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Leveraged Buyout Attractiveness

How do financial characteristics influence the possibility of a LBO?

Index

Abstract

This paper examines the effect of several financial characteristics of publicly traded companies on the probability they go private due to a Leverage Buyout by Private Equity funds. This is done by an analysis of descriptive statistics and the use of a logistic regression model containing data of 1948 US listed firms of which 227 were target of a LBO in the period 2001 till 2007.The incentive realignment theory and the financial distress theory are used to construct variables that increase or reduce the probability a public company goes private. The mean comparison of firm specific financial components shows significant differences in profitability, growth and financial management, suggesting that private equity companies chose their LBO target firm with the use of financial information about it. The logistic regression results report significant positive effects for firms that have high operating income, low cash flow combined with high Tobin's q and are diversified combined with a low Tobin's q. It also reports significant negative effect for companies that have high selling expenses, are diversified and have a large asset value.

Introduction

In the past 3 years it has been relatively quiet in the financial world when it comes to mergers, acquisitions and buyouts. The financial and subsequent economical crises are the main reason for this; first of all there seems to be no money available to make an acquisition and secondly managers consider the risks to high. Before the financial meltdown in 2007 there was a very dynamic M&A market and Leveraged Buyouts (or Highly Leveraged Transactions) were the order of the day. Clearly, nobody expected a financial crisis that hit the market so hard, but experts and managers always calculate for risks, as well as they do for opportunities.

The main subject of this research is Leveraged Buyouts performed by Private Equity Funds. It will be analyzed why certain companies are an interesting investment opportunity for PE Funds and why others aren't. What characteristics are important and if these are found, can their importance be explained by the goals and incentives of the PE Fund and its financial sponsors? This directly forms the main research question of this thesis:

Which financial characteristics/determinants make a company attractive as a Leveraged Buyout target firm?

The foundation of this research is formed by the work of Tim Opler and Sheridan Titman from 1993 (Opler and Titman (1993)). They formulated a similar research question but are mainly interested in the interaction between the Incentive realignment theory and its free cash flow benefits/problems (Jensen (1986, 1989) and the Financial Distress Costs that may occur in a highly leveraged firm. The period of their research included the years 1980 till 1990. The phenomenon LBO was relatively new in that period and in the '90s financial experts experienced for the first time the counter side of firms that went private and couldn't manage the economical distress that followed.

This paper will also be based on the incentive realignment theory and the financial distress costs and their influence on the probability a public firm goes private. Within the limits of these theories, several financial characteristics will be investigates, also ones that are not to be found in the research by Opler and Titman. The goal is to get more insight in the determinants that influence the choice of Private Equity Funds of investing in a company or not.

This papers' plan will be as follows. The next section will briefly give a set out of what private equity is, how a leverage buyout works and why such HLT's exist. The second section discusses the theories that form the fundament of this research. Section III describes the methodology used, the variables that are expected to be of influence for the choice of target of a LBO and the

way the data is collected and structured. Section IV contains the comparison of characteristics of LBO companies and the firms that stayed public, or in short 'the results'. Finally section V gives a conclusion.

I.   Private Equity and LBO's

Private Equity

To get insights in the characteristics of a firm that makes it more or less attractive for a LBO, I will first in short set out what private equity is, how private equity funds work and how a transaction that involves PE is structured. This is important to understand their goals and methods, from there a clearer view in their behavior can be formulated.

A private equity fund is held by different 'private' sponsors that invest with their own money in the fund to make profits. This can be both (rich) individuals and companies that own a lot of excess cash to invest, like pension funds. The PE fund typically invests this money in major, existing firms and gains control of the target firm by buying out the current owners. The target firm can be both publicly held or private owned, but the main goal remains taking control of major companies to make sure it acts the way the PE fund, or actually the PE fund's financial sponsors, wants it to do. At this point, private equity funds fundamentally differ from other private investment companies like Venture Capitalists or person's that invest as Business Angels. These investors mainly invest in young, starting companies and don't take full control of the operations of the target company (Wright and Robbie, 1996). Not rare are situations in which the financial sponsors of a private equity fund are anonymous and don't interact with the firms they indirectly invest in.

The main goal of a private equity fund is generating profits from the investments they make. This doesn't necessarily have to be a short term profit. Critics of PE buyouts argue that these funds buyout well established companies and split up their divisions, fire employees and eventually sell the remaining parts of the company which results in the fact that a perfectly operating firm does no longer exist. This criticism is not without reason; a lot of stakeholders benefit from a company's existence and not particularly from the firm's profitability. This research however, is done under the assumption that the only goal of a company is maximizing profits for its owners (shareholders), without giving an opinion about ethics of private equity sponsored buyouts. It doesn't matter if this means that the company should be split up or

liquidated or that the new owner, the fund, holds on its stakes for several years to generate profits from new investments.

Because of the fact that private equity firms only wants to maximize the profits of the target firm, they must get a very good impression of the target firm's financial and economical situation. Their expertise is valuating companies and deciding whether or not it is profitable to invest in. This isn't an easy job and is almost impossible for private and most of the institutional investors. And even if they manage to make this valuation of enough companies to make substantiated investment decisions, they much likely don't have the financial resources to bid for a controlling stake, nor do they have the credibility to get enough loans and most certainly do they not have the resources, knowledge and energy to restructure the target company. These problems investors face are an important reason private equity funds and other private investment firms exist.

When doing an investment, a new company (i.e. company ZYX) is formed by the private equity firm. The only purpose of company ZYX is taking control of the target company by buying out the current owners. This new company is just an investment vehicle for the financial sponsors of the transaction and its only asset will be the target company. Company ZYX than arranges the debt financing in the form of loans and bonds and determines the optimal capital structure for the transaction. Then, the private equity firm can buy the target company and start the control of it.

Leveraged Buyout

In theory, a private equity firm can finance a buyout transaction completely with equity raised from the investors in the fund. Fact is that PE buyouts are highly leveraged and only finance about 10% to 30% of the total acquisition value with equity. In first instance, the debt comes from the syndicated loan market[1] because issuing bonds will take too much time and there are before the acquisition takes place no assets to back the bond value. After a period of time, the LBO company starts issuing bonds, now backed by its assets, and refinances the debt. The borrowings from the syndicated loan market are complexly structured by different degrees of seniority, which differ in interest rate, maturity, amortization methods (or the amortization in itself) and other aspects.

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[1] *"A syndicated loan is one that is provided by a group of lenders and is structured, arranged, and administered by one or several commercial or investment banks known as arrangers. Starting with the large leveraged buyout (LBO) loans of the mid-1980s, the syndicated loan market has become the dominant way for issuers to tap banks and other institutional capital providers for loans. The reason is simple: Syndicated loans are less expensive and more efficient to administer than traditional bilateral, or individual, credit lines."* [Standard & Poors , A guide to the loan market, 2011]

Leverage Incentives and Risks

This section will in general discuss the reasons companies use leverage in the first place and, more useful for this research, in LBO's. Modigliani en Miller examined the capital structure of companies and stated that debt had no other benefits than for taxes. Loewenstein (1985) argues that tax savings are an important reason for LBO's, even though an acquisition is not necessary to realize these savings. Later researches found empirical evidence for other benefits debt could bring, like a reduction of agency costs and asymmetric information.

Agency costs represent the costs of incentive bias between different stakeholders of a company. It exists because of differences in incentives and motivations between for example the owners of a firm (shareholders) and the managers/directors.[2] Shareholders want to maximize the value of their stocks and managers prefer to see their own income be as large as possible. A solution for this problem could be to use more leverage for financing a firms investments rather than issuing equity. This way, managers are forced to work hard to find and successfully complete profitable projects and the interest costs can be paid. Different studies show that attracting a certain amount of debt in a firm can prevent managers to get lazy and invest unwisely. (e.g. Jensen (1986, 1989)). This is also the first main reason why private equity funds make highly levered acquisitions, they want to induce the management to operate the LBO firm in the interests of the investors. Jensen (1986, 1989) and Grossman and Hart (1982) argue that this incentive alignment by the use of debt is far more effective than any other efforts to reduce agency costs between investors and management, like option packages for the management etc.

Next to the incentive realignments to reduce agency costs, LBO's are highly levered because of asymmetric information and the signaling effect that come along with this phenomenon. Even if manager only have little private information about their firm before the LBO takes place, they have an informational advantage in valuing their company. This means that they have (slightly) better insights in the effects of the buyout on the firm's financial situation after the transaction takes place and if they posses information that is favorable, they are less eager to issue equity and prefer the use of debt. Attracting debt would be a positive signal to outsiders, making the price per share rise while issuing more equity would do the opposite. (Ross (1977), Leland and Pyle (1977)).

The risks of levering a company are defined as the risk of financial distress. An organization being in financial distress can't pay the debt owners their interest and can't pay off their loans. Clearly, by financing disproportionately with debt, the costs of financial distress increase and even seem to increase exponentially. Studies argue that there exist a critical point to which firms

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[2] Other examples of agency costs are the information asymmetries between employees and the board, equity and debt holders and shareholders and employees.

can lever up before putting themselves in a situation of financial distress. Although every company in principle can encounter problems related to financial distress, it turns out to be that LBOs overcome some costs of financial distress in relation to regular companies. This is due to several organizational aspects of LBOs and includes the privatization of bankruptcy, strip financing and reputation and credibility. Thanks to these features, LBO firms overcome a lot of costs related to direct financial distress and can lever up higher than other firms. However, no company can rule out all the risks of bankruptcy and a lot of financial distress costs may occur in LBOs. These costs will be discussed in section II and III, together with the empirical evidence they influence the LBO target decision.

The privatization of debt occurs when a company is highly levered, like in a LBO, and is also one of the main reasons why LBO firms rarely go into a formal bankruptcy. When a firm is financed with a large amount of debt, let's say 80%, it often is the case that the going concern value of the company is vastly greater than the liquidation value, debt sponsors have incentives to restructure the debt instead of asking for a bankruptcy in the case of financial distress. Most likely, a new management board will negotiate on new term of condition of the loans and debt sponsors are willing to grant more attractive conditions (maturity/interest rate), because they benefit more by keeping the LBO company alive. (Jensen, 1989)

A very remarkable feature that occurs in LBO target firm is that debt and equity are owned by the same investors. This is called strip financing and reduces the friction between debt and equity holders. A LBO company that uses strip financing can attract debt more easily without upsetting the equity holders and costs of financial distress are less impressive for the equity owners if they also own the debt.

Last reason why LBOs can lever up more than regular companies is the reputation and credibility of the LBO sponsors. Most of the time, the Private Equity funds that make the acquisition are well-known companies with reputational investors that have proven themselves to look after the interests of debt holders. Banks and other providers of debt won't ask for a bankruptcy as fast as normally when they trust the investors' incentives. This reduces the costs of financial distress and makes LBO firms able to lever up higher.

II.   Theory

For the past decades, a lot of research on capital structure has been done. The main issue these researchers were trying to get a grip on was the reason why firms use leverage in the first place. Three main breakthroughs came from Miller & Modigliani, Myers and Jensen. M&M formed 3

propositions in which they claim that there is no other reason for leverage than tax incentives. The capital structure shouldn't depend on the choice of financial instruments, because the risk and therewith the cost of capital will adjust. The only disturbances in their equilibrated world are taxes, caused by the fact that in almost every country debt is tax deductable. Stewart C. Myers argues in his work The Capital Structure Puzzle that companies do have rational incentives to use leverage in favor of equity. This reason for this, according to Myers, is that equity is more costly for firms due to agency costs. Myers therefore provides evidence for the pecking order theory and states that firms will first look for internal financing (excess cash etc.), than attract debt and only when these resources aren't available, expensive equity is issued. Finally Jensen (in cooperation with Rubeck) developed a theory about the interaction between capital structure and agency costs. He focuses here on the available free cash flow in a company and states that a high percentage of debt triggers managers to invest the money wisely, while having a large fraction of equity leads to excess free cash flow that is likely to be invested unwisely.[3]

What all those 3 theories have in common is that they claim that there are well funded reasons for the use of debt, but also that if there exists a difference between using debt or equity for financing investments; it always benefits using debt over equity. It may be due tax benefits, lowering costs of capital or improving manager's incentives, leveraging pays. However, a lot of researchers disagree on this and provide evidence (often empirical evidence from the field) of financial distress costs that occur in highly leveraged firms. Financial distress takes place when a company cannot generate enough cash flow to pay off its interest on debt. Often these are firms that are economical healthy and can grow, develop and invest in profitable projects, but are in (temporally) distress because of the high interest costs. Examples of researchers that investigated financial distress costs are Andrade and Kaplan (1998) Opler (1993) and Fox and Marcus (1992). They show among others that high leverage brings along another form of risk, namely the risk of distress.

To move on to the subject of this paper, the work of M&M is more or less irrelevant for the study on LBO determinants. I make the assumption that Private Equity funds do have funded incentives for using the amount of debt they concern other than tax incentives. If this wouldn't be the case it would mean that LBO's existence is just a coincidence and that investments funds that do HLTs lever up to the skies without any reason.[4] Because of the fact that private equity funds and substitute investment companies have no other incentive than creating value for their

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[3] Jensen's Free cash flow theory, Opler and Titman (1993)
[4] With this I refer to all the leverage used more than necessary as a tax shield (Axelson 2010)

investors, the chance that to initiate LBO's on such a large scale without doing this to earn money can be ruled out.

Theories that can be used to explain why one company is undergoing a LBO and others aren't are the theories from Myers, Jensen and the theory of financial distress costs. Determinants that are brought forward by Myers or Jensen logically should have a positive effect on use more debt and therewith do a leveraged buyout. Determinants that indicate a financial distressed firm are predicted to have a negative effect on the buyout attractiveness. In the next section, these determinants and their effects will be discussed in more detail, together with the methods and techniques and the data.

III.   Methodology and Techniques

Descriptive Statistics

The research will start with an analysis of descriptive statistics, more precise the existing differences of mean, median and standard deviation between LBO firms and non LBO firms. The means of the both the LBO sample as the control sample will be compared with the use of a 2-sample T-test, assuming unequal variances for the variables with significant differences in their standard deviations (1) and equal variances for variables reporting non-significant difference in it.(2)[5]

$$t = \frac{X1-X2}{\sqrt{(\frac{SD1^2}{N1}+\frac{SD2^2}{N2})}} \tag{1}$$

$$t = \frac{X1-X2}{Sp\sqrt{\frac{1}{N1}+\frac{1}{N2}}} \qquad with \qquad Sp = \sqrt{\frac{(N1-1)s1^2+(N2-1)s2^{\wedge}2}{N1+N2-2}} \tag{2}$$

Each variable will be analyzed separated and will clearly report significant or non-significant differences between the average values of LBO vs. non-LBO companies.

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[5] F-test for equal variances: $\frac{s1^{\wedge}2}{s2^{\wedge}2}$ [*Moore, McCabe, Duckworth and Sclove, 2003,p.488*]

Logistic Regression

As said, the firms that went from public to private due to a LBO and the companies that stayed listed are being compared in this thesis. The data sample consists of all the LBO's in the period 2001 till 2007 and the control sample contains all the U.S. publicly listed firms in the same period.

To estimate the probability a public company goes private, the regression technique can be used. Within a regression, independent variables determine the value of the outcome variable. Some independent variables have a large effect on the dependent variable while some effect could be considered negligible. The most common regression technique to estimate an outcome variable and the effect of several independent variables on this outcome variable is the Multiple Linear Regression technique using OLS. The response variable can be estimated to have any value, making the formula look as follow:

$$y = \beta 0 + \beta t x i - \beta t x j + \varepsilon \qquad (3)$$

$\beta 0$ represents the constant, t represents the year (2001-2007), xi is a certain variable that has a positive effect on the response variable (so in line with free cash flow theory) and xj represents the variable that has a negative effect on the response variable (financial distress theory). In fact their will arise a much longer equation with xi_1, xi_2, xi_3 etcetera, and the same for all the xj variables, because the regression consist more than 2 explanatory variables.

The Linear Regression Model however, is not usable for this research. Companies in the data sample can appear in two forms, being public or being private due to LBO. The question why private companies were acquired is central in this thesis so that the differentiation between firms that are (still) public and the ones that went private must be formed into a dependent/outcome variable. Considering the above, the regression can only have two outcomes; it is LBO or it is not. As mentioned above, the Linear Regression Model can have any value as estimated outcome, making it not suitable for the research. In order to investigate the firm's determinants that are important for LBO attractiveness, the Logistic Probability Model, or Logit Regression, is being used instead. The logit model overcomes limitations of the Linear Probability Model that it can form output values that are larger than one or under zero. This is done by transforming the regression formula so that it fits in the interval (0, 1).[6] By using the logistic regression, the response variable simply become 'yes' or 'no' to the question if this firm in a specific year was the subject of a LBO.

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[6] In fact, the values will never be exactly one or zero, but will infinitely tend towards these boundaries as asymptotes. (Brooks, p. 515)

The Logistic Probability Model fits the interval (0, 1) because it is based on the probability of success versus the probability of failure. The distributions of these probabilities appear as shown in the equations below.

$$Pi = \frac{\beta1+\beta2x2i+\cdots+\beta kxki+ui}{1+e^{(\beta1+\beta2x2i+\cdots+\beta kxki+ui)}}$$ (4)

Equation (1) represents the probability of success; the chance the dependent variable will have the value one. Opposite, the chance of failure appears as:

$$Pi = \frac{1}{1+e^{(\beta1+\beta2x2i+\cdots+\beta kxki+ui)}}$$ (5)

These two formulas show that adding up the chance of success and the chance of failure will result in 1, being the only two possible outcomes and explaining the core of Logistic Regression. Dividing the probability of success by the probability of failure will result in the Odds that a company goes private. Odds are ratios that describe the relative probability between the probability of success and failure. In example, with an odds of 0.25 we could say that the odds for company x in year t of going private are 1 to 4.

$$ODDS = \frac{Pi}{1-Pi} = \frac{\frac{\beta1+\beta2x2i+\cdots+\beta kxki+ui}{1+e^{(\beta1+\beta2x2i+\cdots+\beta kxki+ui)}}}{\frac{1}{1+e^{(\beta1+\beta2x2i+\cdots+\beta kxki+ui)}}}$$ (6)

Since the odds range from 0 to infinity, it requires a transformation so that it can range from -∞ to ∞. This transformation is called the log odds and completes the Logistic Probability Model by calculating the natural logarithm of the odds, fitting the respond variable in the desired range and having a *p* that ranges from 0 to 1.

$$\log\left(\frac{p}{1-p}\right) = \beta0 + \beta1txi - \beta2txj + \varepsilon$$ (7)

In this formula, *p* is a binominal proportion and x is the explanatory variable. The model's parameters are β0, β1 and β2. (***Moore, McCabe, Duckworth*** and ***Sclove****, 2003)*

To indentify influential determinants on the probability a company undergoes a LBO; the organizations in the data sample that went private will be given the value 1. The companies that stayed public will be given the value 0. This dummy variable becomes the dependent/response variable and the financial characteristics become independent variables. These last named are expected to significantly affect the probability a specific firm in a specific year goes from public to private and the signs of the determinants are expected to be correct according to the Incentive realignment theory or the Financial distress theory.

Variables

The variables tested are for a large part the same ones as Opler and Titman (Opler and Titman (1993)) used for their samples of the '80s. These variables can be perfectly used for the period of this research, 2001 till 2007. Next to these variables, related to the 'incentive realignment theory' and the 'financial distress theory', there are also new variables introduced and tested for influence on the LBO targets. These new variables are also argued based on the two mentioned theories and should therefore have a clear positive or negative predicted effect on the LBO probability. All variables used are still financial characteristics and firm specific, not economic variables that change influence more than one company.

The variables above the grey row (Table I) are the proxies for characteristics based on the research of Opler and Titman (Opler and Titman (1993)), sometimes slightly adjusted due to the availability of certain data measures. Variables inspired on their work will be called "Existing variables". The variables below this grey row are the variables added to the research referred to and will be referred to as "New added variables".

As said, Opler and Titman related their variables to the financial distress theory, the Incentive realignment theory or both. Their argument for this is that private equity funds make their decision on whether or not to do a LBO, based on some firm characteristics that are favorable and some that are unfavorable. In Opler and Titman (1993) the writers state [...] *a tradeoff between incentive gains and potential financial distress costs determine which firms undertake LBOs. The costs and benefits are likely to differ across firms in ways that depend on their characteristic [...].* They reason this way because the main focus of their research lied in the question if debt financing is crucial for the gains of LBO's and if buyouts therewith create value. Opler and Titman (1993) make use of previous research by Titman on the capital structure of companies. Some of the variables indentifying financial distress costs are based upon the work of Titman and Wessles (1988) and are proxies for the firm's product uniqueness, the limits of its growth options and collateralizability of its assets (Opler and Titman 1993).

Existing variables

Costs of Financial Distress

The operating income to assets is measured by dividing the EBITDA by the firm's total asset value. This variable is affecting the LBO target firms' choice positively, according to the financial distress theory as well as the incentive realignment theory. If the ratio is high then the regarding firm generates relatively much income with the assets they have, which means they need less financing (and therefore less debt) to cover their assets. The former also means that firms with high operating income to assets will have high growth rates at the moment, but most likely less growth in the future. Financial distress costs are therefore higher for firms with a high operating income ratio (or cash flow variable). Tobin's q is a ratio that serves as a proxy for the growth possibilities of a firm[7] and the extent to which assets are collateralized. It is measured by a ratio of a firm's total market value to the total value of its assets. A well collateralized firm has a 'q' of 1 or higher, while badly collateralized firms have a 'q' between 0 and 1, which means that the assets of a firm can't be replaced with the total value of all the stocks. In this last case, the companies' stocks are considered to be undervalued, which makes them attractive and cheap to buy for among others a private investment fund. A high Tobin's q refers to overvalued stock prices and few growth options (negative/few incentive realignment options) and to high financial distress costs (badly collateralized assets) (Tobin and Brainard (1977) and Opler and Titman (1993)).

The machinery industry dummy separates companies in the machinery and equipment industries from other companies, because of the unique characters of these industries. Product from these industries often require service and additional products like spare parts after the initial sale is conducted. By creating a dummy it is made possible to check for a relation between this kind of companies and the LBO target decision. Companies in the machinery and equipment industry are selected on their primary SIC codes and are given the dummy value 1 if this code lies between 3400 and 4000. It is expected that companies in these industries have more financial distress costs, because of their mentioned after sales costs, and are less attractive for investment funds to buyout.

As a proxy for product uniqueness a variable based on research and development is used, r&d expenses divided by the net sales revenue (which is the ratio of sales and selling expenses to sales). Companies that invest a lot in research and development usually have more unique products and therefore the risk of financial distress is larger. Selling expenses are measured by the ratio of selling, general and administrative costs to the net sales revenue and are expected to be higher for firms that suffer high risks of financial distress, making them less likely to go private.

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[7] The use of Tobin's q as a measure of growth options are on itself subject of discussion.

Highly diversified firms are expected to be less attractive based on the financial distress theory. Large conglomerations are often highly inefficient and large, making it hard and risky to effectively finance the all of the divisions' investments.

Incentive Realignment

The key concept of incentive realignment is to improve management incentives so that they only invest in high quality investments and try harder not to waste financial resources. This can be done by giving the management larger equity stakes and bound their position to their performances. The operating income variable has already been defined for its effects related to the financial distress theory, but also has influence on the LBO decision when looking from the incentive realignment point of view. High EBITDA normally means above average cash flow and incentive realignment can only work when firms (have the possibility to) raise enough cash flow to invest in positive APV/DCF project or can issue enough debt in the right way. High cash flow firms are according to the incentive realignment theory attractive companies for a LBO.

Also Tobin's q affects the LBO decision because of potential incentive realignment options, next to its affect on costs of financial distress. Firms with a high Tobin's q have overvalued stock prices and few growth options. They are therefore less attractive for investment funds to buyout and the free cash flow theory predicts few incentive realignment benefits. Opler and Titman (1993) indentify one major problem with both the operating income variable and Tobin's q, which comes down to the fact that they influence the LBO decision according to the two theories at the same time and with equal sign. They overcome this problem by creating a dummy variable that indentifies firms that have a low Tobin's q and high Cash Flow, referring to the idea that only companies that have low q and high cash flow are good LBO target candidates (Opler and Titman (1993)). Although their issue is not as important for this research as it is for theirs, because this thesis doesn't aim on the tradeoff between financial distress costs and incentive realignment benefits, the dummy variable is added to the regression nevertheless. The study of Opler and Titman (1993) showed significant p-values for this dummy so it is interesting to check if this result is the same for this research sample period and besides, it is obviously possible that Tobin's q and EBITDA/Total Assets are as single variables not of significance influence on the LBO target decision, but the two combined are. This variable is separated in two dummies, one that has the value one for firms that have a Cash Flow above the sample median and a Tobin's q below the sample median and another dummy that has the value one for companies with low cash flow and a high q. Naturally, these two dummies have opposites signs.

Similar to this dummy variable, one more interaction dummy variable is constructed to measure the combined effect of the tradeoff between diversification and low Tobin's q on the LBO target firm decision. This is the dummy that measures for firms that are diversified and have a low Tobin's q. These firms are expected to have more incentive realignment benefits, because diversified firms can be improved by specializing and low Tobin's q means they've undervalued stocks.

As for the diversification index, this variable is a ratio that measures the extent to which a company is diversified by dividing the total number of industries (indentified by SIC codes) a firm is active in by the total number of industries an organization can classify for. Advantage of this measure technique is that it is rather simple to compute and the necessary information is easily accessible, main disadvantage of the technique is that it doesn't correct for the market share of firms.[8] The prediction is that highly diversified firms can perform better by divesting their least performing divisions and specialize in the best performing divisions. This makes them attractive for investment funds to buyout, thus increases the free cash flow benefits. Although diversified companies appear to be attractive LBO target firms, large companies aren't. LBO's have limits on size, even considering the extremely high prices paid, and the greater a company is, the more reluctant PE funds will be to perform a LBO. Therefore another variable is constructed to correct the diversification index for company size, measured by the natural logarithm of the firms' total assets. The sign of this variable will be uncertain because it most certainly correlates with diversification, which is positive, and on the other hand has a negative effect due to limits on financial resources for LBO's.

New added variables

Next to the variables inspired on the study of Opler and Titman (1993), new variables are introduced to investigate whether or not their influence the LBO target firm decision. These variables can also be based on the incentive realignment theory or the financial distress theory.

First new variable introduced in this paper is the debt-to-equity ratio, which measures the proportion of debt in a firm expressed as a multiple of the quantity of equity. The higher this ratio turns out to be, the more the target firm is financed with leverage. Consequently, the PE fund has les opportunities to lever up and will experience fewer benefits due to leverage. The

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[8] A weighted index like the Herfindahl index would be superior to the measure used, but far more difficult to calculate. Next to this, there are little industries that have a monopolist or some firm that occupies more than 50% of the market share. (http://www.econlib.org/library/Enc/Monopoly.html)

D/E ratio therefore is expected to have a negative effect on the LBO target's attractiveness, consistent with the financial distress theory.

In the regression will also be tested for the effective tax rate of a company. A high effective tax rate could indicate that the target firm doesn't maximize the tax shield and large tax benefits could be realized by using a larger proportion of leverage. The tax benefits from leverage are a well established phenomenon in the financial and academic world and substantiated by Miller & Modigliani (1958) and others.

The Working Capital variable is added to the model because it is a well known aspect of corporate financing that maximizing the working capital reduces liquidity problems. Firms that have low working capital or even a deficit of it need to finance their shortage in working capital with interest-bearing debt, which on its turn increases the risk of financial distress. The Working capital is scaled to the total capital value on the credit side of the balance sheet, which is equal to the total asset value of a firm. By measuring for a working capital percentage of total capital, the size effect of companies is eliminated. This size effect is already imbedded in another variable and should be of no influence on the question whether or not Working capital influences the LBO target firm decision.

A very common measure to investigate whether or not a company creates value instead of just redistributing it or even destroy value is to compare the Return on Invested Capital (ROIC) with the Weighted Average Cost of Capital (WACC). If ROIC is higher than the WACC then the firm invests in profitable projects and is able to fully compensate the expected returns of its financial sponsors and even retain earnings. This means the company creates value. If the firm fails to get a ROIC higher than the WACC, management has to divest low ROIC projects and search for new, more profitable investments. Large incentive realignment benefits can be realized when the ROIC is lower than the WACC by better corporate management, which makes a firm with low ROIC a more attractive LBO target firm. If a company fails to create value, one reason for this could be that the firm is too diversified and value creating divisions compensate for the value destroying ones. In this case, management could decide to specialize more into one or a few areas, by divesting the non-profitable divisions. To fully understand the LBO target firm decision, not only the ratio between ROIC and WACC is tested but also these financial criteria separated. I.e. a high ROIC could be attracting enough for investors to conduct a LBO, making the effect of WACC in the ratio spurious.

Another dummy is added to the model which is also based on the Incentive Realignment theory, a variable that measures firms that have above median sales level, below median cash flow and below median cost of capital (WACC). The expectation is that firms that fit in this characteristic,

and therefore will acquire the value 1 for this dummy, fail to make good profits with the high sales they generate due to mismanagement. A low WACC, high sales but low profits could indicate managers don't have the proper drive to maximize profits and margins and stick with compensating their providers of capital. An industry correction might be necessary to get good results on this relationship to the LBO target firm decision, because margins do vary across different industries.

Last new variable introduced is a variable that measures the difference between the Market Value of a firm and its Enterprise Value net of debt. Technically, these two financial components should be equal so the difference should than be zero. If, however, the market misprices the concerning company, a difference between the market value of equity accordance to the DCF model and the market value based on the stock price multiplied with the total number of stocks occurs. If the variable is positive, the stock (and therefore the company) is overvalued and not an interesting LBO target firm. If the opposite is the fact then the firm is clearly undervalued the PE fund can benefit from this. Because of this effect, the variable is expected to have a negative sign and will negatively affect the LBO target firm decision. Large cost of financial distress could be expected when an overpriced firm is bought and it would certainly mean a depreciation of the investment portfolio for the PE fund, which on its turn causes trouble financing the assets.

Table I – *Proxies for Determinants of the LBO target firm choice*

Variable	Measure	Theory	Expected Sign
Operating Income/assets	EBITDA/Book Value of Assets	Incentive realignment theory	Positive
		Financial distress theory	Positive
Tobin's q	Enterprise Value/Total Assets	Incentive realignment theory	Negative
		Financial distress theory	Negative
Machinery industry dummy	1 if SIC = 3400 till 4000	Financial distress theory	Negative
R&D expense	R&D expenses / sales and selling exp / sales	Financial distress theory	Negative
Selling expense	Selling, general and administrative expenses / net sales revenue	Financial distress theory	Negative
Diversification index	Number of SIC codes / Total SIC codes	Incentive realignment theory	Positive
		Financial distress theory	Negative
Log of assets	Size of the firm. Logaritmus naturalis of the total assets.	Financial distress theory	Negative
High cash flow x low Tobin's q	Dummy that has the value 1 when firm's cash flow is above median and Tobin's q is below sample median	Incentive realignment theory	Positive
Low cash flow x high Tobin's q	Dummy that has the value 1 when firm's cash flow is below median and Tobin's q is above sample median	Incentive realignment theory	Negative
Diversified x low Tobin's q	Diversification index combined with below median Tobin's q	Incentive realignment theory	Positive
D / E ratio	Total debt / Total equity (book values)	Incentive Realignment Theory	Negative
WACC	Weighted average cost of capital	Financial distress theory	Negative
Tax rate	Effective tax rate	Incentive Realignment Theory	Positive
Working Capital	Current assets – Current Liabilities/Total Capital	Financial distress theory	Positive
ROIC	Return On Invested Capital	Incentive Realignment Theory	Positive
ROIC / WACC	Return On Invested Capital/Weighted average cost of capital	Incentive Realignment Theory	Positive
High sales, low EBITDA, low WACC	Above median Sales, below median EBITDA and below median WACC	Incentive Realignment Theory	Positive
MV / Equity value	Market Value divided (Enterprise Value – total debt) (DCF)	Financial distress theory	Negative

Data

The dataset for the empirical analyses is build up with the use of two databases: Thompson One Banker and Datastream. The main advantage of using these two is that they are highly compatible and use the same encoding. Thompson one banker is used to collect data of (almost) all the leveraged buyouts in de United States between January 2001 and December 2007, which forms the base sample of the research. This sample consists of 227 Private Equity Deals that are considered as a Leveraged Buyout. Potential bias could arise because Thompson One Banker contains not a 100% complete database. This off course is the case for all suppliers of financial data. The control sample is generated with Datastream and contains a group of 1721 companies that were listed in the mentioned period and weren't the target of a buyout or another acquisition form.

The firms of the base sample (the LBO's) must fit the following criteria: the transaction must be announced between January 2001 and December 2007, all target firms must be public firms before the buyout[9], all acquirers must be private companies, the buyout has to be completed and the acquisition technique must be leveraged buyout.

After restructuring and organizing the data in a correct form to fit the model the data looks as follow:

Table II – *Data structure*

Company	Year	Variable 1	Variable 2	Variable n
X	2007			
X	2006			
X	2005			
X	2004			
X	2003			
X	2002			
X	2001			

The first variable in the model is the LBO dummy, which indicates whether or not a firm is or went private in a specific year. The other variables are independent in the regression and are expected to influence the LBO variable in some way.

The collected data is imported in the statistical program Eviews to run the regression. Others programs like Microsoft Excel don't have a proper working function to run a Logit or similar binary regression and besides this, Eviews gives opportunities to check for other statistical references about the data. Within Eviews, the data is organized similar to the table above, with

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[9] This means no joint-ventures, subsidiaries, mutually owned companies, or government held firms.

the addition that each variable is separated and contains all information of the buyout sample as well as the control sample.

Table III shows an overview of the number of leveraged buyout in each year of the data sample. The years 2002 and 2003 had relatively few LBO's and most of the observed buyout took place in the year 2007.

Table III: Number of going private transactions in each year

Year	Number of LBOs
2001	*25*
2002	*8*
2003	*9*
2004	*10*
2005	*30*
2006	*48*
2007	*97*
7 Years	*227*

Hypothesis summarized

Section III described the methods and techniques used, containing the regression technique, the data collection and the variables used. To find company characteristics that have influence on the LBO target firm decision, a logit regression will be used that has a dummy variable as output that is 1 when a certain company experienced a LBO and is 0 is it remains public. The variables used are related to the financial distress theory, which risks reduces the LBO attractiveness, the incentive realignment theory, which benefits increase the LBO attractiveness and other variables that are related to well know corporate finance theories. It is expected that there exists a tradeoff between companies' characteristics that increases the chance a firm is being bought out and characteristics that decrease this chance. To find out which variable have an effect on the LBO target decision and till what extent, the multivariate logit regression is computed. The hypotheses are:

(1) Variables that proxy for financial characteristics that increase free cash flow benefits or do not increase financial distress costs, positively affects the probability a public company becomes LBO.

(2) Variables that proxy for financial characteristics that do not increase free cash flow benefits of increase financial distress costs, negatively affect the probability a public company becomes LBO.

IV.   Empirical Results

Table IV presents an overview of descriptive statistics of the total sample, the LBO companies and the non-LBO firms. All variables introduced in section III are shown in the first column, presenting the Mean, Median, Standard Deviation and Number of observations in the columns right to it. The overview provides good information about the core differences in financial characteristics between companies that went private and companies that did not. Some observed descriptive statistics report obvious differences between LBO firms and public firms, i.e. R&D expenses has a LBO mean of 17 and a non-LBO mean of 170. Some financial characteristics although require more accurate analysis to uncover significant differences between LBO and non-LBO companies. Also notable are the counts of observed values for each variable. Observed value counts are the sum of observations for each company for each of the 7 years (like in Table II). Some variables report observed values for (almost) all the companies and year, while a variable like R&D expenses only report half of the possible observations as a value. This is caused by lack of available data in the selected databases TOB and Datastream and cannot be solved within the limits of this research.

The means are compared using a Two Sample T-test in Table V. The medians could be compared with statistic testing, but aren't because the medians of dummies are hard to interpret and an analysis of them would provide little value added to the T-test. The outcome values and the significance of them are reported in Table V, where T values are tested for significance on a 5% level. Eleven of the nineteen variables are reported to be significantly different for companies that went private and companies that stayed public. These variables are: Operating Income / Assets, Tobin's q, the machinery industry dummy, R&D expenses, Selling expenses, the Diversification index, the logarithm of Total assets, the diversification x low q dummy, WACC, Working capital/Total capital, ROIC, and the high sales x low ebitda x low wacc dummy. All of those eleven variables indicate that there exists a difference between companies that are LBO and those that stay public in their financial characteristics. Negative T-values suggest that the average of LBO firms is *lower* the average of non-LBO firms, while positive T-values suggest the opposite.

Table IV: Descriptive Statistics of complete sample, LBO firms and non-LBO firms; reporting mean, median, standard deviation and number of counted observations

Descriptive Statistics	All				LBO				Non-LBO			
	Mean	Median	St Dev	N	Mean	Median	St Dev	N	Mean	Median	St Dev	N
Oper. Income	0.045	0.115	4.746	11239	-0,605	0,108	15,848	1005	0,109	0,116	0,222	10234
Tobin's q	1.723	1.198	8.439	10960	2,408	0,980	27,967	954	1,658	1,222	1,861	10006
M. Ind. Dum.	0.217	0.000	0.412	13636	0,181	0	0,385	1589	0,222	0,000	0,416	12047
R&D Exp	157.034	16.304	612.963	6462	17,993	0,728	53,761	560	170,226	18,832	639,607	5902
Selling Exp	899.770	184.944	2781.85	10933	282,451	78,720	752,781	1019	963,221	204,064	2903,936	9914
Div. Index	0.005	0.004	0.003	13636	0,004	0,003	0,002	1589	0,005	0,004	0,003	12047
Log Assets	7.446	7.434	1.916	11916	6,019	6,001	2,033	1038	7,582	7,560	1,848	10878
High CF x Low q	0.749	1.000	0.434	10960	0,751	1,000	0,433	954	0,748	1,000	0,434	10006
Low CF x High q	0.023	0.000	0.151	10960	0,031	0	0,175	954	0,023	0,000	0,149	10006
Div x Low q	0.370	0.000	0.483	10960	0,222	0	0,416	954	0,384	0,000	0,486	10006
D/E ratio	0.428	0.354	1.136	11804	0,444	0,372	0,918	1036	0,426	0,353	1,155	10768
WACC	9.600	8.529	28.125	8679	4,448	7,214	53,530	627	10,001	8,645	25,052	8052
Tax Rate	36.864	34.403	120.627	9462	38,493	36,585	77,648	687	36,737	34,178	123,363	8775
Work Cap	0.271	0.262	0.642	9613	0,224	0,179	0,541	903	0,276	0,267	0,652	8710
ROIC	6.160	8.100	66.193	11391	-0,526	5,589	45,506	980	6,789	8,306	67,784	10411
ROIC/WACC	1.108	1.034	2.321	8657	1,012	1,000	2,467	626	1,115	1,040	2,310	8031
Sales,ebitda,wacc	0.067	0.000	0.251	13636	0,040	0	0,195	1589	0,071	0,000	0,257	12047
MV/EV	0.682	0.893	14.112	10681	0,530	0,888	15,469	824	0,694	0,893	13,994	9857

Table V: 2-sample T-test; values and significance

Variables	T-value LBO-nonLBO	P value
Oper. Income	-4,5505	0,0000*
Tobin's q	2,6253	0,0088*
M. Ind. Dum.	-3,9873	0,0001*
R&D Exp	-5,6301	0,0000*
Selling Exp	-7,4574	0,0000*
Div. Index	-20,7436	0,0000*
Log Assets	-23,8412	0,0000*
High CF x Low q	0,1413	0,8877
Low CF x High q	1,5158	0,1299
Div x Low q	-11,2829	0,0000*
D/E ratio	0,5960	0,5513
WACC	-4,7683	0,0000*
Tax Rate	0,5419	0,5880
Work Cap	-2,6880	0,0073*
ROIC	-4,5768	0,0000*
ROIC/WACC	-1,0100	0,3127
Sales,ebitda,wacc	-5,8016	0,0000*
MV/EV	-0,2944	0,7685

To test which financial characteristics influence the LBO target firm decision, a Logistic regression is run with the LBO dummy as dependent variable and the financial characteristics as explanatory variables. Unfortunately, there appear to be insufficient observations for the variables R&D Expenses, Tax Rate, WACC and ROIC/WACC. Too less observations causes a loss of explanatory power or even failure to create coefficients. The variables R&D Expenses, Tax Rate, WACC are therefore eliminated, not to be tested for. ROIC/WACC is replaced by an estimator of ROIC alone, which has reliable and sufficient observations. Also two models are constructed in order to get better insights in the effect of the new variables on the LBO probability, having one model containing the variables introduced by Opler and Titman (1993) and another one including also the remaining 5 new variables. These models are named Model A and B and are displayed in Table VI below. Within these two regressions, coefficients will be marked with one asterisk when they are statistically significant on a 10% level and with two asterisks when they are significant on a 5% level.

Table VI: Logistic Regression

	Model A		Model B	
Variable	*Coefficient*	*p-value*	*Coefficient*	*p-value*
Intercept	-1.007298	0.1081	-1.299777	0.1378
Operating Income / Total Assets	-0.235648	0.2152	1.681959	0.0383**
Tobin's q	-0.014217	0.6684	-0.156905	0.1459
Machinery Industry Dummy	0.144999	0.6300	-0.266150	0.4575
Selling Expenses/sales	-0.002009	0.0723*	-0.003025	0.0338**
Diversification	-0.346089	0.0115**	-0.419786	0.0085**
Log of Assets	-0.448616	0.0000**	-0.312667	0.0207**
High cash flow, low q	-0.301299	0.3507	-0.673110	0.0879*
Low cash flow, high q	0.598094	0.1822	1.572198	0.0048**
Diversified, low q	-0.226972	0.0338**	1.555328	0.0074**
D / E ratio	-	-	0.079671	0.4590
Working Capital	-	-	0.095755	0.8027
ROIC	-	-	0.00304	0.9343
High Sales, low EBITDA, low WACC	-	-	-0.501677	0.6280
MV / Equity Value	-	-	0.001852	0.8665
Sample size – no LBO	9381		8057	
Sample size – LBO	62		46	
McFadden R²	0.193649		0.134380	

Model - A

A multivariate logit regression of Model A reports the coefficients of all variables fitting the model. This means one variable had to be excluded, because it disturbed the logit model. This leaves us with 9 variables and an intercept to investigate which financial characteristics are important in the LBO target firm decision. Those 9 variables are the ones introduced in the work of Opler and Titman (1993) except R&D expenses. First of all; operating income/assets, machinery industry dummy and both the interaction dummies between cash flow and Tobin's q report opposite signs to their theory based predictions in Section III. The concerning coefficients are also not significant, meaning that the regression provides no empirical evidence for the theoretical prediction that these 4 variables influence the LBO probability.

The estimation shows no significant result for Tobin's q as a variable of influence on the LBO target firm decision. It does however provides significant results for the (negative) effect of Selling Expenses, Log of Assets and the Diversification index, confirming the prediction of the Cost of financial distress theory. The signs of these coefficients also match the theory, but the sign of Selling Expenses is opposite to the results of the 1980-1989 sample investigated by Opler and Titman (1993).

The combined effect of diversification and a low Tobin's q on the probability a firm goes private is expected to be positive according to the Incentive realignment theory. Model A also shows a positive and significant coefficient of this variable, indicating that diversified firms with low q are more attractive to PE funds to buyout. Opler and Titman (1993) found opposite combined effect of these variable, but with less significance and obviously theory contradiction.

Most notable, next to the significant variables, of this model is that none of the variables related to Tobin's q can be considered to have significant influence on the LBO probability, while these variables are most important to the results of the research by Opler and Titman (1993). This difference could indicate a shift in the consideration of Private equity firms from Tobin's q to in example the measure of diversification of a firm.

Model A has a McFadden R^2 of 0.193649, which makes the model a fair interpreter of the effect on the LBO probability.[10]

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[10] A justification for the use of McFadden R^2 can be found in the publication of Sieben and Linssen (2009)

Model - B

Model B is a logistic regression of all the variables introduced in section III, except again R&D Expenses, WACC and Tax Rate and with ROIC replacing the proxy of value creating power ROIC/WACC. It contains the 9 variables from Model A plus 5 new variables[11] and a constant.

Just like Model A, this regression model has coefficient signs opposite to their effect predicted by the theories. Again, the two dummies of Cash flow and Tobin's q show effects different from what could be expected from the theories. Also the Debt-to-Equity ratio, the Market Value to Equity Value and the dummy measuring above median Sales, below median EBITDA and below median WACC, report opposite signs to their underlying theories.

The Operating Income/Assets variable has a significant positive effect on the LBO probability on a 5% level. It had a non-significant effect in Model A, so the variable becomes more important when the model it is in expands. This could be due to the fact that none of the variables that are in Model B but aren't in Model A, have a significant effect on the probability a firm goes private and other variables get more influential.

Tobin's q and the machinery industry dummy show non-significant effects, the same as in Model A. However, the sign of the machinery industry dummy is opposite to its sign in Model A, being now equal to its effect predicted by the Financial distress theory. Most likely this difference occurs because of the large standard errors reported for this coefficient and off course the fact that the coefficients are non-significant.

Selling Expenses, the Diversification Index and the Firm size were expected to have a negative effect on the LBO probability by the Financial distress theory and do report significant negative effects on a 5% level. Because these variables were also significant in the first model, there is strong evidence of the theory that high selling expenses, high level of diversification and large firm size have a negative effect on the probability a firm goes private due to a LBO. As for the firm size; not only do the empirical results support the theory, observing the deal values of the LBO's in the research sample does. Observing deal values shows that only 15 of the 227 buyouts had a deal value more than 10 billion and the largest buyout had a value of 40 billion. In comparison; large corporate M&A's often have a value that is much bigger than 40 billion and appear more frequent.[12] This shows that LBO's are limited by PE firms' financial resources, without ignoring the possibility that also corporate acquisitions might be limited in financing

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[11] See Section III – Variables – New Variables for a description of the variables that are called "new variables" and the reason why they are called this way.
[12] I.e. In the same period as these LBO's, large corporate acquisitions like Fortis/Santander/RBS – ABN Amro ($70billion) and Inbev – Anheuser Busch ($52billion) took place.

their investments and experience a negative relationship between the acquisition odds and the target firm's size.

Although the Incentive realignment theory predicted opposite effects of the two Cash flow x Tobin's q dummies, their coefficients appear significant on a 10% and 5% level in the estimate of Model B. Their signs are not only opposite to the underlying theory, but also to the results of Opler and Titman (1993). With this in mind, it becomes hard to interpreted the results of those two dummies, most certainly because in this regression, the separated cash flow and collateralizability variables report the expected effects. The variable measuring the combined effect of highly diversified firms and that have a low q has a positive effect, significant on a 5% level. This gives more support to the Incentive realignment theory forming the variable.

The explanatory power of Model B is 0.134380, according to the McFadden R^2. This is lower than that of Model A, although this regression includes more variables. Reason for this is the reduction of observation due to the addition of new variables. For instance, the observed firms that went private in a certain year reduce from 62 in Model A to 46 in Model B. Nevertheless Model B provides a decent explanatory power.

V.   Conclusion

This research investigates the incentives of private equity firms for doing a Leveraged Buyout, by comparing companies that undertook a Leveraged Buyout in the period between January 2001 and December 2007 and the firms that stayed public. Based on a mean comparison and two regression models with a total of 15 variables, the results suggest that there are costs of financial distress that decrease the possibility a public company becomes LBO and incentive realignments benefits that increase this possibility.

A 2-sample T-test on the variable means of LBO and non-LBO companies report that there exists great difference of i.e. profitability, growth rate and financial management between the two samples. Most striking are those differences of the values, although not all of the reports are consistent with the theory expectation.

Consistent with the incentive realignment theory, this research's logistic regressions provide evidence for the prediction that companies with high operating income and which are highly diversified in combination with low Tobin's q are more likely to be LBO than other firms. It is also more likely that firms that are not LBO have high cash flow in combination with low Tobin's q and companies with low cash flow and high Tobin's q are more attractive to be LBO, although those results are not consistent with the incentive realignment theory.

The regression results suggest that firms with high selling expenses, a high rate of diversification and that are relatively large are less interesting for PE funds to buyout, consistent with the financial distress theory. This supports the idea that financial distress costs reduce the probability that a public firm goes private due to a LBO.

Because this research provides strong indications for the financial distress theory and the incentive realignment theory, it suggests that debt financing is most important for PE funds to complete their LBO acquisition. There are potential benefits and costs related to highly leveraged transactions that are not relevant for acquisitions supported by relatively much equity.

Although this paper provides strong evidence for the theories and results suggest that private equity funds do chose their LBO target firm based on financial characteristics, additional research is needed to fully explain the motives of PE funds for doing LBO's. Some effects of variables aren't supported by the theories in this paper and some effects couldn't be tested. It might be possible that variables not tested in the regression are of influence on the probability a company goes private, but their effects were not identified due to a lack of available data.

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- Leveraged buyouts
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- Free cash flow benefits
- Costs of financial distress
- Logistic regression
- Two-sample t-test
- Log odds
- Thompson one banker
- Datastream
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- Mean
- Median
- Standard deviation
- Probability
- McFadden R^2