HOW DO FIRMS SOURCE THEIR DEBT?

- THE CHOICE BETWEEN PUBLIC AND PRIVATE DEBT

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Abstract: This paper empirically investigates the determinants of firms' choice of public or private debt and finds strong evidence of the importance of transaction costs and financial intermediaries' superior ability to monitor and correctly deal with firms in financial distress. We extend the literature by refining previously applied methods to further acknowledge mixed debt structure as a third discrete choice, along with having only public or only private debt. We find evidence that financial intermediaries' monitoring alleviates the asset substitution problem, while at the same time allowing public debt investors to free-ride on the intermediary's monitoring function.

Keywords: Debt financing, Public debt, Bonds, Arm's lengths investors, Private debt, Bank loans, Financial intermediaries

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1. INTRODUCTION

This study empirically investigates the determinants of firms' choice of public or private debt and finds strong evidence of the importance of transaction costs and financial intermediaries' superior ability to monitor and correctly deal with firms in financial distress. We extend previous literature in the following ways:

First, we combine two empirical methods of testing firms' debt sourcing choices. We employ a continuous choice model, assessing the levels of public debt to total debt, and a discrete choice model, examining firms' choice to either have only public, only private or a mixed debt structure. This method extends the literature, which is mainly focused on discrete debt choice models that only allow for a choice between public or private debt (Johnson, 1997).

By drawing conclusions from the continuous and discrete models, we are able to reconcile predictions and findings from previous literature. We find evidence that financial intermediaries' monitoring ability alleviates the problem of firms engaging in asset substitution[1], while at the same time allowing public debt investors to free-ride on the intermediary's monitoring function. This reconciles the prediction of Hoshi et al. (1993), that firms with high leverage need more monitoring and therefore choose private debt, and Johnson's (1997) contradicting empirical evidence that leverage is positively related to the degree of public debt.

Further, we detect evidence relating to how lenders deal with firms in financial distress, as we find that the importance of collateral is crucial for firms financed solely by public debt. For firms with mixed debt structure, the public debt investors' preference for collateral seems to be counterbalanced by the monitoring and renegotiation ability of the intermediary.

The question of what determines corporations' choice of debt source is important since credit markets are major sources of global corporate financing (Lin et al., 2013). Recently, it was reported that U.S. corporate bond sales have swollen to record levels in 2014 with a total issue size in excess of USD 1.5 trillion (Bloomberg, 2014). This further strengthens the interest in the question from a practical point of view. Despite the empirical importance of credit markets, we find that there is limited academic evidence on the determinants of debt source choice (Lin et al., 2013). Furthermore, previous literature renders some mixed predictions and varying support for the theories that explain corporations' choice of debt source.

Due to the importance of credit markets and the identified gaps in previous literature, we perform an empirical study aimed at answering the question of what determines corporations' choice of debt source. To answer this question, we identify and test the five main theories in previous literature used to explain debt structure. We state one hypothesis for each theory, which we then test empirically by using proxy variables. This is done to see what theories we can confirm and if we are able to reconcile mixed evidence from prior research.

In line with several previous authors (e.g. Krishnaswami et al., 1999 and Lin et al., 2013), we make a distinction between two main debt sources; public debt and private debt. Our classification of private debt is made up of bank debt, while public debt includes all other items that are not bank debt, such as bonds and notes.

[1] Problem arising when a company exchanges low-risk assets for high-risk investments. This substitution transfers value from a firm's creditors to its shareholders since shareholders gain the upside potential of the high-risk projects while the creditors bear the increased down-side risk (Jensen and Meckling, 1976).

We perform OLS and logistic regression tests on a data set containing of 1,277 firms listed on the New York Stock Exchange and NASDAQ. Through the outcomes of these tests we are able to draw conclusions on the importance of the five main theories and give an answer to the question of what determines firms' choice of debt source.

2. LITERATURE REVIEW

2.1 INTRODUCTION TO THE LITERATURE REVIEW

As a majority of the existing research on capital structure concerns firms' choice between equity and debt financing, the academic focus on the choice between different types of debt is more limited. The literature in this area examines the different characteristics of various debt classes (e.g. Rauh and Sufi, 2010) as well as what factors impact firms' decisions to raise debt from either public or private sources (e.g. Johnson, 1997; Krishnaswami et al., 1999; Denis and Mihov, 2003).

The importance of this research area is demonstrated by Rauh and Sufi (2010) and Johnson (1997), who both address the issue of heterogeneity in debt structures. Rauh and Sufi (2010) find that as many as 25 percent of the firms in their sample significantly adjust their debt structure without changing leverage. Their findings demonstrate that traditional capital structure studies, treating debt as a uniform source of financing, miss substantial variations in capital structures. They further argue that the common capital structure research fails to take into account the existence and effects of the fact that a firm's debt structure often consists of several instruments that are distinct from each other. Debt instruments are proven to be different in various aspects, such as impact on cash flows, maturity, transaction costs, information publication, collateral and incentive properties for managers. By treating debt as uniform, these distinguishing features are overlooked, while they are theoretically important in understanding how firms structure their debt (Johnson, 2007; Denis and Mihov, 2003; Rauh and Sufi, 2010).

The focus of this thesis is to empirically test what drives a firm's debt structure, with debt classified according to the source of funding; either public or private debt. Johnson (1997) frames the question by stating that firms' debt structure should reflect the intersection of its demand for different debt sources and the market's supply of debt by different lenders. Benefits and costs of debt of various sources should determine the certain debt structure that borrowing firms demand. Through a similar argumentation, lenders find certain firms more or less attractive and supply credit accordingly. In other terms, borrowers' demand for public and private debt depends on the benefits and costs of the debt types, whilst the supply of public and private debt depends on the attractiveness of the borrowers' characteristics. In this thesis, we therefore examine what specific factors affect this supply and demand relation.

The following sections describe how previous studies have classified debt and what types of tests have been performed. The last part of this section gives an in-depth description of the theoretical framework applied in this thesis.

2.2 CLASSIFICATION OF DEBT APPLIED IN PREVIOUS RESEARCH

Within the existing literature, there exist several ways of classifying debt. The most common classification separates debt into two classes according to the nature of the source of funding, namely public and private debt. Authors applying this categorisation include Lin et al. (2013), Krishnaswami et al. (1999), Hadlock and James (2002), Houston and James (1996) as well as Hoshi et al. (1993). The division of debt into these groups is based on the inherent differences in the characteristics of the lenders. Public debt sources are

generally characterised as arm's-length investors, such as public bondholders, while private debt sources are characterised as financial intermediaries, such as banks that lend privately (Lin et al., 2013). Rajan (1992), separates between banks and bondholders, stating that the bank is a large and readily accessible creditor while a typical arm's length creditor receives only public information. The theoretical differences of the two types of debt, described in further detail in section 2.5, underpin the forthcoming tests in this thesis.

An alternative way of classifying debt in regards to its sourcing, is to categorise debt as either public, bank or non-bank private debt, as applied by Johnson (1997) and Denis and Mihov (2003). This classification splits public debt in two components by making a distinction between two types of arm's length investors; i) those that invest in public debt issues, classified as public debt, and ii) those that invest in private placements of debt, which can be labelled as non-bank private debt. The non-bank private debt is proven to be an economically important financing source that exhibits different characteristics than both publicly issued debt and bank debt. Denis and Mihov (2003), for example, find that this third distinguished source of financing is especially important for firms with low credit quality.

2.3 DISCRETE AND CONTINUOUS MODELS OF DEBT STRUCTURE

In previous literature there exist two main types of models to explain firms' composition of public and private debt. The first type of model describes the choice between public and private debt as a discrete choice, where the firm raises financing from one of the two. Literature using this type of model is the most common and includes authors such as Rajan (1992) and Besanko and Kanatas (1993) (Johnson, 1997). The other type of model in previous literature is a continuous debt choice model that allows for different mixes of public and private debt. Johnson (1997) argues for this approach since he discovers a widespread use of multiple debt sources in his data set; approximately 41 percent of all the firms in his sample with public debt outstanding also use some bank financing[2].

2.4 METHODS AND SCOPE OF PREVIOUS LITERATURE

In addition to the type of debt classification used and model employed, previous literature can also be characterised by the method of study (theoretical or empirical) and the scope of theories addressed.

As stated by Krishnaswami et al. (1999), many theoretical studies develop hypotheses about what factors drive firms' debt sourcing decisions, without testing them empirically. These theoretical studies include Diamond (1991), Rajan (1992), Besanko and Kanatas (1993) and Chemmanur and Fulghieri (1994). However, the majority of the existing research assesses theoretical predictions through various statistical tests, including OLS regressions (Krishnaswami et al., 1999; Rauh and Sufi, 2010), logistic regressions (Hadlock and James, 2002), multinomial logistic regressions (Denis and Mihov, 2003) and tobit regressions (Johnson, 1997). In these papers, the authors generally test what drives firms' debt structure by applying a ratio of public or private debt to total debt as dependent variable and a set of financial and firm specific measures as explanatory variables.

The measures used to explain variations in the use of public debt are approximations of theories (see section 2.6), with predicted outcomes either based upon findings in previous literature (Johnson, 1997) or own theorisations (Lin et al., 2013). While these types of studies evaluate the choice of debt financing

[2] The discoveries of Johnson (1997) are further confirmed by Rauh and Sufi (2010) who find that there is a simultaneous use of bank debt and bonds.

based on debt proportions on the balance sheet at a given point in time (e.g. Johnson, 1997; Krishnaswami et al., 1999), other authors perform issue based-studies, examining the probabilities for firms to issue either public or private debt (e.g. Hadlock & James, 2002). The issue-based studies represent an incremental approach that allows for an investigation of the impact of firm characteristics on the borrowing decisions with variables measured just prior to the event. This approach also allows for an investigation of borrowing decisions for firms that have no debt outstanding at the time of issuance. However, the drawback of this type of study is that it is not possible to test theories that explain the mix of public and private debt. Moreover, an incremental borrowing decision might represent a temporary deviation from the firm's optimal capital structure policy. For these reasons, our study takes the focus of examining the relative levels of public and private debt on the balance sheet.

A final remark on the distinguishing features of the existing literature is the difference in theoretical scope of studies. The broader studies seek to explain the drivers of debt structure based upon a broad set of theories (e.g. Johnson, 1997; Krishnaswami, 1999), while the more focused research place emphasis on testing specific theories (e.g. Lin et al, 2013; Hadlock and James, 2002). The focus of this thesis is to take into account a broad scope of theories in an attempt to contrast their relative importance.

2.5 THEORIES OF THE CHOICE BETWEEN PUBLIC AND PRIVATE DEBT

By examining the existing literature, we see that a number of theories are applied when testing for what factors impact firms' debt source preferences. We classify the theories as follows;

1. Transaction costs; focuses on the differences in the costs of raising public and private debt, impacting borrower demand.
2. Information asymmetries; relates to the ability and costs for lenders to collect sufficient information about the borrower and the potential reluctance of borrowers to disclose proprietary information to the public markets, impacting both the demand and supply for the two types of debt.
3. Borrower reputation; concerns the reputation held by a borrower, impacting supply.
4. Monitoring; relates to the abilities and costs for arm's length investors and financial intermediaries to impose monitoring of the actions and performance of a borrower, affecting the supply and demand.
5. Financial distress; concerns the increased likelihood and costs of inefficient liquidation of public debt, impacting both supply and demand.

2.5.1 Transaction costs

Theories relating to transaction costs focus on the difference in costs of issuing public debt and taking out a loan from a financial intermediary and how this impacts firms' demand for the two debt types. Commonly used proxy variables in the existing literature are firm size (e.g. total assets) and issue size (e.g. total long-term debt).

2.5.1.1 Theory

The theory of how transaction costs impact the choice of debt source relates to the findings of Nakamura (1993), who provides evidence that disclosure of information for private bank loans is less costly than when issuing public debt. There are mainly three reasons for this transaction cost advantage; avoidance of compensation for investment banks, distribution costs to multiple investors and of out-of-pocket expenses.

Smith (1977) and Bhagat and Frost (1986) complement this evidence by providing proof of the existence of economies of scale in the issuance of public securities. They find that a significant portion of flotation costs does not vary with issue size for public issues, implying greater economies of scale. This suggests that large debt issues will be sold publicly and smaller amounts of debt will be placed privately.

Relating these fundamental theories of transaction costs to the literature of debt sourcing decisions we find that most authors find evidence of the existence of economies of scale in public debt issues. Krishnaswami et al. (1999) discover that the transaction costs of public debt issues explain a sizeable part of the cross-sectional variation in the debt structure. Furthermore, Johnson (1997), Houston and James (1996) and Hadlock and James (2002) also provide evidence in favour of transaction costs being a main contributor, impacting the choice of debt.

2.5.1.2 Proxy variables applied in previous research

Approximating for transaction costs and economies of scale in issuing public debt, firm size is the most commonly used variable, applied by e.g. Krishnaswami et al. (1999), Johnson (1997) Houston and James (1996) and Hadlock and James (2002). Krishnaswami et al. (1999) measure firm size as the market value of preferred and common stock plus the book value of long-term debt and capitalised lease obligations. Johnson (1997) appoints total assets as his measurement of firm size. Houston and James (1996) and Hadlock and James (2002) also use total assets, but refine their measurement in the statistical tests by applying the natural logarithm of assets.

Another measure for the economies of scale is the issue size of debt. Krishnaswami et al. (1999) apply issue size by employing the ratio of the firm's total long-term debt to the number of debt issues. Johnson (1997) applies a similar proxy, as he uses the total long-term debt, however not scaled by the number of debt issues. Drawing references to the tests of Blackwell and Kidwell (1988) and Easterwood and Kadapakkam (1991), Johnson (1997) argues that the total long-term debt is a reasonable proxy as there should be a strong relation between the size of total debt and the size of each debt issue. However, Johnson (1997) ends up not including the variable issue size in his statistical tests, as he finds a high correlation between total assets and long-term debt outstanding. Given the high degree of correlation, he remarks that including both variables in the regressions would create multicollinearity problems.

2.5.2 Information asymmetry

Information asymmetry theories explain how the debt sourcing decision is affected by lenders ability to collect the sufficient amount of information about the borrower (adverse selection), and borrowers potential reluctance in disclosing proprietary information to the public markets (proprietary information). Testing how information asymmetry affects the debt structure is performed through proxy variables including firm age, market-to-book ratio, depreciation ratio, earnings growth volatility and R&D ratio.

2.5.2.1 Theory

Hadlock and James (2002) examine the impact of adverse selection based on creditors' ability to accurately price financial claims of a firm and thereby reduce costs of information asymmetries. They label the ability to accurately price a firm as information benefits for the borrower, against which the borrower weighs a variety of contracting costs[3]. They find that firms are more likely to choose bank debt when variables that measure asymmetric information are elevated. Hence, firms exhibiting characteristics implying a high degree of information asymmetry have a higher demand for bank financing, as the public lenders would not be able to price the firm as accurately. This conclusion is consistent with their hypotheses that banks are superior in pricing financial claims, creating a preference for undervalued firms to seek bank debt as their marginal financing source.

Krishnaswami et al. (1999) test the impact of information asymmetry on the use of public debt, and find support for the theories claiming that firms with large potential information asymmetries, such as younger firms, issue more private debt. Lin et al. (2013) draw additional conclusions, claiming that compared to public bond investors, banks alleviate information asymmetries by having superior access to information, concentrated ownership of debt and strong bargaining power.

Proprietary information models explain the debt structure as dependent on the value of proprietary information a firm holds. A firm that is in the process to raise debt, with valuable proprietary information on e.g. R&D activities, will be reluctant to disclose this information to the public even if it is necessary to obtain public financing at better terms. These types of firms are therefore predicted to prefer banks or other private lenders that have the ability to keep sensitive information confidential (Campbell, 1979). Krishnaswami et al. (1999) test for this theory, and find some empirical support for it. They see that firms with favourable information about their value and future earnings, subject to a high degree of information asymmetry, use more private debt.

2.5.2.2 Proxy variables applied in previous research

Both Hadlock and James (2002) and Krishnaswami et al. (1999) employ the variable firm age as a proxy for information asymmetries, under the claim that higher age means that a firm can present a longer financial track record, which could ease the problem of information asymmetry.

The ratio of market value of assets to book value of assets is applied by Denis and Mihov (2003), Hadlock and James (2002) and Krishnaswami et al. (1999), under the argument that firms with high market-to-book ratios have several growth options and hence a large intangible value. This is said to increase the issue of adverse selection as the number of growth options leads to greater difficulties for a public lender in assessing the value of the financial claims of a company. Banks, on the other hand, with access to the companies' transaction accounts, should be able to make more accurate assessments of these firms' potential. Therefore the intuition is that firms with high market-to-book ratio should have better access to private debt than public debt. Related to the market-to-book ratio is the depreciation ratio, which is another proxy for the growth options of a firm. Krishnaswami et al. (1999) hypothesise that firms with higher depreciation ratios are expected to have relatively fewer growth options in their investment opportunity sets and therefore relatively more tangible value.

[3] Contracting costs include agency costs, monitoring costs, financial distress costs, information monopoly costs, and transactions costs (Hadlock and James, 2002).

Earnings growth volatility is a measure applied by Johnson (1997), defined as the standard deviation of earnings in the years preceding the test year, scaled by total assets. The variable is a proxy for adverse selection since high earnings growth volatility would imply difficulties for the public markets to assess firm performance. Higher earnings growth volatility would therefore be associated with more extensive use of private debt. Other authors, such as Krishnaswami et al. (1999) and Hadlock and James (2002), use similar measures, such as stock return volatility, to make the same assessment.

The R&D ratio, defined as R&D expense scaled by sales, and the market-to-book ratio are applied as proxies for proprietary information in previous literature. Denis and Mihov (2003) argue that R&D spending approximates for proprietary information, since it signals that a company holds a high degree of private information that they likely are reluctant to disclose to the public. Therefore, these types of firms should prefer private financing, where the proprietary information is kept secret with the private lender. Krishnaswami et al. (1999) also include the variable unexpected future earnings as a proxy for proprietary information and argue that firms with positive private information, worth hiding from competitors, should prefer bank financing. They find a positive relation between unexpected future earnings and the reliance on private debt, but only when information asymmetry between the firm and lenders is severe.

2.5.3 Borrower reputation

The borrower reputation theory relates the supply of public and private debt with the reputation of the firm and its credit-worthiness in the eyes of the lenders. The overall hypothesis is that firms with better reputation should turn to public financing to a greater extent. Proxy variables applied in previous literature include firm age, firm size, market-to-book ratio, Altman's Z and earnings growth volatility.

2.5.3.1 Theory

Diamond (1991) investigates the interplay between borrower reputation and bank supervising by developing a model where new borrowers turn to bank financing in order to establish good reputation. With time, when borrower reputation is established and lenders can feel more secure with the firm's future actions, the borrower can turn to public financing because the risk of losing reputation prevents it from the moral hazard of engaging in actions that would benefit shareholders at the expense of lenders. The theoretical conclusion of Diamond (1991) is that young firms initially should turn to bank financing in order to build up reputation before they turn to public debt markets.

Denis and Mihov's (2003) empirical findings support the borrower reputation hypothesis. They find that new debt issues are linked to prior financing decisions. Firms with public debt outstanding are more likely to issue public debt and firms who have not established a reputation in credit markets predominantly choose to issue bank debt. Denis and Mihov (2003) further conclude that credit quality is the most important determinant in the choice of public and private debt. High quality firms, in general, turn to public credit markets while firms with medium credit quality turn to bank financing. However, they find that firms with the lowest credit quality do not choose public debt, but instead turn to the private non-bank credit market for financing.

2.5.3.2 Proxy variables applied in previous research

Approximating for borrower reputation, Diamond (1991) applies the variable firm age under the interpretation that older firms have survived longer and can show a longer financial track record to the

capital markets. Hence, a high age implies a stronger reputation and a positive correlation with the ratio of public debt. Diamond (1991) further uses the variable firm size claiming that a larger company is seen as more reliable and more diversified than smaller companies, implying better reputation, which should attract the interest of public debt investors. The market-to-book ratio is included as a proxy since a high relative market valuation indicates that the capital markets have high expectations on the future performance of a company. This measure is included by Johnson (1997), who argues that a high market-to-book ratio should imply strong availability for public financing.

Related to credit quality, Altman's Z[4] is used by Denis and Mihov (2003) as a measurement of bankruptcy risk and subsequently the reputation of a borrower. According to Altman (1968), firms below the cut-off point 1.81 bear a high risk of facing financial distress. Hence, Denis and Mihov (2003), construct a dummy variable to measure the bankruptcy risk, which takes on the value 1 if below the cut-off and 0 if above. Furthermore, Johnson (1997) includes the earnings growth volatility as a proxy for observable credit risk, which is expected to correlate negatively with the use of public debt.

2.5.4 Monitoring

This section relates to how monitoring, and especially banks' superior ability as financial intermediaries to monitor company performance (Diamond, 1984), affects the choice of debt financing. The previous literature employs a number of variables as proxies for monitoring, including firm size, market-to-book ratio and leverage.

2.5.4.1 Theory

Monitoring theories build upon the fact that monitoring is used as a means for the creditor to control a firm's activities and restrict the borrower from taking actions that are harmful toward creditors. In debt contracts, creditors usually impose some restrictions in the form of covenants on the actions that the firm can take. The restrictions and monitoring activities are generally systematically different between public and private debt and therefore the choice of debt structure has important theoretical and practical implications (Ferguson et al., 2011).

Diamond (1984) builds the monitoring efficiency theory, concluding that it is more efficient for a financial intermediary to monitor a firm's actions than it is for multiple investors. A financial intermediary avoids duplication of effort and eliminates the free-riding problem of multiple investors, which means that each investor has the incentive to free-ride on others' monitoring actions.

Besanko and Kanatas (1993) contribute to the literature related to monitoring by developing a model in which entrepreneurs can use a mix of public and private debt financing. The entrepreneur can influence the payoff from projects by exerting extra effort, but the necessity of sharing the payoffs with external financers reduces his incentive to exert extra effort. In this setting, the bank plays a crucial role in monitoring the entrepreneur and forcing him to supply extra effort. In equilibrium, the entrepreneur employs both bank and public financing and reaches a trade-off between greater bank monitoring and the personal cost (increased effort) that would result from bank monitoring.

[4] Altman's (1968) Z-score is calculated as (1.2 working capital + 1.4 retained earnings + 3.3 earnings before interest and taxes + 0.999 sales)/total assets + 0.6 (market value of equity/book value of debt).

Since monitoring actions will place direct constraints on managers, Denis and Mihov (2003) investigate the role of managerial discretion in the choice of debt structure. The prediction is that managers will prefer to issue public debt in order to avoid the monitoring constraints of taking out a bank loan. Denis and Mihov (2003), Lin et al. (2013) and Meneghetti (2012) develop theories on the relations between this reluctance of monitoring and managerial ownership.

2.5.4.2 Proxy variables applied in previous research

Assessing the impact of monitoring theories, Johnson (1997) and Fama (1985) use the variable firm size under the prediction that differing amounts of information supplied by large and small firms leads monitoring costs to decrease with firm size. Hence, large firms are more likely to issue public debt as the capital markets can more easily monitor large than small firms.

Hoshi et al. (1993), employ Tobin's Q as a proxy for the attractiveness of the firm's investment opportunities and relate this to monitoring. If Tobin's Q is high, the need for bank monitoring is lower. This is because the expected pay-offs for the manager to pursue the good project are higher than the potential private benefits for the manager if he chooses to pursue pet projects that harm the creditor. Hence, Hoshi et al. (1993) argue that Tobin's Q is a proxy for the financial markets' trust in the managers not to engage in value destructing activities.

Furthermore, Hoshi et al. (1993) and Johnson (1997) include leverage to proxy for the need of monitoring. Hoshi et al. (1993) hypothesise that the need for monitoring increases with the level of leverage, since a very low degree of equity increases the risk for asset substitution[5], and hence the lenders need to monitor the managerial activities. Following this argumentation, high leverage should imply a higher portion of bank financing. Johnson (1997), on the other hand, tests this hypothesis empirically and finds a positive relation between leverage and the degree of public debt financing.

Another variable for monitoring, assumed by Meneghetti (2012) and Denis and Mihov (2003), is managerial ownership. They claim that managers who have a high portion of equity-linked compensation will be more exposed to the asset substitution problem and hence have a larger need to be monitored.

2.5.5 Financial distress

The literature focusing on financial distress argues that banks have an advantage over public debt investors in terms of dealing with firms in financial distress and making the correct choice of letting the firm into bankruptcy or to renegotiate the loans. Poor renegotiation ability for public debt investors implies that they should prefer to invest in firms with collateral and high liquidation values. Proxy variables applied for financial distress theories include fixed and financial assets ratio (proportion of fixed and financial assets to total assets) as well as the market-to-book ratio.

2.5.5.1 Theory

Chemmanur and Fulghieri (1994) present the rationale for banks' superior renegotiation abilities by claiming that banks, as opposed to public debt lenders, operate as intermediary capital providers with a

[5] Problem arising when a company exchanges low-risk assets for high-risk investments. This substitution transfers value from a firm's creditors to its shareholders since shareholders gain the upside potential of the high-risk projects while the creditors bear the increased down-side risk (Jensen and Meckling, 1976).

long-term horison and an aim to build and protect a reputation as effective lenders that make correct liquidation decisions. Cantillo and Wright (2000) add to this line of reasoning by arguing that banks are better at effectively monitoring and hence at making decisions to renegotiate or liquidate a project. However, in line with Berlin and Loeys (1988), Cantillo and Wright (2000) also argue that this excess ability comes with a higher cost for the capital lent out to the borrowing firm. Therefore, the prediction is that firms that value the monitoring skills and efforts of the bank are most likely to accept this premium. These firms are generally hypothesised to be characterised by poor prospects of future performance and profitability, and hence have a greater likelihood for financial distress. In line with this argument, corporations with high and stable cash flow and profitability projections should be less inclined to source their financing from banks, as they are not in need of a good reorganiser.

Bolton and Freixas (2000), elaborate on the theories of differences in the cost of bank debt and public debt. They argue that public debt financing is less expensive but bears a bankruptcy cost due to the inability to renegotiate, resulting in liquidation in case of distress. The implication of Bolton & Freixas' (2000) finding is that public debt investors should prefer firms with high liquidation values and collateral, since renegotiation is not as feasible as for bank debt. Both Hoshi et al. (1993) and Johnson (1997) examine this prediction empirically and find proof that there are positive relations between public debt use and indicators of collateral value.

2.5.5.2 Proxy variables applied in previous research

Approximating for the impact of financial distress theories, Johnson (1997) applies the fixed assets ratio as well as the specialised assets ratio. The fixed assets ratio is defined as net property, plant, and equipment divided by total assets and is used as a proxy for asset collateral value. Johnson (1997) further claims that as the collateral value of assets directly depends on the liquidation value of assets, the fixed assets ratio is also a proxy for the liquidation value of assets. In line with the argumentation that public lenders value collateral and high liquidation values, Johnson (1997) finds a positive relation between the fixed assets ratio and firms' use of public debt. The specialised assets ratio is developed in accordance with arguments of Leeth and Scott (1989), who state that liquidation values are lower for highly specialised assets.

Hoshi et al. (1993) use the proxy financial assets ratio defined as financial assets scaled by total assets. They argue that as financial assets are the most easily liquidated assets, they should be valued the highest by lenders. Hence, there should be an even stronger link between the financial assets ratio and the use of public debt than for the fixed assets ratio.

3. HYPOTHESES

Based on the theoretical framework, we present a set of hypotheses enabling us to answer the question of what determines firms' choice of debt source. Through our hypotheses, we wish to test the strength of the five main theories in previous literature. We hypothesise that we should be able to confirm the main results that are found by other researchers. Hence, we predict that firms with economies of scale in public debt issues, low information asymmetry, strong reputation, low monitoring needs and high liquidation values are likely to have a higher degree of public debt on their balance sheet.

1: Firms with economies of scale in public debt issues have a higher degree of public debt.
2: Firms with less information asymmetry have a higher degree of public debt.
3: Firms with a strong reputation as borrowers have a higher degree of public debt.
4: Firms with lower needs for monitoring have a higher degree of public debt.
5: Firms with high liquidation values have a higher degree of public debt.

These hypotheses are tested by performing regressions (described in section 5.) with a number of selected explanatory variables as proxies for the theories.

4. DATA AND VARIABLES

4.1 DATA COLLECTION AND SAMPLE SELECTION

In order to test our hypotheses, we assemble a data set of firms currently listed on the U.S. public markets New York Stock Exchange and NASDAQ. We construct this data sample by using the S&P Capital IQ database, in line with Lin et al. (2013). The database provides financial data on over 50,000 public and private firms around the world. We obtain detailed information about firms' debt compositions as well as other financial and firm specific data needed to perform our tests. The years of interest when downloading the data are 2010 to 2013 as we perform tests on the dependent debt variables of 2013 with explanatory variables constructed as averages of the three years prior to 2013.

We limit our data sample to firms listed in the U.S. since public firms are most likely to find public debt financing feasible and therefore are most likely to confront an active choice between public and private debt (Lin et al. 2013). The U.S. capital markets are also mature and homogenous, allowing for a relatively balanced comparison of all firms in the sample.

We choose not to limit our data sample in terms of size, as we aim to draw general conclusions about what variables impact the use of public debt. Krishnaswami et al. (1999) apply a lower size limit, only including firms with more than USD 100 million in total capital. With the wish to be able to render generalisable results, we do not apply any such cut-off point. However, we test for potential implications of our method by performing a number of robustness checks (see Appendix).

Our initial data sample consists of 5,419 firms within all industries and both those that operate with debt on their balance sheet and those who are fully equity financed. Following Krishnaswami et al. (1999) as well as Lin et al. (2013), we exclude firms in the financial as well as oil and gas industries. These firms are dropped since they have capital structures and profit and loss accounts that are materially different in nature from other firms, which otherwise would distort our results if kept in the data set. Hence, one should bear in mind that our tests and conclusions are not applicable for these kinds of firms.

Next, some of the firms in our gathered sample have portions of debt classified as "other debt". As this debt item is not possible to classify as either public or private, we have cleaned our data set of all firms that have more than 5 percent unclassified debt over total debt. Unclassified debt is then handled as a separate item, distinct from the public and private classification, but included in total debt. The amount of firms with more than 5 percent unclassified debt is however low; only 6.9 percent of the firms that are not in the financial or oil and gas industry[6]. Our method of allowing for firms with up to 5 percent unclassified debt can be compared to Lin et al. (2013) who simply exclude the debt item from their tests.

Thereafter, we exclude firms with negative book values of equity capital, total debt and capital lease. These firms are seen as distortive to our tests, as the negative values of the items are not applicable for the theories tested. The incremental exclusion of these firms, labelled as "other" in Exhibit 1, corresponds to approximately 12.5 percent of the remaining number of firms. The largest exclusion of firms is related to firms that do not have observations for all four years of interest. This is mainly due to firms not having been listed for the whole period. We hence clean the data set of firms that lack data for all the four years. This incremental drop amounts to 33.6 percent of the remaining data set.

The last variable of interest affecting the number of observations in our dataset is the dependent variable; debt. As our tests are based on the firms' relative levels of public debt, only the firms with nonzero debt will be of interest. Hence, we automatically drop 29.8 percent of the 1,818 firms left in our sample after taking the other factors in consideration. Exhibit 1 summarises the process of arriving to our final data set of 1,277 firms.

+++ Insert Exhibit 1 here +++

4.2 DEBT CLASSIFICATION AND DEPENDENT VARIABLES

When classifying debt, we choose to make a distinction between public and private debt, in line with the classification of several authors in section 2.2 (e.g. Krishnaswami et al., 1999 and Lin et al., 2013). This means that our classification of private debt is made up of bank debt, including revolving credit facilities, while public debt includes all other items that are not bank debt, such as bonds and notes.

Our electronic source, Capital IQ, reports the amounts of debt for senior bonds and notes, subordinated bonds and notes, term loans, revolving credit facilities, commercial paper, capital lease, and other debt. We use the debt information from Capital IQ and define total debt as the sum of all Capital IQ's debt items, excluding capital lease, which is seen as non-debt fixed claims. Public debt is then defined as the sum of senior bonds and notes, subordinated bonds and notes and commercial paper. Private debt is defined as all bank debt including revolving credit facilities and term loans. Unclassified debt is included in total debt but excluded from the private/public classification since it is not possible to establish what type of debt it is by looking at public information. To avoid our tests being distorted by this item we exclude firms with more than 5 percent unclassified debt to total debt and perform robustness tests (see Appendix). Finally, the ratio of public debt to total debt is computed. Exhibit 2 summarises the debt and capital items and how they have been classified.

+++ Insert Exhibit 2 here +++

[6] Further discussions regarding the effects of our cleaning the dataset can be found in the Appendix.

As discussed in the section 2, the debt classification we choose is a widely acknowledged classification that is used by several authors (see e.g. Krishnaswami et al., 1999; Houston and James, 1996; Hoshi et al., 1993). The alternative classification of further separating public debt into publicly issued debt and privately issued non-bank debt is viable and could perhaps render additional insights. However, due to two main reasons we choose not to use the alternative classification. First, to our best knowledge there is no electronic database that allows a clear distinction between public and non-bank private debt to be made. Johnson (1997) hand-collected data on public, bank and non-bank private debt by going through Moody's Industrial Manuals and Denis and Mihov's (2003) solution was to gather the information by going through Dow Jones Interactive newswire and the Investment Dealer's Digest. Second, as pointed out by Lin et al. (2013), we argue that one of the main features when theorising about debt structure is the fundamental difference between banks as intermediaries and other investors and therefore we do not pursue the more detailed classification with non-bank private debt.

4.3 EXPLANATORY VARIABLES

The explanatory firm variables that we employ as proxies for debt choice theories are selected on the basis of the previous research, as described in section 2.5. Exhibit 3 presents the full array of the examined variables, all with support from references in previous research.

+++ Insert Exhibit 3 here +++

In line with Krishnaswami et al. (1999) and Johnson (1997), we compute and use the time-series average for the three years preceding the sample in 2013 for all explanatory variables, except age and earnings growth volatility. Measuring and averaging the variables over the preceding period helps mitigating problems with extreme values. Using past characteristics also reduce the likelihood that the observed relations reflect the effects of debt structure itself (Johnson, 1997).

4.3.1 Transaction costs

In order to test the impact of the transaction costs on debt structure, we use two proxy variables; firm size and the issue size of debt. We define firm size as the natural logarithm of the three-year average of total book value of assets. As data for number of debt issues is difficult to access, and our source for data does not include this variable, we have chosen to apply total debt as a proxy measurement for issue size, in line with Johnson (1997) and what has been discussed in the theory section 2.5. Issue size is expressed as the natural logarithm of the three-year average of total debt.

The theoretical discussions and test results in the previous research direct the argumentation that both proxies used for transaction costs should have a positive correlation with the amount of public debt used. Hence, the larger the firm size and the larger the size of debt issues, the lower the importance of the costs of public debt issuance and consequently the higher likelihood for issuing public debt. However, as we expect there to be high multicollinearity between the two proxy variables, we perform a regression using firm size as the dependent variable and issue size as explanatory variable. We find that the correlation between the two variables is 0.62, with a p-value of 0.00 and a R-squared amounting to 0.76. Thus, like Johnson (1997), we decide to omit issue size from our following regressions.

4.3.2 Information asymmetries

As proxies for adverse selection, we employ firm age, market-to-book ratio, depreciation ratio and earnings growth volatility in line with the reasoning discussed in section 2.5. Age is defined as the natural logarithm of the difference in years between 2013 and the year of establishment. Hadlock and James (2002) use the absolute number of years since incorporation but we hypothesise that the natural logarithm renders us with a more accurate model, as we expect a decreasing importance of age in regards to the use of public debt.

We define market-to-book ratio as the three-year average market value of assets[7] scaled by the three-year average book value of assets. Depreciation ratio is the three-year average depreciation over the three-year average market value of equity. Krishnaswami (1999) and Hadlock & James (2002) use measures such as the stock return volatility to make the assessments about information asymmetry. Inspired by the model of Johnson (1997), we choose earnings growth volatility instead and define it as the three-year standard deviation of EBIT scaled by the three-year average total assets.

Proprietary information is tested in line with Denis and Mihov (2003) by the R&D ratio, defined as the three-year average R&D expense divided by the three-year average sales. R&D spending approximates for proprietary information since it signals that a company holds a high degree if private information that it is likely reluctant to disclose to the public. Furthermore, market-to-book ratio also serves as a proxy for proprietary information under the argumentation that a high ratio implies a high degree of growth opportunities, and subsequently a high degree of proprietary information that the firm wishes not to reveal publicly.

Comparing with the practice of Krishnaswami et al. (1999), we find that they include the variable unexpected future earnings as a proxy for proprietary information. As they however find weak evidence of this variable's impact on the choice of debt source, we choose to not to include this variable in our tests.

In this section, we introduce the first case of using the same variable, market-to-book ratio, as a proxy for more than one theory. This leads to the need for caution when interpreting the coefficients of the variables, discussed in further detail in section 6.

4.3.3 Borrower reputation

Testing the borrower reputation theory we use the variables firm age, firm size, market-to-book ratio, earnings growth volatility and Altman's Z[8]. All the variables, except for Altman's Z, have been defined in the previous sections. Altman's (1968) Z-score is calculated as (1.2 working capital + 1.4 retained earnings + 3.3 earnings before interest and taxes + 0.999 sales)/total assets + 0.6 (market value of equity/book value of debt).

Firm age and firm size are included as proxies for reputation in line with Diamond (1991) with the interpretation that older and larger firms have survived longer, can show a longer financial track record to the capital markets, are more reliable and more diversified than younger and smaller firms. Market-to-

[7] Market value of assets is defined as the book value of assets - book value of equity + market value of equity.

[8] We acknowledge that there are other bankruptcy models that that we could use, such as Beaver (1966) (based on American industrial firms), Ohlson (1980) (based on American industrial firms) and Skogsvik (1987) (based on Swedish industrial companies). Since our sample is made up of relatively large public American firms we find Altman's, Beaver's and Ohlson's models to be appropriate. We choose to employ Altman's model since we wish to have comparability with previous research that has used Altman's Z (Denis and Mihov, 2003).

book ratio is included as a proxy in line with Johnson (1997), who argued that a high market-to-book should imply strong availability for public financing.

We include two measures of credit quality; Altman's Z and earnings growth volatility. As in Johnson (1997), we include the earnings growth volatility as a proxy for observable credit risk, which is expected to correlate negatively to the use of public debt. Altman's Z is included as a proxy for bankruptcy risk. We apply the variable in the same manner as Denis and Mihov (2003). Hence, we apply a dummy variable which takes on the value 1 if below the cut-off point (1.81) and 0 if above.

Worth to note in this section is that the market-to-book ratio, following the theorisation of borrower reputation, should have a positive correlation to the use of public debt. This theoretical prediction contradicts the previously presented regarding information asymmetries

4.3.4 Monitoring

In order to assess the impact of monitoring theories, we use three proxies; firm size, market-to-book ratio and leverage. The definitions of firm size and market-to-book ratio follow as above. Leverage is defined as the ratio of total debt over total capital (defined in section 4.2).

Firm size is used in line with Johnson (1997) and Fama (1985) under the reasoning that large firms in general supply more information than small firms, hence allowing public lenders to easier monitor their activities. The market-to-book ratio is applied in line with Hoshi et al. (1993), who employs Tobin's Q as a proxy for the need of monitoring. Due to the inherent multicollinearity between the two variables, we choose to only use the market-to-book ratio as it has been introduced through other theories. Analogous to the argumentation of Hoshi et al. (1993), a high market-to-book ratio implies public market trust in the corporate management and hence a lower need for monitoring, increasing the public interest in financing the firms' debt.

In line with both Hoshi et al. (1993) and Johnson (1997), we include leverage to proxy for the need of monitoring. According to Hoshi et al. (1993), high leverage should imply a higher portion of bank financing. The tests of Johnson (1997), however, rendered contradicting evidence.

We do not apply managerial ownership as a proxy for monitoring, which is used by Meneghetti (2012) and Denis and Mihov (2003). We come to this conclusion based on the facts that the studies render mixed results, and that the availability of good proxies for managerial entrenchment is limited.

4.3.5 Financial distress

Testing the financial distress theories, we use two proxy variables; tangibility ratio and financial assets ratio. The tangibility ratio is the three-year average of net property, plant and equipment (PPE) scaled by the three-year average of total assets, and the financial assets ratio is the same, only substituting net PPE for financial assets.

As public debt holders have larger difficulties than banks to renegotiate terms with a firm that is in financial distress, previous research indicates that firms with high degrees of collateral and liquidation value are more probable to attract public debt financing (Hoshi et al. 1993; Johnson, 1997). Our chosen proxies are indicators of collateral and liquidation values, but with different dynamics. We do not apply

the specialised assets ratio based on the knowledge that Johnson (1997) only renders coefficients of low or no statistical significance of the variable in his tobit regressions.

5. METHOD

5.1 METHOD OVERVIEW

In order to test our hypotheses of how the examined theories influence firms' choice of debt structure, we perform an OLS regression supported by three logistic regressions on our final data sample, consisting of 1,277 firms.

The OLS regression tests the choice of debt as a continuous variable. Through this test, we examine how the theory based proxy variables can assist in understanding how firms choose a certain level of public debt ratio. The practice of using an OLS regression in evaluating this topic is in line with e.g. Krishnaswami et al. (1999).

Subsequently, we apply three separate logistic regressions. Contrasting the aim of the OLS regression, the purpose of the logistic regressions is to test the choice of debt source as a discrete variable, where a company can either have only private debt, only public debt or a mix of the two debt classes. In this test, we hence seek to understand how the explanatory variables can help in understanding how firms choose a certain source of debt over the other. To our best knowledge, this type of test with these three outcomes has not been applied in the previous research. The most similar test used in the existing literature is that of Hadlock and James (2002), who also perform logistic regressions. They however do so on a data set of debt issues, while we perform our regression on balance sheet proportion data. Furthermore, they only test for the differences between the use of public and private debt, hence not acknowledging the existence of the third group, firms borrowing from both sources.

Combined, the results of our two chosen empirical test methods allows us to make inference on how the studied theories affect the levels of public debt financing and how they impact firms' mutually exclusive choice of sourcing debt from public lenders, private lenders or a combination of both.

5.2 MODEL SPECIFICATIONS

5.2.1 OLS regression model

As described in section 4, we have refined the total downloaded data set of 5,419 companies into a final sample, consisting of 1,277 firms listed on NASDAQ and the New York Stock Exchange. All of the firms in the final data set have debt (classified in accordance with Exhibit 2) on their balance sheet, and have been listed for at least 4 years, enabling us to perform tests using explanatory variables constructed as time series averages. Upon this data set, we perform an OLS regression where we apply the ratio of public debt to total debt as the dependent variable and the proxy variables as explanatory variables (see Exhibit 3).

Prior to performing the regression, we however test for the need to apply an instrumental variable for leverage. Johnson (1997) applies an instrumental variable based upon that previous research finds that leverage is related to a number of the same factors that are also important determinants for firms' debt structure decisions. Previous research finds strong relation to variables such firm size, earnings growth volatility and asset collateral value. As we include all of these variables in our main regression we see the importance to test if we find the same relations in our sample. This is done by testing for multicollinearity

by examining the bivariate correlations between all the explanatory variables. In this test we look for high degrees of collinearity between the independent variables, and especially between leverage and the other explanatory variables (see Exhibit 4). Furthermore, we perform a test of each variable's variance inflation factor, which measures how much of the variance of a coefficient estimate is being inflated by multicollinearity. As it is hard to decide upon a cut-off point when assessing bivariate correlations (the accepted levels of collinearity depends on the sample size), and general rules of thumb are applied for the variance inflation factor, we will base our judgement mainly on the latter test, with the first test serving as reference. In this thesis, we choose to apply a fairly conservative cut-off point for the variance inflation factors of 2.5.

+++ Insert Exhibit 4 here +++
+++ Insert Exhibit 5 here +++

Exhibit 5 presents a table of the variance inflation factors, showing that no variable experiences a factor with a value above the adopted cut-off point. Hence, we conclude that our data sample does not suffer of the multicollinearity that leads Johnson (1997) to apply an instrumental variable. Instead, we follow the practice of Hoshi et al. (1993) who use leverage in its ordinary form.

Following this reasoning we include leverage and the other explanatory variables in our main OLS regression below, with the public debt ratio as dependent variable:

$$Public\ debt\ ratio_i = \beta_0 + \beta_1 \cdot \underset{age}{Firm}_i + \cdots + \beta_{10} \cdot Leverage_i + \varepsilon_i \quad (1)$$

The regression is performed with robust standard errors, which is a method used to correct for potential heteroskedasticity. Furthermore, as we include a set of independent variables with different scale of units, e.g. natural logarithm of age and depreciation ratio, we present both unstandardized and standardized coefficients from our regressions. The standardized coefficients allow for comparison of the size of coefficients, since they are standardized in relation to a one standard deviation change instead of a one-unit change.

5.2.2 Logistic model

Several previous authors model debt structure using discrete choice models, only allowing a choice between either public or private debt (Johnson, 1997). We extend this research by developing a discrete model that considers the choice of mixed debt structure in addition to the traditional choice between public and private debt. By taking this approach we also complement the continuous debt choice model specified above with additional insights on what makes a firm fall into one of the three categories.

In order to test the discrete outcomes we use binary logistic regressions, since logistic models can be used to predict the probability of certain outcomes given information on explanatory variables. We perform three binary logistic regressions since we wish to compare three different outcomes of debt structure against each other.

In the first regression we compare companies relying solely on private debt with companies financed solely by public debt. Thereafter we compare companies with only private debt with companies who have some degree of public debt (>0 percent public debt) and lastly we compare firms with a mixed debt structure with those who have only public debt. In all three regressions the outcome debt structure, coded 1, is compared to the base, coded 0 (see Exhibit 6).

+++ Insert Exhibit 6 here +++

The specification of a logistic regression and the accompanying coefficients are not intuitive, and hence require a brief introduction. As mentioned, logistic regression models estimate the probability of one of two outcomes (Pohlman and Leitner, 2003). The dependent variable is binary, coded with a value of 1 for a certain outcome or event, and 0 representing the absence of the event. The model then estimates probabilities as functions of the independent variables. Below we present the specification of our logistic regressions:

$$P_i = \left(\frac{\pi_i}{1-\pi_i}\right) = \frac{e^{t_i}}{1+e^{t_i}} = \frac{1}{1+e^{-t_i}} \quad (2)$$

Where:

$$t_i = \beta_0 + \beta_1 \cdot {}^{Firm}_{age}{}_i + \cdots + \beta_{10} \cdot Leverage_i + \varepsilon_i \quad (3)$$

$$\pi_i \text{ is the probability of the outcome of interest} \quad (4)$$

Since π_i is the probability of the outcome of interest, $\frac{\pi_i}{1-\pi_i}$ is the odds of the outcome of interest. The coefficients, β_n, represent the expected change in logit values, i.e. the natural logarithm of the odds of being in the outcome of interest (coded 1) for a one-unit increase in the corresponding explanatory variable, holding the other independent variables constant. The results of the logistic regressions are presented by both unstandardised and standardised coefficients, enabling us to draw inferences of the estimated model and to make comparisons of the relative impact of the various proxy variables.

5.3 ROBUSTNESS TESTS

Throughout the process of designing and conducting our tests, we have sought references in previous research in order to find support for our chosen approaches. Through this triangulation, we have decided upon a proven source of data, a previously acknowledged classification of debt used as dependent variable (Lin et. al, 2013) and a set of accounting measures and firm specific variables used as proxies for relevant theories that are inspired by previous research (e.g. Johnson, 1997; Krishnaswami et. al, 1999; Denis and Mihov, 2003; and Hoshi et. al, 1993). Furthermore, we have a theoretical foundation for our use of averages of the explanatory variables in our tests (Johnson, 1997; Krishnaswami et. al, 1999).

In regards to our data, we present in Exhibit 1 how we move from 5,419 individual firm observations to the final data set of 1,277 observations. As further described in section 4., this is performed by dropping a certain set of industries that we identify as not applicable for our model as well as firms with a high degree of unclassified debt and those who have not been listed for the adequate number of years (2010 – 2013).

Our approach of limiting the allowed amount of unclassified debt to 5 percent of total debt gives rise for the need of a robustness test. As it is not possible to determine what the accounting item "other debt" consists of, we admit that our limit is arbitrarily chosen, but we perceive it to be the best alternative. We test for the robustness of our chosen approach by adjusting the allowed limit to 0, 10 and 50 percent of total debt. The results of these tests show no material impact from altering the cut-off point (see Appendix). Comparing our debt definition and allowance for some level of other debt, Lin et al. (2013) deal with this issue by excluding the full amount of other debt.

Moreover, we also find the need to perform a robustness test in regards to our definition of total debt, which excludes capital lease. The exclusion is performed in line with Lin et al. (2013) as it is seen as a non-debt fixed claim. However, as Lin et al. (2013) conduct a robustness test to determine the validity of this definition, so do we. Including capital lease as a portion of private debt, and subsequently total debt, we see a few minor differences to our main regression (see Appendix).

Our last robustness test consists of a set of regressions where we test the validity of our results by using a size limit to the total sample. We perform in total four tests where we apply different lower firm size limits, in order to see if size delimitations have impact on the regression results. This robustness test is inspired by Krishnaswami et al. (1999) who use a firm size sample cut-off of USD 100 million in total capital, including a robustness test with cut-offs at USD 250 and USD 500 million. The cut-off is introduced since they only want to include firms with ready access to public debt markets and thereby face the choice between public and private debt. In our tests, we choose to include companies of all sizes, as we wish to be able to draw general inferences for all firms, small and large. As we do not apply any lower size limit to our regressions, we test for the robustness by using minimum sales cut-off points of USD 50, USD 100, USD 500 and USD 1,000 million. The results of these robustness tests give indications of variations in the importance of different explanatory variables depending on what lower size limit is applied. The robustness results are further elaborated on in the Appendix.

6. RESULTS

6.1 DESCRIPTIVE STATISTICS

6.1.1 Overview of the capital and debt structure of the data set

The general characteristics of our data set, upon which we perform our empirical tests, are presented in Exhibit 7. The summary statistics show that out of the full sample of 1,818 firms, 1,277 have debt outstanding in year 2013. The average leverage in percentage of total capital for the total sample is 23 percent, and 33 percent for firms with debt.

Further, we see that the proportions of public and private debt are approximately even, with private debt representing 50.5 percent of the total debt and public debt 49.4 percent. Exhibit 7 moreover shows that the items we exclude from our regressions and perform robustness tests on, unclassified debt and capital lease, only represent small fractions of the total capital.

+++ Insert Exhibit 7 here +++

By examining a time series development of the capital structure (see Exhibit 8), we see that the average leverage has increased from 20 percent in 2010 to 23 percent in 2013. Meanwhile, the public debt ratio has decreased from 52 percent in 2010 to 49 percent in 2013. Furthermore, in Exhibit 9, we identify that a large degree (approximately 13 percent annually) of the firms that do not change their leverage, alter their ratio of public debt substantially.

Interpreting these findings, we draw parallels to Rauh and Sufi (2010), who find that a large portion of the firms in their sample adjust their debt structure despite not altering their leverage[9]. As they conclude of this being evidence of debt heterogeneity, we hence acknowledge the existence of debt heterogeneity also in our data sample. Our descriptive results differ slightly from Rauh and Sufi's (2010), since we compare debt items aggregated to public and private debt while they compare individual debt items such as bank loans, program debt etc. Nevertheless, the results emphasize that a capital structure analysis that focuses on debt as a homogenous type of financing misses a significant fraction of variations in the capital structure.

+++ Insert Exhibit 8 here +++
+++ Insert Exhibit 9 here +++

6.1.2 Distribution of public debt ratios

In Exhibit 10, we present the distribution of public debt ratios for our sample, showing that 47 percent of our sample firms rely on mixes of public and private debt. This relates to the findings of Johnson (1997), who sees that 41 percent of the firms with long-term public debt outstanding also use some bank debt. These findings emphasize the importance of mixed debt structures.

Studying Exhibit 10, we also see that a number of firms are clustered in the tails of the distribution, meaning that they are financed either by only private or only public debt. We find that 34 percent of the sample firms are solely financed by private debt and 19 percent solely financed by public debt. These findings indicate that firms have three discrete choices when determining their debt structure; only private debt, only public debt and mixed debt structure.

+++ Insert Exhibit 10 here +++

[9] Rauh & Sufi (2010) compare adjustments of leverage with adjustments of debt structure and find that over 25 percent of the firms in their sample alter their structure of debt with more than 2.5 percent while keeping leverage capital within a range of ± 2.5 percent.

6.1.3 Descriptive statistics of explanatory variables

Examining the explanatory variables for various sub samples of our data set, we detect a number of distinguishing features. Starting by comparing firms according to their discrete choice classification (firms with only public debt, only private debt or a mixed debt structure), we see distinct differences and patterns in regards to variables such as firm age, firm size, tangibility ratio, financial assets ratio and leverage.

We find that firms that rely on public debt financing are on average older than firms with only private debt financing. Public borrowers are also significantly larger, measured both in terms of total assets and debt issue size.

Despite theses findings, we here note that there does not appear to be a clear linear relationship between the use of public debt and the different firm characteristics. This is indicated by the fact that firms with only public debt financing are actually smaller and younger than the average firm with a mixed debt structure. By examining sub samples of the firms with a mixed debt structure[10], we however detect a trend that more resembles a linear relationship where firm size and age increases by the use of public debt.

Reflecting upon the distinguishing characteristics of firms with only public debt, we see this as a further proof of the need for our application of a discrete choice model with three outcomes.

+++ Insert Exhibit 11 here +++

6.2 REGRESSION RESULTS

In this section, we present the results from our performed regressions. The section is structured as follows:

First, we describe the outcomes of the OLS regression performed on the final data sample. In order to test our theoretically based hypotheses, we start off by describing the proxy variables' impact on the degree of public debt. Thereafter, we synthesize the results of the variables by their theoretical implications. Second, we deepen the analysis by introducing the results from the logistic regressions. The outline of this section is the same as for the OLS regression, but here we place emphasis on the additional or contrasting insights that we find. Lastly, we present a results summary and a review of the hypotheses, where we describe what hypotheses we find support for.

6.2.1 OLS regression

6.2.1.1 Variables

Our OLS regression is performed on a total number of 1,277 firm specific observations, where the public debt ratio is regressed upon by all the prescribed explanatory variables. Overall, we find that the design of our model renders a relatively high coefficient of determination, as the data fits the model by an adjusted R-squared of 0.32. This is to be compared to Lin et al. (2013), Krishnaswami et al. (1999) and Hoshi et al.

[10] Split into three groups based on their public debt ratio; >0 - <33 percent, >33 - <66 percent and >66 - <100 percent.

(1993), who all perform similar types of tests but where levels of R-squared above 0.20 are uncommon[11]. Below we present our findings regarding the estimated coefficients of the explanatory variables, ordered by their statistical significance and economic impact on the public debt ratio. The standardised coefficients are presented for each variable with the unstandardised coefficients following within brackets.

+++ Insert Exhibit 12 here +++

Firm size is the variable with the largest standardised coefficient and the highest degree of statistical significance. The variable has a standardised coefficient of 0.514 (0.118), implying that per every standard deviation increase of firm size the public debt ratio increases by 0.514 standard deviations. Firm size, in our study defined as the natural logarithm of total assets, has been proven to be a key deciding factor in much of the previous research. Johnson (1997) finds in his study that total assets is a significant determinant to the ratio of public debt used by a firm. This is also in line with the findings of Krishnaswami et al. (1999) and Denis and Mihov (2003).

Next, we find that the financial assets ratio has the second largest explanatory power on the debt sourcing decision. The variable, which proxies for highest quality collateral, has a standardised coefficient of 0.173 (0.432), implying a positive correlation with the use of public debt. This is in accordance with the outcomes of the tests performed by Hoshi et al. (1993), where the authors find a strong positive and statistically significant relationship between public debt and the ratio of financial assets to total assets.

Furthermore, firm age, defined as the natural logarithm of age, is also both statistically and economically significant as it has a positive impact on the public debt ratio with a standardized coefficient of 0.132 (0.073). The variable, which relates to both information asymmetry and borrower reputation, is found to have similar impact by Johnson (1997).

Contrasting the findings of Krishnaswami et al. (1999), who find that the depreciation ratio is significantly positively related to the public debt ratio, we do not find such a relationship. Rather, we find evidence of the opposite; that a high degree of depreciation ratio leads to a higher portion of private debt, as the variable exhibits a significant standardised coefficient of -0.077 (-0.064). Krishnaswami et al. (1999) test for deprecation ratio and market-to-book ratio asynchronously, under the argumentation that they proxy for similar theories. We use the two variables in the same model, but test for multicollinearity and find a weak relationship with an adjusted R-squared of 0.02, hence allowing for simultaneous inclusion of the factors.

Also showing the opposite result of previous research is our finding related to Altman's Z. Denis and Mihov (2003) find that firms facing the likelihood of bankruptcy, indicated by an Altman's Z of less than 1.81, are more likely to borrow privately. In our tests, these firms are instead shown to be more prone to have public debt financing. The variable (dummy variable of 1 if Altman's $Z < 1.81$) holds a significant standardised coefficient of 0.052 (0.051). We reflect upon this difference to potentially be due to our chosen test method, as we examine balance sheet proportion data and Denis and Mihov (2003) study new debt issues.

[11] The comparison of R-squared between studies is only indicative since there are variations in the use of explanatory variables and some differing definitions of the dependent variable.

Regarding the tangibility ratio, defined as fixed assets scaled by total assets, we find that the variable is statistically significant with a standardised coefficient of 0.060 (0.115). Hence, there is a positive relationship between the tangibility ratio and public debt ratio. This measure is related to the financial assets ratio, but differs, as the fixed assets are not as easily liquidated as the financial assets. It is hence rational that the measure has less economic impact on the public debt ratio. Johnson (1997) applies the tangibility ratio in his study, absent of the financial assets ratio, and find a strong positive relationship with the use of public debt.

Leverage, used as a proxy for the need and costs for lenders to monitor borrower activities, is found to have a positive relation to the use of public debt. The variable has a standardised coefficient of 0.055 (0.113), which contrasts with Hoshi et al.'s (1993) prediction but confirms the empirical findings of Johnson (1997). The theoretical implications of this are further discussed in section 6.2.1.2.

Next, we find that the R&D ratio has a very small economic impact but a statistically significant negative relationship with public debt. The variable exhibits a standardised coefficient of -0.020 (-0.002). This follows the findings of Denis and Mihov (2003), who find a weak negative relation between R&D expenditures and the likelihood of issuing public debt.

Further building upon the results from Denis and Mihov (2003), we find no significant relation between the market-to-book ratio and the choice of debt financing. The variable has a positive standardised coefficient of 0.044 (0.016), but no statistical significance. The outcome of a non-significant market-to-book coefficient has been expected as the previous research has theorised, and predicted, both negative and positive relations to the ratio of public debt.

Lastly, we find no evidence of a significant relation between the earnings growth volatility and the level of public debt. The standardised coefficient of -0.026 (-0.207) for the variable, which is a proxy for both difficulties in evaluating firm performance and observable credit risk, is statistically insignificant.

6.2.1.2 Theoretical implications

Building on the results for the individual variables, we now take on an aggregated theory-based perspective. Hence, we deepen our analysis of the outcome of the OLS regression by applying the theoretical classifications of variables that can be seen in Exhibit 3.

Relating to the transaction costs of issuing public debt, we discuss the application of both firm size and issue size as proxy variables. However, due to issues of multicollinearity, we only apply firm size in the regressions. As described in section 6.2.1.1, the variable has a very strong positive relation to the use of public debt, in line with much of the previous research. However, as Johnson (1999) states; omitting the issue size variable and acknowledging that the firm size is used as proxy for other theories leads to the need to interpret the outcome of the variable with caution. Taking this into regard, we however reason that the strong outcome of our test and the support in the literature gives us ground to say that there is evidence for large firms exhibiting benefits from economies of scale when issuing public debt.

Information asymmetries are approximated by the variables firm age, market-to-book ratio, depreciation ratio, R&D ratio and earnings growth volatility. As there are a high number of variables used to test this theory, drawing conclusions on this theory is more cumbersome than for the transaction costs theory as described above. On a disaggregated level, we find that only age and the R&D ratio show statistical significant coefficients with the same signs as suggested by theory. The R&D ratio is however of very low

economic significance. The positive coefficient of firm age gives support for the adverse selection theory, but since it is also used as a proxy for borrower reputation it is difficult to discern which theory causes the effect.

For the other variables, we see that the market-to-book ratio and earnings growth volatility are insignificant, while the depreciation ratio is significant but has a sign opposite of that expected from previous research. The insignificance of the market-to-book ratio is also found by Hadlock and James (2002), Denis and Mihov (2003), Johnson (1997) and Houston and James (1996). Krishnaswami et al. (1999), on the other hand, find a statistically significant negative relation with the public debt ratio. The variable is a proxy for growth opportunities, with negative expected relation to public debt. However, it is also a proxy for the capital market's trust in management and the perceived quality of the firm's projects, with positive expected relation to the use of public debt. Due to the contradicting predictions and the unclear evidence from previous research, our hypothesis is that the market-to-book ratio could send out mixed signals to capital markets and thereby the effect of the variable is confounded. However, we return to the market-to-book ratio in our logistic regressions with an elaboration of the discussion.

Borrower reputation is approximated by the variables firm age, firm size, market-to-book ratio, Altman's Z and earnings growth volatility. As many of these variables overlap with the ones described for information asymmetries above, it is evident that the same difficulties in drawing conclusions also arise for this theory. In this case, we have two significant variables in age and firm size, supporting the overall theory that borrower reputation increases the likelihood of raising public debt. However, we see that Altman's Z has a sign opposite to the predicted. Since Denis and Mihov (2003) conclude that credit quality is the most important factor affecting firms' debt structure, this leads to the conclusion that we only have weak support for the borrower reputation theory.

The monitoring theory is tested by the three proxy variables firm age, market-to-book ratio and leverage. Both age and market-to-book ratio have been discussed in the previous paragraphs, but concerning leverage we are rendered with some new information. As described in section 6.2.1, there is a positive relation between leverage and the public debt ratio. Hoshi et al. (1993) theorise a positive correlation to the amount of private debt, as the need for more monitoring is higher for levered firms. We hence find the opposite sign than that of the theory. However, our finding is in fact in line with what Johnson (1997) finds. We return to this contradiction in our logistic regressions and elaborate on a plausible explanation to the result.

The last theory, financial distress, is tested by using a group of variables that relate to the liquidation and collateral value of a firm. The variables used are the tangibility ratio and financial assets ratio, through which we find strong support for the theory. The tangibility ratio and financial assets ratio are to some extent similar as they proxy for the amount and quality of collateral. These similarities are reflected in the regression results, which prove that both factors have a positive impact on the use of public debt. We however note a difference in that the financial assets ratio has a greater explanatory power than the tangibility ratio. Leeth and Scott (1989) provide an explanation to why the financial assets ratio seems to hold greater economic significance. They argue that the liquidation value of assets, and consequently their use as collateral, is lower when the assets are highly specialised. In conclusion we view the outcomes of these two variables, which are used on a stand-alone basis and do not proxy for any other theories, as strong indicators of support for the financial distress theory related to liquidation.

6.2.2 Logistic regressions

The logistic regressions investigate which variables impact the three discrete debt-financing choices. Through this model, we extend the previous literature's discrete choice models between having only public or only private debt by also including the choice of having a mixed debt structure.

The first logistic regression tests the likelihood of the classical discrete choice of firms raising either public or private debt. The second regression tests the probability of having some public debt instead of no public debt. Lastly, the third regression tests what variables impact the probability to either have a mixed debt structure or only public debt. Through these three tests, we argue that we have covered the full spectrum of choices that a firm has in regards to its choice of debt financing.

For the logistic regressions we present standardised and unstandardised coefficients. The standardised coefficients should be interpreted as follows; e.g. a one standard deviation increase in firm size, results on average, in a 0.594 standard deviation increase in the log odds of having only public debt in comparison to having only private debt. The interpretation of the logistic regression's coefficients is described in more detail in section 5.1.2.

6.2.2.1 Variables

The outcomes of the logistic regressions confirm but also bring some additions to our previous findings. First, we still see that firm size is the main contributor as it has strong economic and statistic significance for the first and second logistic regressions. However, it does not have a statistical significance in regards to the choice between having a mixed debt structure or only public debt.

+++ Insert Exhibit 13(a) and 13(b) here +++

In line with the outcome of the OLS regression, we see that the financial assets ratio is of major importance in the discrete choices. The variable is of large economic and statistical significance for the first and third discrete choice. However, it has low significance in regards to the choice of having only private debt or some public debt. From this, we conclude that high quality collateral is of importance for firms that are solely financed by public debt.

Next, we find that leverage is the third most important factor when distinguishing between the three debt structure choices. In the OLS regression we find a significant positive correlation between leverage and the public debt ratio. However, in the logistic regression we identify a pattern that is indicated in the descriptive statistics. We see that leverage is a distinguishing factor firms with a mixed debt structure who are found to have the highest leverage.

Further elaborating on the identified pattern, we see that a high degree of leverage increases the probability for a firm to have some public debt over having only private debt. We also find that the leverage has a negative impact on the likelihood of having only public debt over having a mixed debt structure.

Firm age shows the same pattern as firm size in the logistic regressions, that firms with high age have a higher likelihood of having some level of public debt over only private debt. Firm age does however not impact the likelihood of having only public debt over having a mixed debt structure.

Regarding the tangibility ratio, we see that it is significant when distinguishing between only having public debt and the two alternative choices. This is in line with the finding regarding the financial assets ratio, however the coefficients for the tangibility ratio are somewhat smaller. This confirms the conclusion from the OLS regression that financial assets are more valuable as collateral than tangible assets for public debt investors, since they are easier to liquidate in case of financial distress.

Altman's Z shows to be positively related to having some public debt over having only private debt. Furthermore, we see no difference in Altman's Z between having a mixed debt structure over having only public debt financing.

The depreciation ratio indicates the same pattern in the logistic regressions as in the OLS regressions. A higher depreciation ratio increases the likelihood of having only private debt. We see no significant impact of deprecation ratio on having only public debt over a mixed debt structure.

The market-to-book ratio shows positive impact and statistical significance on the choice between having only public debt and a mixed debt structure. However, there is no observed effect when comparing only private with having some public debt, which is in line with the result from the OLS regression. Regarding the remaining variables, both the earnings growth volatility and the R&D ratio exhibit insignificant coefficients, closely in line with the findings of the OLS regression.

6.2.2.2 Theoretical implications

The main additional theoretical implications from the logistic regressions relate to the monitoring and financial distress theories and involve the three explanatory variables financial assets ratio, tangibility ratio and leverage.

Regarding leverage, we extend our own OLS regression results and reconcile the prediction of Hoshi et al. (1993) and the empirical conclusion of Johnson (1997). We find that leverage has a strong positive impact on having some public debt over only private debt, in line with our OLS a regression result that high leverage should increase the use of public debt. However, it also has a substantial negative impact on the probability of having only public debt over having a mixed debt structure. Hence, we find proof of the findings of both Hoshi et al. (1993) and Johnson (1997). This indicates that when a firm has some private debt, public debt investors can benefit from the financial intermediaries' ability to monitor and make sound liquidation decisions. This allows firms without the characteristics otherwise needed to issue public debt to source debt from public lenders.

The findings of the tangibility ratio and financial assets ratio further build on the observation above. The OLS regression indicates that higher collateral positively impacts the use of public debt. However, the insights from the logistic regressions prove that it is the firms with only public debt who have a distinguishing amount of collateral. This further strengthens the predictions of Bolton and Freixas (2000), that public investors lack the ability to renegotiate and therefore seek firms with collateral in the form of tangible or financial assets. Since firms with mixed debt structure are not distinguished by high collateral values we conclude that the presence of an intermediary's monitoring largely counterbalances the public investors preference to have collateral in the firm.

6.3 RESULTS SUMMARY AND HYPOTHESES

Summarising the results from our tests and concluding the support for our hypotheses of what drives corporations' choice between public and private debt, we find strong support for the transaction costs, monitoring and financial distress theories. We only find weak support for the borrower reputation theory and no support for the information asymmetry theory.

We see support for the transaction costs theory through consistent strong regression results of the firm size variable, indicating that larger firms are likely to have a higher degree of public debt. This holds for both our main tests; hence when assessing what impacts the level of public debt financing (continuous choice model) and when examining the probabilities of having only public debt, only private debt or a mixed debt structure (discrete choice model). These results have strong backing from findings in previous literature (see e.g. Krishnaswami, et al., 1999; Hadlock and James, 2002; Johnson, 1997; Smith, 1977). Therefore, we conclude that transaction costs impact the firms' demand for public debt through the existence of economies of scale in issuing public debt.

Even though we attribute the effect of firm size to a large extent to the transaction costs theory, we also apply the variable as a proxy for borrower reputation and monitoring. Hence, we interpret the firm size variable with caution and acknowledge that these theories also underpin the strong effect of the proxy.

The theory of financial distress receives support through the proxy variables tangibility ratio and financial assets ratio. These variables provide evidence that public debt investors prefer to invest in firms with high collateral value that is easily liquidated, since they lack the ability to renegotiate with debtors in financial distress (Chemmanur and Fulghieri, 1994). Our discrete debt choice model extends the findings of previous literature by highlighting that the need for collateral is most critical for firms financed by only public debt; firms with a mixed debt structure show no significant difference in collateral compared to firms financed by private debt.

The monitoring theory is supported by the proxy variables leverage and firm size. By complementing the continuous model on debt choice with a our discrete model, we find evidence of the importance of monitoring through the result that firms with the highest leverage, and therefore the largest risk for asset substitution, require an intermediary that can monitor their actions. More specifically, we find that the firms with the highest leverage combine the monitoring function of private debt with having public debt as well. This finding reconciles the prediction of Hoshi et al. (1993), that firms with high leverage require monitoring and therefore choose private debt, and Johnson's (1997) contradictory empirical finding that there is a positive correlation between leverage and public debt levels. Additional support for the monitoring theory is found through the significance of firm size as a positive indicator of information supplied to the capital markets, which lowers the needs for monitoring.

We find weak support for the importance of borrower reputation as the proxy variables firm age and size supports the theory while credit quality, found by Denis and Mihov (2003) to be the most important determinant in the choice of public and private debt, is lower for firms with public debt. We conclude our tests by finding no support for the information asymmetry theories, since the main proxy variables market-to-book ratio and deprecation ratio show mixed and opposite evidence respectively.

Commenting on the generalisability of our results, we perform our empirical tests on a data set containing firms listed on the U.S. stock exchanges New York Stock Exchange and NASDAQ. The data set has been refined to exclude firms in the financial and oil and gas industries. As we have not delimited our sample based on any further major criteria, we argue that our results are representative for a wide range of firms

in terms of size, age and industry. However, we acknowledge that our choice of using firms listed on well-developed stock exchanges implies that the firms adhere to a high level of accounting and reporting standards. This potentially reduces the significance of the information asymmetry theory, as investors in these firms are readily supplied with a high degree of information. Hence, our results are not generalisable for private firms, or those listed on less transparent markets.

Furthermore, we have performed three robustness tests to determine the validity of our methods. These tests show that our approach of excluding capital lease and dealing with unclassified debt does not materially affect the outcome of statistical tests. However, when applying lower size limits to our data sample, we see changed significance for some of the theoretical approximations. The main finding of this robustness test is that for very large firms, the monitoring and financial distress theories decrease in importance.

The results of our tests and how they relate to our initial hypotheses are summarised in Exhibit 17.

+++ Insert Exhibit 17 here +++

7. CONCLUSIONS

This study extends previous research on firms' choice of debt structure by applying a broad set of theory based proxy variables on two different regression models, testing for what drives the level of public debt and the probability of having only public debt, only private debt or a mixed debt structure. Through this method, we contribute to the existing literature and find strong evidence of the importance of transaction costs and financial intermediaries' superior ability to monitor and correctly deal with firms in financial distress.

Regarding the design of our test, we have not identified any authors in the existing literature that apply the same combination of empirical methods. Our approach of concluding of the variables' impacts on both the discrete and continuous choice models differ from authors that mainly focus on one of the two. As we extend the discrete choice model to include firms with a mixed debt structure, we are able to include the full scope of firms' choices. The validity of our tests are supported by our robust and statistical significant regression results, performed on a broad set of listed firms only delimited by excluding firms with missing or distorting values.

We find strong support for the transaction costs theory, claiming that large firms exhibit economies of scale in public debt issues and hence use more public debt. Furthermore, we find support for the impact of the monitoring theory. In line with the predictions of this theory, firms with high need of monitoring use more private debt. We also see support for the financial distress theory, claiming that firms with high collateral and liquidation values use a higher degree of public debt. Regarding the borrower reputation theory, we find limited support. According to theory, borrowers with good reputation should see a strong supply of public debt. We however see mixed results for the test indictors of the borrower reputation theory. Lastly, we find no support for the information asymmetry theory, stating that firms exhibiting low information asymmetry should use more public debt.

Reflecting upon the practical implications of our findings, we identify a dynamic that firms can increase their access to the public credit markets by keeping private debt on their balance sheet. When a firm has some private debt, public debt investors can benefit from the financial intermediaries' ability to monitor

and make sound liquidation decisions. This allows firms without the characteristics otherwise needed to issue public debt to source debt from public lenders. This is in line with a similar argument made by Diamond (1991), who claims that young firms build up reputation using private debt to subsequently switch to public financing as they mature. With the size and current growth of the public bond markets, this practical implication can become of use for borrowers wishing to issue public debt.

On the basis of our findings and the previous research we see two interesting topics for future research. Firstly, one can place further focus on the practical implication described above in order to validate how the dynamic functions in practice for firms with "bad characteristics" that wish to issue public debt. Furthermore, one can study how the supply and demand dynamics of firms' choice of debt structure change over time.

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9. EXHIBITS

Exhibit 1. Data set
The chart presents the process of refining the data-set from the initial sample size of 5,419 to 1,277 firms listed on the New York Stock Exchange and NASDAQ as of October 2014.

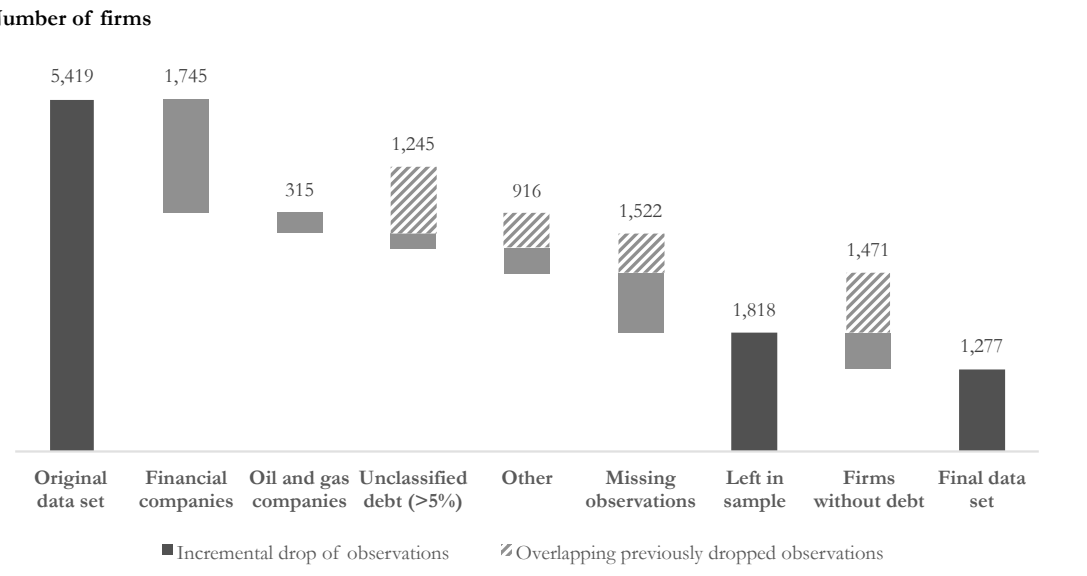


Exhibit 2. Capital and debt structure variables
The table presents the variables related to firms' capital and debt structures.

Variable	Definition
Total capital	Sum of book value of equity, debt, capital lease and convertible debt.
Total debt	Sum of bonds and notes, commercial paper, bank debt, revolvers and unclassified debt.
Public debt	Sum of bonds and notes and commercial paper.
Private debt	Sum of bank term loans and drawn revolvers.
Unclassified debt	Debt not classified as pubilc or private debt.
Total debt ratio	Total debt scaled by total capital.
Public debt ratio	Public debt scaled by total debt.

Exhibit 3. Explanatory variables

The table presents the independent variables used as proxies for the examined theories explaining corporations' choice of debt financing.

Variable	Definition	Theory	Sign	Comment
Firm age	Natural logarithm of firm age.	Information asymmetry	+	Proxy for information available, e.g. historical financial information and track record.
		Borrower reputation	+	Proxy for reputation of performance and survival, built up during the life of the firm.
Firm size	Natural logarithm of total assets.	Transaction costs	+	Proxy for economies of scale when issuing public debt.
		Borrower reputation	+	Proxy for reputation of reliability and diversification of operations.
		Monitoring	+	Proxy for information supplied, large amounts leads to lower monitoring needs.
Issue size	Natural logarithm of total debt.	Transaction costs	+	Proxy for size of debt issues, and economies of scale when issuing public debt.
Market-to-book	Market value of assets scaled by book value of assets.	Information asymmetry	-	Proxy for firms' investment opportunities and adverse selection, increasing lender risk. Proxy for proprietary information that borrowers wish not to disclose publicly.
		Borrower reputation	+	Proxy for capital markets' perception of quality of future projects.
		Monitoring	+	Proxy for reputation and public markets' trust in management.
Depreciation ratio	Depreciation scaled by market value of equity.	Information asymmetry	+	Proxy for tangibility and growth opportunities, high depreciation ratio - high tangibility and few growth options.
R&D ratio	R&D expenses scaled by sales.	Information asymmetry	-	Proxy for proprietary information that borrowers wish not to disclose publicly.
Altman's Z	Dummy variable 1 if Altman's Z < 1.81 and 0 if Z => 1.81.	Borrower reputation	-	Proxy for credit quality, high Altman's Z (>1.81) implies lower risk for bankruptcy and subsequently better reputation among public investors.
Earnings growth volatility	Three year standard deviation of EBIT scaled by total assets.	Information asymmetry	-	Proxy for earnings volatility and difficulties for public markets to evaluate performance.
		Borrower reputation	-	Proxy for observable credit risk, high volatility implies higher risk and lower reputation.
Tangibility ratio	Net PPE scaled by total assets.	Financial distress	+	Proxy for amount of collateral on a company's balance sheet.
Financial assets ratio	Financial assets scaled by total assets.	Financial distress	+	Proxy for amount of the highest quality collateral, the most easily liquidated assets.
Leverage	Total debt scaled by total capital.	Monitoring	-	Proxy for need of monitoring, highly leveraged firms require monitoring due to risks for asset substitution.

All variables other than age and earnings growth volatility are based on averages for the three year period before the observed year (2013).

Exhibit 4. Correlation matrix of all explanatory variables

The table presents a correlation matrix of all the explanatory variables of the examined theories. The table values represent bivariate correlations between the two intersecting variables.

e(V)	Firm age	Firm size	Market-to-book	Depreciation ratio	R&D ratio	Altman's Z	Earnings growth volatility	Tangibility ratio	Financial assets ratio	Leverage	Constant
Firm age	1.000										
Firm size	-0.316	1.000									
Market-to-book	-0.048	-0.006	1.000								
Depreciation ratio	0.018	-0.047	0.083	1.000							
R&D ratio	-0.047	0.123	0.141	0.029	1.000						
Altman's Z	0.145	0.031	0.225	-0.029	0.001	1.000					
Earnings growth volatility	-0.012	0.314	-0.102	-0.015	0.198	0.030	1.000				
Tangibility ratio	-0.052	-0.161	0.039	0.000	-0.037	-0.195	-0.063	1.000			
Financial assets ratio	0.207	-0.105	-0.351	-0.060	-0.418	-0.166	-0.342	0.252	1.000		
Leverage	0.018	-0.302	-0.092	-0.023	-0.150	-0.332	-0.126	-0.003	0.289	1.000	
Constant	-0.658	-0.316	-0.179	0.000	0.013	-0.149	-0.191	-0.077	-0.273	-0.113	1.000

Firm age is the natural logarithm of the difference of year of establishment and 2013. Firm size is the natural logarithm of total assets. Market-to-book is the ratio of market value of total assets (book value of assets - book value of equity + market value of equity) over the book value of total assets. Depreciation ratio equals depreciation over the market value of equity. R&D ratio is the ratio of R&D expenses scaled by sales. Altman's Z is a dummy variable of 1 if Z < 1.81 and 0 if Z => 1.81. Earnings growth volatility is the three year standard deviation of EBIT scaled by total assets. Tangibility ratio equals net property, plant and equipment over total assets. Financial assets ratio equals cash and short term investments over total assets. Leverage is the ratio of total debt to total capital. All variables other than age and earnings growth volatility are based on averages for the three year period before the observed year (2013).

Exhibit 5. Variance inflation factors of all explanatory variables
The table presents variance inflation factors of all the explanatory variables for the examined theories. The table values represent variance inflation factors, squared variance inflation factors, tolerance and R-squared.

Variable	VIF	SQRT VIF	Tolerance	R-Squared
Firm age	1.230	1.110	0.813	0.184
Firm size	1.430	1.200	0.700	0.300
Market-to-book	1.360	1.170	0.737	0.263
Depreciation ratio	1.050	1.020	0.957	0.044
R&D ratio	1.040	1.020	0.961	0.039
Altman's Z	1.310	1.240	0.765	0.235
Earnings growth volatility	1.520	1.230	0.660	0.340
Tangibility ratio	1.260	1.120	0.792	0.208
Financial assets ratio	1.840	1.360	0.541	0.458
Leverage	1.410	1.190	0.708	0.292

Firm age is the natural logarithm of the difference of year of establishment and 2013. Firm size is the natural logarithm of total assets. Market-to-book is the ratio of market value of total assets (book value of assets - book value of equity + market value of equity) over the book value of total assets. Depreciation ratio equals depreciation over the market value of equity. R&D ratio is the ratio of R&D expenses scaled by sales. Altman's Z is a dummy variable of 1 if Z < 1.81 and 0 if Z => 1.81. Earnings growth volatility is the three year standard deviation of EBIT scaled by total assets. Tangibility ratio equals net property, plant and equipment over total assets. Financial assets ratio equals cash and short term investments over total assets. Leverage is the ratio of total debt to total capital. All variables other than age and earnings growth volatility are based on averages for the three year period before the observed year (2013).

Exhibit 6. Description of the logistic regression model
The table presents the setup of dependent variables and number of observations applied in the three logistic regressions performed.

Logistic regression	Dependent variable (coded 0 or 1)		No. of observations			
	Absence of event (0)	Outcome of interest (1)	Private debt	Mixed debt structure	Public debt	Total
1	100% private debt	100% public debt	433	-	248	681
2	100% private debt	>0% public debt	433	596	248	1,277
3	Mixed debt	100% public debt	-	596	248	844

Public debt ratio is defined as public debt scaled by total debt. Public debt is defined as the sum of bonds and notes and commercial paper. Total debt is defined as the sum of bonds and notes, bank debt, commercial paper and unclassified debt.

Exhibit 7. Descriptive statistics of capital and debt structure
The table presents means of the capital and debt structures of all firms in the final data set.

	All firms - mean share of total capital	Firms with debt - mean share of total capital	Firms with debt - mean share of total debt
Observations	1,818	1,277	1,277
Equity (book value)	0.742	0.635	
Total debt, by type	0.232	0.330	
Public debt	0.128	0.182	0.494
Senior bonds	0.117	0.167	0.456
Subordinate bonds	0.008	0.011	0.029
Commercial papers	0.003	0.004	0.009
Private debt	0.103	0.147	0.505
Drawn revolvers	0.062	0.088	0.278
Term loans	0.042	0.059	0.227
Unclassified debt	0.000	0.001	0.002
Other	0.026	0.035	
Capital lease	0.007	0.008	
Convertible debt	0.019	0.027	

Total capital is defined as the sum of book value of equity, debt, capital lease and convertible debt. Total debt is defined as the sum of bonds and notes, bank debt, commercial paper and unclassified debt. Public debt is the sum of bonds and notes and commercial paper. Private debt is the sum of bank term loans and drawn revolvers.

Exhibit 8. Descriptive statistics of capital and debt structure development 2010 - 2013
The table presents means of the capital and debt structures on an annual basis for all firms in the final data set.

	2010 -mean	2011 -mean	2012 -mean	2013 -mean
Observations	1,818	1,818	1,818	1,818
Firms with debt	1,233	1,235	1,257	1,277
Debt / Total capital	0.204	0.213	0.227	0.232
Public debt / Total debt	0.522	0.512	0.489	0.494
Private debt / Total debt	0.475	0.486	0.509	0.505
Unclassified debt / Total debt	0.003	0.002	0.002	0.002

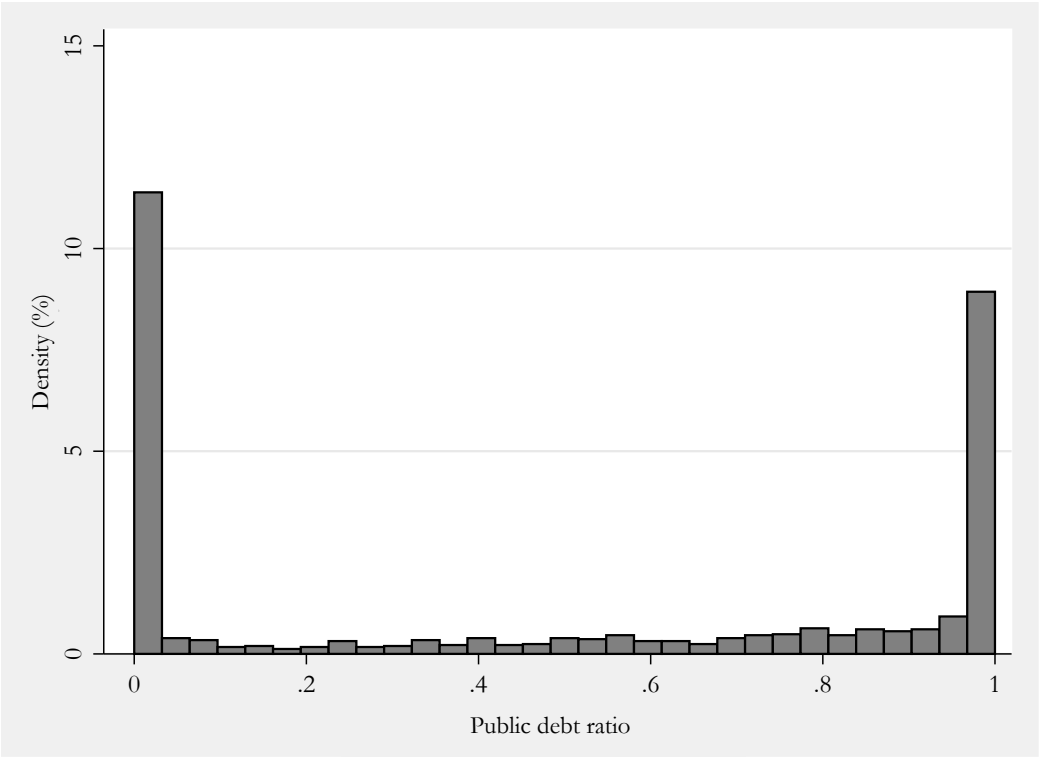
Total capital is defined as the sum of book value of equity, debt, capital lease and convertible debt. Total debt is defined as the sum of bonds and notes, bank debt, commercial paper and unclassified debt. Public debt is the sum of bonds and notes and commercial paper. Private debt is the sum of bank term loans and drawn revolvers.

Exhibit 9. Descriptive statistics annual changes in capital and debt structure 2011 - 2013
The table presents the number of firms with a "stable" capital structure (no annual capital structure change more than +/- 2.5%) and the number of firms within this group that changes their debt composition more than 2.5%, 5%, 10%, 20% and 50%.

	2011		2012		2013	
	No of firms	%	No of firms	%	No of firms	%
Delta: Total debt / Total capital						
Stable (-2.5% to +2.5%)	1,017		997		940	
Delta: Public debt / Total debt						
> 2.5%	137	13.5%	134	13.4%	119	12.7%
> 5%	98	9.6%	91	9.1%	84	8.9%
> 10%	62	6.1%	63	6.3%	62	6.6%
> 20%	40	3.9%	40	4.0%	33	3.5%
> 50%	23	2.3%	28	2.8%	20	2.1%

Total capital is defined as the sum of book value of equity, debt, capital lease and convertible debt. Total debt is defined as the sum of bonds and notes, bank debt, commercial paper and unclassified debt. Public debt is the sum of bonds and notes and commercial paper. Private debt is the sum of bank term loans and drawn revolvers.

Exhibit 10: Distribution of data sample's public debt ratios
The chart presents the distribution of the public debt ratios of all the firms in the final data sample.



Public debt ratio is defined as public debt scaled by total debt. Public debt is defined as the sum of bonds and notes and commercial paper. Total debt is defined as the sum of bonds and notes, bank debt, commercial paper and unclassified debt.

Exhibit 11. Descriptive statistics of explanatory variable means

The table presents means of the independent variables for whole data set and sub groups based on debt structure characteristics.

	All firms	Firms with no debt	Firms with debt	Firms with private debt only	Firms with mixed debt structure	Firms with public debt only	Firms with public debt ratio >0%-<33%	Firms with public debt ratio >33%-<66%	Firms with public debt ratio >66%-<100%
Observations	1,818	541	1,277	433	596	248	123	139	334
Age	46.048	32.329	51.861	38.661	62.119	50.254	51.610	52.734	69.895
Firm size	4,484.321	772.190	6,056.961	822.988	9,985.592	5,753.923	2,151.308	10,144.880	12,804.380
Issue size	1,120.770	9.620	1,591.507	153.053	2,859.391	1,055.991	693.437	3,718.527	3,299.489
Market-to-book	2.076	2.625	1.843	2.008	1.604	2.129	1.504	1.586	1.648
Depreciation ratio	0.111	0.171	0.086	0.086	0.093	0.067	0.083	0.169	0.065
R&D ratio	1.148	3.225	0.269	0.623	0.044	0.188	0.137	0.022	0.020
Earnings growth volatility	0.048	0.074	0.037	0.053	0.024	0.040	0.029	0.028	0.021
Altman's Z	3.971	6.203	3.025	3.700	2.592	2.885	2.656	2.295	2.692
Altman's Z <1.81	24.5%	27.1%	18.3%	24.2%	30.7%	23.4%	25.2%	41.7%	28.1%
Tangibility ratio	0.218	0.132	0.254	0.206	0.290	0.253	0.256	0.252	0.319
Financial assets ratio	0.236	0.401	0.166	0.209	0.105	0.236	0.097	0.106	0.108
Leverage	0.155	0.017	0.214	0.138	0.285	0.178	0.244	0.321	0.285

Total capital is defined as the sum of book value of equity, debt, capital lease and convertible debt. Total debt is defined as the sum of bonds and notes, bank debt, commercial paper and unclassified debt. Public debt is the sum of bonds and notes and commercial paper.

Firm age equals the difference of year of establishment and 2013. Firm size is defined as total assets. Market-to-book is the ratio of market value of total assets (book value of assets - book value of equity + market value of equity) over the book value of total assets. Depreciation ratio equals depreciation over the market value of equity. R&D ratio is the ratio of R&D expenses scaled by sales. Altman's Z is a dummy variable of 1 if Z < 1.81 and 0 if Z => 1.81. Earnings growth volatility is the three year standard deviation of EBIT scaled by total assets. Tangibility ratio equals net property, plant and equipment over total assets. Financial assets ratio equals cash and short term investments over total assets. Leverage is the ratio of total debt to total capital. All variables other than age and earnings growth volatility are based on averages for the three year period before the observed year (2013).

Exhibit 12. OLS regressions on and public debt ratio

The table presents estimations from an OLS regression on public debt ratio (public debt over total debt) on explanatory variables for the studied theories. The table values represent unstandardised and standardised regression coefficients and standard errors.

	Public debt ratio		Public debt ratio	
Observations	1,277		1,277	
R-squared	0.321		0.321	
Adjusted R-squared	0.316		0.316	
	Unstd. Coefficient		Std. Coefficient	
Firm age	0.073	***	0.132	***
	0.014		0.014	
Firm-size	0.118	***	0.514	***
	0.006		0.006	
Market-to-book	0.016		0.044	
	0.011		0.011	
Depreciation ratio	-0.064	***	-0.077	***
	0.016		0.016	
R&D ratio	-0.002	**	-0.020	**
	0.001		0.001	
Altman's Z	0.051	***	0.052	***
	0.025		0.025	
Earnings growth volatility	-0.207		-0.026	
	0.263		0.263	
Tangibility ratio	0.115	***	0.060	***
	0.048		0.048	
Financial assets ratio	0.432	***	0.173	***
	0.090		0.090	
Leverage	0.113	**	0.055	**
	0.057		0.057	
Constant	-0.763	***		
	0.063			

P >|t| *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. One-tailed tests of significance applied for variables with a predicted outcome of being statistically different from zero.

Total capital is defined as the sum of book value of equity, debt, capital lease and convertible debt. Total debt is defined as the sum of bonds and notes, bank debt, commercial paper and unclassified debt. Public debt is the sum of bonds and notes and commercial paper.

Firm age is the natural logarithm of the difference of year of establishment and 2013. Firm size is the natural logarithm of total assets. Market-to-book is the ratio of market value of total assets (book value of assets - book value of equity + market value of equity) over the book value of total assets. Depreciation ratio equals depreciation over the market value of equity. R&D ratio is the ratio of R&D expenses scaled by sales. Altman's Z is a dummy variable of 1 if Z < 1.81 and 0 if Z => 1.81. Earnings growth volatility is the three year standard deviation of EBIT scaled by total assets. Tangibility ratio equals net property, plant and equipment over total assets. Financial assets ratio equals cash and short term investments over total assets. Leverage is the ratio of total debt to total capital. All variables other than age and earnings growth volatility are based on averages for the three year period before the observed year (2013).

Exhibit 13(a). Logistic regressions predicting type of debt structure, standardised coeffiecients
The table presents estimations from logistic regressions of public debt ratio (public debt over total debt) on explanatory variables for the studied theories. The three regressions presents the standardised log-odds of being in one of two potential public debt ratio segments, defined by dummy variables 1 and 0; 1. 0: 0%, 1: 100%, 2. 0: 0%, 1: >0%, and 3. 0: Mix, 1: 100%. The table values represent standardised coefficients and standard errors.

	1. 0% or 100%	2. 0% or >0%	3. Mix or 100%
Observations	681	1,277	844
Pseudo R-squared	0.239	0.272	0.194
Predictive ability	77.39%	78.23%	77.61%
	Std. Coefficient	Std. Coefficient	Std. Coefficient
Firm age	0.159 ***	0.137 ***	-0.028
	0.141	0.106	0.1224
Firm size	0.594 ***	0.528 ***	0.0073
	0.086	0.056	0.0534
Market-to-book	0.065	0.005	0.1057 **
	0.072	0.061	0.0904
Depreciation ratio	-0.086 ***	-0.071 ***	0.0175
	0.135	0.088	0.1797
R&D ratio	-0.032	-0.012	-0.0406
	0.016	0.012	0.0838
Altman's Z	0.120 ***	0.094 ***	0.0554
	0.280	0.202	0.2502
Earnings growth volatility	-0.038	-0.020	-0.031
	2.032	1.564	2.744
Tangibility ratio	0.085 **	0.010	0.154 ***
	0.466	0.366	0.421
Financial assets ratio	0.285 ***	0.058 *	0.350 ***
	0.695	0.532	0.788
Leverage	-0.013	0.196 ***	-0.365 ***
	0.539	0.450	0.620

P >|z| *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. One-tailed tests of significance applied for variables with a predicted outcome of being statistically different from zero.

Total capital is defined as the sum of book value of equity, debt, capital lease and convertible debt. Total debt is defined as the sum of bonds and notes, bank debt, commercial paper and unclassified debt. Public debt is the sum of bonds and notes and commercial paper.
Firm age is the natural logarithm of the difference of year of establishment and 2013. Firm size is the natural logarithm of total assets. Market-to-book is the ratio of market value of total assets (book value of assets - book value of equity + market value of equity) over the book value of total assets. Depreciation ratio equals depreciation over the market value of equity. R&D ratio is the ratio of R&D expenses scaled by sales. Altman's Z is a dummy variable of 1 if Z < 1.81 and 0 if Z => 1.81. Earnings growth volatility is the three year standard deviation of EBIT scaled by total assets. Tangibility ratio equals net property, plant and equipment over total assets. Financial assets ratio equals cash and short term investments over total assets. Leverage is the ratio of total debt to total capital. All variables other than age and earnings growth volatility are based on averages for the three year period before the observed year (2013).

Exhibit 13(b). Logistic regressions predicting type of debt structure, unstandardised coeffiecients
The table presents estimations from logistic regressions of public debt ratio (public debt over total debt) on explanatory variables for the studied theories. The three regressions presents the log-odds of being in one of two potential public debt ratio segments, defined by dummy variables 1 and 0; 1. 0: 0%, 1: 100%, 2. 0: 0%, 1: >0%, and 3. 0: Mix, 1: 100%. The table values represent unstandardised coefficients and standard errors.

	1. 0% or 100%	2. 0% or >0%	3. Mix or 100%
Observations	681	1,277	844
Pseudo R-squared	0.239	0.272	0.194
Predictive ability	77.39%	78.23%	77.61%
	Unstd. Coefficient	Unstd. Coefficient	Unstd. Coefficient
Age	0.501 ***	0.421 ***	-0.076
	0.141	0.106	0.1224
Firm-size	0.788 ***	0.671 ***	0.0093
	0.086	0.056	0.0534
Market-to-book	0.106	0.011	0.224 **
	0.072	0.061	0.0904
Depreciation ratio	-0.321 ***	-0.329 ***	0.096
	0.135	0.088	0.1797
R&D ratio	-0.012	-0.006	-0.0948
	0.016	0.012	0.0838
Altman's Z	0.659 ***	0.514 ***	0.2691
	0.280	0.202	0.2502
Earnings growth volatility	-1.305	-0.905	-1.792
	2.032	1.564	2.744
Tangibility ratio	0.901 **	0.105	1.422 ***
	0.466	0.366	0.421
Financial assets ratio	3.266 ***	0.809 *	5.071 ***
	0.695	0.532	0.788
Leverage	-0.153	2.229 ***	-3.945 ***
	0.539	0.450	0.620
Constant	-8.599	-6.208 ***	-0.918
	0.862	0.566	0.630

P >|z| *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. One-tailed tests of significance applied for variables with a predicted outcome of being statistically different from zero.

Total capital is defined as the sum of book value of equity, debt, capital lease and convertible debt. Total debt is defined as the sum of bonds and notes, bank debt, commercial paper and unclassified debt. Public debt is the sum of bonds and notes and commercial paper.
Firm age is the natural logarithm of the difference of year of establishment and 2013. Firm size is the natural logarithm of total assets. Market-to-book is the ratio of market value of total assets (book value of assets - book value of equity + market value of equity) over the book value of total assets. Depreciation ratio equals depreciation over the market value of equity. R&D ratio is the ratio of R&D expenses scaled by sales. Altman's Z is a dummy variable of 1 if Z < 1.81 and 0 if Z => 1.81. Earnings growth volatility is the three year standard deviation of EBIT scaled by total assets. Tangibility ratio equals net property, plant and equipment over total assets. Financial assets ratio equals cash and short term investments over total assets. Leverage is the ratio of total debt to total capital. All variables other than age and earnings growth volatility are based on averages for the three year period before the observed year (2013).

Exhibit 14. Robustness test of altering unclassified debt cut-off point

The table presents estimations from OLS regressions of public debt ratio (public debt over total debt) on the explanatory variables for the studied theories. In relation to the main regressions, the data sample cut-off point of allowing for 5% unclassified debt ratio (unclassified debt over total debt) is changed in these regressions to 0%, 10% and 50%. The table values represent standardised coefficients and standard errors.

	Cut-off point 0%	Cut-off point 10%	Cut-off point 50%
Observations	955	1,352	1,493
R-squared	0.283	0.327	0.333
Adjusted R-squared	0.275	0.322	0.328
	Std. Coefficient	Std. Coefficient	Std. Coefficient
Firm age	0.136 ***	0.135 ***	0.141 ***
	0.017	0.014	0.013
Firm size	0.484 ***	0.513 ***	0.512 ***
	0.007	0.006	0.005
Market-to-book	0.050	0.042	0.046 *
	0.012	0.011	0.010
Depreciation ratio	-0.073 ***	-0.074 ***	-0.075 ***
	0.016	0.016	0.017
R&D ratio	-0.023 **	-0.019 **	-0.021 **
	0.001	0.001	0.001
Altman's Z	0.090 ***	0.052 **	0.046 **
	0.030	0.024	0.023
Earnings growth volatility	-0.002	-0.032	-0.037
	0.333	0.258	0.251
Tangibility ratio	0.051 **	0.060 ***	0.067 ***
	0.057	0.046	0.044
Financial assets ratio	0.159 ***	0.171 ***	0.179 ***
	0.099	0.087	0.084
Leverage	0.066 **	0.056 **	0.057 **
	0.068	0.056	0.052

P >|t| *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. One-tailed tests of significance applied for variables with a predicted outcome of being statistically different from zero.

Total capital is defined as the sum of book value of equity, debt, capital lease and convertible debt. Total debt is defined as the sum of bonds and notes, bank debt, commercial paper and unclassified debt. Public debt is the sum of bonds and notes and commercial paper.

Firm age is the natural logarithm of the difference of year of establishment and 2013. Firm size is the natural logarithm of total assets. Market-to-book is the ratio of market value of total assets (book value of assets - book value of equity + market value of equity) over the book value of total assets. Depreciation ratio equals depreciation over the market value of equity. R&D ratio is the ratio of R&D expenses scaled by sales. Altman's Z is a dummy variable of 1 if Z < 1.81 and 0 if Z => 1.81. Earnings growth volatility is the three year standard deviation of EBIT scaled by total assets. Tangibility ratio equals net property, plant and equipment over total assets. Financial assets ratio equals cash and short term investments over total assets. Leverage is the ratio of total debt to total capital. All variables other than age and earnings growth volatility are based on averages for the three year period before the observed year (2013).

Exhibit 15. Robustness test of including capital lease as private debt
The table presents estimations from OLS regressions of public debt ratio (public debt over total debt) on the explanatory variables for the studied theories. In relation to the main regressions, the data in these regressions includes capital lease as private debt instead of being treated as non-debt fixed claims. The table values represent standardised coefficients and standard errors.

	Public debt ratio	
Observations	1350	
R-squared	0.337	
Adjusted R-squared	0.332	
	Std. Coefficient	
Firm age	0.140	***
	0.013	
Firm size	0.494	***
	0.006	
Market-to-book	0.011	
	0.009	
Depreciation ratio	-0.074	***
	0.016	
R&D ratio	-0.016	***
	0.001	
Altman's Z	0.024	*
	0.040	
Earnings growth volatility	-0.022	
	0.236	
Tangibility ratio	0.038	*
	0.047	
Financial assets ratio	0.166	***
	0.080	
Leverage	0.138	***
	0.054	

P >|t| *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. One-tailed tests of significance applied for variables with a predicted outcome of being statistically different from zero.

Total capital is defined as the sum of book value of equity, debt, capital lease and convertible debt. Total debt is defined as the sum of bonds and notes, bank debt, commercial paper and unclassified debt. Public debt is the sum of bonds and notes and commercial paper.
Firm age is the natural logarithm of the difference of year of establishment and 2013. Firm size is the natural logarithm of total assets. Market-to-book is the ratio of market value of total assets (book value of assets - book value of equity + market value of equity) over the book value of total assets. Depreciation ratio equals depreciation over the market value of equity. R&D ratio is the ratio of R&D expenses scaled by sales. Altman's Z is a dummy variable of 1 if Z < 1.81 and 0 if Z => 1.81. Earnings growth volatility is the three year standard deviation of EBIT scaled by total assets. Tangibility ratio equals net property, plant and equipment over total assets. Financial assets ratio equals cash and short term investments over total assets. Leverage is the ratio of total debt to total capital. All variables other than age and earnings growth volatility are based on averages for the three year period before the observed year (2013).

Exhibit 16. Robustness test of lower size limits

The table presents estimations from OLS regressions of public debt ratio (public debt over total debt) on the explanatory variables for the studied theories. In relation to our main test, the tested samples are delimited in regards to size, with cut-off points based on sales USD 50m, 100m, 500m and 1000m. The table values represent standardised regression coefficients and standard errors.

	Size limit sales 50m	Size limit sales 100m	Size limit sales 500m	Size limit sales 1000m
Observations	1,135	1,067	757	567
R-squared	0.327	0.317	0.231	0.203
Adjusted R-squared	0.321	0.311	0.221	0.189
	Std. Coefficient	Std. Coefficient	Std. Coefficient	Std. Coefficient
Age	0.140 ***	0.129 ***	0.123 ***	0.159 ***
	0.015	0.015	0.017	0.018
Firm-size	0.489 ***	0.485 ***	0.393 ***	0.361 ***
	0.006	0.007	0.010	0.012
Market-to-book	0.044	0.036	0.041	0.109 **
	0.012	0.013	0.017	0.019
Depreciation ratio	-0.085 ***	-0.088 ***	-0.102 ***	-0.109 ***
	0.016	0.016	0.015	0.016
R&D ratio	0.010	0.004	0.001	0.025
	0.233	0.248	0.305	0.350
Altman's Z	0.038 *	0.020	0.000	-0.001
	0.027	0.029	0.036	0.037
Earnings growth volatility	-0.027	-0.035	-0.087 ***	-0.130 ***
	0.414	0.467	0.559	0.562
Tangibility ratio	0.077 ***	0.081 ***	0.103 ***	0.062 *
	0.051	0.053	0.062	0.070
Financial assets ratio	0.199 ***	0.192 ***	0.137 ***	0.098 *
	0.127	0.137	0.177	0.196
Leverage	0.069 **	0.071 **	0.082 **	0.052
	0.063	0.065	0.076	0.087

P > |t| *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. One-tailed tests of significance applied for variables with a predicted outcome of being statistically different from zero.

Total capital is defined as the sum of book value of equity, debt, capital lease and convertible debt. Total debt is defined as the sum of bonds and notes, bank debt, commercial paper and unclassified debt. Public debt is the sum of bonds and notes and commercial paper.

Firm age is the natural logarithm of the difference of year of establishment and 2013. Firm size is the natural logarithm of total assets. Market-to-book is the ratio of market value of total assets (book value of assets - book value of equity + market value of equity) over the book value of total assets. Depreciation ratio equals depreciation over the market value of equity. R&D ratio is the ratio of R&D expenses scaled by sales. Altman's Z is a dummy variable of 1 if Z < 1.81 and 0 if Z => 1.81. Earnings growth volatility is the three year standard deviation of EBIT scaled by total assets. Tangibility ratio equals net property, plant and equipment over total assets. Financial assets ratio equals cash and short term investments over total assets. Leverage is the ratio of total debt to total capital. All variables other than age and earnings growth volatility are based on averages for the three year period before the observed year (2013).

Exhibit 17. Hypotheses
The table presents the hypotheses tested in order to determine what drives firms' choice of debt financing.

Hypothesis		Support
1:	Firms with economies of scale in public debt issues have a higher degree of public debt.	Strong
2:	Firms with less information asymmetry have a higher degree of public debt.	No
3:	Firms with a strong reputation as borrowers have a higher degree of public debt.	Weak
4:	Firms with lower needs for monitoring have a higher degree of public debt.	Strong
5:	Firms with high liquidation values have a higher degree of public debt.	Strong

10. APPENDIX: ROBUSTNESS TESTS

10.1 ROBUSTNESS TEST 1: ALTERING THE UNCLASSIFIED DEBT CUT-OFF POINT

We perform a robustness test on our method of dealing with unclassified debt (see section 4.1).

The robustness test consists of performing an identical OLS regression as described in section 5.1.1, but altering the data sample by changing the cut-off points for the maximum allowed proportion of unclassified debt. The incremental amount of unclassified debt is treated in the same manner as we treat the 5 percent that we allow for in our main regressions. We apply three different cut-off points; 0, 10 and 50 percent. The two lower cut-offs are used as we want to see if there are any material changes of the regression results by not allowing for any unclassified debt as well as slightly more than we apply in our main test. The cut-off point of 0 percent also creates some comparability with Lin et al. (2013), who choose to exclude all firms with unclassified debt. The highest cut-off point of 50 percent is used since it is substantially higher than the applied limit, and we reason that it should give us further indication if the treatment of the debt item matters to the results.

The outcome of the robustness test (see Exhibit 14) shows that the treatment of unclassified debt has very limited impact on the main test results. Aside from a few variables exhibiting inconsiderable changes in statistical significance, no material impact occurs on the tests by altering the cut-off points, even for the 50 percent level.

10.2 ROBUSTNESS TEST 2: INCLUDING CAPITAL LEASE AS PRIVATE DEBT

The second robustness test is performed due to our approach of excluding capital lease from our definitions of debt (see section 5.2).

Including capital lease as a portion of private debt, and subsequently total debt, we see a few minor differences to our main regression (see Exhibit 15). The statistical significance of the variables Altman's Z and tangibility ratio decreases form the 1 percent level to the 10 percent level. We further see an increased economic impact of the leverage variable. Regarding the other variables no material changes are detected.

10.3 ROBUSTNESS TEST 3: APPLYING LOWER SIZE LIMITS TO THE DATA SET

We perform the third robustness test by applying four different lower size limits to the test sample. As described in section 4.1, we include firms of all sizes in our data set as we wish to design a model enabling us to draw as generalisable conclusions as possible. We choose to not apply any lower size limits, but instead perform robustness tests using sales size limits of USD 50, 100, 500 and 1,000 million. In the robustness test (see Exhibit 16), we find some indications of variations in the relative importance of different explanatory variables depending on what lower size limit is applied.

First of all we find that the R&D ratio directly becomes insignificant as we apply a size limit. This is most likely due to the fact that several of the firms in our sample with high degrees of R&D are active within the pharmaceutical and biotech industries. Within this group, there are many firms generating low or no sales, and hence they fall below all the sales size limits.

We also see that Altman's Z becomes of less importance when introducing size limits. This can be explained by that the larger a firm gets, the lower the need for this measure as a sign of credit quality and borrower reputation. This could largely be due to age and size in itself indicating the credit worthiness of

the business, and instead public lenders will be more focused on being able to correctly evaluate the performance of a business by metrics such as the earnings growth volatility. The earnings growth volatility starts to exhibit a strong economic and statistical significance for the firms with sales above USD 500 million.

The variables tangibility ratio, financial assets ratio and leverage also show interesting patterns of changed significance. As the limit reaches USD 1,000 million, we see that all the three lose large parts of their significance, while the market-to-book ratio and earnings growth volatility have become economically and statistically significant. We hypothesise that this pattern can be related to that the equity financial market holds a close eye on larger firms to a greater extent than on smaller firms. Hence, large firms are well scrutinised by the markets that then take on a role similar to that of the financial intermediary. The demands for high levels of tangibility and financial assets are then less required because the public spotlight will improve the ability to monitor make correct liquidation decisions. We further hypothesise that this will also mitigate the risks for asset substitution.

Building upon the impact of increased public focus on large firms, we see potential reasons for the augmented positive impact of market-to-book ratio on the public debt ratio for firms with sales above USD 1,000 million. We hypothesise that it is plausible that larger and more established firms have built up a substantial reputation and track record. The market-to-book ratio could therefore be interpreted as a proxy for the public market perception of the quality of future projects (Johnson, 1997), thereby explaining the significant positive relation with the public debt ratio. Due to the larger firms' reputation, the market-to-book ratio's proxy for risky growth options and proprietary information is not applicable.