2.6%. Jalilvand, Stewart, and Switzer (1996) find underpricing for their sample of reverse LBOs to be 3.3%. Cook and Officer (1996) compare the underpricing values for reverse LBO companies that re-issue versus reverse

LBO firms that that don't reissue. They show that the mean level of underpricing for reverse LBOs that do not reissue is 1.6%, while the mean level of underpricing for firms that do reissue ranges from 2.7% to 5.9%, depending on how long after the IPO is the second issue of stock.

2.5 Determinants of Reverse LBO Underpricing

As mentioned, a characteristic differentiating reverse LBOs from pure IPOs is that reverse LBOs tend to have less underpricing than do pure IPOs. The lower values of underpricing for reverse LBO IPOs may be explained in part by the comparatively smaller informational asymmetry problem which exist for reverse LBOs as compared to private firms going public for the first time. This is in part due to the fact that reverse LBOs have a previous public trading history, as well as to the high percentage of stock owned by management[3] which may help to reduce potential shareholder-manager conflicts. Finally, the fact that the equity ownership in LBOs is not dispersed among many different stock holders may also help explain the relatively smaller amount of underpricing for reverse LBOs at their IPOs.[4]

Jalilvand, Stewart and Switzer (1996) examined the relationship between investment banker prestige and the underpricing of reverse LBO equity offerings. They found that investment banker prestige is not significantly related to reverse LBO underpricing. Since investment banker prestige has been found to be significantly related

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[3] Muscarella and Vetsuypens (1990) show that for a sample of reverse LBOs the pre-IPO mean ownership of stock by officers and directors of the firm was 63.4%, while the most highly paid executive owned 9.2% of the stock, and the three most highly paid executives owned 26.5% of their firm's equity.

[4] Booth and Chua (1996) have empirically shown that IPO underpricing is a positive function of ownership dispersion.

to the underpricing of pure IPOs, they contended that the presence of fewer asymmetric information problems surrounding the IPOs of reverse LBOs decreases the importance of the role of the investment banker in reducing information asymmetries between the issuing reverse LBO firms and market participants.

At present, no study has tried to directly investigate whether certain LBO firm characteristics may be associated with problems of informational asymmetry. For instance, levels of managerial ownership of equity and of financial leverage may be related to underpricing and to asymmetric information problems at the time of the IPOs. This is because the market may be concerned with the power of managerial incentives and disciplining mechanisms before the IPOs, as well as how these two variables will be affected by the equity offerings. Also, the length of time that LBO firms remained private and changes in performance in the years prior to the offerings may be associated with underpricing and informational asymmetry during the IPOs. If firms stay private for longer periods of time this may signal to the market that more time has been spent to transform the LBO company into a more efficient firm. However, if firms stay private for longer periods of time the amount of time during which these firms were not subject to the scrutiny of the market is larger as well. Hence, this could lead to problems of informational asymmetry. Finally, if firms experience changes in operating performance prior to their IPO this may also affect informational asymmetry between the issuing firms and the market.

This study attempts to investigate if asymmetric information problems suffered by reverse LBO companies at their IPOs are related to LBO firm characteristics such as financial leverage, managerial ownership of equity, or operating performance. Evidence

of such relationships will provide valuable insight about the extent of market concern for these LBO attributes.

3. HYPOTHESES

Hypothesis 1a: During the years prior to the reverse LBO IPO operating performance should be improving.

If, as theorized, LBOs are a mechanism for the reduction of agency problems, this reduction of agency problems should be evident from improvements in operating performance. Since reverse LBO firms should only make the transition from private ownership to public ownership when agency problems have been resolved, we should see signs of this reduction in agency problems during the years preceding the IPO.

Hypothesis 1b: Operating performance and improvements in operating performance should peak the year prior to the IPO.

If there are timing issues involved in the decision to go public, the managers of reverse LBO firms should time the IPO of their firms so that the IPO follow the years in which superior operating performance took place. As well, peak operating performance should occur the year before the IPO.

Hypothesis 2: After the transition from private to public ownership, the reverse LBO firm should experience a decline in operating performance.

If managers of reverse LBO firms time the IPO so that they follow peak operating performance, they may not be able to sustain this operating performance during the years following the IPO. Therefore, we could see a decrease in operating performance during the years following the IPO. Also, since debt and insider ownership levels are typically reduced when LBO firms return to public status, these variables may have less influence on the firm's performance after the IPOs. Therefore, if agency problems which had been resolved make new appearances, operating performance may decline during the years following the IPO. Signs of the reappearance of these agency problems could be evidenced by a reduction in firm operating performance.

Hypothesis 3: The Debt to Asset ratio of firms prior to their IPO should be positively related to operating performance and improvements in operating performance.

If having more debt and the resulting need to make higher interest payments causes managers to run their firms in more efficient ways, firms with higher levels of debt should have superior operating performance. This operating performance will be necessary in order to make interest payments. Thus, the more debt a firm has, the higher will be the incentive to reduce agency problems and the higher will be the resulting operating performance.

Hypothesis 4: Higher levels of managerial ownership of equity after the IPO should be positively related to operating performance and improvements in operating performance.

LBO firms which have managers who retain significant equity ownership after the IPOs should have superior operating performance during the years preceding and following the IPOs. These types of managers may be those who are the most responsible for the reduction of agency problems because they may be making endogenous decisions to maintain their ownership stake in their firms even after the return to public status. If this is true, the benefits to the firm should be observable by superior operating performances during the years preceding the return to public status and the years following the return to public status.

Hypothesis 5: The reduction of the D/A ratio at the time of the IPO will be positively related to underpricing.

If firms reduce their D/A ratio by significant amounts at the time of their IPOs, the market should view this as negative information. Higher debt levels are assumed to be associated with lower agency problems. Therefore, a decrease in the D/A ratio may cause problems of informational asymmetry since the market might be unsure whether agency problems have truly been eliminated, or if, instead, previous agency problems might reappear. These increased potential problems of informational asymmetry should increase levels of underpricing during the IPOs. Also, the larger the decrease in the D/A ratio at the time of the IPO, the more the whole firm is going to be transformed into a new and

different firm at the time of the IPO. Since it is not known with certainty how major changes in capital structure will affect the reverse LBO firm after its return to public status, more uncertainty should surround the equity issues of reverse LBO firms which reduce their D/A to a greater extent. This increased amount of uncertainty should result in increased underpricing.

Hypothesis 6: Levels of managerial ownership of equity after the IPO should be negatively related to underpricing.

If increased managerial ownership of equity results in the owners and managers of a corporation having interests which are more closely reconciled and thus decreases manager-owner conflicts, this should result in smaller problems of informational asymmetry. Hence, if managers of reverse LBO firms retain greater equity ownership stakes after their IPO this should reduce asymmetric information problems. Less informational asymmetry should result in lower levels of underpricing.

Hypothesis 7: Improvements in operating performance should be negatively related to underpricing.

If improvements in operating performance during the years preceding IPOs signal that agency problems have been reduced, this may decrease problems of informational asymmetry between a given firm and the market. This decrease in problems of informational asymmetry between managers market participants should lead to less underpricing.

Hypothesis 8: The length of time between the leveraged buyout and the return to public status should be negatively related to underpricing.

If during the LBO period, agency problems are reduced and the firm is becoming a more efficient and competitive one, the longer the period between the leveraged buyout and the IPO of a firm, the more complete should be the reduction of agency problems. Also, if the LBO firm operates for a longer period of time more efficiently and without old agency problems, it is possible that it is less likely to return to patterns of decreased efficiency upon its return to public status. This may reduce problems of informational asymmetry. These reduced problems of informational asymmetry should subsequently lead to less underpricing.

4. DATA AND EMPIRICAL METHODS

4.1. Sample Selection and Data Sources

The November issues of *Mergers and Acquisitions* from 1992 to 1996 reported reverse LBOs which took place from September 1st of the previous year to August 31st of the year the magazine issue was published. The reverse LBOs used for this study were identified from these issues of *Mergers and Acquisitions*. Since, for the purposes of this study, accounting data was needed for the four years prior to the reverse LBOs, it was not possible to use the Compustat database. Hence, IPO prospecti were used to collect this data. The IPO prospecti were also used to collect most of our information concerning variables relating to the private LBO period. IPO prospecti were downloaded from a

World Wide Web site serviced by the RR Donnelley Financial & IPO Crossroad Company. All prospecti for the reverse LBO IPOs mentioned in the *Mergers & Acquisitions* issues that were found in the RR Donnelley Financial & IPO Crossroad Company prospectus database were collected. The number of available prospecti in the database for 1992 IPOs was limited since this is the first year for which the RR Donnelley Financial & IPO Crossroad Company have IPO prospecti that are downloadable. However, from 1993, most of the prospecti were available. Companies for which prospecti were found were included in the sample of reverse LBOs for this study. After the collection of the IPO prospecti was completed there were 190 reverse LBO firms left in our sample.

Table 1
Reverse LBO Firms Included in the Sample

Table 1 includes the number of reverse LBOs reported by *Mergers and Acquisitions* for each year from 1992 to 1996 relative to the number of reverse LBOs for those years included in the reverse LBO sample of this study

Year	1992	1993	1994	1995	1996	Total
Reverse LBOs reported by Mergers and Acquisitions	38	67	45	43	38	231
# of reverse LBOs included in sample	19	60	41	36	34	190

Table I shows the number of reverse LBO firms for each year from 1992 to 1996 included in our study relative to the number of reverse LBOs for each of those years reported by *Mergers and Acquisitions.* As can be seen from Table I, 231 reverse LBOs were reported by *Mergers and Acquisitions* between 1992 and 1996. Our sample consists of 190 of these reverse leveraged buyouts. Additionally, a glance at the table reveals that about half of the reverse LBOs which were not included in our sample occurred in 1992.

This is due to limited number of prospecti available from the RR Donnelley Financial & IPO Crossroad IPO Company for that year.

Among the other sources used for data collection were the Compustat PC Plus Database and the CRSP database (Center for Research in Security Prices). The Compustat PC Plus Database was used for the collection of accounting data during the years following the IPOs. The CRSP database was used to collect information concerning equity returns and value-weighted market returns for the first 21 days following the IPOs of the reverse LBO firms.

About 80 percent of our sample consists of divisional leveraged buyouts. This compares with Muscarella and Vetsuypens' (1990) study, in which 75 percent of the reverse LBOs consisted of divisional LBOs. The fact that the majority of our sample is composed of divisional buyouts may provide some benefits for the measurement of real operating benefits. Hite and Vetsuypens (1989) and Muscarella and Vetsuypens (1990) point out that measuring the performance of divisional LBOs after their leveraged buyouts may provide a better picture of real gains in efficiency than measuring the performance of full LBOs. This is because, whereas when full LBOs take place parent company shareholders tend to reap much of the gains from the acquisition, this is less the case with divisional buyouts. Hite and Muscarella (1989) mention that divisional buyouts do not suffer as much from the absence of "arm's-length bargaining between buyer and seller" problematic with full LBOs. Parent company shareholder gains are reduced because top level directors may represent the interests of both the buyers and the sellers. Also, some divisional managers may negotiate a purchase price less than the intrinsic value of their division if they have favorable inside information about their division unavailable to parent company managers. Hence, for divisional LBOs, the probability is greater that any

changes in efficiency and operating performance are the result of real efficiency gains rather than the effect of wealth transfers from sellers.

4.2 Operating Performance

We use operating income before interest, taxes, and depreciation deflated by the total book value of assets (OPINC) as our measure of operating performance. Our values of OPINC are used in the examination of the hypothesized productivity gains that reverse LBO firms might be making during the four years prior to their IPOs and the possible decreases in productivity that these firms may experience after the IPOs. In addition, the OPINC measure of operating performance is also used as the dependent variable in some of our cross-sectional regressions.

Healey, Palepu, and Ruback (1992) propose this measure of operating performance for studies regarding mergers and acquisitions. LBO studies such as those by Holthausen and Larcker (1996) and Degeorge and Zeckhauser (1992) use the OPINC measure of operating performance in their analyses. Also, Mikkelson, Partch, and Shah, (1997) use this measure of performance to study the operating performance of pure IPOs. This measure of operating performance is less affected by different accounting methods. In addition, Holthausen and Larcker (1996) mention that this measure of performance is not affected by the "mechanical effect of leverage on the results". Finally, Mikkelson, Partsh, and Shah (1997) mention that dividing operating income by the total value of assets permits comparisons of operating performance "over time and across different firms".

We adjust each firm's operating performance by subtracting the median operating performance of the firms with the same two-digit SIC code as that of our firms. This follows the procedure employed by Holthausen and Larcker (1996).

We also calculate operating performance using eight measures of performance which control for both industry and performance. This permits us to pick a pre-IPO year and evaluate a firm's performance in subsequent years by comparing a firm's performance to firms in its industry which had a similar operating performance as the reverse LBO firm during the pre-IPO year chosen. In order to accomplish this we subtract from each reverse LBO firm's operating performance the median operating performance of the sample of firms having the same two-digit SIC code and within 10 percent of the firm's performance in the initial year looked at. Barber and Lyon (1996) mention that when performance and industry matching is done the most powerful test statistics they find are those in which a match is found for all firms within the 90% - 110% performance filter, and having the same two-digit SIC code. We use Year –4 through to Year –1 as the initial years in our analyses. For example, this means that when Year –4 is the pre-IPO year chosen as the initial year that the group of firms for each firm in our reverse LBO sample matched by industry and performance are chosen in Year –4 and from this sample each subsequent year the median performance of this group of firms is subtracted from each reverse LBO firm. Similarly, if Year –1 is the pre-IPO year chosen to be the initial year of our analysis we match each firm in our reverse LBO sample to a group of firms having the same two-digit SIC code and within the given performance filter. The median performance of this group of firms is then subtracted from the performance of the reverse LBO firm each subsequent year.

Typically, the controlling of industry simultaneously with performance is done in the year before an event. Holthausen and Larcker (1996) and Mikkelson Partch, and Shah (1997) use this industry and performance matched benchmark in their studies. Their event year is the IPO year. However, for our study we have four years which precede the IPO event year. Hence for purposes of comparison we used each of the years from –4 to –1 as the year in which industry and performance matching takes place and then calculated firm performance for each subsequent year adjusted by industry and performance. Our reasoning for doing so is that, if we find that regardless of what year the industry and performance matching takes place or what performance filter we use, we find the same results concerning operating performance as we did when only industry effects were controlled for this will give additional strength and validity to our results.

4.3 Underpricing

The dependent variable in some of our cross-sectional regression models is the 21-day market adjusted underpricing for the IPOs of our sample of reverse LBOs. We use a holding period of 21 days to measure underpricing. This follows Jalilvand, Stewart, and Switzer's (1996) and Muscarella and Vetsuypen's (1989) use of a 21-day holding period, and the utilization of a two week holding period by Carter and Manaster (1990). We calculate 21-day underpricing as the relative price change from the initial offering price to the closing price at the end of the 21st day of trading.

$$\mathbf{R_{j(21)} = (B_{j(21)} - OP_j)/OP_j}$$

Where $\mathbf{R_{j(21)}}$ = Degree of Underpricing for 21 Day Holding Period
$\mathbf{B_{j(21)}}$ = Closing Bid Price on the 21st Day of Trading
$\mathbf{OP_j}$ = Offering Price for Security j

Finally, similar to Beatty and Ritter (1986) we adjust our underpricing values for market movements in order to ascertain that the values calculated for underpricing are not influenced by market-wide stock price movements. We accomplish this by subtracting the 21-day value-weighted market returns from our calculated values for 21-day underpricing.

4.4 STANDARD DEVIATION (STD)

Ritter (1986) explains that the greater the risk of an issue, the greater the underpricing and subsequent post-IPO stock price volatility of the securities sold in the issue. Jalilvand, Stewart, and Switzer (1996) use the standard deviation of post-IPO daily stock returns as a control variable for risk in their study of reverse LBO underpricing. In this study we also use the standard deviation of the stock returns as a control variable. We calculate the return for the initial day of trading as the relative price change from the initial offering price to the closing price at the end of the initial day. This is consistent with the methods used by Jalilvand, Stewart, and Switzer (1996) and Johnson and Miller (1988). In our calculations of the returns for the following twenty days we measure the relative price changes from the initial offering prices to the closing prices. Also, in order to adjust for market movements we adjust each of the daily market returns by subtracting the daily value-weighted market return.

We also calculate a version of the standard deviation variable which does not include the initial trading day. This is because, as noted by Jalilvand, Stewart, and Switzer (1996), and Muscarella and Vetsuypens (1989) most of an issue's underpricing occurs during the first day of trading. Hence, in our cross-sectional regression models in which underpricing is the dependent variable, if the standard deviation independent variable is

calculated including the return from the first day of trading, a problem occurs due to the fact that too powerful a mathematical functional relationship between the standard deviation variable and underpricing exists. By using the standard deviation variable which was calculated without including the return from the first day of trading this problem is somewhat alleviated. Finally, in our cross-sectional regression models in which performance is the dependent variable we use both standard deviation variables to control for risk.

5. DESCRIPTIVE STATISTICS

5.1 Reverse LBO Firm Characteristics

Table 2 presents the descriptive statistics for the variables used in the study. This table documents the [5]D/A[6] ratios for each of the four years preceding the IPOs. We find that the median D/A ratios decrease slightly each year during the four years leading to the IPO. The median D/A ranges from 94.86 percent four years prior to the IPOs to 89.89 percent the year prior to the IPOs. This is followed by a slight rise to 91.06 percent in the D/A ratio measured from the last available statement prior to the IPO. Although there are no other studies with which to compare our leverage values for years –4 through years –1, our leverage values immediately prior to the IPOs can be compared to those found in other studies. Muscarella and Vetsuypens (1990) find that the median leverage value

[5] The D/A ratio is calculated as (Total Liabilities)/(Total Assets).
[6] All of the leverage values are significantly different from zero at the 0.1 % level using a two-tailed T-test. None of the changes in the mean D/A during the years leading to the IPOs were found to be significant.

immediately prior to the IPOs for their sample of reverse LBOs is 78.6 percent. Holthausen and Larcker (1986) find that this value is 86.0 percent.

We also see that the post-IPO median leverage ratio for our sample is 69.4 percent. This results in a decrease in the leverage ratio of 21.4 percent[7]. Hence, our post-IPO median leverage value is higher than the values of 55.5 percent and 58 percent found in the Muscarella and Vetsuypens (1990) and Holthausen and Larcker(1996) studies.

Table 2 also reveals that the median percentage equity ownership of all directors and officers is 52.3 percent immediately before the IPO. Immediately after the IPO this value decreases to 33.6 percent. The median decrease in the percentage equity ownership of directors and officers is of 15 percent. Our values for managerial ownership of equity are slightly lower than those of Muscarella and Vetsuypens (1990) who find that the percentage ownership of directors and officers decreases from 63.4 percent to 44.5 percent as a result of the IPO.

The results in Table 2 also show that the mean value of the percent of the IPO proceeds going to selling shareholders as a percent of the total IPO proceeds is 13.2 percent. However, the median value is 0 since, for the majority of the firms, the entire proceeds went to the issuing firms. This can be compared with the result of Mikkelson, Partch, and Shah (1997) who report that the median value of the percent of the IPO proceeds going to selling shareholders is 6.9 percent .

Finally, Table 2 provides information relating to the length of time between the leveraged buyout and the IPO. The median firm in our sample had an LBO life of approximately 46 months, or slightly less than 4 years. These results are consistent with

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[7] The change in the leverage value at the time of the IPO is significantly different from zero at the 0.1% level using a two-tailed test.

those reported by Holthausen and Larcker (1996), Mian and Rosenfield (1993), Kaplan (1991), and Muscarella and Vetsuypens (1990) who document that LBO firms usually re-enter the public equity markets 2 to 5 years after their leveraged buyouts.

Table 2
Descriptive Statistics for Leverage, Equity Ownership, Equity Selling Behavior, and Months Private

The D/A ratio is defined as total liabilities/total assets. The Pre-IPO D/A ratio is calculated from the most recent financial statement prior to the IPO. The Post-IPO D/A ratio is calculated by adjusting the pre-IPO D/A ratio for the proceeds received from the IPO. The change in the D/A ratio is the pre-IPO D/A ratio minus the post-IPO D/A ratio. The change in the % equity ownership of all directors and officers is the difference between the pre-IPO value and the post-IPO value.

	Mean	Median	Std. Dev.	Quartile 1	Quartile 2
Leverage					
Year –4 D/A Ratio	0.986	0.947	0.379	0.797	1.061
Year –3 D/A Ratio	0.974	0.931	0.380	0.770	1.072
Year –2 D/A Ratio	0.963	0.913	0.330	0.794	1.067
Year –1 D/A Ratio	0.980	0.899	0.339	0.787	1.086
Pre-IPO D/A Ratio	0.975	0.911	0.332	0.787	1.063
Post-IPO D/A Ratio	0.712	0.694	0.256	0.581	0.838
Change in D/A Ratio at time of IPO	0.255	0.214	0.218	0.132	0.304
Equity Ownership					
Pre-IPO % Equity Ownership of all Directors and Officers	50.924	52.4	35.45	15.365	85.65
Post-IPO % Equity Ownership of all Directors and Officers	33.437	33.6	24.032	9	54.5
Change in % Equity Ownership of all Directors and Officers	18.089	15	15.306	5.145	29.45
Percent of IPO Proceeds Going to Selling Shareholders	0.132	0	0.224	0	0.210
Time Private					
Time Between LBO And IPO in Months	50.119	46	36.636	21.75	71.25

Table 3
IPO Stock Return Data

Table 3 lists the mean, median, quartiles, maximum, and minimum of 21-day underpricing, the standard deviation of the stock returns over the 21 first trading days, the standard deviation of the stock returns of the 20 trading days following the initial trading day, 21-day market adjusted underpricing, the standard deviation of the market adjusted stock returns over the first 21 trading days, and the standard deviation of the market adjusted stock returns over the 20 days following the initial trading days.

	21-day underpricing	21-day volatility	20-day post-ipo volatility	21-day market adjusted underpricing	21-day market adjusted volatility	20-day post-ipo market adjusted volatility
Mean	0.13602	0.037648	0.028803	0.126282	0.037431	0.028407
Median	0.096217	0.032723	0.027641	0.089641	0.032353	0.027011
Quartile 1	-0.015394	0.023326	0.021089	-0.020981	0.022886	0.020766
Quartile 2	0.248025	0.044603	0.035582	0.230346	0.044075	0.034488
Minimum	-0.3125	0.005691	0.005826	-0.32598	0.007507	0.007687
Maximum	1.107144	0.126347	0.069713	1.058497	0.124922	0.070059

Table 3 reports descriptive statistics concerning underpricing and volatility. The average 21-day underpricing value is 13.60 percent. The table also reports a 21-day market adjusted underpricing value of 12.63. This difference of 0.97 percent with the non-adjusted value is significant at the 0.1 percent significance level. The significant difference between the two values shows the potential benefits of using the adjusted underpricing value if, in fact, the reverse LBO securities were affected by market movements during their first 21 trading days. On the other hand, if these securities were not affected by market movements the use of the adjusted values for underpricing could incorrectly distort our values for underpricing.

Also, we document that our 21-day underpricing values are considerably larger than the values for 21-day underpricing of 3.19 percent and 2.01 percent found by Jalilvand, Stewart, and Switzer (1996) , and Muscarella and Vetsuypens (1989). However, comparing these values is not particularly useful due to the fact that their samples were comprised almost entirely of reverse LBOs which took place during the 1980s while the sample used in this study is comprised only of reverse LBOs that have occurred since 1992. Muscarella and Vetsuypens (1989) mention that the existence of "hot and cold" IPO markets has been extensively discussed in the literature and that comparing the underpricing values of IPOs occurring in different periods can be problematic.

Finally, values for volatility are reported as well. The standard deviation values which include the initial day returns are 3.76 percent and 3.74 percent, respectively, for the calculations in which market adjustments were not made and in which market adjustments were made. The corresponding values for the calculations of volatility which do not include the initial trading day are 2.88 percent and 2.84 percent.

5.2 Unadjusted and Industry Adjusted Operating Performance

Table 3 reports results related to operating performance using the OPINC measure from year -4 to year +3. Unadjusted operating performance increases considerably each year from year -4 to year -1. Operating income increases from about 12.89 cents of operating income per dollar of total assets owned by the firm in year –4 to approximately 17.14 cents of operating income per dollar of total assets by year -1. It can also be seen

that from year -1 to year +1 there is no noteworthy change in operating performance. A slight increase in operating performance occurs from year -1 to year 0, as operating income deflated by total assets rises from about 17.14 cents to 17.86 cents. This is followed by a slight decrease in operating performance from year -1 to year 0 as this value drops to 17.78 cents. A large decrease in performance occurs from year +1 to year +2 as operating income drops to approximately 15.27 cents per dollar of total assets. Finally, an increase in performance from year +2 to year +3 seems to occur as operating income rises to 17.13 cents per dollar of total assets.

Table 4 reports the industry adjusted measures of operating performance. Rather large increases in performance occur during each of the years from year -4 to year -1. Industry adjusted operating performance during that period rises from 1.68 cents per dollar of assets to 6.87 cents per dollar of total assets. Between year –1 and year 0 almost no change occurs since industry adjusted operating performance decreases by a scant .07 of a cent per dollar of total assets. This is followed by a slight decrease in industry adjusted operating performance between year 0 and year +1 as industry adjusted operating income drops to 6.53 cents per dollar of total assets. From year +1 to year +2 a large decrease in industry adjusted performance occurs as operating income per dollar of assets drops to 4.35 cents per dollar of total assets owned by the reverse LBO firm. Finally, from year +2 to year +3 there is an increase in performance as industry adjusted operating performance increases to 6.42 cents per dollar of total assets.

Table 4
Unadjusted and Industry Adjusted Operating Performance

Table 4 lists operating performance using the OPINC measure performance of the reverse LBO firms during the period from year -4 to year +3 where year -1 is the year before the IPOs and year 0 is the year during which the IPOs are taking place. The median and mean measures of performance are reported. As well, the significance levels that the mean measures of performance are significantly different from zero are reported. The industry adjusted figures are calculated by subtracting from the OPINC values the median contemporaneous performance of firms matched to the reverse LBO firms by two-digit SIC codes. The median, mean, and significance levels of the industry adjusted measures of operating performance are reported on the bottom half of the table

	Year -4	Year -3	Year -2	Year -1	Year 0	Year +1	Year +2	Year +3
OPINC/TA [a]								
Median	0.12583	0.12307	.13370	.16103	.16810	.16305	.14520	.17945
Mean	0.12893	0.13567	0.14507	0.17136	0.17860	0.17782	0.15266	0.17126
Significance level [b]	.000	.000	.000	.000	.000	.000	.000	.000
# observations	62	121	148	181	156	120	85	42
OPINC/TA Industry adjusted								
Median	0.00585	0.00831	0.02694	0.04366	0.05337	0.04893	0.03472	0.05770
Mean	0.01683	0.03105	0.04056	0.06872	0.06865	0.06534	.04346	.06422
Significance level [b]	.109	.012	.000	.000	.000	.000	.000	.000
# observations	57	109	132	162	156	120	85	42

[a] OPINC/TA is defined as operating income before depreciation, interest, and taxes.
[b] Significance level for two-tailed test that mean is significantly different from zero.

Table 5 reports yearly changes in non-adjusted and industry adjusted operating performance and the significance levels for these differences. For the unadjusted measures of operating performance, the only consecutive years between which there was a significant change in operating performance were year -2 and year -1. The increase in operating performance from year -2 to year -1 was of 2.16 cents per dollar of total assets. Table 5 also reports that between year -4 and year -1 there was a significant increase in operating performance of 2.54 cents per dollar of total assets.

Table 5
Yearly Changes in Unadjusted and Industry Adjusted Operating Performance

Table 5 lists the yearly differences in operating performance using the OPINC measure of performance of the reverse LBO firms during the period from year -4 to year +3 where year -1 is the year before the IPOs and year 0 is the year during which the IPOs are taking place. As well, the significance levels for the two-tailed tests to determine the difference of means are reported. The industry adjusted figures are calculated by subtracting from the OPINC values the median contemporaneous performance of firms matched to the reverse LBO firms by two-digit SIC codes. The yearly differences in industry adjusted operating income and the significance levels using two-tailed tests to determine the difference of these means are reported on the bottom half of the table.

	Year -4 to Year –3	Year -3 to Year –2	Year -2 to Year -1	Year -1 to Year 0	Year 0 to Year +1	Year 1 to Year +2	Year 2 to Year +3	Year –4 to Year -1
Change in OPINC/TA	0.00433	0.01253	0.02155	.004803	-.00709	-.02720	-.01110	0.02544
Significance level[b]	.491	.157	.006	.559	.281	.002	.337	.039
Change in industry adjusted OPINC/TA	0.007857	0.01788	0.02227	0.00336	-0.00762	-0.02160	-0.00127	0.03819
Significance level[b]	.208	.058	.006	.688	.26	.013	.399	.002

[b] Significance level for two-tailed T test to determine difference of means.

The only set of consecutive years between which there was a significant decrease in operating performance was between year +1 and year +2. The decrease in operating

performance between those two years was of 2.72 cents per dollar of total assets. Finally, the change in unadjusted operating performance between year +2 and year +3 is insignificant.

The values for the yearly changes in the industry adjusted measures of operating performance are also reported in Table 5. The increases in operating income from year -3 to year -2 and from year -2 to year -1 are significant. The corresponding increases in operating income are of 1.79 cents and 2.23 cents per dollar of total assets. Also, the decrease in operating performance of 2.16 cents per dollar of assets from year +1 to year +2 is significant. Finally, the change in industry adjusted operating performance from year +2 to year +3 is insignificant.

The results in table 4 and table 5 confirm the proposed theory that LBO firms are in a transitory state during which efficiency is improved. Once the transformation of the previously inefficient firm or division of a firm into an efficient firm is complete, the new, more competitive, firm makes the transition from private ownership to public ownership. The industry adjusted values for operating income show that, during each of the years from year -4 to year –1, LBO firms make improvements in operating performance. As well, all the pre-IPO increases in operating performance except for the improvement between year -4 and year -3 are statistically significant. Finally, the increase in operating performance from year -4 to year -1 is also statistically significant.

In addition, as opposed to the idea proposed by Degeorge and Zeckhauser (1993) that reverse LBO firms select their IPO after a year when they experienced an exceptional operating performance which may have been the result of a manipulation of accounting numbers, in fact, the IPOs take place after three years of increases in operating performance. If accounting numbers were manipulated in order to achieve the numbers

for year –1, we might expect to see the performance numbers for year –2 to be inferior to those of year –3. However, we see that year –2 operating performance is significantly superior to that of year –3. Therefore, it does not seem that year –1 costs or expenses were inappropriately expensed in year –2.

The results from table 4 and table 5 confirm the results found by Holthausen and Larcker (1996) that when using the OPINC measure of operating performance, operating performance does not significantly change from year –1 to year +1. Our results are consistent with the hypothesis that LBO firms sustain their year -1 performance during the IPO year and the following year, but after this period decreases in efficiency occur. This may be a result of a decrease in managerial incentives and managerial disciplining mechanisms following the IPO. If, on the other hand, as Degeorge and Zeckhauser (1993) contend, the accounting numbers of year –1 were manipulated, there should have been a decline in performance during year +0, or at the latest in year +1. The fact that such a decrease in performance is not found, in addition to the previous finding that operating performance improved from year –3 to year –2, weakens the contention that the operating performance numbers of year –1 are the result of a manipulation of accounting numbers. Finally, the change in industry adjusted performance from Year +2 to Year +3 that is seen in table 4 does not have any particular relevance to our examination of the changes in operating performance since this change in performance is insignificant.

Another interesting result is that, not only is the performance of LBO firms improving during the years from year -4 to year -1, but the magnitude of this increase is considerable. The results in table 4 show that industry adjusted operating performance increases from 1.68 cents per dollar of total assets in year -4 to 6.87 cents per dollar of total assets by year -1. Hence, the industry adjusted performance in year -1 is 409 percent

greater in year -4 than it was on year -1. This means that the relative superiority of our reverse LBO firms when compared to their same industry counterparts during the period from year -4 to year -1 more than quadruples.

An argument against this performance comparison method could be that for year -4 this study only has industry adjusted data for 57 firms while for year –1 there is industry adjusted data for 162 firms. Hence, the argument could me made that we are comparing two different samples. However, if we compare the operating performance of the 57 firms for which we have year -4 industry adjusted operating performance data to the operating performance of these same 57 firms in year -1 we see from table 5 that industry adjusted operating performance has increased by 3.82 cents per total dollar of assets. Hence, the industry adjusted operating income of 1.68 cents per dollar of total assets in year -4 grows to 5.50 cents per dollar of total assets owned by the firm by year -1. Thus, if we compare year -4 operating performance to year -1 operating performance, in this way, it is found that year -1 operating performance is 327 percent larger than the operating performance of year -4. Therefore, even when only the 57 firms for which we have industry adjusted data for year -4 are examined it can be seen that the relative superiority of the reverse LBO firms compared to their same industry counterparts more than triples from year -4 to year -1.

5.3 Industry and Performance Adjusted Operating Performance

Tables 6a, 6b, 6c, and 6d provide information concerning operating performance which is adjusted using companies with the same two-digit SIC codes and within 10 percent of the operating performance of the reverse LBO firms. This information is useful because if it is found when the reverse LBO firms are matched with their industry rivals with similar operating performance during any of the four pre-IPO years that the reverse LBO firms experience relative gains in performance during the years leading to the IPO, and subsequently experience declines in relative operating performance after the IPO, the conclusions made concerning the results in tables 4 and 5 will be strengthened.

Table 6a shows that when the reverse LBO firms are matched to their same industry rivals with similar operating performance in year –4 that they make relative improvements in average operating performance from year –4 to year 0. Following this improvement in relative performance the reverse LBO firms experience decreases in relative average performance between year 0 and year +2. Table 6b, which reports the results when the firms are matched by industry and performance in year –3, shows similar results to those found in table 6a. It is found that relative average performance increases considerably from year –3 until year 0. Following this there is a slight increase in relative average performance between year 0 and year +1. Between year +1 and year +2 a considerable decrease in relative average performance is noticed. Table 6c and table 6d document that relative average performance increases are noticed that last until year +1. These are followed by relative average performance decreases between year +1 and year +2.

The results found in tables 6a, 6b, 6c, and 6d, thus, confirm the results found previously. It is documented that if the operating performance of the reverse LBO firms is adjusted using an industry and performance matched benchmark that relative performance increases occur leading up to the IPO which are followed by a relative performance decrease between year +1 and year +2. These results strengthen the hypothesis that improvements in efficiency are being made prior to the IPO, while during the period after the IPO the efficiency and operating performance of the reverse LBO firms seem to be decreasing[8]. However, the results also show that when the reverse LBO firms are compared with industry rivals with similar operating performances that they seem to experience relative improvements in operating performance that last until the IPO year, or even until the year following the IPOs. This is contrast to the finding that when only industry adjustments are made, relative improvements in operating performance end in the year prior to the IPO.

[8] Similar results to those found in tables 6a, 6b, 6c, and 6d are found when we use a 20 percent filter rule. These results are presented in the appendix

Table 6a
Industry and Performance Adjusted Operating Performance
Where firms are Matched by Industry and Performance in Year -4

Table 6a provides adjusted operating performance data. Operating performance is calculated using the OPINC measure of operating performance which is defined as operating cash flows before depreciation, interest, and taxes deflated by the book value of total assets. Operating performance is adjusted by subtracting the median contemporaneous performance of a group of firms matched by two-digit SIC code and by performance in year –4. The performance matching is accomplished by matching reverse LBO firms to firms which had operating performances within 10 percent of the operating performances of the reverse LBO firms in year –4. The significance levels that the mean estimates are significantly different from zero are reported.

	Year -4	Year -3	Year -2	Year -1	Year 0	Year +1	Year +2	Year +3
Median	0.001678	0.001229	0.019453	0.037863	0.050127	0.057231	0.036693	0.06955
Mean	-0.0012	0.005619	0.025309	0.04703	0.062495	0.052549	0.039763	0.069099
Significance level	.846	.532	.068	.002	.000	.004	.028	.063
N	46	46	46	46	43	31	22	10

Table 6b
Industry and Performance Adjusted Operating Performance
Where firms are Matched by Industry and Performance in Year -3

Table 6b provides adjusted operating performance data. Operating performance is calculated using the OPINC measure of operating performance which is defined as operating cash flows before depreciation, interest, and taxes deflated by the book value of total assets. Operating performance is adjusted by subtracting the median contemporaneous performance of a group of firms matched by two-digit SIC code and by performance in year –3. The performance matching is accomplished by matching reverse LBO firms to firms which had operating performances within 10 percent of the operating performances of the reverse LBO firms in year –3. The significance levels that the mean estimates are significantly different from zero are reported.

	Year -3	Year -2	Year -1	Year 0	Year +1	Year +2	Year +3
Median	0.001482	0.016661	0.042068	0.048687	0.052688	0.027887	0.0491
Mean	-0.0001	0.025662	0.060729	0.064661	0.065426	0.042543	0.060586
Significance level	.98	.142	.000	.000	.000	.01	.011
N	78	78	78	73	53	41	20

Table 6c
Industry and Performance Adjusted Operating Performance
Where firms are Matched by Industry and Performance in Year -2

Table 6c provides adjusted operating performance data. Operating performance is calculated using the OPINC measure of operating performance which is defined as operating cash flows before depreciation, interest, and taxes deflated by the book value of total assets. Operating performance is adjusted by subtracting the median contemporaneous performance of a group of firms matched by two-digit SIC code and by performance in year –2. The performance matching is accomplished by matching reverse LBO firms to firms which had operating performances within 10 percent of the operating performances of the reverse LBO firms in year –2. The significance levels that the mean estimates are significantly different from zero are reported.

	Year -2	Year -1	Year 0	Year +1	Year +2	Year +3
Median	0.001497	0.025168	0.034614	0.037004	0.0281	0.058828
Mean	0.003238	0.030001	0.047639	0.055596	0.051902	0.059549
Significance level	.004	.000	.000	.000	.021	.007
N	102	102	99	72	51	27

Table 6d
Industry and Performance Adjusted Operating Performance
Where firms are Matched by Industry and Performance in Year -1

Table 6d provides adjusted operating performance data. Operating performance is calculated using the OPINC measure of operating performance which is defined as operating cash flows before depreciation, interest, and taxes deflated by the book value of total assets. Operating performance is adjusted by subtracting the median contemporaneous performance of a group of firms matched by two-digit SIC code and by performance in year –1. The performance matching is accomplished by matching reverse LBO firms to firms which had operating performances within 10 percent of the operating performances of the reverse LBO firms in year –1. The significance levels that the mean estimates are significantly different from zero are reported.

	Year -1	Year 0	Year +1	Year +2	Year +3
Median	0.001447	0.017123	0.023739	-0.0014	0.0488
Mean	0.003545	0.02556	0.03423	0.016734	0.05184
Significance level	.01	.001	.000	.167	.001
# observations	136	135	102	74	39

6. Cross-sectional Regression Results and Discussion

6.1 Operating Performance on Managerial Equity Ownership and Leverage

Tables 7a and 7b report the results of cross-sectional regressions in which the industry adjusted operating performance of years -1 and year 0 are the dependent variables and the independent variables of interest are the percentage managerial ownership of equity before the IPOs, the percentage managerial ownership of equity after the IPOs, and the leverage ratio immediately prior to the IPOs. In order to control for risk, two different risk variables are used. First, the standard deviation of the reverse LBO stock returns over the first 21 trading days of these securities is used. Second, the standard deviation of the reverse LBO stock returns over the twenty days following the IPO day is utilized. In order to control for size we use the natural logarithm of the value of total assets in millions of dollars immediately prior to the IPOs.

From table 7a and table 7b it is documented that, without the inclusion of the control variables into the equations that the percentage managerial ownership of equity before the IPOs, the percentage managerial ownership of equity after the IPOs, and the leverage ratio immediately prior to the IPOs are all significantly positively related to the industry adjusted operating performances of year -1 and year 0. However, both the magnitude of the coefficient of the managerial percentage ownership of equity before the IPO variable and the significance level of this estimate are larger than the coefficient of

the percentage managerial ownership of equity after the IPO variable and the significance level of that estimate.

With the inclusion of control variables in the regression models, the positive relationships between the percentage managerial ownership of equity after the IPO and the industry adjusted operating performances of year -1 and year 0 remain significant. Also, the positive relationships between the pre-IPO leverage ratio and the industry adjusted operating performances of year -1 and year 0 remain significant. However, the significant positive relationships between the percentage managerial ownership of equity prior to the IPOs and the industry adjusted operating performances of year -1 and year 0 are lost with the addition of the control variables in the regression equations.

Table 7a and table 7b show that the natural logarithm of total assets prior to the IPO is significantly negatively related to the industry adjusted operating performance in year -1 and year 0. Therefore, it seems that smaller firms have industry adjusted operating performances significantly superior to those of larger firms. An examination of the control variables for risk reveals that neither of the control variables are significantly related to the industry adjusted operating performance in year -1 or year 0. However, the significance level for the coefficient of the standard deviation variable which includes the initial day return is considerably larger than the significance level for the coefficient of the standard deviation variable which does not include the stock return of this day.

Table 7c shows the results for regression models in which the dependent variable is the average annual industry adjusted operating performance of year -2, year -1, and year 0 and the independent variables of interest are the percentage managerial ownership of equity immediately prior to the IPO, the percentage managerial ownership of equity

immediately after the IPO, and the leverage ratio immediately prior to the IPO. Control variables for size and risk are also included in some of the regression models in Table 7c.

The results in Table 7c are similar to those in Table 7a and Table 7b. A significant positive relationship between the average annual performances of year -2, year-1 and year 0 and the percent managerial ownership of equity after the IPO is documented. As well, there is a significant positive relationship between the average annual performances of year -2, year-1 and year 0 and the leverage ratio prior to the IPOs. These two statistically significant relationships remain significant when control variables are added to the models. Table 7c also shows that the relationship between the average annual performances of year -2, year-1 and year 0 and the percent managerial ownership of equity prior to the IPO is a statistically significantly positive in the univariate case. However, this relationship becomes an insignificant one with the addition of control variables in the regression models. Finally, table 7c also documents that the average annual performance of year -2, year-1 and year 0 is significantly negatively related to the natural logarithm of total assets, but is not significantly related to the control variables for risk.

The results in table 7a, 7b, and 7c support the theory that increased managerial ownership of equity reduces conflicts of interest between the managers and owners of a corporation and help leads to value maximization. These results demonstrate that, if firms have managers who retain high equity ownership levels after the return of their firms to public status, these firms will experience superior operating performances between the period two years before the IPO to the year of the IPO. This is the case even after controlling for size and ex-post IPO risk.

Tables 7a, 7b, and 7c also show that the magnitude and the significance level of the regression coefficient in front of the post-IPO percentage ownership of equity by management variable are considerably larger than the corresponding values for the pre-IPO percentage ownership of equity by management variable. In addition, the relationship between the pre-IPO percentage of equity owned by management and operating performance becomes insignificant in the multivariate case. This shows that the industry adjusted operating performance of the years during the period two years before the IPOs to that of the IPO year can be explained better by the post-IPO level of equity owned by management than by the pre-IPO level of equity owned by management.

These findings are of interest concerning the question of whether high levels of managerial ownership resulting from endogenous forces may have a different relationship with the reduction of agency problems than high levels of managerial ownership resulting from exogenous forces. The high ownership stakes of managers in their firms during the LBO period may be more related to exogenous forces than similar high equity ownership levels of management after the IPO. This may be because, during the LBO period, the very composition of the LBO firm dictates that managers should be major owners of their firms. After the IPO, the decision to remain important owners of their firms by managers may be more related to endogenous variables such as managers wishing to keep their interests closely aligned to those of their firms. If, in fact, the decision to remain significant owners of their companies by those managers who retain high equity ownership stakes after the return of their firms to public status is endogenous and is made several years before the IPOs, managers who make such decisions may be the sorts of managers who help to reduce agency problems in their firms and help lead to value maximization.

Table 7a, 7b, and 7c also support the claim that the discipline imposed by high leverage and the resulting necessity to make large interest payments force managers to operate their firms more efficiently. The pre-IPO leverage ratio is significantly positively related to the industry adjusted performance during the period from two years before the IPOs to the year of the IPO. This relationship remains significant even when control variables are added to the regression models.

Finally, the pre-IPO size of reverse LBO firms is significantly negatively related to the industry adjusted operating performance of reverse LBO firms during their last two years of private status and the year in which they return to public status. This provides some support for the incentive-intensity hypothesis which says that too much growth is a major form of inefficiency and waste in corporations.

Table 7d documents the results for regression models in which the change in industry adjusted operating performance from year -4 to year 0 is the dependent variable and the independent variables are the same as in tables 7a, 7b, and 7c. Results in table 7d are consistent with those in tables 7a, 7b, and 7c. The change in industry adjusted performance from the period four years before the IPO year until the IPO year is significantly positively related to the percentage ownership of management immediately after the IPO. This remains the case even when control variables are included in the regression models. However, in contrast to the results found in tables 7a, 7b, and 7c the relationship between the change in industry adjusted operating performance from year -4 to year 0 and the percentage of equity owned by management prior to the IPO is not significant for the univariate case. Also, similarly to the previous results this relationship is insignificant when control variables are included in the regression models. Finally,

neither the IPO leverage ratio, nor the control variables are significantly related to the change in operating performance from year -4 to year 0.

Hence, the results in table 7d provide support for the hypothesis that increased managerial ownership helps to reduce owner-manager conflicts and leads to increased efficiency and operating performances. Also, this strengthens the contention that if high levels of managerial ownership of equity after the IPO are due more to endogenous forces than is the case for high levels of managerial ownership of equity before the IPO, an implication of this is that high post-IPO levels of managerial ownership of equity is more useful for the reduction of agency problems. The results documented in table 7d may actually provide stronger support for the above contention than did the results in tables 7a, 7b, and 7c because relative improvements in efficiency over time is probably an even clearer sign of a reduction in agency problems than is looking at whether operating performance seems to be efficient at a given point in time.

The results in table 7d also weaken the argument that leverage is an effective disciplining mechanism which forces managers to operate their firms more efficiently. There is no relationship between the pre-IPO leverage ratio and improvements in operating performance from the period four years prior to the IPO-year to the IPO-year. Also, there is no apparent relationship between size or risk and the change in operating performance between the mentioned periods. Hence, it does not seem that smaller or riskier reverse LBO firms alter their levels of efficiency to any greater extent than do larger or less risky LBO firms during the last four years of private ownership.

Table 7a
OLS Regressions: Year –1 Industry Adjusted Performance on Managerial Ownership Before the IPO, Managerial Ownership After the IPO, the Leverage Ratio Immediately Prior to the IPO, and Control Variables

Operating performance is calculated using the OPINC/assets measure of performance which is defined as operating cash flows before depreciation, interest, and taxes deflated by the book value of total assets. The industry adjustment is accomplished by matching each LBO firm to the sample of firms having the same two-digit SIC code and subtracting the median performance of this sample of firms from the firm's own operating performance. Year -1 is the year prior to the IPO year. Mgr%Pre is defined as the percent of equity owned by directors and officers immediately prior to the IPO. Mgr%Post is defined as the percent of equity owned by directors and officers immediately prior to the IPO. IPO LEV is defined as (total liabilities/total assets) immediately prior to the IPO. σ 20 Day RET is defined as the standard deviation of the stock returns over the twenty days following the IPO. σ 21 Day RET is defined as the standard deviation of the stock returns over the first 21 trading days. Ln Asset is the natural logarithm of the total assets immediately prior to the IPO in millions of dollars.

Model	1	2	3	4	5	6	7	8
α	0.0075 (.777)	0.0985 (.028)	0.0752 (.116)	0.0980 (.064)	-0.0035 (.893)	0.107 (.015)	0.0798 (.091)	0.0987 (.059)
Mgr%Pre					0.0005 (.032)	0.0003 (.208)	0.0003 (.239)	0.0003 (.238)
Mgr%post	0.0009 (.007)	0.0006 (.062)	0.0006 (.084)	0.0006 (.074)				
IPO LEV	0.0490 (.038)	0.0516 (.026)	0.0456 (.052)	0.0512 (.028)	0.0494 (.033)	0.0516 (.022)	0.0453 (.047)	0.0506 (.027)
σ 20 Day Ret				0.0186 (.980)				0.2130 (.768)
σ 21 Day Ret			0.478 (.182)				0.528 (.129)	
Ln Asset		-0.0196 (.004)	-0.0170 (.014)	-0.0194 (.007)		-0.0202 (.002)	-0.0173 (.011)	-0.0194 (.006)
F Stat	6.168 (.003)	7.235 (.000)	5.764 (.000)	5.249 (.001)	4.891 (.009)	6.67 (.000)	5.503 (.000)	4.872 (.001)
R Square Adj	.064	.110	.113	.102	.047	.097	.102	.089
N	152	152	151	151	160	160	159	159

Significance levels are in parentheses.

Table 7b
OLS Regressions: Year 0 Industry Adjusted Performance on Managerial Ownership Before the IPO, Managerial Ownership After the IPO, the Leverage Ratio Immediately Prior to the IPO, and Control Variables

Operating performance is calculated using the OPINC/assets measure of performance which is defined as operating cash flows before depreciation, interest, and taxes deflated by the book value of total assets. The industry adjustment is accomplished by matching each LBO firm to the sample of firms having the same two-digit SIC code and subtracting the median performance of this sample of firms from the firm's own operating performance. Year 0 is the year is the IPO year. Mgr%Pre is defined as the percent of equity owned by directors and officers immediately prior to the IPO. Mgr%Post is defined as the percent of equity owned by directors and officers immediately prior to the IPO. IPO LEV is defined as (total liabilities/total assets) immediately prior to the IPO. σ 20 Day RET is defined as the standard deviation of the stock returns over the twenty days following the IPO. σ 21 Day RET is defined as the standard deviation of the stock returns over the first 21 trading days. Ln Asset is the natural logarithm of the total assets immediately prior to the IPO in millions of dollars.

Model	1	2	3	4	5	6	7	8
α	-0.0437 (.075)	0.0045 (.909)	0.0070 (.868)	0.0086 (.854)	-0.0397 (.100)	-0.0180 (.639)	0.0175 (.673)	0.0136 (.768)
Mgr%Pre					.0004 (.070)	0.003 (.209)	0.003 (.220)	0.0002 (.235)
Mgr%Post	0.008 (.009)	0.006 (.038)	0.006 (.041)	0.007 (.043)				
IPO LEV	0.0910 (.000)	0.0931 (.000)	0.0934 (.000)	0.0932 (.000)	0.0925 (.000)	0.0947 (.000)	0.0943 (.000)	0.0940 (.000)
σ 20 Day Ret				-0.108 (.876)				0.123 (.854)
σ 21 Day Ret			-0.0515 (.876)				0.0134 (.967)	
Ln Asset		-0.0090 (.118)	-0.0091 (.126)	-0.0093 (.132)		-0.0108 (.057)	-0.0106 (.070)	-0.0103 (.087)
F Stat	12.427 (.000)	9.192 (.000)	6.732 (.000)	6.732 (.000)	11.25 (.000)	8.859 (.000)	6.494 (.000)	6.503 (.000)
R Square Adj	.136	.145	.137	.137	.118	.134	.126	.127
N	146	146	145	145	154	154	153	153

Significance levels are in parentheses.

Table 7c
OLS Regressions: Average of Year –2, Year -1, and Year 0 Industry Adjusted Performance on Managerial Ownership Before the IPO, Managerial Ownership After the IPO, the Leverage Ratio Immediately Prior to the IPO, and Control Variables

Operating performance is calculated using the OPINC/assets measure of performance which is defined as operating cash flows before depreciation, interest, and taxes deflated by the book value of total assets. The industry adjustment is accomplished by matching each LBO firm to the sample of firms having the same two-digit SIC code and subtracting the median performance of this sample of firms from the firm's own operating performance. Year -2 is the year two years prior to the IPO year. Year -1 is the year prior to the IPO. Year 0 is the year of the IPO. Mgr%Pre is defined as the percent of equity owned by directors and officers immediately prior to the IPO. Mgr%Post is defined as the percent of equity owned by directors and officers immediately prior to the IPO. IPO LEV is defined as (total liabilities/total assets) immediately prior to the IPO. σ 20 Day RET is defined as the standard deviation of the stock returns over the twenty days following the IPO. σ 21 Day RET is defined as the standard deviation of the stock returns over the first 21 trading days. Ln Asset is the natural logarithm of the total assets immediately prior to the IPO in millions of dollars.

Model	1	2	3	4	5	6	7	8
α	0.0198	0.0411	0.0194	0.0404	-0.0176	0.0473	0.0223	0.0396
	(.368)	(.258)	(.620)	(.342)	(.413)	(.186)	(.563)	(.346)
Mgr%Pre					0.0004	0.003	0.0002	0.0003
					(.036)	(.149)	(.21)	(.173)
Mgr%Post	0.0008	0.0006	0.0005	0.006				
	(.007)	(.037)	(.066)	(.045)				
IPO LEV	0.0581	0.0625	0.0595	0.0625	0.0583	0.0627	0.0598	0.0619
	(.004)	(.002)	(.003)	(.002)	(.003)	(.001)	(.002)	(.002)
σ 20 Day Ret				0.0205				0.214
				(.974)				(.727)
σ 21 Day Ret			0.494				.542	
			(.150)				(.105)	
Ln Asset		-0.0116	-0.0099	-0.0116		-0.0123	-0.0103	-0.0117
		(.038)	(.084)	(.049)		(.025)	(.066)	(.044)
F Stat	8.606	7.393	6.127	5.492	7.368	6.802	5.8450	5.093
	(.000)	(.000)	(.000)	(.000)	(.001)	(.000)	(.000)	(.001)
R Square	.123	.151	.160	.143	.099	.130	.143	.124
Adj								
N	109	109	109	109	117	117	117	117

Significance levels are in parentheses.

Table 7d
OLS Regressions: Change in Industry Adjusted Performance from year -4 to year 0 on Managerial Ownership Before the IPO, Managerial Ownership After the IPO, the Leverage Ratio Immediately Prior to the IPO, and Control Variables

Operating performance is calculated using the OPINC/assets measure of performance which is defined as operating cash flows before depreciation, interest, and taxes deflated by the book value of total assets. The industry adjustment is accomplished by matching each LBO firm to the sample of firms having the same two-digit SIC code and subtracting the median performance of this sample of firms from the firm's own operating performance. Year -4 is the year four years prior to the IPO year. Year 0 is the IPO year. The change in performance from year -4 to year 0 is defined as year 0 performance minus year -4 performance. Mgr%Pre is defined as the percent of equity owned by directors and officers immediately prior to the IPO. Mgr%Post is defined as the percent of equity owned by directors and officers immediately prior to the IPO. IPO LEV is defined as (total liabilities/total assets) immediately prior to the IPO. σ 20 Day RET is defined as the standard deviation of the stock returns over the twenty days following the IPO. σ 21 Day RET is defined as the standard deviation of the stock returns over the first 21 trading days. Ln Asset is the natural logarithm of the total assets immediately prior to the IPO in millions of dollars.

Model	1	2	3	4	5	6	7	8
α	-0.0053 (.888)	-0.0225 (.727)	-0.0105 (.898)	0.0075 (.915)	-0.0003 (.993)	-0.0277 (.670)	0.0037 (.963)	.0003 (.996)
Mgr%Pre					0.0005 (.211)	0.0005 (.184)	0.0005 (.193)	.0005 (.173)
Mgr%Post	0.0011 (.054)	0.0011 (.053)	0.0011 (.062)	0.0011 (.054)				
IPO D/A	.0343 (.299)	0.0315 (.36)	.0363 (.306)	0.0377 (.280)	0.0343 (.295)	0.0294 (.392)	0.0342 (.332)	0.0347 (.317)
σ 20 day ret			-1.015 (.503)				-0.999 (.487)	
σ 21 day ret				-0.784 (.285)				-0.758 (.285)
Ln Asset		0.0034 (.741)	.0012 (.909)	0.0013 (.898)		0.0053 (.608)	0.0033 (.76)	0.0035 (.738)
F Stat	2.633 (.084)	1.754 (.171)	1.412 (.248)	1.615 (.190)	1.533 (.227)	1.094 (.362)	0.934 (.453)	1.117 (.361)
R Square Adj	.071	.05	.037	.054	.022	.006	-.006	.01
N	44	44	44	44	48	48	48	48

Significance levels are in parentheses.

6.2 Operating Performance on Changes in the Leverage Ratio

Tables 8a, 8b, 8c, and 8d provide information about the effect of changes in the leverage ratio during the years before the reverse LBOs on the operating performances of these firms. Specifically, the relationship between decreases in the leverage ratio between year –3 and the point in time immediately prior to the IPO[9] and the adjusted operating performances of the years following such decreases is examined.

Table 8a documents that the relationship between the industry adjusted operating performance of year -1 and the reduction in the leverage ratio is significantly negative. This remains the case when a control variable for size is included in the regression models. Also, when the standard deviation of the stock returns for the twenty trading days following the IPO variable is included in the regression models, the decrease in the leverage ratio is still significantly negatively related to year -1 industry adjusted operating performance. However, when the standard deviation of the stock returns over the first twenty-one trading days is included in the regression models, the significantly negative relationship between the decrease in the leverage ratio and year –1 industry adjusted performance disappears.

Table 8b shows that the relationship between the industry adjusted performance in year 0 and the decrease in the leverage ratio from year –3 to the period immediately before the IPO is significantly negative. This is also the case after controlling for size and risk.

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[9] In order to determine our estimate of the leverage ratio at the point in time immediately prior to the IPO we use the leverage value from the last financial statement available prior to the IPO. This statement is typically the last quarterly statement available prior to the IPO. For cases in which the last quarterly statement prior to the IPO was not available the year –1 financial statement was used to find the estimate of the leverage ratio immediately prior to the IPO.

Table 8c documents that there is no significant relationship between the aforementioned decrease in the leverage ratio and the industry adjusted performance of year 1. This is the case both when there are no control variables in the regression models and when control variables are included in these regression models.

Table 8d shows the relationship between the industry adjusted operating performance in year + 2 and the decrease in the leverage ratio between year –3 and the period immediately prior to the IPO. This relationship is a significantly negative one with or without the presence of control variables in the regression models.

The results found in tables 8a, 8b, and 8d provide support for the hypothesis that debt is a useful tool to force managers to operate their firms more efficiently. The more a firm decreases its leverage ratio during the last three years before its IPO, the worse its operating performance during the pre-IPO year, the IPO year, and the year +2. An interpretation of these results could be that firms which decrease their leverage ratios during the last three years before their IPOs suffer from the lack of an appropriate disciplining mechanism to force managers to operate their firm efficiently. An implication of this is that, even if LBO firms have the ability to reduce their debt load as a result of superior operating performance they might be better off to maintain these heavy debt loads and search for positive net-present-value projects to invest in.

In addition, our results weaken the theoretical notion that agency problems and operational problems are fixed and that firms should wish to reduce the heavy debt burden caused by the leveraged buyout and return to more optimal capital structures. If this were the case, those firms which reduced their debt levels in order to return to the capital structure which they thought of as optimal should have experienced superior operating performances. However, the results show that operating performance decreases upon the

reduction of financial leverage. Hence, we do not find evidence that decreasing levels of financial leverage provides benefits for reverse LBO firms.

Table 8a
OLS Regressions: Year -1 Industry adjusted Performance on the Change in the D/A ratio from Year-3 to the Period Immediately Prior to the IPO and Control Variables

Operating performance is calculated using the OPINC/assets measure of performance which is defined as operating cash flows before depreciation, interest, and taxes deflated by the book value of total assets. The industry adjustment is accomplished by matching each LBO firm to the sample of firms having the same two-digit SIC code and subtracting the median performance of this sample of firms from the firm's own operating performance. Year -1 is the year prior to the IPO year. $D/A_{y-3} - D/A_{IPO}$ is defined as the decrease in the leverage ratio from year –3 to the point in time immediately before the IPO. In order to determine our estimate of the leverage ratio at the point in time immediately prior to the IPO we use the leverage value from the last financial statement available prior to the IPO. This statement is typically the last quarterly statement available prior to the IPO. For cases in which the last quarterly statement prior to the IPO was not available the year –1 financial statement was used to find the estimate of the leverage ratio immediately prior to the IPO. Ln Asset is the natural logarithm of the total assets immediately prior to the IPO in millions of dollars. σ 20 Day RET is defined as the standard deviation of the stock returns over the twenty days following the IPO. σ 21 Day RET is defined as the standard deviation of the stock returns over the first 21 trading days.

Model	1	2	3	4
α	0.067 (.000)	0.169 (.000)	0.131 (.002)	0.163 (.001)
$D/A_{y-3} - D/A_{IPO}$	-0.0335 (.091)	-0.0318 (.095)	-0.0281 (.139)	-0.0317 (.097)
σ 20 day ret				0.124 (.871)
σ 21 day ret			0.621 (.119)	
Ln Asset		-0.0197 (.002)	-0.0169 (.009)	-0.0193 (.004)
F Stat	2.91 (.091)	6.639 (.002)	5.309 (.002)	4.394 (.006)
R Square Adj	.017	.094	.106	.085
N	110	110	110	110

Significance levels are in parentheses.

Table 8b
OLS Regressions: Year 0 Industry Adjusted Performance on the Change in the D/A ratio from Year-3 to the Period Immediately Prior to the IPO and Control Variables

Operating performance is calculated using the OPINC/assets measure of performance which is defined as operating cash flows before depreciation, interest, and taxes deflated by the book value of total assets. The industry adjustment is accomplished by matching each LBO firm to the sample of firms having the same two-digit SIC code and subtracting the median performance of this sample of firms from the firm's own operating performance. Year 0 is the IPO year. $D/A_{y-3} - D/A_{IPO}$ is defined as the decrease in the leverage ratio from year –3 to the point in time immediately before the IPO. In order to determine our estimate of the leverage ratio at the point in time immediately prior to the IPO we use the leverage value from the last financial statement available prior to the IPO. This statement is typically the last quarterly statement available prior to the IPO. For cases in which the last quarterly statement prior to the IPO was not available the year –1 financial statement was used to find the estimate of the leverage ratio immediately prior to the IPO. σ 20 Day RET is defined as the standard deviation of the stock returns over the twenty days following the IPO. σ 21 Day RET is defined as the standard deviation of the stock returns over the first 21 trading days. Ln Asset is the natural logarithm of the total assets immediately prior to the IPO in millions of dollars.

Model	1	2	3	4
α	0.0739 (.000)	0.15 (.000)	0.145 (.001)	0.135 (.006)
$D/A_{y-3} - D/A_{IPO}$	-0.0617 (.002)	-0.0589 (.002)	-.0583 (.003)	-0.0586 (.002)
σ 20 day ret				.352 (.656)
σ 21 day ret			0.0916 (.829)	
Ln Asset		-0.0145 (.019)	-0.0142 (.026)	-0.0134 (.042)
F Stat	10.337 (.002)	8.264 (.000)	5.472 (.002)	5.531 (.002)
R Square Adj	.085	.127	.118	.120
N	101	101	101	101

Significance levels are in parentheses.

Table 8c
OLS Regressions: Year +1 Industry Adjusted Performance on the Change in the D/A ratio from Year-3 to the Period Immediately Prior to the IPO and Control Variables

Operating performance is calculated using the OPINC/assets measure of performance which is defined as operating cash flows before depreciation, interest, and taxes deflated by the book value of total assets. The industry adjustment is accomplished by matching each LBO firm to the sample of firms having the same two-digit SIC code and subtracting the median performance of this sample of firms from the firm's own operating performance. Year +1 is the year after the IPO year. $D/A_{y-3} - D/A_{IPO}$ is defined as the decrease in the leverage ratio from year −3 to the point in time immediately before the IPO. In order to determine our estimate of the leverage ratio at the point in time immediately prior to the IPO we use the leverage value from the last financial statement available prior to the IPO. This statement is typically the last quarterly statement available prior to the IPO. For cases in which the last quarterly statement prior to the IPO was not available the year −1 financial statement was used to find the estimate of the leverage ratio immediately prior to the IPO. σ 20 Day RET is defined as the standard deviation of the stock returns over the twenty days following the IPO. σ 21 Day RET is defined as the standard deviation of the stock returns over the first 21 trading days. Ln Asset is the natural logarithm of the total assets immediately prior to the IPO in millions of dollars.

Model	1	2	3	4
α	0.0558 (.000)	0.117 (.008)	0.103 (.060)	0.11 (.077)
$D/A_{y-3} - D/A_{IPO}$	-0.0301 (.233)	-0.0290 (.281)	-0.024 (.359)	-0.0268 (.288)
σ 20 day ret				0.166 (.873)
σ 21 day ret			0.27 (.669)	
Ln Asset		-0.0118 (.142)	-0.0109 (.190)	-0.0113 (.185)
F Stat	1.446 (.233)	1.836 (.167)	1.272 (.290)	1.217 (.310)
R Square Adj	.006	.022	.011	.008
N	77	77	77	77

Significance levels are in parentheses.

Table 8d
OLS Regressions: Year + 2 Industry Adjusted Performance on the Change in the D/A ratio from Year-3 to D/A Ratio Immediately Before the IPO and Control Variables

Operating performance is calculated using the OPINC/assets measure of performance which is defined as operating cash flows before depreciation, interest, and taxes deflated by the book value of total assets. The industry adjustment is accomplished by matching each LBO firm to the sample of firms having the same two-digit SIC code and subtracting the median performance of this sample of firms from the firm's own operating performance. Year 2 is the year two years after the IPO year. $D/A_{y-3} - D/A_{IPO}$ is defined as the decrease in the leverage ratio from year –3 to the point in time immediately before the IPO. In order to determine our estimate of the leverage ratio at the point in time immediately prior to the IPO we use the leverage value from the last financial statement available prior to the IPO. This statement is typically the last quarterly statement available prior to the IPO. For cases in which the last quarterly statement prior to the IPO was not available the year –1 financial statement was used to find the estimate of the leverage ratio immediately prior to the IPO. σ 20 Day RET is defined as the standard deviation of the stock returns over the twenty days following the IPO. σ 21 Day RET is defined as the standard deviation of the stock returns over the first 21 trading days. Ln Asset is the natural logarithm of the total assets immediately prior to the IPO in millions of dollars.

Model	1	2	3	4
α	0.0387 (.003)	0.0724 (.149)	-0.0533 (.366)	0.0816 (.239)
$D/A_{y-3} - D/A_{IPO}$	-0.0895 (.038)	-0.0887 (.041)	-0.0826 (.065)	-0.0894 (.042)
σ 20 day ret				-0.258 (.846)
σ 21 day ret			0.463 (.539)	
Ln Asset		-0.0066 (.484)	-0.0059 (.534)	-0.0070 (.472)
F Stat	4.51 (.038)	2.483 (.093)	1.764 (.165)	1.639 (.191)
R Square Adj	.059	.05	.039	.033
N	57	57	57	57

Significance levels are in parentheses.

6.3 Underpricing on Managerial Equity Ownership

Table 9 documents the results from cross-sectional regression models in which underpricing is regressed on equity ownership variables at the time of the IPO. The results show that the percent of equity owned by management before the IPO is not related to underpricing for either the univariate or the multivariate cases

In addition, table 9 documents that managerial equity ownership after the offerings is significantly positively related to underpricing in the univariate case. Although the magnitude and significance of the estimate are reduced when a control variable for size is entered into the regression equations the relationship between equity ownership and underpricing remains significantly positive. When the control variable for risk is added into the regression equations this relationship becomes insignificant. Hence, it may be that firms with additional risk may have managers who retain greater ownership stakes in their firms after the IPO.

These results weaken the hypothesis that underpricing should be negatively related to the percentage of equity ownership owned by management after the offering. Moreover, a positive relationship between the two variables seems to be documented. If underpricing is an adequate proxy for problems of informational asymmetry existing during the offerings, the univariate result seems to indicate that if managers retain high levels of ownership after the offerings this could increase problems of informational asymmetry. One explanation for this could be that the knowledge that managers will remain significant owners of their firms after the IPO might increase market uncertainty concerning the equity offerings. This could happen if as mentioned by Demsetz (1983) and Fama and Jensen (1983), too high a percentage of management ownership of equity

may hurt corporate financial performance if managers become entrenched and are not subject anymore to the managerial labor market.

However, table 9 also reports that when risk is included in the model the relationship between post-IPO managerial ownership of equity and underpricing becomes insignificant. An explanation of this result could be that the greater uncertainty and risk surrounding the issues of certain firms induces the managers of these firms to retain significant ownership in their firms in order to signal positive information to the market. Thus, the negative relationship found between managerial equity ownership after the offerings and underpricing may actually be a proxy for the relationship between underpricing and firms whose equity offerings are perceived to be risky by market participants.

Table 9
OLS Regressions: 21-Day Market Adjusted Underpricing on Pre-IPO Managerial Ownership of Equity, Post-IPO Managerial Ownership of Equity, and Control Variables

21-Day market adjusted underpricing is defined as the relative price change from the initial offering price to the closing price at the end of the 21st day of trading minus the 21-day value-weighted market return. Mgr%Pre is defined as the percent of equity owned by directors and officers immediately prior to the IPO. Mgr%Post is defined as the percent of equity owned by directors and officers immediately after the IPO. σ 20 Day RET is defined as the standard deviation of the stock returns over the twenty days following the IPO. Ln Asset is the natural logarithm of total assets immediately prior to the IPO in millions of dollars.

Model	1	2	3	4	5	6
α	0.0893 (.003)	0.233 (.005)	-0.0415 (.680)	0.0750 (.014)	0.197 (.018)	-0.0617 (.543)
Mgr%Pre	0.0008 (.11)	0.0005 (.282)	0.0002 (.698)			
Mana%Post				0.0017 (.019)	0.0012 (.064)	0.0008 (.311)
σ 20 day ret			6.859 (.000)			6.691 (.000)
Ln Asset		-0.0261 (.061)	-0.0068 (.625)		-0.0223 (.115)	-0.0045 (.752)
F Stat	2.573 (.110)	3.088 (.048)	8.632 (.000)	5.559 (.019)	4.061 (.019)	8.539 (.000)
R Square Adj	0.009	.022	.111	.025	.034	.115
N	185	185	185	176	176	176

Significance levels are in parentheses.

6.4 Underpricing on Change in Performance

Table 10 presents results about the relationship between changes in industry adjusted performance from two years prior to the offerings to the year of the offerings and underpricing. For both the univariate and the multivariate cases, improvements in industry adjusted operating performance are negatively related to underpricing.

These results strengthen the hypothesis that the equity issues of reverse LBO firms which have superior operating performances during the years leading to their IPOs will be viewed with less uncertainty by the market, while the issues of firms which have inferior operating performances will be associated with more market uncertainty. Hence, the results provide evidence that firms making improvements in operating performance over the two years which end in the IPO year may have less problems of asymmetric information. Conversely, firms which experience decreases in operating performance during this period may have more information asymmetry problems at the time of their IPOs and correspondingly greater problems in signaling their true market values.

Table 10
OLS Regressions: 21-Day Market Adjusted Underpricing on the Change in Industry Adjusted Operating Performance From Year –2 to Year 0, and Control Variables

21-Day market adjusted underpricing is defined as the relative price change from the initial offering price to the closing price at the end of the 21st day of trading minus the 21-day value-weighted market return. σ 20 Day RET is defined as the standard deviation of the stock returns over the twenty days following the IPO. Ln Asset is the natural logarithm of total assets immediately prior to the IPO in millions of dollars. Operating performance is calculated using the OPINC/assets measure of performance which is defined as operating cash flows before depreciation, interest, and taxes deflated by the book value of total assets. The industry adjustment is accomplished by matching each LBO firm to the sample of firms having the same two-digit SIC code and subtracting the median performance of this sample of firms from the firm's own operating performance. Year -2 is the year two years prior to the IPO year. Year 0 is the IPO year.

Model	1	2	3
α	0.142 (.000)	0.379 (.000)	0.0947 (.357)
Year 0 Perf – Year -2 Perf	-0.318 (.050)	-0.341 (.030)	-0.314 (.033)
Ln Asset		-0.046 (.003)	-0.0255 (.091)
σ 20 day ret			6.514 (.000)
F Stat	3.925 (.050)	6.828 (.002)	10.698 (.000)
R Square Adj.	.024	.09	.198
N	119	119	119

Significance levels are in parentheses.

6.5 Underpricing on Leverage and Changes in Leverage.

Table 11 reports the results from regression models in which underpricing is the dependent variable and the independent variables of interest are the pre-IPO leverage ratio and the IPO-induced reduction in the leverage ratio. Models 1 to 3 show that, for both the univariate and multivariate regression models, the IPO induced reduction in the leverage ratio is significantly positively related to underpricing. Thus, it seems that the greater the reduction in the leverage ratio resulting from an IPO the greater the market uncertainty surrounding that particular IPO. This is consistent with the hypothesis that agency problems may result for firms which reduce the discipline formerly imposed by high levels of debt. In this case, reductions in the leverage ratio at the time of IPOs, and resulting market concerns about the effects of this on future firm performance, may result in increased market uncertainty surrounding these equity offerings. This increased uncertainty may heighten problems of informational asymmetry and lead to increased underpricing.

Another explanation of this result is that, the greater the decrease in the leverage ratio at the time of the IPO, the more will the reverse LBO firm undergo fundamental changes at this time. Thus, for firms with large decreases in the leverage ratio at the time of the IPO, information found in the IPO prospecti concerning firm operating performance during the period before the IPO may not be relevant to predict post-IPO operating performance. This may lead to increased problems of informational asymmetry surrounding issues in which firm leverage ratios decrease substantially as a result of the offerings. Conversely, if leverage ratios are not substantially changed due to equity

offerings, LBO operating performance described in the prospecti can be a more reasonable estimate of future reverse LBO operating performance. In these cases, smaller problems of informational asymmetry should be present. Hence, less underpricing should be observed for these equity offerings.

Models 4 to 6 in table 11 document that the pre-IPO leverage value is significantly positively related to underpricing in both the univariate and multivariate cases. This seems to weaken support for the claim that increased leverage should be viewed positively by the market. However, model 7 which includes both the pre-IPO leverage ratio and the IPO induced reduction in the leverage ratio variable shows that the relationship between the pre-IPO leverage ratio and underpricing is insignificant, while the relationship between the IPO induced reduction in the leverage ratio and underpricing is still significantly positive. An examination of this result suggests that perhaps the former relationship was acting as a proxy for the latter relationship. This may occur if firms with the highest pre-IPO leverage values also tend to reduce their leverage ratios the most at the time of their IPOs. Therefore, the result found in model 7 concerning the significantly positive relationship between that the pre-IPO leverage ratio and underpricing could simply be representing the highly positively significant relationship between the IPO induced change in the leverage ratio and underpricing[10].

[10] We have performed a simple regression analysis to determine the relationship between the pre-IPO D/A ratio and the IPO induced change in the D/A ratio and found that the two variables are significantly positively related at the 0.1 percent level.

Table 11
OLS Regressions: 21-Day Market Adjusted Underpricing on the IPO D/A ratio and the IPO Induced Reduction in the D/A ratio and Control Variables

21-Day market adjusted underpricing is defined as the relative price change from the initial offering price to the closing price at the end of the 21st day of trading minus the 21-day value-weighted market return. σ 20 Day RET is defined as the standard deviation of the stock returns over the twenty days following the IPO. Ln Asset is the natural logarithm of total assets immediately prior to the IPO in millions of dollars. IPO LEV is defined as (total liabilities/total assets) immediately prior to the IPO. Reduction in D/A is defined as the Pre-IPO Debt to Asset ratio minus the Post-IPO Debt to Asset ratio

Model	1	2	3	4	5	6	7
α	0.0490 (.054)	0.0598 (.517)	-0.221 (.042)	0.0317 (.568)	0.1780 (.031)	-0.0972 (.332)	-0.239 (.029)
IPO LEV				0.0994 (.053)	0.107 (.036)	0.0851 (.080)	-0.100 (.191)
Reduction in D/A	0.305 (.000)	0.300 (.001)	0.279 (.001)				0.419 (.002)
σ 20 day ret			6.690 (.000)			6.680 (.000)	6.875 (.000)
Ln Asset		-0.0019 (.903)	0.0171 (.257)		-0.0307 (.027)	-0.0095 (.480)	0.0320 (.091)
F Stat	16.625 (.000)	8.275 (.000)	12.8120 (.000)	3.803 (.053)	4.666 (.011)	9.8813 (.000)	10.084 (.000)
R Square Adj	.078	.073	.161	.015	.038	.125	.164
N	186	186	186	186	186	186	186

Significance levels are in parentheses.

6.6 Underpricing on Length of Time Between Buyout and IPO

Table 12 provides information about the relationship between 21-day market adjusted underpricing and the length of time that LBO firms remain private. It is documented from the univariate model that the relationship between these two variables is significantly negative. The multivariate regression models show that, even after controlling for size and risk, the relationship between underpricing and the length of LBO firm life remains significantly negative.

This finding supports the hypothesis that the longer the period of time between the leveraged buyout and the return of the LBO firm to public status, the more complete should be the reduction of agency problems. If the entire LBO process is viewed as a mechanism for the reduction of agency problems and the transformation of inefficient firms into more efficient and competitive ones, the longer the length of LBO life, the longer the period during which agency problems can be resolved. If market participants have this point of view, there should be less uncertainty and underpricing associated with reverse LBO firms with longer LBO lives since these firms will have had more time and opportunity to resolve their operational and agency problems

Additionally, the longer the length of time between the leveraged buyout and the IPO, the longer the period during which firms may operate in more efficient manners. It is possible that, if firms operate efficiently for longer periods of time before their IPOs, they will be less likely to return to former patterns of inefficiency upon their return to public status. Again, if market participants take this viewpoint, there should be less uncertainty and resulting underpricing for the IPOs of firms with longer LBO lives.

Finally, another reason why underpricing may be significantly negatively related to the length of LBO life is that certain LBO firms which return to public status after short periods of time may be doing so because they find that their operating activities are too constrained due to the necessity to meet high interest payment requirements. For these firms the LBO decision will not have been a good one. These firms will decide to have an IPO in order to use the proceeds to reduce their indebtedness. Such firms may have considerable amounts of uncertainty surrounding their IPOs. This uncertainty may lead to increased amounts of underpricing.

Table 12
OLS Regressions: 21-Day Market Adjusted Underpricing on the Length of Time Between the Buyout and the IPO, and Control Variables

21-Day market adjusted underpricing is defined as the relative price change from the initial offering price to the closing price at the end of the 21st day of trading minus the 21-day value-weighted market return. σ 20 Day RET is defined as the standard deviation of the stock returns over the twenty days following the IPO. Ln Asset is the natural logarithm of total assets immediately prior to the IPO in millions of dollars. Time is defined as the number of months between the leveraged buyout and the IPO.

Model	1	2	3
α	0.1881 (.000)	0.3130 (.000)	0.0077 (.937)
Time	-0.0012 (.012)	-0.0010 (.032)	-0.008 (.075)
σ 20 day ret			6.712 (.000)
Ln Asset		-0.0268 (.058)	-0.0061 (.668)
F Stat	6.471 (.012)	5.106 (.007)	10.047 (.000)
R Square Adj	.031	.046	.137
N	172	172	172

Significance levels are in parentheses.

6.7 Length of Time Between the Buyout and the IPO on Post-Ipo Stock Price Volatility and Reverse LBO Firm Size

Table 13, table 14, and table 15 provide information about the association between the length of time between the leveraged buyout and the IPO and the size of reverse LBO firms at their IPOs and the stock return volatility after the IPOs. Table 13 documents that the measure of stock return volatility which does not include the initial trading day is significantly negatively related to the length of the LBO life. However, after controlling for size, this measure of volatility loses its significant relationship with the length of time from the leveraged buyout to the IPO.

Table 14 reports the relationship between the measure of volatility including the initial trading day and the length of LBO life. The results indicate that this measure of volatility is also significantly negatively related to the length of LBO life both for the case in which a control variable for size is added to the models and for the univariate case.

These results are consistent with the results in Table 12 concerning the relationship between underpricing and the length of LBO life. Longer periods of time between the leveraged buyouts and the IPOs are related to lower levels of stock return volatility following the IPOs. Conversely, shorter periods of private ownership are related to more stock return volatility. These relationships can be explained in similar ways to those used to explain why market uncertainty surrounding reverse LBO equity offerings should be negatively related to the length of LBO firm life. This is because increased market uncertainty concerning equity issues and the correct value of a firm's equity should logically lead to increased stock price volatility following the IPOs. Therefore, any

factors which might contribute to the heightening of market uncertainty surrounding particular issues should also contribute to increased post-IPO stock return volatility. Hence, increased post-IPO stock return volatility may result if market participants are more uncertain about reverse LBO issues for reverse LBO firms with short LBO lives because these firms have not had enough time to solve their operational and agency problems. Also, increased stock return volatility may result if the market believes that these firms have become efficient, but they have not operated efficiently for a long enough period for old patterns of inefficiency to not return following the IPOs. Finally, post-IPO stock return volatility may be higher if increased market uncertainty about the issues of reverse LBO firms with short LBO firm lives occur because these short LBO firm lives are associated with these firms being hindered in their performance by the heavy debt loads undertaken at the time of the buyouts. Thus, these three factors may explain why market uncertainty concerning reverse LBO issues should be negatively related to the length of the LBO life and why the same relationship should hold between stock return volatility following the IPO and the length of the LBO life.

Table 15 reports the relationship between the size of LBO firms at their IPO and the length of time between the leveraged buyout and the IPO. It is documented that the length of LBO firm life is significantly positively related to the size of reverse LBO firms at their IPO. We explain that smaller firms tend to be riskier firms, possibly more prone to increased volatility of their cash flows. Hence, smaller firms might find that the continual necessity to make high interest payments hinders their operations and performance. Larger firms, on the other hand, might find that the heavy debt loads undertaken at the time of their buyouts are less problematic for their continued success.

Table 13
OLS Regressions: 20-Day Post-IPO-Day Stock Price Volatility on the Length of LBO Firm Life and Control Variables

20-Day Post-IPO-Day Stock price volatility is defined as the standard deviation of the market adjusted stock returns over the twenty days following the initial trading day. The market adjustment is made by subtracting the value-weighted market return from the stock return during each of these twenty days. Time is defined as the number of months between the leveraged buyout and the IPO. Size is defined as the natural logarithm of total assets in millions of dollars prior to the IPO.

Model	1	2
α	0.0311	0.0045
	(.000)	(.000)
Time	-0.0001	-0.0000
	(.030)	(.158)
Size		-0.0031
		(.000)
R Square Adjusted	.022	.127
F Stat	4.810	13.478
	(.030)	(.000)
N	172	172

Significance levels are in parentheses.

Table 14
OLS Regressions: 21-Day Post-IPO Stock Price Volatility on the Length of LBO Life and Control Variables

21-Day Post-IPO Stock price volatility is defined as the standard deviation of the market adjusted stock returns over the twenty-one days following the IPO. The market adjustment is made by subtracting the value-weighted market return from the stock return during each of these twenty days. Time is defined as the length of time between the leveraged buyout and the IPO. Size is defined as the natural logarithm of total assets in millions of dollars prior to the IPO.

Model	1	2
α	0.0426 (.000)	0.0613 (.000)
Time	-0.0001 (.023)	-0.0001 (.082)
Size		-0.0040 (.003)
F Stat	5.234 (.023)	7.135 (.000)
R Square Adjusted	.024	.067
N	172	172

Significance levels are in parentheses.

Table 15
OLS Regressions: Pre-IPO Reverse LBO Firm Size on the Length of LBO Firm Life and Control Variables

Pre-IPO Reverse LBO Firm Size is defined as the natural logarithm of total assets in millions of dollars prior to the IPO. The market adjustment is made by subtracting the value-weighted market return from the stock return during each of these twenty days. Time is defined as the length of time between the leveraged buyout and the IPO. σ 20 Day RET is defined as the standard deviation of the market adjusted stock returns over the twenty days following the IPO. σ 21 Day RET is defined as the standard deviation of the market adjusted stock returns over the first 21 trading days.

Model	1	2	3
α	4.664 (.000)	5.805 (.000)	5.190 (.000)
Time	0.0066 (.009)	0.0044 (.073)	0.0050 (.051)
σ 20 day ret			-12.32 (.003)
σ 21 day ret		-36.68 (.000)	
F Stat	6.913 (.009)	14.183 (.000)	7.57 (.001)
R Square Adjusted	.033	.134	.071
N	172	172	172

Significance levels are in parentheses.

7.0 Summary and Conclusions

Our study attempts to fill several gaps in the literature about reverse LBOs. Whereas previous studies limited their observation period of the pre-IPO period to the year prior to the IPO, we have examined operating performance during the four years preceding the IPO. The opportunity to examine this data provides us with a unique opportunity to document efficiency gains which are being made during the last four years of LBO firm life. We have also studied the relationships between the equity ownership of management, both prior to and after the equity offerings, with operating performance and changes in operating performance during the years leading up to the IPO. In addition, this study has verified if there is an association between pre-IPO financial leverage and operating performance during the years leading up to the IPO. As well, we have examined the relationship between changes in financial leverage during the private LBO period and operating performance during the years leading to and proceeding the IPOs. A determination of whether reverse LBO underpricing is related to managerial equity ownership and financial leverage variables is also made. In addition, we document the relationship between reverse LBO underpricing and both pre-IPO financial leverage and changes in financial leverage caused by the IPOs. Finally we have considered whether the length of time between the leveraged buyout and the IPO is related to underpricing, post-IPO stock volatility, or the size of reverse LBO firms prior to their equity offerings.

We find that reverse LBO firms experience significant increases in operating performance during the four years prior to their IPOs. In fact, our study shows that reverse LBO firms more than triple their performance relative to their industry rivals

during these four years. Additionally, this study shows that significant increases in industry adjusted operating performance occur both two years before the offerings, and the year before the offerings. These results lend support to the hypothesis that improvements in efficiency occur during the LBO period. Because of the fact that we are only examining LBO companies which return to public status we cannot state that all LBOs result in gains of efficiency. However, we do claim that those LBO firms which return to public status have made substantial efficiency gains during their transitory LBO period.

We report that during the period from the pre-IPO year to the post-IPO year no significant increase in operating performance occurs. Subsequently, from year +1 to year +2 we find that reverse LBO firms experience a significant decrease in operating performance. These results are consistent with those of Holthausen and Larcker (1996), who find that when using the OPINC measure of operating performance that no significant decreases in operating performance occur between the period from year -1 to year +1.

Our results show that there may, in fact, be a timing issue involved with the IPOs, since increases in operating performance end in year −1, after which operating performance remain fairly constant for a period of two years. Hence, the IPOs seem to be timed to follow the year during which possible improvements in efficiency may have reached their peak.

The finding that operating performance significantly decreases between year +1 and year +2 provides some support for the hypothesis that certain benefits which the reverse LBO firms may have received while they were private diminish upon the

transition of these firms to public status. Therefore, the loss of possible LBO benefits related to efficiency may be the cause of this drop in operating performance.

Our results about improvements in operating performance prior to the offerings and declines after the offerings are confirmed by the calculated values for the performance and industry adjusted measures of operating performance. It is found that if firms are matched to their same industry rivals with similar performance during any of the four years leading to the IPO that the reverse LBO firms still experience relative gains in performance during the years leading to the IPO. Similarly, the magnitudes of the relative superiorities in operating performance of the reverse LBO firms decrease during the period after the offerings.

This study presents results which show that firms in which managers retain significant equity ownership stakes after the IPOs experience significantly superior average yearly industry adjusted operating performances during the period from year –2 to year 0. Our results also document that changes in operating performance between the period four years prior to the offerings and the IPO year are significantly positively related to the percentage of equity owned by management after the offerings. However, we do not find that the percentage of equity owned by management prior to the IPOs is related to operating performance or changes in operating performance. We contend that these results support the idea that high levels of managerial ownership of equity after the IPOs may be more shaped by endogenous factors than high levels of managerial ownership of equity prior to the IPO. This may be because, during the private period, the very composition of the LBO firm dictates that managers should be significant owners of their firms. However, after the IPO, the decision to remain significant owners of their firms by managers may be more related to endogenous factors. The existence of these

endogenous factors may explain why the post-IPO level of managerial ownership of equity is significantly positively related to operating performance during the period from the year two years before the IPO to the IPO year. If managers make endogenous decisions, for whatever reasons, to keep their interests aligned with those of their firms after the equity offerings, it is likely that these managers are those who will help their firm lead to value maximization. We contend that these managers make such endogenous decisions to remain significant owners of their firms after the return of these to public status several years before the IPO. Once these decisions are taken, these managers have their interests more closely aligned with those of their firms than do managers who know that they will substantially decrease their ownership stakes as a result of the IPO. This closer alignment of interests leads to increased operating performances during the years leading up to the IPO year.

We also document that firms with higher leverage ratios prior to their IPOs experience superior operating performances during the two years leading to their IPOs and the year of their IPOs. In addition, we show that decreases in the leverage ratio between the period three years prior to the IPOs and the period immediately prior to the IPOs result in significantly inferior operating performances during the year prior to the IPO, the year of the IPO, and the year two years after the IPOs. These findings support the contention that high levels of financial leverage are useful as a disciplining mechanism to ensure that managers run their firms in efficient manners. Reduced levels of financial leverage, on the other hand, lower the effectiveness of this disciplining mechanism, and may lead to non-value maximizing behavior on the part of managers.

Our results also weaken the notion that agency and operational problems are fixed and that LBO firms should try to reduce their debt burdens in order to return to more

optimal capital structures. If this were the case, we should see a positive association between decreases in financial leverage and performance. However, we find the opposite case.

This study also documents the relationship between managerial ownership of equity during the period surrounding the IPO and underpricing. We use underpricing as a proxy for problems of informational asymmetry surrounding equity issues and market uncertainty about given issues. While we find that managerial ownership of equity prior to the offerings in not related to underpricing, we find that for the univariate case managerial ownership of equity immediately after the offering is positively related to underpricing. While this finding weakens our contention that this relationship should be negative, it strengthens the claims of Demsetz (1983) and Fama and Jensen (1983) that if managers own too high a percentage of equity, they will become entrenched and will be able to pursue non-value-maximizing behavior. This could increase market uncertainty surrounding an equity offering and result in increased underpricing. However, we also find that, after controlling for risk, the relationship between the equity ownership of managers after the offerings and underpricing becomes insignificant. Perhaps this means that the managers of risky firms retain higher ownership stakes in their firms after the IPO in order to signal a positive message about their firms to market participants. Hence, the finding that the equity ownership of managers after the IPO is positively related to underpricing may simply be a proxy for the relationship between risky firms and underpricing.

We also study the relationship between underpricing and both the change in financial leverage as a result of the IPO , and the pre-IPO financial leverage value. We find that the greater the reduction in financial leverage as a result of the IPO, the greater

the amount of underpricing. This implies that the market may become more uncertain about reverse LBO firms which decrease their financial leverage by too great an amount due to the loss of the discipline formerly imposed by higher levels of debt. Also, predicting the post-IPO operating performance of such firms by using their pre-IPO operating performance numbers may prove to not be very useful if the capital structure changes alter the ways that these firm operate. Hence, the lack of relevant information to predict the future operating performance of these firms might cause increased problems of informational asymmetry to surround the IPOs of such firms.

Also, we find that pre-IPO levels of financial leverage are positively related to underpricing. However, our results show that this relationship may be caused by the possibility that the firms with the highest pre-IPO levels of financial leverage decrease their levels of financial leverage the most during their IPOs. Hence, high amounts of underpricing found for reverse LBO firms with the highest levels of financial leverage may be the result of these firms considerably decreasing their levels of financial leverage as a result of their IPOs.

Our study also documents the relationship between underpricing and changes in operating performance occurring during the period leading to the IPO. We find that changes in operating performance between the period two years prior to the IPO and the IPO year are negatively related to underpricing. This may mean that if firms are making improvements in their operating performance during the period leading to their IPO, market participants will feel less uncertain concerning the equity offerings of these firms. This decreased uncertainty will lead to smaller problems informational asymmetry and underpricing.

The relationship between the length of time between the leveraged buyouts and the IPOs and underpricing is also examined in this study. We find that the longer the period between the leveraged buyout and the IPO, the less underpricing experienced at the IPO. This supports the hypothesis that market uncertainty may be higher for reverse LBOs which had shorter LBO lives because the market may think these firms have not been private for a long enough period to properly reduce their operational and agency problems. As well, market participants may believe that even if LBO firms have become efficient that if they operated efficiently for shorter periods of time before their IPOs, they will be more likely to return to former patterns of inefficiency upon their return to public status. Finally, the market may associate reverse LBO firms with short LBO lives with the possibility that the short lives were due to these firms not being able to properly function with the existence of heavy debt burdens.

Results concerning the relationship between the length of LBO firm life and post-IPO stock price volatility confirm our hypothesis that market uncertainty should be higher for reverse LBO firms with shorter LBO firm lives. It is found that the length of time between the leveraged buyout and the IPO is significantly negatively related to stock price volatility following the IPOs. Since stock price volatility may be largely caused by market uncertainty concerning the true value of the equity of a given firm, this finding supports the claim that market participants will feel more uncertain about the equity of reverse LBO firms which had short LBO lives.

Finally, we document that firms with longer LBO lives tend to be larger firms and that firms with shorter LBO lives are usually smaller firms. This finding could be partially explained by the fact that smaller firms tend to be riskier firms, more prone to increased volatility of cash flows. Hence, smaller firms might wish to return to public

status sooner than larger firms because they find the debt burden of the leveraged buyout to be a greater hindrance to their operations than would larger firms.

Further research concerning reverse LBOs might include work helping to explain the extent to which managerial ownership of equity before and after the IPOs is determined by exogenous versus indogenous factors. In addition, information relating to when managers make their decision to remain significant owners after the IPOs would be insightful. Such information would be useful in order to determine whether operating performance during the years leading to the IPOs is, in fact, caused by managers whose interests are closely aligned with those of their firms because of their wish to remain significant owners of their firms after the return of these to public status.

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Appendix 1

Table 1
Industry and Performance Adjusted Operating Performance
Where firms are Matched by Industry and Performance
Using a 20 Percent Filter in Year -4

Table 6a provides adjusted operating performance data. Operating performance is calculated using the OPINC measure of operating performance which is defined as operating cash flows before depreciation, interest, and taxes deflated by the book value of total assets. Operating performance is adjusted by subtracting the median contemporaneous performance of a group of firms matched by two-digit SIC code and by performance in year –4. The performance matching is accomplished by matching LBO firms to firms which had operating performances within 20 percent of the operating performances of the LBO firms in year –4. The significance levels that the mean estimates are significantly different from zero are reported.

	Year -4	Year -3	Year -2	Year -1	Year 0	Year +1	Year +2	Year +3
Median	0.00187	0.00492	0.01193	0.02970	0.04475	0.05020	0.01530	0.02020
Mean	-0.00024	0.00606	0.02216	0.04434	0.05685	0.04494	0.03181	0.04598
Significance level	.967	.451	.106	.004	.000	.006	.026	.142
N	48	48	48	48	45	32	23	11

Table 2
Industry and Performance Adjusted Operating Performance
Where firms are Matched by Industry and Performance
Using a 20 Percent Filter in Year -3

Table 6a provides adjusted operating performance data. Operating performance is calculated using the OPINC measure of operating performance which is defined as operating cash flows before depreciation, interest, and taxes deflated by the book value of total assets. Operating performance is adjusted by subtracting the median contemporaneous performance of a group of firms matched by two-digit SIC code and by performance in year –3. The performance matching is accomplished by matching LBO firms to firms which had operating performances within 20 percent of the operating performances of the LBO firms in year –3. The significance levels that the mean estimates are significantly different from zero are reported.

	Year -3	Year -2	Year -1	Year 0	Year +1	Year +2	Year +3
Median	0.00282	0.017282	0.043252	0.047828	0.045749	0.022269	0.0316
Mean	-0.00107	0.028614	0.055047	0.062561	0.056298	0.032398	0.049982
Significance level	.812	.018	.000	.000	.000	.032	.027
N	87	87	87	82	59	46	21

Table 3
Industry and Performance Adjusted Operating Performance
Where firms are Matched by Industry and Performance
Using a 20 Percent Filter in Year -2

Table 6c provides adjusted operating performance data. Operating performance is calculated using the OPINC measure of operating performance which is defined as operating cash flows before depreciation, interest, and taxes deflated by the book value of total assets. Operating performance is adjusted by subtracting the median contemporaneous performance of a group of firms matched by two-digit SIC code and by performance in year –2. The performance matching is accomplished by matching LBO firms to firms which had operating performances within 20 percent of the operating performances of the LBO firms in year –2. The significance levels that the mean estimates are significantly different from zero are reported.

	Year -2	Year -1	Year 0	Year +1	Year +2	Year +3
Median	0.002462	0.023733	0.036654	0.0393	0.035603	0.062195
Mean	0.005539	0.037437	0.04797	0.051047	0.041777	0.061825
Significance level	.000	.000	.000	.000	.011	.044
# observations	108	108	104	77	56	29

Table 4
Industry and Performance Adjusted Operating Performance
Where firms are Matched by Industry and Performance
Using a 20 Percent Filter in Year -1

Table 6d provides adjusted operating performance data. Operating performance is calculated using the OPINC measure of operating performance which is defined as operating cash flows before depreciation, interest, and taxes deflated by the book value of total assets. Operating performance is adjusted by subtracting the median contemporaneous performance of a group of firms matched by two-digit SIC code and by performance in year −1. The performance matching is accomplished by matching LBO firms to firms which had operating performances within 20 percent of the operating performances of the LBO firms in year −1. The significance levels that the mean estimates are significantly different from zero are reported.

	Year -1	Year 0	Year +1	Year +2	Year +3
Median	0.0044	0.020359	0.0303	0.00688	0.0325
Mean	0.007067	0.027973	0.035939	0.01627	0.05060
Significance level	.000	.000	.000	.15	.001
N	143	143	107	77	39