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Access to Capital and its Effect on Capital Structures, Leverage Deficits, and Acquisition Probabilities

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Access to Capital and its Effect on Capital Structures, Leverage Deficits, and Acquisition Probabilities

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Abstract

By using a large sample of Norwegian public and private firms, we study the effect of access to public equity markets on the firm's capital structure, leverage deficit, and acquisition probability. We find that publicly listed firms use less debt financing compared to private firms and conclude that this is driven by the higher costs of asymmetric information facing unlisted firms. Next, we provide evidence that both types of firms have target capital structures and show that access to capital enables listed firms to rebalance their leverage ratio quicker towards this target compared to unlisted ones. Finally, we present evidence against the free cash flow theory as we find that underleveraging significantly reduces the likelihood of undertaking acquisitions. We show that access to capital has no significant effect on this relationship between the leverage deficit and the acquisition probability.

JEL Classification: G32; G34

Keywords: Financing; Capital structure; Leverage deficit; Financial frictions; M&A

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1. Introduction

In 1958, Franco Modigliani and Merton Miller showed that the capital structure of a firm is irrelevant to the firm's market value under certain strict assumptions (Modigliani & Miller, 1958). Since the introduction of this 'capital structure irrelevance proposition', extensive research has been devoted to relaxing the assumptions imposed by Modigliani and Miller and several theories have been established explaining the real effects of capital structure. More recent studies show that the existence of market imperfections such as taxes, agency costs, and information asymmetries indicate that capital structure matters (see, for instance, Kraus and Litzenberger, 1973; Jensen and Meckling, 1976; Myers and Majluf, 1984; or Graham and Harvey, 2001). Interestingly, the exposure to some of these market imperfections varies across firms of different listing statuses. For instance, by going public, firms can alter their exposure to financing frictions such as information asymmetries and agency problems (Brav, 2009). Consequently, the financial policies of firms should vary depending on their listing statuses.

Several capital structure theories have been established based on the aforementioned market imperfections. The traditional trade-off theory suggests that the tax benefits of debt should be balanced against the bankruptcy penalties of debt to arrive at the optimal, or target, leverage ratio. Conversely, the pecking order theory posits that there is no such thing as a target leverage ratio, but that the capital structure of a firm is merely a results of the firm's cumulative efforts to finance its investment opportunities while minimizing the costs of asymmetric information. Finally, agency theory introduces the problem of costly agency conflicts to the financing decision. All theories offer testable predictions regarding the financial policy of the firm, and we will show that these theories must be taken together in explaining the observed financing behavior.

In addition to addressing the effects of access to capital on the observed capital structures, we analyze the effect of access to capital on a firm's tendency to deviate from its predicted target capital structure. Such leverage deficits have also been shown to impact other aspects of the firm's financing behavior, for instance major acquisition decisions (Harford, Klasa, & Walcott, 2009; Uysal, 2011). This is particularly true if the firm is financially constrained, such that raising external capital to finance investment opportunities becomes more challenging. As going public will reduce these capital constraints, we expect that the effect of leverage deficits on acquisition probabilities will vary with the listing status of the firm.

The overwhelming majority of empirical research in corporate finance concerns publicly listed companies due to a lack of available data on privately held firms. As a result, there are gaps in our knowledge about the financing behavior of private firms, which are just recently being addressed by a small but growing body of corporate finance literature comparing firms of different listing statuses[1]. Our thesis aims to contribute to this research by establishing a link between access to capital and the firm's capital structure, leverage deficit, and acquisition behavior. Privately held firms are subject to greater financing frictions, implying that their cost of capital should be high compared to that of listed companies (Faulkender & Petersen, 2006; Brav, 2009). This should lead to differences in the financing behavior of private and public firms, introducing several important questions that the existing literature fails to address. First, we investigate the effect of access to public equity markets on the characteristics of capital structure. Specifically, we ask: (1) Does the leverage ratio of private companies differ systematically from that of public firms? (2) Can the findings in the existing literature on the determinants of leverage among public firms be extrapolated to private firms? Next, firms' actual debt ratio does not always correspond to their optimal debt ratio, leading to a leverage deficit[2]. The persistence of deviations from the target leverage ratio is likely to be affected by a firm's ability to access external capital markets. We therefore ask: (3) Is the leverage deficit of private firms systematically different from that of public firms? Moreover, leverage deficits are likely to influence other financial aspects of the firm, such as major investment decisions (Harford et al., 2009; Uysal, 2011). Finally, we therefore investigate how leverage deficits impact capital intensive investments: (4) How do deviations from the target capital structure influence the acquisition probability of a firm, and are there significant differences between private and public companies? We address these questions by using a sample of Norwegian private and public firms provided by the Centre for Corporate Governance Research (CCGR) at BI Norwegian Business School.

Our thesis presents evidence that there are important differences in the financing behavior of the two types of firms. We show that private firms use more debt financing in their capital structure compared to their public counterparts, answering question 1 above. Since access to public equity markets reduces the degree of information asymmetry between insiders and outsiders of the firm, the cost of

[1] For instance, see Brav (2009) or Gao, Harford, & Li (2014).

[2] The leverage deficit is measured as the difference between the actual capital structure and the target capital structure (Hovakimian, Opler, & Titman, 2001).

equity is lower for public firms than for private ones. This lower cost of equity leads listed firms to use more equity financing in their capital structure compared to unlisted firms. Moreover, in answering question 2, we show that the existing findings on the determinants of leverage among public companies cannot be extrapolated to private firms. Rather, since private firms are far more exposed to the problems of asymmetric information compared to their public counterparts, the pecking order theory will be better able to predict their financing behavior as compared to the trade-off theory, which is more applicable to public firms.

However, we also show that the traditional capital structure theories must be taken together when explaining the financial policy of a firm. While the pecking order theory is found to be more appropriate among privately held firms, it cannot fully explain their financing behavior. Rather, the trade-off theory has to be taken into account when analyzing these firms as well. Specifically, we present evidence that both types of firms rebalance their leverage ratio to meet their predicted target, as predicted by the trade-off theory. We also show that the higher cost of equity facing unlisted firms leads their rebalancing costs to be higher, and the speed of adjustment towards the target is therefore lower for private firms than for public ones. To answer question 3, these findings indicate that the leverage deficit of private firms is significantly more persistent that the leverage deficit of public ones.

Finally, when addressing question 4, we find that using too little debt in the capital structure leads to a lower probability of undertaking acquisitions. This finding provides surprising evidence against the predictions of the free cash flow theory and the financial synergies hypothesis, as both theories would suggest the opposite relationship when interpreted in their strictest sense. However, the arguments underlying the free cash flow theory may be in accordance with our findings. Specifically, most M&As are financed with external funds (Opler, Pinkowitz, Stulz, & Williamson, 1999) and since too little debt leads to inefficient investment levels by managers, these managers should find it more difficult to raise external capital to finance their M&A opportunities. We also show that access to public equity markets has no significant effect on the interdependence of leverage deficits and acquisition probabilities.

Our study contributes to the existing corporate finance literature in two primary ways. First, we contribute by closing the knowledge gap on the differences in the financial policies of private and public firms. In particular, we present novel evidence that access to public equity markets is an important determinant of leverage deficits and the readjustment efforts of a firm. Second, building on the

analyses of Harford et al. (2009) and Uysal (2011), we contribute by expanding our knowledge on the effect of leverage deficits on acquisition probabilities, and we believe this study to be the first ever to address the differences between private and public firms with respect to this interdependency.

The rest of this paper proceeds as follows. Section 2 summarizes the existing literature. In Section 3 we present our theoretical framework, and commence by describing the main differences between private and public firms before developing the hypotheses to be tested. The empirical methodology is described in Section 4. For the reader's convenience, we divide the section into three parts, one for each of the three topics: (1) Access to capital and capital structure; (2) Access to capital and leverage deficits; and (3) Access to capital and the effect of leverage deficits on mergers and acquisitions (M&As). In this section we also describe the robustness checks to be conducted. Section 5 describes the data sources and samples, and presents a preliminary analysis using the summary statistics. Section 6 presents the empirical analysis and the main results. Again, we divide the section into three parts according to the main topics. Section 7 concludes the thesis. The bibliography is provided in Section 8, and the appendices provide an overview of the variable definitions (A.1), along with tables that include the full regression results[3] (A.2).

2. Literature Review

Our review of the existing theories and literature consists of five parts. First, we summarize the main capital structure theories. Second, the established determinants of capital structure are described. Third, we review the discussion on the existence of a target capital structure. Next, the literature describing the interdependence of target capital structures and acquisition decisions is summarized. Finally, the proposed determinants of acquisition probabilities are reviewed.

2.1. Capital Structure Theories

Modigliani and Miller (1958) shows that the capital structure of a firm is irrelevant to its market value under the assumption of perfect and frictionless capital markets. Specifically, the article assumes the absence of taxes, transaction costs, bankruptcy costs, agency costs, information asymmetries, and that investors and companies can borrow at the same interest rate (Brigham, Ehrhardt, & Fox, 2016).

[3] We do not report the results for industry and year dummies in the regression tables provided in the main analysis section due to space implications. Instead, we present these in Appendix A.2.

However unrealistic these assumptions are in the real world, the article establishes the conditions under which capital structure is irrelevant. As such, it presents a baseline model from which we can relax the assumptions in order to analyze the real effects of leverage decisions on firm valuations. As Myers (2001) points out, there are three prime reasons why capital structure should matter: taxes, information asymmetries, and agency costs. These financing frictions give rise to the traditional theories on capital structure, namely the trade-off theory, the pecking order theory, and the free cash flow theory, respectively (Myers, 2001). We note that there is not one universal theory that can explain the debt-to-equity decision of a firm, but rather that the theories must be taken together in an attempt to explain the 'capital structure puzzle' (Myers, 1984; Myers, 2001). In the following sections, we present these theories.

2.1.1. Taxes: The Traditional Trade-Off Theory

When allowing for market imperfections, increased debt levels give rise to both benefits and costs that influence the value of the firm. The traditional trade-off theory suggests that debt gives rise to tax benefits and bankruptcy penalties which must be balanced against each other when deciding on the optimal capital structure (Kraus & Litzenberger, 1973). Modigliani and Miller (1963) showed that in the presence of corporate taxes, higher debt levels generate valuable tax shields due to the tax deductibility of interest payments. In fact, Graham (2000) shows that firms paying taxes at the full statutory rate can increase firm value by an average of 7.5% by increasing their leverage (Myers, 2001). However, higher debt levels also increase the risk of incurring bankruptcy and reorganization penalties because the firm becomes obligated to service higher debt payments. Threats of financial distress will involve both direct and indirect costs that reduce the present value of the free cash flows to shareholders and thus the value of the firm (Kraus & Litzenberger, 1973). The traditional trade-off theory therefore suggests that firms should increase leverage until the marginal costs of financial distress just offset the marginal tax benefits. This trade-off leads companies to target a specific debt ratio which maximizes firm value.

2.1.2. Asymmetric Information: The Pecking Order Theory

In contrast to the trade-off theory, the pecking order theory does not support the hypothesis that firms target a specific capital structure. Rather, the theory suggests that financing behavior is determined by the firm's cumulative need to finance

investment opportunities. The theory suggests that financing frictions such as transaction costs and information asymmetries cause firms to raise capital in a particular pecking order (Myers & Majluf, 1984; Myers, 1984). Asymmetric information and transaction costs increase the cost of capital, so firms will choose to raise funds using the securities that minimize the exposure to these frictions. First, because asymmetric information between managers (insiders) and investors (outsiders) regarding firm value is relevant only when raising external financing, internally generated funds (i.e. retained earnings) will be preferred to debt and equity issuances. Second, because the costs of information asymmetry increase with the riskiness of the security, firms will use debt financing rather than equity, conditional on raising external funds. Hence, the theory suggests firms will prefer to use internal financing over external, and debt before equity if issuing securities. When capital is needed for investments, funding will be raised according to this pecking order, and hence, the capital structure will be a result of firms' cumulative financing efforts, rather than of attempts to maximize firm value (Myers, 1984; Myers, 2001).

2.1.3. Agency Costs: The Extended Trade-Off Theory

Jensen & Meckling (1976) extend the trade-off theory, arguing that agency costs are important determinants of capital structure. The authors define the agency relationship as a contract under which a principal (e.g. the shareholders) hires an agent (e.g. the managers) to perform some service which involves making decisions on behalf of the principal. When both parties are utility maximizers and their interests are not aligned, this relationship may give rise to costly agency conflicts. Both equity and debt financing give rise to costly conflicts of interest between stakeholders which must be balanced against each other, alongside the tax benefits and bankruptcy penalties described above.

The agency costs of equity are related to the shareholders' monitoring of the manager, the manager's bonding efforts with the shareholders, as well as residual losses due to a divergence between the interests of managers and shareholders (Jensen & Meckling, 1976). In particular, using too much equity gives rise to the 'free cash flow problem' (Jensen, 1986)[4] whereby managers will prefer to maximize their own utility by spending free cash flow on perquisites and inefficient growth initiatives rather than redistributing cash flow to owners, because growth

[4] The free cash flow theory (Jensen, 1986) is often used to extend the traditional trade-off theory to incorporate agency costs it the model and will presented as such here.

fosters power and increased job security for the manager. These agency costs of equity will reduce the value of the firm but can to some extent be mitigated by increasing the debt ratio. For instance, debt has the benefit of reducing agency problems of free cash flow because higher debt service requirements reduce the incentives of managers to squander excess cash on perquisites and overpriced acquisitions. Rather, managers must use the cash to repay debt, as not doing so would lead to bankruptcy and the loss of the manager's job (Jensen, 1986; Stulz, 1990). Jensen (1986) refers to this as the 'control hypothesis for debt creation', whereby debt can replace dividends as a means to redistribute cash flow to owners while ensuring an alignment of managers' and shareholders' incentives. This is the main point of the free cash flow theory.

However, the control effects of debt must be balanced against the agency costs of debt. These include monitoring and bonding costs, bankruptcy and reorganization costs, as well as costs associated with 'the incentives effect of debt' (Jensen & Meckling, 1976). The latter point refers to 'the wealth expropriation hypothesis', i.e. the theory that when firms are financed almost entirely with debt, managers (acting in the interest of shareholders) may become incentivized to expropriate wealth from bondholders to shareholders, for instance by investing in more risky projects when facing financial distress. When confronted with financial distress, shareholders will benefit from riskier projects because these offer higher potential payoffs while it is the bondholders that will carry most of the increased risk (Jensen & Meckling, 1976). In contrast, bondholders will not benefit from the increased cash flows, yet their funds will be lost should the project fail. This leads to 'risk shifting' and a transfer of wealth from bondholders to shareholders, and so there are potential agency conflicts not only between managers and outsiders, but also between shareholders and bondholders[5].

Hence, in considering the optimal level of debt there is a trade-off between the agency costs of equity and the agency costs of debt. As such, Jensen and Meckling (1976) argue that the total agency costs will vary with the capital structure of the firm, and again, the optimal capital structure exist where the marginal costs equals the marginal benefits of debt.

[5] Note that we do not cover all sources of agency costs and wealth expropriation here. The interested reader should look up the 'debt overhang problem' as described by Myers (1977) or review the full summary of agency conflicts in Myers (2001).

2.1.4. Agency Costs: Under- and Overinvestment

Stulz's (1990) article on 'the agency costs of managerial discretion' is closely related to the free cash flow theory and explains how the use of debt can lead to either over- or underinvestment. The article suggests that asymmetric information between managers and shareholders leads to inefficient investments by the company which is costly for shareholders. As in the free cash flow theory, managers will always prefer to spend excess cash flow on investments as opposed to redistributing cash to owners, even when projects yield a negative net present value (NPV), because investments increase managers' utility. Thus, managers will never be credible in the eyes of shareholders when claiming that free cash flow is too low to finance positive-NPV projects. Information asymmetries therefore lead to underinvestment in positive-NPV projects when cash is actually insufficient, and overinvestment in negative-NPV projects when cash is abundant.

Due to higher debt service requirements, increasing the leverage ratio will reduce the cash flow available for investments, which lowers the risk of overinvestment but worsens the problem of underinvestment. Vice versa, reducing the leverage ratio leads to more cash flow available for investments, increasing the risk of overinvestment but reducing the problem of underinvestment. Stulz (1990) concludes that this trade-off suggests there must be a unique solution for the optimal capital structure, which will depend on the distribution of the firm's cash flows and on the investment opportunity set available to the firm. For instance, the theory suggests that the value of a cash cow company with few profitable investment opportunities would benefit from adding debt to the capital structure, as managers are more likely to overinvest in such situations. In contrast, the value of growth companies with many investment opportunities but little excess cash would suffer from increased leverage, as managers would have less cash available to finance profitable growth opportunities.

2.2. Determinants of Capital Structure

As mentioned, there are no universal theory explaining the observed financing behavior of firms, and the theories summarized above will offer different predictions as to how characteristics of the firm determine capital structure. In this section, we summarize the determinants which are consistently shown to be correlated with the debt ratio, explaining what signs the trade-off theory and the pecking order theory predict for each determinant, and what signs the literature typically finds. As we shall see, the two main theories are more often than not in

conflict as to what relationship we should expect between a given determinant and the firm's leverage. Frank and Goyal (2009) point out that the trade-off theory is more able to correctly predict the relationships compared to the pecking order theory. Our summary is based on the findings of Rajan and Zingales (1995) and Frank and Goyal (2009), who both highlight asset tangibility, growth opportunities, firm size, and profitability as the four most important determinants of debt ratios for public companies.

2.2.1. Asset Tangibility

First, asset tangibility will reduce financial distress costs because tangible assets are less prone to lose value in the event of bankruptcy. Furthermore, tangible assets are safer and can thus be collateralized when raising debt financing, reducing the risk to the lender and thus the agency costs they incur in the contractual relationship (Rajan & Zingales, 1995). Since the costs of debt are reduced, the trade-off theory predicts a positive correlation between asset tangibility and leverage.

Conversely, the pecking order theory predicts a negative correlation because tangible assets have lower information asymmetry, which reduces the cost of issuing the more information-sensitive security, i.e. equity. Firms with high asset tangibility should therefore use more equity financing relative to firms with intangible assets who should rely more heavily on debt.

The findings of both Rajan and Zingales (1995) and Frank and Goyal (2009) are in line with the predictions of the trade-off theory; There is a positive relation between asset tangibility and debt ratios. We will measure asset tangibility as the ratio of tangible fixed assets to total assets:

$$Asset\ Tangibility = \frac{Tangible\ Fixed\ Assets}{Total\ Assets}$$

2.2.2. Growth Opportunities

Second, in accordance with the free cash flow theory, the ability to invest in growth opportunities declines with the degree of leverage due to the higher debt service requirements. Thus, firms for which many positive-NPV projects are available should limit the use of debt and rely more heavily on equity financing. The trade-off theory therefore suggests a lower degree of leverage for firms with many growth opportunities (Rajan & Zingales, 1995).

In contrast, the pecking order theory predicts a positive relationship because growing firms should accumulate more debt as they finance more and more projects (Frank & Goyal, 2009).

Frank and Goyal (2009) find that growth opportunities are negatively correlated with leverage, which is as predicted by the trade-off theory. The market-to-book asset ratio is the most commonly used proxy for growth opportunities (Frank and Goyal, 2009). However, because the market value of equity is rarely available for private firms, we follow Brav (2009) in using growth in sales:

$$Growth\ Opportunities_t = Growth\ in\ Sales_t = \frac{Sales_t}{Sales_{t-1}}$$

2.2.3. Firm Size

Third, the trade-off theory would suggest firm size to be positively correlated with leverage because larger firms are more diversified and the risk of bankruptcy is thus lower. Accordingly, larger firms can handle more debt before the marginal cost of bankruptcy equals the marginal tax benefits of debt.

Conversely, the pecking order theory would suggest the opposite relationship between size and leverage; Larger firms will tend to be more well-known in capital markets, and so the degree of information asymmetry should decrease with firm size. This makes it less costly to issue information-sensitive securities such as equity (Frank & Goyal, 2009), and so the debt ratio should decrease with the size of the firm.

Rajan and Zingales (1995) find a negative relationship in most G-7 countries but struggle to explain exactly why. On the other hand, Frank and Goyal (2009) find a positive relationship, measuring size differently than Rajan and Zingales (1995). Frank and Goyal (2009) point out that Rajan and Zingales (1995) exclude industry- and year-fixed effects which are likely to materially change inferences; By excluding industry effects, other factors can become insignificant or even change signs. We therefore follow Frank and Goyal (2009) in including industry- and year-fixed effects in our model and in using the natural logarithm of total assets as our proxy for size:

$$Firm\ Size = ln(Total\ Assets)$$

2.2.4. Profitability

Fourth, profitability is found to be an important determinant of capital structure. Again, the capital structure theories are in conflict as to the relationship between profitability and financial leverage. The pecking order theory suggests a negative correlation because higher profitability increases the availability of internally generated funds, which are preferred to external capital (Myers & Majluf, 1984).

The trade-off theory offers several predictions. The traditional theory suggests a positive relationship because profitable firms are less prone to face financial distress and place more value on tax shields (Frank & Goyal, 2009). Consequently, such firms will increase leverage to reap the associated benefits. Depending on the efficiency of the market for corporate control, the agency perspective of the trade-off theory (i.e. the free cash flow theory) predicts either a positive relationship or a negative one. If the market for corporate control is efficient, then increased profitability should lead to higher leverage in order to enforce cash payouts to shareholders. If not, then managers are more likely to squander cash on perquisites, and profitability should be inversely related to leverage (Jensen, 1986).

Rajan and Zingales (1995), as well as Frank and Goyal (2009), find a negative relationship between profitability and leverage, as predicted by the pecking order theory. Frank and Goyal (2009) highlight the prediction of a positive relationship between profitability and leverage as the main empirical weakness of the static trade-off theory. However, other findings suggest that profitability should be excluded as a determinant (Hovakimian et al., 2001; Brav, 2009) because the significant negative relationship shows up empirically not because profitability determines the target leverage ratio, but rather because profitability passively moves the firm away from its target over time with the generation of internal funds (Hovakimian et al., 2001; Brav, 2009). Following Brav (2009), we use return on assets (ROA) as our measure of profitability:

$$Profitability = ROA = \frac{EBI}{Total\ Assets}$$

2.2.5. Fixed Effects: Industry and Time

Finally, Frank and Goyal (2009) add that there are industry-fixed effects so that firms in industries where the median debt ratio is high will have higher debt ratios. There is also a positive relationship between expected inflation and leverage, but this is highlighted as the least reliable determinant of capital structure among the six variables highlighted here. Frank and Goyal (2009) show that omitting these

variables can materially influence inferences on other variables, and we thus include industry- and year-fixed effects in our model specifications.

2.2.6. Additional Control: Risk of Sales

Frank and Goyal (2009) find that the six characteristics above can explain about 27% of the variation in firms' leverage ratios, while adding other control variables proposed in the literature only adds another 2%. Moreover, their review paper shows that the signs and significances of the additional controls are highly dependent on the definitions of debt ratios and on which other control factors that are included in the model. As such, robustness is weak, and we use only the core factors that consistently show up as important determinants of capital structure as controls in our models.

Nevertheless, in a recent PhD dissertation from BI Norwegian Business School, Ignacio García de Olalla Lopez (2014) find that the risk of sales is an additional robust control when analyzing a sample of Norwegian private and public firms from 2000 to 2011 obtained from the CCGR. Since we use a similar sample, we include the risk of sales as an additional regressor to reduce the potential issue of omitted variable bias in our models.

The trade-off theory suggests that riskier firms should use less debt because volatile cash flows increase the probability of bankruptcy (Graham & Harvey, 2001). Conversely, the pecking order theory suggests a positive relationship with leverage because high-risk firms are more likely to have volatile beliefs which can increase the occurrence of adverse selection (García de Olalla Lopez, 2014).

To control for firm risk, we follow García de Olalla Lopez (2014) in using the risk of sales, defined as the standard deviation of growth in sales based on at least three observations during the sample period.

2.2.7. The Role of Access to Capital

We are interested in analyzing the effect of access to public equity markets on the debt-to-equity relationship and will in addition to the aforementioned core controls incorporate the listing status of the firm as a determinant of capital structure. Prior research provides some insights on what to expect.

First, Faulkender and Petersen (2006) have provided evidence that supply-side effects are important determinants of leverage. In analyzing the effect of having access to public bond markets, the study finds that firms with access use 35% more debt on average compared to firms without access, even after controlling for the

traditional determinants of capital structure. Next, Brav (2009) have analyzed the effect of access to public equity markets and find that access to capital is statistically and economically significant in determining firms' leverage ratio. Private firms are constrained in their access to equity, explaining their higher use of debt financing.

Although Frank and Goyal (2009) find no support that the core factors affect leverage differently for financially constrained firms, their paper uses different proxies for financial constraints compared to the two studies by Faulkender and Petersen (2006) and Brav (2009). More importantly, whereas Frank and Goyal (2009) uses a sample of public firms, we have access to a unique sample consisting of both private and public firms, giving us the novel opportunity to use a more appropriate proxy for access to capital, specifically the listing status of the firm.

2.3. The Existence of a Target Capital Structure

The trade-off theory predicts the existence of an optimal capital structure which firms target in order to maximize firm valuation (Kraus & Litzenberger, 1973). Testing the existence of target capital structures often involves testing and comparing the statistical power of the trade-off theory versus the pecking order hypothesis, as the latter theory does not support the existence of an optimal debt ratio. Several studies have done exactly this (e.g. Shyam-Sunder & Myers, 1999; Graham & Harvey, 2001; Fama & French, 2002; Leary & Roberts, 2005), and as Frank and Goyal (2009) argue, the findings of existing studies largely suggest that a universal theory of capital structure would likely have many elements in common with the trade-off theory. In what follows, we summarize the literature supporting the existence of target capital structures.

Graham and Harvey (2001) conduct a survey of 392 CFOs, finding that 81% follow a target debt ratio (either flexibly, somewhat strictly, or strictly). Moreover, they find moderate support for the trade-off theory and little support for the pecking order theory. These findings are supported by Frank and Goyal (2009), who argue that the pecking order theory really struggles with explaining the observed determinants of capital structure and need some further theoretical development to stand on its own. In contrast, five of the six observed determinants are correctly predicted by the static trade-off theory, while the sign of the sixth determinant (profitability) can be correctly predicted by using a dynamic trade-off model in which the debt is allowed to drift within a target range (Frank and Goyal, 2009). Hence, even though the trade-off theory's failure to correctly predict the sign on

profitability is a major fallacy of the theory, this might not be as big of a problem as first suggested (Hovakimian et al., 2001; Frank and Goyal, 2009; Brav, 2009).

Further, Fama and French (2002) find that in accordance with the trade-off theory, the leverage ratio tends to be mean-reverting. However, the authors find the results to be inconclusive because the rate of reversion is "suspiciously low", suggesting an indifference toward target capital structures. In fact, this tendency of debt ratios to deviate from its proposed target for significant periods of time was one of the prime reasons why Myers (1984) presented the pecking order theory as an alternative to begin with. Leary and Roberts (2005) later explain this slow rate of reversion as a result of adjustment costs that make firms rebalance only if the leverage ratio crosses an upper or lower limit, as implied by the dynamic trade-off theory (Fisher, Heinkel, & Zechner, 1989). Additionally, Flannery and Rangan (2006, pp. 499-500) find the adjustment speed to be twice as high as that of Fama and French (2002), stating that: "While one might dispute whether a 30% annual adjustment speed is "slow" or "rapid", it is surely not zero", as should be expected under a strict version of the pecking order theory.

Both Leary and Roberts (2005) and Flannery and Rangan (2006) do, however, lend support to elements of the pecking order theory, in particular the idea that information asymmetries make firms prefer internal over external financing. Similarly, Hovakimian et al. (2001) argue that the pecking order theory can explain financing behavior in the short run, but that firms nevertheless tend to move toward a target debt ratio in the long run, as suggested by the trade-off model. Graham and Harvey (2001) also find that financing policies are largely consistent with the pecking order theory, but that asymmetric information do not explain the behavior as the theory suggests.

Similarly, even though previous literature has measured the predictive performance of the two theories against one another, we expect to find evidence lending support to elements of both theories. For instance, while we emphasize that the existence of target debt ratios is heavily supported by the literature on corporate capital structures, we still expect the pecking order theory to be more relevant when analyzing private firms, because the friction of asymmetric information is much higher in private markets.

2.4. The Leverage Deficit and Acquisition Probability

Firms may encounter random events that will bump them away from their target capital structure (Shyam-Sunder & Myers, 1999), causing the actual debt ratio to

deviate from the target. This introduces what is referred to as a 'leverage deficit', defined as the difference between the actual and the target debt ratio (Hovakimian et al., 2001). Whereas there are vast amounts of research testing the existence of target capital structures and the rebalancing efforts of firms with a leverage deficit, there has been less focus on the interdependence between deviations from target debt ratios and the subsequent acquisition behavior of firms. In this section, we summarize the limited research on the area.

Leverage deficits are interesting because they influence other financial aspects of the firm, such as which securities to issue and what investment opportunities to follow (Fama & French, 2002; Harford et al., 2009; Uysal, 2011). For instance, several studies show that overleveraged firms will be less able to issue further debt, as explained by the 'debt overhang problem' (Hovakimian et al., 2001; Fama & French, 2002). Consequently, overleveraged firms will be more financially constrained, affecting their ability to finance capital intensive investment opportunities (Harford et al., 2009). Uysal (2011) shows that there is a strong relationship between a company's leverage deficit and its acquisition behavior, as too much leverage severely impedes a firm from pursuing acquisition opportunities. Specifically, overleveraged firms will be less likely to make acquisitions; tend to acquire smaller targets; use less cash in financing the deal; and pay lower acquisition premiums. In line with the free cash flow theory (Jensen, 1986; Stulz, 1990), the study also shows that overleveraged firms are more selective in their acquisition choices, as indicated by the positive reaction of capital markets when overleveraged firms announce acquisitions. Similarly, Clayton and Ravid (2002) show that firms with higher leverage ratios tend to make lower bids, making them less likely to win the bidding contest, while Harford et al. (2009) present evidence that a bidder's ex ante leverage deficit is correlated with the degree of equity used to finance deals. Since overleveraging reduces the ability to finance the deal using cash and debt, overleveraged firms will be more likely to use stock issuances.

Furthermore, empirical evidence show that firms rebalance their leverage ratios both before and after undertaking major acquisitions. Whereas Uysal (2011) show that firms will rebalance their debt ratio in anticipation of future acquisition opportunities, Harford et al. (2009) find that firms which have their capital structures altered due to large acquisitions will reverse 75% of the resulting overleverage during the following five years. Both findings are consistent with the existence of target capital structures and illustrate the strong interdependence of leverage deficits and acquisitions decisions.

Closely related to this discussion is the 'the financial synergies hypothesis', introduced by Myers and Majluf (1984). This hypothesis suggests that, given asymmetric information, value is created in mergers and acquisitions (M&As) when a bidder with ample financial slack[6] acquires a target that is too financially constrained to undertake all its positive-NPV opportunities. As the acquirer subsequently funds all the unfunded but profitable investment opportunities of the target, the firms' combined value increases. Thus, bidders should seek out targets which have many growth opportunities but limited financial slack (i.e. firms with the underinvestment problem) and which are subject to information asymmetries such that investors are more likely to undervalue their shares. In sum, the hypothesis would suggest that slack-rich firms are more likely to be bidders and that slack-poor firms are more often targets. Bruner (1988) presents evidence supporting this theory, suggesting that bidders have significantly more financial slack pre-acquisition, while targets have significantly less financial slack ex ante. In a different study, Uysal (2011) find only moderate support for the theory, presenting evidence that overleveraged firms are less likely to be acquirers but that underleveraged firms are not significantly more likely to be acquirers.

2.5. Determinants of Acquisition Probability

In addition to the leverage deficit, prior research shows that several factors are important determinants of the acquisition probability of a firm. Here, we provide a brief summary of the firm characteristics and industry traits which should be related to the probability that a firm undertakes an acquisition.

2.5.1. Growth Opportunities

The acquisition probability is expected to increase with a firm's growth opportunities. Sorensen (2000) suggest that acquirers are typically businesses using M&As to pursue their growth opportunities. Several other studies indicate that growth firms have a tendency to undertake M&As when expanding their operations (Jovanovic & Rousseau, 2002; Van Bekkum, Smith, & Pennings, 2011). As before, we use growth in sales to proxy for a firm's growth opportunities.

[6] By financial slack is meant all cash, marketable securities, and the ability to issue risk-free debt. To some extent financial slack and leverage deficits will proxy for one another.

2.5.2. Firm Size

The literature suggests that the acquisition probability is positively correlated with firm size. First, Uysal (2011) argues that larger firms tend to have better access to external capital markets, making it easier to raise funds on short notice to take advantage of acquisition opportunities. Second, Hovakimian et al. (2001) suggest that larger firms are more likely to be acquirers because they have more diversified revenue streams, leading to less volatile cash flows and thus a greater, and more predictable, generation of internal funds across all states of the economy. Like before, we use log assets to proxy for firm size.

2.5.3. Profitability

Harford (1999) shows that companies with greater internal cash flow generation are more likely to undertake wealth-destroying acquisitions, in line with the free cash flow theory of Jensen (1986) and Stulz (1990) claiming that managers controlling abundant cash flows have a tendency to overinvest in negative-NPV projects. Hence, excess cash flow generation increases the likelihood of bidding on acquisition targets. To proxy for the profitability of a firm, we continue using ROA.

2.5.4. Historical Leverage

Uysal (2011) suggest that the acquisition probability is negatively related to a firm's historical use of leverage. However, it should be stressed that a high debt ratio is not necessarily an indication of being overleveraged, as target debt ratios vary across firms. To control for the historical leverage of a firm, we follow Uysal (2011) in using the trailing 3-year average leverage ratio.

2.5.5. Industry M&A Liquidity

Schlingemann, Stulz, and Walkling (2002) show that the liquidity in the market for corporate assets within an industry is an important factor determining a firm's acquisition probability. A high liquidity should increase the probability that a firm in the industry undertakes an acquisition. Furthermore, research shows that this liquidity is cyclical by nature, occurring in waves (e.g. see Martynova & Renneboog, 2008). Thus, to capture this liquidity effect, we employ the 'Industry M&A Liquidity' factor of Schlingemann et al. (2002), defined as the annual sum of acquisition values in an industry divided by the total assets of all firms in the industry.

2.5.6. Industry Concentration

Uysal (2011) suggest that firms in highly concentrated industries normally have fewer acquisition targets available, reducing the probability of undertaking acquisitions. We borrow from Uysal (2011) in including the 'Herfindahl Index' (HI) as our measure of industry concentration. This is defined as the annual sum of squared market shares of all firms in a given industry, where market share is measured as a firm's proportion of the industry's total sales.

2.5.7. Additional Controls

In addition to the above controls, we add year dummies to control for macroeconomic factors which have nothing to do with the causal relationship between the leverage deficits and acquisition probabilities, using the first year as the reference year[7].

Uysal (2011) also includes stock returns as a control variable to avoid a confound of leverage deficit and misvaluations on acquisition probabilities. However, stock returns are not available for private companies, so we are forced to exclude this variable from our regressions.

3. Theoretical Framework

3.1. Main Differences Between Private and Public Firms

The existence of market imperfections such as taxes, agency costs, and information asymmetries indicate that capital structure should matter (Myers, 2001). Interestingly, the exposure to some of these market imperfections varies across firms of different listing statuses. With Norwegian corporate tax laws being equal for private and public companies, we expect that any systematic differences in the use of leverage between private and public firms must be explained either by agency costs or information asymmetries[8]. Moreover, previous studies suggest that these frictions are also important determinants of acquisition behavior (Hansen, 1987; Myers & Majluf, 1987; Bruner, 1988; Stulz 1990), and so we expect that there will be systematic differences in the effect of leverage deficits on the M&A

[7] As specified in the data section, the inclusion of the trailing three-year average leverage ratio restricts the sample to the years 2005 – 2017 when estimating regression Model 5.

[8] Faulkender and Petersen (2006) provide evidence that the cost of debt is an important determinant of the use of leverage. However, our primary interest lies in analyzing the implications of market imperfections for the cost of equity. While incorporating an analysis of the cost of debt would be highly interesting, it is beyond the scope of this thesis.

probability for the two types of firms. Before presenting the predictions to be tested under the ceteris paribus condition, we explain how private and public firms differ with respect to their exposure to these market imperfections, and what implications this has for the cost of equity and thus for the financial constraints facing the firm.

3.1.1. Agency Costs

Agency costs are closely related to the degree of control among shareholders, as control reduces the principal's need to monitor the agent (Jensen & Meckling, 1976). One of the fundamental differences between private and public companies is their ownership structure and thus the shareholders' degree of control over the firm. The ownership of private companies is often highly concentrated, while for public companies it is typically dispersed across many shareholders, each of whom have negligible control over the company. Correspondingly, the value shareholders place on remaining in control of the firm should be higher for private companies relative to public ones. Several studies from the corporate control literature support this argument, finding that large shareholders will be less willing to use equity financing as this might dilute their ownership interest in the company (Stulz, 1988; Amihud, Lev, & Travlos, 1990). Moreover, the value of remaining in control is typically highlighted as one of the key reasons why companies decide not to go public (Brav, 2009). Since equity issuances involve giving away control, the cost of raising equity financing should be higher for private firms than for public ones (Brav, 2009).

Furthermore, significant ownership stakes among managers is more typical for privately held firms, ensuring a better alignment of incentives among managers and shareholders of unlisted firms (Brav, 2009). In contrast, the higher tendency of separation of ownership and control in public companies can lead management to prefer issuing equity because this dilutes the ownership and control of any individual shareholder, improving managers' ability to spend free cash flow in their own self-interest (Morellec, 2004). As such, the cost of equity should not only be higher for shareholders of private firms, as argued above, but equity issuances should also be more valuable to the managers of public companies (Brav, 2009).

3.1.2. Asymmetric Information

An important implication of being publicly traded is the much higher requirements to disclose financial information, as well as the continuous and detailed coverage by financial analysts and the media (Berzins & Bøhren, 2009).

This introduces a fundamental difference in the transparency of public and private firms, where we would expect the problem of asymmetric information to be much higher between private firms and their capital providers. Recalling that riskier securities are more sensitive to the problem of asymmetric information, this should lead equity issuances to be much more costly for privately held firms according to the pecking order theory (Myers & Majluf, 1984; Myers, 1984).

Another reason why the cost of equity is higher for private firms is that the shares are not tradable in the open market (Berzins & Bøhren, 2009). By gaining access to a liquid second-hand market, firms can establish a publicly known market value on its shares, thus mitigating some of the information asymmetries that are impeding private firms from using stock as acquisition currency (Lowry, Michaely, & Volkova, 2017). In fact, Brau and Fawcett (2006) survey 336 CFOs and find the need to facilitate acquisitions to be the main reason why firms go public. By being more able to use stock as the medium of exchange, public firms will rely less on internally generated cash and debt financing. As a result, we expect public firms to find it easier to take advantage of their investment opportunities, particularly when being overleveraged.

3.2. Hypotheses Development

The fact that the cost of equity should be higher for private firms compared to their public counterparts proposes several testable predictions regarding the differences between private and public companies in terms of: (*i*) their target capital structures; (*ii*) their tendency to deviate from the target capital structure; and (*iii*) the effect of such deviations on acquisition probabilities. We commence by exploring the relationship between access to public equity markets and capital structure.

3.2.1. Access to Capital and Capital Structure

First, we ask: (1) Does the leverage ratio of private companies differ systematically from that of public firms? Based on the discussion above, the following null and alternative hypotheses are developed:

$H_0 1$: *The leverage ratio of a firm is independent of the firm's listing status.*

H_A1: *The leverage ratio of a firm depends on the firm's listing status. Ceteris paribus, private companies have higher leverage ratios than public companies.*

Because equity financing should be more expensive for unlisted firms, the alternative hypothesis states that private firms should have a stronger aversion against using equity over debt as compared to listed companies. Hence, we expect that private firms will have higher leverage ratios than public ones.

Next, we turn to the determinants of capital structure and ask: (2) Can the findings in the existing literature on the determinants of leverage among public firms be extrapolated to private firms?

$H_0 2$: *Determinants of capital structure are independent of the firm's listing status.*

$H_A 2$: *Determinants of capital structure depend on the firm's listing status. Private firms will have determinants that are more in line with the pecking order theory, and public firms will have determinants that are more in line with the trade-off theory.*

While we expect to see similar signs as those found in previous research for both public and private firms (see Section 2.2), we expect the pecking order theory to be more suited in explaining private firms' capital structures, as stated in the alternative hypothesis. This follows since the frictions of high transaction costs and information asymmetries are much more acute for private companies. Specifically, as predicted by the pecking order theory, the higher information asymmetries for private firms should lead such firms to have a much stronger preference for internally generated funds over external capital, when compared to public firms. Correspondingly, the leverage ratio of private firms should exhibit a higher sensitivity to the profitability variable (i.e. a more negative relationship). The lower degree of transparency for private firms should also translate into a lower sensitivity to the 'trade-off determinants' of capital structure: The leverage ratio should exhibit a lower sensitivity to asset tangibility (i.e. a less positive relationship); growth opportunities (i.e. a less negative relationship); firm size (i.e. a less positive relationship); and risk of sales (i.e. a less negative relationship), when compared to public firms.

Before proceeding to the relationship between access to capital and leverage deficits, we present a couple of hypotheses that allow us to explain why the financing behavior of the two types of firms might differ. While these hypotheses do not provide any explicit answer to the four main research questions, they are nevertheless included in order to provide insights that will be important when explaining our findings. Specifically, we address the theories that it is the value of control and differing degrees of information asymmetry that lead equity to be more expensive for private companies than for public ones.

First, if the value of control leads equity financing to be more expensive for private companies than for public ones, we would expect ownership concentration to be a statistically significant determinant of private firms' capital structure, as stated in the alternative hypothesis. As the shareholders of private firms place more value on control, private firms will be less likely to use equity financing and more likely to issue debt. Hence, ownership concentration should be positively correlated with the leverage of private firms. Similarly, since the value of control is negligible for shareholders of public companies, we do not expect ownership concentration to be a significant explanatory variable for the debt ratios of public firms.

$H_0$3*: The leverage ratio of a firm is independent of its ownership concentration.*

H_A3: *The leverage ratio of a private firm depends on its ownership concentration. Ceteris paribus, leverage increases in ownership structure for private companies.*

Next, in order to investigate the theory that private firms' higher exposure to the problem of asymmetric information leads equity issuances to be more expensive compared to public firms, we follow Brav (2009) in isolating the subsample of private firms because we have no decent proxy for the degree of information asymmetry in the full sample of firms. In Norway, firms incorporated as public companies (ASAs) are not necessarily quoted on a stock exchange. By defining 'private' companies as all those that are not quoted, and 'public' companies as all those that are, the subsample of private companies will contain two types of firms: (1) unlisted ASs; and (2) unlisted ASAs. The main difference between these two types of firms is the stricter legal requirements placed on unlisted ASAs, reducing the problem of information asymmetry for such companies. In particular, the laws regarding the board of directors and financial auditing are stricter, ensuring

adherence to principles of corporate governance and the timely provision of financial information. Hence, the variations in enterprise types among firms in the subsample of private companies will serve as a decent proxy for the degree of information asymmetry (Brav, 2009).

As theorized, information asymmetry should make equity issuances relatively more expensive. We therefore expect the more opaque unlisted ASs to rely more heavily on debt financing, compared to the more transparent unlisted ASAs, for which equity will be less costly:

$H_0$4: *The leverage ratio of a firm is independent of the degree of information asymmetry it faces.*

H_A4: *The leverage ratio of a firm depends on the degree of information asymmetry it faces. In the subsample of private firms, unlisted ASs will have higher leverage ratios compared to unlisted ASAs.*

3.2.2. Access to Capital and Leverage Deficits

Next, we analyze if there are any systematic differences in the leverage deficits of private and public firms (i.e. research question 3). Firms may encounter random events that will bump them away from their target capital structure (Shyam-Sunder & Myers, 1999), causing the occurrence of a leverage deficit. In a world with complete and perfect capital markets, there would be no costs associated with rebalancing the capital structure to the optimal level, and so firms would close their entire leverage deficit as soon as it appeared. However, in the presence of market imperfections, there will be adjustment costs making firms unwilling to rebalance immediately. Since privately held firms are subject to greater market imperfections, they will be more financially constrained in general, and have a higher cost of equity in particular. As a result, we theorize that they should be subject to larger adjustment costs when compared to public companies. Hence, the leverage ratio of private firms should take longer in readjusting to its mean:

$H_0$5: *The readjustment rate of the leverage ratio is independent of the firm's listing status.*

H_A5: *The readjustment rate of the leverage ratio depends on the firm's listing status. The leverage ratio of private firms will exhibit a slower readjustment rate to its target compared to that of public firms.*

3.2.3. Access to Capital and the Effect of Leverage Deficits on M&As

Finally, we turn to the implications of financial constraints on other dimensions of firm behavior. In particular, deviations from the target capital structure has been found to affect the acquisition probability of public companies (Uysal, 2011), and we are interested in uncovering any similar effects for private firms. We therefore ask: (4) How do deviations from the target debt ratio influence the acquisition probability of firms, and are there significant differences between private and public companies?

First, firms that have too much leverage compared to their target debt ratio will be financially constrained, leading to the underinvestment problem (Jensen, 1986; Stulz, 1990). Consequently, overleveraged firms should be less likely to undertake acquisitions. Furthermore, we have theorized that private firms will be more constrained from using stock as acquisition currency which impedes their ability to undertake acquisitions, especially if they are overleveraged. If overleveraged, the firm is unable to raise further debt to finance the transaction using cash, and since private firms are less able to issue stock as the medium of exchange, they will be even more constrained in the overleveraged state compared to public firms. The acquisition probability should therefore be negatively related to overleveraging and even more so for private firms compared to public ones.

H_06: *The likelihood of acquiring is independent of the firm's leverage deficit.*

$H_{A1}6$: *The likelihood of acquiring depends on the firm's leverage deficit. The acquisition probability is negatively correlated with the degree of overleverage, and more so for private firms.*

Second, the 'financial synergies hypothesis' (Myers & Majluf, 1984) suggests that underleveraged firms will be more likely to be acquirers. This is also in line with the free cash flow theory of Jensen (1986) and the 'agency costs of managerial discretion'-proposition of Stulz (1990). In particular, too little leverage increases the cash flow available to managers for making investments. Thus, we expect underleveraged firms to be more likely to acquire. Moreover, prior research shows

that acquisitions are generally financed by raising external funds, which is easier to do for listed firms (Opler et al., 1999). An underleveraged public company should therefore be even more likely to acquire compared to a private firm.

$H_{A2}6$: *The likelihood of acquiring depends on the firm's leverage deficit. The acquisition probability is positively correlated with the degree of underleverage, and more so for public firms.*

4. Empirical Methodology

The primary goal of this thesis is to establish a link between a firm's access to public equity markets, its use of financial leverage, and its acquisition probability. This will require us to take several steps in our estimation procedure and we therefore choose to present our empirical methodology in three different parts, one for each step. We commence by explaining our methodology for analyzing the effect of access to capital on the use of financial leverage. Next, we describe how we will measure the effect of access to capital on the leverage deficit of firms. Finally, we describe our methodology for analyzing the effect of access to capital on the relationship between leverage deficits and acquisition behavior.

4.1. Access to Capital and Capital Structure

Before presenting the specification of the regression models that will be used to test hypotheses 1 through 4, a comment on our measurement of the dependent variable is warranted.

4.1.1. Market versus Book Leverage

The theories of capital structure described in Section 2.1 are all related to the market leverage of a firm. For instance, the capital structure irrelevance proposition of Modigliani and Miller (1958) posits that the choice between debt and equity is irrelevant to the market value of a firm, and not to its book value. However, because the market value of equity is unobservable for private firms, this study will rely on book leverage instead of market leverage. In order to facilitate comparisons between the two types of firms, we will use this measure of leverage for the public firms in our sample as well.

Using book leverage instead of market leverage should not be a problem when estimating the determinants of leverage, according to several influential studies on

the topic (Rajan & Zingales, 1995; Fama & French, 2002; Leary & Roberts, 2005). Specifically, Bowman (1980, pp. 253) points out that accounting values and market values are "statistically indistinguishable" for this purpose. Furthermore, because the market value of equity is related to several factors outside the managers' control, accounting values may be more relevant to managers in determining their target debt ratio (Myers, 1977). On the other hand, an issue with using book leverage is that the debt ratio is not bounded between zero and one as it would be under the market leverage definition and as assumed in the capital structure theories. The fact that book leverage can be a negative number and larger than one introduces more noise to the data compared to models using the market leverage (Welch, 2004). We reduce this issue by winsorizing all accounting variables at the 2.5% level of each tail, restricting the dependent variable to stay closer to the range of 0 to 1 compared to using an unwinsorized dependent variable.

4.1.2. Regression Models

As will be described in the data section (Section 5), we obtain an unbalanced panel data set for the period 2000 – 2017. Brooks (2014) argues that the simplest way to deal with such data is to estimate a pooled panel OLS regression. Thus, all models in this subsection are estimated using fixed effects models which controls for both time- and industry-fixed effects in the data, referred to by Brooks (2014) as the least squares dummy variable (LSDV) approach. Furthermore, due to the potential of heteroskedasticity and autocorrelation, we cluster standard errors by years to ensure consistency with the fixed effects regression assumptions (Stock & Watson, 2012). We cluster only in the year dimension because Thompson (2011) shows that it is unnecessary to double-cluster on both time and entity if the panel data is highly unbalanced, as is the case here. Rather, it is sufficient to cluster by the dimension with fewer observations, i.e. the time dimension.

The dependent variable in all of the following regression models is the leverage ratio, which we will define as[9]:

$$Leverage\ Ratio\ (LR) = \frac{Total\ Debt}{Total\ Assets}$$

[9] All variables have been defined and computed according to the definitions provided by the CCGR at BI Norwegian Business School.

In estimating the determinants of the leverage ratio, we first develop a baseline model (Model 1) using the main firm characteristics that show up consistently in the literature as being significant determinants of firms' leverage ratios. As elaborated on in Section 2.2, these include asset tangibility, growth opportunities, firm size, and profitability (Rajan & Zingales, 1995; Frank & Goyal, 2009). In addition, we add the risk of sales as a control variable to reduce the influence of omitted variable bias (García de Olalla Lopez, 2014).

Frank and Goyal (2009) also highlight industry effects as important in determining capital structures, controlling for firm characteristics that are common in a given industry but that can vary significantly across industries. We include industry dummies to control for these effects and follow the procedure of the CCGR at BI Norwegian Business School in classifying firms into one of nine industry sectors based on their NAICS codes[10]. To mitigate the dummy variable trap, we use firm-year observations from the service sector as our reference group. This group is chosen because it contains the highest number of observations, and we anticipate that the group will score significantly different from other groups on the dependent variable as service-sector firms should theoretically use less debt financing.

Since we estimate a single pooled panel OLS regression, we further include year dummies to capture the influence of macroeconomic factors which vary considerably during the sample period (e.g. due to the financial crisis in 2007) and which may influence the financial distress costs of debt. Furthermore, the Norwegian tax laws changed once during the period[11], potentially influencing the tax benefits of debt, and thus controlling for time-fixed effects becomes of upmost importance. Again, we avoid problems of multicollinearity by employing *n-1* year dummies, using the first year as our reference year.

Finally, in order to estimate the effect of access to public equity markets on the use of financial leverage (i.e. hypothesis 1), we add the dummy variable Pub which equals one if the firm is publicly listed and zero otherwise. Moreover, we want to investigate how access to capital influences the sensitivity of the leverage ratio to each of the determinants of capital structure (i.e. hypothesis 2). We achieve this by utilizing interaction terms in which the dummy Pub is interacted with each of the explanatory variables. Our model specification thus becomes as follows:

[10] See Appendix A.1 for industry dummy definitions.

[11] See 'Section 4.4 Robustness' for a description of the expected effects of the 2006 tax reform.

$$LR_{(i,t)} = \beta_0 + \beta_1 Pub_{(i,t-1)} + \beta_2 Tng_{(i,t-1)} + \beta_3 Growth_{(i,t-1)} + \beta_4 Size_{(i,t-1)} + \beta_5 Risk_{(i,t-1)} + \beta_6 ROA_{(i,t-1)} + \beta_7 Pub_{(i,t-1)} \times Tng_{(i,t-1)} + \beta_8 Pub_{(i,t-1)} \times Growth_{(i,t-1)} + \beta_9 Pub_{(i,t-1)} \times Size_{(i,t-1)} + \beta_{10} Pub_{(i,t-1)} \times Risk_{(i,t-1)} + \beta_{11} Pub_{(i,t-1)} \times ROA_{(i,t-1)} + \boldsymbol{\phi D} + \varepsilon_{(i,t)} \quad \textbf{(1)}$$

where $LR_{(i,t)}$ is the leverage ratio of firm *i* in year *t*; β_0 is a constant; Pub is the dummy for public firms; Tng is asset tangibility; $Growth$ is growth opportunities; $Size$ is firm size; $Risk$ is risk of sales; ROA is profitability; $\boldsymbol{D}$ is a vector containing the industry and year dummies; $\boldsymbol{\phi}$ is a vector containing the corresponding coefficients; and $\varepsilon_{i,t}$ is an error term.

Following prior research (Frank & Goyal, 2009; Brav, 2009; Harford et al., 2009; Uysal, 2011), the control variables are lagged by one year because this increases the probability that causality runs from the explanatory variables to the leverage ratio, and not in the opposite direction. Even though this does not solve the problem of endogeneity completely, at least it ensures that the explanatory variables are in the information set of the firm at time *t,* i.e. when choosing source of financing (Frank & Goyal, 2009).

In Model 1 above, β_0 is the intercept for private firms and β_1 shows the intercept differential for public firms. Thus, β_1 will capture some of the partial effect of listing status on the use of leverage. However, having introduced the interaction terms, one must be cautious not to interpret β_1 as the total partial effect of listing status on leverage ratios. Rather, we borrow from Brav (2009) in illustrating the total partial effect in a separate step. For each firm-year observation in the sample, we use Model 1 to compute the firm's predicted leverage together with the predicted leverage if the firm was of the opposite listing status. The total partial effect of listing status will then be presented as a comparison of the means of these predicted values, as well as a calculation of the percentage of times where the predicted leverage is higher if the firm is private than if the firm is public.

The slope coefficients for private firms, β_2 to β_6, show the dependent variable's sensitivity to the characteristics of private firms (i.e. our reference group). β_7 to β_{11} capture the difference in the sensitivity for public firms compared to the reference group. For instance, β_2 will show the sensitivity of the leverage ratio to the asset tangibility of private firms, while $\beta_2 + \beta_7$ will show the same sensitivity for public ones. β_7 is thus the differential between private and public firms with respect to the effect of tangibility on leverage ratios. If the coefficient on an interaction term is

found to be statistically significant, we reject the null hypothesis that the leverage ratio's sensitivity to the particular firm characteristic is the same for private and public firms. Hence, the significance of coefficients β_7 to β_{11} will provide answers regarding hypotheses *$H_0$2* and *H_A2*.

Next, we include ownership concentration as an explanatory variable in order to test hypothesis 3, i.e. that the debt ratio of private firms increases in ownership concentration due to the value existing shareholders places on remaining in control of the firm. As a proxy for ownership concentration, we use the percentage of equity held by the largest shareholder. We want to compare the sign and significance of the coefficients on ownership concentration for private and public firms, making β_7 and β_{13} the coefficients of interest in Model 2:

$$LR_{(i,t)} = \beta_0 + \beta_1 Pub_{(i,t-1)} + \beta_2 Tng_{(i,t-1)} + \beta_3 Growth_{(i,t-1)} + \beta_4 Size_{(i,t-1)} + \beta_5 Risk_{(i,t-1)} + \beta_6 ROA_{(i,t-1)} + \beta_7 OC_{(i,t-1)} + \beta_8 Pub_{(i,t-1)} \times Tng_{(i,t-1)} + \beta_9 Pub_{(i,t-1)} \times Growth_{(i,t-1)} + \beta_{10} Pub_{(i,t-1)} \times Size_{(i,t-1)} + \beta_{11} Pub_{(i,t-1)} \times Risk_{(i,t-1)} + \beta_{12} Pub_{(i,t-1)} \times ROA_{(i,t-1)} + \beta_{13} Pub_{(i,t-1)} \times OC_{(i,t-1)} + \boldsymbol{\phi D} + \varepsilon_{(i,t)} \quad \textbf{(2)}$$

where OC is the firm's ownership concentration, and all other variables are defined as before. Again, we cluster standard errors by years.

Finally, in order to test hypothesis 4, we need to control for the effect of asymmetric information on leverage ratios. To do so, we must use the subsample of unlisted firms as explained in Section 3.2.1. As mentioned, this subsample will contain two types of unlisted firms: (1) unlisted ASs; and (2) unlisted ASAs, where the variation in enterprise types in the subsample will serve as a decent proxy for information asymmetry (Brav, 2009) (i.e. the enterprise type 'unlisted ASAs' indicates low information asymmetry while 'unlisted ASs' indicates high information asymmetry).

We run the following regression using the subsample of private firms, adding the dummy variable $PubNQ$ which equals one (zero) if the firm is an unlisted ASA (unlisted AS). We expect the corresponding coefficient, β_1, to be significant and to have a negative sign:

$$LR_{(i,t)} = \beta_0 + \beta_1 PubNQ_{(i,t-1)} + \beta_2 Tng_{(i,t-1)} + \beta_3 Growth_{(i,t-1)} + \beta_4 Size_{(i,t-1)} + \beta_5 Risk_{(i,t-1)} + \beta_6 ROA_{(i,t-1)} + \beta_7 OC_{(i,t-1)} + \boldsymbol{\phi D} + \varepsilon_{(i,t)} \quad \textbf{(3)}$$

As before, Model 3 is estimated with lagged explanatory variables and with a clustering of standard errors by years.

4.2. Access to Capital and Leverage Deficits

Next, since private firms do not have access to public equity markets, we theorized that such firms will be more financially constrained and thus less able to rebalance their capital structure relative to listed companies. To test this, we proceed to the second step of our methodology, analyzing whether the leverage ratio of private firms exhibits a lower readjustment rate towards its target.

4.2.1. Partial Adjustment Model

To analyze whether the leverage ratio of private firms exhibits a slower readjustment to its target compared to that of public firms, we follow several influential studies (Fama & French, 2002; Flannery & Rangan, 2006) in estimating a partial adjustment model that captures the speed of adjustment rate of the leverage ratio. In general, the partial adjustment model is estimated as follows:

$$\Delta LR_{(i,t)} = \alpha + \lambda\left(LR^{*}_{(i,t)} - LR_{(i,t-1)}\right) + \varepsilon_{(i,t)}$$

where $\Delta LR_{(i,t)}$ is the change in the actual leverage ratio of firm *i* from period *t-1* to period *t*; α is a constant; λ is the speed of adjustment coefficient; $LR^{*}_{(i,t)}$ is the unobservable target leverage ratio of firm *i* in period *t*; $LR_{(i,t-1)}$ is the actual leverage ratio of firm *i* in period *t-1*; and ε is an error term.

The coefficient λ measures how much of the leverage deficit a firm adjusts in a given period and this variable should, according to the trade-off theory, lie between 0 and 1. As Shyam-Sunder and Myers (1999) point out, $\lambda > 0$ indicates that firms are actively rebalancing their debt levels. Furthermore, in a world without adjustment costs, the static trade-off theory posits that a firm would close the entire leverage deficit (i.e. $\lambda = 1$) as soon as the debt ratio deviated from its target. This follows because deviations from the target is costly as the firm loses out on the benefits of using the optimal level of debt. However, in the presence of adjustment costs, firms will not rebalance before the costs of having a leverage deficit outweighs the costs of rebalancing, and so $\lambda < 1$ indicates the presence of adjustment costs. We therefore expect to find $0 < \lambda < 1$.

We have theorized that private firms will find it more costly to rebalance their capital structure, suggesting that they should have a lower speed of adjustment coefficient compared to public firms (hypothesis 5). In order to compare the speed of adjustment of the two types of firms, we estimate Model 4 (below) separately for the subsamples of private and public firms, and then use a two-sample Z-test to examine if there is a statistically significant difference in the speed of adjustment for the two types of firms.

The unobservable target leverage ratio, $LR^*_{(i,t)}$, can be expressed as $LR^*_{(i,t)} = \boldsymbol{\beta X}_{(i,t-1)}$, where $\boldsymbol{X}_{(i,t-1)}$ is a vector containing the explanatory variables of the target leverage ratio and $\boldsymbol{\beta}$ is a vector containing the corresponding coefficients (Flannery & Rangan, 2006). To proxy for $LR^*_{(i,t)}$ we use the firm characteristics that are proposed by the existing literature to be determinants of target capital structure. Specifically, $\boldsymbol{X}_{(i,t-1)}$ includes our proxies for asset tangibility, growth opportunities, firm size, and risk of sales, and excludes profitability because it has been argued to be a determinant of actual leverage ratios rather than target leverage ratios (Hovakimian et al, 2001; Brav, 2009). In addition, we find ownership concentration to be a statistically significant determinant of capital structure (see Section 6.1) and therefore include this variable in the vector. Substituting this into the partial adjustment model gives the regression function below (Model 4), where we also add industry- and year-fixed effects:

$$LR_{(i,t)} = (\lambda\boldsymbol{\beta})\boldsymbol{X}_{(i,t-1)} + (1-\lambda)LR_{(i,t-1)} + \boldsymbol{\phi D} + \varepsilon_{(i,t)} \qquad \textbf{(4)}$$

where $LR_{(i,t)}$ is the leverage ratio of firm *i* in period *t*; λ is the speed of adjustment coefficient; $\boldsymbol{D}$ is a vector containing the industry and year dummies; and $\boldsymbol{\phi}$ is a vector containing the corresponding coefficients. Other variables have been explained above.

This equation indicates that firms take steps to readjust their leverage ratio at the beginning of the year ($LR_{(i,t-1)}$) toward their target for the year ($\boldsymbol{\beta X}_{(i,t-1)}$). To estimate Model 4, we follow Shyam-Sunder (1999) and Brav (2009) in using a pooled panel OLS regression and use robust standard errors clustered by years.

4.3. Access to Capital and the Effect of Leverage Deficits on M&As

The third and final step of our methodology involves analyzing if there are any predictable differences between public and private firms in the relationship between

leverage deficits and the probability of undertaking an M&A transaction. Before presenting the regression model, we describe our procedure for estimating the leverage deficit.

4.3.1. Estimating the Target Leverage Ratio and the Leverage Deficit

Going forward, we follow Harford et al. (2009) and Uysal (2011) in defining the leverage deficit of a firm as its actual debt ratio minus its target debt ratio:

$$Leverage\ Deficit = \ Actual\ Debt\ Ratio - Target\ Debt\ Ratio$$

Intuitively, this variable shows whether a firm is overleveraged or underleveraged compared to its target capital structure, where a positive (negative) leverage deficit indicates the use of too much (too little) debt.

Whereas the observed debt ratios in our sample represent the actual debt ratio in the equation above, the target debt ratios are unobservable. The existing literature proposes several proxies for the target capital structure of a firm, including the industry median leverage ratio (DeAngelo, DeAngelo, & Whited, 2011), the firm's 3-year average debt ratio (Shyam-Sunder & Myers, 1999), and the fitted values from a regression of leverage ratios (Hovakimian et al., 2001; Kayhan & Titman, 2007; Harford et al., 2009; Uysal, 2011). We find the latter approach to be most appropriate, and this method has also gained the most traction in the literature. First, the 'industry median approach' has a severe limitation in that it uses the debt ratio of a single firm (i.e. the median one) to proxy as the target for all other firms in the industry, completely ignoring the fact that the trade-off theory implies that the debt ratio should be a function of firm-specific characteristics (Agyei-Boapeah, 2014). Next, the '3-year average approach' is (as all averages are) highly sensitive to extreme outliers. In contrast, the 'regression approach' reduces this problem somewhat and is consistent with the trade-off theory's implication that debt ratios should vary with firm-specific factors. Hence, by using the regression approach we allow for the realistic situation in which two firms have the same debt ratio, but one is overleveraged and the other is underleveraged compared to their individual targets.

In contrast to the proxy used in Model 4, we will now use the fitted values from Model 1 as the unobserved target leverage ratio, because the regression will be run on a sample including firms of both listing statuses as opposed to being run separately for public and private firms which was the case before. Model 1 is

preferred to Model 2 because the inclusion of ownership concentration makes the dummy variable for listing status (Pub) insignificant. As before, we exclude profitability (ROA) from the regression because it should be a determinant of actual leverage ratios rather than of target leverage ratios.

To test hypotheses $H_{A1}6$ and $H_{A2}6$, we need to distinguish between the effects of being underleveraged and overleveraged. With the leverage deficit in a continuous form, we can only measure its effect on the acquisition probability in general. Rather, Model 5 below aims to compare firms that are highly under- or overleveraged to the firms that are relatively close to their target debt ratios (the reference group). To achieve this, we separate the firm-year observations in our sample into groups based on the magnitude of their leverage deficit. We define only those firms with very large deficits to be under- or overleveraged (i.e. firms within the first and fourth quartile of the leverage deficit variable, respectively), while those that have moderate deficits are assumed to be acceptably close to their target debt ratios (i.e. firms within the second and third quartiles of the leverage deficit variable). This assumption should be in line with the survey findings of Graham and Harvey (2001) that most CFOs (81%) use flexible, somewhat strict, or strict target debt ratios (or rather, ranges). Thus, we introduce the dummy variables $UnderLev$, taking the value one if the firm is underleveraged compared to the reference group, and $OverLev$, taking the value one the firm is overleveraged.

Furthermore, to ensure that causality runs in the correct direction, we must lag the leverage deficit dummies by one year in the regression model below. We are interested in measuring the effect of a leverage deficit in period *t* on a firm's M&A behavior in period *t+1*. This can only be achieved by incorporating lagged leverage deficit dummies, because the accounting data used to calculate the deficit is measured at the end of each year. Hence, lagged deficit variables ensure that we study the effect on a firm's subsequent M&A behavior, rather than on past behavior.

4.3.2. Regression Model

In Model 5 below, we employ a pooled panel probit regression with robust standard errors clustered in the year dimension to estimate the effect of leverage deficits on a firm's acquisition probability. The model utilizes the interaction dummy Pub to enable us to measure how access to public equity markets influences the sensitivity of the acquisition probability to the leverage deficit of private versus public firms. As before, we also include Pub as a separate dummy to control for

the effect of access to capital on the dependent variable. Hence, the final regression model becomes as follows:

$$P(Acquirer = 1)_{(i,t)} = \Phi(\beta_0 + \beta_1 Pub_{(i,t-1)} + \beta_2 UnderLev_{(i,t-1)} + \beta_3 OverLev_{(i,t-1)} + \beta_4 Pub_{(i,t-1)} \times UnderLev_{(i,t-1)} + \beta_5 Pub_{(i,t-1)} \times OverLev_{(i,t-1)} + \beta_6 HI_{(i,t)} + \beta_7 M\&A\ Liq_{(i,t)} + \beta_8 Trail3yrAvg_{(i,t)} + \boldsymbol{\phi W}_{(i,t-1)} + \boldsymbol{\gamma D}_{(i,t)} \quad \textbf{(5)}$$

where $P(Acquirer = 1)$ is the probability of being an acquirer; β_0 is the intercept for private firms; Pub is the listing status dummy; β_2 to β_5 are the coefficients of interest (i.e. the effects of being underleveraged or overleveraged for private firms and the differentials for public firms); HI is the Herfindahl Index; $M\&A\ Liq$ is the industry M&A liquidity measure; $Trail3yrAvg$ is the trailing 3-year average leverage ratio; $\boldsymbol{W}$ is a vector containing the firm-specific control variables *Growth*, *Size*, and *ROA*; $\boldsymbol{\phi}$ is a vector containing the corresponding coefficients; $\boldsymbol{D}$ is the vector containing the year dummies; and $\boldsymbol{\gamma}$ contains their coefficients. Like in previous regressions, the firm-specific control variables are lagged to ensure that firm characteristics are in the information set of the firm.

4.4. Robustness

4.4.1. Robustness Checks for Models 1 to 4

As Myers (2001) points out, capital structure theories are conditional rather than general, meaning that financing behavior can be driven by factors which are relevant in a given circumstance but unimportant in others. To check the robustness of the results we get from models 1 to 4, we evaluate the behavior of the regressors under different subsamples consisting of firms which should be facing different circumstances. Although a separate analysis with respect to the robustness of the regressors when using a different dependent variable (e.g. long-term debt to total assets) would be highly interesting, we are restricted from doing so due to the lack of data obtained from the CCGR[12]. Rather, we divide the main sample into 4 subsamples according to growth opportunities and time periods[13].

[12] Students are allowed a limited amount of data items from the CCGR database.

[13] We would optimally like to run robustness checks using subsamples according to firm size. Larger firms should be more well-known in capital markets and should thus have better access to capital. However, since the publicly listed firms in our sample are typically much larger than the private

First, we split our sample according to the firms' investment opportunity set, using the subsamples of low-growth and high-growth firms as measured by the variable growth in sales. We define the former as those within the first quartile of growth in sales and the latter as those within the fourth quartile. Berger and Udell (1998) argue that the availability of few investment opportunities indicate that firms are in superior stages of their lifecycles, and such firms should therefore have better access to external capital when compared to firms with many growth opportunities available. Moreover, Myers (1977) point out that high-growth firms should use more equity financing to avoid the debt overhang problem.

Second, we evaluate the models' performance on subsamples of firms before and after the Norwegian tax law reform which came into effect on January 1st, 2006. According to Alstadsæter and Fjærli (2009), dividends from private companies were tax exempt until 2006, which made firms increase their leverage ratios prior to the reform in order to redistribute internally generated funds to manager-owners. Subsequent to the reform, firms distributed less of their internally generated equity due to the new taxation scheme on dividends, leading to a radical decrease in the leverage ratio of firms from 2006 onwards. Consequently, leverage ratios should differ systematically across the two time periods before and after 2006, and we therefore evaluate the robustness of the explanatory factors across time.

4.4.2. Robustness Checks for Model 5

For Model 5 we do not rerun the regression according to growth opportunities and time periods. There are too few firm-year observations within the first and fourth quartile of the growth variable that includes an M&A transaction (less than 25), and the filtering process for the acquisition subsample leaves us with too few M&A transactions prior to the tax reform. Rather, we rerun the regression using a pooled panel logit regression in place of the pooled panel probit regression. Brooks (2014) points out that probit and logit models give similar results, except when the dependent binary variable takes the value of one for less than 10% of the observations. As this is the case in our data set, we find it appropriate to reevaluate hypothesis 6 using the logit regression model to check the robustness of our initial findings.

ones, we cannot define a meaningful cut-off point on size that includes a satisfactory number of firms of both listing statuses (i.e. not too few and not too many).

5. Data

5.1. Data Sources

All Norwegian companies are legally required to submit standardized accounting information and to report each shareholder's stake of the firm to the government via Brønnøysundregisteret (www.brreg.no). The Centre for Corporate Governance Research at BI Norwegian Business School keeps a unique database of all Norwegian private and public companies by attaining this data from Experian (www.experian.no). We retrieve 32 data items for the period 2000 – 2017. To gather inflation data for our sample period, we use the Norwegian statistics bureau, Statistics Norway (SSB, www.ssb.no). Alternatively, inflation data could have been provided by the CCGR, but due to a restriction on the number of data items students can request, we use SSB data instead. Finally, to retrieve information related to domestic mergers and acquisitions in which Norwegian public and private firms have acted as acquirers, we use the Zephyr database provided by Bureau van Dijk (BvD), which is a leading provider of business information on European firms.

5.2. Samples

5.2.1. Main sample

CCGR provides us with an unbalanced panel data set consisting of 4,092,593 firm-year observations on both private and public companies. All data items are measured at the end of each year. We restrict the sample in several ways. First, we follow Titman and Wessels (1988) in eliminating all firm-year observations with missing values on any of the data items. Next, we exclude enterprise types that are not limited liability companies, keeping only firms incorporated as an AS or ASA. Third, we follow the existing literature (e.g. Brav, 2009; Uysal, 2011) in removing observations from the financial industry, the regulated utility industry, and public sector firms (e.g. public administration and defence) because firms in these industries are restricted to comply with government requirements with respect to their use of financial leverage[14]. Fourth, we drop observations of inactive firms by eliminating those without any assets or sales. Moreover, to exclude very small firms, many of which are likely to be non-operating companies such as single purpose vehicles (SPVs), we drop all firm-year observations which have revenues

[14] The industry observations in our sample are classified according to the Standard Industry Classification (SIC) system, NAIC, developed by SSB. From 2008 onwards, the European NACE Rev. 2 industry classification system replaced NACE Rev. 1, and SSB followed the EU in updating the national SIC codes from 2009. Thus, since our data covers the period 2000 to 2017, the industry codes in our sample changes from 2009 onwards. We account for this when managing our sample.

less than NOK 6 million which is the threshold where Norwegian private firms become legally required to have their accounts audited as of 2019 (www.altinn.no). Finally, observations with inconsistent values are dropped (e.g. negative values of asset items, debt items, or where the largest owner holds more than 100% of the equity, and so forth). This procedure leaves us with 794,827 firm-year observations to be used in computing the variables that goes in to our models (~19% of the initial sample).[15]

Furthermore, since we are interested in measuring the effect of financing behavior on subsequent M&A decisions, we extract M&A data for deals that were announced in the period 2001 – 2017 from Zephyr. We retrieve all deals in which the acquirer is Norwegian and where the deal value is known, providing us with an initial sample of 1,898 deal observations. We remove all transactions with multiple acquirers, all deals in which the acquirer is either an individual or the Norwegian government, as well as all deals marked as either withdrawn or pending. In order to merge the two data sets, we need to observe the company registration number in both of them. When this ID number is missing from the Zephyr data set, we manually search for the company's name online and add the ID number whenever it can be obtained from reliable sources such as proff.no or regnskapstall.no. Those firms for which we cannot find the organization number are removed from the sample. After merging the two data sets, we remove the M&A transactions that cannot be attributed to any of the firms in the CCGR data. Finally, we drop all observations where the deal value is less than 1% of the acquirer's assets. This procedure leaves us with a sample of 660 M&A transactions before computing variables (~35% of the initial Zephyr sample).

We next create the variables to be used in regression models 1, 2 and 4, as defined by the CCGR at BI Norwegian Business School. In creating the variables, we rely only on firms for which observations are available for at least two consecutive periods because our models incorporate the lagged regressors to ensure that these are in the information set of the firm when choosing debt levels. As such, all firm-year observations with missing values on the lagged variables are removed before running our regressions. This involves removing all firm-year observations from both year 2000 and year 2001. Specifically, the leverage ratio in 2001 will depend on the lagged variable 'growth in sales' from year 2000, which cannot be computed as our data does not include observations from 1999. Hence, our final

[15] We have no way of identifying and removing daughter companies. The capital structure of such firms will depend on that of the parent, introducing a limitation to our thesis.

sample consists of 494,497 firm-year observations from 2002 – 2017. All currency items are inflation adjusted to 2017-values. In order to reduce the influence of data errors and extreme outliers, we follow Uysal (2011) in winsorizing all accounting variables at the 2.5% level of each tail.

5.2.2. Acquisition Subsample

Model 5, used for estimating the acquisition probability of a firm, includes the variable 'historical leverage', measured as the trailing three-year average leverage ratio of the firm. In estimating this variable, we exclude all firms for which we do not have three successive observations on the firm's leverage ratio. This reduces the sample by ~52% to only 239,936 firm-year observations and restricts the sample period to 2005 – 2017. To reduce the impact of any potential issues related to attrition in our sample, we use this subsample only when estimating Model 5, i.e. when analyzing the impact of leverage deficits on acquisition probabilities. Hence, models 1, 2, and 4 are estimated using the main sample described in the subsection above.

5.2.3. Subsample of Private Firms

For Model 3, we use the subsample of private firms. It should be noted that we follow Brav (2009) in defining private firms as those that are not publicly listed, and public companies as those that are, rather than relying on the enterprise types (i.e. AS or ASA) to define what constitutes a private or a public firm. These definitions are more in line with our goal of analyzing the effects of access to public equity markets on the financial policies of firms, compared to using the firms' enterprise types as a measure of access to capital. Hence, our subsample of private firms will include both unlisted ASs as well as unlisted ASAs. To avoid confusion, we will refer to unlisted ASAs only when addressing the subsample of private firms in testing hypothesis 4. We obtain this subsample by isolating the unlisted companies in the main sample, resulting in a subsample of 493,316 unlisted companies, 492,711 of which are ASs and 605 of which are ASAs.

5.3. Descriptive Statistics

Panel A of Table I reports the descriptive statistics of the main variables, including the mean, median, and standard deviation of each variable. The definition of the different variables can be found in Appendix A.1. Panel B summarizes the

transaction data for the acquisition subsample, including the number of acquirers, as well as the mean, median, and standard deviation of the transaction values.

Capital Structure: We commence by evaluating the explanatory variables of capital structure, comparing the means and median values for firms of different listing statuses. Naturally, public firms are generally larger compared to their private counterparts. Listed firms also grow faster, suggesting that it is mostly firms with many growth opportunities that choose to become publicly listed because access to public equity markets better enable such firms to pursue their investment opportunities. Public firms hold on average 6.21% in proportion of tangible assets, compared to 20.60% among unlisted firms. The median values, however, are much lower for both types of firms. For public firms the median asset tangibility is only 0.65%, while it is 9.67% for private ones. Thus, most firms hold low proportions of tangible assets, with a few firms having much higher asset tangibility, leading to a positive skewness of the variable. When we turn our attention to the measure of risk, the mean volatility in sales among public firms is significantly higher compared to the risk of sales for private firms (0.9083 versus 0.2810, respectively). Again, the variable is positively skewed as the corresponding median values are 0.8422 for listed companies and 0.1884 for the unlisted ones. Finally, both the mean and median return on assets (ROA) is lower among listed firms (5.93% and 5.05%) compared to private firms (9.52% and 8.23%).

As we have theorized, public firms also seem to use more equity financing in their capital structure, with a mean and median leverage ratio of 44.40% and 42.50%, respectively, compared to 63.99% and 66.25% for private firms. This provides preliminary evidence against the null hypothesis that the use of financial leverage is independent of the firm's listing status, favouring our alternative hypothesis that private firms use more debt financing in their capital structure. Further, the table shows the relatively more concentrated ownership structure in private firms, which should lead to a higher value placed on remaining in control for the shareholders of private firms. The largest shareholder holds on average a 75.73% stake in private firms, compared to only 33.80% in public ones. Again, the variable is skewed as the medians are 95.00% and 31.74% for private and public firms, correspondingly.

Leverage Deficits: The median leverage deficit of both private and public firms shows a moderate positive deficit of 1.08 percentage points and 0.66 percentage

Table I: Summary Statistics

This table provides the summary statistics. Panel A summarizes the variables used in regression models 1 to 4, as well as the continuous leverage deficit variable. Panel B summarizes the key data for the acquisition subsample which is used in estimating Model 5. All accounting variables have been winsorized at the 2.5% level of each tail and are provided in 2017-values. All variable definitions are found in Appendix A.1. Private firms are defined as the unlisted firms in our sample, and public firms are the listed firms in our sample.

Panel A

Variable	Obs.	Mean	Median	St. dev.
Leverage ratio	**494,497**	**0.6394**	**0.6622**	**0.2099**
Private	493,275	0.6399	0.6625	0.2096
Public	1,222	0.4440	0.4250	0.2206
Leverage deficit	**288,946**	**-0.0083**	**0.0108**	**0.2049**
Private	288,323	-0.0084	0.0108	0.2048
Public	623	0.0206	0.0066	0.2271
Δ leverage ratio	**494,497**	**0.0018**	**-0.0006**	**0.1008**
Private	493,275	0.0018	-0.0006	0.1008
Public	1,222	0.0141	0.0063	0.1136
Asset tangibility	**494,497**	**0.2056**	**0.0964**	**0.2477**
Private	493,275	0.2060	0.0967	0.2478
Public	1,222	0.0621	0.0065	0.1397
Growth in sales	**494,497**	**1.0803**	**1.0324**	**0.2710**
Private	493,275	1.0800	1.0324	0.2702
Public	1,222	1.1710	1.0557	0.4872
Firm size	**494,497**	**16.4034**	**16.0901**	**1.4002**
Private	493,275	16.3950	16.0861	1.3913
Public	1,222	19.8019	20.1353	0.6362
Risk of sales	**494,497**	**0.2826**	**0.1888**	**0.2936**
Private	493,275	0.2810	0.1884	0.2912
Public	1,222	0.9083	0.8422	0.4952
Profitability (ROA)	**494,497**	**0.0951**	**0.0822**	**0.1194**
Private	493,275	0.0952	0.0823	0.1194
Public	1,222	0.0593	0.0505	0.1178
Stake of largest owner	**494,497**	**0.7563**	**0.9500**	**0.2765**
Private	493,275	0.7573	0.9500	0.2759
Public	1,222	0.3380	0.3174	0.2041

(Continued on next page)

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Panel B	
Number of Firms in Acquisition Subsample:	288,946
Private firms in Acquisition Subsample:	288,323
Public firms in Acquisition Subsample:	623
Number of Acquirers:	224
Number of Private Acquirers:	110
Number of Public Acquirers:	114
Probability of Acquiring:	0.0775%
Mean Acquisition Size among Acquirers:	NOK 728 027 842
Median Acquisition Size among Acquirers:	NOK 138 934 625
St. dev. Acquisition Size among Acquirers:	NOK 1 376 110 804

points, respectively. This implies that most private and public firms are slightly overleveraged relative to their predicted targets. The mean values paint a different picture; private firms are on average slightly underleveraged (-0.84 percentage points) and public firms are somewhat overleveraged (2.06 percentage point). Furthermore, there is large variation around the median as indicated by the standard deviation in both subsamples. This suggest that subgroups of firms deviate highly from their target debt ratio, and it is this variation that allows us to test for the effect of leverage deficits on the acquisition probability. It is worth mentioning that firms are classified as underleveraged if their actual debt ratio deviates from the target by more than -11.95 percentage points, and as overleveraged if the difference from the target exceeds 12.36 percentage points in the positive direction.

As theorized, the median leverage deficit of unlisted firms is higher than that of their public counterparts. This might be a result of the higher readjustment costs facing private firms, implying that they will take longer in rebalancing to their target debt ratios. However, the absolute value of the average leverage deficit is higher for public companies, suggesting that the average public firm deviates more from the target relative to the average private firm. This could be because private firms will try to avoid incurring a leverage deficit in the first place exactly because it is more costly for them to deviate from their target.

Acquisitions: In total, acquisitions have taken place in only 224 of the 288,946 firm-year observations (i.e. 0.08%). As a result, the explanatory variables' effect on the acquisition probability will be economically insignificant in the regression results provided in Section 6.3. However, the signs and statistical significances of each coefficient will still be interesting and can provide meaningful answers to the questions we have raised. The number of acquiring firms is evenly split across private (110) and public (114) firms. The mean and median acquisition size is NOK 728 million and NOK 139 million, respectively. Acquisition sizes vary considerably within the sample, as the standard deviation is very large (i.e. NOK 1.38 billion).

6. Results and Main Analysis

This section provides the regression results and discussions of our findings. As before, we will address the effect of access to capital on capital structure, leverage deficits, and acquisition probability in three separate subsections.

6.1. Access to Capital and Capital Structure

Here, we study the effects of listing statuses on the use of financial leverage and on the determinants of capital structure. We have asked: (1) Does the leverage ratio of private companies differ systematically from that of public firms? (2) Can the findings in the existing literature on the determinants of leverage be extrapolated to private firms? Table II presents the results from models 1, 2 and 3, which aim to answer these questions.

Column 1 of Panel A shows the regression results for Model 1, in which we estimate the leverage ratio by using the explanatory variables which have consistently been found to be significant determinants of capital structure. Column 2 shows the results from regression model 2, where ownership concentration has been added as an explanatory variable. In column 3 we report the results from Model 3, which is employed to analyze the effect of asymmetric information on the use of financial leverage. Several of the regressors never take the value zero, and we therefore center the continuous regressors at their median values in all of the three models. Centering at the median is preferred over centering at the mean because most explanatory variables are skewed, as discussed in the descriptive statistics section. The effect of centering is that the intercept coefficients take on

Table II: Determinants of Leverage (Pooled Panel OLS Regression)

Panel A reports the coefficients obtained from running a pooled panel OLS regression with heteroskedasticity robust standard errors clustered by the year dimension (reported in parentheses). The leverage ratio is the dependent variable. All variable definitions are found in Appendix A.1. Regressors are lagged one year to ensure that these are in the information set of firms at time t, and continuous regressors are centered at their median value. The regressions also include dummy variables capturing year- and industry-fixed effects which are not reported due to space implications (see Appendix A.2 for the full results). Panel B reports the total partial effect of listing status. For each firm, we predict its leverage as if it was private and as if it was public, and report the means of these predicted values, along with the percentage of times for which the predicted leverage is higher if the firm is private than if it is public. In columns 1 and 2, we report the results from Models 1 and 2, for which the entire sample is used. In column 3, we report the results from Model 3, using the subsample of private firms only. ***, **, and * indicate significance at the 1%, 5%, and 10% level.

Panel A

Leverage ratio	**Model 1** (Entire sample)		**Model 2** (Entire sample)		**Model 3** (Unlisted firms only)	
Intercept	0.6348***	(0.0024)	0.6481***	(0.0030)	0.6484***	(0.0030)
Pub	-0.2231***	(0.0605)	-0.0858	(0.0650)		
Tng	0.1412***	(0.0076)	0.1414***	(0.0080)	0.1410***	(0.0079)
Growth	0.0625***	(0.0038)	0.0632***	(0.0038)	0.0633***	(0.0038)
Size	-0.0313***	(0.0017)	-0.0316***	(0.0010)	-0.0315***	(0.0010)
Risk	0.0260***	(0.0040)	0.0264***	(0.0040)	0.0265***	(0.0040)
ROA	-0.3870***	(0.0199)	-0.3800***	(0.0200)	-0.3806***	(0.0199)
Pub × Tng	0.2076***	(0.0240)	0.1791***	(0.0238)		
Pub × Growth	-0.0625***	(0.0143)	-0.0643***	(0.0146)		
Pub × Size	0.0431***	(0.0154)	0.0380**	(0.0157)		
Pub × Risk	-0.0294***	(0.0075)	-0.0267***	(0.0077)		
Pub × ROA	0.4231***	(0.0598)	0.4231***	(0.0618)		
OC			0.0548***	(0.0034)	0.0544***	(0.0035)
Pub × OC			0.1411***	(0.0443)		
PubNQ					-0.0668***	(0.0075)
Observations	*494,497*		*494,497*		*493,316*	
Adj. R^2	*0.1078*		*0.1129*		*0.1113*	

Panel B

	Model 1	**Model 2**
Pred. Lev^{Priv}	0.6397	0.6456
Pred. Lev^{Pub}	0.4533	0.5581
$Lev^{Priv} > Lev^{Pub}$	95.28%	81.17%

more meaningful values, while the slope coefficients remain unchanged. Panel B reports for models 1 and 2 the total partial effect of listing status on the use of financial leverage. That is, we follow Brav (2009) in predicting for each firm-year observation its leverage ratio as if it was private and as if it was public. Then, we report the means of these predicted values, along with the percentage of times the predicted leverage is higher if the firm is private than if the firm is public.

As mentioned in the methodology section, the coefficient on an interaction term shows a public firm's differential from a private firm with respect to the particular variable's effect on the leverage ratio. For instance, to see the effect of asset tangibility on the debt ratio for a public firm, one must add the coefficient on Tng to the coefficient on the interaction term $Pub \times Tng$. Hence, the signs reported on interaction terms in Table II need not correspond to the signs for public firms per se.

6.1.1. Findings from Model 1: Determinants of Capital Structure

Commencing with the results from Model 1, the first thing to notice is that all regressors are statistically significant at the 1% level. As suggested by the existing literature, we find asset tangibility, growth opportunities, firm size, profitability, and risk of sales to be significant determinants of capital structure, for both types of firms. However, there are a few surprising results with respect to some of the signs for public firms. First, we find the sign on profitability ($ROA + Pub \times ROA$) to be positive, as predicted by the trade-off theory. This is surprising considering that both Rajan and Zingales (1995) and Frank and Goyal (2009) find profitability to be negatively correlated with the leverage ratio of public firms. Next, the growth in sales variable for public firms ($Growth + Pub \times Growth$) is found to have a very small effect on the leverage ratio (the effect can only be seen by including five decimal places) and the effect is positive, rather than negative which we would expect based on the evidence presented in prior research. Except for these two differences, the signs for public firms are consistent with the existing literature.

More interesting is it to evaluate the regression results with the hypotheses in mind. First, we evaluate the null hypothesis ($H_0 1$) that the leverage ratio of a firm is independent of the firm's listing status, versus the alternative ($H_A 1$) that leverage ratios depend on listing statuses. Specifically, we hypothesized that private companies should have higher leverage ratios than public firms because they are unable to access public equity markets. As indicated by the coefficient on the dummy variable for listing status (Pub), public firms use significantly less debt

than their private counterparts (41.17% vs. 63.48%, respectively). However, since this dummy is also used in the interaction terms, we cannot rely solely on the intercept coefficient for public firms as the total partial effect of listing status. Rather, Panel B in Table II shows a better measure of the total partial effect. As expected, we find that private firms are predicted to use about 19 percentage points more leverage compared to public firms. Moreover, the predicted leverage ratio of a firm is higher in 95.28% of cases if the firm is private compared to the predicted leverage if that same firm is public. Hence, we find evidence in favor of the alternative hypothesis; The leverage ratio of a firm depends on the firm's listing status, and private firms use more debt financing that their public counterparts.

The second null hypothesis, $H_0 2$, stated that the determinants of capital structure are independent of the firm's listing status, with the alternative hypothesis, $H_A 2$, being that determinants depend on listing statuses. We expect that private firms will have determinants that are more in line with the pecking order theory, and that public firms will have determinants as predicted by the trade-off theory. The first column in Panel A of Table II shows that, for private firms, all signs in Model 1 are as predicted by the pecking order theory, except for the sign on asset tangibility (Tng). Nevertheless, the coefficient on asset tangibility is less positive for private firms compared to public firms, meaning that the leverage ratio of private companies exhibits a lower sensitivity to this 'trade-off determinant', as hypothesized. These findings should be the result of private firms facing larger costs of asymmetric information, implying that their leverage ratio should be better explained by the pecking order theory than by the trade-off theory. We address this theory with Model 3. Proceeding, the leverage ratio of private firms increases with the availability of growth opportunities and the risk of sales, while it decreases with firm size and profitability. In comparison, we find that public firms have determinants as predicted by the trade-off theory, except for the sign on the coefficient for growth in sales ($Growth + Pub \times Growth$) which is slightly positive. Next, the use of financial leverage in public firms increases with asset tangibility, firm size, and profitability, and decreases in the riskiness of sales.

In sum, we can reject the null hypothesis that determinants of capital structure are independent of the firm's listing status. More importantly, we find strong evidence in favor of the alternative hypothesis that the pecking order theory can better explain the financial policies of private firms, while the trade-off theory is more suited in the context of public companies. This strongly supports our theory that costs of asymmetric information are higher for private companies, which will

be further tested with hypothesis $H_0$4. In particular, since private firms are less transparent to outsiders, they will exhibit a stronger ordering in their choice of financing, preferring internally generated funds over external financing, and debt over equity. This is in line with our results that profitability has an economically large negative impact on private firms' use of debt, and that private firms use significantly more debt than public ones.

6.1.2. Findings from Model 2: Ownership Concentration

So far, we have provided evidence that private firms use more leverage than public firms, and that the pecking order theory is better able to explain the financial policies of unlisted companies. Model 2 extends Model 1 by adding the ownership concentration as a determinant of capital structure, allowing us to evaluate whether the value of control is an important driver of these observed differences. Specifically, if the value of control leads equity to be more expensive for private companies than for public ones, we would expect ownership concentration to be more important in determining the leverage of private firms than of public firms. According to the theory, unlisted firms should be less likely to use equity financing as this dilutes the stake of existing shareholders who place high value on remaining in control of the firm. The shareholders of public firms, on the other hand, should place less value on control because their stakes are already negligible.

By including ownership concentration as a regressor, the dummy variable for listing status (Pub) becomes statistically insignificant. Furthermore, the sign on the coefficient on growth in sales for public firms ($Growth + Pub \times Growth$) changes from being slightly positive to negative. Thus, all determinants for public firms now have signs predicted by the trade-off theory, lending further support to the rejection of hypothesis $H_0$2. As was the case in Model 1, the pecking order theory can explain all signs for private companies except for asset tangibility (Tng), but this variable's effect on the use of leverage is still lower than the corresponding effect for public firms. As before, this is in line with theory that private firms face greater information asymmetries. Panel B shows the total partial effect of listing status on the use of financial leverage in Model 2, with private firms being predicted to use about 9 percentage points more debt than their public counterparts (64.56% vs. 55.81%). However, the evidence against the first null hypothesis ($H_0$1) is not as strong as in Model 1; Now, the firm's predicted leverage is higher if the firm is private than if the firm is public in only 81.17% of the predictions.

However, the main purpose of Model 2 is to test the third null hypothesis, $H_0 3$, which states that the leverage ratio is independent of the firm's ownership concentration. The alternative is that the leverage ratio of a private firm increases in the firm's ownership concentration. The second column of Table II reports the coefficient on the ownership concentration variable for private firms (OC) and the differential for public firms ($Pub \times OC$). Both are found to be highly statistically significant, so we can reject the null hypothesis that ownership structure does not matter for the choice of financing. As hypothesized, the leverage ratio increases in the ownership concentration for private firms. However, this effect is both statistically and economically stronger for public companies, which provides evidence against the theory that it is the higher value placed on control in private firms that explains the differences we have observed in the financial policies of private and public companies. We therefore conclude that ownership concentration matters in financing decisions, but that the value of control cannot explain the higher cost of equity for private firms.

6.1.3. Findings from Model 3: Asymmetric Information

Model 3 is run on the subsample of private (unlisted) firms and addresses whether the higher cost of asymmetric information for private firms is able to explain why the cost of equity is greater for such firms. If so, we would expect the dummy variable for unlisted ASAs ($PubNQ$) to be economically and statistically significant, and that its sign should be negative. As noted, this dummy is used to proxy for the degree of information asymmetry in the subsample of unlisted firms, where unlisted ASAs should be more transparent to outsiders relative to unlisted ASs. Since unlisted ASAs are more transparent to outsiders, they should have a greater preference for using equity financing and therefore have lower leverage ratios compared to unlisted ASs.

The null hypothesis, $H_0 4$, states that leverage ratios are independent of the degree of asymmetric information. The alternative, $H_A 4$, predicts that the leverage ratio increases in the degree of information asymmetry. Column 3 in Table II shows the regression results of Model 3. In the subsample of private firms, we find that all variables have signs as predicted by the pecking order theory except for asset tangibility. This is in line with regression models 1 and 2. Turning to the coefficient of interest, the dummy variable for unlisted ASAs ($PubNQ$) has a coefficient that is negative and significantly different from zero at the 1% level, as predicted by the alternative hypothesis. Hence, there is strong evidence that firms use less debt

financing in their capital structure as a result of being more transparent to outsiders. We therefore reject the null hypothesis and conclude that costs of asymmetric information largely explain why private equity is more costly than public equity. According to the pecking order theory, greater costs of asymmetric information lead firms to use less of the information-sensitive security (i.e. equity), and the capital structure of private firms therefore consists of more debt financing.

6.1.4. Robustness Checks of Models 1 to 3

As described in the methodology section, we evaluate our main results using different subsamples of firms which should be facing different circumstances, and thus, for which a particular theory should be more applicable. We split the sample into four subsamples and rerun regression models 1 to 3: (1) a subsample of low-growth firms; (2) a subsample of high-growth firms; (3) a subsample for the period before the tax reform; and (4) a subsample for the period after the tax reform.

Model 1: Table III show the results of the robustness checks for Model 1. The findings are highly robust across the four subsamples, although with a few exceptions. First, the interaction term $Pub \times Risk$ is statistically insignificant in all subsamples except the one consisting of firm-year observations in the period after the 2006 tax reform. This suggest that the external validity may be weak for our finding that there is a significant difference in the sensitivity of the leverage ratio to the risk of sales variable between private and public firms. Hence, other researchers using different samples may not obtain similar results as we have. Recall that firm risk has not been proposed by Rajan and Zingales (1995), nor by Frank and Goyal (2009), to be a consistent determinant of capital structure. Rather, we included the variable to reduce issues of omitted variable bias because García de Olalla Lopez (2014) has found the variable to be significant using a sample obtained from the CCGR data set. Hence, it comes as no surprise that our findings on this variable might have weak external validity.

Second, the interaction term $Pub \times ROA$ is insignificant for the period prior to the tax reform. The difference between public and private firms may be insignificant because the financing policies of private firms was driven more by the motive of redistributing internally generated funds to shareholders before the tax exemption on dividends would change in 2006, rather than by the information asymmetries facing the firm as suggested by the pecking order theory.

Table III: Robustness Checks for Model 1 (Determinants of Leverage)

*This table shows the robustness results from running a pooled panel OLS regression with heteroskedasticity robust standard errors clustered by time (reported in parentheses). The dependent variable is the leverage ratio. All variable definitions are provided in Appendix A.1. Regressors are lagged by one year, centered at their median value, and winsorized at the 2.5% level. The regressions also include industry and year dummies which are not reported. Columns 1 and 2 report the results for the subsamples of low-growth and high-growth firms, respectively. Columns 3 and 4 report the results for observations prior to and after the 2006 tax reform, respectively. ***, **, and * indicate significance at the 1%, 5%, and 10% level.*

Leverage ratio	Lo-growth firms	Hi-growth firms	Pre tax reform	Post tax reform
Intercept	**0.6279*****	**0.6451*****	**0.6251*****	**0.6426*****
	(0.0031)	(0.0030)	(0.0018)	(0.0019)
Pub	**-0.2137****	**-0.2566*****	**-0.4022*****	**-0.1554****
	(0.0943)	(0.0652)	(0.0325)	(0.0694)
Tng	**0.1647*****	**0.1392*****	**0.1808*****	**0.1283*****
	(0.0075)	(0.0084)	(0.0037)	(0.0060)
Growth	**0.0613*****	**0.0458*****	**0.0499*****	**0.0670*****
	(0.0132)	(0.0036)	(0.0038)	(0.0043)
Size	**-0.0353*****	**-0.0292*****	**-0.0334*****	**-0.0290*****
	(0.0012)	(0.0015)	(0.0013)	(0.0012)
Risk	**0.0320*****	**0.0123*****	**0.0161*****	**0.0277*****
	(0.0041)	(0.0034)	(0.0026)	(0.0045)
ROA	**-0.4203*****	**-0.4387*****	**-0.2965*****	**-0.4152*****
	(0.0205)	(0.0213)	(0.0461)	(0.0154)
Pub × Tng	**0.1785*****	**0.2908*****	**0.2459*****	**0.1857*****
	(0.0670)	(0.0561)	(0.0263)	(0.0388)
Pub × Growth	**-0.1452****	**-0.0402**	**-0.0711*****	**-0.0691*****
	(0.0728)	(0.0306)	(0.0151)	(0.0180)
Pub × Size	**0.0355**	**0.0435*****	**0.0840*****	**0.0281**
	(0.0229)	(0.0166)	(0.0074)	(0.0187)
Pub × Risk	**-0.0085**	**0.0139**	**-0.0094**	**-0.0291*****
	(0.0171)	(0.0192)	(0.0010)	(0.0093)
Pub × ROA	**0.4703*****	**0.4802*****	**0.1220**	**0.4966*****
	(0.0847)	(0.0695)	(0.1143)	(0.0453)
Observations	*123,625*	*123,625*	*118,384*	*376,113*
Adj. R^2	*0.1226*	*0.1368*	*0.1340*	*0.1030*

Third, the interaction term $Pub \times Size$ is insignificant among low-growth firms and for firm-year observations in the period after the tax reform. First, this indicates that there is not a significant difference in the leverage ratio's sensitivity to firm size between private and public firms among low-growth firms. Second, the insignificance in the subsample of firms after the tax reform may be driven by the fact that private firms radically decreased their leverage ratio to more normal debt levels after the reform (Alstadsæter & Fjærli, 2009).

Fourth, the interaction term $Pub \times Growth$ is insignificant among high-growth firms, suggesting that there is no significant difference in the leverage ratio's sensitivity to growth opportunities between public versus private companies in this subsample. This is not surprising considering the subsample's nature.

Finally, and most interestingly, we observe that the listing status dummy (Pub) takes on largely different values before and after the tax reform. Even though the dummy cannot be interpreted as the total partial effect of listing status on the use of leverage, this indicates that the tax reform had major implications for the use of debt. Recall that the reform introduced dividend taxation for the shareholders of private firms. We observe that publicly listed firms use 40.22% less debt compared to private companies before the reform, but only 15.54% less debt after the reform. This suggests that private firms rapidly increased their leverage ratio prior to the reform and rapidly decreased it subsequent to the reform. This is in line with the observations of Alstadsæter and Fjærli (2009) that private firms increased leverage in order to distribute internally generated funds to shareholders before the reform would take place.

Model 2: Table IV, presented on the next page, shows the robustness results for Model 2. The results from the main sample are highly robust across the four subsamples, with the robustness being largely as explained for Model 1, however with two exceptions. First, $Pub \times ROA$ becomes significant among low-growth firms when ownership concentration is included in the regression model. Second, the listing status dummy (Pub), which was found to be insignificant in the main sample after the inclusion of OC, becomes significant at the 10% level for high-growth firms and at the 1% level for the period prior to the 2006 tax reform.

More interesting is the robustness of the variables for ownership concentration, i.e. OC and $Pub \times OC$. While the former is highly robust across all subsamples, the latter becomes insignificant among low-growth firms. Hence, the effect of ownership concentration on leverage ratios is not significantly different for the two

Table IV: Robustness Checks for Model 2 (Ownership Concentration)

*These are the results of a pooled panel OLS regression with robust standard errors clustered by time. The dependent variable is the leverage ratio (see Appendix A.1 for other definitions). Regressors are lagged by one year, centered at their median value, and winsorized at the 2.5% level. The regressions also include industry and year dummies which are not reported. Columns 1 and 2 report the results for the subsamples of low-growth and high-growth firms, respectively. Columns 3 and 4 report the results for observations prior to and after the 2006 tax reform, respectively. ***, **, and * indicate significance at the 1%, 5%, and 10% level.*

Leverage ratio	Lo-growth firms	Hi-growth firms	Pre tax reform	Post tax reform
Intercept	**0.6429*****	**0.6585*****	**0.6337*****	**0.6563*****
	(0.0039)	(0.0038)	(0.0022)	(0.0019)
Pub	**-0.1048**	**-0.1268***	**-0.2262*****	**-0.0423**
	(0.1016)	(0.0685)	(0.0783)	(0.7406)
Tng	**0.1661*****	**0.1389*****	**0.1830*****	**0.1275*****
	(0.0079)	(0.0087)	(0.0038)	(0.0678)
Growth	**0.0612*****	**0.0457*****	**0.0503*****	**0.0678*****
	(0.0128)	(0.0036)	(0.0040)	(0.0042)
Size	**-0.0370*****	**-0.0306*****	**-0.0345*****	**-0.0307*****
	(0.0012)	(0.0015)	(0.0013)	(0.0012)
Risk	**0.0332*****	**0.0123*****	**0.0170*****	**0.0278*****
	(0.0040)	(0.0034)	(0.0026)	(0.0048)
ROA	**-0.4121*****	**-0.4319*****	**-0.2883*****	**-0.4091*****
	(0.0204)	(0.0216)	(0.0448)	(0.0153)
Pub × Tng	**0.1598****	**0.2847*****	**0.1801*****	**0.1739*****
	(0.0648)	(0.0437)	(0.0270)	(0.0383)
Pub × Growth	**-0.1321***	**-0.0456**	**-0.0704*****	**-0.0700*****
	(0.0725)	(0.0292)	(0.0160)	(0.0183)
Pub × Size	**0.0317**	**0.0419****	**0.0765*****	**0.0244**
	(0.0237)	(0.0176)	(0.0111)	(0.0190)
Pub × Risk	**-0.0137**	**0.00225**	**-0.0062**	**-0.0356*****
	(0.0173)	(0.0184)	(0.0010)	(0.0095)
Pub × ROA	**0.4721*****	**0.4654*****	**0.1208**	**0.5015*****
	(0.0863)	(0.0665)	(0.1201)	(0.0466)
OC	**0.0644*****	**0.0491*****	**0.0377*****	**0.0615*****
	(0.0056)	(0.0036)	(0.0004)	(0.0014)
Pub × OC	**0.0881**	**0.1407*****	**0.1929*****	**0.1082****
	(0.0668)	(0.0464)	(0.0713)	(0.0469)
Observations	*123,625*	*123,625*	*118,384*	*376,113*
Adj. R^2	*0.1284*	*0.1413*	*0.1372*	*0.1089*

types of firms in this subsample. Perhaps this is because low-growth firms have fewer investment opportunities that need financing in general, and so there will be no need to raise external capital as often, leading to a lower difference in the value placed on remaining in control for the two types of firms.

Model 3: Table V shows that the dummy variable for information asymmetry ($PubNQ$) is robust across all subsamples, except among low-growth firms. As in the previous subsection, such firms have fewer investment opportunities and should

Table V: Robustness Checks for Model 3 (Asymmetric Information)

*This table shows the robustness results from running a pooled panel OLS regression on the subsample of private firms, with heteroskedasticity robust standard errors clustered by time reported in parentheses. The dependent variable is the leverage ratio. All variable definitions are provided in Appendix A.1. Regressors are lagged by one year, centered at their median value, and winsorized at the 2.5% level. The regressions also include industry and year dummies which are not reported. Columns 1 and 2 report the results for the subsamples of low-growth and high-growth firms, respectively. Columns 3 and 4 report the results for observations prior to and after the 2006 tax reform, respectively. ***, **, and * indicate significance at the 1%, 5%, and 10% level.*

Leverage ratio	Lo-growth firms	Hi-growth firms	Pre tax reform	Post tax reform
Intercept	**0.6430*****	**0.6592*****	**0.6339*****	**0.6566*****
	(0.0038)	(0.0037)	(0.0023)	(0.0019)
Tng	**0.1659*****	**0.1381*****	**0.1819*****	**0.1274*****
	(0.0078)	(0.0084)	(0.0038)	(0.0062)
Growth	**0.0612*****	**0.0457*****	**0.0501*****	**0.0679*****
	(0.0128)	(0.0036)	(0.0039)	(0.0042)
Size	**-0.0369*****	**-0.0302*****	**-0.0341*****	**-0.0306*****
	(0.0012)	(0.0015)	(0.0013)	(0.0012)
Risk	**0.0334*****	**0.0124*****	**0.0177*****	**0.0278*****
	(0.0039)	(0.0033)	(0.0027)	(0.0047)
ROA	**-0.4125*****	**-0.4328*****	**-0.2898*****	**-0.4094*****
	(0.0204)	(0.0214)	(0.0449)	(0.0153)
OC	**0.0641*****	**0.0483*****	**0.0366*****	**0.0614*****
	(0.0056)	(0.0037)	(0.0049)	(0.0015)
PubNQ	**-0.0134**	**-0.0996*****	**-0.0722*****	**-0.0435*****
	(0.0215)	(0.0037)	(0.0107)	(0.0097)
Observations	*123,329*	*123,329*	*118,076*	*375,240*
Adj. R^2	*0.1263*	*0.1387*	*0.1340*	*0.1075*

therefore not have to visit the external capital markets as often. Since problems of asymmetric information is relevant only when raising external funds, the associated costs should be far less important to the financial policy of low-growth firms. This might explain why the dummy for information asymmetry is insignificant in the subsample of low-growth firms. Next, Table V also shows that all other control variables are highly robust across the four subsamples.

6.1.5. Section Summary

In answering our main questions presented at the beginning of this section, we conclude that the leverage ratio of private companies is economically and statistically higher than that of public firms. Furthermore, we conclude that the findings in the existing literature on the determinants of leverage among public companies cannot be extrapolated to private firms. Rather, our findings suggest that the two types of firms make widely different considerations in choosing their capital structures. Since private firms are, in general, far more exposed to the problems of asymmetric information compared to their public counterparts, the pecking order theory will be better able to predict their financing behavior as compared to the trade-off theory, which is more applicable to public firms. In sum, we conclude that access to capital is an important determinant of firms' capital structure decisions.

6.2. Access to Capital and Leverage Deficits

We now turn to the analysis of how access to public equity markets affects the leverage deficit of firms in our sample. Specifically, we have asked: Is the leverage deficit of private firms systematically different from that of public firms? To try to answer this question, we estimate and compare the speed of adjustment coefficient for public and private firms by running the partial adjustment regression model on separate samples for the two types of firms. We then run a two-sample Z-test to evaluate whether the coefficient of interest is significantly different across the two subsamples. Panel A of Table VI shows the results of these regressions, where the coefficient on the lagged leverage ratio ($LR_{(i,t-1)}$) should be interpreted as $(1-\lambda)$. Hence, the speed of adjustment coefficient can be found by subtracting from 1 the coefficient on the lagged leverage ratio. In column 1, we report the results from Model 4 using the subsample of private firms only. Column 2 shows the corresponding results when isolating the subsample of public firms. In Panel B we report the results from the two-sample Z-test, testing whether there is a significant difference in the speed of adjustment coefficient between the two types of firms.

6.2.1. Findings from Model 4: Partial Adjustment Model

The null hypothesis, $H_0 5$, is that the readjustment rate of the leverage ratio is independent of listing status. The alternative hypothesis states that the leverage ratio of private firms will exhibit a slower readjustment rate to its target compared to that of public firms. Hence, we expect that the coefficient on the lagged leverage ratio, $(1 - \lambda)$, will be higher for private firms relative to their public counterparts. We find that the coefficient is 0.8975 for firms in the private subsample and 0.8482 for firms in the public subsample. Thus, the readjustment rate for private firms is about 10.25%, whereas it is 15.18% for public ones. Panel B shows that we can reject the

Table VI: Partial Adjustment Model (Pooled Panel OLS Regression)

*Panel A shows the regression results from a pooled panel OLS regression with the leverage ratio in period t as the dependent variable. The coefficient of interest is (1- λ) on $LR_{(i,t-1)}$, where λ is the speed of adjustment coefficient. Other variable definitions are provided in Appendix A.1. Reported in parentheses are the heteroskedasticity robust standard errors adjusted for clustering by time. The first column shows the results of the partial adjustment model for private firms. Column 2 shows the results for public firms. In Panel B we report the results from a two-sample Z-test, testing if the speed of adjustment coefficient is the same for private and public firms. All regressors are centered at their median value to get a meaningful intercept. Independent variables are lagged by one year and have been winsorized at the 2.5% level of each tail. The regression includes also industry and year dummies which are not reported (See Appendix A.2). ***, **, and * indicate significance at the 1%, 5%, and 10% level, correspondingly.*

Panel A

Leverage ratio$_{(i,\,t)}$	**Model 4** (Private firms only)		**Model 4** (Public firms only)	
Intercept	0.6864***	(0.0014)	0.6301***	(0.0368)
Tng	0.0004	(0.0003)	0.0785***	(0.0274)
Growth	-0.0095***	(0.0015)	0.0047	(0.0109)
Size	-0.0057***	(0.0007)	0.0087	(0.0097)
Risk	0.0048***	(0.0016)	0.0106	(0.0098)
OC	0.0067***	(0.0023)	0.0357*	(0.0187)
$LR_{(i,\,t-1)}$	0.8975***	(0.0107)	0.8482***	(0.0233)
Observations	*493,275*		*1,222*	
Adj. R^2	*0.7387*		*0.6891*	

Panel B

Z-value	-34.0331	**P-value**	0.0000

null hypothesis at the 1% level, so we provide strong evidence that private firms take longer in readjusting to their target leverage ratio. We have theorized that this is explained by the higher financing constraints faced by private companies. These constraints impose larger adjustment costs on unlisted firms relative to the listed ones, who may access public equity markets and therefore should have a lower cost of equity. Answering the main question, we conclude that access to capital matters and, as a result, the leverage deficit of public firms is significantly different from the leverage deficit of their private counterparts.

The results presented so far suggest that the traditional capital structure theories must be taken together in explaining firms' financial behavior, as argued by Myers (2001). Our findings indicate that while firms do rebalance their leverage ratio towards the target capital structure, lending support to the trade-off theory, the pecking order theory is more applicable to private companies since their readjustment rate is lower when compared to public companies. The result that the readjustment rate is 10.25% for private firms and 15.18% for public firms is pretty similar to the results presented by Fama and French (2002), who claimed that the rate of reversion they found (7-17%) was suspiciously slow to support the trade-off theory. Flannery and Rangan (2006) finds the speed of adjustment of public firms to be about 30%, which is twice as high as the rate we have uncovered. However, as pointed out by Leary and Roberts (2005), a dynamic version of the trade-off theory supports lower readjustment rates because firms rebalance their leverage ratio only once it crosses an upper or lower limit due to the costs of rebalancing. Moreover, the rate of readjustment is evidently not zero, as would be the case under a strict version of the pecking order theory. We therefore support the statement of Myers (2001) that the two theories must be taken together when explaining the financial policies of firms.

6.2.2. Robustness Checks of Model 4

Table VII on the next page shows the robustness of the results from the partial adjustment model across the four subsamples of firms facing different circumstances that may influence the results. In all subsamples except for the one consisting of firm-year observations prior to the tax reform, we find that the speed of adjustment of private firms is significantly lower than that of public ones. As we have already discussed, the leverage ratios of private firms increased substantially in the period leading up to the 2006 tax reform, which offers an explanation for why private firms readjusted significantly quicker than public firms prior to the tax

reform. Hence, we expect the external validity of our findings to be strong even though the result is not robust to this particular subsample.

Table VII: Robustness Checks for Model 4 (Partial Adjustment Model)

*Panel A shows the regression results from a pooled panel OLS regression with the leverage ratio in period t as the dependent variable. Other variable definitions are provided in Appendix A.1. The coefficient of interest is (1-λ) on $LR_{(i,t-1)}$, where λ is the speed of adjustment coefficient. Reported in parentheses are the heteroskedasticity robust standard errors adjusted for clustering by time. Columns 1 and 2 report the robustness results for the subsamples of low-growth and high-growth firms, respectively. Columns 3 and 4 report the robustness results for observations prior to and after the 2006 tax reform, respectively. In Panel B we report the results from a two-sample Z-test for each subsample, testing whether or not the speed of adjustment coefficient is the same for private and public firms. Independent variables are lagged by one year, centered at their median value, and have been winsorized at the 2.5% level of each tail. The regression includes also industry and year dummies which are not reported. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.*

Panel A

$LR_{(i,t)}$	Low-growth firms		Hi-growth firms		Pre tax reform		Post tax reform	
	Private	Public	Private	Public	Private	Public	Private	Public
Int.	**0.6868*****	**0.5741*****	**0.6825*****	**0.7038*****	**0.6771*****	**0.5879*****	**0.6603*****	**0.6419*****
	(0.0019)	(0.0621)	(0.0016)	(0.0613)	(0.0015)	(0.0724)	(0.0009)	(0.0388)
Tng	**0.0114*****	**0.1546*****	**0.0129*****	**0.1046*****	**0.0270*****	**0.1218*****	**0.0007**	**0.0334**
	(0.0027)	(0.0371)	(0.0032)	(0.0339)	(0.0030)	(0.0283)	(0.0022)	(0.0403)
Growth	**-0.0130*****	**0.0139**	**-0.0041**	**0.0000**	**-0.0070*****	**0.0109**	**-0.0010*****	**0.0030**
	(0.0050)	(0.0360)	(0.0029)	(0.0151)	(0.0025)	(0.0120)	(0.0022)	(0.0126)
Size	**-0.0085*****	**0.0085**	**-0.0054*****	**0.0041**	**-0.0080*****	**0.0158**	**-0.0025*****	**0.0085**
	(0.0008)	(0.0148)	(0.0007)	(0.0118)	(0.0021)	(0.0143)	(0.0006)	(0.0114)
Risk	**0.0011**	**0.0373*****	**0.0053****	**-0.0026**	**0.0011**	**0.0347*****	**0.0056*****	**-0.0006**
	(0.0013)	(0.0117)	(0.0025)	(0.0118)	(0.0028)	(0.0126)	(0.0016)	(0.0110)
OC	**0.0054****	**0.0081**	**0.0103*****	**0.0801*****	**0.0072**	**0.0278**	**0.0067*****	**0.0414****
	(0.0025)	(0.0419)	(0.0027)	(0.0234)	(0.0079)	(0.0528)	(0.0013)	(0.0205)
$LR_{(i, t-1)}$	**0.8836*****	**0.8403*****	**0.8876*****	**0.8411*****	**0.8173*****	**0.8317*****	**0.9154*****	**0.8554*****
	(0.0105)	(0.0391)	(0.0116)	(0.0303)	(0.0159)	(0.0177)	(0.0061)	(0.0267)
Obs.	*123,175*	*450*	*123,143*	*482*	*118,074*	*310*	*375,201*	*912*
Adj. R^2	*0.7356*	*0.6745*	*0.6955*	*0.7005*	*0.6552*	*0.7005*	*0.7590*	*0.6880*

Panel B

	Low-growth firms	Hi-growth firms	Pre tax reform	Post tax reform
Z-value	-19.3171	-23.2741	-19.7618	-28.0145
P-value	0.0000	0.0000	0.0000	0.0000

6.3. Access to Capital and the Effect of Leverage Deficits on M&As

Finally, we address the interdependency of access to public equity markets and the effect of leverage deficits on the firm's acquisition probability. Specifically, we have asked: How do deviations from the target debt ratio influence the acquisition probability of firms, and are there significant differences between private and public companies? Table VIII shows the results of the pooled panel probit regression for Model 5, alongside the robustness results when using the logistic regression model instead. Column 1 reports the results of the former, and column 2 reports the results of the latter.

It should be noted that it is highly unlikely to be an acquirer in our acquisition subsample, as M&As have taken place in only 224 of the 288,946 firm-year observations (i.e. 0.08%). As a result, the explanatory variables' effect on the acquisition probability will be economically insignificant, and we are therefore more interested in the signs and statistical significances of each coefficient. Nevertheless, we report the results as average marginal effects, as the coefficient estimates would otherwise be difficult to interpret.

6.3.1. Findings from Model 5: Leverage Deficits and Acquisition Probability

Our results offer mixed support for the regressors which have been suggested as determinants of a firm's acquisition probability. Growth opportunities ($Growth$), firm size ($Size$), and the industry's M&A liquidity ($MALiq$) are all statistically significant and increases the acquisition probability, in line with the suggestions of the current literature. Whereas the growth opportunities coefficient is significant at the 5% level, both firm size and industry M&A liquidity are highly statistically significant. Contrary to the evidence presented in previous research, our analysis does not find a firm's profitability (ROA), historical leverage ($Trail3yrAvg$), nor the industry concentration (HI), to be significant determinants of acquisition probabilities. Furthermore, the variable controlling for a firm's listing status (Pub) is significant at the 5% level and indicates that access to public equity markets increases the probability of acquiring another firm. As before, one must be careful not to interpret this as the total partial effect of access to capital since the dummy variable is also interacted with the leverage deficits in other regressors. Nevertheless, the positive effect of being publicly listed on acquisition probability is in line with previous findings that M&As are generally financed by raising external funds (Opler et al., 1999).

We have hypothesized that overleveraged firms should be less likely to acquire

Table VIII: M&A Probability (Pooled Panel Probit/Logit Regressions)

In column 1 we report the results of Model 5 as average marginal effects, using a pooled panel probit regression. Column 2 reports the robustness results for Model 5, replacing the probit model with a pooled panel logit regression. Due to the highly unbalanced split of the dependent variable between 0 and 1 in our sample, we are interested in the signs and significances of each coefficient rather than on their magnitudes. Heteroskedasticity robust standard errors adjusted for clustering by time is reported in parentheses. The dependent variable is the probability of being an acquirer. For other variable definitions, see Appendix A.1. The regression includes also an intercept and year dummies which are not reported here (see Appendix A.2 for the full results).

Pr(Acquirer)	**Model 5** (Probit Regression)		**Robustness** (Logit Regression)	
Pub	0.009586**	(0.004793)	0.002302**	(0.001156)
Growth	0.000017**	(0.000007)	0.000015*	(0.000008)
Size	0.000051***	(0.000011)	0.000073***	(0.000014)
ROA	-0.000016	(0.000043)	-0.000035	(0.000053)
Trail3yrAvg	-0.000075	(0.000049)	-0.000102	(0.000069)
MALiq	0.000546***	(0.000154)	0.000612***	(0.000177)
HI	-0.000038	(0.000054)	-0.000081	(0.000074)
OverLev	0.000003	(0.000008)	0.000003	(0.000009)
UnderLev	-0.000022*	(0.000012)	-0.000034*	(0.000018)
Pub × OverLev	0.000006	(0.000020)	0.000013	(0.000019)
Pub × UnderLev	-0.000005	(0.000022)	-0.000003	(0.000024)
Observations	*288,946*		*288,946*	

because they will be constrained from raising further debt. Since private firms cannot use stock as the medium of exchange to the same extent as their public counterparts, the effect should be stronger for private firms. As shown in column 1 of Table VIII, we do not find overleveraging to be a statistically significant determinant of acquisition probabilities, neither for private firms nor for public ones. This goes against the predictions of the free cash flow theory, which would suggest that overleveraged firms should be less likely than the reference group to undertake acquisitions as they should be constrained from doing so by their high debt service requirements. In sum, we find no support for the alternative hypothesis, $H_{A1}6$, that a firm's degree of overleverage reduces the likelihood of acquiring and that this effect should be stronger for private firms.

Next, we hypothesized that too little debt financing should increase the likelihood of acquiring, and that the effect should be stronger for public firms. For private firms, the effect of being underleveraged compared to the reference group is found to be statistically significant at the 10% level, as indicated by the coefficient estimate on the variable $UnderLev$. Hence, we can reject the null hypothesis, $H_0 6$, that the acquisition probability is independent of the firm's leverage deficit. Surprisingly, the coefficient takes on a negative sign, indicating that underleveraging decreases the probability of acquiring. This is in conflict with the overinvestment prediction of the free cash flow theory, under which managers of underleveraged firms will tend to overinvest in acquisition opportunities. Similarly, these results present evidence against the financial synergies hypothesis of Myers & Majluf (1984), whereby underleveraged firms should be more likely to acquire since such firms can subsequently finance the unfunded growth opportunities of the target company to generate financial synergies. However, while both theories would suggest the opposite relationship when interpreted in their strictest sense, the arguments underlying the free cash flow theory may be in accordance with our findings. Specifically, most M&As are financed with external funds (Opler et al., 1999) and since too little debt leads to inefficient investment levels by managers, these managers should find it more difficult to raise external capital to finance their M&A opportunities. Inefficient investments deplete shareholder value, so external investors may regard these managers as less capable compared to managers of firms with no leverage deficit.

In sum, while we find support in favor of rejecting the null hypothesis that the acquisition probability is independent of the leverage deficit, we do not find support for the alternative hypothesis $H_{A2} 6$. The effect of underleveraging on M&A probabilities has the opposite sign of what we predicted and is not significantly different for public firms compared to private ones, since the coefficient on the interaction term $Pub \times UnderLev$ is insignificant. Hence, we cannot conclude that access to public equity markets has an effect on the relationship between underleveraging and the likelihood of acquiring another firm.

6.3.2. Robustness Check of Model 5

Column 2 of Table VIII reports the robustness results for Model 5. We address hypothesis 6 again, this time by using a pooled logit model in place of the pooled probit regression, as explained in the methodology section. The two models may give non-negligible different results because the split of the dependent binary

variable between zero and one is highly unbalanced in our panel data set (Brooks, 2014). The results show that inferences are robust to using a logit model instead of the probit model.

7. Conclusion

Using a large data set of Norwegian private and public companies, we analyze the effect of access to public equity markets on several aspects of the financial policy of the firm. Specifically, we establish a link between the firm's access to capital and its use of financial leverage, its tendency to deviate from the target leverage ratio, and the effect of any such deviations on the firm's subsequent acquisition behavior.

Our thesis addresses four main research question, and we now summarize our findings to answer each of them. First, we asked: (1) Does the leverage ratio of private companies differ systematically from that of public firms? We present evidence that private firms use significantly more debt financing in their capital structure compared to their public counterparts. Our analysis suggests that the striking differences in the financial policies of the two types of firms can be explained by the larger costs of asymmetric information facing unlisted companies. Access to public equity markets reduces the degree of information asymmetry between insiders and outsiders of the firm, which largely explains why the cost of equity is lower for public firms than for private ones. This lower cost of equity leads listed firms to use more equity financing in their capital structure compared to unlisted firms. Moreover, in contrast to the evidence presented in prior research (Brav, 2009), we show that the value shareholders place on remaining in control of the firm does not explain why equity issuances are more costly for unlisted companies than for listed ones.

Next, we have asked: (2) Can the findings in the existing literature on the determinants of leverage among public firms be extrapolated to private firms? In accordance with our findings that the problems of asymmetric information are much more acute for private companies, we show that the pecking order theory performs better in predicting the financing behavior of private firms, while the trade-off theory is more applicable to public firms. Specifically, our results show that the signs on the determinants of leverage differ significantly across the two types of firms and we therefore conclude that the findings in the existing literature cannot be extrapolated to private firms.

Third, we raised the question: (3) Is the leverage deficit of private firms systematically different from that of public firms? To answer this, we employ a partial adjustment model and compare the speed of which the two types of firms readjust their capital structures toward their predicted target leverage ratios. We show that the lack of access to capital impedes unlisted firms from rebalancing their leverage ratio as quickly as their public counterparts. This should be the result of the higher rebalancing costs facing firms without access to public equity markets. As such, we present the novel evidence that access to capital is an important determinant of leverage deficits and the rebalancing efforts of a firm. Moreover, our results from this analysis also suggest that the pecking order theory cannot fully explain the financing behavior of private firms. This theory does not support the existence of a target capital structure, yet we find that both private and public companies readjust their leverage ratio towards their predicted target. Hence, in addition to the pecking order theory, the trade-off theory has to be taken into account when analyzing privately held firms as well.

Finally, we asked: (4) How do deviations from the target capital structure influence the acquisition probability of a firm, and are there significant differences between private and public companies? We show that the leverage deficit of a firm has important implications for its subsequent acquisition decisions. In general, using too little debt compared to the target capital structure reduces the likelihood of undertaking acquisitions. We also show that access to public equity markets has no significant effect on the interdependency of leverage deficits and acquisition probabilities. The negative effect of being underleveraged on the firm's acquisition probability is not significantly different for private and public firms, while the effect of being overleveraged is insignificant for both groups. The answers we provide to this question provides surprising evidence against the overinvestment predictions of the free cash flow theory, whereby firms that are less constrained by debt service requirements (i.e. underleveraged firms) should be more likely to acquire. Even more so, while underleveraged firms are significantly less likely to pursue acquisition opportunities, we show that overleveraged firms are not. Our findings also provide evidence against the financial synergies hypothesis, in which underleveraged firms should acquire overleveraged targets and subsequently finance the target's unfunded growth opportunities to generate financial synergies.

The results in our thesis provide ideas for future research. In particular, more research is called for analyzing the interdependence of leverage deficits and acquisition behavior in the context of private firms. The evidence we provide

against the free cash flow theory and the financial synergies hypothesis is contrary to the findings of prior research, but all of the existing literature has been based entirely on the M&A behavior of public firms. We therefore hope to see further efforts relating to samples of unlisted firms, which may confirm the evidence provided in this thesis.

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A. Appendices

A.1. Definition of Variables

Δ***LR*** is the change in a firm's leverage ratio from period *t-1* to period *t*.

Acquirer is a dummy variable equal to one if the firm has made an acquisition and zero if else. It is used as a dependent variable to measure the effect of the leverage deficit on the probability of making an acquisition.

Acquisition Size is measured as the sum of the annual transaction values for an acquirer.

D is a dummy variable containing the year and industry dummies in models 1 to 4, and the year dummies in model 5.

Growth is the growth opportunities of a firm, proxied by growth in sales.

HI is the Herfindahl Index which measures the industry concentration in a given year. It is defined as the annual sum of squared market shares of all firms in a given industry, where market share is measured as a firm's proportion of the industry's total sales.

Ind1 is a dummy variable equal to one if the firm is in the service sector. This group serves as the reference group in models 1 to 4, and the dummy is therefore excluded from the regressions.

Ind2 is a dummy variable equal to one if the firm's industry is unknown and zero otherwise.

Ind3 is a dummy variable equal to one if the firm is in the agriculture sector and zero otherwise.

Ind4 is a dummy variable equal to one if the firm is in the manufacturing sector and zero otherwise.

Ind5 is a dummy variable equal to one if the firm is in the energy sector and zero otherwise.

Ind6 is a dummy variable equal to one if the firm is in the construction sector and zero otherwise.

Ind7 is a dummy variable equal to one if the firm is in the trade sector and zero otherwise.

Ind8 is a dummy variable equal to one if the firm is in the transport sector and zero otherwise.

Ind9 is a dummy variable equal to one if the firm's industry is multisector and zero otherwise. By multisector is meant that there are multiple industries reported for a given firm-year observation in the CCGR data.

LR is leverage ratio, calculated as the ratio of total book value of debt to total book value of assets.

Leverage Deficit is defined as the actual leverage ratio minus the firm's predicted target leverage ratio.

MALiq is a variable that captures the annual liquidity in the mergers and acquisitions market per industry (the industry M&A liquidity construct of Schlingemann et al. (2002)). This variable is computed as the ratio of the sum of acquisition values per industry per year to the total assets of all firms in the industry per year.

OverLev is a dummy variable equal to one if the firm is highly overleveraged and zero otherwise. We define firms within the fourth quartile of the leverage deficit variable as overleveraged.

Ownership Concentration is measured as the percentage of equity held by the largest shareholder.

Pub is a dummy variable equal to one if the firm is publicly listed and zero if the firm is privately held.

PubNQ is a dummy variable used to proxy for information asymmetry in the subsample of unlisted firms. The variable is equal to one if the firm is registered as a public company (ASA) and zero if it is registered as a private firm (AS)

Risk is the firm risk, proxied by the risk of sales. We measure this as the standard deviation of growth in sales based on at least three observations.

ROA is return on assets, used as a proxy for the profitability of a firm. It is measure as the ratio of earnings before interest (EBI) to total assets.

Size is the firm size measured as the natural logarithm of assets.

***Speed of adjustment (*λ) is the rate of which a firm rebalances its leverage ratio towards the target.

Tng is the asset tangibility of a firm. It is measured as the ratio of total fixed tangible assets to total assets.

Trail3yrAvg is the firm's historical leverage, measured as the trailing 3-year average of the firm's leverage ratio.

UnderLev is a dummy variable equal to one if the firm is highly underleveraged and zero otherwise. We define firms within the first quartile of the leverage deficit variable as overleveraged.

W is a vector used in Model 5 containing the variables *Growth*, *Size*, and *ROA*.

A.2. Tables with Full Regression Results

Table IX: Determinants of Leverage (Full Results for Models 1 – 3)

*Panel A reports the coefficients obtained from running a pooled panel OLS regression with heteroskedasticity robust standard errors clustered on the year dimension (reported in parentheses). Leverage ratio is the dependent variable. All variable definitions are found in Appendix A.1. Regressors are lagged by one year to ensure that these are in the information set of firms at time t, and continuous regressors are centered at their median value. The reference year is 2002 and the reference industry is the service sector. Panel B reports the total partial effect of listing status. For each firm, we predict its leverage as if it was private and as if it was public, and report the means of these predicted values, along with the percentage of times for which the predicted leverage is higher if the firm is private than if it is public. In columns 1 and 2, we report the results from Models 1 and 2, for which the entire sample is used. In column 3, we report the results from Model 3, using the subsample of private firms only. ***, **, and * indicate significance at the 1%, 5%, and 10% level.*

Panel A

Leverage ratio	**Model 1** (Entire sample)		**Model 2** (Entire sample)		**Model 3** (Unlisted firms only)	
Intercept	0.6348***	(0.0024)	0.6481***	(0.0030)	0.6484***	(0.0030)
Pub	-0.2231***	(0.0605)	-0.0858	(0.0650)		
Tng	0.1412***	(0.0076)	0.1414***	(0.0080)	0.1410***	(0.0079)
Growth	0.0625***	(0.0038)	0.0632***	(0.0038)	0.0633***	(0.0038)
Size	-0.0313***	(0.0017)	-0.0316***	(0.0010)	-0.0315***	(0.0010)
Risk	0.0260***	(0.0040)	0.0264***	(0.0040)	0.0265***	(0.0040)
ROA	-0.3870***	(0.0199)	-0.3800***	(0.0200)	-0.3806***	(0.0199)
Pub × Tng	0.2076***	(0.0240)	0.1791***	(0.0238)		
Pub × Growth	-0.0625***	(0.0143)	-0.0643***	(0.0146)		
Pub × Size	0.0431***	(0.0154)	0.0380**	(0.0157)		
Pub × Risk	-0.0294***	(0.0075)	-0.0267***	(0.0077)		
Pub × ROA	0.4231***	(0.0598)	0.4231***	(0.0618)		
OC			0.0548***	(0.0034)	0.0544***	(0.0035)
Pub × OC			0.1411***	(0.0443)		
PubNQ					-0.0668***	(0.0075)
2003	0.0108***	(0.0006)	0.0110***	(0.0006)	0.0110***	(0.0006)
2004	0.0328***	(0.0006)	0.0329***	(0.0006)	0.0330***	(0.0006)
2005	0.0046***	(0.0006)	0.0046***	(0.0006)	0.0045***	(0.0006)
2006	0.0044***	(0.0006)	0.0031***	(0.0006)	0.0029***	(0.0006)
2007	-0.0000	(0.0006)	-0.0020***	(0.0007)	-0.0022***	(0.0007)

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2008	0.0062***	(0.0007)	0.0042***	(0.0007)	0.0039***	(0.0007)
2009	-0.0024***	(0.0006)	-0.0043***	(0.0006)	-0.0046***	(0.0006)
2010	0.0047***	(0.0006)	0.0027***	(0.0006)	0.0024***	(0.0007)
2011	0.0006	(0.0006)	-0.0016**	(0.0007)	-0.0020***	(0.0007)
2012	0.0007	(0.0007)	-0.0016**	(0.0008)	-0.0020***	(0.0008)
2013	0.0079***	(0.0006)	0.0053***	(0.0007)	0.0049***	(0.0007)
2014	0.0091***	(0.0006)	0.0063***	(0.0007)	0.0059***	(0.0007)
2015	0.0167***	(0.0006)	0.0137***	(0.0007)	0.0133***	(0.0007)
2016	0.0538***	(0.0008)	0.0496***	(0.0010)	0.0497***	(0.0010)
2017	-0.0052***	(0.0017)	0.0052***	(0.0017)	0.0141***	(0.0018)
Ind2	-0.0413***	(0.0044)	-0.0410***	(0.0042)	-0.0414***	(0.0042)
Ind3	0.0031	(0.0026)	0.0058**	(0.0026)	0.0058**	(0.0026)
Ind4	-0.0122**	(0.0060)	-0.0165***	(0.0061)	-0.0211***	(0.0060)
Ind5	-0.0785***	(0.0029)	-0.0096***	(0.0030)	-0.0010***	(0.0030)
Ind6	-0.0380***	(0.0030)	-0.0378***	(0.0031)	-0.0380***	(0.0031)
Ind7	-0.0045*	(0.0025)	-0.0075***	(0.0026)	-0.0076***	(0.0026)
Ind8	0.0004	(0.0013)	-0.0003	(0.0013)	-0.0002	(0.0013)
Ind9	-0.0182***	(0.0023)	-0.0194***	(0.0029)	-0.0196***	(0.0031)
Observations	*494,497*		*494,497*		*493,316*	
Adj. R^2	*0.1078*		*0.1129*		*0.1113*	

Panel B

	Model 1	**Model 2**
Pred. Lev^{Priv}	0.6397	0.6456
Pred. Lev^{Pub}	0.4533	0.5581
$Lev^{Priv} > Lev^{Pub}$	95.28%	81.17%

Table X: Partial Adjustment Model (Full Results for Model 4)

*Panel A shows the full regression results, including industry and year dummies, from a pooled panel OLS regression with the leverage ratio in period t as the dependent variable. The reference year is 2002 and the reference industry is the service sector. Other variable definitions are provided in Appendix A.1. Reported in parentheses are the heteroskedasticity robust standard errors adjusted for clustering across time. The first column shows the results of the partial adjustment model for private firms. Column 2 shows the results for public firms. In Panel B we report the results from a two-sample Z-test, testing if the speed of adjustment coefficient is the same for private and public firms. All regressors are centered at their median value to get a meaningful intercept. Independent variables are lagged by one year and have been winsorized at the 2.5% level of each tail. ***, **, and * indicate significance at the 1%, 5%, and 10% level.*

Panel A

Leverage ratio$_{(i,\,t)}$	**Model 4** (Private firms only)		**Model 4** (Public firms only)	
Intercept	0.6864***	(0.0014)	0.6301***	(0.0368)
Tng	0.0004	(0.0003)	0.0785***	(0.0274)
Growth	-0.0095***	(0.0015)	0.0047	(0.0109)
Size	-0.0057***	(0.0007)	0.0087	(0.0097)
Risk	0.0048***	(0.0016)	0.0106	(0.0098)
OC	0.0067***	(0.0023)	0.0357*	(0.0187)
LR$_{(i,\,t-1)}$	0.8975***	(0.0107)	0.8482***	(0.0233)
2003	-0.0161***	(0.0004)	-0.0178***	(0.0020)
2004	-0.0020***	(0.0005)	-0.0112***	(0.0023)
2005	-0.0529***	(0.0007)	-0.0089**	(0.0038)
2006	-0.0278***	(0.0004)	0.0067	(0.0048)
2007	-0.0299***	(0.0004)	-0.0067*	(0.0038)
2008	-0.0246***	(0.0004)	0.0257***	(0.0039)
2009	-0.0309***	(0.0004)	-0.0167***	(0.0046)
2010	-0.0195***	(0.0003)	0.0012	(0.0051)
2011	-0.0265***	(0.0004)	0.0150***	(0.0056)
2012	-0.0249***	(0.0005)	-0.0054	(0.0069)
2013	-0.0207***	(0.0004)	0.0054	(0.0071)
2014	-0.0229***	(0.0005)	0.0190**	(0.0081)
2015	-0.0197***	(0.0005)	-0.0078	(0.0079)
2016	-0.0059***	(0.0008)	-0.1106***	(0.0139)

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2017	-0.0444***	(0.0010)	-0.0359***	(0.0103)
Ind2	0.0006	(0.0021)	0.0375***	(0.0053)
Ind3	-0.0000	(0.0028)	-0.0405	(0.0371)
Ind4	0.0079	(0.0063)	0.0061	(0.0152)
Ind5	-0.0015	(0.0016)	-0.0215	(0.0233)
Ind6	-0.0024**	(0.0012)	-0.0066	(0.0099)
Ind7	-0.0013	(0.0010)	-0.0234	(0.0278)
Ind8	0.0010	(0.0012)	-0.0192	(0.0148)
Ind9	0.0009	(0.0009)	-0.0158	(0.0137)
Observations	*493,275*		*1,222*	
Adj. R^2	*0.7387*		*0.6891*	

Panel B

Z-value	-34.0331	**P-value**	0.0000

Table XI: M&A Probability (Full Results for Model 5)

Here we report the full results of Model 5, including year dummies, as average marginal effects. Column 1 reports the results of a pooled panel probit regression, while column 2 shows the robustness results of a logit regression. Due to the highly unbalanced split of the dependent variable between 0 and 1 in our sample, we are interested in the signs and significances of each coefficient rather than on their magnitudes. Heteroskedasticity robust standard errors adjusted for clustering by time is reported in parentheses. The reference year is 2005. The dependent variable is the probability of being an acquirer. For other variable definitions, see Appendix A.1.

Pr(Acquirer)	**Model 5** (Probit Regression)		**Robustness** (Logit Regression)	
Pub	0.009586**	(0.004793)	0.002302**	(0.001156)
Growth	0.000017**	(0.000007)	0.000015*	(0.000008)
Size	0.000051***	(0.000011)	0.000073***	(0.000014)
ROA	-0.000016	(0.000043)	-0.000035	(0.000053)
Trail3yrAvg	-0.000075	(0.000049)	-0.000102	(0.000069)
MALiq	0.000546***	(0.000154)	0.000612***	(0.000177)
HI	-0.000038	(0.000054)	-0.000081	(0.000074)
OverLev	0.000003	(0.000008)	0.000003	(0.000009)
UnderLev	-0.000022*	(0.000012)	-0.000034*	(0.000018)
Pub × OverLev	0.000006	(0.000020)	0.000013	(0.000019)
Pub × UnderLev	-0.000005	(0.000022)	-0.000003	(0.000024)
2006	0.000024***	(0.000008)	0.000024***	(0.000009)
2007	0.000036***	(0.000012)	0.000037***	(0.000012)
2008	-0.000011***	(0.000003)	-0.000010***	(0.000002)
2009	-0.000030***	(0.000008)	-0.000029***	(0.000008)
2010	-0.000029***	(0.000008)	-0.000029***	(0.000008)
2011	-0.000004***	(0.000001)	-0.000003**	(0.000002)
2012	-0.000012***	(0.000003)	-0.000011***	(0.000003)
2013	-0.000012***	(0.000003)	-0.000012***	(0.000004)
2014	-0.000026***	(0.000007)	-0.000026***	(0.000007)
2015	-0.000029***	(0.000008)	-0.000029***	(0.000008)
2016	-0.000009**	(0.000005)	-0.000009**	(0.000004)
2017	0.000230***	(0.000075)	0.000024***	(0.000008)
Observations	*288,946*		*288,946*	