Cash Flow-Investment Sensitivities of European Companies in the 1990s

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Abstract

In contradiction to the classic theory of finance, liquidity plays a crucial role for investment behavior. Two possible explanations therefore are a wedge between internal and external cost of capital (costly external finance; CEF) and the tendency of management to overinvest in their own interest (empire building; EB). This paper contributes to the yet unanswered question, which of the two effects, is responsible by analyzing a pan-European sample of stock exchange listed companies. We examine the different behavior of various sub samples of firms, which we expect to behave differently according to the two theories. The CEF predicts, that companies with financial slack, with a low leverage, and with a high credit worthiness are less responsive to liquidity shocks. According to the EB, block holders among a firm's owners should reduce cash flow-investment sensitivities.

We analyze a sample compound of European large caps and growth companies from the 1990s and find that both financial slack, and leverage on the one hand and ownership concentration on the other hand are relevant for the importance of liquidity for investment. The results hold not only for investment in fixed assets, but in most cases also for investment in other balance and off balance sheet items (i.e. human capital and "burned" cash). In addition we show that information asymmetries and empire building are relevant for both large caps and to a lesser extent for growth companies.

In general European capital markets in the 1990 seem to suffer from both CEF and EB and as a consequence investment may be at a sub optimal level.

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Key words: Investment; Cash Flow; Tobin's q; Output; Cost of Capital; Asymmetric Information; Principal-Agent

Table of Content

1. INTRODUCTION AND APPROACH

One sure bet…is that sagging profits will limit capital spending…The gap between corporations' investment outlays and their internally generated funds, mainly cash flow, was the widest since the early 1980s. Companies had been able to bridge that gap with cheap equity financing and credit. Now, financial conditions are generally tighter, leaving no alternative to shrinking cash flow.

(*JAMES C. COOPER & KATHLEEN MADIGAN, Business Week, Nov. 23, 1998)*

This bureaucracy is not interested in maximizing profit, but rather in expanding the organization and its own power.

(*ERICH FROMM, The Art of Loving, 1956)*

The multiple drivers of investment are among the most discussed topics in corporate finance.[1] As the quotes above demonstrate, there are two principle ways of looking at liquidity and investment. As indicated by the first quote, it is commonly assumed that liquidity plays an important role as source of finance, however, it is far from being clear, how and why cash flows influence corporate investment in spite of Modigliani/Miller's irrelevance theorem. In the past a number of possible explanations for its relevance have been found. Cash flow may serve as proxy for current or future investment opportunities, or its influence may be driven by a cost advantage of internal versus external finance. As the latter quote - which admittedly comes from a non economic observer of corporate behavior - shows, the influence of cash flow on investment may even be caused by other motives: Management may tend to spend all funds available to enlarge their "empire", instead of redistributing it among the shareholders.

We contribute to this discussion by examining the influence of cash flow on a panel of listed European companies. The sample consists of two sub samples, including growth companies and large caps from Germany, France, Italy, Spain and the UK in the 1990s. We thereby distinguish between different sub samples of companies, which we expect to be effected by liquidity in a different way, while we are controlling for other factors, such as future profitability, by including growth opportunities, output and cost of capital in our model. Depending on what kind of companies shows a higher cash flow-investment sensitivity, we will distinguish between effects caused by costly external finance (CEF) and by empire building (EB) behavior.

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[1] See Hubbard (1998) p. 193.

A common test of the CEF hypothesis is to identify ex ante which companies from a panel are likely to face liquidity constraints, and to compare the cash flow-investment sensitivities of constrained and unconstrained sub samples.[2] We will therefore derive a set of indicators for financial constraints from the literature. According to the CEF it should additionally make a difference, how easy it is for a firm to access external finance. A proxy therefore is credit ratings.[3]

One way to test the EB hypothesis is to split a sample according to its ownership structure.[4] Empire building behavior is likely to be more complicated for managers in the presence of a strong shareholder with a stake of more than 25 percent. Hence, the cash flow sensibility of companies without block holders, where empire building may more likely take place is expected to be stronger.

The debate about whether the CEF or the EB causes cash flow-investment sensitivities is both relevant from an academic and practical point of view. According to the CEF, companies would constantly underinvest, restricted by information asymmetries. If the EB is true, permanent overinvestment of the affected firms by managers, who primarily pursue their own interest, would lead to a massive and continuous destruction of shareholder value.

The document is structured as follows. First we will describe the necessary definitions and theory. Therefore, we will look at different theories of investment with a strong emphasis on liquidity as well as at the theoretical background of agency theory and asymmetric information. Therefrom we will derive the different behavior of our sub samples according to the CEF and the EB hypotheses. In section 4, we will describe our sample. Section 5 finally contains the regression results. We will conclude with an interpretation of our key findings.

2. THEORETICAL BACKGROUND

In order to test the impact of liquidity on investment, we need to control for the influence of other drivers. In the following section we will briefly define investment and then describe the theoretical background of the liquidity model, emphasizing particularly on asymmetric

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[2] See inter alia Fazzari (1988).

[3] See inter alia Whited (1992) and Gilchrist (1995 and 1998) for credit rating and inter alia Hoshi (1991), Shin (1999) and Behr (1998).

information and principal agent conflicts. For lack of space, we will not discuss the theoretical aspects of the drivers of investment in perfect capital markets, which are output[5], cost of capital[6] and future growth opportunities.[7] We will nevertheless control for the respective effects in our regressions.

Samuelson (1992) defines investment as "economic activity that forgoes consumption today with an eye to increasing output in the future". It includes tangible (e.g., structure, equipment, and inventories) and intangible capital (e.g., education or "human capital", R&D, brand equity). Net investment is the change in capital from period to period. Gross investment additionally includes replacement investment, which equals depreciation.[8]

In terms of accounting, investment results in the activation of assets, however, subject to the respective accounting principles. Whereas tangible assets typically get activated on the balance sheet, putting intangible assets (i.e. R&D, patents, human capital, brands, customers) on the balance sheet is restricted in the most common accounting principles.[9]

2.1. Categorization of Assets

Total investment of a company, according to our definition, is compound of changes in the activated assets on the balance sheet. Assets are divided differently according to different accounting standards. The overarching principles, however, are similar in the most important sets of standards. Assets are thereby divided into fixed assets and current assets. Fixed assets consist of tangible (i.e. PPE), intangible (e.g., goodwill, patents, licenses) and financial (i.e. long term investment) assets. Current assets include mainly inventories, receivables as well as cash and short term investments (available for sale).[10] We do not cover prepayments, which are treated as a separate, albeit, much smaller group.[11]

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4 See inter alia Goergen (2001) and Gugler (1997).

5 See inter alia Jenkinson (1981).

6 See inter alia Chirinko (1993), Elliott (1980), and Valderrama (2001).

7 See inter alia Keynes (1936) pp. 141f, Tobin (1969), Brainard (1977), Gehrke (1994)

8 See Jorgenson (1971) p. 1112 and Samuelson (1992) p. 739.

9 See Swoboda (1999) pp 23f, Nobes (1995) pp. 192f, 212f, 249, 275, 297.

10 See Bertl (1998) pp. 257f, Egger (1999) p. 316, OSIRIS Database.

11 For a more detailed discussion of investment in the different balance sheet items refer to Swoboda (2002).

To give a more accurate picture of investment we examine investment in two additional items: Human capital (i.e., expansion in work force), which - in spite of the crucial role it plays for a company - is not activated on the balance sheet and immaterial assets, which consist of the amount of cash "burned" every year. Assuming a rational company, this money should either go into R&D or into marketing activities.[12] Hence, we treat these expenses as a kind of investment and test what role liquidity plays for it.

2.2. Liquidity as Driver of Investment in Imperfect Capital Markets

Researchers regularly included proxies for liquidity into their equations, and thereby improved the results of their investment models, even though the theoretical basis for inserting respective variables into an investment model, has long been missing.[13] The unquestionable relevance of liquidity is also supported by surveys. The Confederation of British Industry (CBI), for example, found out that up to a quarter of the companies report their investment to actually be constrained by the availability of internal finance.[14]

In the past decades, substantial theoretical and empirical evidence for the role that liquidity plays have been collected. The basic assumption thereby is that capital markets are not perfect. Albeit this thought has already been brought up in the 1950s, its renaissance took place only in the 1980s, triggered by a groundbreaking paper of Fazzari, Hubbard and Peterson (1988), which entailed a considerable number of comparable studies.[15]

To test for the impact of liquidity an equation in the general form of

$$\frac{I_{it}}{K_{it}} = \int \frac{X_{it}}{K_{it}} + \alpha_1 * \frac{CF_{it}}{K_{it}} + \varepsilon_{it}$$

Equation 1: Cash flow model

[12] Gugler (2000) p.13 argues in a similar way and includes R&D and marketing into his measure of total investment.

[13] See Chirinko (1993) p. 1902.

[14] See Carruth (2000) p. 277.

[15] See inter alia Hubbard (1998) pp. 198f and 202ff - 204.

is used, where X represents a vector of current and lagged control variables (e.g., proxies for output or future growth opportunities (Tobin's q).[16] By doing so, one can avoid simply measuring accelerator effects or future investment opportunities.[17]

Empirical results show that the fact that liquidity is important for investment is undisputable. The reason therefore is uncertain. There are a number of capital market inefficiencies, which may be responsible for the impact of liquidity on investment. The most prominent ones are information asymmetries, principal-agent conflicts, transaction costs and taxes.

Transaction costs should not be relevant for listed companies in well developed countries in North America or Europe.[18] The second reason for the wedge between the costs of retained earnings, debt and equity lies in the tax deductibility of interest payments, whereas equity finance is comparably "punished" by tax authorities. One might assume that the observed wedge between debt and equity is caused by the tax deductibility of the former one, but it seems to be largely independent of this effect.[19] Hence, we focus on the remaining two, which we will discuss in the following sections.

2.2.1. Asymmetric Information and Liquidity

In a world with perfect information, no taxes, no transaction costs and no other capital market imperfections, investment would solely depend on the availability of investment opportunities. Any project with a positive NPV could be financed by any combination of equity and debt capital.[20]

In the real world there are information asymmetries between actual and potential equity and debt capital providers and management as well as principal agent conflicts, which we will discuss thereafter. Asymmetric information causes frictions, which impede or at least

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16 See Fazzari (1988) p. 163f.

17 See Whited (1992) p. 1426 and Hoshi (1991) p. 35 and Devereux (1989) p. 22; in that case, in particular during a speculative bubble, q should matter less than cash flow, in comparison with other periods. This, however, is not the case, indicating that, at least for some firms, liquidity effects do play a significant role (Devereux p. 22).

18 See Kathuria (1995) pp. 211f and Samuel (1996a) p. 2.

19 See Jensen (1976) p. 333.

20 See Myers (1984) p. 419.

complicate the substitution of equity and debt capital. Three major reasons have therefore been identified.

Firstly, Jensen (1976) demonstrates that equity holders can transfer risk to lenders without appropriate compensation by ex post increasing the risk of their projects. Secondly, Stiglitz and Weiss (1981) reveal that access to external debt may be impossible even in a market equilibrium. Thirdly, Myers and Majluf (1984) show that according to the "pecking order" or "financial hierarchy" theory, firms prefer internal to external finance and when they do issue securities they prefer bonds to stocks. As a consequence, a firm with ample financial slack (i.e. cash, marketable securities, or the possibility to issue risk free debt) would invest, whereas another firm with less liquidity ceteris paribus would not invest.

Jensen (1976), shows that, if an owner-manager of a firm has the chance to take up debt at first, and at a later stage to decide in which project to invest, he could transfer wealth from bond holders to himself. By first promising to invest in low variance projects and investing in a high risk venture after he has taken up the capital, he can increase the value of the stock at the expense of the bond. [21]

According to Stiglitz and Weiss (1981) in some cases potential borrowers are not hindered from taking up debt by the market price of capital, but rather by its availability. In a perfect world, the market should always be cleared at a price, which lies at the intersection of the supply and the demand curves, leaving no space for a rationing phenomenon. Two traditional reasons for rationing are monopolies and government interference with markets.[22]

However, even in the absence of traditional frictions, non-market-clearing of credit markets is possible, caused by an interdependence between the profit maximizing function of banks and behavioral changes of borrowers with respect to changing interest rates. If demand for loans increases, typically lenders should increase interest to get to an equilibrium. Increased interest rates change the investment pattern of borrowers for two reasons. First, there is adverse selection: Investors with low return and low risk projects will be scared off by high interest rates, leaving a portfolio of high risk borrowers for the bank. Secondly, the risk affinity of borrowers themselves gets affected by the level of interest. The higher a bank rises interest

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[21] See Jensen (1976) pp. 335ff and Devereux (1989) pp. 2ff.

[22] See Bester (1987) pp. 136f.

rates for existing debt, the more risk the borrower will have to take in order to meet payment targets.[23]

This effect, which upon the existence of asymmetric information can be neither observed nor controlled by the lender, may well exceed the marginal revenue from a higher interest rate for the bank and may cause the lender to refrain from raising interest rates in spite of the existing bargaining power. The consequence is credit rationing, i.e. liquidity may not be available for borrowers who are willing to pay (even more than) the market rate.[24]

The third theory, introduced by Myers and Majluf (1984) comes into place, if we assume that management has insider information, which investors do not have, and - as empirically supported - management rather acts in the interest of existing shareholders and not in the one of new shareholders, when considering the issuance of additional equity.[25] If a firm needs additional capital to pursue a project with a positive NPV, it will only raise the capital, if the dilution of existing capital by the capital increase does not surpass the added value by the new project. As a result, management will never take up capital if the company is under-, but only if it is overvalued. In certain situations NPV-positive projects, which require more liquidity than the firm has available, may be passed up to protect existing shareholders. A firm with financial slack at hand may thus be better off than one without cash reserves and deliver the additional value to existing shareholders.[26]

A second consequence of the information asymmetry between management and investors is that, whenever management expects a firm to be overvalued (e.g., due to expected but not yet published losses), additional shares should be issued. This signaling effect leads to a systematic underpricing of newly issued equity similar to Akerlof's (1970) lemon principle. The lemon principle states that, if sellers cannot transmit credible information to buyers, in the existence of "lemons" (i.e. defective products) the market for good products will break down, as every buyer will assume that his counterpart wants to trade a lemon and, hence, will never be willing to pay

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[23] See Stiglitz (1981) p. 394.

[24] See Greenwald (1984) pp. 195 and 198.

[25] See Myers (1984) pp. 420f and p. 446; an additional assumption is that shareholders do not consequently rebalance their portfolio upon issue-invest decisions of the firm.

[26] See Myers (1984) pp. 422ff.

the price for a good product.[27] In parallel, investors automatically assume that shares are only issued, when the market overvalues a company. Consequently, the issuance of equity is perceived as a negative signal and the company gets punished with a discount. Firms, hence, prefer existing equity (i.e. retained earnings or reserves) to emitting a negative signal by issuing new shares. As a consequence, not only overvalued firms, but all firms face financial constraints from asymmetric information.[28]

Another option to finance an investment opportunity is to issue debt capital. The share of profit which goes to debt capital holders is always less than the one which would go to new equity holders. Assuming asymmetric information, i.e. management knows earlier than investors, if a project is NPV positive, management will always prefer external debt to external equity.[29]

Hence, management will rationally and in the interest of shareholders prefer internal to external finance and, if it is required, to issue securities, rather issue bonds than stocks.[30] The rational reluctance with respect to giving out new shares or bonds leads to the omission of NPV-positive projects. As a consequence, investment does not only depend on the profitability of the potential projects, but also on the availability of liquidity.

The three effects described above may lead to systematic underinvestment of firms. In the following, we will discuss principal-agent conflicts and how cash flow-sensitivity in contrast to what we described above, may be an indicator of systematic overinvestment.

2.2.2. Principal-Agent Conflicts and Liquidity

A principal-agent relationship occurs, whenever one individual, the agent, takes decisions on behalf of somebody else (the principal), by which he influences both his own and the other person's welfare. If the utility functions of the two individuals differ, which very often will be the case, the agent will not necessarily act in the best interest of the principal. If we additionally assume asymmetric information, i.e. the principal is not able to observe and verify

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[27] See Akerlof (1970) p. 489.

[28] See Myers (1984) pp. 428 and 441 and Greenwald (1984) p. 195.

[29] See Myers (1984) p. 440.

[30] See Myers (1984) pp. 440f; according to this model, a firm would never issue shares. Myers explains that diverging information about uncertainty between managers and investors leads to the rational issuance of equity. In most cases, however, information about firm value seems to be a stronger determinant than asymmetric information about risk.

exactly what the agent does, a utility optimizing agent may act against the interests of his principal. This conflict is called principal-agent conflict, the loss resulting from the agent's action in opposition to the optimal action together with monitoring costs and bonding expenditures for the agent is defined as agency costs. A prominent area of such conflicts are the potentially diverging interests between the shareholders and the top managers of a company. [31]

Whereas shareholders in general aim for the optimal return to risk ratio, management may have an (at least partly) diverse set of goals. The reduction of personal risk by pursuing a diversification strategy into different industries, which may be sub optimal from a portfolio point of view, or the increase of personal power and prestige by increasing firm size are among the most prominent ones.[32] In order to reach these goals, "empire building" behavior, i.e. investing available cash flow independent of the availability of adequate investment opportunities can be the dominant strategy.[33]

These effects can be reduced, albeit in most cases, not eliminated by the introduction of monitoring and incentive mechanisms, which align the goals of the principal and the agent. Such measures can be external audits, sanctions upon behavior of management, if it diverges from the interest of the shareholders (i.e. internal auditing), compulsory approbation of shareholders in case of important decisions or the threat by shareholders to replace management.[34] An additional way to hinder management from investing free cash flow sub optimally is to decrease the disposable income, which management may use for unjustified diversification, by taking up debt.[35]

3. CASH-FLOW INVESTMENT SENSITIVITIES IN THE EMPIRICAL LITERATURE

In this section we discuss the findings of the empirical literature, which complement the theoretical findings described above. In the following we report the results, which are relevant

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[31] See Jensen (1976) pp. 308ff and Spremann (1987) pp. 5f and 22.

[32] See Denis (1997) p. 136.

[33] See Delingat (1996) p. 35.

[34] See Jensen (1976) p. 325 and Delingat (1996) p. 47.

[35] See (Greenwald (1984) p. 195.

for our study, classified in two categories: Studies which examine the influence of costly external finance on investment, and studies which analyze empire building and managerial incentives. A general overview of the literature, which clearly supports the existence of cash flow-investment sensitivities, as well as additional sources, not directly related to our work can be found in Appendix A: Overview of the Empirical Literature.

3.1. Empirical Evidence of the CEF Hypothesis

Fazzari et al. (1988) show in their famous study that investment of a group of companies, which is ex ante classified as being financially constrained (measured by dividend pay-out ratios), much more depends on fluctuation of cash flow than the comparison group, which has sufficient liquidity. They reason that this effect stems from a wedge between internal and external cost of capital. Hubbard, Kashyap and Whited (1995) examine, why their standard neoclassic model gets rejected for a sub sample of financially restricted firms, measured by a low pay-our ratio, while it is relatively successful for the unconstrained sample and also point out the importance of cash flow as an explanatory variable for investment. Vermeulen (2000) supports this line of reasoning by showing that firms with a weak balance sheet, and, hence, a more difficult access to external finance more strongly depend on cash flow. Based on meso-economic data, Behr and Bellgardt (1998) show that German SMEs strongly depend on liquidity. Thereby sectors, which face financial constraints, measured in terms of pay-out ratios face a stronger dependency on cash flows than others. Behr and Bellgardt (2000) confirms these results by showing that firms with little working capital, and little cash reserves are more dependent on liquidity, when making investment decisions.

Gilchrist and Himmelberg (1998) in addition find that small companies, with presumably higher costs of obtaining external funds are more responsive to liquidity shocks than large ones. Gilchrist and Himmelberg (1995) distinguish between two different roles of cash flow: On the one hand as predictor for future investment opportunities and on the other hand as an additional source of finance for otherwise financially restricted companies. They find the latter effect only to be relevant for firms without bond rating, for which capital market access is likely to be more difficult than for the group of rated companies. Whited (1992) shows that due to frictions in financial markets, in particular asymmetric information in debt markets, a model of investment behavior must account for differential access to capital markets. This effect can better be

observed at unrated firms, whereas the existence of a rating apparently reduces respective information asymmetries.

Bo et al. (2002) find out that inventory investments follow a similar pattern as capital expenditure with respect to financial constraints.

Recapitulating, we can say, that previous studies have found plenty of evidence indicating that due to costly external finance, financial constraints, measured as low pay-out ratios, lack of financial slack and high leverage increases cash flow-investment sensitivities. This applies also to companies which have difficulties accessing capital markets according to their small size and to their low bond ratings. The effect is not limited to investment in fixed assets alone, but exists as well with respect to inventory investments.

3.2. Empirical Evidence of the EB Hypothesis

Already Grabowski and Mueller (1972) show that an investment model, which does not only consider shareholder value maximization, but also other - potentially diverging - managerial goals delivers superior results. They conclude that management interests are of relevance for the determination of investment. Kadapakkam et al. (1998) examine in an aggregate study investment in six OECD countries. While using different measures of size, they show that cash flow-investment sensitivity is largest in the large firm size group - thereby contradicting Gilchrist et al. (1998) and Swoboda (2002). They ration that this is caused by managerial agency problems, which seem to outweigh the presumably less efficient capital markets for small firms.[36] Devereux and Schiantarelli (1989) find that cash flow plays a greater role than it would deserve as mere proxy for future growth opportunities. The fact that young firms are more responsive than older ones indicates the existence of information asymmetries, as described above. In addition liquidity actually plays a more important role for large firms than for small ones. They conclude that the more diverse ownership structure of these firms may alleviate the occurrence of agency conflicts, leading to empire building behavior. Samuel (1996a) claims that pay-out ratios, which often serve as proxy for financial constraints, are no appropriate measure to distinguish between information-theoretic and managerial inefficiencies.

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[36] These findings are confirmed by Swoboda (2002) in a comparative study of growth companies and large caps, which he performed with the data sample also used for this study. He shows, that investment of growth companies is driven to a larger extent by q, whereas large caps are more strongly influenced by liquidity.

Thus, he tests the different impact of cash flow on investment for three sub samples split along other dimensions (size, exchange listing, R&D intensity) and finds that the EB gets supported. Hubbard et al. (1995) furthermore look at whether empire building behavior plays a role, by distinguishing between young and mature firms. However, the model does not get rejected for the mature firms with low pay-out ratio, as the EB hypothesis would predict.

Gugler (1997) explicitly shows, based on an Austrian sample, that ownership structure influences cash flow-investment sensitivities, however, information asymmetries seem to be relevant as well. He finds that family controlled firms appear to suffer from cash constraints, whereas state owned firms invest in assets or employment maximization instead of paying out dividends. Investment of bank owned companies is not influenced by changes in cash flow. Gugler links this fact to the monitoring power of a bank. Hence, they conclude that agency costs are not important for business fixed investment. Goergen (2001) directly shows that a high ownership concentration can reduce the influence of cash flow on investment, even though this effect only takes place for institutional investors and for not industrial firms, which, as he presumes, may tunnel private benefits by increasing investment upon the availability of cash flow. He concludes that cash flow dependency may stem from agency conflicts, which can be reduced by effective monitoring.

The empiric literature on managerial incentives focuses primarily on size, age, and ownership structure. With respect to the first two variables the data seems to be contradictory. The existence of a block holder among the shareholders seems, however, to clearly reduce cash flow-investment sensitivities, indicating that empire building behavior plays a crucial role in explaining respective sensitivities.

4. INVESTMENT BEHAVIOR ACCORDING TO THE CEF AND EB HYPOTHESES

After having described the theoretical background of our work, we will empirically segregate the influence of principal agent conflicts and of asymmetric information on the cash flow sensitivity of investment. To test the CEF and the EB hypotheses we explain why firms with different attributes should behave differently according to the two theories and derive variables as well as appropriate proxies along which we can split the panel into sub samples. The four variables, which have been proven to be meaningful in the past are financial slack, leverage, credit worthiness and ownership structure.

In the following we will explain the reason behind the variables and examine in detail whether differences would support the CEF or the EB hypothesis for the overall sample, separately for large caps and growth companies and for different balance sheet and off balance sheet items.

4.1. Financial Slack and the CEF Hypothesis

The most common and obvious method to test whether capital markets are not perfect and the financial situation of a company plays a role for investment, is to identify companies, which are financially constrained and test whether the supply of additional finance by way of cash flow, which should ease this situation, influences investment. For a control group, which is not restricted, changes in supply of liquidity should matter less. This approach has been used by Fazzari et. al (1988) and by a large number of succeeding papers. We can therefrom derive our first hypothesis.

Hypothesis 1: *Companies with ample financial slack pursue investment opportunities, which companies without slack need to reject even though they are NPV-positive. Hence, the latter sub sample of firms is more sensitive to changes in cash flow.*

In order to test for financial slack, we chose two different variables, which have already been used by comparable studies: Following Behr et al. we take the amount of cash, which we adjust for differences in size and in asset intensity by dividing it by fixed assets, and the amount of working capital, which is the ratio of cash and stocks divided by current liabilities, and, hence, shows whether short term liabilities are backed by short term liquidity. The worse this ratio gets, the higher are the chances that a company faces liquidity constraints and possibly financial distress.[37]

We split the sample into two sub samples and assign a dummy variable to each firm, depending whether they belong to the upper (i.e. unconstrained) or lower (i.e. constrained) half.

4.2. Leverage and the CEF Hypothesis

With respect to leverage the reason, why cash flow should play a role is more subtle, but nevertheless comprehensive. According to Modigliani and Miller's (1958) proposition 1 differences in the capital structure should not matter for the valuation of a firm. A firm's value

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[37] See Behr et al. (2000) p. 267 and also Vermeulen (2000) p. 14.

should be determined by its assets alone and not by who the profit or cash flow gets distributed to.[38] In the real world, however, companies can only take up debt to a limited extent. A firm may want to increase its leverage to benefit from tax shields. Insolvency costs put a cap to indebtedness, as equity and in particular debt holders, who share only the risk, but not the profit from the risk of a high leverage, are only willing to pay them up to a certain amount.[39] A high leverage may, hence, restrict investment, whereas companies with a low leverage are likely to have more financial leeway. In accordance with Vermeulen (2000) and Behr et. al. (1998 and 2000) we formulate hypothesis 2:

Hypothesis 2: *Companies with a low leverage pursue investment opportunities, which companies with high leverage need to reject even though they are NPV-positive. Hence, the latter sub sample of firms is more sensitive to changes in cash flow.*

We measure the leverage of the firms in our sample by two means. The equity ratio simply measures how much debt a firm has already taken on its books,[40] whereas the coverage ratio ((non-current liabilities + shareholders' funds) / fixed assets) shows the long term flexibility with respect to debt policy.[41] Again we assign a dummy variable depending on whether a firm belongs to the upper or lower half of the sample.

This second test aims in particular at the explanations of Jensen and Stiglitz/Weiss. According to Myers/Majluf, leveraged and unleveraged companies should be equally reluctant to raise additional capital for attractive investment opportunities.

4.3. Credit Worthiness and the CEF Hypothesis

Bond ratings are a common and useful measure in the context of financially constrained companies.[42] Inter alia Whited (1992) and Gilchrist and Himmelberg (1995 and 1998) use this variable to identify companies which cannot, or at least only at higher costs, access financial

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[38] See Modigliani (1958) p. 268.

[39] See Kruschwitz (1999) pp. 238ff and Jensen (1976) pp. 334f.

[40] Vermeulen (2000) p. 14 argues in a similar way and uses the debt to total assets ratio to determine companies with a weak balance sheet, which he expects to be financially constrained, Hu (1995) p. 477 follows a similar logic and uses a debt to market value ratio.

[41] See Behr (2000) p. 267.

[42] See Fazzari (2000) pp. 698f.

markets. The rating thereby serves as a summary statistic of all available information, processed by the rating agency.[43]

We can expect differences between companies with a good rating, with a bad rating and with no rating at all. At first, one can assume that the mere existence of a rating reduces information costs, and in general increases capital market efficiency, thereby mitigating the influence of cash flow. Secondly, the aversion of management to issue debt capital should disappear upon the availability of risk free debt. Corporate bonds issued by an Axx rated firm are not risk free, however, they bear less risk, than debt of a firm, which is unrated or rated below Axx. These two arguments lead to hypothesis 3a and 3b

Hypothesis 3a: *The existence of a rating decreases information asymmetries. As a consequence investment of companies without rating stronger depends on cash flow than investment of rated firms.*

Hypothesis 3b: *Investment of companies with an Axx rating are less dependent on cash flow than worse rated firms, for which external debt is further away from being risk free.*

We took the information on rating from the Osiris database, which reports S&P and Moody's ratings as of 2001 and keep the membership in the sub samples constant over time. We thereby distinguish between three sub samples: The first one consists of companies without rating, which face higher information asymmetries, as the market cannot rely on the objective assessment of a rating agency, the second one of companies with an Axx (i.e. better than B) rating, which should be able to access financial markets easily and thirdly firms with a worse rating, which are expected to face higher capital market access costs. Depending on the sub sample membership, we assign dummy variables for no rating, for Axx and for worse than Axx to each firm.

We expect companies with a rating to be less dependent on cash flow than unrated ones, as credit rationing should be less likely for them. In addition, we expect the availability of near-risk free debt to decrease the sensitivity of cash flow of companies with an Axx rating.

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[43] See Gilchrist (1995) pp. 553f.

Empire behavior may moderately be influenced, as the existence of a rating implies continuous monitoring by a third party, which is, however, not focused on achieving profitability, but rather on avoiding financial distress.

4.4. Ownership Structure and the EB Hypothesis

As discussed in section 2.2.2 a manager may be more interested to "build an empire" to increase his personal power or prestige or to decrease the risk he personally faces by diversifying, instead of optimizing the value of the firm. He can do so, by investing in projects, which are NPV-negative, but serve his purpose. It will be difficult for an agent to convince the owner of a firm to get additional funds from debt or even equity donors for such a project. It may, however, be much easier for him to unnoticedly redirect funds into such projects, once these funds are available inside the firm. Hence, such investments are expected to stronger depend on available liquidity than investments, which are in the interest of shareholders.

Principal agent conflicts have long been known in practical experience as well as in theory. One can mitigate them by effectively monitoring the agent or by aligning the goals of a principal and an agent with the aid of incentives. As a consequence, mandatory monitoring efforts have been assigned by law (e.g., by external auditors and the supervisory board of directors). Nevertheless, it is difficult if not impossible to outside-in measure what monitoring efforts and incentives are chosen by a company, and to determine how effective these measures are.

One way to estimate monitoring efforts is to analyze the ownership structure of a firm to see whether it should grant an efficient level of monitoring for a company. Assuming rational behavior, shareholders will optimize the monitoring according to the costs they have to bear personally for their effort and the expected possible gains. Consequently, a small shareholder may rather rely on the monitoring efforts of others than to personally carry high information costs. On the other hand, it is efficient for a large shareholder to "invest" in monitoring, in order to protect his stake. For a company with a high free float and no block holder, shareholder monitoring may turn into a public good, with little incentive for each shareholder to actively monitor himself.[44]

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[44] See Delingat (1996) p. 48.

Following Gugler (1997) and Goergen (2001), who empirically showed the influence of ownership structures on investment, we expect the level of monitoring to be lower for a company with many shareholders without significant holdings, whereas the management of a company with a dominant shareholder should be supervised much closer. Empire building behavior should therefore decrease upon the existence of a block holder.[45]

Consequently we formulate:

Hypothesis 4: *Block holders are more willing to invest in monitoring. Companies with block holders are, consequently, less vulnerable to empire building behavior and should show lower cash flow-investment sensitivity.*

For our study, we define a shareholder with a stake of at least 25 percent as block holder.[46] We assign a respective dummy variable to every company. The information on the ownership structure is taken from OSIRIS, which contains an ownership concentration indicator as of 2001. We keep the membership in the two sub samples constant over time.[47]

5. DESCRIPTION OF DATA SAMPLE

The data we use is mostly taken from OSIRIS, which is a database of listed corporates, banks and insurance companies around the world. In addition to income statement, balance sheet, cash flow and business ratios it contains news, ownership information, ratings, earnings estimates and stock data. According to its self-definition it is the most complete global listed company database available.[48] From that database, we selected the large caps and growth companies from the most prominent stock exchange indices from five European countries (France,

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[45] See Gugler (1997) pp. 26f and Goergen (2001) pp. 280f.

[46] See Goergen (2001) p. 265 for a similar approach, Gugler (1997) distinguishes between family-, bank- and government owned businesses, of which the latter ones are expected to be less effective with regard to monitoring, as the government represents a large number of individuals with little incentive to personally invest into monitoring.

[47] An additional way to test the EB hypothesis is to split the sample according to size. We do not further analyze this split, as - using the same panel - Swoboda (2002) already showed, that the influence of liquidity is stronger for the group of large caps than for the growth firms. This supports the findings of Devereux et al. (1989) and Kadapakkam et al. (1998) and indicates that managerial incentives can explain cash flow-investment sensitivities.

[48] http://www.osiris.bvdep.com/cgi/template.dll?freetpl=frame.tpl&product=20&page=SuiteProductPage.asp&productname=OSIRIS.

Germany, Italy, Spain and the UK). The selected indices account for approximately 75-80 percent[49] of the market capitalization of the respective countries.

In the following, we will first describe the composition of the sample and then briefly discuss how we operationalize the variables.

5.1. Overall description

The sample contains the available large cap companies from the leading indices of five European countries: France's CAC 40 Germany's DAX 100, Italy's MIB 30, Spain's IBX 35 and the UK's FTSE 100. These indices contain the largest listed corporations of the respective countries. The DAX 100 for example includes the hundred largest companies by turnover and market capitalization.[50] In total our sample contains 234 large caps.

In addition we included 605 growth companies from the same period. The companies are listed on different European growth markets: *Neuer Markt* in Germany, the UK *Tech Market*, the *Nouveau Marché* in France, the *Nuovo Mercato* in Italy, and the *Nuovo Mercado* in Spain. The prerequisites for a listing in a growth market are less strict (e.g., in terms of size of a company) than for the blue chip indices.[51]

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[49] Weighted average according to total market capitalization of stock exchange.

[50] See Deutsche Börse (2002) p. 5.

[51] See Deutsche Börse (2001) p. 1.

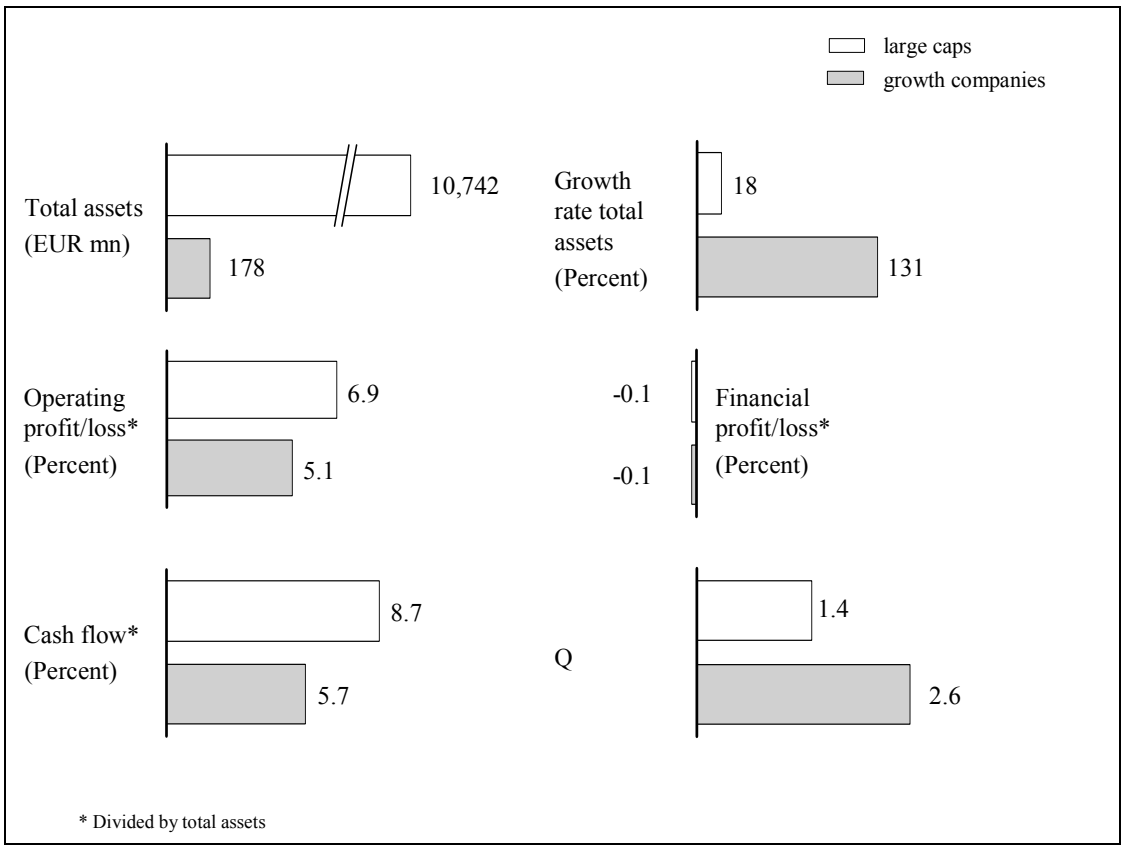

Exhibit 1: Average key ratios of total sample

Financial firms are excluded from the sample to avoid a distortion of the results, due to the different balance sheet structure.[52] This leaves us with a total sample of 839 companies (605 growth companies and 234 large caps). From the 1596 large cap firm years we eliminated 677 due to missing values and as we exclude outliers.[53] With respect to growth companies, we chose a similar approach. As a large part of the companies were only incorporated in recent years the average number of years per company is only around 3. The elimination process of incomplete data and outliers as described above reduces the sub sample of growth companies to 644 firm years stemming from 296 companies.

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[52] Similar approaches have been taken by inter alia Fama (1999) and Hovakimian (2001).

[53] We exclude q values above 8 (this value is taken on an ad-hoc base, however, it balances the requirements to distort our results and to keep the sample size reasonable big), top and bottom 0.5% of changes in sales, cash flow and investment in the various balance sheet items (in the latter case, we do not eliminate the firm year from all the regressions, but only from the ones, where it produces an outlier). The number of observations on which the regressions are based are reported with the regression results.

As merger and acquisition (M&A) activity can be seen as a different way of investing in the used capital market,[54] we do not completely exclude this activity from our data. However, large mergers or acquisitions, which result in a large change in the respective balance sheet item outside of the boundaries described above are not included in the regression.

The description of the sample is summarized in Exhibit 1. An extensive description of the various sub samples we use for testing is contained in Appendix B: Description of Data Sub Samples.

5.2. Operationalization of Variables

In this section we describe how we operationalized investment and its four drivers.

5.2.1. Dependent Variables

Investment undertaken by a company in a certain year equals the difference of total assets between t and t-1 plus the depreciations in period t. If the replacement investment falls short of depreciation, investment of period t is negative. The same logic applies to the various sub-categories (tangible and intangible fixed assets,[55] current assets (inventories, receivables, and liquidity), human capital, immaterial assets).[56]

As it is estimated that roughly one half of investment is replacement investment[57] or that replacement investment even predominates total investment expenditures at the aggregate level[58] we measure investment in fixed assets as gross[59] investment, i.e. including depreciation. For all other kinds of investment, including off-balance items we use a net[60] investment rate, as information on depreciation of the respective balance or even off-balance sheet items is not available. To account for differences in size and for inflation over time and to avoid

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54 See Jovanovic (2002) p. 1.

55 For some companies OSIRIS additionally includes "other fixed assets", which we do not include in our study.

56 A similar approach is chosen by Demirgüc-Kunt (1996), who distinguishes between long-term and short-term investment (p. 3).

57 See Feldstein (1980) p. 13.

58 See Kuznets (1961) quoted after Jorgenson (1971) p. 1112.

59 Inter alia Oliner (1995), Hoshi (1991), Funke (1998), Behr (2000).

60 A similar approach is chosen by inter alia Chapman (1996) and Kadapakkam (1998), an alternative suggested by Nadiri (1993) is to calculate depreciation rates.

heteroscedasticity we divide change in assets by the respective item at the beginning of the period.

$$I_t = \frac{K_t - K_{t-1}}{K_{t-1}} \text{ and } I_{FA_t} = \frac{K_{FA\_t} - K_{FA\_t-1} + \delta}{K_{FA\_t-1}}$$

Equation 2: Operationalization of investment

with $K_t - K_{t-1}$ being the change in the capital stock in period t and δ being depreciation.

With respect to human capital, the approach is different; we measure changes in the number of employees (FTE), as reported from the OSIRIS database.

5.2.2. Independent variables

Liquidity itself can be calculated in two different ways, either as stock of cash or as cash flow. The latter one proved to be the empirically more successful proxy for liquidity in the past.[61] Hence, we will use cash flow as reported in the OSIRIS database as measure for liquidity in our equations. In accordance with our procedure with respect to investment, we adjust for size and inflation by dividing cash flow by total assets at the beginning of the year.

Besides liquidity, which is our key variable, we include Δ sales (change of sales between t and t-1 divided by the respective total assets), cost of capital (the secondary market rate), and future growth opportunities (Tobin's q) in our regressions to control for the respective effects.[62]

6. EMPIRICAL RESULTS

To test our hypotheses on investment behavior, we test the explanatory power of cash flow, q, interest rate, and sales for investment, emphasizing in particular on the difference between cash flow sensitivities of the respective sub sample and the control group. This section contains a brief description of the methodology followed by a detailed report of our results.

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[61] See Carpenter (1998) pp. 513 and 515 and Devereux (1989) p. 30.

[62] A more detailed discussion of the variables can be found in Swoboda (2002).

6.1. Methodology of Regression

We split the panel into different sub samples along the seven variables derived above and separately perform ordinary least square (OLS) regressions for the sub samples. This is the standard approach, also chosen by inter alia Fazzari, Hubbard and Petersen (1988) or Hoshi et al. (1991).

To avoid systematic distortions due to fundamental differences between large caps and growth companies we will in addition to the results for the total sample, separately calculate the equations for the two sub samples of large caps and growth companies.

The tested equation includes all four variables defined above (Δ sales and cash flow both divided by the beginning of period capital stock, cost of capital (r) and q, as well as an error term):

$$\frac{I_{ti}}{A_{ti-1}} = \alpha_1 + \alpha_2 * \Delta(\frac{Sa_{ti}}{A_{ti-1}} - \frac{Sa_{ti-1}}{A_{ti-2}}) + \alpha_3 * \frac{CF_{ti}}{A_{ti-1}} + \alpha_4 * r_{ti-1} + \alpha_5 * Q_{ti-1} + \alpha_{6i} + \alpha_{7t} + \varepsilon_{it}$$

Equation 3: Investment model

As we have few observations per company, the inclusion of fixed firm effects makes little sense. Instead, we include market and sector dummies.[63] The first ones are significant in some of the equations, in particular with respect to growth markets, the latter ones contributed in almost all cases only insignificantly. The results are only changed to a small degree by both. In addition we added year dummies, which were significant with a negative sign in some cases. These dummies have as well very little effect on the overall outcome, with two exceptions: The significance of interest rates decreases dramatically - well below the 85 percent level in most cases, once we add the time dummies[64] and the significance of the results for growth companies partly drops below the 90 percent level. In line with the majority of the literature we kept the dummies in the equations, but do not report them in the tables below. The more detailed results in Appendix D: Additional Regression Results, however, are displayed without dummies to allow for additional conclusions.

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[63] Based on the information in Osiris and Bloomberg we assigned 1 out of 23 sectors to each company.

[64] For a more detailed description of our results with respect to interest rates refer to Swoboda (2002) p. 45

The model is not affected by serial correlation or collinearity.[65] In order to insure comparability among the coefficients of different variables, we report the z-transformed betas instead of the unstandardized coefficients for all equations, which are available from the authors upon request. The significance of the coefficients is indicated by *** for a 99 percent, by ** for a 95 percent, and by * for a 90 percent confidence interval. The exact t-values and standard errors are available upon request.

6.2. Regression Results

In the following we report the regression results for the sub samples. We thereby compare the sub samples, which we expect to be driven by liquidity according to the EB or CEF hypotheses with the sub sample, which we predict to be less dependent on cash flow. We primarily test the impact of the four drivers on investment in fixed assets. In the appendix we display the results with respect to the other asset classes (total assets, current assets, as well as the respective sub items; in addition, we include our proxies for immaterial off-balance sheet assets and human capital).

Table 1 displays the results from our equations for the entire sample, Table 2 for the large caps and Table 3 for the growth companies. In the following subsections we summarize the results along the hypotheses we derived above.

6.2.1. Costly External Finance Hypothesis

First we discuss our findings with respect to the CEF hypothesis. We will start with the sub samples which are split according to financial slack, to see whether we find general support. Thereafter we will examine the impact of leverage to see whether we can find evidence for a risk transfer to debt holders and credit rationing. Finally we will take a look at credit worthiness which plays a role according to Myers/Majluf.

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[65] Results of the Durbin-Watson test are between 1.63 and 2.02 for the model, variance inflation factors around 1 and a condition index of eigenvalues below 9.

Entire sample; dependent variables: fixed assets

Sample	n	**Cash flow**	Δ sales	Interest rate	Q
Split according to (cash + stocks) / current liabilities					
Lower half	*499*	0.167 ***	0.208 ***	-0.017	0.177 ***
Upper half	*374*	0.142 ***	-0.085 +	0.073	0.258 ***
Split according to (cash / fixed assets)					
Lower half	*587*	0.238 ***	0.083 **	-0.006	0.322 ***
Upper half	*327*	0.050	0.030	0.158	0.254 ***
Split according to (Shareholders' funds/total capital)					
Lower half	*565*	0.194 ***	0.081 **	0.018	0.135 ***
Upper half	*336*	0.136 **	0.045	0.283 *	0.331 ***
Split according to (Non-current liabilities+ shareholders' funds)/fixed assets)					
Lower half	*551*	0.181 ***	0.087 **	0.044	0.237 ***
Upper half	*362*	-0.004	0.061	.-085	0.389 ***
Split according to Rating (only large companies)					
Not rated	*303*	0.150 **	0.131 **	0.015	0.280 ***
Rating > A	*119*	0.458 ***	0.402 ***	-0.014	-0.297 ***
Rating Axx	*236*	0.431 ***	0.219 ***	-0.016	-0.070
Split according to existing of block holder					
Without block holder	*532*	0.059	0.150 ***	0.056	0.258 ***
With block holder	*312*	0.133 **	0.088 +	-0.023	0.187 ***

\+ Significant at the 85% level
* Significant at the 90% level
** Significant at the 95% level
*** Significant at the 99% level

Definition of dpendent variables according to section 5.1.1.
Δ sales and cash flow scaled by total assets in t-1.
Interest rate is the secondary market rate of the first day of the fiscal year.
Q is a ratio of market value of equity and debt capital divided by total assets.
All equations include fixed year and industry effects (results not reported)

Split according to (cash / fixed assets): lower half <31%, upper half >31%
Split according to (cash + stocks) / current liabilities: lower half <27% upper half >27%
Split according to (Shareholders' funds/total capital): lower half <41% upper half > 41%
Split according to (Non-current liabilities+shareholders' funds)/fixed assets) (=coverage ratio): lower half <150% upper half>150%

Large caps from DAX100, CAC 40, MIB 30, IBX 35, and FTSE 100
Growth companies from Neuer Markt, Tech Market, Nouveau Marché, Nuovo Mercato, Nuovo Mercado

Data from Osiris, Datastream, Bloomberg

Table 1: Entire sample; dependent variable: fixed assets

Large caps; dependent variable: fixed assets

Sample	n	**Cash flow**	Δ sales	Interest rate	Q
Split according to (cash + stocks) / current liabilities					
Lower half	409	0.383 ***	0.209 ***	-0.103	-0.075
Upper half	232	0.175 **	0.138 **	-0.004	0.094
Split according to (cash / fixed assets)					
Lower half	469	0.357 ***	0.171 ***	-0.046	0.156 ***
Upper half	190	0.213 **	0.091	0.091	0.165
Split according to (Shareholders' funds/total capital)					
Lower half	460	0.303 ***	0.197 ***	0.072	0.043
Upper half	188	0.137	0.281 ***	0.068	-0.010
Split according to (Non-current liabilities+ shareholders' funds)/fixed assets)					
Lower half	468	0.335 ***	0.162 ***	-0.026	0.036
Upper half	191	0.168 *	0.278 ***	0.041	0.169 *
Split according to Rating (only large companies)					
Not rated	303	0.150 ***	0.131 ***	0.015	0.28 ***
Rating > A	119	0.458 ***	0.402 ***	-0.014	-0.297 **
Rating Axx	236	0.431 ***	0.219 ***	-0.016	-0.070
Split according to existing of block holder					
Without block holder	396	0.331 ***	0.066	-0.017	0.006
With block holder	241	0.208 ***	0.299 ***	-0.033 **	0.136 *

* Significant at the 90% level
** Significant at the 95% level
*** Significant at the 99% level

Definition of dpendent variables according to section 5.1.1.
Δ sales and cash flow scaled by total assets in t-1.
Interest rate is the secondary market rate of the first day of the fiscal year.
Q is a ratio of market value of equity and debt capital divided by total assets.
All equations include fixed year and industry effects (results not reported)

Split according to (cash / fixed assets): lower half <31%, upper half >31%
Split according to (cash + stocks) / current liabilities: lower half <27% upper half >27%
Split according to (Shareholders' funds/total capital): lower half <41% upper half > 41%
Split according to (Non-current liabilities+shareholders' funds)/fixed assets) (=coverage ratio): lower half <150% upper half>150%

Large caps from DAX100, CAC 40, MIB 30, IBX35, and FTSE 100
Growth companies from Neuer Markt, Tech Market, Nouveau Marché, Nuovo Mercato, Nuovo Mercado

Data from Osiris, Datastream, Bloomberg

Table 2: Large caps; dependent variable: fixed assets

Growth companies; dependent variable: fixed assets

Sample	n	Cash flow	Δ sales	Interest rate	Q
Split according to (cash + stocks) / current liabilities					
Lower half	89	-0.378	0.368	0.455	0.262
Upper half	141	0.097	0.254 **	0.308	0.158
Split according to (cash / fixed assets)					
Lower half	117	0.185 *	0.091	0.006	0.186 *
Upper half	136	0.247 **	0.018	0.136	0.193 **
Split according to (Shareholders' funds/total capital)					
Lower half	104	0.014	0.058	-0.093	0.166 *
Upper half	147	0.249 **	0.152	0.433	0.275 ***
Split according to (Non-current liabilities+ shareholders' funds)/fixed assets)					
Lower half	82	0.327 **	0.067	-0.003	0.097
Upper half	170	0.097	0.009	-0.290 **	0.347 ***
Split according to existing of block holder					
Without block holder	135	0.457 *	0.056	-0.447	0.267
With block holder	70	0.112	0.268 ***	-0.050	0.094

* Significant at the 90% level
** Significant at the 95% level
*** Significant at the 99% level

Definition of dpendent variables according to section 5.1.1.
Δ sales and cash flow scaled by total assets in t-1.
Interest rate is the secondary market rate of the first day of the fiscal year.
Q is a ratio of market value of equity and debt capital divided by total assets.
All equations include fixed year and industry effects (results not reported)

Split according to (cash / fixed assets): lower half <31%, upper half >31%
Split according to (cash + stocks) / current liabilities: lower half <27% upper half >27%
Split according to (Shareholders' funds/total capital): lower half <41% upper half > 41%
Split according to (Non-current liabilities+shareholders' funds)/fixed assets) (=coverage ratio): lower half <150% upper half>150%

Large caps from DAX100, CAC 40, MIB 30, IBX35, and FTSE 100
Growth companies from Neuer Markt, Tech Market, Nouveau Marché, Nuovo Mercato, Nuovo Mercado

Data from Osiris, Datastream, Bloomberg

Table 3: Growth companies; dependent variable: fixed assets

6.2.1.1. Results of Test of CEF with Respect to Financial Slack

The first proxy for financial slack, working capital (cash and stocks divided by current liabilities), supports hypothesis 1 and, hence, the CEF. Constrained companies, from the total

sample (Table 1) depend stronger on cash flow than the not constrained, which are strongly driven by future growth opportunities as the q-theory would predict. However, we also find the unconstrained firms to be, to a lesser extent, driven by cash flow. These findings are largely in line with the empirical literature described in section 3.1.. In addition to previous findings, we show that these information asymmetries exist in particular for large companies (see Table 2) whereas as we do not find systematic differences for growth companies (see Table 3), contradicting Gilchrist et al. (1998). In spite of the better analyst coverage and the presumably more efficient capital markets for large caps, the information barrier between investors and management seems to be higher for larger firms. This may be caused by a closer relationship between management and shareholders of the smaller companies.

The second proxy, cash divided by fixed assets confirms the findings from above. The relevance of cash flow clearly decreases, if companies are unconstrained. Again, these results hold only for the sample of larger companies.

A separate look at large and growth companies, not including fixed year and sector effects reveals an additional insight (see Exhibit 8 and Exhibit 9 in Appendix D: Additional Regression Results). For growth companies, the strongest difference between the two sub samples lies in the explanatory power of cost of capital, whereas we do not find systematic differences with respect to the other variables. This actually indicates that growth companies with little cash rely on debt capital as their predominant source of finance and not on cash flow when it comes to investment. As Exhibit 2 in Appendix B: Description of Data Sub Samples shows, these may be explained by the lack of cash flow (cash flow accounts for roughly 6 percent of assets, whereas large companies without financial slack account for more than 13 percent). If there is no cash flow and financial reserves are exhausted, debt capital may remain the only source of finance.

6.2.1.2. Result of Test of CEF with Respect to Leverage

The second segregator between cash flow sensitive and insensitive firms according to the CEF is leverage, measured by the share of equity and the coverage ratio.

As Table 1 shows, if equity is scarce, cash flow is significant and shows stronger influence on investment than for the unconstrained sample. Again the impact of expectations, predicted by the q-theory is stronger for the unconstrained firms. A look at the other balance and off-balance sheet items (Exhibit 10 in Appendix D: Additional Regression Results) shows that in

opposition to the restricted companies, unrestricted firms are mainly driven by future growth opportunities, which are stronger and significant for 9 out of 10 items, and sales, where the difference is less clear. These results still hold, if we separately look at large caps. Growth companies also respond stronger to future growth opportunities, however, against our expectations, also to cash flow, if they are unconstrained. This results are in line with previous findings by Vermeulen (2000) and Behr et al. (1998 and 2000). With respect to the sub sample of growth companies, we do not find support for the costly finance hypothesis.

The second measure for leverage is the coverage ratio. As predicted, for the total sample, the relevance of cash flow is stronger for constrained, and the impact of growth opportunities is stronger for unconstrained companies.[66] Both measures for leverage support hypothesis 2, with respect to large caps, with respect to growth companies we do not find conclusive support for the CEF.

As for financial slack, a separate look at large companies (Table 2) shows that the described effects are - to an even stronger degree - true for large companies. For growth companies, the results are mixed. With respect to the coverage ratio, small companies also seem to display signs of information inefficiencies, whereas we cannot confirm this result with respect to the equity ratio.

An additional look at other balance sheet items shows that for the sub sample with a high equity ratio, cash flow is only relevant with respect to current and immaterial assets. The explanation therefore may be that when access to external capital gets more difficult, cash flow may become the predominant driver of investment, whereas companies which can easily gain access to additional financial resources may nevertheless invest available cash into current assets. This is possible support for the EB hypothesis, which we discuss below.

An additional popular proxy for financial constraints is the dividend pay-out ratio. In contrast to Modigliani and Miller (1958), who propose that dividend policy does not matter in perfect capital markets, the signaling theory states that management can spread information about future cash flows by the amount of cash it distributes to its shareholders.[67] Pay-out ratios as

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[66] In contradiction Behr (2000) rejects the CEF hypothesis based on a distinction of firms along coverage ratios.

[67] See Hartmann-Wendels (1987) pp. 230f.

measure of financial constraints have, however, also been heavily under attack.[68] Nevertheless, we initially included them as an additional variable. Our results show that in accordance with Gilchrist and Himmelberg (1998) a split of the sample according to pay-out ratios does not support the CEF. Hence, we decided to drop this ratio, the detailed regression results are available from the authors upon request.

Summarizing the results with respect to financial slack and leverage, we find that in line with the literature splits according to four different variables, which all serve as proxies for financial constraints, show mostly the behavior, which we expected according to the CEF. Cash flow is more relevant for the sub sample, which we defined as financially constrained, whereas future growth opportunities show a higher explanatory power for investment of the sub sample of unconstrained firms. In addition to the existing literature, we show, that these results hold only with regard to large companies whereas the results with respect to growth companies are mixed. An additional look at current assets reveals that investment in this asset class also is affected by information asymmetries. Investment in human capital seems not to be restricted by costly external finance related problems.

6.2.1.3. Results of Test of CEF with Respect to Credit Worthiness

For the reasons described in section 4.3., we expect companies with a lower credit rating to depend on cash flow more strongly, as access to external capital is less favorable for them. Investment of companies with an excellent rating should on the other hand depend on output, cost of capital and Tobin's q, and not on cash flow, as the easy access to (nearly risk free) external capital should prevent them from liquidity constraints. Listed, but not rated companies should face larger information asymmetries than the ones with a rating. In addition they could possibly depend on q more strongly, as they may depend on equity finance, which is in general easier when expectations are optimistic and, hence, prices - and consequently q - are high.

As Exhibit 12 shows, the sub sample with a low rating has - as we predicted the largest cash flow sensitivity. Companies with an Axx rating show, as expected, a - marginally - lower cash flow sensitivity. Companies without rating do depend, however, to a much lesser degree on cash flow.

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[68] As Kaplan (2000) demonstrates, the example of Microsoft shows that there are profitable companies, which do not pay dividends in order to pursue growth strategies

The data does neither support hypothesis 3a, nor hypothesis 3b. However, the studies demonstrating the expected effects focused on the US, whereas our results are based on a European sample. Hence we expect the different pattern to be partly caused by the high number of companies, which are unrated in Europe, even though their credit worthiness would live up to an excellent rating.

In addition the results with respect to investment in current assets, human capital and immaterial assets (Exhibit 12 in Appendix D: Additional Regression Results) we can show that these items are as restricted as balance sheet items.

6.2.2. Empire Building Hypothesis

With the previous tests, we found some evidence for the CEF, however, also indications for the EB hypothesis. In the following, we explicitly test the EB hypothesis by comparing the cash flow sensitivity of two sub samples, split along the ownership variable, defined in chapter 4.4.. According to hypothesis 4, a high concentration of ownership, i.e. the existence of block holders, should reduce the respective sensitivity.

As Table 2 and Table 3 show, we find that indeed both sub samples of companies with block holders (large caps and growth companies) shows a lower cash flow sensitivity than the sub sample without shareholders with a share of more than 25 percent. The better part of the literature (e.g., Kadapakkam et al. (1998) and (Devereux (1989)) predicts large caps to be unimmunized to empire building behavior, whereas the studies, which explicitly focus on ownership structure do not report differences according to size. Our results confirm the latter studies, showing decreasing cash flow sensitivities in the presence of a block holder. Companies with a block holder are stronger driven by expectations, however this effect is only significant for large caps.

7. CONCLUSION

We have examined the explanatory power of liquidity and growth opportunities measured by Tobin's q for different sub samples of companies. We thereby split our panel into two sub samples, according to eight different variables and predicted differences according to the empire building (EB) and the costly external finance (CEF) hypothesis. The majority of our equations support the two hypotheses. We identified several ways to test the CEF. With respect to financial slack and leverage, we tested five different proxies, of which four support

the CEF. A cut according to credit worthiness, which in the past has only been tested for the US shows less clear results, reflecting the different role ratings play in Europe. In addition to previous studies, we thereby show that both large caps and - however, to a much lesser extent - small growth companies are affected by information asymmetries which potentially lead to underinvestment, not only with respect to fixed assets, but also regarding current assets. Expansion in work force seems to be largely immune to respective effects.

With respect to the EB hypothesis, we find that block holdings reduce the influence of cash flow and in return increase the one of future growth opportunities. We confirm previous findings, which identify empire building behavior as explanation for investment-cash flow sensitivities and in addition can show that the resulting overinvestment concerns not only fixed assets but also other balance and off balance sheet (i.e. immaterial assets; "burned" cash) items. Small growth companies in addition seem to overinvest with respect to intangible fixed and current assets.

We conclude that for large as well as for growth companies in Europe in the 1990s, costly external finance effects and empire building behavior can be observed. These effects lead - with respect to different balance- and off balance sheet items - to a level of investment that may differ from the optimal one, either in terms of overinvestment triggered by managers, who do not act on behalf of their shareholders or in terms of underinvestment caused by information asymmetries.

Future studies, which use simple measures as size or age as a proxy for financial constraints or managerial incentives should be aware of the fact that both effects can be found for large, mature and small, young firms.

In terms of policy implications; we find that block shareholders have a positive impact on by reducing cash flow-investment sensitivities of large caps. One way to increase the power of small shareholders is by giving them minority rights and stronger supervisory powers. Problems caused by a wedge between costs for external and internal finance can be decreased by giving companies access to efficient debt capital markets. The promotion of such markets as well as of rating standards available and affordable for smaller companies will help to reduce the problem.

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Appendix A: Overview of the Empirical Literature

Empirical literature on the impact of liquidity on investment can be categorized into two groups. The first one merely tests whether cash flow is a significant driver of investment, whereas the second one is interested in the question why this is the case.

General Literature on Cash Flow-Investment Sensitivities

The evidence for the relevance of cash flow for investment is striking. Authors almost unanimously report liquidity to be a strong driver. In a broad study of more than 6.500 SMEs between 1987 and 1997 by the Bundesbank (2001), it is found that cash flow among other factors significantly influences investment in Germany. Alonso-Borrego and Bentolila (1994) find liquidity to be relevant for Spanish firms between 1983 and 1987 while testing the significance of a q model. Carpenter, Fazzari and Petersen (1998) show that investment of inventories is strongly influenced by the availability of internal finance, which is best measured by cash flow. Minton and Schrand (1999) examine the reduction of investment due to higher cash flow volatility, which, according to their study is associated with a higher likelihood of a firm needing to access capital markets and with higher costs for doing so. Thereby they also find that, as expected, investment is determined by the level of cash flow. Lamont (1996) shows that a decrease in cash flow, which is independent of business opportunities, negatively affects investment, by examining the investment behavior of non-oil subsidiaries of oil companies after a sharp decrease in oil price. Funke, Maurer, Siddiqui and Strulik (1998) add an additional aspect to the discussion, by testing the significance of external finance and supporting the hypothesis that investment behavior cannot be analyzed independently of the availability of (internal and external) liquidity. Samuel (1996) uses panel data from the US between 1972 and 1990 to perform a horse race between different theories on investment, capturing the influence of liquidity, output, cost of capital and growth opportunities. He finds cash flow to be the single-most determinant of capital expenditures. Against the majority of studies, Bond and Cummins (2001) find that the impact of cash flow can be mitigated to insignificance by the utilization of an innovative measure of q. Despite the fact that various measures of marginal q have been constructed by different authors, they conclude that the often observed failure of q models to explain investment is caused by a measurement error of actual q and that liquidity does not play a role for investment, apart from serving as proxy for growth opportunities. While the studies described above clearly show that liquidity plays a crucial role for investment, they do not answer the question why this is the case. In the literature, evidence for asymmetric information and principal agent conflicts is described.

Additional Empirical Evidence of the CEF Hypothesis

The better part of articles on the CEF follows the rational of Fazzari (1988). In addition to the studies presented in section 3.1 e.g. Chapman and Stegman (1996) support them with respect to 58 Australian firms, using almost the same methodology. Kaplan and Zingales (1995, 1997, 2000) are the spearhead of criticism of the paper of Fazzari et al. (1988) and the thereby triggered literature. They report empirical evidence and theoretical explanation, why

investment-cash flow sensitivities should provide no useful measure of financing constraints. They examine the firms, which are constrained according to Fazzari et al. (1988) case by case and report only 15 percent of firm-years to actually be in a financial squeeze, whereas for the rest of the sample additional external finance would have been available. Strikingly, they find the firms, which actually are restricted, to be less sensitive to cash flow than the others. They conclude that cash flow acts as a proxy for investment opportunities and that managers apparently choose to rely on internal funds despite the availability of additional external capital. The theoretical explanation therefore may be that cash flow sensitivity may not increase monotonically with financial constraints for two reasons. On one hand constrained companies may decide to hoard cash flow precautionary, rather than spend it and on the other hand adjustment costs to cash flow shocks (e.g. the costs for not finishing the construction of a facility) may decrease cash flow sensitivity. Fazzari et al (2000) in reply criticize Kaplan et al.'s approach, to which they respond in Kaplan et al. (2000). Despite the fact that the debate is yet unresolved, there seems to be conclusive support for the hypothesis that information asymmetries leads to cash flow-investment sensitivities. However, there seem to be additional reasons behind the impact of cash flow.

An alternative way to observe the wedge between internal finance and external debt capital, in the tradition of Hoshi et al. (1991) is to distinguish between countries with different financial systems. An additional part of the literature tests different behavior of sub samples which are more likely to overcome information asymmetries. Hoshi, Kashyap and Scharfstein (1991) examine the effect of institutional ties between banks and companies. A membership in a Japanese keiretsu (a group of companies with traditionally close ties between each other), in which also a bank is integrated, reduces the cash flow sensitivity of a firm. Shin and Park (1999) confirm these findings with respect to chaebols, the Korean equivalent to Keiretsus. Valderrama looks at the existence of an interest rate channel in Austria in the 1990 and thereby finds that liquidity is the most important determinant of investment. She also shows that this effect can be diminished by using trade credits or having a close relationship to a house bank. Behr et al. (1998) in contradiction find no "house bank"-effect for Germany. A bank oriented system with close ties between lenders and borrowers could help to overcome asymmetric information inefficiencies, and pave the way to external funds. Bond, Mairesse and Mulkay (1997) show that firms in the UK are more sensitive to cash flow than firms in the three continental countries Belgium, Germany, and France. The UK's market-oriented system could lead to stronger financial constraints than the other countries' bank-based system. Mulkay, Hall and Mairesse (2000) examine investment in capital goods and R&D in France and the US between 1982 and 1993. They find that cash flow matters for capital as well as R&D investment in the US, but for neither of them in France.

Based on aggregate data, Kadapakkam and Kumar (1998) examine the influence of cash flow on investment in six OECD countries. The magnitude of the cash flow variable is largest for the UK and smallest for the US, with Germany, Canada, France and Japan lying in between, which contradicts the findings explained above.

Managerial Incentives

In addition to the literature described in section 3.2, Gugler, Mueller and Yurtoglu (2000) explicitly distinguish between information asymmetries and managerial discretion as explanation of cash flow sensitivity of investment. They distinguish between companies with returns on investment above and below their cost of capital. Investment of the former ones (i.e. potential underinvestment) is likely to be constrained by information asymmetries, whereas the others are potential victims of overinvestment due to managerial discretion. Cash flow is actually relevant for both groups. Additionally they show that a high stock market valuation decreases the effect for constrained firms, which can be explained by easier access to capital markets, if prices are high, whereas cash flow sensitivity increases for the potentially over investing group. This is consistent with the observation that managers of highly valued companies may feel "safe" from being taken over and expand their "empire" beyond the optimal point for their shareholders. Additional support for the EB comes from Blanchard et al. (1994), who scrutinize the behavior of firms after business independent cash windfalls (e.g. from the settlement of a lawsuit). They find an increase of investment despite the lack of attractive business opportunities. The cash flow was distributed, if at all, only to large shareholders or as executive compensation. This pattern can probably best be explained by managerial incentive problems. Shin et al. (2002) find that firms invest relatively more in the final quarter of their fiscal year, albeit this investment is less responsive to changes in business opportunities. As this effect is stronger for large firms and firms with large cash holdings he concludes that managerial incentive problems are the reason for it. Kathuria and Mueller (1995) distinguish between underinvestment caused by financial constraints and overinvestment due to empire building behavior. They find that not only companies, which they expect to be financially constrained albeit profitable depend on cash flow, as the CEF hypothesis would predict. They interpret the strong positive relationship between cash flow and investment of firms that have returns on investment below their cost of capital as evidence for managers to overinvest in favor of their own position. Hadlock (1998) further analyzes the impact of ownership. High insider ownership should decrease empire building behavior, as the increased share of profit would decrease the desire of managers to overinvest in non-optimal projects to increase their "empire", which is the case at a higher level of ownership.

A number of additional studies show that personal attributes of management substantially influence investment behavior, a fact which can hardly be explained by financial constraints stemming from asymmetric information. Malmendier (2002) shows that managerial overinvestment is not a general phenomenon, but depends on what the CEO of a company is like. Lundstrum (2002) finds additional evidence for the impact of management attributes on investment by showing that R&D investment decreases with the age of the CEO.

Appendix B: Description of Data Sub Samples

In the following, we describe how the sub samples[69] differ in terms of size, profitability, q, cash flow, investment ratio and cash stocks. To capture the differences, related to these variables, we report the statistics separately for large caps and growth companies, as the systematic differences between the two sub samples (see Exhibit 1 in section 5.1) would otherwise massively distort the picture. The companies, which we expect to be influenced by cash flow are shaded, whereas the columns for the ones, which should be independent of liquidity and driven by future growth opportunities are white.

Split along Availability of Financial Slack

The first cut is the one between firms with and without financial slack measured as cash divided by fixed assets (Exhibit 2), of which the former ones hold about twice as much liquidity in the case of large caps and three times as much in the case of growth firms. Both large and growth companies with large cash holdings are smaller and invest less (sic!) than the comparison group, even though this difference is less striking for the large caps. With respect to the other dimensions there is no systematic difference between the two sub samples.

If we take the second measure, cash and stocks divided by current liabilities (Exhibit 3), the picture looks similar. However, the difference with respect to size (growth firms) and q (large firms) largely disappears. If cash flow should nevertheless remain significant for the companies without financial slack in opposition to the others, which are expected to be influenced by q, we would take this as a strong indication of the CEF hypothesis.

Split along Leverage

The second indicator is a company's leverage. Measured in the simple form of dividing equity by total assets (Exhibit 4), companies with high leverage are larger and less profitable (measured both in terms of actual profit, cash flow and q as indicator for respective future growth opportunities). This is true for both large and growth firms. There are minor differences with respect to cash holdings and the investment rate.

If we measure leverage by the coverage ratio (Exhibit 5), which also differentiates along the asset structure of a firm, we get a similar picture. In terms of profitability the spread between the high leverage and the low leverage large caps decreases somewhat, whereas the investment ratio of the high leverage (sic!) firms exceeds the one of the other sub sample by far. With respect to growth companies the story is somewhat different. Whereas the gap in terms of size, profitability, cash holdings and investment widens, low gearing firms according to this second measure face a higher q.

Split along Credit Worthiness

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[69] The sub samples described below differ somewhat from the total sample above, as they include only the firm years for which all relevant data for the regression is available.

Our last variable to test whether the impact of liquidity can be explained by the CEF hypothesis is credit worthiness. The sample contains only companies from the large firm sample, as there are too few growth companies (a single digit number) with a credit rating in our sample. In opposition to the splits above, in the case of credit ratings, the sub sample of companies, which we expect to be influenced by cash flow, is on average smaller than the others (Exhibit 6). This allows us, in the case of mutual support of the hypothesis, to rule out size as the dominant factor. The other variables show little difference between the different sub samples with one exception. Total investment of companies with a bad rating is almost twice as large as the one of both Axx rated and unrated firms.

Split along Ownership Structure

The last variable allows us to isolate firms which are potentially more strongly exposed to empire building than others. Companies without block holders, which should be more vulnerable to cash flow shocks are on average smaller than the comparison group (Exhibit 7). The two sub samples of large companies are remarkably homogeneous, whereas there are vast differences with respect to growth firms. They are more profitable (in fact the growth firms without block holders deliver on average a negative result), however, show a much higher investment rate.

Considering all seven splits, the sub samples, which we expect to be cash flow sensitive are diverse, even though the variables which serve as predominant proxy for financial constraints, are somewhat correlated, with a correlation coefficient of around 0.5 for membership of any two of the four. With respect to size of large caps, for example, we expect in four cases the sub sample of firms with more assets to be cash flow sensitive, whereas in three cases the sample which is smaller, should exhibit a larger cash flow-investment sensitivity.

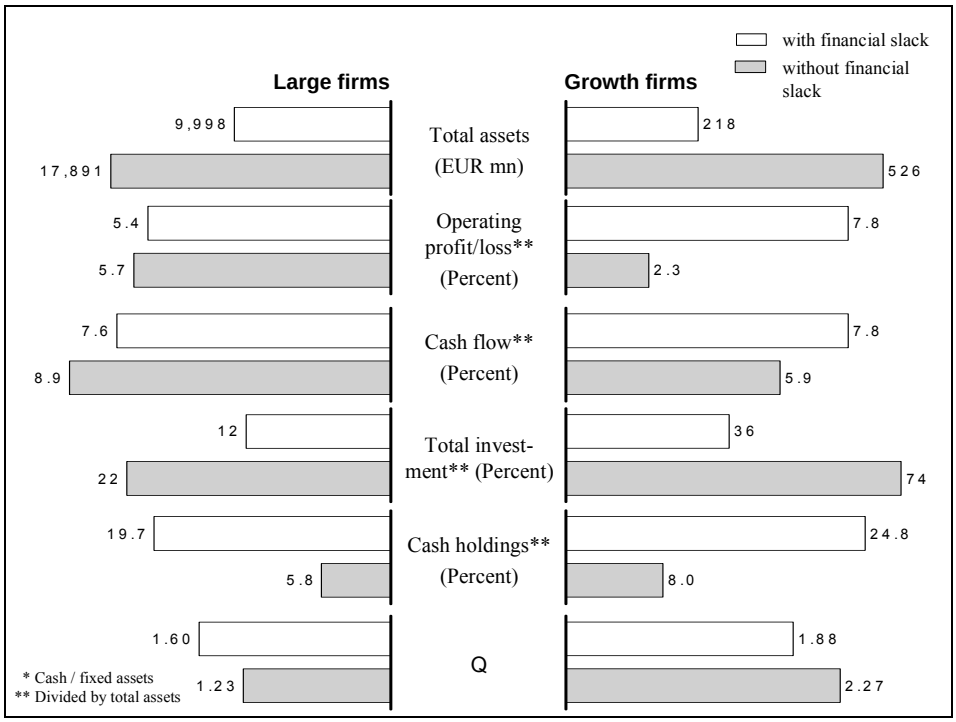

Exhibit 2: Average key ratios of sub samples with and without financial slack measured as cash/fixed assets

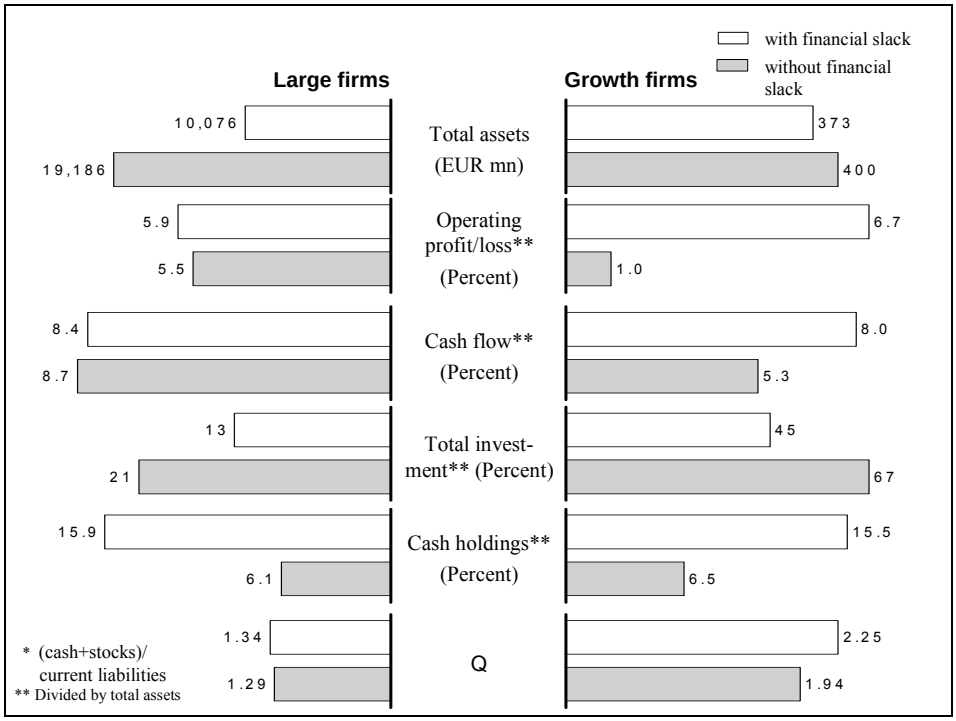

Exhibit 3: Average key ratios of sub samples with and without financial slack measured as (cash + stocks)/current liabilities

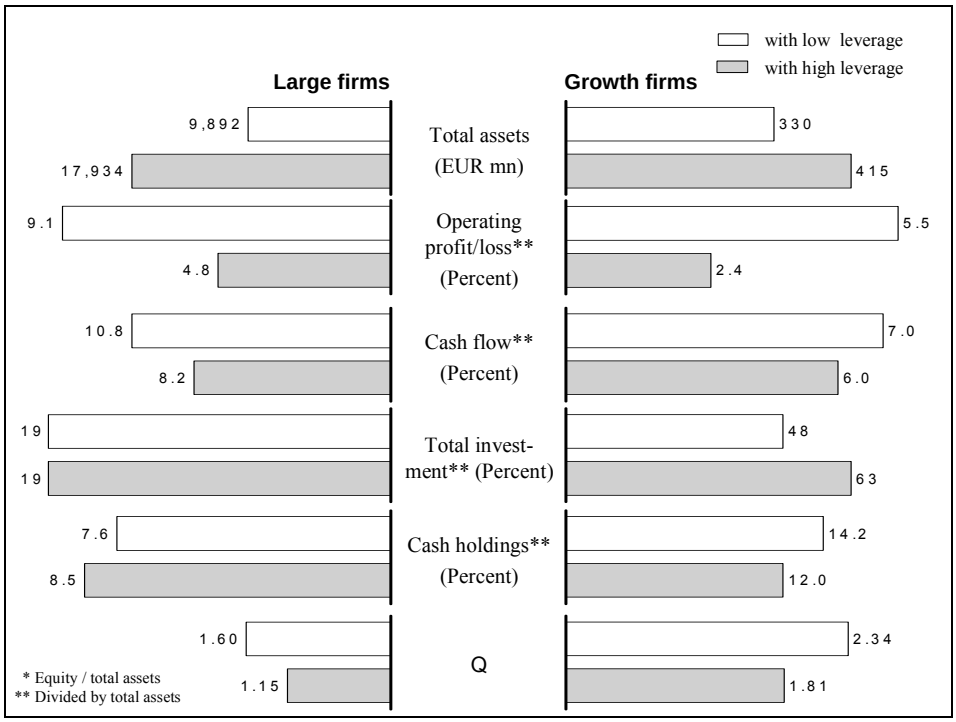

Exhibit 4: Average key ratios of sub samples with high and low leverage measured as equity/ total assets

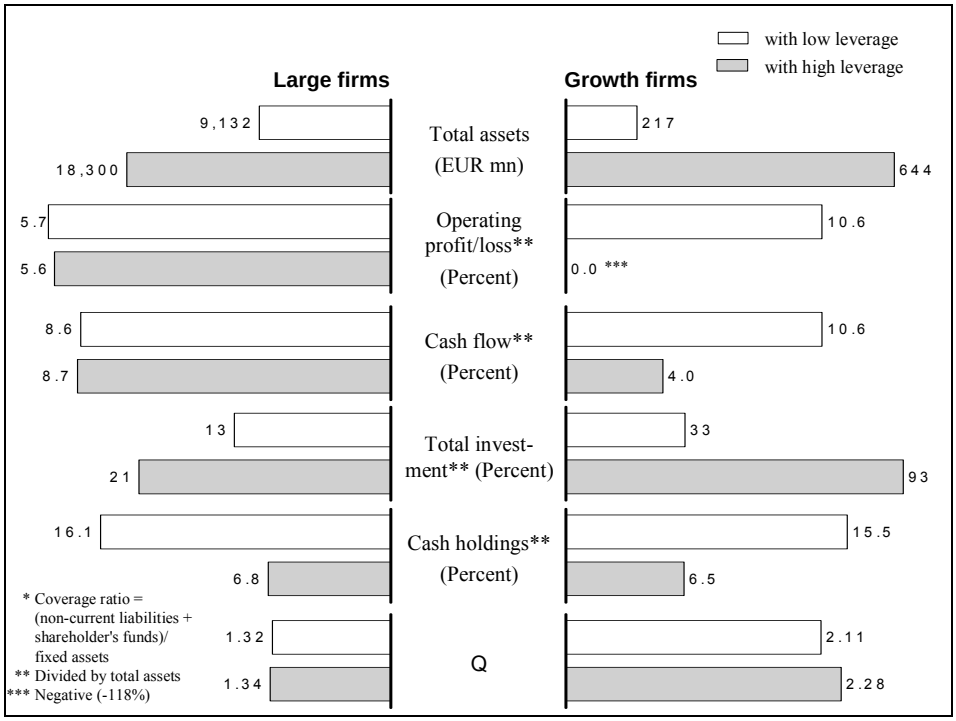

Exhibit 5: Average key ratios of sub samples with high and low leverage measured as coverage ratio

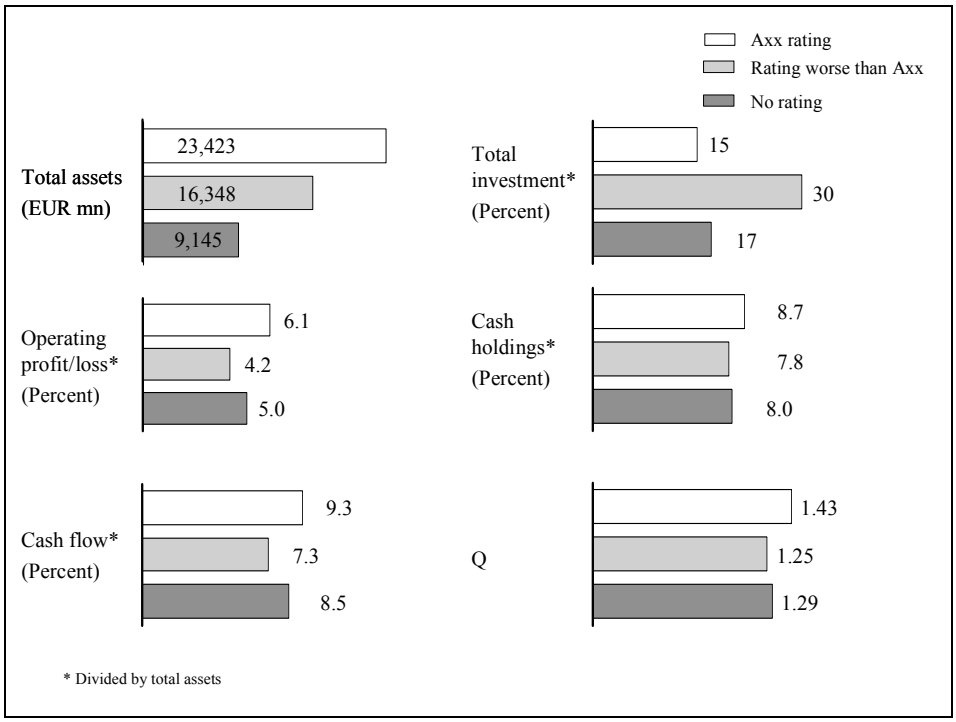

Exhibit 6: Key ratios of sub samples of large companies with credit rating of Axx, below Axx and without rating

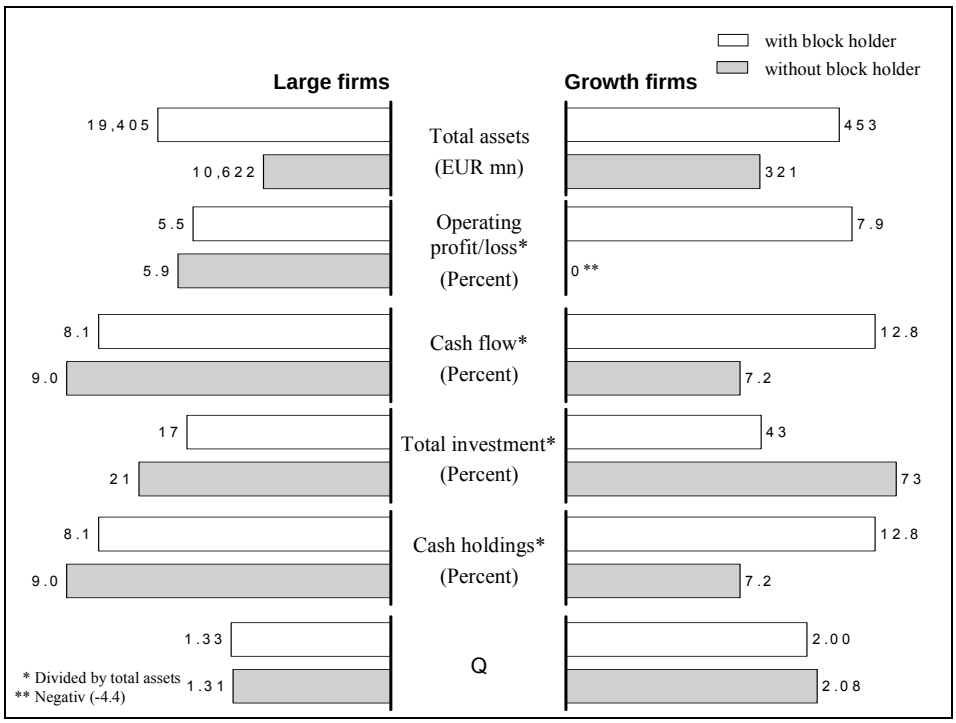

Exhibit 7: Average key ratios of sub samples of with and without block holders

Appendix C: Definition of Control Variables

Future Growth Opportunities (Tobin's q)

Future growth opportunities ideally would be measured by marginal q, which, however, is unobservable.[70] In contrast to few other authors, who use general proxies for Tobin's q (e.g., stock index divided by price index, return on capital divided by cost of capital,[71] return on invested capital divided by cost of capital,[72] econometric forecasts[73]), we follow the majority, who calculate average q explicitly, based on proxies for market value and book value at replacement.

$$q = \frac{E_{(MV)} + De_{(MV)}}{A_{(r)}}$$

Equation 4: Tobin's q

The numerator consists of the sum of the market values of debt and equity.[74] Market value of equity thereby is compound of the market value of common stock plus the market value of preferred stock. Whereas the value of common stock is simply the number of outstanding shares multiplied by its year-end price, preferred stock by some authors is valued by capitalizing its dividend as a perpetuity.[75]

We use upon availability the compound market value of equity and debt at the beginning of the fiscal year, which is published by Bloomberg or alternatively the beginning of year market value of equity from Datastream and add the value of long term debt.[76] By taking the valuation of a single day at the beginning of the fiscal year[77], high level of noise could be included. Previous results, however, suggest that using time averaged market valuations does not radically improve the results.[78]

As market value of debt is considerably harder to calculate and on the other hand is less volatile than the one of equity, we use book value of debt from the OSIRIS database as a proxy[79] for market value of debt, when total market value is not available. Thereby we follow Gehrke (1994) and take debt at book value.

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[70] See Tobin (1969), and Hayashi (1982)

[71] See Behr (2000) p. 264f or Gugler (2000) pp. 6ff

[72] See Jenkinson (1981) p. 52.

[73] See Abel (1986) pp. 252ff.

[74] See Brainard (1977) p. 249; an alternative formulation leading to the same result was introduced by Kaplan (1997): He uses the book value of assets plus the market value of common equity less the sum of the book value of common equity. An alternative approach is to calculate q based only on market and book value of equity (see Gehrke (1994) p. 127.

[75] See Whited (1992) pp. 1456f and Fazzari (1988) pp. 192ff.

[76] A similar approach is chosen by Kadapakkam (1998) p. 303.

[77] The respective market valuation is actually taken from the last day of the previous fiscal year of the company, which is December 31st in most, but not in all cases; by selecting this value we avoid possible endogenity problems.

[78] See Alonso-Borrego (1994) pp. 59.

[79] Kathuria (1995) chooses the same approach and argues that experiments with estimated market values regressed on book values yielded coefficients of 1.0 with R^2s of 99 percent (p. 231); Barro (1990) for example finds that the fluctuation of q is dominated by the growth rate of the market value of equity, in comparison to fluctuations in market value of debt are minor (p. 120); alternative approaches are to adjust book value of debt by the method of Bernanke and Campbell (1988) (see

The denominator of Equation 4 consists of the replacement cost of assets. Liquid securities, inventories, and accounts receivable are regularly accounted for at a market value.[80] For assets such as goodwill or patents other than book values are hardly available.[81] The value of physical capital can be calculated by using a recursion technique, however, there are a number of uncertainties within the respective calculations, which are likely to rather decrease than increase the accuracy of the calculation.[82] In addition, the rather short time series of our panel and the low inflation rate in the 1990s would only lead to a limited adjustment.

Structural shifts like the rise in energy prices in the 1970s may lead to a faster devaluation of existing assets. However, empirical studies find little evidence for this "capital mismeasurement" hypothesis.[83] As all improvements obtained from these more involved computations of q are fairly limited,[84] we take the book values taken from OSIRIS.

For a practical reason, we use the same q for all different kinds of investment. It is not possible to divide market value among different balance sheet items. Given the long list of problems associated with q, starting with the unobservability of marginal q, we expect this uniform q to be an acceptable proxy for the different equations.

Output

The best proxy for output are sales. Some authors additionally adjust that figure by change in finished goods or in case of not reported numbers by an industry average percentage of total inventories.[85] We use the sales number directly taken from OSIRIS, divided by total assets. In order to be consistent with the theoretical framework we use change of sales.

User Cost of Capital

The rate of interest of debt (i.e., bond rate or treasury bill rate) is both an easy accessible and well usable proxy for cost of capital.[86] Consequently, we chose to use the secondary market rate (yield of government bond, beginning of month) from the respective country at the first day of the fiscal year of the company.[87]

Whited (1992) p. 1457) or calculate its market value by dividing the reported interest expenses by a market interest. (inter alia, Hoshi (1991) pp. 44f).

80 See Behr (1998) p. 41ff.

81 See Hoshi (1991) p. 45.

82 See Gehrke (1994) p. 52.

83 See Chirinko (1993a) p. 1890.

84 Inter alia Kaplan (1997) p. 177 and Fazzari (1988) p. 166; additionally we want to emphasize that a systematic bias of q across the whole sample (e.g., due to the prohibition to take certain items onto the balance sheet) should not change the result of our regression.

85 See Whited (1992) p. 1455.

86 See Elliott (1980) pp. 982f and 994.

87 Source: Datastream.

Appendix D: Additional Regression Results

Constrained companies driven by liquidity, output, and interest not constrained by q

xyz Sign as expected (i.e. positive for sales, CF and q, negative for interest); significant and stronger than comparison group

xyz Sign as expected

Standardized coefficients (beta)

		Total Assets	Fixed Assets	Tangible Fixed Assets	Intangible Fixed Assets	Current Assets	Stocks	Debtors	Cash	Employees	Immat Assets
Restricted	ΔSales	0.216 ***	0.201 ***	0.170 ***	0.070 +	0.357 ***	0.135 ***	0.356 ***	0.129 ***	-0.128 **	0.116 **
	CF	0.272 ***	0.175 ***	0.116 **	0.122 ***	0.303 ***	0.192 ***	0.254 ***	0.234 ***	-0.029	0.100 *
	Interest	-0.134 ***	-0.189 ***	-0.060	-0.067 +	-0.171 ***	-0.136 ***	-0.168 ***	-0.056	-0.090 +	0.052
	Q	0.193 ***	0.187 ***	0.113 **	0.229 ***	0.122 ***	0.166 ***	0.162 ***	-0.014	0.049	0.172 ***
	n	*510*	*499*	*497*	*466*	*510*	*497*	*503*	*510*	*299*	*396*
Not restricted	ΔSales	0.188 ***	-0.078 +	0.195 ***	0.017	0.231 ***	0.181 ***	0.055	0.158 ***	0.040	0.039
	CF	-0.178 ***	0.136 ***	-0.175 ***	0.020	0.018	0.108 **	0.071 +	0.014	0.009	0.333 ***
	Interest	-0.107 **	-0.120 **	-0.025	-0.055	-0.082 +	-0.247 ***	-0.099 **	-0.032	-0.102 +	0.047
	Q	0.392 ***	0.318 ***	0.318 ***	0.342 ***	0.287 ***	0.145 ***	0.393 ***	0.131 **	0.345 ***	0.147 **
	n	*385*	*374*	*381*	*305*	*385*	*368*	*383*	*385*	*233*	*244*
LARGE											
Restricted	ΔSales	0.264 ***	0.214 ***	0.176 ***	0.119 ***	0.300 ***	0.271 ***	0.250 ***	0.142 ***	-0.088	0.090 *
	CF	0.636 ***	0.409 ***	0.247 ***	0.726 ***	0.466 ***	0.177 ***	0.655 ***	0.082	0.059	0.083
	Interest	-0.137 ***	-0.161 ***	-0.067	-0.132 ***	-0.184 ***	-0.125 ***	-0.142 ***	-0.087 *	-0.103 *	0.039
	Q	-0.165 ***	-0.095 *	-0.115 **	-0.178 ***	-0.115 ***	0.005	-0.298 ***	0.101 *	-0.120	0.153 **
	n	*414*	*409*	*402*	*384*	*414*	*409*	*410*	*414*	*264*	*368*
Not restricted	ΔSales	0.320 ***	0.181 ***	0.180 ***	0.119 *	0.307 ***	0.182 ***	0.204 ***	0.064	0.238 ***	-0.093
	CF	0.203 ***	0.273 ***	0.255 ***	-0.106	0.239 ***	0.181 **	0.233 ***	0.279 ***	0.096	0.144 *
	Interest	-0.045	-0.017	-0.035	0.106 +	-0.047	-0.138 **	-0.049	-0.075	-0.066	0.048
	Q	0.257 ***	0.145 **	0.016	0.132 *	0.230 ***	-0.001	0.236 ***	0.087	0.104	0.249 ***
	n	*240*	*232*	*238*	*208*	*240*	*235*	*239*	*240*	*144*	*195*
GROWTH											
Restricted	ΔSales	0.163 +	0.239 **	0.132	0.047	0.459 ***	0.115	0.501 ***	0.141	-0.189	0.256
	CF	0.138	0.111	0.151 +	0.045	0.356 ***	0.033	0.212 **	0.340 ***	-0.044	0.363 *
	Interest	-0.135	-0.336 ***	0.030	-0.052	-0.231 **	0.354 ***	-0.286 ***	-0.043	0.192	0.274
	Q	0.263 **	0.157 +	0.424 ***	0.260 **	0.043	-0.197 *	0.112	-0.042	0.134	0.294
	n	*95*	*89*	*94*	*81*	*95*	*87*	*92*	*95*	*34*	*27*
Not restricted	ΔSales	0.220 ***	-0.086	0.192 **	0.089	0.230 **	0.030	0.008	0.200 **	-0.026	0.220 +
	CF	-0.161 **	0.207 **	-0.293 ***	0.116	0.021	0.245 ***	0.090	0.009	0.030	0.531 ***
	Interest	-0.173 **	-0.223 **	0.018	-0.102	-0.122	0.164 *	-0.146 +	-0.029	-0.174 +	0.034
	Q	0.300 ***	0.226 **	0.329 ***	0.318 ***	0.206 **	0.413 ***	0.271 ***	0.127	0.235 **	0.146
	n	*144*	*141*	*142*	*96*	*144*	*132*	*143*	*144*	*88*	*48*

- Liquidity constraints measured by (cash+stocks)/current liabilities
- Liquidity constrained companies from full and both sub-samples as predicted driven by liquidity
- Expectations (q) in most equations (for all, growth and large companies) more relevant if companies are unconstrained
- Less difference with respect to output and interest

\+ 85% confidence interval ** 95% confidence interval

* 90% confidence interval *** 99% confidence interval

Exhibit 8: Regression results of sub samples according to cash and stocks divided by current liabilities

xyz Sign as expected (i.e. positive for sales, CF and q, negative for interest);significant and stronger than comparison group

xyz Sign as expected

Standardized coefficients (beta)

		Total Assets	Fixed Assets	Tangible Fixed Assets	Intangible Fixed Assets	Current Assets	Stocks	Debtors	Cash	Employees	Immat Assets
Restricted	ΔSales	0.253 ***	0.083 **	0.252 ***	0.053	0.385 ***	0.087 **	0.305 ***	0.161 ***	-0.044	0.106 **
	CF	0.077 **	0.229 ***	-0.039	0.105 **	0.207 ***	0.219 ***	0.170 ***	0.200 ***	-0.123 **	-0.172 ***
	Interest	-0.118 ***	-0.128 ***	-0.048	-0.067 +	-0.165 ***	-0.174 ***	-0.138 ***	-0.075 *	-0.114 **	0.017
	Q	0.373 ***	0.363 ***	0.262 ***	0.334 ***	0.278 ***	0.201 ***	0.351 ***	-0.051	0.274 ***	0.123 **
	n	*605*	*587*	*588*	*553*	*605*	*577*	*598*	*605*	*355*	*465*
Not restricted	ΔSales	0.307 ***	0.033	0.120 **	0.076	0.320 ***	0.245 ***	0.252 ***	0.297 ***	-0.128 *	0.047 ***
	CF	-0.006	0.024	-0.078	0.168 ***	-0.030	0.042	0.048	-0.065	0.140 **	0.292
	Interest	-0.022	-0.043	0.088 +	-0.026	-0.006	-0.147 **	-0.022	0.018	0.044	0.119 +
	Q	0.227 ***	0.311 ***	0.215 ***	0.235 ***	0.172 ***	0.164 ***	0.145 **	0.151 **	0.173 ***	0.033
	n	*332*	*327*	*332*	*244*	*332*	*297*	*329*	*332*	*202*	*416*
LARGE											
Restricted	ΔSales	0.257 ***	0.181 ***	0.194 ***	0.081 **	0.377 ***	0.256 ***	0.235 ***	0.174 ***	0.027	0.067
	CF	0.596 ***	0.371 ***	0.242 ***	0.666 ***	0.363 ***	0.200 ***	0.639 ***	0.111 **	-0.034	0.056
	Interest	-0.093 ***	-0.084 **	-0.046	-0.111 ***	-0.125 ***	-0.130 ***	-0.095 ***	-0.095 **	-0.113 *	0.020
	Q	0.044	0.151 ***	-0.001	0.006	0.087 **	0.042	-0.123 ***	0.152 ***	0.058	0.185 ***
	n	*478*	*469*	*464*	*443*	*478*	*465*	*475*	*478*	*294*	*422*
Not restricted	ΔSales	0.148 **	0.166 **	0.112 +	0.026	0.106 +	0.075	0.170 **	0.037	-0.014	-0.068
	CF	0.288 ***	0.177 *	0.245 **	-0.099	0.371 ***	-0.046	0.257 ***	0.342 ***	0.099	0.249 **
	Interest	-0.138 **	-0.063	0.032	-0.123 +	-0.126 *	-0.074	-0.116 *	-0.091	0.027	0.076
	Q	0.124	0.199 **	-0.016	0.062	0.036	0.158 +	0.042	-0.018	0.040	0.035
	n	*194*	*190*	*194*	*161*	*194*	*186*	*191*	*194*	*120*	*151*
GROWTH											
Restricted	ΔSales	0.200 **	0.065	0.330 ***	0.080	0.401 ***	-0.036	0.357 ***	0.141 +	-0.089	0.240 *
	CF	-0.109	0.165 *	-0.204 **	0.031	0.159 **	0.250 ***	0.055	0.200 **	-0.184	0.528 ***
	Interest	-0.179 *	-0.289 ***	-0.045	-0.094	-0.275 ***	-0.330 ***	-0.235 ***	-0.085	-0.106	0.083
	Q	0.250 ***	0.218 **	0.384 ***	0.264 **	0.108	0.028	0.259 ***	-0.145 +	0.189	0.097
	n	*126*	*117*	*123*	*109*	*126*	*111*	*122*	*126*	*60*	*42*
Not restricted	ΔSales	0.384 ***	0.021	0.116	0.197 *	0.388 ***	0.415 ***	0.304 ***	0.359 ***	-0.149	0.225
	CF	0.010	0.060	-0.149 *	0.334 ***	-0.044	0.150 +	0.065	-0.102	0.289 ***	0.298 **
	Interest	0.028	-0.031	0.194 **	0.000	0.057	-0.264 ***	0.033	0.088	0.073	0.235 +
	Q	0.211 **	0.248 ***	0.182 *	0.318 ***	0.149 *	0.123	0.107	0.149 *	0.214 *	0.198
	n	*137*	*136*	*137*	*82*	*137*	*110*	*137*	*137*	*81*	*43*

Liquidity constraints measured by cash/fixed assets

\+ 85% confidence interval ** 95% confidence interval

* 90% confidence interval *** 99% confidence interval

Exhibit 9: Regression results of sub samples according to cash divided by fixed assets

Regression results of sub samples with high and low leverage

xyz Sign as expected (i.e. positive for sales, CF and q, negative for interest); significant and stronger than comparison group

xyz Sign as expected

Standardized coefficients (beta)

		Total Assets	Fixed Assets	Tangible Fixed Assets	Intangible Fixed Assets	Current Assets	Stocks	Debtors	Cash	Employees	Immat Assets
Restricted	ΔSales	0.277 ***	0.082 **	0.206 ***	0.066 +	0.449 ***	0.136 ***	0.370 ***	0.237 ***	-0.115 **	0.153 ***
	CF	0.064 *	0.198 ***	-0.048	0.091 **	0.219 ***	0.185 ***	0.160 ***	0.233 ***	-0.121 **	0.148 ***
	Interest	-0.136 ***	-0.155 ***	-0.049	-0.076 *	-0.153 ***	-0.154 ***	-0.141 ***	-0.081 **	-0.076	0.026
	Q	0.322 ***	0.288 ***	0.226 ***	0.320 ***	0.203 ***	0.198 ***	0.275 ***	-0.016	0.070	0.176 ***
	n	569	551	552	509	569	548	561	569	336	445
Not restricted	ΔSales	0.262 ***	0.048	0.208 ***	-0.114 *	0.282 ***	0.189 ***	0.214 ***	0.242 ***	-0.031	0.010
	CF	-0.040	0.002	-0.097 *	0.044	-0.034	0.106 *	0.041	-0.057	0.171 ***	0.270 ***
	Interest	-0.026	-0.117 **	0.025	-0.087 +	0.000	-0.255 ***	-0.024	0.045	-0.004	0.124 *
	Q	0.270 ***	0.408 ***	0.230 ***	0.278 ***	0.201 ***	0.121 **	0.192 ***	0.141 **	0.416 ***	0.006
	n	367	362	367	287	367	326	365	367	220	215
LARGE											
Restricted	ΔSales	0.252 ***	0.173 ***	0.148 ***	0.085 **	0.350 ***	0.273 ***	0.173 ***	0.174 ***	-0.064	0.075 +
	CF	0.614 ***	0.373 ***	0.262 ***	0.690 ***	0.402 ***	0.178 ***	0.720 ***	0.097 *	0.061	0.118 **
	Interest	-0.133 ***	-0.139 ***	-0.078 *	-0.127 ***	-0.138 ***	-0.143 ***	-0.111 ***	-0.100 **	-0.081	0.049
	Q	-0.105 ***	0.020	-0.086 +	-0.112 ***	-0.004	0.017	-0.243 ***	0.108 **	-0.096	0.170 ***
	n	476	468	462	429	476	465	471	476	290	417
Not restricted	ΔSales	0.307 ***	0.318 ***	0.273 ***	0.318 ***	0.231 ***	0.173 **	0.307 ***	0.057	0.193 **	-0.104
	CF	0.256 ***	0.194 **	0.204 **	-0.139 *	0.318 ***	0.177 **	0.216 ***	0.321 ***	-0.002	0.020
	Interest	-0.096 +	-0.054	0.010	-0.180 **	-0.084	-0.104	-0.104 +	-0.014	0.011	0.038
	Q	0.212 ***	0.153 *	-0.032	0.093	0.182 **	-0.021	0.100	0.179 **	0.372 ***	0.180 *
	n	196	191	196	175	196	186	195	196	124	156
GROWTH											
Restricted	ΔSales	0.269 ***	0.069	0.284 ***	0.099	0.540 ***	-0.004	0.486 ***	0.304 ***	-0.176	0.494 **
	CF	-0.037	0.273 **	-0.173 *	0.064	0.242 ***	0.360 ***	0.102	0.291 ***	-0.180	0.368 **
	Interest	-0.153	-0.226 **	0.057	-0.084	-0.170 *	-0.129	-0.175 **	-0.068	0.078	0.004
	Q	0.240 **	0.122	0.384 ***	0.262 **	0.105	0.130	0.249 ***	-0.077	0.013	0.243
	n	92	82	89	79	92	82	89	92	45	27
Not restricted	ΔSales	0.277 ***	0.027	0.184 **	-0.089	0.305 ***	0.282 ***	0.221 ***	0.265 ***	-0.102	0.048
	CF	-0.068	0.062	-0.170 **	0.151 +	-0.084	0.166 **	0.032	-0.131 *	0.258 **	0.393 ***
	Interest	0.002	-0.193 **	0.085	-0.149 +	0.042	-0.425 ***	0.000	0.101	-0.043	0.311 **
	Q	0.185 **	0.351 ***	0.188 **	0.250 **	0.123 +	0.014	0.098	0.091	0.332 ***	0.082
	n	170	170	170	111	170	139	169	170	95	58

Liquidity constraint measured by "Deckungsgrad" (Non-current liabilities+shareholders' funds)/fixed assets)

\+ 85% confidence interval ** 95% confidence interval

* 90% confidence interval *** 99% confidence interval

Exhibit 10: Regression results of sub samples according to coverage ratio

xyz Sign as expected (i.e. positive for sales, CF and q, negative for interest); significant and stronger than comparison group

xyz Sign as expected

Standardized coefficients (beta)

		Total Assets	Fixed Assets	Tangible Fixed Assets	Intangible Fixed Assets	Current Assets	Stocks	Debtors	Cash	Employees	Immat Assets
Low equity share	ΔSales	0.091 **	0.057	0.084 **	0.061	0.100 **	0.025	0.099 **	0.065 +	-0.128 **	0.119 **
	CF	0.257 ***	0.221 ***	-0.002	0.143 ***	0.130 ***	0.162 ***	0.222 ***	0.047	-0.035	0.141 ***
	Interest	-0.101 **	-0.167 ***	-0.052	-0.055	-0.027	-0.174 ***	-0.067 *	0.032	-0.061	0.037
	Q	0.162 ***	0.138 ***	0.077 *	0.252 ***	0.089 **	0.152 ***	0.104 **	-0.002	0.137 **	0.200 ***
	n	575	565	566	499	579	550	575	579	331	444
High equity share	ΔSales	0.309 ***	0.041 **	0.255 ***	0.079	0.302 ***	0.159 ***	0.270 ***	0.189 ***	0.025	0.110 +
	CF	-0.084 *	0.115	-0.106 **	0.024	0.096 *	0.150 ***	0.077 +	0.091 *	-0.008	0.267 ***
	Interest	-0.088 *	-0.117 **	0.049	-0.062	-0.082 +	-0.188 ***	-0.079 +	-0.033	-0.023	0.134 *
	Q	0.448 ***	0.365 **	0.328 ***	0.367 ***	0.294 ***	0.175 ***	0.441 ***	0.129 **	0.397 ***	0.155 **
	n	345	336	341	285	345	312	339	345	215	206
LARGE											
Low equity share	ΔSales	0.072 **	0.091 **	0.085 *	0.116 ***	0.022	0.106 **	0.049 +	-0.135 ***	0.010	-0.022
	CF	0.796 ***	0.462 ***	0.284 ***	0.713 ***	0.550 ***	0.245 ***	0.788 ***	0.213 ***	0.117	0.090 *
	Interest	-0.120 ***	-0.139 ***	-0.086 *	-0.128 ***	-0.090 **	-0.113 **	-0.127 ***	-0.014	-0.075	0.047
	Q	0.186 ***	-0.096	-0.167 ***	-0.158 ***	-0.055	-0.017	-0.240 ***	0.033	-0.215 ***	0.239 ***
	n	470	460	459	420	470	455	468	470	285	405
High equity share	ΔSales	0.375 ***	0.028	0.237 ***	-0.077	0.292 ***	0.397 ***	0.244 ***	0.161 **	0.092	0.107
	CF	0.135 **	0.210 ***	0.139 *	0.264 ***	0.265 ***	0.111	0.092	0.281 ***	0.049	0.185 **
	Interest	-0.054	-0.012	0.034	0.010	-0.135 **	-0.144 **	0.010	-0.137 **	-0.042	0.094
	Q	0.388 ***	0.286 ***	0.084	0.331 ***	0.330 ***	0.010	0.367 ***	0.228 ***	0.414 ***	0.107
	n	191	188	188	173	191	185	187	191	121	158
GROWTH											
Low equity share	ΔSales	0.188 *	0.068	0.143 +	0.062	0.273 ***	-0.143	0.246 **	0.281 ***	-0.282 *	0.450 ***
	CF	-0.027	0.111	-0.198 **	0.085	-0.051	0.193 *	-0.044	-0.067	0.114	0.457 ***
	Interest	-0.112	-0.337 ***	0.033	-0.012	-0.034	-0.354 ***	-0.052	0.035	-0.098	-0.016
	Q	0.186 *	0.065	0.199 *	0.339 **	-0.032	0.077	0.025	-0.105	0.347 **	-0.101
	n	108	104	106	78	108	94	106	108	45	38
High equity share	ΔSales	0.322 ***	0.102	0.297 ***	0.146 +	0.315 ***	0.177 *	0.353 ***	0.171 **	-0.009	0.148
	CF	-0.082 **	0.185 **	-0.180 **	0.090	0.108	0.276 ***	0.176 **	0.059	-0.023	0.414 ***
	Interest	-0.119	-0.222 **	0.077	-0.103	-0.072	-0.274 ***	-0.151 *	0.009	0.020	0.208
	Q	0.343 ***	0.292 ***	0.380 ***	0.303 ***	0.217 **	0.066	0.381 ***	0.086	0.247 **	0.287 *
	n	153	147	188	111	153	126	187	153	93	47

Equity share = Shareholders' funds/total capital

\+ 85% confidence interval ** 95% confidence interval

* 90% confidence interval *** 99% confidence interval

Exhibit 11: Regression results of sub samples according to equity share

xyz Sign as expected (i.e. positive for sales, CF and q, negative for interest); significant and stronger than comparison groups

xyz Sign as expected

Standardized coefficients (beta)

		Total Assets	Fixed Assets	Tangible Fixed Assets	Intangible Fixed Assets	Current Assets	Stocks	Debtors	Cash	Employees	Immat Assets
not rated	Δ Sales	0.275 ***	0.139 ***	0.304 ***	0.037	0.299 ***	0.279 ***	0.316 ***	0.104 **	0.174 **	-0.024
	CF	0.175 ***	0.210 ***	0.115 *	0.204 ***	0.260 ***	0.163 **	0.134 **	0.276 ***	0.083	0.011
	Interest	-0.143 ***	-0.124 **	-0.054	-0.116 **	-0.093 *	-0.055	-0.032	-0.056	-0.046	0.021
	Q	0.322 ***	0.226 ***	0.090	0.241 ***	0.238 ***	0.043	0.227 ***	0.185 ***	0.129 +	0.072
	n	*306*	*303*	*301*	*294*	*306*	*288*	*301*	*306*	*192*	*262*
Axx	Δ Sales	0.464 ***	0.303 ***	0.237 ***	0.163 **	0.558 ***	0.227 ***	0.282 ***	0.200 ***	0.219 ***	0.188 ***
	CF	0.141 *	0.350 ***	0.261 ***	-0.068	0.015	-0.083	0.003	0.141 *	-0.377 ***	-0.123 *
	Interest	-0.068	-0.050	-0.053	-0.192 ***	-0.087 *	-0.162 ***	-0.232 ***	-0.048	-0.088	0.042
	Q	0.023	-0.136 *	-0.120	0.059	0.127 *	0.174 **	0.071	-0.006	0.568 ***	0.291 ***
	n	*241*	*236*	*237*	*209*	*241*	*239*	*240*	*241*	*131*	*207*
> A	Δ Sales	0.193 ***	0.228 ***	0.072	0.058	0.159 **	0.208 **	0.124 ***	0.097	-0.268 **	-0.068
	CF	0.795 ***	0.565 ***	0.520 ***	0.861 ***	0.726 ***	0.422 ***	0.972 ***	0.099	0.227 +	0.320 ***
	Interest	-0.087 *	-0.125 +	-0.033	-0.014	-0.145 **	-0.247 ***	-0.051 +	-0.142 +	0.012	0.110
	Q	-0.158 ***	-0.212 *	-0.432 ***	-0.112 **	-0.126 *	-0.122	-0.352 ***	0.208 **	0.214 +	0.205 *
	n	*124*	*119*	*119*	*100*	*124*	*123*	*124*	*124*	*90*	*103*

- Axx rating is AAA, AA, or A rating from Standard and Poor's or corresponding ratio from Moody's or
- > A rating is BBB or worse
- Growth companies omitted as sample contains only 9 rated growth companies

\+ 85% confidence interval ** 95% confidence interval

* 90% confidence interval *** 99% confidence interval

Exhibit 12: Regression results of sub samples according to credit worthiness

xyz Sign as expected (i.e. positive for sales, CF and q, negative for interest); significant and stronger than comparison group

xyz Sign as expected

Standardized coefficients (beta)

		Total Assets	Fixed Assets	Tangible Fixed Assets	Intangible Fixed Assets	Current Assets	Stocks	Debtors	Cash	Employees	Immat Assets
no block-holder	ΔSales	0.352 ***	0.139 ***	0.169 ***	0.125 ***	0.400 ***	0.163 ***	0.371 ***	0.176 ***	-0.035	0.118 **
	CF	0.090 ***	0.065 +	-0.179 ***	0.322 ***	0.210 ***	0.139 ***	0.173 ***	0.232 ***	-0.089 *	0.284 ***
	Interest	-0.171 ***	-0.157 ***	-0.054	-0.089 **	-0.145 ***	-0.142 ***	-0.148 ***	-0.049	-0.106 **	0.032
	Q	0.260 ***	0.269 ***	0.238 ***	0.267 ***	0.279 ***	0.181 ***	0.306 ***	0.036	0.376 ***	0.071
	n	*545*	*532*	*538*	*440*	*545*	*519*	*541*	*545*	*322*	*380*
block-holder	ΔSales	0.236 ***	0.049	0.240 ***	0.038	0.292 ***	0.216 ***	0.252 ***	0.249 ***	-0.056	0.140 **
	CF	-0.054	0.166 ***	0.076	-0.056	-0.055	0.112 *	-0.099 *	-0.030	0.039	0.051
	Interest	-0.042	-0.116 **	0.022	-0.028	-0.004	-0.188 ***	0.004	0.029	0.062	0.079
	Q	0.323 ***	0.253 ***	0.190 ***	0.286 ***	0.138 **	0.101 +	0.198 ***	0.074	0.134 *	0.216 ***
	n	*316*	*312*	*308*	*297*	*316*	*292*	*310*	*316*	*201*	*254*
LARGE											
no block-holder	ΔSales	0.237 ***	0.094 **	0.183 ***	0.107 ***	0.353 ***	0.136 **	0.187 ***	0.132 **	0.096 +	0.134 **
	CF	0.724 ***	0.304 ***	0.261 ***	0.724 ***	0.395 ***	0.213 ***	0.711 ***	0.116 **	-0.104	0.177 ***
	Interest	-0.086 ***	-0.091 **	-0.058	-0.056 +	-0.093 **	-0.115 **	-0.076 **	-0.055	-0.116 *	0.010
	Q	-0.215 ***	0.004	0.123 **	-0.193 ***	0.077 *	0.006	-0.177 ***	0.197 ***	0.362 ***	0.106 *
	n	*404*	*396*	*397*	*348*	*404*	*392*	*402*	*404*	*240*	*346*
block-holder	ΔSales	0.364 ***	0.258 ***	0.256 ***	0.188 ***	0.354 ***	0.394 ***	0.452 ***	0.076	0.086	0.006
	CF	0.181 ***	0.298 ***	0.168 **	0.223 ***	0.252 ***	0.058	0.165 **	0.258 ***	0.024	-0.001
	Interest	-0.117 **	-0.117 **	-0.007	-0.126 **	-0.184 ***	-0.124 **	-0.132 **	-0.125 **	0.028	0.076
	Q	0.222 ***	0.091	0.060	0.190 ***	0.053	-0.014	0.006	0.076	-0.046	0.196 **
	n	*243*	*241*	*236*	*235*	*243*	*237*	*239*	*243*	*166*	*214*
GROWTH											
no block-holder	ΔSales	0.357 ***	0.219 ***	0.181 **	0.189 *	0.446 ***	0.253 ***	0.448 ***	0.197 **	-0.123	0.448 ***
	CF	-0.181 **	0.056	-0.387 ***	0.258 ***	0.203 ***	0.128 +	0.069	0.266 ***	-0.100	0.069
	Interest	-0.266 ***	-0.320 ***	-0.018	-0.149	-0.263 ***	-0.255 ***	-0.243 ***	-0.079	-0.126	-0.243 ***
	Q	0.240 ***	0.209 **	0.368 ***	0.322 ***	0.156 *	0.165 *	0.307 ***	-0.099	0.241 **	0.307 ***
	n	*140*	*135*	*140*	*91*	*140*	*126*	*138*	*140*	*81*	*33*
block-holder	ΔSales	0.220 *	-0.109	0.217 *	0.067	0.311 ***	0.208 +	0.248 **	0.283 *	-0.100	0.248 **
	CF	-0.092	0.051	-0.025	-0.038	-0.097	0.395 ***	-0.136	-0.106	0.116	-0.136
	Interest	0.020	-0.137	0.143	-0.064	0.166	-0.367 ***	0.232 *	0.211 *	0.427 **	0.232 *
	Q	0.203 +	0.176	0.240 *	0.239 *	0.024	-0.164	0.040	0.020	0.048	0.040
	n	*72*	*70*	*71*	*61*	*72*	*54*	*70*	*72*	*34*	*39*

Block holder = shareholder with a stake of at least 25 %

\+ 85% confidence interval ** 95% confidence interval

* 90% confidence interval *** 99% confidence interval

Exhibit 13: Regression results of sub samples according to ownership structure

Appendix E: Abbreviations

$A_{(r)}$	Assets at replacement cost
CEF	Costly External Finance
CF	Cash Flow
δ	Depreciation Rate
De	Debt
$De_{(MV)}$	Market Value of Debt
E	Equity
$E_{(MV)}$	Market Value of Equity
EB	Empire Building
FTE	Full Time Equivalents (=number of employees
GDP	Gross Domestic Product
i	Interest Payments
I	Investment
I_{FA}	Investment in Fixed Assets
IPO	Initial Public Offering
K	Capital Stock (= total assets)
$K_{(R)}$	Capital Stock at Replacement Cost
L	Liquidity
M&A	Merger and Acquisition
PPE	Property, Plant, and Equipment
q	Tobin's q
R&D	Research and Development
SME	Small and Medium Sized Enterprise
UC	User Cost of Capital

Appendix E: List of Exhibits and Equations

Exhibits

Equations