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THE EFFECT OF LEVERAGE ON FIRM GROWTH

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ABSTRACT

The choice of capital structure is one of the most dominant decisions that define the financial state of a firm. Modigliani and Miller (1958) state that capital structure is irrelevant, but the financial conditions required for this statement are not met in the real world. Different capital structure theories have been presented but there is no consensus of which of these theories could be considered as a norm. This complicates the investigation of capital structure's effects on firm operations. One big issue is how leverage affects the firm's investments and growth.

The purpose of this study is to contribute to the discussion of the effect of leverage on firm growth measured in capital expenditures and changes in employment. Furthermore, whether the firm's growth opportunities affect this relationship. This research also closely concentrates on the financial crisis and how that has affected the relationship between leverage and firm growth.

The data in this research consist of listed U.S. companies from 2002-2013 with at least one billion dollar sales measured in 2002 dollars. Growth is measured with capital expenditures growth, employment growth and net investment growth. Multiple linear regressions with White adjusted standard errors are estimated for three time periods: whole period of 2002-2013, normal period of 2002-2006 and 2011-2013 combined, and abnormal period of 2007-2010. This is done to test if the financial crisis has affected the relation between leverage and firm growth. The regressions are also conducted for subgroups defined by Tobin's q to examine if the firms' growth opportunities affect the relation between capital structure and growth.

The results show that in normal economical times, leverage is negatively associated with firm growth. However, this relation is stronger for firms with poor growth opportunities. During economical downturn, leverage has a strong negative relation with growth for firms with poor growth opportunities, but not for other firms. The results provide evidence for that leverage is negatively associated with firm growth particularly for firms with low growth opportunities and that economical downturn strengthens this relation for firms with poor growth opportunities and eliminates it for firms with high growth opportunities.

KEYWORDS: Capital structure, Growth, Leverage, Investment, Subprime crisis

1. INTRODUCTION

Every firm has to think what is the optimal debt level that maximizes the firm's profitability and allows the firm to take the projects with positive net present value and increase the growth of the firm. Modigliani and Miller (MM) (1958) argued in their famous paper that capital structure is irrelevant. However, their results assume that the capital markets are perfect, corporate taxes are absent and firm's financing and investment decisions are independent. These assumptions do not hold in real world, and that is why MM's results can only be considered as theoretical framework. Many more capital structure theories that try to identify the "perfect" capital structure of companies have been presented. Tradeoff theory suggests that the optimal capital structure is a result of a tradeoff between the costs and benefits of borrowing. It is based on the MM theory, but the benefits of taxes are added to the equation (see e.g. Myers, 1984). On the other hand, pecking order theory proposes that firms have a pecking order of the financing of their operations (see e.g. Donaldson, 1961; Myers, 1984). The theory suggests that firms prefer internal to external financing, and if they have to obtain external funds, they issue debt rather than equity. The choice of capital structure can also be a consequence of the agency costs between stakeholders that emerge from different interests (see e.g. Jensen & Meckling, 1976). Debt is also observed to be used as a shield against hostile takeover threats (see e.g. Harris & Raviv, 1988). Capital structure can also be formed of the financial distress or constraints that firms face. If a firm is not able to enter the capital markets due to insufficient asset base or similar reason, it may prevent the firm from obtaining external funding and thus result in missed growth opportunities (see e.g. Whited, 1992). Capital structure is a widely studied field, but because of the multiple different factors that can have an effect on the capital structure decisions, there has not been found any general theory about the formation of an optimal capital structure.

In addition to capital structure, firm growth is also affected by many factors. The factors behind firm growth are also widely studied, and there are many propositions for the most important determinants of firm growth. Pasanen (2007) divided the strategies of firm growth to organic and non-organic. Organic growth is growth that arises from inside the firm and non-organic growth is a result of acquisitions. The factors of firm growth are often divided to internal and external factors (see e.g. Hansen, Wernerfelt & Birger, 1989). Internal factors include things such as human resource management, size of the company, company structure etc., when external factors include industrial factors,

competitors and other economical factors. All these factors affect the firm's possible growth in some way, but many have argued that after all, the biggest contribution to firm growth comes from inside the company. Many researches of specific internal factors have usually concentrated on the age, size and management of the firm. As this research studies the effect of leverage on firm growth, it also mainly focuses on the internal factors that affect firm growth.

Because of the unclear factors that define a firm's capital structure and increases growth, it seems important to study this topic to see if leverage affects firm growth. Increasing firm performance and growing the firms operations are usually the main target in every business. Firm growth increases the value for shareholders and the firm itself because through growth, firms have more possibilities to generate profit. If the capital structure has an effect on firm growth, it then must be closely planned in order to maximize the firm's profitability. However, since no optimal capital structure have, and probably will not be found, it is important to study how it affects the firm growth and consequently future profitability. Central banks have tried to support firm growth by offering historically low interest rates after the financial crisis that occurred in 2007 in order to give companies a possibility to increase their business by issuing inexpensive debt. If capital structure affects growth, the low-cost financing may result in unexpected consequences in terms of growth. Because of all the unanswered question in both research areas of capital structure and firm growth, it is highly justified to study how firm growth reacts to different capital structures. There are many empirical studies that give support to that leverage has a negative relationship to firm growth. However these studies are mainly executed before the financial crisis that started in 2007 and thus the results may no longer be valid in modern economy.

This study tries to find implications that leverage affects firm growth. Firm growth is studied through three different measures; net investment growth, real growth rate of capital expenditures and the growth rate of the number of employees. The purpose of this study is to contribute to the discussion of firm leverage and its effect on firm growth, which is measured in employment, capital expenditures and net investment growth, particularly during economical downturns. Earlier studies have found that leverage might have a negative effect on growth for only firms with low growth opportunities and not so much for other firms.

This research follows closely to Lang's, Ofek's and Stulz's paper "Leverage, investment and firm growth" from 1996. The sample firms are collected from the

United States and all the firms must have sales for over 1 billion dollars each year. The firms must also have SIC codes between 2000 and 3999 that represents the manufacturing division. The time span that the data is collected is from 2002 to 2013. As mentioned, the regressions are also computed for two additional subperiods. These periods are divided in normal and abnormal periods, which are defined by the subprime crisis that occurred in 2007. Including the time periods defined by financial crisis gives justification to reproduce the idea of Lang et al. (1996), since this financial crisis was unlike any other experienced in the modern global financial world and thus may have had an effect on the capital structure decisions of firms. Because of the magnitude of the crisis and the fact that it has affected the whole financial world, valuable growth opportunities are likely to have been lost and thus made growth of firms more difficult. Also risk aversion of investors has increased and obtaining new external funding may have become more challenging. The motivation of this paper is to contribute to the earlier literature and to find if the subprime crisis has affected the impact of leverage on firm growth.

1.1 Research problems and hypotheses

This study tries to answer three research problems. First problem is to find if leverage affects the growth of firms defined by different growth variables. Earlier results suggest a negative effect of leverage on firm growth. Second problem is to find if firm's growth opportunities affect the relationship between leverage and firm growth. Capital structure theories suggest that firms with good investment opportunities should have low leverage and thus, a negative relation between leverage and growth should be observed for firms with good investment opportunities. However, earlier results find (see Lang, Ofek and Stulz, 1996) that mainly firms with poor investment opportunities experience a negative relation between leverage and firm growth. Third research problem captures the main contribution of this study, which is to show how leverage affects firm growth in modern economy that experiences high and low peaks. The third research problem is to find if leverage has a different effect on firm growth during economical downturns. This research problem signifies this study and gives new contribution to existing literature. Three research questions are as follows:

1. Does leverage affect the growth of firms defined by different growth variables?

2. Does the firm's growth opportunities affect the relationship between leverage and firm growth?

3. Does leverage have a different effect on firm growth during economical downturns?

To examine if the negative effect is persistent for all firms despite different growth opportunities or just for firms with poor growth opportunities, and also to find if different economical times affect the relationship between leverage and firm growth, two hypotheses for three time periods are proposed. The first hypothesis in this research is

H1: *Leverage and firm growth has a negative relationship*.

This hypothesis is tested to generally find implications of leverage affecting firm growth. The second hypothesis is

H2: *Leverage has a different effect on firm growth depending on the firm's growth opportunities.*

Since globalization has made financial crises affect firms all over the world despite the origin of the crisis, the two hypotheses are tested for two additional time periods to find if the effect of leverage changes during different economic periods. To answer the research problems, the two hypotheses are tested for different time periods. The time periods tested in addition to the whole period are the normal period of 2002–2006 and 2011–2013 combined, and the financial crisis period of 2007–2010. This method enables to analyze the effect of leverage on firm growth in general and also the effect of financial crisis on that relation.

Earlier results imply that in contrary to MM's research, there is a strong negative relationship between leverage and firm growth and investments. According to earlier results especially by Lang et al. (1996), firms with low growth opportunities might suffer significantly more of leverage in terms of firm growth. Lang et al. (1996) find support for the first hypothesis, but it may be because firms with low growth opportunities have much more significant and negative relationship between leverage and growth than firms with high growth opportunities, which is practically evidence for supporting the second hypothesis. However, in addition to testing these hypotheses during 2002–2013, testing the effect of leverage on firm growth during the financial

crisis of 2007–2010 does not have much earlier evidence and this study tries to contribute to this lack of knowledge.

The thesis is structured as follows. First, earlier literature and previous results on the topic are presented. Then the financial crisis is studied in order to point out issues that could affect the capital structures of firms and to illustrate how economical atmosphere has changed. Then the sample data is presented and analyzed. After data analysis, the regressions are conducted following the analysis of the results. The research is concluded in the final chapter.

2. LITERATURE REVIEW

This chapter analysis some theories concerning firm's capital structure and firm growth. First, capital structure related theories are presented, and second the theories related to firm growth are presented. Finally, earlier results on the effect of leverage on firm growth are presented and discussed.

2.1 Capital structure theories

Capital structure is an important and widely studied field in finance. After Modigliani and Miller presented in 1958 their result that capital structure is irrelevant, a wave of researches started to try to describe the construction of an optimal capital structure. In this chapter some of the main papers on capital structure and the theories behind it are reviewed. First, the famous Modigliani-Miller paper from 1958, which has given the basis for all the following studies, is presented. After that, some other famous theories such as tradeoff theory, pecking order theory and theories related to agency costs are reviewed. Also some other models are presented and finally, earlier results on the topic are presented.

2.1.1 Modigliani-Miller

Modigliani and Miller (1958) studied the cost of capital when the investments yields are uncertain and the funds can be obtained from many different sources such as pure debt instruments or pure equity issues. The cost of capital is an important aspect in investments because the yield of the investment must exceed interest rate to be profitable. The economic theorists have avoided the cost of capital problem by assuming that the yield of assets such as bonds, are sure and known streams. Given this assumption, the cost of capital of an investment is simply the interest rate of bonds, and when acting rationally, the firm will push their investment to the point where the marginal yield on physical assets is equal to the market rate of interest. This behavior follows two criteria of rationality in investment decisions: (1) the maximization of profits and (2) the maximization of market value. According to the first criterion, the asset is rational to acquire only if it will raise the net profit of the firm and to do so, the expected rate of return of the asset must exceed the market interest rate. The second criterion states that the asset is rational to acquire if it adds the market value of the firm

more than the cost of the acquisition. Again, the asset increases value only if the yield of the asset exceeds the market interest rate. To reduce the effect of uncertainty, some formulas have been created that take into account a risk discount. Risk discount is subtracted from the yield of the asset to allow the existence of uncertainty. The resulting "risk adjusted" or "certainty equivalent" yield is used to determine the investment decisions. However there is no satisfactory explanation for the size of the risk discount.

After the economists recognized the importance of uncertainty, the equivalence of profit maximization and market value maximization disappeared. Under uncertainty, the outcomes of investment decisions are no longer unique profit outcomes, but many different possible outcomes that can be described as a subjective probability distribution. This leads to the fact that decisions that affect the expected value of the investment, will also affect the characteristics of the distribution of outcomes. So the use of debt rather than equity to fund the investment may increase the expected return of the stockholders but only at the cost of increased dispersion of the outcomes. Under the uncertainty, the investment decision can only be ranked by the "utility function" of the owners, which builds a confrontation between the expected yield and the other characteristics of the distribution. This utility approach is a step forward from the original certainty approach and it gives a little room to explore the different effects of debt and equity financing, and it also gives some meaning to the cost of different funds. However, it has some drawbacks mainly for normative purposes. Thus, an alternative approach, based on the market value maximization, can provide a useful theory of investment and basis for an operational definition of cost of capital. According to this approach, an investment is worth undertaking only if it raises the market value of the firm's shares. This market value maximization approach has been an appreciated, yet not very developed theory and what seems to be lacking is a sufficient theory of the effect of capital structure on the market valuation. The main purpose of MM's paper is to develop such theory and its implications for the cost-of-capital problem.

MM's results were that under certain conditions, the capital structure of the firm is irrelevant. In other words, there is no difference to the firm value, whether the funds to finance investments is obtained by debt or equity issues. However, this only means that it does not matter which financing instrument is used, but the owners may still favor one financing plan to another. These findings are the basis of the modern investment theories, and even though they are still used as a framework, there are many researches that show results where the source of financing matters. Also the MM theorem has been

criticized for not paying enough attention to market imperfections, risks and the limitations that high leverage brings.

Modigliani and Miller (1963) corrected their theory of irrelevant capital structure by adding tax shield in their study. They find that debt financing can give a significant tax advantage but firms should not always seek to use the maximum possible amount of debt in their capital structures. For instance, using retained earnings rather than debt to finance projects can be cheaper regardless of the tax advantage. More importantly there are limitations given by lenders and other costs resulting from debt.

Harris and Raviv (1991) reviewed a large sample of researches concerning the theory of capital structure. They find four different categories that try to determine firm's capital structure. First category is the agency approach, where they state that due to the conflicts between agents, leverage is positively associated with firm value and negatively associated with the extent of growth opportunities. Second category is the asymmetric information, which means that it is assumed that insiders or managers have inside information about the future cash flows and investment opportunities. One point of view is also that firm's capital structure signals the inside information to the outsiders. In this category they state that leverage increases with the extent of asymmetric information. Third category is models based on product/input market interactions. These models explore the relationship between capital structure and the firm's product market strategy or characteristics of products/inputs. They find that leverage increases when the product is not unique, and that the level of leverage is associated with different firm characteristics. Fourth category is the theories driven by corporate control considerations, in which they state that the competition for the corporate control affects the capital structure.

2.1.2 Tradeoff theory

The optimal capital structure of a firm is often described by a tradeoff between the costs and benefits of borrowing. Tradeoff theory is based on the Modigliani-Miller theorem, which stated capital structure irrelevant, but because the interest payments offer a tax shield that can have significant value, a tax benefit of debt is added to the theory. Tax shield is the benefit of debt and since the objective function of a firm is linear, the optimal debt ratio would be 100%. This proposition is of course impossible, because there has to be a cost for a large proportion of debt. The obvious cost is bankruptcy cost.

(Murray & Vidhan, 2007; Myers, 1984). Myers (1984) suggests that a firm following tradeoff theory sets a target debt ratio by balancing debt tax shields and costs of bankruptcy and then moves towards this target gradually. This happens by substituting debt for equity or equity to debt until the firm's debt ratio is at optimum and the market value is maximized.

Empirical evidence shows that there is a large observed variation in actual debt ratios and the reason that firms do not seem to be in their optimal debt ratio might be the costs of adjustment. Large costs of adjustment can explain why there is a lag when firms try to adjust their debt ratios after random events that offset them (Myers, 1984). Another possible explanation for the variation is that managers do not know, or care, about the optimal debt ratio and thus they do not pursue it actively. Also the cost of financial distress, which includes bankruptcy costs and related costs, explains some of the financial behavior in the case of debt ratio. Previous literature on costs of financial distress has given two statements about financing behavior: (1) Risky firms, i.e. firms with wide variation in market value, tend to borrow less because the higher the variance rate, the greater the probability of default regardless of debt claims. Safe firms are able to borrow more before the expected costs of financial distress exceed the benefits of tax shield. (2) Firms with tangible assets borrow less than firms with intangible assets and growth opportunities. The cost of financial distress depends not only of the probability of trouble, but the value lost. Intangible assets and growth opportunities are more prone to lose value in financial distress. (Myers, 1984.)

Zhang (2009) argues that firm's do not follow the optimal capital structure in practice. As said before, tradeoff theory suggests that the optimal capital structure is determined by the benefits of tax shield and the costs of bankruptcy. According to Zhang (2009), the bankruptcy costs are not simple to measure. Bankruptcy costs consists of direct and indirect costs. Direct costs include items such as legal, accounting and reorganization costs and these are rather simple to measure. These costs have been found to be around 4% to 10% of the firm's value three years prior the bankruptcy (Altman, 1984). The indirect costs include items such as lost sales, declining margins, loss of key personnel and loss of management time and effort. These costs are much harder to measure and Zhang (2009) argues that these costs might be substantially larger than the direct costs. Because of the overvaluation of tax shield and the undervaluation of the bankruptcy costs, the "optimal" capital structure suggest too high leverage and thus the optimal capital structures of firms are not met in practice.

2.1.3 Pecking order theory

One of the basic theories of capital structure is ”Pecking order” theory (see e.g. Donaldson, 1961; Myers, 1984; Myers and Majluf, 1984). Donaldson (1961) introduced a theory that firms tend to prefer internal financing rather than external financing and debt to equity if it issues securities. According to this description, firms accumulate their retained earnings and become less levered when they are profitable, and accumulate debt, becoming more levered, when unprofitable (Hovakimian, Opler & Titman, 2001). Donaldson (1961: 67) states “Management strongly favored internal generation as a source of new funds even to the exclusion of external sources except for occasional unavoidable ‘bulges’ in the need for funds.” He also notices that these ‘bulges’ were not met by cutting dividends as most of the managers saw this as unthinkable. However, when external financing was needed, managers were not willing to issue stocks. This is the pecking order that financial managers tend to follow when they need to raise new funds.

It can be argued that internal funds are preferred to avoid issue costs and if external finance is needed, then debt would still be preferred to equity issues because of the still lower issue costs (Myers, 1984). However the “Pecking order” theory is based on asymmetric information between the managers and investors in the capital markets. We assume that asymmetric information is given and both managers and investors realize this. This can lead to a situation where firms pass investment opportunities with positive net present values (NPV). For example a firm needs to raise N dollars of funds for an investment opportunity with known net present value of y. The firm value without this investment is x. Here the managers know the values of y and x but investors do not. If a firm issues stocks the benefit of raising this N amount of dollars is y but there is also a possible cost, which is the possibility of issuing underpriced stocks. This happens when the firm decides to issue stocks for a market value of N, but managers know that the real value of the stocks after the investment opportunity is N_1. This difference of N and N_1 will be the value of the shares when the investors acquire the same knowledge as the managers. (Myers, 1984; Myers et. al, 1984.)

Myers and Majluf (1984) came to a conclusion that in this situation the most rational objective for managers to pursue is to maximize the “true” value of the existing shares because they worry about the value of old shareholders’ stake in the firm. Define ΔN is the over- or undervaluation of the issued shares N_1-N. If ΔN is negative, then the information that the managers posses is unfavorable and the firm will always issue,

even if the only benefit of the issue is a zero NPV investment. If ΔN is positive, the inside information of managers is favorable but the firm may pass a positive NPV investment opportunity rather than issuing undervalued stocks. This is a good example of asymmetric information working on capital markets. The cost of relying on external financing is not only the administrative costs, but it can lead to a situation where the firm chooses not to issue and thus pass up an investment opportunity with positive NPV. This can be avoided if the firm is capable to raise the needed funds internally.

This raises a question that if a firm is not willing to issue stocks because of the possibility of underpricing, then should it issue debt instead? Myers (1984) state that there are advantages of debt over equity issues and that issuing debt is a better solution. The firm issues and invests only if the NPV of the investment opportunity is greater or equal to the amount of over- ($\Delta N<0$) or undervaluation ($\Delta N>0$) of the shares ΔN. If the ΔN is higher than the NPV of the investment and the firm issue, the value of the stake of old shareholders will decrease and the firm refuses to raise the money but at the same time the intrinsic value of the firm decreases because of the missed positive NPV investment opportunity. (Myers, 1984; Myers et. al, 1984.)

However, if a firm is able to reduce ΔN to less than the NPV of the investment, it can take over the opportunity and it will not affect the old stakeholders' value. This is possible by issuing the safest possible securities, i.e. a security that does not change its value when the inside information of managers becomes public. If the firm is able to issue default-risk free debt, then ΔN is zero, and the firm will take every positive NPV investment opportunity. The absolute value of ΔN will be less for debt than for equity even if default risk is added to the equation. To conclude this approach, firms should always issue debt rather than equity if the manager's information is favorable ($\Delta N>0$). (Myers, 1984; Myers et. al, 1984.)

If the manager's information is unfavorable, and any risky security issue is overpriced, then it would be logical for the firm to make ΔN as big as possible to take the maximum advantage of new investors. This seems reasonable and thus a rule could be defined that "Issue debt if the firm is undervalued, and equity, if overvalued". Note that it is assumed that managers act in old stakeholders' interest. However from the point of view of the investors, it seems possible to recognize the situation of the firm. If the firm is issuing equity only when the firm is overpriced, then in equity issues the investors can think that the firm's debt capacity is full and they refuse to buy the equity since it is

assumed overpriced. This behavior effectively drives the firm to raise their funds as the pecking order theory states. (Myers, 1984; Myers et. al, 1984.)

This example has assumptions that all the investors are rational and they realize the situation based on this model and thus it cannot be taken as a truth. It is to show how asymmetric information can predict the two main ideas behind the pecking order theory: first, the firms prefer internal financing and second, debt is preferred over equity if external finance is needed. (Myers, 1984.)

In consistent with the pecking order theory, empirical evidence suggest that there is a negative relationship between profitability and leverage, since profitable firms tend to accumulate their retained earnings and finance their investments with these funds. However, the pecking order theory seems to work only in short-run and firms tend to make financial decisions that in the long-run drive their leverage to the target ratio, which is consistent with tradeoff models of capital structure choice. For example Hovakimian et al. (2001) find evidence that more profitable firms have on average lower leverage, but these firms also tend to issue debt rather than equity and they are more likely to repurchase equity rather than retire debt. These actions drive the leverage ratio towards the target ratio and are consistent with the tradeoff models (Hovakimian et. al, 2001). Tradeoff models suggest that firms move their capital structure towards a target, which is determined by a tradeoff of the costs and benefits of borrowing (Myers, 1984).

2.1.4 Agency costs

Another cost that rises when a firm's leverage increases is agency costs. Jensen and Meckling (1976) formed capital structure based on agency costs. They base their research on earlier work by Fama and Miller (1972). Agency costs emerge when a principal gives an agent the authority to do decisions on behalf of the principal and if both of the parties are utility maximizers, there is a good opportunity that the agent does not act in the best interest of the principal. In other words there are conflicts of interest amongst stakeholders. Jensen and Meckling consider agency costs as a sum of three factors: (1) the monitoring expenditures by the principal, (2) the bonding expenditures by the agent, and (3) the residual loss. They also identify two types of conflicts: conflicts between managers and equity holders, and conflicts between managers and debt holders. (Harris et al., 1991; Jensen et al., 1976.)

The agency costs are practically present in every firm unless the manager owns 100 percent of the company. Hence we can assume that outside equity affects the amount of agency costs. If a manager wholly owns a firm, he will make decisions trying to maximize his and firm's utility. If the owner-manager sells equity and thus receives outside financing, agency costs arise due to the divergence between his and the outside equity holders' interests. Then the owner-manager does not capture the entire gain from the profit enhancement activities, but he does bear the entire cost of these activities. As the owner-manager's fraction of the equity falls, his fractional share of incomes fall and he might be tempted to use larger amounts of the corporate resources to perquisites (such as private jets etc.). Outside equity holders might then be forced to use more resources in monitoring the owner-manager's behavior and thus the owner-manager's wealth costs rise when his fractional ownership falls. It could also lead to a situation where the manager's ownership has decreased and he might not be interested in searching new technologies or improving the firm's operations if it requires too much effort. (Jensen et al., 1976.)

If a firm could avoid the agency cost problems when the manager wholly owns the firm and thus eliminating the agency costs associated with outside equity, then why firms are not single-owned and the needed funds are not just borrowed? Firms are generally owned by a large number of principals and so there must be an explanation for this.

Jensen and Meckling (1976) recognized that with debt financing, the equity holders might invest suboptimally, as they may benefit from investing to risky projects that reduce the value of the firm. Such investments decrease the value of the debt because if the debt holders correctly anticipate the equity holders' future behavior, the equity holders receive less for the debt than they otherwise would. The equity holders who issue the debt carry this cost of the incentive to invest in value-decreasing projects created by debt. This problem where a company changes its low-risk assets to high-risk investments is called the "asset substitution effect". (Harris et al., 1991; Jensen et al. 1976.)

Adding provisions to the bond agreements that would constrain the manager's decisions could eliminate the asset substitution effect. However, to completely protect the bondholders, these provisions would have to be extremely detailed and cover most operating aspects of the enterprise. The possibility of creating such provisions is almost impossible and most likely very expensive. It could also reduce the firm value because

it could limit the manager's ability to take optimal actions on certain issues. (Harris et al., 1991; Jensen et al., 1976.)

Jung, Kim and Stulz (1996) investigated the firms' decisions whether to issue debt or equity when obtaining external financing. They compared their results to the three most accepted theories that explain the firms' funding decisions. First the pecking order theory that states that asymmetric information makes equity issues more costly than debt issues because managers want to maximize the wealth of the old shareholders. That is why issuing debt is preferred to equity and if forced to issue equity, the stock price has a negative reaction. Second the agency model, which suggests that managers sometime pursue their own objectives, like firm growth, at the expense of shareholders. If managers concentrate on growing the firm, equity issues are more profitable than debt if the firm has valuable growth opportunities, but not otherwise. And finally the timing model, which proposes that firms issuing equity experience long-term underperformance afterwards. If equity is overpriced and markets underreact to the equity issue, the wealth of existing shareholders is maximized. The results that Jung et al. (1996) find support strongly the agency model. They show that a typical firm issuing equity has valuable investment opportunities and they experience asset growth before and after the issue. Also the stock prices in these situations do not show significant variation. Firms that do not have valuable investment opportunities but still issue equity against the pecking order theory, also experience high asset growth but similarly extremely significant negative stock price reactions. For the timing model, Jung et al. (1996) failed to show any significant supporting results.

Other authors have also studied the agency costs rising from the conflicts between managers and equity holders. In contrast to the conservative behavior of managers introduced by Hirshleifer et al. (1992), Jensen (1986) states that managers have incentives to grow their firms beyond optimal size because growth increases the resources and power that managers possess. Firm growth is also associated with increases in managers' compensations, because changes in compensations are positively related to the growth in sales. This supports the assumption that managers are more likely to invest all available funds than distributing them in cash to the investors. Also Harris and Raviv (1990) showed that managers always want to continue the firm's current projects even if investors would prefer to liquidate the firm. In Stulz (1990), managers always want to invest all available funds even if distributing the cash to investor would be better for the investors. However, Jensen (1986) and Stulz (1990) also suggest that increasing debt can prevent the "free cash flow" hypothesis where

managers use all available funds in poor investments. When debt levels are increased, it limits the financial resources available for the managers in the future.

Another important subject that agency costs have an affect to is the reputation of the firm. It arises from the same asset substitution effect characteristics as Jensen and Meckling (1976) described. Diamond (1989) explains in his paper about incentive problem between borrowers and lenders that firms use their loans to fund new projects and if there are no reputational effects, firms might have an incentive to invest to risky projects that might gain big profits but can also realize into large losses. If a firm has a short credit history and there is sufficient adverse selection, these incentives might be present. On the other hand if a firm has a good and long credit history and reputation, reputation can become a good incentive to prevent firms to invest in risky projects. When reputation has an incentive in investment decisions, it has an effect on project acceptance. Firms with certain reputations will turn down some profitable projects that other firms would be willing to accept. Especially older firms that have acquired good reputation are more willing to accept low-risk projects with positive net present value when there would be a choice to accept a higher risk project with higher net present value. The reputation acquired is considered as an important character and firms with good reputation are willing to protect it.

In addition to firm reputation, managers also might have their own reputation at stake. The traditional agency problem as described before is that managers invest in risky projects that can reduce the value of the firm in hope of high returns. Hirshleifer and Thakor (1992) present an alternative approach to the agency problem. According to their paper, if the manager's future wage is dependent on the outcome of the investment, the manager tries to build a good managerial reputation. This is obtained by seeking safe investments; investments that bondholders prefer and shareholders do not. This reduces the agency costs between the firm and creditors when the investment is funded with imperfectly covenant-protected debt. Because of the reduced agency costs, this also leads to higher debt-equity ratio. There is also a possible problem occurring when managers act too conservatively. If manager invests only in safe projects, the firm value might reduce and shareholders' wealth might decrease when projects with better outcomes are rejected. Therefore, even though managerial conservatism reduces agency costs and manager's reputation improves, it might not be optimal in all conditions.

2.1.5 Debt against takeover threats

The capital structure affects the probability and successfulness of takeovers. The linkage between the market for corporate control and capital structure was introduced in the late 1980's. The main principal in this linkage is that equity carries voting rights and debt does not (Harris et al., 1988 and Stulz, 1988). Because of the distribution of votes, capital structure affects the outcome of takeover contests. Harris and Raviv (1988) state that the capital structure indirectly determines the fraction of the equity owned by a firm's manager. If the manager has a large stake, the takeover attempt by the rival is not easy to accomplish even if the rival manager would have a better ability to run the firm. On the other hand, if the manager's stake is small, the takeover might happen even if the new manager would have lower ability in the control of the firm. Third possibility for the outcome is that the rival gathers enough equity from passive investors so that passive investors vote for the outcome of the takeover.

In Harris et al. (1988) the manager's stake is determined indirectly by the capital structure choices of the firm. Manager can increase his stake by repurchasing equity from passive investors and financing this repurchase by debt. When debt is issued, the value of the equity decreases allowing the manager to buy larger stake than without issuing debt. To make the takeover attempt unsuccessful, managers tend to increase the firm's leverage. In the case of unsuccessful tender offers, leverage is increased, which is accompanied by stock price increase. Also leverage seems to be negatively correlated to the possibility of tender offer going through. As in Harris et al. (1988) the manager's stake can be increased by issuing debt, Stulz (1988) results in a similar suggestion where takeover targets increase their level of debt similarly increasing the gain to takeover target shareholders if the takeover occurs, but also reducing the likelihood of this event. The gain to the shareholders increases because the takeover premium is positively related to debt/equity ratio, resulting in a higher stock price when leverage increases.

It is important to notice that takeover threats resulting in changes in capital structure in the form of higher leverage should only be viewed as short-term changes in capital structure. Firms tend to increase their leverage to adapt their capital structure optimally only when faced with imminent and hostile takeover threats. Thus these theories have nothing to say about the long-run capital structure choices of firms. (Harris et al. 1990.)

2.1.6 Financial distress and constraints

Financial distress, liquidity constraints and credit restrictions affect the investment opportunities and growth of firms. Numbers of studies show evidence that share issues typically represent around 5 percent of new external funds. If most of the new external funds in firms are obtained by issuing debt, credit restrictions might have a significant effect on corporate decisions. Asymmetric information theories state that small firms with low liquid assets have difficulties in entering and obtaining external finance from the capital markets, which is due to the low assets that cannot act as a collateral to back up their borrowing. This leads to these firms to behave as they have a high and variable discount rate. Whited (1992) finds that difficulties in obtaining external finance affects firm's investment. Firms might be forced to reduce investment in order to build up its asset base so they can access the capital markets later.

Fazzarri, Hubbard and Petersen (1988) find that firms with financial constraints may be exposed to large negative effects of economical downturns. This is present especially for small firms. They find that firms with assets less than 100 million dollars retain, on average, about 77 percent of their income. If an economic downturn is to happen, and the firm has financial constraints, their funds would experience a substantial drop following a drop in investments and growth. This is due to their inability to issue debt, and the decline in their income and consequently in their retained earnings used to fund investments. This magnifies the effect of financial crisis and worsens the balance sheet positions of these firms.

Opler and Titman (1994) find interesting results when highly leveraged firms face industry downturns. These firms face financial constraints because of the high interest payments. In case of industry downturns, the highly leveraged firms seem to be quicker to response so that they change their operating strategies to raise efficiency. This usually means reducing employment and capital expenditures, which can lead to decrease in profitability of business. They find that firms in the top leverage decile in industries that experience decreases in production have a 26 percent stronger decline in sales than the firms in the lowest leverage decile. Consequently, these firms tend to lose market share and experience lower operating profits than their competitors. This indicates that the costs of financial distress are higher than the benefits of leverage. Because the subprime crisis affected the majority of financial world regardless of industry, it is interesting to see how it has affected the growth of firms with high leverage since firms have faced financial distress caused by this crisis.

2.2 Theories of firm growth

This research is focused on studying the effect of leverage on firm growth, and thus it is reasonable to present theories and earlier results also on the factors affecting firm growth. As capital structure, firm growth also is a widely studied area and many researchers have tried to find factors influencing firm growth. However, researchers have not been able to find a consensus on the factors that determines firm growth. This chapter presents some of the possible explanations on the matter.

2.2.1 Organic vs. non-organic growth

Firm growth is generally understood as increase in size. Pasanen (2007) identifies two strategies for firm growth: organic and non-organic growth. These growth strategies differ substantially and produce challenges for managers. Organic growth has often been referred as growth that increases employment, whereas non-organic growth has been referred as growth through acquisitions, where employment does not increase, rather than shift from one firm to another. Pasanen (2007) finds that firms that grew through acquiring businesses experienced clearly larger scale of operation than firms that grew organically. He also notices that generally, the acquiring firms have been active longer than the organically growing firms. This finding might also explain the larger scale of operation for the acquiring firms. Also, the younger firms may not have enough resources to buy businesses.

Another aspect that Pasanen (2007) notices is that the number of founders affected the strategy that firms use to grow. He finds that firms that have had only one founder have typically grown through acquisitions, where firms with a team of founders did not acquire new businesses as much and tried to grow organically. Other factors that have an effect to firm's decision to grow organically or through acquisitions were the firm's product structures, customer structures and the knowledge of products and services.

Pasanen (2007) concludes that firm growth pattern is associated with firm characteristics. There were more similarities than differences between acquisition growth and organic growth firms, but some characteristics could be distinguished between the two groups. The most important factors in determining the strategy between acquisition growth and organic growth was the firm age and scale of

operations. The firm growth pattern is important for firm characteristics and thus have managerial implications.

2.2.2 Internal and external factors affecting growth

Some researchers have divided the factors affecting firm growth in two categories: internal and external factors. Here, some of these factors are presented, but the focus is kept on internal factors, because in this research the data is acquired from the United States and only from industrial firms to find results that are not affected by external factors.

Hansen, Wernerfelt & Birger (1989) examined the economic and organizational factors affecting firm performance. In their study, they present three major external determinants that affect firm-lever profitability: (1) The characteristics of the industry that the firm is operating, (2) the firm's position relative to its competitors and finally (3) the quality or quantity of firm's resources. For the organizational variable, Hansen et al. (1989) use a measure of organizational climate that capture many dimensions of organizational factors. From these dimensions, Hansen et al. (1989) choose "Emphasis on Human Resources" and "Emphasis on Goal Accomplishment". These variables represent the internal factors affecting firm performance.

Hansen et al. (1989) find that both economical and organizational factors are important and independent factors in explaining firm performance. However, the organizational, i.e. internal, factors explain approximately twice as much of firm profit rates as the economical factors. Hansen et al. (1989) interpret the results so that good organizational practices may result to good choices of economical environment, which could even increase the importance of internal factors.

Acar (1993) also studied the impact of key internal factors on firm performance for small firms. He examines five groups of internal factors and their effect on firm performance. These groups are (1) owner/manager experience, (2) age of firm, (3) production competencies, (4) marketing competencies and (5) strategy. He finds that competencies in terms of technology and acquisition management, and good accounting practices had the largest positive effect on firm size. He also finds that firms with good cash management and financial practices had the largest positive effect on firm's sales

revenues. In contrast to earlier results, Acar (1989) cannot show relations between firm age and performance and also not for owner's experience and firm performance.

2.2.3 Firm size and firm growth

Few of the most examined fields in the determination of firm growth are the relationship between firm growth and firm size and the relationship between firm growth and firm age. Hart and Prais (1956) started the research in the area of the effect of firm size on growth by examining the growth of British companies. They find that before the Second World War, concentration in industries increased. After the war, smaller firms showed very high growth rates, which resulted in decreasing concentration during 1939–1950. They also find that rise of new industries and new firms generally decrease the concentration in industries.

From more recent time, Evans (1987a,b) concentrated on the determinants of firm growth. Evans (1987a,b) gives several contributions to the earlier literature. One of these contributions is his result concerning the effect of firm size on firm growth. For the relationship between firm growth and firm size, Evans (1987a,b) finds that firm growth decreases at diminishing rate with firm size. He finds that firm growth decreases with firm size in 89 out of 100 industries. This negative relation holds also when firm age is held constant. Gibrat's Law, which states that firm growth is independent of firm size is thus rejected in Evans (1987a,b). This departure from Gibrat's Law decreases as firm size increases, however the departure always remains. This finding that Gibrat's Law does not hold is important, as many studies have assumed that the law holds. Especially for small firms, Gibrat's Law fails. According to Evans (1987b), it is not unreasonable to assume that Gibrat's Law holds for very large firms, but for the small firms, in cannot be assumed reasonably.

Huynh and Petrunia (2008) studied the role of financial variables in firm growth. They find that firm growth increases with the firm's assets. Huynh et al. (2008) show that firms that have entered the industry with high level of assets have been able to raise substantial amounts of new capital, indicating that it is clearly easier to enter capital markets with large initial asset base. Consistently with earlier results, Huynh et al. (2008) also find that firm growth has a negative relationship with firm size and firm growth displays negative growth persistence.

2.2.4 Firm age and firm growth

The other widely studied determinant of firm growth is firm age. Jovanovic (1982) suggests a theory of firm growth in which efficient firms grow and survive, while inefficient firms decline and fail. According to Jovanovic (1982), firms find their true efficiency through time with a Bayesian learning process. This learning process starts with firms entering an industry with incomplete knowledge of their own productivity, but they gain more information through production. A general version of his model predicts that firm growth is negatively related to firm age when firm size is held constant.

Evans (1987a,b) finds consistent results with Jovanovic about the effect of firm age on firm growth. He finds that firm age is an important determinant of firm growth and that the relationship between firm growth and firm age is negative. The results show that firm growth decreases with firm age when firm size is held constant for young firms. This finding holds for 87 of 100 industries between 1976 and 1980. He also finds that the same negative relation is present for a sample that pools older firms together and uses an estimate of age based on the average for the age category as a regressor. This results in a conclusion that the negative relation between firm growth and firm age is robust for alternative specifications, to alternative samples and to alternative time periods.

Also consistent results of negative relationship between firm age and firm growth is found by Huynh et al. (2008). They find a U-shaped relationship between firm growth and firm age, where young firms grow rapidly, but the minimum of firm age-growth relationship is found at around seven years of firm age. This means that the age effect of high growth for young firms levels at around age seven.

2.2.5 The effect of human factor on firm growth

It is argued that especially for small businesses, the human factor has an overwhelming effect on firm's performance. Human factor seems to have high importance on the firm's operations especially for small firms because in these firms, the manager or owner-manager has a very high impact on the operations. Morrison, Breen and Ali (2003) studied the effect of owner-managers' intention, the abilities of the business and the opportunity environment on firm growth. They find that a balanced alignment

created with all of these factors, drive the firm to growth. With some of these factors being weak or missing, firm growth is unlikely to be achieved. If a firm lacks opportunities, the owner-managers are not able to form good intentions. If the firm lacks business ability, the owner-managers' intention and the business opportunities are unlikely to be realized. Thus, all of these factors are needed in order the firm to grow.

Another human factor related operation in firms is human resource management. Datta, Guthrie and Wright (2005) studied the impact of human resource management on firm performance across industries. They find that firm competitiveness can be influenced with high-performance work systems. These high-performance work systems are human resource practices that aim to enhance and develop the abilities of employees. This finding is consistent with many earlier results regarding the effect of good human resource management. Datta et al. (2005) also find that especially in industries with low capital intensity, each one-standard-deviation increase in the high-performance work systems scale is associated with 14,3 percent higher sales per employee. For high capital intensity industries, the increase per employee was only approximately 1 percent. The high-performance work systems also affected significantly sales per employee (+20,1%) for growing industries. In low growth industries, each standard deviation increase in the work systems produced a slight decrease in sales per employee.

Batt (2002) also examined the effect of human resource management on firms' sales growth and employee quit rates. She finds similar results as Datta et al. (2005) that greater use of high-involvement human resource practices results in higher sales growth and lower quit rates. It is clear that management and so-called "human factor" has an effect on firm performance because good management can motivate the employees, set reasonable targets and take advantage of growth opportunities. Without good management, it is considerably harder to increase firm performance.

2.2.6 Capital structure and firm growth

Earlier literature on this topic suggests that leverage and firm growth have a negative relationship. Theories of capital structure state that firms with valuable growth opportunities should choose low leverage. Based on this theory, it seems highly important to investigate the effects of leverage since high leverage may prevent firms to grow. Previous literature studying growth opportunities has concentrated on other proxies for liquidity than leverage, even though increased leverage reduces the available

funds for investment, and makes it more difficult to raise new funding (Lang et al., 1996).

Myers (1977) studied the corporate borrowing decision and according to the theory of corporate borrowing decision, the amount of debt issued by a firm should be the amount that maximizes the market firm value. According to the theory, this debt amount is inversely related to the part of firm value that is contingent on discretionary future expenditure of the firm, where discretionary future expenditure includes all future investments and variable costs. For this theory to be correct, Myers suggests two propositions that should hold. First, debt should be used more to finance assets-in-place, rather than growth opportunities. This is because investment in assets-in-place is not discretionary. Second, for assets-in-place, heavy debt financing should be associated with capital-intensity and high operating leverage, and also with profitability. To conclude, Myers (1977) suggests that firms with high growth opportunities will use less debt.

Kim and Sorensen (1986) also find results that support the ones in Myers (1977). In Kim et al. (1986), negative correlation between growth in earnings before interests and taxes (EBIT), and debt ratio is observed. The result is significant and relatively high as when EBIT growth increases with 1 percent, the debt ratio decreases by approximately one-third of a percent. However, Kim et al. (1986) argue that the relationship between EBIT growth and debt ratio may be a consequence of availability of internal funds. Firms that have a history with high growth, may not need as much external funds, and consequently result to lower debt ratios.

Harris and Raviv (1990) find implications that leverage is positively associated with firm value, default probability, extent of regulation, free cash flow, liquidation value, extent to which the firm is a takeover target and the importance of managerial reputation. Huynh et al. (2008) also find similar implications of positive relationship between leverage and firm growth. The sensitivity of growth to leverage is highest for firms in the lowest to intermediate leverage quintiles.

Capital structure and firm growth seem to possess a relationship, but it seems unclear of which way the relationship goes. The majority of results concerning this relationship seem to suggest a negative relation, but also positive relations between leverage and firm growth are proposed. However, the results also differ depending on what determinant is used to measure growth. Firm growth can be measured in many ways and

leverage can have a different effect on different growth measures. In this research, growth is measured by capital expenditures, net investment and employment growth. All in all, leverage clearly has an effect on the future firm growth and it feels important to find the true association between leverage and firm growth.

2.3 Earlier results

There are many studies concentrating on the effect of leverage on firm growth in terms of employment and investments, but not much using a time span that include the financial crisis between 2007–2010. Generally, leverage is expected to be negatively associated with firm growth. Stulz (1990) finds that debt payments generated from high leverage force managers to pay out cash flow and hence reduce investment and result in underinvestment. Dang (2011) finds evidence from UK supporting the problem of underinvestment due leverage. He finds that firms that have high growth opportunities reduce leverage in order to control the underinvestment problem, which occurs when firms are forced to spend their cash in interest payments resulting in less funds available for investments. Also, little evidence is found that by actively lowering firm leverage to reduce underinvestment incentives, firms will be more able to make value-increasing investments. When the effect of leverage on investments is examined, Dang (2011) finds that leverage has a strong, direct negative effect on the level of investment.

Cantor (1990) finds that each dollar more in cash flow generates approximately 45 cents more investment for highly levered firms than for low-levered firms indicating that investment is more sensitive to cash flows for firms with high leverage. Highly levered firms have higher than average volatility in their expenditures. This sensitivity to cash flow fluctuations can be determined by the burden that debt obligations produce. High leverage limits the firm's ability to borrow more funds and hence they are forced to try to maintain a positive cash flow cushion. To maintain the positive cash flow, these firms are more likely to reduce or postpone investments quickly if sales drop.

Sharpe (1994) studied the relationship between a firm's financial leverage and the cyclicality of its employment. The paper suggests that leverage and firm size have an effect on changes in labor force when sales decrease. He finds that, in particular highly levered and small firms are quicker to optimize their labor force during a recession but they do not hire new labor as quickly when the economy is rising. Cantor (1990) shows

evidence that leverage at the firm level is associated with employment growth rates. Firms with higher leverage have higher volatility in their employment rate and vary their employment more in response to cash flow and sales changes. This relationship is not a result of special industry factors, differences in firm growth rates or firm sizes. Because highly levered firms might have difficulties to obtain more debt, they might be forced to lay off labor force when sales drop in order to maintain profitability.

Aivazian, Ge and Qiu (2005) find that in Canadian firms leverage has a significant negative impact on investments and even stronger significant impact on investments in firms with low growth opportunities, i.e. low Tobin's q. This result is consistent with the results of Lang et al. (1996), who show that leverage has a strong and significant impact on different growth variables with firms that have low Tobin's q.

As the research follows the paper by Lang et al. (1996), similar results can also be expected. Table 1 shows a summary of the results by Lang et al. (1996).

Table 1. Summary results by Lang, Ofek and Stulz (1996)

The table summarizes the results of the paper by Lang, Ofek and Stulz (1996). The table shows the coefficients between leverage and growth measures. The time span in this study is 1970–1989.

Book leverage	**Investment/ FA(0)**	**1-year employment growth**	**3-year employment growth**	**1-year capital expenditures growth**	**3-year capital expenditures growth**
Whole sample					
Unadjusted	-0,105***	-0,066***	-0,200***	-0,480***	-0,634***
Industry-adjusted	-0,089***	-0,057**	-0,155***	-0,428***	-0,416***
Tobin's q < 1					
Unadjusted	-0,125***	-0,091***	-0,249***	-0,531***	-0,747***
Industry-adjusted	-0,118***	-0,098***	-0,238***	-0,516***	-0,585***
Tobin's q > 1					
Unadjusted	-0,035	0,025	0,011	-0,305***	-0,140
Industry-adjusted	-0,016	0,047	0,064	-0,205*	0,035

* significant at the 10% level

** significant at the 5% level

*** significant at the 1% level

Lang et al. (1996) first find a strong negative relationship between leverage and future growth despite differences in firm size, how leverage is measured, and which variables are used to forecast growths. They find a strong negative relationship between book leverage and growth for the whole sample. The results show that a firm that has half the average book leverage can have almost 50 percent higher capital expenditures growth. After controlling for industry effects, they still find the same result with a strong negative relationship between leverage and growth.

However, financial theory suggests that leverage should not have such a significant effect on growth if the firm has valuable investment opportunities. Firm's growth opportunities are measured with Tobin's q. A high q (>1) indicates that the firm has many valuable investment opportunities and vice versa. After letting investment opportunities affect the impact of leverage on growth, Lang et al. (1996) find that all the dependent variables, that were net investment growth, rate of employment growth and rate of change in investment, are significantly negatively related to leverage for firms with low Tobin's q (<1). However, for firms with high Tobin's q, Lang et al. (1996) could not show highly significant negative relationship between leverage and growth except for only one variable, the 1-year capital expenditures growth. The relation between leverage and the 1-year capital expenditures growth is negative but the coefficient was only three-fifths of what it is for low-q firms. In addition, half of these coefficients for high-q firms are positive, even though not significant. These results diminish the significance of the first results where Lang et al. (1996) find negative significant relations between leverage and growth for all firms. This indicates that the difficulties to obtain external funding are not so serious for high-q firms whose valuable investment opportunities are recognized in the capital markets. In contrary, it seems that if leverage reduces growth, it is because firms with high leverage have difficulties to obtain external funding because their investment opportunities are not recognized and investors are reluctant to offer funding. Consequently, this leads to higher opportunity costs for these low-q firms. The result that negative relation between growth and leverage exists for only low-q firms holds within and across industries, for different measures of leverage based on book values, for different measures of investment opportunities, for different estimation methods, for subsamples of better performing firms, for subperiods and for small firms. (Lang et al., 1996.)

3. DATA AND METHODOLOGY

This chapter presents the data and methodology used in this study. First, the time period of 2002–2013 is examined in the point of view of financial markets to illustrate the economical state of this time. Next, the data is introduced and described and finally the methodology used in this study is presented.

3.1 Financial markets during the observed period

This research is conducted with data from time span of 2002–2013. The research data in Lang et al. (1996) is from 1970 to 1989, and thus it seems justified to reproduce their research idea with new data to see whether there has been a change in the relationship between growth and leverage. Also the new regulations and new instruments in the financial markets may have had an effect on the capital structure policy in firms. Firms may also be more careful after the global financial crisis that occurred between 2007 and 2010. These are the motives that this research is made with data from time period of 2002–2013.

In addition to examine the whole period of 2002–2013, additional subperiods are included to find implications of the effects of financial crisis on the relation between leverage and firm growth. The subperiods are divided in normal and abnormal years. The normal years are 2002–2006 and 2011–2013 combined and the abnormal years are 2007–2010.

These normal and abnormal periods can be identified from figure 1 that shows the daily S&P 500 index closing values. In 2002, the economy was reviving from the dot-com crisis that collapsed the markets at the turn of the century and after this, the stock markets rose until the subprime crisis. Figure 1 shows how S&P 500 started to decrease during 2007 and finally collapsed in the end of 2008 mostly because of the collapse of Lehman Brothers that triggered the global financial crisis. In the beginning of 2011 the S&P 500 index has climbed almost back to the level before the crisis.

In the end of 2014 the S&P 500 has climbed over 2000 points and according to many investors, U.S. stock markets are in a bubble. Also other indicators support this view. Figure 2 shows the Dow Jones stock market daily closing values from 1985 to 2014. Two confirmed bubbles, dot-com and housing, can be identified from it. During the dot-

com bubble in 1997 to 2001, the Dow Jones stock market peaked at around 12000 points. During the housing bubble between 2007 and 2010 the Dow Jones peaked at around 14000 points.

Figure 1. S&P 500 index closing values: 2002–2013. Source: Yahoo! Finance

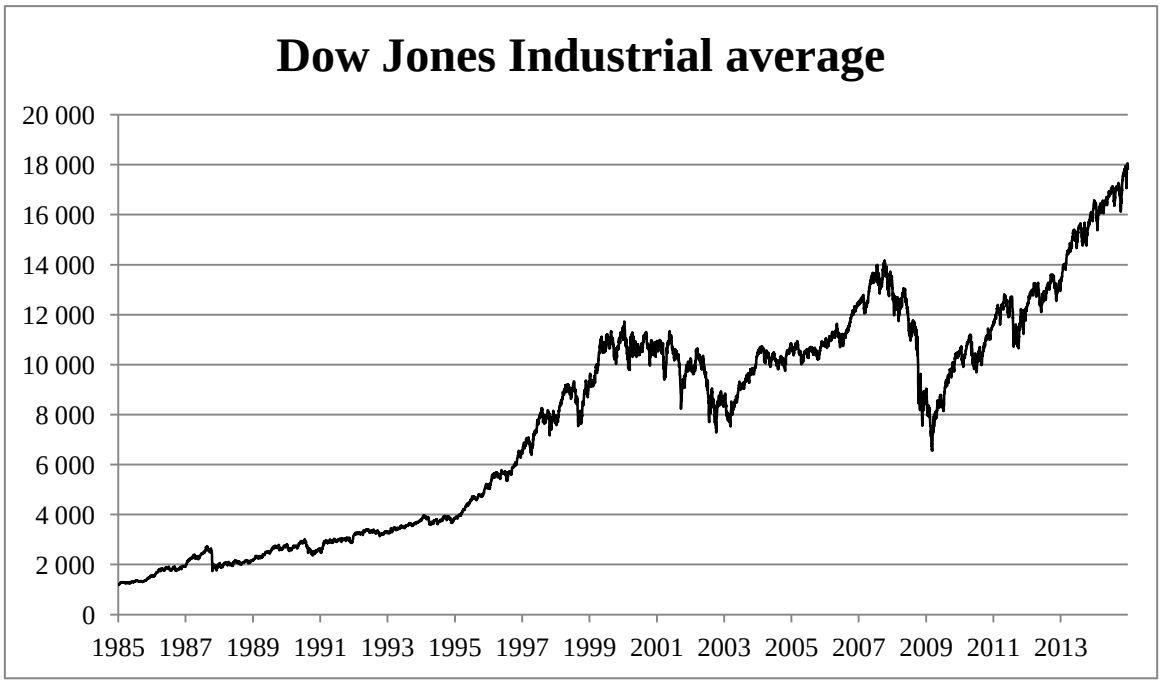

Figure 2. Daily Dow Jones Industrial average closing values: 1985 –2014. Source: Stooq.com

At the moment the Dow Jones industrial average is above 16000 points, which indicates that the next bubble might already exist and the burst is not long away. Some analysts think that this might be a consequence of the Federal Reserve's loose interest rate policy as they are trying to add liquidity to the markets. In July 2013 Bryan Kelly from CNBC reported that the "total-market-cap to GDP" ratio is at its all time high of 118%. Some investors use this ratio in order to measure the state of financial markets. According to the report, the ratio has exceeded 100% only twice before: in 1999 and in 2007. (CNBC, 2013.)

Federal funds rate is an important interest rate that is used as a benchmark in financial markets. Figure 3 shows the daily federal funds rate for the period 2002–2013. The figure shows how the interest rates were historically low from 2002 to 2004. This boosted the economy and it was followed by a rising interest rate policy from the Federal Reserve before the collapse. After the collapse, the Federal Reserve has kept the interest rates low in order to revive the economy by offering low cost debt.

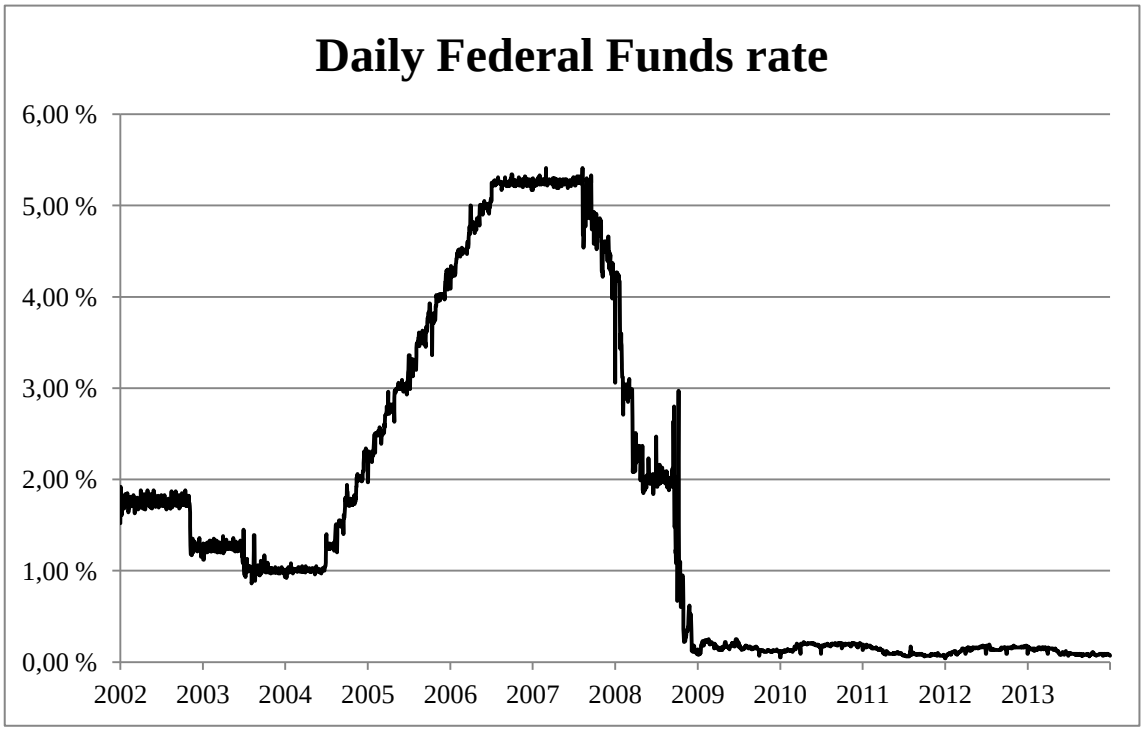

Figure 3. Daily Federal Funds rate: 2002–2013. Source: Federal Reserve Bank of New York

From figure 3 it can be seen that after 2007 the daily federal funds rate has been decreasing and finally been near zero after 2009. This is due to the interest rate policy

practiced by the Federal Reserve as they are trying to restore the economy by offering cheap money. This is supposed to give companies a chance to get hold of relatively inexpensive funds and if companies exploit this opportunity, it has a clear affect to firm leverage.

Figures 1, 2 and 3 give justification for the different subperiods in this research. The US economy had a financial crisis called dot-com crisis between 1997 and 2001. The economy started to grow in 2002 and remained "normal" until the subprime crisis that started to affect the economy in 2007. From figure 1 it can be seen that the latter normal period started around 2011 and has continued since even though the interest rate policy is still trying to make recovery moves to help the economy. It could be argued that the latter normal period has already ended and the economy is now in a new abnormal period, but since this cannot yet be confirmed, it is assumed that the normal economy period is still under way.

3.1.1 Subprime crisis

As can be seen from the figures 1 and 2, both S&P 500 index and Dow Jones industrial average collapsed during 2007. This was the result of the subprime mortgage crisis that occurred in the United States. Before the crisis the macroeconomic conditions were that growth was strong and inflation was low. This resulted in strong capital ratios, innovations, low default rates, high business volumes and profitability. Financial markets also enjoyed historically low interest rates for a few years before the crisis. These factors may have affected the actors in financial markets by making them overconfident and reducing their risk aversion.

The factors that were essential in the rising of the subprime crisis were the increase in US real estate prices, the easy obtainability of loans and financial innovations. The most important innovation was the subprime mortgage and the instruments derived from these loans. The subprime mortgages meant that people with bad credit histories were able to buy real estate with borrowed money. The interest rates were low (around 1%) and this led to a lending boom that was the beginning of the crisis. These subprime mortgages were transformed into instruments that had high risk and high margins and they were tradable in the markets. When the Federal Reserve started to raise the interest rates from 1% to 5,25% in 2004 (see fig. 2), the lending decreased and the rise in housing prices stopped. In 2006 the default rates started to rise but not until 2007 these

defaults really affected the economy in the US. The instruments derived from the subprime mortgage loans quickly lost value through the defaults and the crash in real estate prices made the underlying assets almost worthless. The crisis spread quickly and affected the whole economy and also transmitted to other countries. (Ackermann, 2008.)

The financial crisis described was so severe that it affected many areas of finance. Banks are now more concerned about the asymmetric information and default risks that companies have and liquidity has gained more importance. The Basel Committee on Banking Supervision made new regulations for banks in form of Basel III and these regulations have high concentration towards capital requirements, liquidity and different types of risks. Also leverage ratios of banks are regulated more specifically and a minimum leverage ratio of 6% was introduced in July 2013. All these regulations mean that banks have to decrease their lending to meet the requirements. (Bank for International Settlements, 2014.)

Because the financial crisis occurred rapidly and the changes in economy were so unanticipated, it is interesting to see how leverage affected the growth of companies during and after the crisis. Many growth opportunities disappeared when markets collapsed and if firms were using debt to finance their investments, they might have been left with large debts and interest payments without any particular target to use it to. On the other hand, after the crisis firms have been able to obtain inexpensive external funding because of the low interest rates. If the firms have been able to use these funds efficiently, they might have been able to grow and this could show as a positive relation between leverage and firm growth. The US economy has started to stabilize so it is possible to see and analyze the effects of the crisis on leverage and firm growth. This is why the crisis subperiod is included in this research.

3.2 Data

To make this research as significant as possible, the data consist of only large firms. There are several benefits to using large firms. First, if a negative relationship between leverage and growth exists, we could expect it to be weaker for larger firms that have been running for longer time period and thus already used public securities markets. If such relationship exists, it is more convincing to show it with a sample of large rather

than small firms. Second, a relation between leverage and growth has stronger implications for aggregate economic growth if it can be shown with large firms. Third, the data used in this research is easier to obtain from larger firms and this reduces the possibility of data omissions.

Because the research data is composed of large firms, restrictions to assure that the firms fit the definition of "large" have to be made. Thus, the base sample is also restricted so that the firms must have data on sales and at least one billion in sales each year of the time period. The data is collected from firms operating in the United States, so that no regional regulations can affect the data. To avoid industry-specific regulations, the firms must have SIC codes in the range of 2000–3999, which means that the sample consists of only industrial firms.

To calculate the growth measures, the firms must have data on capital expenditures, fixed assets, depreciation and number of employees for each year. To measure leverage, firms must have data on book values of short- and long-term debt and on book value of total assets. Tobin's q is used to measure the firms' growth opportunities and for this variable, firms must also have data on market value of equity.

The data is obtained from ThomsonReuters. To ensure that the data is valid and to minimize biases in the data, the companies in the base sample are restricted so that they have to be listed in New York Stock Exchange or Nasdaq. Firms that are unlisted, delisted or traded in OTC bulletin board are not included in the sample.

3.3 Definition of variables

In this section all the variables used in this research are explained. First are the dependent variables that measure firm growth in three different ways. Next, the independent variable firm leverage and the control variables that affect firm growth are defined. Finally business cycle indicator variable is introduced.

3.3.1 Dependent variables

To measure firm growth, three dependent growth measure variables are included in the regressions. First is the growth rate of real capital expenditures. It is used to measure the

rate of change of investment. It is defined as the ratio of capital expenditures in year +1 (+3) adjusted for inflation (using the consumer price index CPI) to the capital expenditures in year 0, minus one.

(1) $$\frac{CapEx\ (+1\ or +3) - CapEx\ (0)}{CapEx\ (0)}$$

Second growth variable is the ratio of the number of employees in year +1 (+3) to the number of employees in year 0, minus one. This measures the growth rate of employment. The employment growth measure is justified as Cantor (1990) shows that firm level leverage has an effect on employment when there is change in sales and cash flow and also Sharpe (1994) shows that the effect of sales growth on employment depends on leverage.

(2) $$\frac{Empl\ (+1\ or +3) - Empl\ (0)}{Empl\ (0)}$$

The final measure is the net investment growth. It is defined as net investment in year +1 divided by the book value of fixed assets in year 0. Net investment is measured as capital expenditures in year +1 minus depreciation in year +1. Measuring investments net of depreciation provides a more accurate picture of the actual value of the investment.

(3) $$\frac{Inv\ (+1)}{FA\ (0)} = \frac{CapEx\ (+1) - Depreciation\ (+1)}{FA\ (0)}$$

In all of the equations *Inv* is investment, *FA* is fixed assets, *CapEx* is capital expenditures and *Empl* is the number of employees. These are applied for the years indicated in the parenthesis. Year 0 refers to the base year.

The growth rate of real capital expenditures and the ratio of the number of employees are calculated for both year +1 to year 0 and year +3 to year 0. The net investment growth is computed for only year +1.

3.3.2 Independent variables

The purpose of this study is to investigate the effect of book leverage on firm growth. Book leverage acts as the explanatory variable and it is measured as the ratio of the book value of short-term and long-term debt to the book value of total assets. Following Lang et al. (1996), the book leverage is used instead of market leverage because market leverage could reflect recent changes in the market value of equity or the market expectations of growth. Lang et al. (1996) tested alternative measures of leverage and all except market leverage gave similar relations with firm growth.

3.3.3 Control variables

In addition to book leverage, other variables that are known to affect the growth measures are controlled. First control variable is cash flow before interest expense in year 1 divided by total assets in year 0. Cash flow is measured before interest expense because cash flow net of interest expense captures the effect of leverage only partially, because firms with higher interest expense have higher leverage. Fazzari, Hubbard and Petersen (1988) find that a firm's opportunity cost of internal finance can be substantially lower than the opportunity cost of external finance. This can be reasoned so that investment is related to the availability of internal funds. For this reason, cash flow measured before interest expense is more accurate because this way high leverage and resulting high interest expense cannot affect as much to the cash flow. Also cash flow net of interest expense may proxy the firm's capital structure rather than the availability of internal funds. Cash flow before interest expense then also partly eliminates the effects of a firm's capital structure.

(4) $$\frac{Cash\ flow\ before\ interest\ expense\ (1)}{TA\ (0)}$$

Second control variable is percentage sales growth from year -1 to 0 to allow for a multiplier effect.

(5) $$\frac{Sales\ (0)}{Sales\ (-1)}$$

The third control variable is capital expenditures in year 0, divided by fixed assets in year 0.

(6) $$\frac{CapEx\ (0)}{FA\ (0)}$$

The final control variable is Tobin's q, which is also used to define if the firm has high or low growth opportunities. Tobin's q is computed for all firms and for all yearly observations. Tobin's q is defined as the ratio of the sum of the book value of debt and market value of equity to the replacement value of the firm's assets. Replacement value of the firm's assets is calculated as total assets or as book value of equity plus book value of debt. Tobin's q is based on the finding that the relation between market value and replacement cost has a strong impact on investment decisions. Q represents the ratio of market value to replacement costs and if, at the margin, q exceeds 1, firms have an incentive to invest since the value of their new investment in capital would exceed its costs (Lindenberg & Ross, 1981). This can be simplified so that firms with higher q's have more valuable growth opportunities. In this study, if Tobin's q exceeds one, the firm is believed to have high growth opportunities and if the figure is below one, the firm is treated as it has low growth opportunities.

(7) $$\frac{MV\ (equity)+BV\ (debt)}{TA}$$

, where *TA* is total assets, MV is market value and BV is book value. There is one exception in the use of Tobin's q as control variable in this study. Because of multicollinearity, Tobin's q is not used in one of the regressions because it shows a relatively high and significant correlation with cash flow before interest expenses divided by total assets. In this case, Tobin's q also showed very high variance inflation factor (VIF), which indicates multicollinearity.

3.3.4 Dummy variable

Because of business cycle, growth can be high for firms for certain years and if simultaneously firm leverage is low, a negative relationship between firm leverage and growth measures could be found because leverage proxies for business cycle. To avoid this, indicator variables are added to the regressions for each year. These indicator variable coefficients are not presented in the results tables.

To illustrate the variables in a more reader-friendly manner, table 2 summarizes and shortly defines the variables used in this study.

Table 2. Summary of variables

The table summarizes the variables used in this study and also shortly defines them.

Type	Variable	Definition
Dependent	1-year capital expenditures growth	Measures the growth of capital expenditures in 1 year, capital expenditures in year 1 divided by capital expenditures in year 0
	3-year capital expenditures growth	Measures the growth of capital expenditures in 3 years, capital expenditures in year 3 divided by capital expenditures in year 0
	1-year employment growth	Measures the growth of employees in 1 year, number of employees in year 1 divided by no. of employees in year 0
	3-year employment growth	Measures the growth of employees in 3 years, number of employees in year 3 divided by no. of employees in year 0
	Net investment growth	Measure the net growth of investments, capital expenditures in year 1 minus deprecation divided by fixed assets in year 0
Independent	Book leverage	Measures the ratio of debt to total assets, book value of total debt divided by book value of total assets
Control	Cash flow (1) / TA (0)	Cash flow gross of interest expenses in year 1 divided by total assets in year 0
	Capital expenditures (0) / FA (0)	Capital expenditures in year 0 divided by fixed assets in year 0
	Sales growth	Sales in year 0 divided by sales in year -1
	Tobin's Q	Book value of debt and market value of equity divided by book value of total assets
Dummy	Business cycle	A dummy variable for each year is included

3.4 Descriptive statistics

The data in this research consist of 386 listed companies from the North America from years 2002 to 2013. The final sample consists of 4632 firm-year observations. Table 3 presents the general characteristics of the data set.

Table 3. Descriptive statistics

The sample period is 2002–2013. Included firms have $1 billion of sales in 2002 dollars for each year. All data are obtained from ThomsonReuters database. Capital expenditures (employment) growth is the percent change in capital expenditures (employment) for years +1 to 0 and +3 to 0. Net investment growth is capital expenditures minus depreciation for year +1 divided by the book value of fixed assets (FA) for year 0. Leverage is book value of total debt divided by book value of total assets (TA). Sales growth is sales for year +1 divided by sales for year 0. Tobin's q is total market value of equity and book value of total debt divided by book value of total assets. Cash flow is gross of interest expenses. All values are adjusted for inflation.

Variable	Average	25th percentile	Median	75th percentile	Standard deviation	# of obs.
1-year CapEx growth	0,453	-0,192	0,074	0,407	5,648	4246
3-year CapEx growth	1,183	-0,206	0,238	0,862	15,654	3474
1-year employment growth	0,068	-0,034	0,023	0,092	0,940	4246
3-year employment growth	0,238	-0,061	0,080	0,274	1,946	3474
Net investment growth	0,065	-0,044	0,011	0,075	1,015	4246
Book leverage	0,216	0,041	0,177	0,291	0,528	4632
Cash flow (1) / TA (0)	0,034	0,052	0,101	0,146	1,380	4246
CapEx (0) / FA (0)	0,213	0,116	0,173	0,257	0,166	4629
Sales growth	1,152	0,991	1,079	1,174	1,640	4227
Tobin's q	2,326	0,939	1,355	2,071	13,940	4632

As in Lang et al. (1996) the data set shows positive median values for every growth measure. The 3-year capital expenditures growth seems relatively high compared to Lang et al. (1996), with over three times higher median value. Moreover, in contrast to

their study, the Tobin's q values are significantly higher in this data set as the median Tobin's q is almost twice as high. Here, even the 25th percentile is near one, which is considered as the threshold value that defines if a firm has high or low growth opportunities. In this data set it seems that most of the companies are highly valued in the equity markets, since high market value raises the Tobin's q. The average leverage is slightly lower than in Lang et al. (1996).

The average capital expenditures growth for years 1 and 3 differ clearly from the ones in Lang et al. (1996). These are relatively high as average 1-year capital expenditures growth is 45,3% and for 3-years it is 118,3%. To compare, Lang et al. (1996) have average values of 11,1% and 23,7%, respectively. However, the median values for these variables are 7,4% and 20,6%, that are clearly closer to the average values in Lang et al. (1996). However, regardless of the median values, firms seem to have used significantly more funds in capital expenditures during the time period in this study.

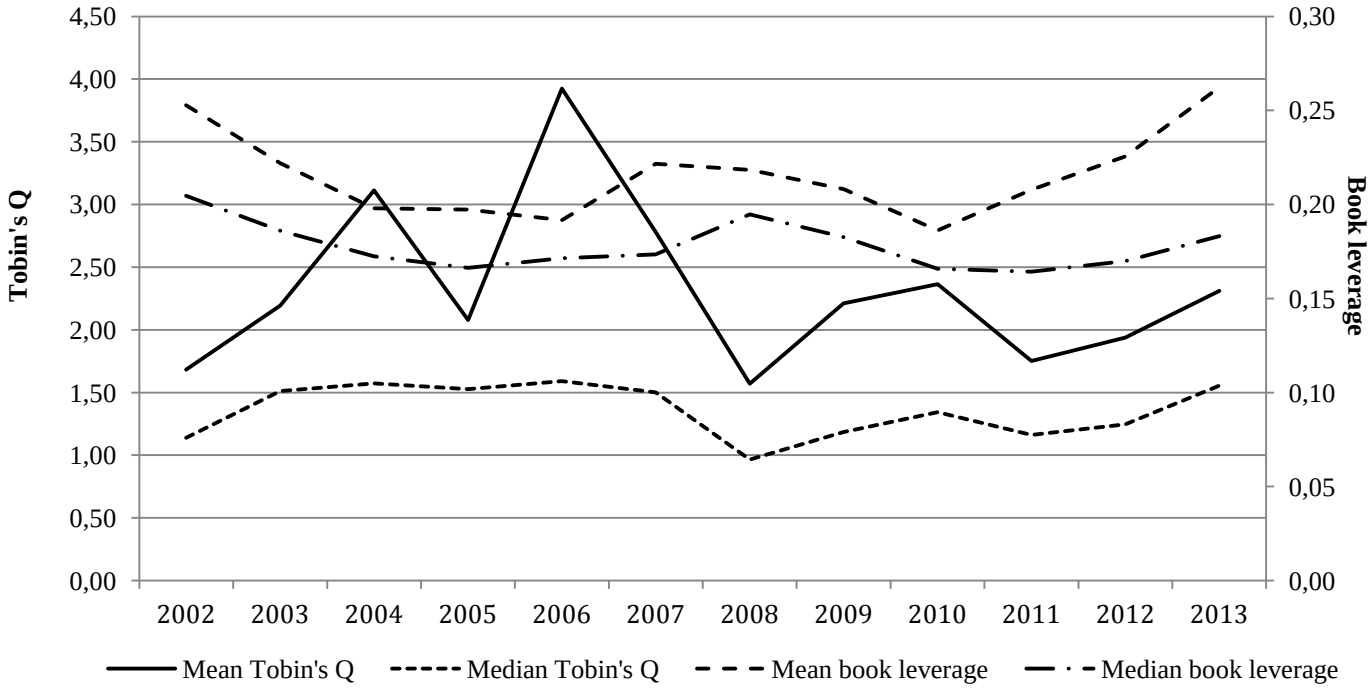

Figure 4. The annual mean and median of book leverage and Tobin's q

As a considerable part of this research aims to find if leverage has a different effect on growth for firms with different level of growth opportunities, it is reasonable to illustrate the development of leverage and Tobin's q during this time period. Figure 4

shows the development of mean and median book leverages and Tobin's q's for the whole sample in the time period of 2002–2013. The figure shows clearly how the subprime crisis affected firms' growth opportunities and thus their market values, as the Tobin's q, especially average Tobin's q drops substantially in 2006–2007. This indicates that when the crisis occurred, the investment possibilities for firms decreased. There seems to also be a slight reaction in book leverages to the financial crisis. Figure 4 shows that the average book leverages decreased during the crisis. The leverage ratios started to rise in 2006 and reached its peak around 2007 and 2008. The leverage ratios then decreased until 2010, after they started to rise again. This might be because of extremely low interest rates that Federal Reserve has provided since 2009 (see fig. 3), but there might also be other possible implications of the crisis on corporate financing decisions.

3.4.1 Correlations between variables

The correlations between all the variables are shown in table 4. The first line shows the unadjusted correlations and the second line shows the industry-adjusted correlations. The dependent variables are 1- and 3-year capital expenditures (CapEx) growth, 1- and 3-year employment growth and net investment growth. Leverage is the independent variable and the rest are control variables. This setting follows the Lang et al. (1996) paper. Leverage seems to correlate slightly negatively with all the dependent variables in unadjusted observations, although none of the correlations is significant. In the industry-adjusted correlations there are two significant results in 3-year CapEx and employment growth, but unlike in Lang et al. (1996), these correlations are positive. However all the correlations between leverage and growth measures are relatively low.

Another noteworthy observation is the high and significant negative correlation between Tobin's q and cash flow. The correlation is near minus one and it is significant at 1 percent level for both raw and industry-adjusted data. This correlation can lead to multicollinearity problems when they are both used as control variables and therefore multicollinearity tests are applied to test if the correlation between Tobin's q and cash flow has a significant effect on results. To test the multicollinearity, variance inflation factors (VIFs) of the variables are examined and if the values are above five, the variable with the highest VIF is dropped from the regression. Some literature suggests that VIFs higher than 5 show multicollinearity and some literature even suggest 10 as the cutoff value. VIF is calculated as $VIF_i = 1/(1 - r_i^2)$ and hence, $VIF_i = 5$ implies

Table 4. Correlations between variables

The first line gives correlation between variables for the raw data. The second line gives the correlation between variables using industry-adjusted data. Industry-adjusted variables are obtained by subtracting the industry median at the four-, three-, and two-digit SIC levels. Capital expenditures (CapEx) growth is the percent change in capital expenditures. Employment growth is the percent change in employment. Net investment growth is capital expenditures minus depreciation for year +1 divided by the book value of fixed assets (FA) for year 0. Leverage is book value of total debt divided by book value of total assets (TA). Sales growth is sales for year +1 divided by sales for year 0. Tobin's q is total market value of equity and book value of total debt divided by book value of total assets. Cash flow is gross of interest expenses. All values are adjusted for inflation.

	1-year CapEx growth	**3-year CapEx growth**	**1-year employment growth**	**3-year employment growth**	**Net investment growth**	**Book leverage**	**Cash flow /TA**	**Capital expenditures (0) / FA**	**Sales growth**
3-year CapEx growth	0,752**	1							
	0,190**	1							
1-year employment growth	0,796**	0,847**	1						
	0,072**	0,126**	1						
3-year employment growth	0,630**	0,871**	0,767**	1					
	0,029	0,232**	0,582**	1					
Net investment growth	0,224**	0,019	0,022	0,02	1				
	0,251**	0,221**	0,122**	0,180**	1				
Book leverage	-0,009	-0,007	-0,018	-0,014	-0,009	1			
	0,000	0,055**	-0,021	0,057**	0,007	1			
Cash flow / TA	-0,033*	-0,01	-0,011	-0,089**	-0,034*	-0,155**	1		
	-0,059**	-0,031	-0,029	-0,309**	-0,094**	-0,166**	1		
CapEx (0) / FA	-0,041**	-0,042*	0,008	0,012	0,127**	-0,071**	-0,063**	1	
	-0,072**	-0,086**	0,055**	0,104**	0,149**	-0,041**	-0,073**	1	
Sales growth	0,110**	0,012	0,066**	0,098**	0,002	0,003	0,013	0,034*	1
	0,126**	0,011	0,063**	0,094**	0,042*	0,009	0,014	0,022	1
Tobin's Q	0,046**	0,011	0,028	0,096**	0,058**	0,169**	-0,904**	0,047**	0,000
	0,089**	0,055**	0,095**	0,343**	0,160**	0,178**	-0,905**	0,035*	-0,007

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

that $r_i^2 = 0{,}8$, or 80% of the variability in the *i*th variable is explained by the remainder of the variables in the model (Craney & Surles, 2002). The level of VIF that determines

existing multicollinearity is a “rule-of-thumb” rather than an exact fact. Also values as low as 2 and 2,5 have been used as the cutoff value. Cutoff value of five is chosen here because it is considered as rather safe value to ignore multicollinearity and after testing the VIFs for all the different data settings used in this study, the highest VIFs occurred only for control variables (Tobin’s q and cash flow before interest), which is known to have only minor effect on the results as the variables of interest do not have multicollinearity.

For cases where VIF exceeds five, the control variable with the highest VIF is dropped from the regression to ensure that multicollinearity does not bias the results. The VIF exceeds five only once out of eighteen instances in this study, so we can somewhat safely assume that it does not significantly affect the results of this study. In this case, Tobin’s q delivers the highest VIF and thus is dropped from the control variables in that particular regression.

This data set provides significantly different correlations than earlier literature suggests. Especially interesting are the positive and highly significant correlations with the industry-adjusted data between leverage and 3-year capital expenditures and employment growth since the correlations between leverage and growth measures have consistently found to be negative and significant in earlier research. This provides motivation to conduct further investigation with multivariate regressions to find if the effect of leverage on firm growth has diminished or changed during the time between this and earlier studies.

3.5 Methods

The regressions in this research paper concentrate on investigating the relationship between leverage and firm growth. To test the effect of high or low Tobin’s q on the relationship between leverage and firm growth, subgroups based on Tobin’s q are also examined. Earlier literature suggests that leverage may not affect the growth of firms with high Tobin’s q as much as firms with low Tobin’s q. This smaller effect of leverage on firms with many valuable investment opportunities is assumed to be a consequence of capital markets reactions when they recognize the investment opportunities and thus can rely to that the firm will invest in sensible and value-increasing investments. In contrast, capital markets may not be able to recognize the

investment opportunities of low Tobin's q firms, and this leads to a lower market capitalization. This raises the cost of capital to these firms because investors are not certain that the funds will be invested profitably. Because of these assumptions, it is interesting to see if there is a significantly different effect of leverage on the growth of high and low Tobin's q firms.

Explanatory variables (including independent, control and dummy variables) are regressed against the dependent variables (growth measures) using multiple linear regressions for *n* data points and *m* independent variables. The regression model assumes constant variances and no correlation between the error terms. This is unlikely to hold with this data set, as industry effects or other similar effects are likely to increase correlation. This can lead to upwardly biased p-values and to avoid these problems, using the White adjustment, heteroskedasticity-consistent standard errors are obtained and used to compute more reliable t-statistics for the regression coefficients.

The methods used in this research do not include dummy variables to control for industry effect and thus the regressions are also presented with industry-adjusted data. Bradley, Jarrell and Kim (1984) show that "permanent" or average firm leverage ratios are strongly related to industry classification and that the relation holds even if regulated firms are excluded. They find that cross-sectional regressions on industry dummy variables explain 54 percent of variation in firm leverages. After excluding firms that face regulations, the industry still explains 25 percent of the variation. The industry-adjusted regression is used to study whether firms with higher growth in a specific industry have higher or lower leverages than the firms with lower growth. The industry adjustment is computed so that all the variables are adjusted by the industry median. Industries are specified by US SIC codes. This is done so that if five or more firms share the same four-digit SIC code, the industry median for all variables are calculated and then subtracted from all the observations. If there are less than five firms sharing the same four-digit code, then the number of firms in one industry is computed with the same three-digit code. If this does not produce five or more firms for the industry, two-digit codes are used. Firms that do not share two-digit SIC codes with four or more firms are excluded from the industry-adjusted data.

Mann-Whitney-Wilcoxon (MWW) test (also known as Wilcoxon rank-sum or Mann-Whitney U test) is applied to compare the variable means and medians of the low- and high-q subgroups. This will help to interpret the results and give a deeper insight for analysis. Before running the MWW test, the outliers of the growth variables are

excluded. This is done so that the Z-scores of the variables are obtained, and observations with Z-score of over 3,29 or under -3,29 are excluded. This method excludes 0,1% of the variables with highest standard deviations and thus gives more reasonable average values.

4. REGRESSION RESULTS

The regression results are presented in this chapter. The dependent variables are regressed against the independent and control variables. Because firm growth can be high due to business cycle and if simultaneously firm leverage is low, a negative relationship between firm growth and leverage could be found because leverage proxies for business cycle. To avoid this, indicator variables are added in the regressions for each year, although their coefficients are not presented in the results.

The regression results are presented in three parts. First, the regressions and analysis are presented for the whole time period of 2002–2013. Second, the "normal" years of 2002–2006 and 2011–2013 combined are analyzed and finally the 2007–2010 "abnormal" years including the financial crisis are examined. The regressions are done for raw and industry-adjusted data. The regressions are also produced for subgroups defined by Tobin's q. Mann-Whitney-Wilcoxon tests are introduced to compare the means and medians of the independent and dependent variables between the Tobin's q subgroups.

4.1 Whole time period: 2002–2013

First, the results of the regressions are presented for the whole time period of 2002–2013 and for both unadjusted and industry-adjusted data. Also the Tobin's q subgroups are examined separately for this period.

Table 5 shows the regression results for unadjusted data in 2002–2013. Leverage seems to have a significant negative relationship with all growth measures except 3-year capital expenditures growth. However the coefficient for that measure is also negative. The other significance levels stay at 1-percent except for 1-year capital expenditures growth (5%-level). One approach to assess the relationship is as follows: The 1-year capital expenditures growth average is 45,3% and the average book leverage is 21,6%. The point estimate for the leverage coefficient implies that if a firm has half the book leverage, it would have 1-year capital expenditures growth of 53%, which is a difference of approximately 17%. However this is slightly biased as the average annual capital expenditures growth in this data set is relatively high. Using the median annual capital expenditures growth, the difference would be slightly over 100%.

Capital expenditures are associated with subsequent decreases in 3-year capital expenditures growth and increases in employment growth. Sales growth that is used to capture the multiplier effect does not have any significant coefficients with any of the growth measures. Finally cash flow before interest is slightly positively and significantly associated with employment growth.

Table 5. Regressions of growth measures on leverage: 2002–2013

The sample period is 2002–2013. Included firms have $1 billion of sales in 2002 dollars for each year. All data are obtained from ThomsonReuters database. Capital expenditures (employment) growth is the percent change in capital expenditures (employment) for years +1 to 0 and +3 to 0. Net investment growth is capital expenditures minus depreciation for year +1 divided by the book value of fixed assets (FA) for year 0. Leverage is book value of total debt divided by book value of total assets (TA). Sales growth is sales for year +1 divided by sales for year 0. Tobin's q is total market value of equity and book value of total debt divided by book value of total assets. Cash flow is gross of interest expenses. All values are adjusted for inflation. Results are corrected for heteroskedasticity. *t*-values are in parentheses.

Unadjusted regressions 2002–2013	**1-year capital expenditures growth**	**3-year capital expenditures growth**	**1-year employment growth**	**3-year employment growth**	**Net investment growth**
Leverage	-0.717	-0.458	-0.047	-0.210	-0.096
	(2.37)**	(1.39)	(3.04)***	(3.92)***	(2.61)***
Cash Flow / TA	-0.957	2.060	0.058	0.167	-0.113
	(1.23)	(0.72)	(2.41)**	(1.92)*	(0.56)
CapEx (0) / FA	-1.243	-2.926	0.124	0.230	0.789
	(1.64)	(2.93)***	(3.08)***	(1.82)*	(1.57)
Sales Growth	0.324	-0.022	0.014	0.021	-0.011
	(1.08)	(0.27)	(1.23)	(0.79)	(0.49)
Tobin's q	0.062	0.559	0.013	0.059	0.013
	(0.93)	(1.10)	(3.81)***	(5.87)***	(0.78)
Constant	-0.698	0.023	-0.995	-0.955	-0.100
	(3.18)***	(0.04)	(33.50)***	(22.37)***	(1.22)
R-squared	0.03	0.10	0.04	0.12	0.02
# of obs.	3,841	3,071	3,841	3,071	3,841

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

The regressions above do not control for industry effects. Table 6 presents the regression results with all the variables adjusted for industry. Industries were formed using four-, three- and two-digit SIC codes so that every industry group has at least 5

firms. Then the median values of variables for each group were subtracted from the observations.

Table 6. Industry-adjusted regressions of growth measures on leverage: 2002–2013

The sample period is 2002–2013. Included firms have $1 billion of sales in 2002 dollars for each year. All data are obtained from ThomsonReuters database. Capital expenditures (employment) growth is the percent change in capital expenditures (employment) for years +1 to 0 and +3 to 0. Net investment growth is capital expenditures minus depreciation for year +1 divided by the book value of fixed assets (FA) for year 0. Leverage is book value of total debt divided by book value of total assets (TA). Sales growth is sales for year +1 divided by sales for year 0. Tobin's q is total market value of equity and book value of total debt divided by book value of total assets. Cash flow is gross of interest expenses. All values are adjusted for inflation. All variables are industry-adjusted. Results are corrected for heteroskedasticity. *t*-values are in parentheses.

Industry-adjusted regressions 2002–2013	**1-year capital expenditures growth**	**3-year capital expenditures growth**	**1-year employment growth**	**3-year employment growth**	**Net investment growth**
Leverage	-0.763	-0.496	-0.045	-0.174	-0.117
	(2.31)**	(1.03)	(2.73)***	(3.30)***	(2.23)**
Cash Flow / TA	-1.024	2.220	0.055	0.166	-0.079
	(1.22)	(0.71)	(2.26)**	(1.86)*	(0.39)
CapEx (0) / FA	-1.789	-3.095	0.098	0.208	0.302
	(2.98)***	(2.97)***	(2.36)**	(1.57)	(2.60)***
Sales Growth	0.349	-0.013	0.014	0.024	0.008
	(1.12)	(0.17)	(1.24)	(0.89)	(1.37)
Tobin's q	0.060	0.590	0.013	0.057	0.022
	(0.76)	(1.05)	(3.44)***	(5.80)***	(1.23)
Constant	0.238	1.268	0.040	0.089	0.038
	(3.53)***	(3.71)***	(1.40)	(3.88)***	(3.03)***
R-squared	0.04	0.11	0.03	0.11	0.06
# of obs.	3,336	2,668	3,336	2,668	3,336

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

The industry-adjusted regressions give corresponding results with the unadjusted ones. Again, highly significant and negative relations between book leverage and growth measures are observed. In terms of the used growth measures, firms with higher leverage than industry median grow less than the industry median. Compared to unadjusted regressions, the significance of the coefficient between leverage and net investment growth has dropped from 1-percent to 5-percent level, but the strengths of

the relations have stayed approximately the same. Capital expenditures now show even more explanatory power as it associates negatively also with 1-year capital expenditures growth and positively with subsequent net investment growth. Sales growth still remains insignificant for all dependent variables and also the coefficients stay at moderate levels except for 1-year CapEx growth.

4.1.1 Effect of growth opportunities on the relation of leverage and firm growth

The strong and significant negative relationship between leverage and firm growth gives an implication that regardless of firm's characteristics, leverage weakens the firm's growth. However Lang et al. (1996) find that low-q firms show significant and negative relation between leverage and growth making the negative and significant results for whole sample largely insignificant. In their study, high-q firms show only one out of five significant and negative relations. For other growth measures for high-q firms, the results vary from negative to positive with none of them being significant. To test if this is the case, the sample is divided in two subgroups based on Tobin's q. Tobin's q tries to capture the firm's growth opportunities by assuming that the capital markets recognizes those opportunities, and consequently this can be observed from the market value of the firm. If the firm's Tobin's q is over one, it is assumed to have high growth opportunities and vice versa. Table 7 shows the unadjusted regressions for the high- and low Tobin's q subgroups.

When growth opportunities are allowed to affect the relation between growth and leverage, some clear differences between the subgroups can be observed. In both cases leverage seems to affect negatively and significantly at least some of the growth measures, but further investigation reveals that the size of the relations are clearly different. For the high-q firms, leverage has a significant relation with all the growth measures except for 3-year capital expenditures growth and net investment growth. The strongest coefficient is for 1-year CapEx growth being -0,686 with a significance level of 5%. For employment growth, a highly significant negative relationship is present, but the relations are relatively low (-0,041 and -0,183). All in all, leverage seems to be partially associated with firm growth for high-q firms. However, the relations are not very strong and the results leave some space for more specific research.

Table 7. Tobin's q & the relation between leverage and firm growth: whole period

The sample period is 2002–2013. Included firms have $1 billion of sales in 2002 dollars for each year. All data are obtained from ThomsonReuters database. Capital expenditures (employment) growth is the percent change in capital expenditures (employment) for years +1 to 0 and +3 to 0. Net investment growth is capital expenditures minus depreciation for year +1 divided by the book value of fixed assets (FA) for year 0. Leverage is book value of total debt divided by book value of total assets (TA). Sales growth is sales for year +1 divided by sales for year 0. Tobin's q is total market value of equity and book value of total debt divided by book value of total assets. Cash flow is gross of interest expenses. All values are adjusted for inflation. Results are corrected for heteroskedasticity. *t*-values are in parentheses.

Tobin's q > 1 2002–2013	**1-year capital expenditures growth**	**3-year capital expenditures growth**	**1-year employment growth**	**3-year employment growth**	**Net investment growth**
Leverage	-0.686	-0.199	-0.041	-0.183	-0.065
	(2.11)**	(0.54)	(2.87)***	(3.22)***	(1.44)
Cash Flow / TA	-1.147	2.404	0.044	0.151	-0.165
	(1.28)	(0.73)	(1.62)	(1.71)*	(0.71)
CapEx (0) / FA	-1.200	-2.719	0.092	0.271	1.003
	(1.29)	(2.58)***	(2.18)**	(1.81)*	(1.42)
Sales Growth	0.321	-0.027	0.011	0.020	-0.019
	(1.06)	(0.33)	(1.01)	(0.73)	(0.63)
Tobin's q	0.036	0.596	0.011	0.055	0.009
	(0.48)	(1.05)	(2.95)***	(5.82)***	(0.45)
Constant	-0.581	-0.223	-0.995	-0.941	-0.140
	(2.18)**	(0.25)	(51.38)***	(18.88)***	(0.99)
R-squared	0.03	0.11	0.03	0.12	0.03
# of obs.	2,722	2,243	2,722	2,243	2,722

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Tobin's q < 1 2002–2013	**1-year capital expenditures growth**	**3-year capital expenditures growth**	**1-year employment growth**	**3-year employment growth**	**Net investment growth**
Leverage	-0.919	-1.599	-0.216	-0.308	-0.198
	(3.57)***	(2.94)***	(2.80)***	(2.28)**	(1.49)
Cash Flow / TA	0.089	0.665	-0.068	-0.008	-0.138
	(0.22)	(0.86)	(0.52)	(0.04)	(0.42)
CapEx (0) / FA	-1.676	-2.560	0.034	0.013	0.014
	(4.95)***	(4.74)***	(0.36)	(0.12)	(0.09)
Sales Growth	0.294	0.094	-0.010	-0.008	-0.193
	(1.39)	(0.40)	(0.15)	(0.07)	(0.74)
Tobin's q	0.230	0.354	0.069	0.387	0.182
	(1.61)	(0.86)	(1.02)	(4.15)***	(1.32)
Constant	-0.841	0.463	-0.933	-1.157	0.115
	(3.65)***	(1.21)	(5.73)***	(9.44)***	(0.50)
R-squared	0.08	0.08	0.03	0.08	0.03
# of obs.	1,119	828	1,119	828	1,119

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

The interesting observations are found in the right-hand side of table 7 where the same regressions are run for firms with q < 1. The relations between leverage and growth measures are highly significant, except for net investment growth. 1- and 3-year CapEx growth and 1-year employment growth show negative coefficients with significance level of 1%. 3-year employment growth also shows a negative coefficient with 5% significance level. When compared to high-q firms, even though both subgroups provide negative significant coefficients, the coefficients for low q –firms are much stronger. For 1-year CapEx growth, and 1- and 3-year employment growth the coefficients are approximately -0,2 stronger. Low-q firms also have a negative relationship between leverage and 3-year capital expenditures growth with 1% significance level, where high-q firms did not show any significant relation. The coefficient is -1,599, which can be considered extremely strong. This implies that for firms with low growth opportunities, the effect of leverage on capital expenditures growth seems to have a clearly longer-term effect than for high-q firms.

The lower coefficients and less significant results for high-q firms suggest that perhaps the negative effect of leverage on growth is relevant for mainly firms with low growth opportunities. If capital markets recognize the firm's growth opportunities, borrowing against these opportunities might not be a problem for these firms. However, if the growth opportunities are not recognized by outside investors, highly levered firms may face difficulties to obtain new outside funds and thus leverage would lead in reduced growth. However this conclusion can not be stated as certain, since even though high-q firms show smaller relationships between leverage and growth measures, they are still negative and significant so the negative effect of leverage on firm growth seems to be present even if capital markets recognize the growth opportunities.

Table 8 shows the industry-adjusted regression results for high- and low-q firms. The majority of the results seem similar to the unadjusted regression results, but the sizes of coefficients between high and low-q firms have leveled closer to each other. After industry-adjustment, net investment growth shows significant and negative relation with leverage for the first time for the Tobin's q subgroups. Again, all the coefficients between leverage and growth measures are negative.

For high-q firms, approximately the same relations exist as in unadjusted regressions, with less significant coefficients in 1- and 3-year employment. Also as mentioned, net investment growth now shows significant relation with leverage in industry-adjusted regressions.

Table 8. Tobin's q & the industry-adjusted relation between leverage and growth: whole period

The sample period is 2002–2013. Included firms have $1 billion of sales in 2002 dollars for each year. All data are obtained from ThomsonReuters database. Capital expenditures (employment) growth is the percent change in capital expenditures (employment) for years +1 to 0 and +3 to 0. Net investment growth is capital expenditures minus depreciation for year +1 divided by the book value of fixed assets (FA) for year 0. Leverage is book value of total debt divided by book value of total assets (TA). Sales growth is sales for year +1 divided by sales for year 0. Tobin's q is total market value of equity and book value of total debt divided by book value of total assets. Cash flow is gross of interest expenses. All values are adjusted for inflation. All variables are industry-adjusted. Results are corrected for heteroskedasticity. *t*-values are in parentheses.

Tobin's q > 1 2002–2013	**1-year capital expenditures growth**	**3-year capital expenditures growth**	**1-year employment growth**	**3-year employment growth**	**Net investment growth**
Leverage	-0.739	-0.326	-0.037	-0.144	-0.108
	(2.11)**	(0.85)	(2.51)**	(2.46)**	(1.98)**
Cash Flow / TA	-1.195	2.346	0.046	0.170	-0.077
	(1.26)	(0.72)	(1.69)*	(1.88)*	(0.35)
CapEx (0) / FA	-1.796	-2.364	0.094	0.296	0.390
	(2.50)**	(2.34)**	(2.02)**	(1.73)*	(3.07)***
Sales Growth	0.345	0.001	0.012	0.021	0.010
	(1.11)	(0.01)	(1.06)	(0.76)	(1.64)
Tobin's q	0.039	0.595	0.011	0.056	0.020
	(0.45)	(1.03)	(2.88)***	(6.12)***	(1.08)
Constant	0.233	1.296	0.012	0.090	0.032
	(2.60)***	(2.61)***	(0.92)	(2.97)***	(1.82)*
R-squared	0.04	0.12	0.03	0.11	0.10
# of obs.	2,295	1,885	2,295	1,885	2,295

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Tobin's q < 1 2002–2013	**1-year capital expenditures growth**	**3-year capital expenditures growth**	**1-year employment growth**	**3-year employment growth**	**Net investment growth**
Leverage	-0.665	-0.919	-0.164	-0.279	-0.222
	(3.18)***	(1.74)*	(1.94)*	(1.99)**	(2.06)**
Cash Flow / TA	-0.256	0.144	-0.191	-0.325	-0.316
	(0.59)	(0.15)	(1.14)	(1.39)	(0.68)
CapEx (0) / FA	-1.632	-2.742	0.041	-0.134	-0.075
	(4.67)***	(3.25)***	(0.36)	(1.32)	(0.29)
Sales Growth	0.016	-0.274	-0.042	-0.094	-0.335
	(0.11)	(0.94)	(0.51)	(0.66)	(0.90)
Tobin's q	0.300	0.560	0.078	0.530	0.229
	(1.75)*	(1.39)	(0.70)	(4.16)***	(1.30)
Constant	0.297	1.383	0.118	0.082	0.027
	(2.24)**	(3.75)***	(1.18)	(1.93)*	(1.09)
R-squared	0.14	0.14	0.04	0.11	0.05
# of obs.	671	492	671	492	671

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

For low-q firms, leverage is negatively and significantly associated with all the growth measures. The significance levels have however dropped from 1% to 5% levels in 3-year CapEx and 1-year employment growth. Also the coefficients are not as strong as in unadjusted regressions. Still, compared to high-q firms, the low-q group shows stronger negative relations between leverage and growth measures except for the 1-year capital expenditures growth.

Table 9 shows the results for Mann-Whiney-Wilcoxon (MWW) test that compares the means and medians between the high- and low-q subgroups during the period of 2002–2013. Results give support for the significantly lower growth and investments for low Tobin's q firms. As mentioned earlier, capital structure theories suggest that firms with high growth opportunities should have low leverage. The average debt levels for the subgroups are approximately the same, but when comparing the medians, in line with capital structure theories, low-q firms have over 20% more debt. For the growth measures, low-q firms show lower average and median values for every variable.

Table 9. Mann-Whitney-Wilcoxon test between subgroups: 2002–2013

The mean and median of the growth measures and leverage are compared between the high-q and low-q subgroups. The difference has been tested with Mann-Whitney-Wilcoxon test, which is a non-parametric test.

2002–2013				**Mann-Whitney-Wilcoxon**	
		Q < 1	**Q > 1**	**Z-value**	**Pr > |Z|**
1-year CapEx growth	**Mean**	12,19%	33,93%	-9,0930	0,0000
	Median	-2,21%	11,58%		
3-year CapEx growth	**Mean**	58,02%	87,57%	-3,6260	0,0000
	Median	15,08%	27,00%		
1-year employment growth	**Mean**	-1,00%	7,50%	-16,2390	0,0000
	Median	-0,76%	3,80%		
3-year employment growth	**Mean**	5,62%	22,60%	-11,7190	0,0000
	Median	0,48%	11,22%		
Net investment growth	**Mean**	-0,14%	9,30%	-14,4870	0,0000
	Median	-1,90%	2,49%		
Leverage	**Mean**	21,03%	21,84%	-5,9840	0,0000
	Median	20,46%	16,68%		

The results show a clear difference between the high- and low-q firms. For high-q firms the average net investment growth is 9,3% and the median is 2,49%. For low-q firms,

these same figures are -0,14% and -1,9%, respectively. During this time period, low-q firms have generally decreased their annual investments when high-q firms have increased them. Also the 1-year capital expenditures growth shows similar and even more extreme deviation. This gives support for the subgrouping of the sample, since high-q firms are assumed to have more valuable investment opportunities than low-q firms and thus higher capital expenditures. Also noteworthy is that every mean and median of the growth measures are positive for high-q firms, when low-q firms show negative values for five out of ten instances.

These regressions were conducted for time period from 2002 to 2013, which includes the most severe financial crisis that global financial markets have experienced. The economic downturn that started in 2007 has almost certainly decreased the growth opportunities of firms and reduced investments. Difficult times have lead firms to reduce employment and investments even though valuable investment opportunities are present. This abnormal period may have biased the results when examining the whole period. However, these results still provide some evidence that the effect of leverage on firm growth is negative in general, but no conclusion for the effect of growth opportunities on this relation can be drawn here. It is of great interest to examine the crisis and normal periods separately, because it is possible that the results for the subperiods can differ substantially because of the extreme financial conditions in 2007–2010. The regressions for the subperiods are presented in the following chapters.

4.2 Normal years: 2002–2006 and 2011–2013

To find out if different economical states affect the relation between leverage and growth measures, the subperiods for normal and crisis years are studied separately. This helps to give deeper insight in the analysis and it offers a possibility to see if the relation between leverage and firm growth is different during the crisis than the whole period or the so-called normal period. The crisis may have affected the capital structures of firms resulting in differing observations than for the whole period. In this chapter, the normal years 2002–2006 and 2011–2013 are analyzed. First, the regressions are computed for the whole sample, and then for the low-q and high-q subsamples. Regressions are done for both raw and industry-adjusted data. Finally the MWW test is applied to compare the means and medians of the high- and low-q firms.

Table 10 shows the results for the whole sample during normal years. The results are quite in line with the regressions for the 2002–2013 period. As before for the whole time period, leverage shows significant and negative relations for 1-year CapEx growth and 1- and 3-year employment growth. The relation with net investment growth loses its significance but is still slightly negative. The 1-year capital expenditures growth now has a higher significance at 1% level suggesting that leverage has a negative short-term effect on firm's investments even in normal economical times. The coefficient is not as large as before (-0,717 vs. -0,445), but it is still considerably strong to have a significant effect on capital expenditures.

Table 10. Regressions of growth measures on leverage: 2002–2006, 2011–2013

The sample period is 2002–2006 and 2011–2013. Included firms have $1 billion of sales in 2002 dollars for each year. All data are obtained from ThomsonReuters database. Capital expenditures (employment) growth is the percent change in capital expenditures (employment) for years +1 to 0 and +3 to 0. Net investment growth is capital expenditures minus depreciation for year +1 divided by the book value of fixed assets (FA) for year 0. Leverage is book value of total debt divided by book value of total assets (TA). Sales growth is sales for year +1 divided by sales for year 0. Tobin's q is total market value of equity and book value of total debt divided by book value of total assets. Cash flow is gross of interest expenses. All values are adjusted for inflation. Results are corrected for heteroskedasticity. *t*-values are in parentheses.

Unadjusted regressions 2002–2006, 2011–2013	**1-year capital expenditures growth**	**3-year capital expenditures growth**	**1-year employment growth**	**3-year employment growth**	**Net investment growth**
Leverage	-0.445	-0.497	-0.049	-0.236	-0.030
	(3.28)***	(1.55)	(2.40)**	(2.70)***	(0.35)
Cash Flow / TA	-0.385	-0.114	0.008	0.216	-0.028
	(1.39)	(0.43)	(0.18)	(2.87)***	(0.20)
CapEx (0) / FA	-0.499	-1.907	0.126	0.139	1.050
	(0.59)	(3.17)***	(2.26)**	(1.25)	(1.33)
Sales Growth	0.138	0.167	0.027	0.125	-0.021
	(2.43)**	(1.11)	(1.04)	(1.41)	(0.44)
Tobin's q	0.056	0.018	0.010	0.038	-0.010
	(1.65)*	(0.53)	(2.58)***	(3.73)***	(0.37)
Constant	-0.762	-0.587	-1.000	-1.170	-0.129
	(5.79)***	(2.46)**	(25.75)***	(11.62)***	(1.17)
R-squared	0.01	0.04	0.02	0.10	0.02
# of obs.	2,305	1,535	2,305	1,535	2,305

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Cash flow still positively and significantly predicts 3-year employment growth but not 1-year employment growth as before. Capital expenditures still has same negative predictive power for 3-year capital expenditures growth and positive relation with 1-year employment growth. For 3-year employment growth the significance does not exist anymore. Sales growth, which is used in the regressions to allow for multiplier effect shows a significant coefficient for the first time. Sales growth positively predicts 1-year capital expenditures growth with 5% significance.

The sizes of the coefficients have remained approximately the same, except for the 1-year CapEx growth where leverage now has about 0,3 lesser effect. The similarity of the results compared to the whole period might imply that the abnormal period may not be significantly affecting the results for the whole period. However, the abnormal period itself can show very differing results.

Table 10 does not take industry effects in to account, hence the regressions are computed also with industry-adjusted data. Table 11 presents the industry-adjusted regression results for time periods 2002–2006 and 2011–2013. Again, leverage seems to affect the growth measures but the industry-adjustment has produced slight changes to the results. 1-year CapEx and employment growth retain their significant negative relations with book leverage. 3-year employment growth does not produce significant results anymore. The negative coefficient between leverage and 1-year CapEx growth has strengthened to -0,543 and the effect on 1-year employment growth has remained at the same level. Interestingly net investment growth is now clearly negative and significantly related to leverage.

Note that all the significant relations between leverage and growth measures are present for short-term measures only. The results could be interpreted so that when industry effects are taken into account, leverage has a short-term negative effect on firm growth, but not for long-term. In normal economic periods firms seem to be able to retain their growth after obtaining debt relatively quickly.

Other significant results from table 11 are that cash flow before interest still has a positive and significant effect on long-term employment growth, capital expenditures per fixed assets affect negatively future capital expenditures and sales growth is highly significantly and positively related to short-term capital expenditures growth.

Table 11. Industry-adjusted regressions of growth measures on leverage: 2002–2006, 2011–2013

The sample period is 2002–2006 and 2011–2013. Included firms have $1 billion of sales in 2002 dollars for each year. All data are obtained from ThomsonReuters database. Capital expenditures (employment) growth is the percent change in capital expenditures (employment) for years +1 to 0 and +3 to 0. Net investment growth is capital expenditures minus depreciation for year +1 divided by the book value of fixed assets (FA) for year 0. Leverage is book value of total debt divided by book value of total assets (TA). Sales growth is sales for year +1 divided by sales for year 0. Tobin's q is total market value of equity and book value of total debt divided by book value of total assets. Cash flow is gross of interest expenses. All values are adjusted for inflation. All variables are industry-adjusted. Results are corrected for heteroskedasticity. *t*-values are in parentheses.

Industry-adjusted regressions 2002–2006, 2011–2013	**1-year capital expenditures growth**	**3-year capital expenditures growth**	**1-year employment growth**	**3-year employment growth**	**Net investment growth**
Leverage	-0.543	-0.399	-0.047	-0.180	-0.099
	(2.99)***	(1.25)	(2.20)**	(1.63)	(3.48)***
Cash Flow / TA	-0.352	-0.187	0.015	0.214	0.026
	(1.41)	(0.62)	(0.35)	(2.84)***	(0.31)
CapEx (0) / FA	-1.432	-1.854	0.103	0.102	0.271
	(3.34)***	(3.06)***	(1.82)*	(0.99)	(2.24)**
Sales Growth	0.186	0.190	0.027	0.162	0.018
	(3.11)***	(1.07)	(1.02)	(1.82)*	(1.22)
Tobin's q	0.082	-0.009	0.011	0.039	0.016
	(2.32)**	(0.24)	(2.48)**	(3.19)***	(1.98)**
Constant	0.209	-0.119	0.036	-0.069	0.042
	(3.27)***	(1.22)	(1.27)	(3.45)***	(3.40)***
R-squared	0.04	0.04	0.02	0.11	0.03
# of obs.	2,000	1,332	2,000	1,332	2,000

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

4.2.1 Effect of growth opportunities on the relation of leverage and firm growth

When regressed for the whole time period, firm's growth opportunities affected particularly the magnitude of the relations between leverage and growth measures. To see if such differences still exist in normal economic times, the subgroup regressions are computed again for years 2002–2006 and 2011–2013. Table 12 presents the results for unadjusted data. The regressions for the high-q subgroup differ slightly from the other regressions in this study. Tobin's q has been dropped from the control variables because this dataset provided extremely high multicollinearity between Tobin's q and cash flow

before interest. Since Tobin's q provided higher variance inflation factors than cash flow before interest, it has been dropped from the regression.

Table 12 shows evidence for the importance of low-q firms in the earlier negative and significant relations between leverage and growth measures. High-q firms show significant results for only 1-year capital expenditures growth, 3-year employment growth and net investment growth. However, 1-year CapEx growth and net investment growth have significance level of only 10% and also the sizes of the coefficients are relatively small. 3-year employment growth shows high significance and also the size of coefficient is considerable, which implies that even for firms with high growth opportunities, leverage is negatively associated with the number of employees in the long run even in normal economical times.

Low-q firms show much stronger coefficients and also higher significance levels. The 1-year CapEx growth is almost 8 times stronger than for high-q firms and the result is also significant at 1-percent level. The 3-year capital expenditures growth has an extremely negative coefficient of -2,410 with a significance of 10%. The 1- and 3-year employment growths also show rather strong negative coefficients with a high 1% significance level. Surprisingly, net investment growth does not show any significance for the low-q group.

The different results between the subgroups gives evidence that low-q firms have a significantly stronger negative relation between book leverage and the growth measures. Even though the high-q firms also have some negative and significant relations, the relations are much stronger for the low-q firms. Especially the long-term capital expenditures growth for low-q firms shows very powerful negative relation with leverage offering more evidence for that the firms with low growth opportunities suffer from long-term negative effects of leverage similarly as in the results for whole period.

For high-q firms, cash flow before interest has a highly significant negative relation with 3-year employment growth. Cash flow before interest also slightly affects the 3-year capital expenditures growth for these firms. Sales growth affects positively and significantly the 1-year capital expenditures growth for high-q firms. Unlike high-q firms, the low-q subgroup shows highly significant and negative relation between base year capital expenditures and 1- and 3-year capital expenditures growth. This might be because low-q firms do not have much investment opportunities and once they make a big investment, they focus on that and reduce their investments in the near future.

Table 12. Tobin's q & the relation between leverage and growth: normal period

The sample period is 2002–2006 and 2011–2013. Included firms have $1 billion of sales in 2002 dollars for each year. All data are obtained from ThomsonReuters database. Capital expenditures (employment) growth is the percent change in capital expenditures (employment) for years +1 to 0 and +3 to 0. Net investment growth is capital expenditures minus depreciation for year +1 divided by the book value of fixed assets (FA) for year 0. Leverage is book value of total debt divided by book value of total assets (TA). Sales growth is sales for year +1 divided by sales for year 0. Tobin's q is total market value of equity and book value of total debt divided by book value of total assets. Cash flow is gross of interest expenses. All values are adjusted for inflation. Results are corrected for heteroskedasticity. *t*-values are in parentheses.

Tobin's q > 1 2002–2006, 2011–2013	**1-year capital expenditures growth**	**3-year capital expenditures growth**	**1-year employment growth**	**3-year employment growth**	**Net investment growth**
Leverage	-0.115	-0.137	-0.015	-0.236	-0.090
	(1.80)*	(0.46)	(1.45)	(2.78)***	(1.67)*
Cash Flow / TA	-0.007	-0.009	0.000	-0.137	-0.000
	(0.69)	(2.10)**	(0.20)	(52.88)***	(0.09)
CapEx (0) / FA	0.330	-0.065	0.033	0.015	0.195
	(0.85)	(0.20)	(1.15)	(0.20)	(0.96)
Sales Growth	0.136	0.074	0.026	0.125	-0.010
	(2.52)**	(0.53)	(0.99)	(1.39)	(0.26)
Constant	-0.900	-0.941	-0.978	-1.000	0.069
	(7.23)***	(4.11)***	(28.92)***	(9.05)***	(2.41)**
R-squared	0.01	0.04	0.02	0.27	0.00
# of obs.	1,710	1,231	1,710	1,231	1,710

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Tobin's q < 1 2002–2006, 2011–2013	**1-year capital expenditures growth**	**3-year capital expenditures growth**	**1-year employment growth**	**3-year employment growth**	**Net investment growth**
Leverage	-0.812	-2.410	-0.412	-0.787	-0.290
	(3.03)***	(1.91)*	(2.77)***	(3.89)***	(1.24)
Cash Flow / TA	-0.561	-0.572	-0.184	-0.664	-0.709
	(1.05)	(0.52)	(0.86)	(1.30)	(0.96)
CapEx (0) / FA	-2.067	-4.395	0.108	-0.145	-0.200
	(5.87)***	(4.62)***	(0.37)	(0.66)	(0.55)
Sales Growth	0.046	0.462	-0.003	0.002	-0.382
	(0.46)	(1.25)	(0.07)	(0.01)	(0.91)
Tobin's q	0.317	0.050	0.164	0.531	0.312
	(1.33)	(0.06)	(1.31)	(3.09)***	(1.21)
Constant	-0.567	-0.204	-0.996	-1.315	0.294
	(2.51)**	(0.28)	(8.28)***	(7.16)***	(0.76)
R-squared	0.08	0.06	0.02	0.14	0.06
# of obs.	593	302	593	302	593

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

To control for industry-specific effects the regressions for normal years are conducted also with industry-adjusted data. The results are presented in table 13. The results tell a similar story as in unadjusted regressions. High-q firms show significant negative results for 1-year CapEx and employment growth and net investment growth. However, the sizes of the coefficients for 1-year employment growth and net investment growth are near zero (-0,038 and -0,075) and thus they do not give much indication in one way or another. The 1-year capital expenditures growth gives a relatively strong coefficient of minus 0,429 implying that leverage really has a negative effect on short-term capital expenditures growth even for high-q firms. In contrast to the unadjusted regressions, the base year capital expenditures now show highly significant and negative relations with 1- and 3-year CapEx growth. This is also interesting and shows that also the high-q firms seem to reduce their investments after years of high capital expenditures.

As expected, the low-q firms show much stronger negative relations between leverage and growth measures. All of the coefficients except 3-year CapEx growth now show significant negative relations. This lack of significance slightly diminishes the interpretation that low-q firms have a long-term negative effect of leverage on growth. The most interesting thing is that the coefficients are still clearly stronger for low-q firms than for high-q firms. For example 1-year employment growth shows 10 times more negative relation with leverage for low-q firms. 1-year CapEx growth coefficient is also almost twice as large than for high-q firms. For the other explanatory variables, the base year capital expenditures show very negative and significant relations with future capital expenditures growth measures. Again, these coefficients are well stronger for the low-q subgroup.

To conclude, it seems that in normal economic times, leverage has a negative relation with firm growth, but the relations are much stronger for firms with low growth opportunities. This is slightly differing from Lang et al. (1996) paper, where they were not able to find almost any significant and negative relations between leverage and growth measures for the high-q firms. In this data set, even though the relations are not very strong, there still exist negative and significant relations for the high-q firms also. The results give evidence that the effect of leverage on firm growth has changed since the 1970–1989 data set used in the Lang et al. (1996) study. Leverage now has some effect on firm growth regardless of their growth opportunities. However, low growth opportunity firms suffer clearly more from leverage in terms of firm growth. Also, it can be said with caution that low-q firms experience longer-term negative effects of

Table 13. Tobin's q & the industry-adjusted relation between leverage and growth: normal period

The sample period is 2002–2006 and 2011–2013. Included firms have $1 billion of sales in 2002 dollars for each year. All data are obtained from ThomsonReuters database. Capital expenditures (employment) growth is the percent change in capital expenditures (employment) for years +1 to 0 and +3 to 0. Net investment growth is capital expenditures minus depreciation for year +1 divided by the book value of fixed assets (FA) for year 0. Leverage is book value of total debt divided by book value of total assets (TA). Sales growth is sales for year +1 divided by sales for year 0. Tobin's q is total market value of equity and book value of total debt divided by book value of total assets. Cash flow is gross of interest expenses. All values are adjusted for inflation. All variables are industry-adjusted. Results are corrected for heteroskedasticity. *t*-values are in parentheses.

Tobin's q > 1 2002–2006, 2011–2013	**1-year capital expenditures growth**	**3-year capital expenditures growth**	**1-year employment growth**	**3-year employment growth**	**Net investment growth**
Leverage	-0.429	-0.140	-0.038	-0.143	-0.075
	(2.51)**	(0.53)	(1.79)*	(1.32)	(2.89)***
Cash Flow / TA	-0.471	-0.219	0.010	0.204	0.054
	(1.65)*	(0.70)	(0.21)	(2.44)**	(0.84)
CapEx (0) / FA	-1.279	-1.488	0.088	0.179	0.346
	(2.92)***	(3.03)***	(1.60)	(1.43)	(2.93)***
Sales Growth	0.179	0.156	0.027	0.163	0.024
	(3.05)***	(0.86)	(1.00)	(1.72)*	(1.48)
Tobin's q	0.047	-0.038	0.009	0.027	0.014
	(1.53)	(0.95)	(1.98)**	(2.17)**	(1.76)*
Constant	0.208	-0.203	0.011	-0.053	0.043
	(2.49)**	(3.47)***	(0.81)	(2.17)**	(2.41)**
R-squared	0.04	0.06	0.03	0.12	0.07
# of obs.	1,435	1,025	1,435	1,025	1,435

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Tobin's q < 1 2002–2006, 2011–2013	**1-year capital expenditures growth**	**3-year capital expenditures growth**	**1-year employment growth**	**3-year employment growth**	**Net investment growth**
Leverage	-0.793	-1.045	-0.355	-0.409	-0.287
	(2.21)**	(1.34)	(2.00)**	(2.15)**	(1.70)*
Cash Flow / TA	-0.884	1.258	-0.242	-1.157	-0.924
	(1.33)	(0.63)	(0.85)	(1.93)*	(0.98)
CapEx (0) / FA	-2.123	-3.613	0.170	-0.294	-0.269
	(5.14)***	(2.53)**	(0.51)	(1.16)	(0.59)
Sales Growth	-0.048	0.307	-0.019	-0.124	-0.517
	(0.41)	(1.27)	(0.26)	(0.59)	(0.94)
Tobin's q	0.342	0.247	0.230	0.436	0.342
	(1.11)	(0.36)	(1.31)	(1.83)*	(1.20)
Constant	0.255	0.188	0.086	-0.161	0.001
	(1.79)*	(0.79)	(1.18)	(4.24)***	(0.03)
R-squared	0.09	0.13	0.01	0.15	0.08
# of obs.	368	189	368	189	368

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

leverage on firm growth compared to the high-q firms. During normal times, the first hypothesis is supported and the second hypothesis gets weak support as leverage negatively affects growth for all firms, but there are more significant negative relations for the low-q firms and these relations are also stronger.

Table 14 presents the results for Mann-Whitney-Wilcoxon test for the normal periods of 2002–2006 and 2011–2013. As for the whole time period, the low-q firms again show clearly lower average and median growth for all the growth measures.

Table 14. Mann-Whitney-Wilcoxon test between subgroups: 2002–2006, 2011–2013

The mean and median of the growth measures and leverage are compared between the high-q and low-q subgroups. The difference has been tested with Mann-Whitney-Wilcoxon test, which is a non-parametric test.

2002–2006, 2011–2013				**Mann-Whitney-Wilcoxon**	
		Q < 1	**Q > 1**	**Z-value**	**Pr > |Z|**
1-year CapEx growth	**Mean**	13,16%	27,51%	-5,060	0,000
	Median	0,96%	10,24%		
3-year CapEx growth	**Mean**	51,23%	62,05%	-1,717	0,086
	Median	20,97%	28,75%		
1-year employment growth	**Mean**	0,25%	6,21%	-10,848	0,000
	Median	0,00%	3,89%		
3-year employment growth	**Mean**	4,50%	20,27%	-8,621	0,000
	Median	0,00%	12,07%		
Net investment growth	**Mean**	1,07%	10,33%	-10,193	0,000
	Median	-1,30%	2,57%		
Leverage	**Mean**	21,20%	22,25%	-4,710	0,000
	Median	20,78%	16,75%		

During the normal economic times, in contrast to the whole period analysis, the low-q firms now show positive average and median values in all but one cases. It appears that during these times, firms have been able to grow in general despite their growth opportunities. This could be expected, since during normal economic times, firms aim and are generally able to grow their operations. The leverage levels for both groups have stayed approximately at the same level as during the whole period. These results leave interesting expectations for the MWW test in the crisis period.

4.3 Abnormal years: 2007–2010

The final examination focuses on the subprime financial crisis period that occurred approximately in 2007–2010. This part gives new evidence of the effect of leverage on growth, since the crisis period has not yet been studied very deeply. The financial crisis was extremely hard for almost all the companies in developed countries and thus it is interesting to see if leverage has had a different effect on firm growth during this period. Again, the same regressions are conducted for the whole data sample, and separately for the high- and low-q subsamples. Also the regressions are done with unadjusted and industry-adjusted data. Table 15 shows the results for the unadjusted regressions with the whole data sample for years 2007–2010.

Table 15. Regressions of growth measures on leverage: 2007–2010

The sample period is 2007–2010. Included firms have $1 billion of sales in 2002 dollars for each year. All data are obtained from ThomsonReuters database. Capital expenditures (employment) growth is the percent change in capital expenditures (employment) for years +1 to 0 and +3 to 0. Net investment growth is capital expenditures minus depreciation for year +1 divided by the book value of fixed assets (FA) for year 0. Leverage is book value of total debt divided by book value of total assets (TA). Sales growth is sales for year +1 divided by sales for year 0. Tobin's q is total market value of equity and book value of total debt divided by book value of total assets. Cash flow is gross of interest expenses. All values are adjusted for inflation. Results are corrected for heteroskedasticity. *t*-values are in parentheses.

Unadjusted regressions, 2007–2010	**1-year capital expenditures growth**	**3-year capital expenditures growth**	**1-year employment growth**	**3-year employment growth**	**Net investment growth**
Leverage	-1.547	1.101	-0.014	-0.104	-0.002
	(1.23)	(0.73)	(0.49)	(2.49)**	(0.03)
Cash Flow / TA	-1.955	5.025	0.133	0.204	-0.131
	(0.97)	(0.88)	(3.52)***	(4.32)***	(0.37)
CapEx (0) / FA	-2.628	-3.716	0.125	0.250	0.346
	(1.76)*	(2.78)***	(2.32)**	(1.79)*	(3.17)***
Sales Growth	0.512	-0.010	0.002	0.000	0.001
	(0.82)	(0.12)	(0.72)	(0.01)	(0.22)
Tobin's q	0.013	0.854	0.018	0.057	0.021
	(0.09)	(1.09)	(3.48)***	(6.03)***	(0.69)
Constant	-0.119	-0.956	-0.990	-0.955	-0.035
	(0.20)	(0.60)	(67.73)***	(27.07)***	(0.41)
R-squared	0.05	0.14	0.08	0.17	0.15
# of obs.	1,536	1,536	1,536	1,536	1,536

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Immediately, a clear difference to earlier results can be noticed. Only one of the growth measures now show significant coefficient in relation to leverage. This growth measure is 3-year employment growth, with a size of -0,104 and a significance level of 5%. This is very interesting, because during the financial crisis, the regressions would have been expected to show negative significant coefficients because of the lack of growth opportunities and financial distress in general. However, only the 3-year employment growth shows a negative significant coefficient and 3-year capital expenditures growth even shows a clearly positive coefficient, though insignificant.

The base year capital expenditures is now significantly related to all of the growth measures. For the 1- and 3- year CapEx growth, the relations are highly negative, for the 1- and 3-year employment growth they are positive and also net investment growth shows a positive and significant coefficient. Finally, cash flow before interest is positively and significantly related to 1- and 3-year employment growth with a 1% significance level. The results for the unadjusted regressions in crisis period are interesting, because they are clearly different than in the other periods examined. Some indications can be interpreted here that the financial crisis period has been different in terms of the effect of leverage on firm growth. To see if industry effects alter the results, the same regressions are done with industry-adjusted data, and the results are presented in table 16.

The results with industry-adjusted data stay approximately the same as in unadjusted regressions. Again, only 3-year employment growth shows significant coefficient of -0,116 and other relations between leverage and growth measures are insignificant. Cash flow before interest still has positive and significant relations to employment growth. Base year capital expenditures loses significance in the relations with employment growth, but still show large negative and significant coefficients with 1- and 3-year CapEx growth. With net investment growth, CapEx in year 0 shows a positive and highly significant relation.

For the whole sample, leverage seems not to be related to firm growth except for long-term employment growth in the abnormal years. This is a clearly different result compared to the whole time period and normal years where leverage showed much more negative effect against the growth measures. The abnormal years are obviously different in terms of the effect of leverage on firm growth. Next the regressions are conducted for the Tobin's q subgroups to see if the growth opportunities have affected the effect of leverage on firm growth during the financial crisis.

Table 16. Industry-adjusted regressions of growth measures on leverage: 2007–2010

The sample period is 2007–2010. Included firms have $1 billion of sales in 2002 dollars for each year. All data are obtained from ThomsonReuters database. Capital expenditures (employment) growth is the percent change in capital expenditures (employment) for years +1 to 0 and +3 to 0. Net investment growth is capital expenditures minus depreciation for year +1 divided by the book value of fixed assets (FA) for year 0. Leverage is book value of total debt divided by book value of total assets (TA). Sales growth is sales for year +1 divided by sales for year 0. Tobin's q is total market value of equity and book value of total debt divided by book value of total assets. Cash flow is gross of interest expenses. All values are adjusted for inflation. All variables are industry-adjusted. Results are corrected for heteroskedasticity. *t*-values are in parentheses.

Original 2007–2010	**1-year capital expenditures growth**	**3-year capital expenditures growth**	**1-year employment growth**	**3-year employment growth**	**Net investment growth**
Leverage	-1.712	1.431	-0.025	-0.116	-0.032
	(1.32)	(0.79)	(0.87)	(3.41)***	(0.44)
Cash Flow / TA	-2.231	5.241	0.107	0.173	-0.161
	(1.03)	(0.86)	(2.67)***	(3.73)***	(0.43)
CapEx (0) / FA	-2.578	-4.028	0.088	0.202	0.383
	(1.79)*	(3.12)***	(1.49)	(1.33)	(2.90)***
Sales Growth	0.505	0.001	0.002	0.001	0.000
	(0.81)	(0.01)	(0.97)	(0.14)	(0.00)
Tobin's q	-0.009	0.870	0.016	0.053	0.019
	(0.06)	(1.05)	(3.01)***	(6.17)***	(0.58)
Constant	0.504	1.127	0.061	0.090	0.040
	(4.88)***	(4.66)***	(5.52)***	(4.00)***	(2.89)***
R-squared	0.05	0.15	0.07	0.15	0.16
# of obs.	1,336	1,336	1,336	1,336	1,336

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

4.3.1 Effect of growth opportunities on the relation of leverage and firm growth

As the regressions for the whole sample during the crisis did not offer any conclusive evidence, it is highly interesting to see if there still exist negative relations between leverage and firm growth for the subgroup of firms. To examine this possibility, the regressions are again conducted for the high- and low-q subgroups. Also the regressions are done for both raw and industry-adjusted data. Table 17 shows the results for unadjusted regressions for the subgroups in 2007–2010. Recall from table 15 and 16 that leverage was significantly related to only 3-year employment growth during 2007–2010. The same case appears for the high-q subgroup, but when the focus is shifted to

Table 17. Tobin's q & the relation between leverage and growth: abnormal period

The sample period is 2007–2010. Included firms have $1 billion of sales in 2002 dollars for each year. All data are obtained from ThomsonReuters database. Capital expenditures (employment) growth is the percent change in capital expenditures (employment) for years +1 to 0 and +3 to 0. Net investment growth is capital expenditures minus depreciation for year +1 divided by the book value of fixed assets (FA) for year 0. Leverage is book value of total debt divided by book value of total assets (TA). Sales growth is sales for year +1 divided by sales for year 0. Tobin's q is total market value of equity and book value of total debt divided by book value of total assets. Cash flow is gross of interest expenses. All values are adjusted for inflation. Results are corrected for heteroskedasticity. *t*-values are in parentheses.

Tobin's q > 1 2007–2010	**1-year capital expenditures growth**	**3-year capital expenditures growth**	**1-year employment growth**	**3-year employment growth**	**Net investment growth**
Leverage	-1.557	2.062	-0.005	-0.093	-0.042
	(1.04)	(1.06)	(0.13)	(2.20)**	(0.41)
Cash Flow / TA	-2.301	5.776	0.105	0.181	-0.198
	(0.94)	(0.89)	(3.32)***	(3.98)***	(0.50)
CapEx (0) / FA	-0.201	0.149	0.014	-0.053	0.026
	(0.62)	(0.19)	(0.33)	(0.58)	(0.39)
Sales Growth	0.480	-0.033	0.000	0.002	0.004
	(0.78)	(0.34)	(0.01)	(0.22)	(0.67)
Tobin's q	-0.032	0.886	0.013	0.052	0.016
	(0.18)	(1.06)	(3.09)***	(6.19)***	(0.47)
Constant	-0.400	-2.257	-0.940	-0.865	0.059
	(0.61)	(1.05)	(63.58)***	(21.73)***	(0.50)
R-squared	0.04	0.14	0.04	0.15	0.12
# of obs.	1,008	1,008	1,008	1,008	1,008

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Tobin's q < 1 2007–2010	**1-year capital expenditures growth**	**3-year capital expenditures growth**	**1-year employment growth**	**3-year employment growth**	**Net investment growth**
Leverage	-1.046	-1.365	-0.020	0.029	-0.095
	(2.38)**	(2.58)***	(0.41)	(0.20)	(1.65)*
Cash Flow / TA	0.681	1.318	0.129	0.012	0.315
	(1.44)	(1.45)	(1.26)	(0.07)	(3.89)***
CapEx (0) / FA	-1.400	-2.112	0.023	0.117	0.163
	(2.71)***	(3.81)***	(0.50)	(1.63)	(1.82)*
Sales Growth	0.706	-0.448	0.094	-0.080	0.114
	(1.46)	(1.23)	(2.07)**	(0.74)	(3.04)***
Tobin's q	0.165	0.758	0.042	0.269	0.041
	(0.85)	(1.67)*	(1.14)	(3.32)***	(1.06)
Constant	-0.992	0.614	-1.109	-1.056	-0.171
	(1.90)*	(1.18)	(22.37)***	(9.87)***	(3.66)***
R-squared	0.08	0.13	0.13	0.06	0.12
# of obs.	526	526	526	526	526

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

the low-q group, some interesting results are present. First, there are significant and negative coefficients for both capital expenditures growth measures. The significance levels are 5% and 1% and the coefficients are quite strong, the 1-year being -1,046 and the 3-year being -1,365. Also net investment growth is negatively predicted by leverage with 10% significance level. The financial crisis period seems to have effectively increased the negative relation between leverage and capital expenditures of the low-q firms.

These results support the findings of Lang et al. (1996), where the high-q group did not show much significant relations between leverage and growth measures. The low-q group however showed many significant relations between leverage and growth measures and thus dominating the significant and negative relations observed for the whole group in their study. With this data set, the whole sample did not show significant relation for the growth measures except for 3-year employment growth, which was probably caused by the high-q group's negative relation between the said variables. The reason for this similarity in results for whole sample and high-q group might be that the high-q group has almost twice as many observations, and thus the negative relations observed for the low-q group were not strong enough to be present for the whole sample. The one significant relation for the high-q group though seems to be strong enough to present significant relation for the whole sample as well.

To find if controlling for industry effects could give more insight and clearer results, the regressions are done with the industry-adjusted data. The results are presented in table 18. These results show the clearest evidence for how firm growth is related to book leverage for firms with different amount of valuable growth opportunities. The high-q group does not show any significant correlations between leverage and growth measures whatsoever. Also there is not any logic for the signs of the correlation coefficients. To conclude, during financial crisis, leverage does not have any relation to firm growth for firms with high growth opportunities.

For the low-q firms, the results are opposite. Leverage has highly significant and strong negative relations with four of the five growth measures. Only 3-year employment growth is not affected by leverage. During financial crisis, the low-q firms suffer severely from the effects of leverage on firm growth and high-q firms do not face the growth limiting effects of debt. The results obtained for the industry-adjusted regressions during the financial crisis are very convincing. Leverage does not have

Table 18. Tobin's q & the industry-adjusted relation between leverage and growth: abnormal period

The sample period is 2002–2006 and 2011–2013. Included firms have $1 billion of sales in 2002 dollars for each year. All data are obtained from ThomsonReuters database. Capital expenditures (employment) growth is the percent change in capital expenditures (employment) for years +1 to 0 and +3 to 0. Net investment growth is capital expenditures minus depreciation for year +1 divided by the book value of fixed assets (FA) for year 0. Leverage is book value of total debt divided by book value of total assets (TA). Sales growth is sales for year +1 divided by sales for year 0. Tobin's q is total market value of equity and book value of total debt divided by book value of total assets. Cash flow is gross of interest expenses. All values are adjusted for inflation. All variables are industry-adjusted. Results are corrected for heteroskedasticity. *t*-values are in parentheses.

Tobin's q > 1, 2007–2010	**1-year capital expenditures growth**	**3-year capital expenditures growth**	**1-year employment growth**	**3-year employment growth**	**Net investment growth**
Leverage	-1.987	1.979	0.008	-0.062	-0.054
	(1.17)	(0.89)	(0.21)	(1.38)	(0.62)
Cash Flow / TA	-2.686	5.792	0.115	0.224	-0.175
	(1.00)	(0.85)	(3.03)***	(4.07)***	(0.45)
CapEx (0) / FA	-3.069	-3.685	0.108	0.240	0.603
	(1.41)	(2.32)**	(1.47)	(1.10)	(3.66)***
Sales Growth	0.513	0.003	-0.001	-0.001	-0.002
	(0.82)	(0.03)	(0.27)	(0.08)	(0.50)
Tobin's q	-0.044	0.905	0.013	0.054	0.016
	(0.23)	(1.03)	(3.25)***	(7.04)***	(0.48)
Constant	0.488	1.103	0.049	0.088	0.041
	(3.61)***	(3.53)***	(4.15)***	(2.79)***	(2.03)**
R-squared	0.05	0.15	0.04	0.16	0.18
# of obs.	860	860	860	860	860

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Tobin's q < 1, 2007–2010	**1-year capital expenditures growth**	**3-year capital expenditures growth**	**1-year employment growth**	**3-year employment growth**	**Net investment growth**
Leverage	-0.614	-1.857	-0.113	-0.118	-0.119
	(2.93)***	(2.92)***	(2.86)***	(0.71)	(2.21)**
Cash Flow / TA	0.515	0.724	0.019	-0.142	0.286
	(1.27)	(0.77)	(0.17)	(0.80)	(2.91)***
CapEx (0) / FA	-1.078	-2.151	-0.007	0.057	0.201
	(2.93)***	(3.37)***	(0.17)	(0.68)	(2.54)**
Sales Growth	0.102	-1.032	0.041	-0.173	0.060
	(0.29)	(1.71)*	(0.83)	(1.22)	(1.49)
Tobin's q	0.295	1.274	0.136	0.437	0.049
	(1.28)	(2.07)**	(2.94)***	(3.23)***	(0.98)
Constant	0.746	1.400	0.092	0.089	0.039
	(4.91)***	(3.72)***	(3.92)***	(2.22)**	(2.52)**
R-squared	0.24	0.17	0.19	0.10	0.19
# of obs.	303	303	303	303	303

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

relations to the growth measures for the whole sample or the high-q sample (except once), but for the low-q sample, leverage effectively decreases the firm growth. This implies that during hard economical times, leverage has a very strong effect on firm growth if the firm does not have valuable growth opportunities recognized in the capital markets. To analyze more deeply the difference between high- and low-q groups, the Mann-Whitney-Wilcoxon test is applied for the abnormal years sample. The MWW test results are presented in table 19.

Table 19. Mann-Whitney-Wilcoxon test between subgroups: 2007–2010

The mean and median of the growth measures and leverage are compared between the high-q and low-q subgroups. The difference has been tested with Mann-Whitney-Wilcoxon test, which is a non-parametric test.

2007–2010				**Mann-Whitney-Wilcoxon**	
		Q < 1	**Q > 1**	**Z-value**	**Pr > |Z|**
1-year CapEx growth	**Mean**	5,82%	37,12%	-7,8570	0,0000
	Median	-10,61%	13,11%		
3-year CapEx growth	**Mean**	49,39%	90,84%	-2,9090	0,0040
	Median	10,52%	22,73%		
1-year employment growth	**Mean**	-3,22%	7,49%	-11,7900	0,0000
	Median	-3,01%	3,43%		
3-year employment growth	**Mean**	4,63%	22,16%	-7,6310	0,0000
	Median	1,12%	10,00%		
Net investment growth	**Mean**	-1,85%	7,30%	-10,1490	0,0000
	Median	-3,00%	2,21%		
Leverage	**Mean**	20,78%	20,91%	-3,7990	0,0000
	Median	20,26%	16,16%		

The MWW test supports the regression results. The low-q group exhibits clearly lower average and median values for the growth measures. For example the median value for 1-year CapEx growth is -10,61% for the low-q firms, and 13,11% for the high-q firms. The difference is substantial and provides evidence for a great difference firm growth between the two groups. The same is shown for the 3-year CapEx growth, where low-q firms have roughly half smaller figures for average and median. Also net investment growth shows similar relation. For low-q firms, the median value is -3% and for high-q firms 2,21%. Employment growth shows clearly positive values for high-q firms, but

negative values for the low-q in the 1-year case and for the 3-year employment growth, low-q group presents five to ten times lower values (though positive) than high-q group.

The results are apparent: during difficult financial times, leverage can have a significant negative effect on firm growth, especially in terms of investments and capital expenditures, for firms with valuable but unrecognized investment opportunities and for firms with poor investment opportunities. In times of financial crisis, the first hypothesis gets no support, as the whole sample of firms did not experience negative growth caused by leverage. The second hypothesis is strongly supported, since low-q firms had a significant negative relation between leverage and firm growth, whereas high-q firms did not show any significant relations.

5. ANALYSIS AND DISCUSSION

In this chapter, the regression results are summarized and analyzed. The discussion is divided in three categories, split in terms of the growth measures. First subchapter discusses the 1- and 3-year capital expenditures growth and the effect of leverage on them. Second, the effect of leverage on 1- and 3-year employment growth is summarized and finally the net investment growths relation to book leverage is summarized.

5.1 The effect of leverage on future capital expenditures growth

The relations of book leverage to 1- and 3-year capital expenditures growth in different time periods and different data sets are summarized in table 20. The results are presented with unadjusted and industry-adjusted data.

During the whole time period of 2002–2013, book leverage has a negative relation to 1-year capital expenditures growth for the whole data sample, and for both high- and low-q subgroups. With the unadjusted data, the negative relation was strongest for the low-q group and with industry-adjusted data, it was strongest for the whole sample group. This provides a slight possibility to predict that the second hypothesis, which tested the effect of growth opportunities to the relation between leverage and firm growth, might get support so that low-q group suffers most of the effect of leverage in terms of capital expenditures growth.

When the focus is shifted to the 3-year capital expenditures growth, only one group shows significant association with leverage. Low-q group has a strong negative coefficient of -1,599 with 1% significance level for the unadjusted regression. After industry-adjustment, the low-q firms still remains the only group to show significant results with a negative relation of -0,919 between leverage and 3-year capital expenditures growth. This coefficient is significant at 10% level. Firms whose growth opportunities are not recognized in the capital markets seem to experience stronger and longer-term negative effects of book leverage on capital expenditures growth. This may be caused by the inability to obtain new external funding because investors are not certain if the funds are invested profitably. The long-term effect is present only for the

low-q group, which is an interesting observation and could give firms with low growth opportunities something to think in terms of capital structure.

Table 20. Summary results of the effect of leverage on capital expenditures growth

Table shows the relation between book leverage and 1- and 3-year capital expenditures growth. The results are provided for the whole sample, and the low- and high-q subsamples. Also unadjusted and industry-adjusted results are presented separately. Results are corrected for heteroskedasticity. *t*-values are in parentheses.

	Unadjusted		*Industry-adjusted*	
Book leverage	**1-year capital expenditures growth**	**3-year capital expenditures growth**	**1-year capital expenditures growth**	**3-year capital expenditures growth**
2002–2013				
Whole sample	-0.717	-0.458	-0.763	-0.496
	(2.37)**	(1.39)	(2.31)**	(1.03)
Tobin's q > 1	-0.686	-0.199	-0.739	-0.326
	(2.11)**	(0.54)	(2.11)**	(0.85)
Tobin's q < 1	-0.919	-1.599	-0.665	-0.919
	(3.57)***	(2.94)***	(3.18)***	(1.74)*
2002–2006, 2011–2013				
Whole sample	-0.445	-0.497	-0.543	-0.399
	(3.28)***	(1.55)	(2.99)***	(1.25)
Tobin's q > 1	-0.115	-0.137	-0.429	-0.140
	(1.80)*	(0.46)	(2.51)**	(0.53)
Tobin's q < 1	-0.812	-2.410	-0.793	-1.045
	(3.03)***	(1.91)*	(2.21)**	(1.34)
2007–2010				
Whole sample	-1.547	1.101	-1.712	1.431
	(1.23)	(0.73)	(1.32)	(0.79)
Tobin's q > 1	-1.557	2.062	-1.987	1.979
	(1.04)	(1.06)	(1.17)	(0.89)
Tobin's q < 1	-1.046	-1.365	-0.614	-1.857
	(2.38)**	(2.58)***	(2.93)***	(2.92)***

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

In the normal economic time period of 2002–2006 and 2011–2013, the results remain mainly similar as for the whole period. It is noteworthy, that during the normal period, the predictive power of the coefficients is lower than in the whole time period. This may be caused by the stronger negative effects during the financial crisis that results in strengthened coefficients when observed with the whole time period. The 1-year capital

expenditures growth is still significantly and negatively related to book leverage for all different data sets. For the whole sample, the 1-year CapEx growth has negative coefficients with 1% significance for both unadjusted and industry-adjusted data. For the high-q group, particularly in the unadjusted regressions, the relation between leverage and 1-year CapEx growth is considerably smaller than during the whole period (-0,115 vs. -0,686). Also the significance level for this coefficient is only 10%, which might imply an uncertain relation between leverage and 1-year CapEx growth for the high-q firms in this period. However, the industry-adjusted coefficient shows a stronger negative figure of -0,429 with 5% significance level, so no definite conclusions can be drawn here. On the other hand, to support the importance of the growth opportunities, low-q firms show more significant and more negative coefficients in both unadjusted and industry-adjusted regressions (-0,812 and -0,793, respectively).

For the 3-year capital expenditures growth in normal period, the only significant relation is for the low-q group in the unadjusted regressions. The coefficient is extremely large and negative -2,410 but the significance level stays at moderate 10% level. Compared to the results from the whole sample, this supports the interpretation that leverage affects the long-term CapEx growth more for low-q firms.

In the abnormal period of 2007–2010, the effect of leverage is unambiguous. The significance of the relation between leverage and capital expenditures growth is absent in the whole sample and high-q results. During these abnormal times, book leverage has had no significant effect on the capital expenditures for these in general and for firms with high growth opportunities. However, the low-q firms show highly significant and negative results for the relation. In the unadjusted regressions, the low-q group shows a negative relation between leverage and 1-year CapEx growth of -1,046 with 5% significance. In the industry-adjusted results, the relation is lower, being only -0,614, but the significance is at 1% level. For the 3-year CapEx growth, both unadjusted and industry-adjusted regressions present negative coefficients with 1% significance level for the low-q subgroup. In unadjusted regressions, the coefficient is -1,365 and in industry-adjusted -1,857.

The results give evidence to that leverage negatively affects the future capital expenditures growth in normal economic times. The negative relation is present for all firms regardless of firm's growth opportunities. However, firms with low growth opportunities experience stronger and longer-term declines in CapEx growth than other firms. The results also give strong support for the different effect of leverage on CapEx

growth in financially difficult times. In abnormal period, leverage strongly and negatively affects the firm's capital expenditures growth in both short- and long-term if the firm has poor growth opportunities or if the firm's valuable growth opportunities are not recognized in the capital markets. These firms can experience significant decrease in capital expenditures growth in hard financial times if they have high leverage. Firms with high growth opportunities did not experience any relation with leverage during these times. This adds new insight for the significance of leverage during financial crisis.

5.2 The effect of leverage on future employment growth

Next, the relations between book leverage and 1- and 3-year employment growth are summarized in table 21. During the whole time period, all of the coefficients for both unadjusted and industry-adjusted data are significant and negative. However, the low-q subgroup shows much stronger negative relations between leverage and employment growth than the high-q group. Also when compared to the whole sample, low-q group still shows stronger negative coefficients in both unadjusted and industry-adjusted regressions and for both 1- and 3-year employment growth.

In the normal economic time period, low-q group has negative and significant relations between leverage and 1- and 3-year employment growth for both unadjusted and industry-adjusted settings. During this period, high-q group loses significance in the unadjusted regressions for the 1-year employment growth coefficient and in the industry-adjusted regressions for the 3-year employment growth coefficient. Again, this enhances the support of the hypothesis that low-q firms have a stronger negative relation between leverage and firm growth than the high-q firms. Another interesting observation is that in the unadjusted results, the 3-year employment growth shows negative and highly significant relations with book leverage for all the data groups. However, the industry-adjustment has affected the results so that for this long-term employment growth, only the low-q firms show significant results, still negative. Thus, the long-term negative effect of leverage on employment growth, particularly for low-q firms, receives more evidence.

For the abnormal period of 2007–2010, the results are not very much in line with the other periods. In unadjusted results, the only significant effects (at 5% level) of leverage

are found for only the long-term employment growth for the whole sample and high-q group. However, the sizes of the coefficients are relatively small -0,104 and -0,093. Interestingly, the low-q group shows a slightly positive and far from significant coefficient. In the industry-adjusted results, the low-q firms show a negative and highly significant coefficient for the 1-year employment growth, but not for the 3-year figure. For the whole sample, a highly significant and negative relation between leverage and 3-year employment growth is present. The high-q group shows no significant relations.

Table 21. Summary results of the effect of leverage on employment growth

Table shows the relation between book leverage and 1- and 3-year employment growth. The results are provided for the whole sample, and the low- and high-q subsamples. Also unadjusted and industry-adjusted results are presented separately. Results are corrected for heteroskedasticity. *t*-values are in parentheses.

	Unadjusted		*Industry-adjusted*	
Book leverage	**1-year employment growth**	**3-year employment growth**	**1-year employment growth**	**3-year employment growth**
2002–2013				
Whole sample	-0.047	-0.210	-0.045	-0.174
	(3.04)***	(3.92)***	(2.73)***	(3.30)***
Tobin's q > 1	-0.041	-0.183	-0.037	-0.144
	(2.87)***	(3.22)***	(2.51)**	(2.46)**
Tobin's q < 1	-0.216	-0.308	-0.164	-0.279
	(2.80)***	(2.28)**	(1.94)*	(1.99)**
2002–2006, 2011–2013				
Whole sample	-0.049	-0.236	-0.047	-0.180
	(2.40)**	(2.70)***	(2.20)**	(1.63)
Tobin's q > 1	-0.015	-0.236	-0.038	-0.143
	(1.45)	(2.78)***	(1.79)*	(1.32)
Tobin's q < 1	-0.412	-0.787	-0.355	-0.409
	(2.77)***	(3.89)***	(2.00)**	(2.15)**
2007–2010				
Whole sample	-0.014	-0.104	-0.025	-0.116
	(0.49)	(2.49)**	(0.87)	(3.41)***
Tobin's q > 1	-0.005	-0.093	0.008	-0.062
	(0.13)	(2.20)**	(0.21)	(1.38)
Tobin's q < 1	-0.020	0.029	-0.113	-0.118
	(0.41)	(0.20)	(2.86)***	(0.71)

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Generally, during the whole time period leverage seems to be negatively related to employment growth, both short- and long-term. This may be a consequence of increasing mechanization and automation in the last couple of decades. Also in normal times, leverage shows some negative predictive power to employment growth especially for low-q firms. Little evidence is also found for the statement that low-q firms experience longer-term negative effects of leverage, since that group is the only one to show significant negative relation between 3-year employment growth and leverage in the industry-adjusted regressions. During the financial crisis, the effects of leverage on employment growth are not very logical and clear as they are for the capital expenditures growth. The financial crisis does not seem to have any obvious effect on the relation between leverage and employment growth, except the fact that the relation between leverage and employment growth is almost non-existent during the abnormal period. However, the effect of leverage on employment growth during this period stays slightly unclear.

5.3 The effect of leverage on future net investment growth

To remind the reader, net investment provides a more accurate picture of investment's actual value as it takes depreciation into account. The variable net investment growth is also dependent of the firm's fixed assets and thus it captures different characteristics of firm's development than capital expenditures growth. The summarized regression results of net investment growth on book leverage are presented in table 22.

The net investment growth produces very little significant relations with book leverage in the unadjusted regressions. One highly significant relation is found for the whole sample and for the whole time period. This relation is slightly negative -0,096 and significant at 1% level. In the normal period, high-q group experiences a minor negative relation between leverage and net investment growth, and in the abnormal period, the low-q group shows a small negative relation. These coefficients are only significant at 10% level.

Because of the low amount of relevant results in unadjusted regressions, the focus is put on the industry-adjusted results when analyzing the relation between leverage and net investment growth. With industry-adjusted data, the results are much more encouraging in terms of getting meaningful conclusions. For the whole time period, leverage is

negatively and significantly (5%-level) related to net investment growth for all three sample groups, with the low-q group producing the strongest negative relation. During the normal time period, the whole data sample and high-q group show low negative relations with 1-percent significance level. The low-q group shows clearly stronger negative relation, but with a significance level of only 10%. The size of the coefficient for the low-q group is three to four times larger than for the other sample groups implying a stronger negative effect of leverage on net investment growth for firms with low growth opportunities.

Table 22. Summary results of the effect of leverage on net investment growth

Table shows the relation between book leverage and net investment growth. The results are provided for the whole sample, and the low- and high-q subsamples. Also unadjusted and industry-adjusted results are presented separately. Results are corrected for heteroskedasticity. *t*-values are in parentheses.

	Unadjusted	*Industry-adjusted*
Book leverage	**Net investment growth**	
2002–2013		
Whole sample	-0.096	-0.117
	(2.61)***	(2.23)**
Tobin's q > 1	-0.065	-0.108
	(1.44)	(1.98)**
Tobin's q < 1	-0.198	-0.222
	(1.49)	(2.06)**
2002–2006, 2011–2013		
Whole sample	-0.030	-0.099
	(0.35)	(3.48)***
Tobin's q > 1	-0.090	-0.075
	(1.67)*	(2.89)***
Tobin's q < 1	-0.290	-0.287
	(1.24)	(1.70)*
2007–2010		
Whole sample	-0.002	-0.032
	(0.03)	(0.44)
Tobin's q > 1	-0.042	-0.054
	(0.41)	(0.62)
Tobin's q < 1	-0.095	-0.119
	(1.65)*	(2.21)**

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

The financial crisis period shows the most interesting results in terms of finding new evidence for the effect of leverage on firm growth. During this period, only the low-q group shows a significant relation between leverage and net investment growth with a coefficient of -0,119. There is a clear switch in the results between the time periods. During the financial crisis only firms with low growth opportunities have had leverage affecting their net investment growth significantly, when in other periods the effect was observed for every sample. This again adds support to the findings that during difficult economic times, firms with low growth opportunities suffer more of the negative effect of leverage on firm growth and they are forced to decrease their investments if their leverage levels are high.

6. CONCLUSIONS

The rapidly changing financial atmosphere provides many challenges to companies, as they have to be ready and quick to adapt to new situations. The capital structure in a company is one of the biggest financial decisions and if the level of leverage affects the firm's growth and profitability, it must be thought carefully. This research finds evidence that leverage has an effect on firm growth, and that effect is negative, particularly during difficult financial times.

In this study, leverage is regressed against five growth variables to find if there are any significant relations. The regressions are done with raw unadjusted data and also with industry-adjusted data to control for industry effects. The time period of 2002–2013 that this paper studies, includes one of the biggest financial crisis that global economy has experienced. This crisis provides a great opportunity to examine whether the crisis period is different than normal periods in terms the effect of leverage on firm growth. To illustrate this, in addition to the whole time period, the regressions are also done for normal time periods of 2002–2006 and 2011–2013 combined, and for abnormal time period of 2007–2010. This technique offers a chance to see if the decisions regarding capital structure have some greater importance when a financial crisis occurs.

This paper tries to answer three research questions:

1. Does leverage affect the growth of firms defined by different growth variables?
2. Does the firm's growth opportunities affect the relationship between leverage and firm growth?
3. Does leverage have a different effect on firm growth during economical downturns?

To find answers to these questions, two hypotheses are tested for three time periods; the whole period, the normal period and the abnormal period. The hypotheses are as follows:

H1: Leverage and firm growth has a negative relationship.
H2: Leverage has a different effect on firm growth depending on the firm's growth opportunities.

Table 23. Summary of regression results

Table summarizes the results of the effect of book leverage on growth measures. The first row shows the results with unadjusted data, and the second row shows the results with industry-adjusted data. Relations are stated as "Negative" as negative relation with 5% significance level, "Weak negative" as negative relation with 10% significance level and "No" as no significance in the relation. Whole period is 2002–2013, normal years are 2002–2006 and 2011–2013 combined and abnormal years are 2007–2010.

Book leverage	1-year capital expenditures growth	3-year capital expenditures growth	1-year employment growth	3-year employment growth	Net investment growth
Whole period					
Overall	Negative	No	Negative	Negative	Negative
	Negative	No	Negative	Negative	Negative
Tobin's q > 1	Negative	No	Negative	Negative	No
	Negative	No	Negative	Negative	Negative
Tobin's q < 1	Negative	Negative	Negative	Negative	No
	Negative	Weak negative	Weak negative	Negative	Negative
Normal years					
Overall	Negative	No	Negative	Negative	No
	Negative	No	Negative	No	Negative
Tobin's q > 1	Weak negative	No	No	Negative	Weak negative
	Negative	No	Weak negative	No	Negative
Tobin's q < 1	Negative	Weak negative	Negative	Negative	No
	Negative	No	Negative	Negative	Weak negative
Abnormal years					
Overall	No	No	No	Negative	No
	No	No	No	Negative	No
Tobin's q > 1	No	No	No	Negative	No
	No	No	No	No	No
Tobin's q < 1	Negative	Negative	No	No	Weak negative
	Negative	Negative	Negative	No	Negative

The regression results are summarized in table 23. This paper shows that during the whole time period, there is a negative relationship between leverage and firm growth in general, supporting the first hypothesis. The negative relations hold for all firms regardless of their growth opportunities, and they also hold in both unadjusted and industry-adjusted regressions. However, firm growth is affected by leverage more strongly for firms with low growth opportunities. In all but one case, the low-q group experience stronger negative coefficients compared to the whole sample and the high-q group. The low-q firms are also the only group that shows negative and significant relation between leverage and 3-year capital expenditures growth, suggesting that these

firms experience a longer negative reaction on leverage in terms of capital expenditures. The stronger and longer-term relations for low-q groups support the second hypothesis, but based on these results, the second hypothesis is not totally supported as the high-q group also presents a clear negative relation between leverage and the other growth measures.

Similar results are obtained in the normal time period as well. During 2002–2006 and 2011–2013, there still exist clear negative relations between leverage and the growth variables for the whole sample. Also the subgroups show negative and significant relations, but compared to the whole time period, the high-q groups shows slightly less significant coefficients. However, there seems to be enough significant and negative relations for the high-q group to support the first hypothesis. The low-q firms show approximately same types of results as for the whole period, and on the basis of these results, the first hypothesis seems to have support during the normal time period also, at least partially.

For the second hypothesis during the normal period, the results give more support for the hypothesis than during the whole period. Even though the high-q group shows predictive negative power of leverage on growth measures, the relations are clearly stronger and consistent for the low-q group. During the normal time period, the negative relations found are stronger for the low-q firms with no exceptions and the high-q group shows only three highly significant negative relations out of ten possibilities. This result gives more evidence for the second hypothesis as it suggests that the negative effect of leverage on growth affects more those firms that have good growth opportunities but they are not recognized in the capital markets and firms that do not have good growth opportunities but still want to grow. It is noteworthy, that during normal time period, the low-q group shows only a weak negative relation between leverage and the 3-year capital expenditures growth, indicating that in normal economic times, the low-q firms may not experience as long-term negative effects of leverage as during the whole time period. The second hypothesis seems to get relatively strong support with this data set during the normal time period. This is in line with capital structure theories that suggest that firms with high leverage may not be able to take advantage of growth opportunities and firms with poor growth opportunities should not use their funds in poor investments.

The last time period, the abnormal years of 2007–2010, offers the most interesting contribution to this field of study, since not much earlier research has yet been able to

document the effect of leverage on firm growth during this time. The results are certainly differing compared to the other time periods in this research. During the time period of 2007–2010 and using the whole sample, only the long-term employment growth show negative and significant relations with leverage. The other coefficients between leverage and growth variables are not significant. The same findings are present for the unadjusted and industry-adjusted data. During the financial crisis, there is no clear relation between leverage and growth for the whole sample resulting the first hypothesis to not be supported.

When the subgroups defined by the growth opportunities are compared, the results are surprising, but expected based on earlier research. Firms with high growth opportunities have only one significant and negative relation between leverage and the growth variables. This is for the 3-year employment growth, but it is only present when the regressions are done with unadjusted data. All the other coefficients, whether unadjusted or industry-adjusted, are insignificant. For the low-q group, the results are entirely different. The low-q group shows significant and negative relations between book leverage and the growth variables for all except 3-year employment growth. These results provide strong evidence that during financial turmoil, firms with no growth opportunities or growth opportunities that are not recognized in the markets, experience significant negative effects of leverage in terms of growth. This may be a consequence of that the investors are not willing to offer new debt for the low-q firms during economically difficult times because of increased risk aversion and because of that these firms are not able to show that they have valuable investment opportunities. Thus, the investors focus even more on the firms that are known to invest their funds profitably. Based on these findings, during the abnormal period, the first hypothesis does not have any support as the whole sample and high-q group shows almost no relation between leverage and the growth variables. However, the second hypothesis gets strong support in the financial crisis time period.

To conclude, table 24 summarizes the hypotheses testing. During the whole time period, the hypothesis one is supported, since all the sample groups show clear negative relation between leverage and the growth measures. The second hypothesis is weakly supported, because both Tobin’s q subgroups show negative coefficients but the low-q group shows clearly stronger and longer-term negative effects of leverage on firm growth. However, it is noteworthy that the high-q group also experiences a clear negative relation between leverage and growth, but the difference in the magnitudes of the coefficients compared to low-q group gives weak support for the second hypothesis.

Table 24. Hypotheses test results

The table shows whether the hypotheses are supported, not supported or weakly supported. The first hypothesis is "Leverage and firm growth has a negative relationship" and the second hypothesis is "Leverage has a different effect on firm growth depending on the firm's growth opportunities". The whole period is years 2002–2013, the normal period is years 2002–2006 and 2011–2013, and the abnormal period is years 2007–2010.

Time period	Hypothesis 1	Hypothesis 2
Whole period	Supported	Weakly supported
Normal period	Supported	Weakly supported
Abnormal period	Not supported	Supported

During normal period, the first hypothesis is supported, because all the sample groups show enough negative and significant relations between leverage and growth variables. For the second hypothesis, the results give weak support. The low-q group shows clearly more significant and negative coefficients than the high-q group. However, because the high-q group also experiences negative effects of leverage on firm growth, the hypotheses cannot be totally supported.

For the abnormal period, the first hypothesis does not receive any support, since the high-q group and the whole data sample did not produce almost any significant negative relations. The second hypothesis is strongly supported, because the low-q subgroup provided strong evidence for a negative relation between leverage and firm growth and as stated, the other samples did not.

This research contributes to the earlier findings that leverage affects firm growth. Results show that during normal times, leverage decreases future growth for all firms in terms of capital expenditures, net investment and partly employment, regardless of their growth opportunities. Increased leverage decreases the amount of funds available and the firm's ability to raise additional funds and these financial constraints effectively reduce future investments. However, the negative effect of leverage on firm growth is clearly stronger for firms with low growth opportunities and it seems that under

financial constraints, the high-q firms are still able to obtain new funding to use in their investments.

The biggest contribution of this study is the finding that during difficult financial times, only firms with low growth opportunities are strongly and negatively affected by leverage in terms of growth. The globalized financial markets are a favorable breeding ground for financial crisis such as the subprime crisis, and companies need to be prepared for extreme situations. In the light of these findings, companies need to valuate their growth opportunities and consider their capital structure also from this point of view.

The results of this research suggest that further examination concentrating on capital structure's effects on firm performance during financial crisis is needed, as it seems to have had a great effect on the relationship between book leverage and firm growth. The results also may give companies valuable guidance when making capital structure decisions.

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