Private Ownership and the Cost of Debt: Evidence from the Bond Market

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ABSTRACT

Using a sample of public bonds issued by privately-owned and publicly-owned companies we find that, after controlling for financial fundamentals, bond characteristics, and information environment effects, the cost of public debt issued by privately-owned companies as captured by ratings and yield spreads is significantly higher than that issued by publicly-owned companies. This higher cost is justified, but only in part, by higher than expected actual rates of default among privately-owned firms. Among privately-owned companies, the cost of debt is higher for companies controlled by private equity (PE) firms. However, ownership by large PE firm reduces the cost of debt to their investees as compared to those owned by smaller PE firms. The results contribute to our understanding of the costs of public versus private ownership and our knowledge on the role of ownership type and "soft" information in bond valuation.

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1. Introduction

A considerable body of analytical and empirical research examines the effect of ownership structure on firm value. Among the value-driving ownership characteristics investigated by past research are concentration, disparity between control and cash flow rights, identity of the controlling group (management, employees, or family) and the type of ownership (public or private).

With respect to the valuation effects of public ownership, various characteristics of public ownership relative to private ownership that have bearing on the firm's value have been identified, the most obvious of which is the greater liquidity of public equity ownership. The net effect of these characteristics on the cost of public equity appears to be favorable, as evidenced by the so-called "public equity premium" or, conversely, the "private equity discount."

The effect of ownership type on the cost of debt, however, is less clear. On one hand, the greater ability of the publicly-owned firms (hereafter, public firms)[1] to raise equity capital, the typically richer and more transparent financial information that they provide, and their lower ownership concentration may result in a lower cost of debt in public firms. On the other hand, the disparity of ownership and control, the myopic behavior and opportunistic reporting of their management induced by equity-based compensation and capital markets' pressures, and their greater exposure to litigation risk, may lead to a higher cost of debt for public firms. The extent to which these opposing factors affect the cost of public debt of private as compared with public firms remains an open empirical question.

[1] For ease of exposition, we refer to firms with private equity and public debt as "private" firms while we refer to firms with public equity and public debt as "public" firms.

In this paper we attempt to fill in this gap. In doing so, we face two difficulties. First, financial information on privately-owned companies, at least in the U.S., is limited to regulated firms (primarily in the insurance and banking industries). Second, it is difficult to disentangle the effect of ownership on the cost of debt from that of the reporting and disclosure regime that is much stricter for firms with public ownership.

We alleviate these empirical difficulties by comparing the cost of debt of publicly-owned firms to that of privately-owned companies considered "public" by the virtue of issuing debt to the public. Even though privately-owned, these firms are subject to the same financial reporting and disclosure requirements as their publicly-owned peers.[2]

We estimate the difference in the cost of the public debt between publicly- and privately-owned firms. To isolate the effect of ownership factor on the cost of debt, we control for all other determinants of cost of debt proposed in the literature, including the financial fundamentals of the firm and its bond characteristics. We also control for differences that may exist between these two groups of firms in the quality and transparency of information.

Our main sample consists of 256 private equity and public debt (hereafter "private") firms and 3,415 public equity and public debt (hereafter "public") firms, which represent, respectively 1,150 and 29,193 firm-years over the years 1987-2010. For some of our tests we use an additional sample of 166 firms (represented by 670 private firm-years and 959 public firm-years) that change their ownership during the sample period from private to public or vice versa. We find that, after controlling for firm and bond characteristics identified by past research as affecting the cost of debt, the extent and quality of information available on these firms, as well

[2] The definition of "security" in the Securities Act of 1933 and the Securities Exchange Act of 1934 includes both stocks and bonds.

as the endogenous nature of the ownership choice, the cost of debt, measured alternately by yield spread and rating, is higher for private firms.

We also find a higher frequency of distress events for private firms relative to what would be expected based on their fundamentals.[3] This greater default risk to creditors of private firms is likely related to the limited access of these firms to the public equity market. This conclusion is also supported by our finding that private firms experience a higher cost of debt during recessions, periods in which accessibility to capital market is critical to avoid default.

To the extent that rating agencies take historical default probability into consideration, these higher default rates should be reflected already in the rating. Yet, when we control also for rating in addition to employing all of the other controls indicated above, the spread for private firms is still higher by 147 basis points than the spread on comparable public firms. This unexplained discount of private firms' bonds suggests that investors may over-discount these bonds.

In addition to comparing the cost of debt between public and private firms, we also compare this cost between different types of private firms. Specifically, within private firms, we find that ownership by private equity (PE) firms is associated with a higher cost of debt, consistent with the notion that greater separation of ownership and control in PE-backed companies as compared to other private firms, may lead to more risk taking (Fama and Jensen 1983, Badertscher et al. 2013).[4] We further show that ownership by large PE firms is associated with a lower cost of debt to their investees as compared to ownership by smaller PE firms, consistent with large PE firms having greater reputational concerns as repeated players in the capital markets.

[3] We follow Moody's definition of default which includes distressed exchanges, Chapter 11 and Chapter 7 bankruptcies, dividend omission, and missed interest and/or principal payments.

[4] We note that these results are in contrast to the findings of lower cost of *syndicated loans* obtained by PE-backed companies (e.g., Demiroglu and James 2010; Ivashina and Kovner 2011; and De Fontenay 2013).

The paper makes a number of contributions to the literature. First, the finding that the net favorable effect of being public on the cost of equity capital extends to the cost of debt contributes to our understanding of the consequences of the private versus public ownership choice on the firm's cost of capital. Only a couple of papers directly address this issue: Saunders and Steffen (2011) for syndicated loans in the United Kingdom and Kovner and Wei (2012) for new bond issuances. The different implications of these studies are discussed in the following section. Second, the findings concerning the influence of ownership type on bond spreads and credit ratings extends the literature on the role of "soft information" in the determination of bond valuation and credit ratings. The paper further extends the literature on the effect of ownership characteristics and the identity of its major shareholders (e.g., PE firms) on the cost of debt. Lastly, our finding contributes to our understanding of the effect of ownership structure on default risk.

The remainder of the paper is organized as follows. The next section reviews the literature on ownership characteristics and their expected effect on the cost of capital in general and the cost of debt in particular. Section 3 presents and discusses the hypotheses. Section 4 describes the empirical design. Section 5 describes the sample and the data. Section 6 presents the results and their discussion. Robustness tests are described in section 7, and concluding remarks are provided in the last section of the paper.

2. Literature Review

Early finance theory viewed stockholders as a dispersed yet homogenous group, and management as an agent that acts in the best interests of the stockholders (McConnell and Servaes 1990), being disciplined by either takeover threats (Manne 1965; Martin and McConnell 1991) or the labor market (Fama 1980). This view of the irrelevance of ownership structure and

the benign behavior by management has evolved and altered over time with the development of agency theory which introduced complexity and richness into the management-ownership relation. In their seminal paper, Jensen and Meckling (1976) show formally how agency costs arising from the separation of ownership and control (management) affect firm value. Subsequent work has dealt with the effect on firm value of various ownership and management characteristics such as the separation of ownership and control, management ownership, ownership concentration and the identity of the major equity holders (e.g., family, the public, institutional investors, PE firms, etc.)

2.1. Theory and Evidence on the Effect of Ownership Features on the Cost of Debt

2.1.1. Ownership concentration and disparity between ownership and control

The disparity between ownership and control has been shown theoretically to lower the firm's value (Grossman and Hart 1988; Harris and Raviv 1988). The empirical evidence is consistent with this prediction. For example, Claessens et al. (2002) show that the beneficial incentive effect of having a large number of shareholders dissipates and, in fact, becomes negative when the extent of control exerted by them exceeds their cash flow rights. The negative implications of ownership and control disparity on the cost of debt are also documented in Claessens et al. (2002). Aslan and Kumar (2012) present a model where raising the dominant shareholder's ratio of control-to-cash-flow ownership increases the unconditional probability of default and lowers the creditors' payoffs conditional on a default. The equilibrium cost of debt is therefore positively related to the disparity between control and cash flow rights. The evidence they provide is consistent with their model's prediction. Relatedly, Johnson et al. (2000), Gilson (2006) and Jiang, Lee, and Yue (2010) provide evidence that 'tunneling' by the dominant shareholders who control the firm adversely affects debt-holders.

2.1.2. Public versus private ownership

Public firm's equity, primarily because of its liquidity and the easier access of the public firm to the capital markets, is traded at a premium relative to the value of a similar private equity.[5] Private firms have limited access to the equity capital markets, which imposes restrictions on external financing. Because of the limited access to capital, private firms are more likely to forego positive net present value investments (Stein 2003) and are more likely to default.[6] Such limited access of privately-owned firms to the equity market is likely to affect also their cost of public debt, since private firms may be more likely to become financially constrained or distressed when their operating performance deteriorates, all else equal.[7] Therefore, public debt market may require a higher premium for private firms to compensate for higher ex ante credit risk private firms can have.

Other characteristics along which these two types of equity ownership differ and which are likely to affect the cost of debt include the extent of separation between management and ownership, the level of litigation risk, and the differences in information environment. These characteristics affect the firm's cost of debt either directly or indirectly through their effect on the disclosure and reporting attributes of these two types of equity ownership (see, for example, Ball and Shivakumar 2005, Burgstahler et al. 2006, and Givoly et al. 2010 for evidence of this effect).

[5] The extent of this public equity premium (or private equity discount), however, is subject to debate (see for example, Hertzel and Smith 1993, Koeplin et al. 2000, Das et al. 2002, Kooli, et al. 2003, and Comment 2012). See Bruner et al. (1998) for a review of the different approaches to measuring the premium.

[6] Ivashina and Scharfstein (2010) find evidence that firms are more likely to default when liquidity deteriorates. Campello, Graham, and Harvey (2010) provide survey evidence on the importance of liquidity when a firm is financially constrained or is in distress.

[7] Standard & Poor's rating criteria include the ability of the company to raise equity capital (see Standard & Poor's Corporate Ratings Criteria Sept. 26, 2008. http://www.standardandpoors.com/ratings/criteria/en/us).

To the extent that private firms' ownership characteristics exacerbate or ameliorate agency problems, such characteristics will be associated with a higher or lower cost of debt. On the one hand, the weaker separation of ownership and control in privately owned firms (Badertscher et al. 2013) reduces agency problems between the management and stakeholders, resulting in less severe agency problems for these private firms. As was discussed in section 2.1.1 above, the lower separation of ownership and control can reduce the unconditional probability of default, increase the creditors' payoffs conditional on default (Aslan and Kumar 2012) and further mitigates 'tunneling' behavior (Johnson et al. 2000, Gilson 2006; and Jiang, Lee, and Yue 2010). On the other hand, private firms have more concentrated ownership and control, leading to more acute conflicts between shareholders and debt-holders.[8] Taken together, the net effect of private ownership on the cost of debt due to agency conflicts is ambiguous.

Other private ownership characteristics, however, have a clearer directional effect on the cost of debt. First, there are benefits of being private in the form of a lower risk of litigation (Badertscher et al. 2014) and less disperse ownership that facilitates debt renegotiation or restructuring which, in turn, reduce the probability of default.[9]

Another characteristic of private ownership which is likely to increase the cost of debt to private firms is that these firms operate in a more opaque information environment, are covered less by the press, have limited analysts' coverage, and do not have stock prices available (Katz 2009). These traits render private firms riskier in the eyes of public debt-holders who assign these firms a higher default risk, especially as this higher level of information asymmetry

[8] According to the Standard & Poor rating criteria, "Controlling ownership negatively influences corporate decision-making to promote the interests of the controlling owners above those of other stakeholders." (Standard & Poor's Corporate Ratings Criteria, Methodology: Management and Governance Credit Factors for Corporate Entities and Insurers, November, 13, 2012, http://www.standardandpoors.com/ratings/criteria/en/us).

[9] Gilson, John, and Lang (1990) provide evidence that firms with more complex capital structure are more likely to fail in private restructuring, hence have enhanced probability of filing for bankruptcy.

exacerbates moral hazard problems between management and the stakeholders (Jensen and Meckling 1976). In contrast, the myopic behavior and opportunistic reporting of their management induced by equity-based compensation and capital markets' pressures are documented to lead to higher earnings management and lower earnings persistence for public firms (Givoly et al. 2010).

Several recent studies examine empirically the cost of debt differential between private and public companies. Pagano et al. (1998) examine the change in the cost of debt of 40 Italian IPOs and find a reduction in that cost following the IPO. However, their design does not allow determining whether the cost reduction is a result of a change in ownership or of improved public information associated with stock exchange listing. Saunders and Steffen (2011) test the cost of syndicated loans for privately held vs. publicly traded companies in the United Kingdom and conclude that privately held firms incur a higher cost, after controlling for borrower and loan characteristics. They attribute the difference to the higher cost of information production associated with private firms. Note that Saunders and Steffen (2011)'s main analysis is conducted on private firms with *private* debt. These firms are not subject to the additional disclosure and auditing requirements of the stock exchange. Our sample consists of public firms with a different type of ownership (all subject to the same reporting and mandatory disclosure requirements). In particular, a substantial amount of information regarding the creditworthiness of a firm is revealed when the firm issues public bonds (Hale and Santos 2009; Saunders and Steffen 2011). As such, our sample enables us to better separate the information from ownership explanations. Saunders and Steffen (2011) further compare the cost of loans between private firms with public debt and public firms, but do not find significant differences, and attribute these findings to the similar information environment that the two groups of firms are subject to.

Their result would suggest that we will find no differences in the cost of public debt in our sample. We note, however, that syndicated loans have different attributes than public bonds. For example, the banks that syndicate the loans benefit from private information, seniority of their claims, as well as contractual features (e.g., covenants, performance pricing, collateral) that can trigger state-contingent renegotiation with borrower firms (Roberts and Sufi 2009).

Similar to our study, Kovner and Wei (2012) focus on the cost of public debt of private vs. public firms. They find that bonds issued by private firms are discounted relative to those issued by public firms. Their study differs from ours in a number of respects. First, they test the bond pricing at issuance. This is a time in which the private-firm-turned-public has an obvious informational disadvantage relative to its more established public companies, making it difficult to attribute the cost of debt differential to the ownership type.[10] In particular, most private firms with public debt have only one bond issuance (average of 1.24 in our sample). Hence, the bond issuance is likely the first time the private firms publicly disclose their financial statements, making it difficult to separate the effect of the information environment from the ownership type. Further, in assessing the effect of ownership on the cost of debt, Kovner and Wei (2012) control for the effect of firm's fundamentals using a limited set of variables that includes only total assets, total debt, and EBITDA, making the attribution of the results to ownership type less reliable.[11] Finally, they do not distinguish, as our paper does, between different ownership characteristics of private firms (e.g., ownership by PE firms).

[10] In robustness test, they examine the secondary market's pricing. However, that sample is limited to 40 bond issues.

[11] The limited set of control variables is apparently due to missing 10K information for many of the sample firms in Kovner and Wei (2012). Missing 10K information would occur for public companies with less than 500 stakeholders for which 10K filing is not required. The presence in the sample of these firms, for which limited public information is available, makes it likely that the cost of debt differential attributed to ownership type stems in fact from another source – the extent and quality of information.

2.1.3. Private ownership through a private equity firm

Equity may be held privately by an investment company denoted as a "private equity" (PE) firm. PE-backed private companies have certain ownership attributes that have a bearing on their cost of capital. Typically, PE firm raises pools of capital from institutional investors and acquires majority control of mature, profitable businesses via leverage buyouts (LBO) with the objective of holding them for five to seven years while improving their financial performance and value. The return on these investments is typically in the form of capital gains from an IPO, a merger, or the sale to another company.

The partners of the PE firms, while not involved in the active management of their investees, sit on the boards of the private companies in their portfolio and are quite active in advising these companies and monitoring and motivating their management teams (e.g., Kaplan and Stromberg 2009; Masulis and Thomas 2009).

The effect of the above characteristics of ownership by PE firms on their investees' cost of debt is not clear. PE-backed private companies typically have greater separation of ownership and control which may lead to more risk taking (Fama and Jensen 1983; Badertscher et al. 2013) and thus likely result in a higher default risk, which translates to higher cost of debt. On the other hand, PE firms, being repeat players in the capital market, are likely to use their reputation with creditors to mitigate the problems of borrower adverse selection and moral hazard associated with lending to private companies. This could enable PE-backed companies to obtain lower cost loans and benefit from less restrictive debt covenants (Demiroglu and James 2010, Ivashina and Kovner 2011, De Fontenay 2013). These positive reputational effects of PE ownership are a function of the strength and market position of the PE firm, and therefore more likely to be pronounced when the PE firm is large in terms of assets under management. Finally, the

proportion of stock owned by top executives at minority-owned, PE-backed companies, is significantly greater than managerial stock ownership at majority-owned, PE-backed companies (Katz 2009; Badertscher et al. 2013). Therefore, the separation of the ownership and control, and its effect on risk taking, is more likely to be pronounced when the PE firm holds majority-ownership in its portfolio firm.

3. Hypotheses

The findings by prior research on how firm ownership might influence the cost of debt are mixed and the direction of the effect of various attributes that distinguish private from public firms on the cost of debt is not uniform (see the discussion in section 2.1.1 and 2.1.2 above). As a result we test the following non-directional hypothesis:

H1: The cost of debt of private companies is not significantly different from that of public companies.

As the review of the salient literature indicates, each type of ownership structure within the private firms (i.e., ownership by a PE firm) has characteristics that have conflicting effects on the cost of debt (see the discussion in section 2.1.3). Therefore, we have no prediction about the direction of their effect on the cost of debt and, accordingly, test the following non-directional hypotheses:

H2: The cost of debt of private companies is not significantly different from that of other private companies in which a PE firm owns a share.

H3: The cost of debt of private companies in which a PE firm is a shareholder is not significantly affected by the size of the PE firm.

H4: The cost of debt of private companies in which a PE firm is a shareholder is not significantly affected by PE firm majority- versus minority-ownership.

4. Research Design

4.1. Measures of the Cost of Debt

We use two alternative measures that capture the cost of debt through the underlying credit risk of the debt security: the credit rating (*RATING*) and the yield spread (*SPREAD*). These measures are assessed once a year, at the beginning of the fourth month of the fiscal year.

Credit rating, *RATING*, is based on S&P rating system. For the statistical analysis, we convert the rating designations from AAA (the highest) to D (the lowest) into numerical scale, ranging from 1 (AAA) to 21 (D).[12] The definitions of all of the variables used in this study are provided in the Appendix.

SPREAD is calculated by subtracting from the yield-to-maturity of the company's bond-year the concurrent yield-to-maturity of a matched Treasury bond. Following Easton, Monahan and Vasvari (2009), we match each bond-year with a Treasury bond in the CRSP database that has (1) the same remaining time to maturity in years as the corporate bond (specifically, a Treasury bond that matures no more than six months before or after the time to maturity remaining of the corporate bond) and (2) the closest annual coupon rate. We further require that the ratio of the absolute difference between the coupon rate on the corporate bond and the coupon rate on the matched Treasury bond does not exceed 0.45 of the corporate bond's coupon rate. This requirement results in about 10% of the bond firm-year observations not having *SPREAD* information.

4.2. Determinants of Cost of Debt

In assessing the effect of firm ownership on the cost of debt, we control for other determinants of the cost of debt. The determinants used in our analyses are based on prior

[12] While this numerical conversion has been used by other studies (e.g., Amato and Furfine 2004; Kisgen 2006), we also used, as part of our robustness tests, alternative non-linear conversions with no effect on our inferences.

research (for a survey of this research, see Ashbaugh-Skaife et al. 2006). They consist of two sets of variables. One set is that of firm fundamentals and bond characteristics, most of which are credit risk-related. The other set of variables is designed to capture the information environment of the firm in terms of the extent and quality of information about the firm. All of the determinants are measured for each firm-year and are defined in the Appendix. The set of firm fundamentals is represented by the following variables: *LEV_ADJ* (leverage adjusted for off-balance sheet accounts), *INT_COV* (interest coverage ratio), *Z_SCORE* (the Altman's Z-Score), *ROA* (return on assets), *LOSS* (an indicator variable for a loss firm-year), *FCF* (free cash flow deflated by lagged total assets), *INTANG* (intangible assets deflated by total assets), *PPE* (net property, plant and equipment deflated by lagged total assets), *GROWTH* (growth in sales), *DURATION* (average duration of the firm's outstanding bonds expressed as number of years); *SENIORITY* (the proportion of bond issues designated as senior bonds), and *FSIZE* (firm size, measured by natural log of the sum of the market value of the equity (imputed market value for private firms) and the book value of debt).[13] Other fundamentals being equal, large firms are more likely to access more resources to avoid default than small firms. Large firms are, further, more likely to be diversified than small firms, which reduces the uncertainty of their future cash flows. At the same time, firm size relates to the information environment in which the firm operates. Because it represents the market value of the firm, it is related to analyst following and institutional ownership, thus indicating greater research efforts and breadth of information about the firm. Larger firms also are subject to a greater political cost, which tends to improve the

[13] The market value of the equity of privately owned firms is estimated by multiplying the firm's assets, and separately, the firm's sales, by the median in the firm's 3-digit industry in the year of, respectively, the assets and sales multipliers, and averaging the two products.

quality of their reporting. For these reasons, firm size may be viewed as a hybrid variable, conveying both fundamentals and information environment factors.[14]

To further explore the effect of the information environment in which the firm operates, we also examine two additional explanatory variables beyond firm fundamentals and firm size: *BIGAUDI* (an indicator variable for Big-4/5 auditors). This variable is designed to capture the quality of the firm's financial reporting (see Mansi et al. 2004), and *PUBLIC_NEW* (an indicator variable for firms that has been public (either debt or equity) less than five years). A longer history of the firm as a public corporation is likely to be associated with availability of more public information and greater familiarity of investors and creditors with the firm's operations, management, and prospects.

The first hypothesis of the paper concerning the cost of debt of public and private firms, H1, is tested through the following cross-sectional regressions estimated over pooled firm-years, using *RATING* and *SPREAD* as alternate measures of the cost of debt (firm subscripts are omitted):

$$SPREAD_t \text{ or } RATING_t = f\{PRIVATE_t, LEV\_ADJ_t, INT\_COV_t, Z\_SCORE_t, ROA_t, LOSS_t, FCF_t, INTANG_t, PPE_t, GROWTH_t, DURATION_t, SENIORITY_t, FSIZE_t, BIGAUDI_t, PUBLIC\_NEW_t)\} \quad (1)$$

SPREAD and *RATING* are defined and discussed in the previous section, and the determinants of the cost of debt are presented above. Our variable of interest in regression (1) is *PRIVATE*, an indicator variable, receiving the values of one if the firm is privately-owned and zero otherwise. A significant positive coefficient on this variable would indicate that, after controlling for risk-related firm fundamentals, the cost of debt of private firms is higher than that

[14] We also use an alternative measure of size, the dollar value of the bond issue at the time of its initial offering. The use of this variable, which is highly correlated with *FSIZE*, yields similar results.

of public firms. All regressions further include industry and year fixed effects. With appropriate changes, regression (1) is also used to test hypotheses H2, H3 and H4 that pertain to the effect of the identity of the major shareholders of the firm (e.g., PE firms) on the cost of debt.

4.3. Likelihood of Default and Rate of Recovery

To facilitate the interpretation of the main results regarding the effect of private ownership on the cost of debt, we also examine whether private ownership affects the two parameters that determine credit risk, namely, the likelihood of default and the extent of recovery by the creditors of their debt to the firm in case of a default. For the default's examination, we employ the hazard model suggested by Shumway (2001).[15] We augment their model by additional measures of firm fundamentals used in the literature. The model, specified in regression (2), also incorporates accounting-based predictors used by Altman (1968), Zmijewski (1984), and Kovner and Wei (2012) as well as determinants of cost of debt in regression (1) of this study. The hazard model is tested using the following cross-sectional regression estimated over pooled firm-years in our main sample (firm subscripts are omitted):

$$\Pr(DEFAULT_t) = f\{PRIVATE_{t-1}, LEV\_ADJ_{t-1}, INT\_COV_{t-1}. Z\_SCORE_{t-1}, ROA_{t-1}, LOSS_{t-1}, FCF_{t-1,} \\ INTANG_{t-1}, PPE_{t-1}, GROWTH_{t-1}, FSIZE_{t-1}\} \quad (2)$$

where a *DEFAULT* event (0,1) is defined as either bankruptcy (Chapter 11 and Chapter 7 bankruptcies), default (missed interest and/or principal payments), distressed exchange[16] or dividend omission.[17] All of the independent variables are as defined in section 4.2.

[15] Shumway (2001) and Campbell, Hilscher and Szilagyi (2008) provide evidence that hazard rate model based on reduced form econometric specification outperforms other distress prediction models (e.g., discriminant analysis, simple logit) in terms of both in- and out-of-sample forecasting accuracy.

[16] "Distressed exchange" refers to a fundamental change in the contractual relationship between a debtor and its creditors such as a reduction in the effective interest rate, extension of time to repay, subordination of claims, or substitution of lower priority equity securities for debt claims.

[17] We follow Moody's definition of dividend omission that is characterized as a default event by Moody's.

Following Shumway (2001), we estimate the hazard rate model in the equation (2) by employing multivariate logit approach to estimate the effect of private ownership on the default risk after controlling for accounting fundamentals.[18] A significant positive coefficient on *PRIVATE* would indicate that, after controlling for default risk-related firm fundamentals, the ex post default likelihood of private firms is higher than that of public firms, which would be consistent with private firms having higher default risk than public firms.

The other parameter that determines credit risk is the rate of recovery. To test whether private ownership affects the recovery rate by the creditors in the wake of a bankruptcy or other default, we estimate a regression model following Acharya, Bharath and Srinivasan (2007) and Donovan, Frankel, and Martin (2014). Specifically, the expected rate of recovery is estimated using the following regression model estimated from a subset of the firm-years in the default sample for which the data are available from Moody's database (firm subscripts are omitted):

$$RECOVERY\_RATE = f\{PRIVATE_{t-1}, EBITDA_{t-1}, TA_{t-1}, PPE_{t-1}, LEV\_ADJ_{t-1}, DUR\_DEFAULT_{t-1}, DISTRESS\_EXCH_{t-1}, SECURED_{t-1}\} \quad (3)$$

where *RECOVERY_RATE* is the firm-level recovery rate from Moody's DRS database (denoted there as the "family recovery rates"), and *PRIVATE* (an indicator variable) is defined in section 4.2 above. *EBITDA*, *PPE*, and *LEV_ADJ* capture fundamentals prior to default which are likely to affect creditor recovery rates. *EBITDA* is measured as earnings before interest, taxes, depreciation, and amortization divided by lagged total assets, and *PPE* and *LEV_ADJ* are defined in section 4.2 above. *TA* is total assets defined as log of total assets. *DUR_DEFAULT* is the duration of default event measured as the difference in the number of months between the date of

[18] Shumway (2001) analytically shows that hazard rate model can be estimated by multivariate logit approach including all the available panel data of firm-year observations. Our results employing the logit approach, however, are unaffected when we use proportional hazard model (Cox 1972).

default event and the date of resolution of default from Moody's DRS database following Donovan et al. (2014). Donovan et al. (2014) include *DUR_DEFAULT* in their recovery rate regression based on the intuition that the longer the duration of default, the more likely that lower the rate of recovery from default. *DISTRESS_EXCH* is an indicator variable that is 1 if the default event is a distressed exchange and 0 otherwise. This variable is designed to capture higher recovery rate of firms going through distressed exchanges compared to other types of default events such as bankruptcy shown by Franks and Torous (1994). Lastly, *SECURED* is an indicator variable that is 1 if the firm has secured debt and 0 otherwise. If the firm has secured debt at the time of default, secured creditors are likely to have higher recovery rate everything else the same. Therefore, we include this variable to capture cross-sectional variation in recovery rates driven by secured status of debt claims.[19]

As with the case of the default prediction model regression (2), the variable *PRIVATE* is introduced in order to assess, in this case, whether, after controlling for firm's characteristics that affect the rate of recovery, that rate is also influenced by whether the company is private or public.[20] Following Acharya et al. (2007), determinants of recovery rates are measured at t-1, the firm-year immediately preceding the default event.

4.4. Construction of a Matched Sample

[19] Donovan et al. (2014) use proportion of secured debt as a determinant of the recovery rate. While this measure is likely to be a sharper measure of the percentage of distressed claims that are secured, measurement of this variable relies on Moody's DRS database, which substantially limits the sample. We employ an alternative definition by collecting sample firms' secured debt status from Moody's DRS as well as Mergent FISD and SDC databases and hand-matching them to our database of private-public firms with the recovery rate information. However, our results are qualitatively the same when we apply the alternative definition of *SECURED*.

[20] Following prior studies, we also estimate regressions (2) and (3) using *LEV* instead of *LEV_ADJ*. Further, instead of including Atlman's Z-score, we include variables used in the calculation of Z-score (*RE, EBIT, SALES_TURN*) as explanatory variables in regression (2). In these alternate specifications, we find that our results are qualitatively similar.

Regression (1) is estimated from a pooled sample of firm-years across firms and years. As part of our robustness tests, we also estimate the regression from a matched sample of firm-years. The matched sample is constructed by matching each private firm-year with a public firm-year. The matching is based on the proximity of the matched firm to the test firm's score (i.e., propensity score). We match each of the firm-year bond observations belonging to a private-equity firm to a firm-year bond observation belonging to a public-equity firm. In order to reduce the problem of endogeneity, we identify the determinants of the choice of being a private company, based on the findings of past research[21] and estimate the coefficients from a regression of the ownership type (the *PRIVATE* variable). The dependent variable in the propensity score's logit model is a private-equity firm indicator variable (*PRIVATE*) and the independent variables reflect firm characteristics such as size, financial risk and constraints, growth opportunities and asset composition. Specifically, the model is estimated and scores of potential matches among public firms are determined by using the following independent variables: *INT_COV, LOSS, INTANG, PPE,* and *GROWTH*. Because of the presumed strong influence of industry affiliation, firm size and leverage on the choice of ownership type, for the public firm-year that is matched to the private-firm year, we imposed a further restriction on the selection of the matched sample. In addition to having the closest score to a given private firm-year, the selected public firm-year observation must belong to the same fiscal year, 3-digit industry, quintile of total assets' distribution and quintile of leverage distribution as the private firm-year. Finally, to ensure that each private firm-year and its match are reasonably similar to each other, we restrict the two

[21] See, for example, Ball and Shivakumar (2005) and Givoly et al. (2010). In order to address self-selection concerns, we further follow the Heckman (1979) procedure (untabulated). All results remain qualitatively similar.

firm-years to have propensity scores within 0.10. We allow a public firm-year to serve as a match only once per year.

5. Sample and Data

5.1. Sample

Our sample consists of firms with public debt in the 24-year period 1987-2010. To identify private firms that have publicly-traded debt, we follow the procedure used by Katz (2009), Givoly et al. (2010), and Badertscher et al. (2013). Specifically, we select from COMPUSTAT any of the sample firm-years that satisfy the following criteria: (1) the firm's stock price at fiscal year-end is unavailable, (2) the firm has total debt as well as total annual revenues exceeding $1 million, (3) the firm is a domestic (U.S.) company, (4) the firm is not a subsidiary of another public firm, and (5) the firm is not a financial institution or in a regulated industry (SIC codes 6000-6999 and 4800-4900). We exclude financial institutions (SIC codes 6000-6999) from our sample since many of the accounting items and financial ratios used in our analyses do not apply to these firms. We also exclude from our main sample firms that changed their ownership during the sample period, denoted as "transitioning" firms. This sub-sample is tested separately, as explained below. Finally, we exclude from consideration convertible bonds because of their more complex valuation.

Of the sample of firm-year observations belonging to the firms that meet the above criteria, we retain only those firm-years for which information on at least one of the cost of debt measures (*SPREAD* or *RATING*) is available.

The resulting main sample consists of 1,150 firm-years of private firms representing 256 distinct firms and 29,193 firm-years of public firms with available data for all of the control variables, representing 3,415 distinct firms. Our tests are conducted on both the full sample and

the propensity-matched sample. The latter is constructed through the process described in section 4.4 and consists of 343 firm-years with availability of all of the control variables and their distinct matched public firms.

We also take advantage of the sample of "transitioning" firms by conducting a supplementary test of the main hypotheses based on the firms' time-series. This sub-sample consists of 73 firms that were initially private (representing 268 yearly observations as private firms) and have subsequently become public (resulting in 397 yearly observations as public firms) and 93 that were initially public (representing 402 yearly observations as public firms) and have subsequently become private (resulting in 562 yearly observations as private firms).

For the measurement of cost of debt per firm-year, we employ *SPREAD* and *RATING*. While *RATING* is provided on a firm-year basis, *SPREAD* is available for each outstanding bond issue. About 17% of the firm-years of private firms and about 42% of the firm-years of public firms contain more than one outstanding bond (most commonly two). In all, our sample of firm-years reflects 36,771 separate bond-years, or an average of 3.06 bonds per firm-year. To avoid giving undue weight to firm-years with multiple bond issues outstanding and to avoid cross-sectional dependence of the observations, each firm with more than one outstanding bond issue in any year is represented in the statistical analyses only once for that year. This is accomplished by averaging the *SPREAD* for that firm-year across the firm's bond issues outstanding in the year.

For the purpose of testing hypotheses 2-4, we further construct subsamples of private firms based on the identity of their owners. Specifically, we categorize private firms as being PE-owned, defined as firms whose equity is held in part by PE firms (with further partitioning of these subsamples into majority- and minority PE ownership, and small and large PE owners).

5.2. Data

Our data comes from a variety of sources. Monthly bond price data is obtained from Interactive Data Pricing and Reference Data, a provider of third-party bond prices and other financial services, whose subscribers include thousands of financial institutions worldwide ranging from central banks to large investment banks.[22] In collecting bond price data, Interactive Data prioritizes its data sources, reporting transaction-based bid prices when available, and using either institutionally-based matrix bid prices or dealer bid quotes (referred to as "evaluated prices") to fill in the series for periods where bond bid prices are missing (generally as a result of infrequent trading). In addition, supplementary bond characteristics and spreads data for the years 2008-2010 are obtained from TRACE.

Financial statement information and S&P rating information is obtained from COMPUSTAT. Data needed to determine ownership and ownership rates of private equity firms by PE, or management are hand-collected from SEC filings. We construct the following ownership variables based on these data: Ownership by a PE firm (*PE*), majority ownership by a PE firm (*PE_MAJ*), and ownership by one of the largest PE firms in terms of dollar investments (*PE_RANK*). All of these variables are defined in the Appendix.

Information on default events is based on the database constructed in Lee (2014). That database consists of bankruptcies (Chapter 7 and Chapter 11 bankruptcies), defaults, distressed exchanges, and other default events following Moody's definition of default. That database contains 4,897 non-overlapping default events of non-financial firms for the period 1980-2011.[23] Matching the default events to the private-public database used in our study yields a sample of

[22] Other research using this database includes Hemler (1990), Gay and Manaster (1991), Hand et al. (1992), Shulman and Bayless (1993), Cooper and Shulman (1994), Hancock and Kwast (2001), Dudney and Geppert (2008), and Givoly et al. (2013).

[23] The database is compiled and hand-matched from a number of sources including FACTIVA, Lexis Nexis, Capital IQ, PACER, SDC Platinum restructuring database, Moody's rating database, the CRSP Monthly Stock file, the website Bankruptcy.com, and the list of bankruptcy filings generously provided by Lynn Lopucki.

879 firm-years containing default events. Missing financial data needed for distress prediction reduces this sample to 738 firm-years with 111 private firm-years and 627 public firm-years. Together with the public-private database, we have 32,726 non-distress firm years, and 738 distress firm-years to conduct our hazard rate tests.

We obtain firm-level data on the rates of recoveries from Moody's Default Risk Service (Moody's DRS) database, one of the most comprehensive sources of debt- and firm-level credit recovery rates data for firms. We match the firm-level recovery rate (denoted by Moody's as "family recovery rates") with our private-public database combined with cost of debt data. Our final sample of recovery rates consists of 374 firm-years with 56 private firm years and 318 public firm years.

5.3. Descriptive Statistics

Table 1 shows descriptive statistics about the sample of firms and firm-years that is used to test our main hypotheses. The panel shows that the distribution of the sample firm-years over the years is not meaningfully tilted toward periods of economic expansion (e.g., 2003-2007) or contraction (e.g., 2000-2001 and 2008-2009).

Panel B of Table 1 shows the distribution of the sample firms by industry. Comparing columns (5) and (6) reveals no strong over- or under- representation by the combined sample of the population distribution of firms by industry. The comparison between columns (2) and (3) shows that in some industries, there is greater representation by either private firms (e.g., industry 27- Printing and Publishing) or public firms (e.g., industry 48 – Communications). To the extent that such disproportional industry representation biases the results, this bias is attenuated through the use of industry and year fixed effects and the construction of the matched sample.

Panel C of Table 1 presents firm and bond characteristics for the firm-years of, separately, the private and public companies. It is apparent from the panel that the two subsamples are quite distinct. Private firms are smaller, with *FSIZE*, defined as the sum of the book value of the debt and the market value of the equity (imputed value, in the case of private companies) being smaller among private than public companies, with a median of \$1.032 billion ($e^{6.939}$) *vs.* \$2.527 ($e^{7.835}$) billion of public companies. The private firms are also less profitable (in terms of their return on asset (*ROA*) and frequency of losses (*LOSS*)). They further have a higher leverage (*LEV_ADJ*) and their asset composition is more tilted toward intangibles (*INTANG*). Their *Z_SCORE* is lower (a median of 0.327 compared with a median of 0.612 of public companies), indicating a higher risk of bankruptcy. The private firms also have a shorter history of having their securities publicly traded (*PUBLIC_NEW*) with 53% of the private firm-years are no more than five years from the year in which the firm's security became public as opposed to only 16% of the public firm-years.

The bonds issued by the private companies reflect their firm characteristics. They have much fewer numbers of bonds outstanding, as shown by a mean of *BONDS* of 1.24 for private companies vs. 3.16 bonds outstanding for public companies. The bonds issued by the private companies are riskier as captured by a higher spread (a median spread of 7.9% vs. 1.9% for the public firms) and a lower rating (a median rating of 14 vs. 10 for the public firms). All of the above differences between firm and bond characteristics of private and public firms are statistically significant at a higher than 1% level of significance.

6. Results

6.1. The Effect of Private vs. Public Ownership on the Cost of Debt

The main results on the effect of private ownership on the cost of debt are provided in tables 2, 3 and 4. Table 2 shows the results from estimating regression (1) for the full sample alternately using the yield spread and rating as a measure of cost of debt. As expected, all of the variables representing financial fundamentals are associated with both the spread and the rating in the anticipated direction, and almost all of them are highly significant.

Among the "information environment" variables the variable *FSIZE,* which is a hybrid variable representing both an economic fundamental of the firm as well as the richness of its information environment, has a strong and very significant effect on reducing the cost of debt. *PUBLIC_NEW*, which captures the age of the firm as a public firm, indicates bonds of firms that have only recently become public are positively associated with a higher cost of debt. The size of the audit firm as captured by *BIGAUDI* is insignificant, however. The impact of the information variables on the cost of debt suggests that in setting the ratings and in setting the spread, rating agencies and investors, respectively, take into account not only the economic fundamentals of the firms as reflected in their financial statements, but also "soft" elements such as the information risk of the company. To further control for the information environment, we restricted our public sample to only those firm-years without equity analyst coverage as determined by IBES, and we also controlled for discretionary accruals and timely loss recognition. Adding these controls leave the results (untabulated) unchanged.

The main variable of interest, *PRIVATE,* is positive and highly significant, suggesting that *after controlling* for an array of firm and bond fundamentals likely to affect the cost of debt as measured by either *SPREAD* or *RATING*, private ownership is associated with a higher cost of debt than public ownership. The fact that this variable is significant after controlling for the information variables suggests that when investors price bonds, and rating agencies decide on the

ratings, they consider other "soft elements" beyond those represented by our "information environment" variables such as management quality and accessibility to the capital markets. An alternative interpretation of the persistent significance of *PRIVATE* is that rating agencies and investors overestimate the credit risk of private companies. We examine the validity of the latter interpretation in the next section in which we compare the difference in default rates and creditors' recovery rates between private and public companies.

To gain an additional insight into the relative contribution of economic fundamentals, information environment, and types of ownership to the explanatory power of the regression, we decompose the R^2 from regression (1), using Shapley's decomposition procedure (see Shapley 1953). The Shapley values indicate that, of the total explanatory power of the full regression that includes all of these three groups of variables (that collectively yield an Adjusted R^2 of 54.23% for the Spread regression, see Table 2), firm and bond fundamentals explain 47.9%, information variables 21.4%, and type of ownership 9.2% (industry and year fixed effects contribute to 21.4% of the explanatory power of the regression). This statistic highlights the fact that the ownership type has an important effect on the cost of debt.

As explained in section 4.4, we conduct the analysis also on a propensity-score-matched sample generated through a procedure that results in a sample of matched pairs selected based on a propensity score matching procedure. A probit regression is used to estimate the propensity scores and the proximity of the matched sample to the test sample. The estimates of the propensity-score regression are provided in panel A of Table 3; the homogeneity of the private and public firm-years in terms of the variables underlying the propensity-score estimation is shown in Panel B of Table 3. Panel A shows that propensity score regression identifies correctly the variables associated with the choice of the ownership type. All the variables, with the

exception of *LOSS*, are significant and the MacKelvey Pseudo R^2 is 41.8%. Further, as panel B of Table 3 shows, the propensity score process succeeds in generating fairly similar groups of public and private companies: The differences in the variables underlying the propensity score estimation between public and private firms in the matched sample, which are significant in the full sample are either no longer significant in the matched sample or the significance is reduced in magnitude.

The results from estimating regression (1) obtained from the matched sample are presented in Table 4. The results are very similar to, and confirm those from the full sample. In particular, the coefficient on *PRIVATE* continues to be positive and significant for the matched sample. Further, the role of economic fundamentals, information environment, and ownership (that collectively yield an Adjusted R^2 of 60.39% for the Spread regression, see Table 4) as measured by the Shapley values of these groups of variables (38.14%, 15.89% and 9.15%, respectively) is similar to that obtained from the full sample.

A likely reason for the discount of bonds issued by privately-owned companies relative to those issued by publicly-owned companies is the more limited access of these companies to the capital market. The accessibility factor is expected to be more influential at recessionary times for more financially constrained firms (Erel et al. 2012). Therefore, we expect the 'discount' of bonds of private firms to be deeper in recessionary periods. We test this expectation by augmenting regression (1) by an indicator variable for a recession year, *REC*, and an interactive variable *REC*PRIVATE*. The variable *REC*, which receives the value of one when the year is a recession year, as defined by National Bureau of Economic Research (NBER) and zero otherwise, captures the fixed effect, if any, of recession year on the mean spread or mean rating

in our sample.[24] The interactive variable captures the additional 'penalty' for bonds issued by private companies in recession years as compared with such discount in non-recession years.

The results, presented in Table 5, show that the cost of debt of public firms is higher during recession years (the coefficient of *REC* is positive and significant). More importantly, the variable of interest, *PRIVATE*REC*, which captures the excess cost of debt to private firms over that to public firms during recession years, is positive and significant in both the *SPREAD* and the *RATING* regressions. This result lends support to the notion that limited access to capital markets in financially constrained periods is an important explanation of the higher cost of debt of private firms. Further, the coefficient of *PRIVATE* in the regressions is still positive and significant indicating that the higher cost of debt of private firms is not limited to recession years and thus appears not to be fully explained by limited access to new capital only during recession periods.

We repeat the above analysis using the propensity matched sample. The (untabulated) results based on this, much smaller sample (of about 350 observations vs. about 12,000 observations in the full sample) yields very similar results.

6.2. The Effect of Ownership Structure on the Cost of Debt of Private Companies

As explained in sections 2 and 3, ownership of private companies by PE firms have characteristics that can influence the cost of debt of these companies in either direction. We first test the effect of PE ownership on the cost of debt. For this test, we estimate regression (1) from the entire sample of private companies, and replace the variable *PRIVATE* with an indicator variable, *PE*, that receives the value of one if a PE firm has some share in the ownership of the

[24] Recession years in our sample period include 1990, 1991, 2001, 2008, and 2009 as defined by NBER website: http://www.nber.org/cycles/cyclesmain.html.

private company, and zero otherwise. We further test the effect of two specific characteristics of PE ownership on the cost of debt: The extent of ownership (majority vs. minority) and the size of the PE. An indicator variable, *PE_MAJ*, receives a value of one if the PE is a majority shareholder and zero otherwise. We capture the size of the PE by the total value of the investment portfolio held by the PE. The variable used to measure the total value of the portfolio, is an indicator denoted as *PE_RANK* that receives the value of one if the PE firm is among the top 15 PE firms by equity invested (following Badertscher et al. 2013 and based on data obtained from Thomson Financial VentureXpert) and zero otherwise.

The results are shown in Table 6. The variable of interest is *DUMMY* which is an indicator variable that stands alternately for *PE*, *PE_MAJ,* and *PE_RANK* described above. The first two-column panel presents the results from estimating the augmented regression from the entire sample of private companies. The *DUMMY* variable in this panel, *PE*, is positive and significant, suggesting that having a private equity firm as an owner increases the cost of debt of the private company, consistent with the greater separation of ownership and control in PE-backed private companies, which may lead to more risk taking (Fama and Jensen 1983; Badertscher et al. 2013) and thus likely to result in a higher cost of debt. The remaining panels of the table show results pertaining to the effect of the PE ownership characteristics on the cost of debt described above. These results are obtained from variations of regression (1) estimated from the subsample of observations belonging to PE-backed companies (about 2/3 of the observations on private companies).

The first characteristic is the extent of ownership (majority vs. minority) by the PE firm. A positive coefficient of *DUMMY* variable in this panel, *PE_MAJ*, would indicate that majority ownership accentuates ownership-control separation and thus leads to a higher cost of debt. The

results presented in the second panel of Table 6 are mixed: The coefficient of *PE_MAJ* is positive in both *SPREAD* and *RATING* regressions but insignificant in the *RATING* regression and only marginally significant (at above 10% level) in the *SPREAD* regression.

The second characteristic is the size of the PE firm in terms of value of its total investment portfolio (*PE_RANK*). As explained in section 3, we expect that the positive reputational effects of PE ownership are more likely to be pronounced when the PE firm is large in terms of assets under management. The coefficients of both variables in the third panel of Table 6 are negative and significant (for both the *SPREAD* and *RATING* regressions). This suggests that private firms that are owned by large PE sponsors are more likely to use their reputation with creditors to mitigate the problems of borrower adverse selection and moral hazard associated with lending to private companies.

6.3. Ex-post Default and Recovery Rates

The finding so far consistently suggests that the cost of debt measured either by yield spread or bond rating is higher for private firms, after controlling for both economic fundamentals and the different information environment of these two groups of firms. The most plausible explanation for this finding is the more restricted access of private firms to external financing. Such limited access should manifest itself ex-post in the form of a higher default rate or a lower debt-recovery rate than those expected given the firm and debt fundamentals. We examine the validity of this explanation by determining whether the default rate is lower or the debt-recovery rate is higher than their predicted values given the economic determinants of each. As explained in section 4.3, we use for this examination the default prediction model specified in regression (2). This model is a variation of the hazard model proposed by Shumway (2001), augmented by additional measures of firm fundamentals suggested in the literature. To predict recovery rates,

we use the approach proposed by Acharya et al. (2007) and Donovan et al. (2014), as specified in regression (3).

The results of the effect of private ownership on the probability of default are provided in Table 7. These results are based on a sample of 30,877 firm-year observations, containing 738 default cases. The table shows that all of the financial fundamentals are significantly associated with realized distress outcome consistent with the literature. The coefficient of *PRIVATE* is positive and significant, suggesting that the distress rate is significantly higher for private companies, after controlling for firm and bond fundamentals.

The assessment of the difference between private and public companies in recovery rates following default events is based on 333 of the 738 default cases for which recovery data (from Moody's DRS database) and accounting data needed to estimate the model are available. The results, presented in Table 8 shows that all the fundamental predictors have the expected sign, and most of them are significant. Our variable of interest, *PRIVATE*, has an insignificant coefficient, suggesting that the recovery rate of creditors' loans following a default event is not different between private and public companies.[25]

6.4. Incorporation of Rating in the Explanation of Spreads

The above findings leave us with one explanation for the lower rating assigned by credit rating agencies to private companies, namely, a higher rate of default among these companies, not captured by fundamentals but likely related to the limited ability of these companies to raise capital at times of distress. This conclusion is supported also by the examination of the behavior of the cost of debt of private companies during periods of economic recession. It appears

[25] We conduct probability of default and recovery rate tests on a subsample of 333 default cases that are in both test samples, and obtain qualitatively similar results. We also find that recovery rate results are unaffected when we include predicted default probability in our regression.

therefore that accessibility to external capital is one of the "soft" factors considered by the credit rating agencies in their rating decisions.

If credit ratings properly reflect the accessibility-to-capital factor, we would expect that investors, who observed the rating, would also incorporate this information in setting the spread. That is, after controlling for *RATING*, the variable *PRIVATE* will no longer be associated with the yield spread. To test this prediction, we re-estimated regression (1) with *SPREAD* as the dependent variable, adding *RATING* to the set of explanatory variables. Table 9 presents the results from this regression estimated separately from the full sample and the propensity-score matched sample. Both samples yield the same, somewhat surprising result: While the magnitude of the 'discount" of private firms' debt is diminished when *RATING* is added to the *SPREAD* regression (the coefficient of *PRIVATE* goes down from 2.777, see Table 2, to 1.468), the variable *PRIVATE* is still significant in explaining the yield spread. This significance is observed after controlling not just for firm and bond fundamentals as well as information environment variables, but also for the credit rating.

A number of interpretations can be offered for this finding. One interpretation is that credit rating agencies do not fully correct for the added risk of the debt issued by private companies, yet investors (through the determination of the spread) correct for it. Another interpretation is that the rating agencies properly rate credit risk of the private companies, but the bond market over-discounts ("bashing") private companies' debt. A third explanation for the finding is that there are important risk factors that are omitted from our regression. Since we employ a broad range of explanatory variables that have been tested by numerous past studies, we doubt that this explanation is valid. At any rate, reluctantly, we leave the examination of the unexplained discount of private firms' debt open for further research.

7. Additional Analyses and Robustness Tests

In the previous sections we report the results from a number of supplemental analyses. For example, to further control for the effect of information environment on the differential cost of debt of public vs. private firms, in an additional test, we restricted the public sample to only those firm-years without equity analyst coverage, and also controlled for variables that capture firms' accounting quality - discretionary accruals and timely loss recognition. We further repeated the main analyses using propensity-score-matched sample and conducted the Heckman (1979) procedure. In addition to the above supplementary tests, we conducted the following analyses and robustness tests.

In addition to our sample of public and private firms, we also use sample firms that during the sample period have changed their ownership from being public to being private or vice versa. While the type of ownership of these firms in any given year is unambiguous, their characteristics as privately- or publicly-owned are likely to have gradually changed in the years surrounding the ownership transition. While we exclude these "hybrid" firms from our analyses to strengthen the power of our tests, we take advantage of this sample of transitioning firms by further testing the effect of ownership on the cost of debt using a difference-in- differences design whereby we conduct "before and after" tests on the sample of the transitioning firms. Because of the relatively small sample size of "transitioning" firms, we dropped from regression (1) two control variables (*DURATION* and *SENIORITY*) whose availability requirements led to a sharp drop in the number of observations. The results, reported in Table 10, show that the cost of debt of private companies, measured by either yield spreads or ratings, significantly increases when a public firm becomes private, and significantly decreases when a private firm becomes

public. This time-series analysis supplements and reinforces the main results that are based on cross-sectional tests.

The variable *RATING* is based on a conversion of S&P ratings (with AAA being the highest to D being the lowest rating) to a numerical scale (from 1, the highest rating, to 21). While this scale has been used by past research (e.g., Amato and Furfine 2004, Kisgen 2006), we conduct our main tests using a number of alternative scales that include non-linear scale (specifically natural logarithm of, and squaring of, the numerical rating) as well as partitioning the range between 1 and 21 to four groups, or quartiles. The results, and in particular the sign and significance of coefficients of *PRIVATE*, our main variable of interest, remain intact.

The literature on default prediction employing hazard rate models employs a variety of control variables as well as different definitions of these variables.[26] To ensure that our results are robust to inclusion and definition of control variables in the hazard rate model, we conduct our hazard rate default outcome tests using alternative subsets of variables. We also employ total assets, instead of lagged assets, as deflators, and use *LEV* (total liabilities divided by total assets) instead of *LEV_ADJ*. Our results are qualitatively the same under all of alternative specifications we examined.

8. Summary and Concluding Remarks

We provide evidence in this paper that, after controlling for factors identified by past research as affecting the cost of debt (including firm fundamentals, bond characteristics, the firm's information environment, as well as the endogenous nature of the choice of being public), the cost of debt is higher for privately-owned firms compared to publicly-owned firms.

[26] Shumway (2001), Campbell et al. (2008), and Bharath and Shumway (2008), among others, make comparison among different hazard rate model specifications employed in default prediction.

Specifically, after these controls, the yield spread is higher on average by more than 100 basis points (with the exact amount depending on the test specification).

Within the privately-owned firms, we find that ownership by a PE firm results in a higher cost of debt and worse credit ratings. This result is attributed by us to the greater separation of ownership and control in PE-backed private companies, which likely leads to more risk taking and thus a higher cost of debt. This cost-increasing effect is more pronounced for private companies in which the PE firm holds a majority stake. However, we also find that the positive reputational effect of PE firms in lowering cost of debt is more pronounced for large PE firms, in fact more than oversetting the unfavorable effect of ownership-control separation.

Our main explanation of the results of a higher cost of debt issued by privately-owned companies is their more limited access to capital markets. This explanation is supported by two other findings of the paper. One finding is that, given their fundamentals, the frequency of default events is higher for private firms, a possible reflection of these companies' difficulty in accessing the capital markets in case of distress. The other finding consistent with the 'accessibility' explanation is that the excess cost of debt to these firms is greater at times of recession when financial distress is more common and accessibility to capital markets becomes more critical.

The accessibility explanation cannot fully explain the excess of cost of debt for private firms because rating agencies should properly incorporate this factor in their determination of credit ratings. Yet, we find that the excess yield spread, albeit smaller, still exists (the variable *PRIVATE* is positive and significant) even when we add to the spread regression the bond rating as another explanatory variable. This is a somewhat surprising result that we are unable to satisfactorily explain. It can be interpreted by either insufficient controls for risk in our (fairly

comprehensive) model, or by irrational ‘bashing” of private firms’ debt by investors. We reluctantly leave the resolution of this puzzle to future research.

The finding that the net favorable effect of being public on the cost of equity capital extends to the cost of debt contributes to our understanding of the consequences of the ownership choice on the firm’s cost of capital. The analyses further provide additional insights into the role of “soft information” in the determination of bond valuation.

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Appendix
Definitions of Variables (in Alphabetical Order)

Variable	Definition	Sources
BIGAUDI	An indicator variable that is equal to 1 if the firm's auditor belongs to one of the Big-5 auditors (Big-4 after the demise of Arthur Anderson in 2002) and 0 otherwise.	COMPUSTAT
BONDS	Number of bonds per firm year outstanding.	Interactive Data, TRACE
DEFAULT	An indicator variable that is equal to 1 if the firm year contains a default event (per Moody's definition of default) which includes bankruptcy (Chapter 11 and Chapter 7 bankruptcies), default (missed interest and/or principal payments), distressed exchange, or dividend omission, and 0 otherwise.	Lee (2014)
DISTRESS_EXCH	An indicator variable that is equal to 1 if the default event is distressed exchange and 0 otherwise.	Moody's DRS
DUR_DEFAULT	The duration of default event measured as the difference in the number of months between the date of default event and the date of resolution of default.	Moody's DRS
DURATION	Average duration of the firm's outstanding bonds expressed as a number of years.	Interactive Data, TRACE
EBIT	Earnings Before Interest and Taxes / Lagged Total Assets	COMPUSTAT
EBITDA	Earnings Before Interest, Taxes , Depreciation and Amortization / Lagged Total Assets	COMPUSTAT
FCF	Free Cash Flow, defined as ((Cash Flow from Operations - Average CAPEX for years t, t-1, and t-2) / Lagged Total Assets).	COMPUSTAT

Variable	Definition	Sources
FSIZE	Firm size proxied by the natural log of the sum of the market value of equity (PRCC*SHO) and book value of debt (DT). For private companies, we estimate the hypothetical market value of equity by multiplying the firm's sale, and separately the firm's assets, by the median sales multiplier and the median assets multiplier in the firm's 3-digit industry, respectively. We then average these two market value estimates.	COMPUSTAT
GROWTH	Sales Growth ((Total Sales - Lagged Total Sales) / Lagged Total Sales).	COMPUSTAT
INT_COV	Interest coverage ratio (Income before Tax and before Interest Expense / Interest Expense), The value is set to zero when the numerator is negative.	COMPUSTAT
INTANG	Intangible assets (Intangible Assets / Total Assets).	COMPUSTAT
LEV	Leverage (Total Liabilities / Total Assets).	COMPUSTAT
LEV_ADJ	Leverage adjusted for off-Balance Sheet accounts, computed as [Total Liabilities + Underfunded Pension Obligations + (Rent Expense *6*.65)] / [Total Assets + .35*Underfunded Pension + LIFO Reserve *.65 + Interest Capitalized * .65 + (Rent Expense *6*.65)].	Moody (2007)
LOSS	An indicator variable capturing whether the firm is a loss firm (1) or a not (0).	COMPUSTAT
MATURITY	The average years of maturity for bonds outstanding.	Interactive Data, TRACE
PE	An indicator variable representing whether the firm is owned by a private equity (1) or not (0).	Thomson Financial VentureXpert
PE_MAJ	An indicator variable representing whether the PE firm in the PE-owned private firm has a majority interest ($\geq$ 50%) in the firm (1) or not (0).	Hand-collected

Variable	Definition	Sources
PE_RANK	An indicator variable representing whether the PE firm (*PE*=1) is a large PE firm (1) or not (0); Large PE firm includes the following Top 15 PE funds by equity invested: Carlyle Group, Blackstone, Warburg Pincus, KKR, Goldman Sachs, Cerberus Capital, Fortress, Apollo, Bain, TPG, 3i, Apax, Thomas and Lee, Morgan Stanley, Welsh, Carson, Anderson & Stowe.	Thomson Financial VentureXpert
PPE	Net property, plant, and equipment (Total Gross Property Plant and Equipment-Accumulated Depreciation and Amortization) / Lagged Total Assets).	COMPUSTAT
PRIVATE	An indicator variable representing private (1) vs. public (0) status of the firm.	Hand-collected
PUBLIC_NEW	An indicator variable equal to 1 if the firm-year is less than 5 years from the year the firm became public (by issuing either public debt or public equity)	COMPUSTAT
RATING	S&P credit rating converted into numeric ratings with the highest rating (AAA) is assigned the value of 1 and the lowest rating is assigned the value 21. Measured at the end of the third month of the fiscal year.	COMPUSTAT
RE	Retained Earnings / Total Assets.	COMPUSTAT
REC	An indicator variable equal to 1 if the fiscal year is a contraction (i.e., recession) year according to the NBER website http://www.nber.org/cycles/cyclesmain.html. The fiscal years included are 1990, 1991, 2001, 2008, and 2009.	NBER website
RECOVERY_RATE	Family recovery rate defined by Moody's, which measures the enterprise value of the corporate family relative to its total liabilities at default resolution available to be distributed to creditors.	Moody's DRS
ROA	Return on assets, computed as the ratio of (Income from Continuing Operations before Extraordinary Income / Lagged Total Assets).	COMPUSTAT

Variable	Definition	Sources
SALES_TURN	Sales turnover (Sales / Lagged Total Assets).	COMPUSTAT
SECURED	An indicator variable equal to 1 if the firm has secured debt and 0 otherwise.	Moody's DRS
SENIORITY	The proportion of bond issues designated as senior bonds.	FISD, SDC
SPREAD	The excess of yield-to-maturity of the bond (*YTM*) on a matched Treasury bond that has at the end of the third month of the fiscal year (1) a remaining time to maturity within six months from the remaining time to maturity of the sample bond, and (2) a coupon rate closest to that of the sample bonds but one that does not deviates from the coupon rate of the sample bond by more than 45%.	Interactive Data, TRACE, CRSP
TA	Log of Total Assets.	COMPUSTAT
WC	Working capital (Current Assets – Current Liabilities)/ Lagged Total Assets.	COMPUSTAT
YRS_TO_MATURITY	Remaining number of years to maturity.	Interactive Data, TRACE
YTM	Yield to Maturity, measured at the end of the third month of the fiscal year.	Interactive Data, TRACE
Z_SCORE	An updated Altman's Z-score from Shumway (2001) where the weights are obtained following Shumway's hazard rate model approach: 1.2**WC*+0.6**RE*+10.1**EBIT*-0.47**SALES_TURN* [data 1962-1992] [see Table 2, page 117 of Shumway 2001].	COMPUSTAT

Table 1
Descriptive Statistics on the Firm Sample

Panel A: Distribution of Firm-year Observations by Year

YEAR	Number of Private Firms	Number of Public Firms
1987	11	976
1988	20	914
1989	24	841
1990	23	789
1991	20	813
1992	22	876
1993	19	952
1994	25	997
1995	25	1,108
1996	23	1,248
1997	38	1,386
1998	54	1,492
1999	84	1,510
2000	103	1,526
2001	127	1,489
2002	114	1,440
2003	100	1,465
2004	81	1,457
2005	63	1,419
2006	49	1,395
2007	40	1,324
2008	33	1,264
2009	29	1,248
2010	23	1,264
Total	1,150	29,193

*Panel B: Distribution of Firm Observations by Industry**

Industry (2-digit SIC code)	Number of Private Firms	% of Private Firms	Number of Public Firms	% of Public Firms	% of All Sample Firms	% of all COMPUSTAT Firms
	(1)	(2)	(3)	(4)	(5)	(6)
13	2	0.8%	210	6.1%	5.8%	7.4%
20	12	4.7%	101	3.0%	3.1%	2.4%
26	9	3.5%	75	2.2%	2.3%	0.9%
27	14	5.5%	57	1.7%	1.9%	0.8%
28	18	7.0%	209	6.1%	6.2%	10.7%
29	4	1.6%	54	1.6%	1.6%	0.8%
33	7	2.7%	89	2.6%	2.6%	1.4%
34	10	3.9%	50	1.5%	1.6%	1.1%
35	16	6.3%	154	4.5%	4.6%	4.6%
36	9	3.5%	183	5.4%	5.2%	8.2%
37	12	4.7%	103	3.0%	3.1%	2.2%
38	7	2.7%	106	3.1%	3.1%	5.5%
48	10	3.9%	346	10.1%	9.7%	3.7%
49	11	4.3%	290	8.5%	8.2%	3.8%
50	10	3.9%	65	1.9%	2.0%	1.9%
51	5	2.0%	53	1.6%	1.6%	1.3%
54	9	3.5%	51	1.5%	1.6%	0.5%
58	7	2.7%	50	1.5%	1.6%	1.1%
59	5	2.0%	67	2.0%	2.0%	1.5%
73	14	5.5%	222	6.5%	6.4%	11.2%
79	11	4.3%	60	1.8%	1.9%	0.9%
80	6	2.3%	87	2.5%	2.5%	1.4%
All other industries	48	18.8%	733	21.5%	21.3%	26.7%
Full Sample	**256**	**100.0%**	**3,415**	**100.0%**	**100%**	**100.0%**

*Listed are industries with at least 50 public firms in our sample.

Panel C: Descriptive Statistics on Firm and Bond Characteristics

	Private Firm-Years				Public Firm-Years				Difference			
Firm Characteristics	Number of firm-year with available *SPREAD* or *RATING*	Mean	Median	Std.dev.	Number of firm-year with available *SPREAD* or *RATING*	Mean	Median	Std.dev.	Mean		Median	
LEV_ADJ	1,150	1.053	0.988	0.293	29,193	0.728	0.689	0.259	0.326	***	0.299	***
INT_COV	1,150	1.328	1.138	1.073	29,193	4.147	3.119	3.160	-2.819	***	-1.982	***
Z_SCORE	1,150	0.265	0.327	0.779	29,193	0.592	0.612	0.958	-0.326	***	-0.285	***
ROA	1,150	-0.014	-0.003	0.083	29,193	0.027	0.038	0.093	-0.042	***	-0.041	***
LOSS	1,150	0.519	1.000	0.500	29,193	0.234	0.000	0.423	0.285	***	1.000	***
FCF	1,150	0.017	0.018	0.087	29,193	0.036	0.028	0.197	-0.019	***	-0.010	***
INTANG	1,150	0.250	0.173	0.255	29,193	0.152	0.062	0.207	0.098	***	0.111	***
PPE	1,150	0.323	0.265	0.231	29,193	0.433	0.387	0.281	-0.110	***	-0.122	***
GROWTH	1,150	-0.090	0.034	0.691	29,193	0.025	0.044	0.448	-0.115	***	-0.010	
FSIZE	1,150	7.085	6.939	1.001	29,193	7.898	7.835	1.624	-0.813	***	-0.896	***
BIGAUDI	1,150	0.936	1.000	0.245	29,193	0.957	1.000	0.202	-0.022	***	0.000	
PUBLIC_NEW	1,150	0.530	1.000	0.499	29,193	0.160	0.000	0.367	0.370	***	1.000	***
Bond Characteristics	Number of firm-years	Mean	Median	Std.dev.	Number of firm-years	Mean	Median	Std.dev.	Mean		Median	
BONDS	634	1.240	1.000	0.293	11,389	3.160	2.000	4.458	-1.920	***	-1.000	***
SPREAD (%)	634	9.579	7.937	1.073	11,389	3.333	1.935	3.860	6.246	***	6.002	***
MATURITY	634	9.361	10.000	0.779	11,389	13.478	10.000	8.026	-4.116	***	0.000	
YRS_TO_MATURITY	634	5.518	5.625	0.083	11,389	9.187	7.000	7.365	-3.669	***	-1.375	**
DURATION	634	3.764	3.760	0.087	11,389	5.263	5.244	2.231	-1.499	***	-1.484	***
SENIORITY	634	0.303	0.000	0.255	11,389	0.731	1.000	0.407	-0.429	***	-1.000	***
RATING (from 1 to 21)	1,015	14.515	14.000	0.231	28,433	10.191	10.000	3.851	4.324	***	4.000	***

*,**,*** indicate significance at the 10%, 5%, and 1% level using a two-tailed t-test (mean) and Wilcoxon signed rank test (median), respectively. Differences between means are tested for significance using a two-tailed t-test; differences in medians are tested for significance using a two-tailed Wilcoxon signed rank test. All variables are as defined in Appendix.

Table 2
Determinants of Cost of Debt for the Full Sample

	SPREAD				***RATING***			
	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat
Intercept	5.881	20.65	10.959	24.50	13.674	92.00	19.013	80.84
PRIVATE	**2.846**	**10.28**	**2.777**	**10.73**	**1.096**	**11.03**	**0.851**	**8.99**
LEV_ADJ	1.207	5.25	1.277	5.71	1.872	16.37	2.121	20.62
INT_COV	-0.142	-6.48	-0.067	-2.81	-0.361	-29.26	-0.222	-19.56
Z_SCORE	-0.379	-3.95	-0.190	-1.89	-0.603	-11.59	-0.531	-11.58
ROA	-4.368	-4.03	-3.776	-3.55	-2.480	-3.84	-1.015	-1.71
LOSS	1.739	12.35	1.680	12.51	1.194	13.66	1.096	13.87
FCF	-0.650	-2.71	-1.077	-4.73	0.277	1.20	0.037	0.19
INTANG	-1.286	-5.36	-0.865	-4.09	0.013	0.10	0.602	5.14
PPE	-1.015	-5.62	-0.763	-4.82	-0.916	-8.02	-0.661	-6.54
GROWTH	-0.351	-2.71	-0.248	-2.00	0.440	3.99	0.313	3.46
DURATION	-0.273	-13.81	-0.201	-10.93	-0.276	-21.278	-0.209	-18.36
SENIORITY	-1.767	-14.24	-0.917	-7.38	-2.168	-32.377	-1.114	-17.55
FSIZE			-0.703	-18.08			-0.922	-46.60
BIGAUDI			-0.088	-0.32			-0.063	-0.38
PUBLIC_NEW			0.311	2.16			0.626	7.75
Industry FE	Yes		Yes		Yes		Yes	
Year FE	Yes		Yes		Yes		Yes	
Adjusted R^2	49.84%		54.23%		53.74%		62.86%	
N	12,023		12,023		11,128		11,128	

Regressions include industry and year indicator variables, which have not been tabulated. The t-statistics have been adjusted to control for the clustering by year and multiple firm observations. All variables are as defined in Appendix.

Table 3
Results from Estimating the Propensity Score Matched Regression

Panel A: Probit Model Estimates

	Intercept	*LOSS*	*PPE*	*INTANG*	*GROWTH*	*INT_COV*
Coefficient	-1.362	-0.074	-0.801	1.312	-0.189	-0.711
Odds Ratio	na	0.928	0.449	3.712	0.828	0.491
z-statistic	-13.79	-1.03	-9.39	-10.57	-3.25	-22.36
Industry FE	Yes					
Year FE	Yes					
MacKelvey Pseudo R^2	41.80%					
N	30,343					

All variables are as defined in Appendix.

Panel B: Main Characteristics of the Propensity Score Matched Observations

	Private Firm-Years				Public Firm-Years				Difference		
Firm Characteristics	Number of firm-year with available *SPREAD* or *RATING*	Mean	Median	Std.dev.	Number of firm-year with available *SPREAD* or *RATING*	Mean	Median	Std.dev.	Mean		Median	
LEV_ADJ	343	1.090	1.018	0.306	343	1.056	0.977	0.283	0.034		0.041	
INT_COV	343	1.359	1.178	0.838	343	1.977	1.436	1.940	-0.618	***	-0.259	***
Z_SCORE	343	0.250	0.257	0.715	343	0.175	0.211	1.147	0.074		0.046	
ROA	343	-0.009	0.002	0.076	343	-0.015	0.003	0.110	0.006		-0.001	
LOSS	343	0.481	0.000	0.500	343	0.472	0.000	0.500	0.009		0.000	
FCF	343	0.018	0.020	0.076	343	0.001	0.013	0.102	0.017	**	0.007	*
INTANG	343	0.217	0.155	0.229	343	0.209	0.116	0.255	0.008		0.039	
PPE	343	0.371	0.303	0.248	343	0.409	0.348	0.277	-0.038	***	-0.045	***
GROWTH	343	0.012	0.048	0.595	343	0.066	0.048	0.382	-0.054		0.000	
FSIZE	343	6.930	6.859	0.927	343	6.815	6.835	1.086	0.114		0.024	
BIGAUDI	343	0.948	1.000	0.223	343	0.948	1.000	0.223	0.000		0.000	
PUBLIC_NEW	343	0.554	1.000	0.498	343	0.143	0.000	0.350	0.411	***	1.000	***
Bond Characteristics	Number of firm-years	Mean	Median	Std.dev.	Number of firm-years	Mean	Median	Std.dev.	Mean		Median	
BONDS	167	1.281	1.000	0.828	167	1.830	1.000	2.086	-0.549	***	0.000	
SPREAD (%)	167	9.062	7.641	5.767	167	6.448	5.139	4.893	2.614	***	2.502	***
MATURITY	167	9.460	10.000	2.152	167	10.504	10.000	4.678	-1.044	**	0.000	
YRS_TO_MATURITY	167	5.735	5.667	2.267	167	6.544	5.583	4.386	-0.809	**	0.083	
DURATION	167	3.873	3.839	1.095	167	4.606	5.094	2.072	-0.733	***	-1.255	***
SENIORITY	167	0.266	0.000	0.417	167	0.443	0.333	0.467	-0.177	***	-0.333	***
RATING (from 1 to 21)	343	14.504	14.000	1.837	343	13.770	14.000	2.943	0.735	***	0.000	

*,**,*** indicate significance at the 10%, 5%, and 1% level using a two-tailed t-test (mean) and Wilcoxon signed rank test (median), respectively. Differences between means are tested for significance using a two-tailed t-test; differences in medians are tested for significance using a two-tailed Wilcoxon signed rank test. All variables are as defined in Appendix.

Table 4
Determinants of Cost of Debt for the Propensity Score Matched Sample

	SPREAD				***RATING***			
	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat
Intercept	18.194	5.04	24.014	5.45	18.376	8.51	24.355	14.47
PRIVATE	**1.877**	**3.87**	**2.481**	**4.34**	**0.522**	**2.71**	**0.444**	**1.75**
LEV_ADJ	2.662	3.43	2.391	3.06	1.880	5.12	1.567	4.61
INT_COV	-0.383	-2.29	0.002	0.01	-0.749	-7.47	-0.355	-3.07
Z_SCORE	-0.153	-0.41	-0.837	-2.01	-0.215	-1.09	-0.905	-4.12
ROA	-6.659	-1.47	-4.586	-1.05	-2.596	-1.22	-0.325	-0.16
LOSS	1.645	2.20	1.394	1.91	-0.109	-0.31	-0.394	-1.30
FCF	-8.072	-2.78	-6.094	-2.10	-2.024	-1.26	0.203	0.14
INTANG	-1.668	-1.52	-1.154	-1.06	-0.441	-0.89	-0.021	-0.05
PPE	-3.061	-3.22	-2.068	-2.08	-2.033	-3.55	-1.034	-2.19
GROWTH	-0.782	-0.99	-0.367	-0.45	0.556	1.29	1.087	3.03
DURATION	-0.444	-2.97	-0.392	-2.64	-0.201	-2.37	-1.087	-6.28
SENIORITY	-0.812	-1.51	-0.692	-1.34	-1.089	-3.80	-0.282	-0.83
FSIZE			-1.003	-3.55			0.261	1.10
BIGAUDI			-0.831	-0.90			-0.150	-2.22
PUBLIC_NEW			-0.274	-0.40			-0.897	-3.49
Industry FE	Yes		Yes		Yes		Yes	
Year FE	Yes		Yes		Yes		Yes	
Adjusted R^2	58.19%		60.39%		54.27%		64.79%	
N	334		334		334		334	

Regressions include industry and year indicator variables, which have not been tabulated. The t-statistics have been adjusted to control for the clustering by year and multiple firm observations. All variables are as defined in Appendix.

Table 5
The Effect of Recessionary Years on the Cost of Debt

	SPREAD		***RATING***	
	Coeff	t-stat	Coeff	t-stat
Intercept	10.906	24.12	19.069	81.16
PRIVATE	**2.239**	**9.32**	**0.753**	**7.26**
REC	**0.120**	**0.94**	**0.445**	**5.90**
PRIVATE*REC	**2.688**	**5.85**	**0.627**	**2.96**
LEV_ADJ	1.276	5.71	2.096	20.38
INT_COV	-0.068	-2.86	-0.225	-19.81
Z_SCORE	-0.188	-1.87	-0.525	-11.45
ROA	-3.831	-3.61	-1.095	-1.83
LOSS	1.687	12.60	1.107	13.99
FCF	-1.082	-4.75	0.074	0.39
INTANG	-0.870	-4.13	0.584	5.00
PPE	-0.769	-4.86	-0.667	-6.60
GROWTH	-0.208	-1.67	0.286	3.16
DURATION	-0.201	-10.98	-0.209	-18.41
SENIORITY	-0.911	-7.35	-1.130	-17.81
FSIZE	-0.702	-18.07	-0.917	-46.33
BIGAUDI	-0.107	-0.40	-0.045	-0.27
PUBLIC_NEW	0.304	2.11	0.604	7.48
Industry FE	Yes		Yes	
Year FE	Yes		Yes	
Adjusted R^2	54.55%		62.99%	
N	12,023		11,128	

Regressions include industry and year indicator variables, which have not been tabulated. The t-statistics have been adjusted to control for the clustering by year and multiple firm observations. All variables are as defined in Appendix.

Table 6
The Effect of PE Ownership and PE Characteristics on the Cost of Debt

	All Private Companies				Private Companies with Private Equity Ownership							
	DUMMY = PE				*DUMMY = PE_MAJ*				*DUMMY = PE_RANK*			
	SPREAD		***RATING***		***SPREAD***		***RATING***		***SPREAD***		***RATING***	
	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat
Intercept	28.957	11.46	20.451	25.08	29.373	10.10	17.207	22.62	30.843	11.29	17.009	23.17
DUMMY	**0.301**	**1.84**	**0.444**	**2.83**	**0.842**	**1.55**	**0.132**	**0.69**	**-1.189**	**-2.62**	**-0.536**	**-3.34**
LEV_ADJ	0.565	0.89	1.193	5.40	0.650	0.91	0.949	3.69	0.569	0.82	0.959	3.71
INT_COV	-1.202	-4.47	-0.654	-8.77	-2.255	-3.55	-0.279	-1.79	-2.149	-3.44	-0.294	-1.93
Z_SCORE	-0.024	-0.05	-0.662	-4.54	0.637	1.02	-0.290	-1.89	0.594	0.95	-0.292	-1.89
ROA	-4.513	-1.29	-1.015	-0.77	-9.435	-2.62	-2.736	-2.14	-9.966	-2.81	-2.654	-2.08
LOSS	1.493	3.15	-0.219	-1.33	-0.047	-0.08	-0.248	-1.26	0.028	0.05	-0.253	-1.29
FCF	-3.044	-1.02	-0.353	-0.30	-3.322	-0.80	-1.856	-1.43	-3.029	-0.73	-1.820	-1.39
INTANG	-3.485	-4.67	-0.582	-1.95	-2.619	-2.99	-0.126	-0.38	-2.305	-2.66	-0.160	-0.48
PPE	-3.132	-4.13	-1.467	-3.72	-1.172	-0.96	-0.866	-1.88	-1.561	-1.29	-0.852	-1.88
GROWTH	-0.417	-1.26	0.205	0.91	-0.079	-0.18	-0.315	-1.97	-0.071	-0.16	-0.306	-1.90
DURATION	-0.526	-2.85	-0.027	-0.33	-0.753	-3.22	-0.140	-2.03	-0.744	-3.20	-0.136	-1.96
SENIORITY	0.259	0.67	-0.211	-1.28	0.227	0.41	0.093	0.51	-0.103	-0.19	0.140	0.83
FSIZE	-0.517	-2.60	-0.567	-5.43	-0.303	-1.12	-0.217	-2.66	-0.339	-1.29	-0.206	-2.48
BIGAUDI	-0.502	-0.79	-0.889	-3.15	-0.505	-0.53	0.189	0.95	-0.833	-0.82	0.175	0.84
PUBLIC_NEW	-0.071	-0.19	-0.038	-0.25	0.350	0.72	-0.161	-1.06	0.429	0.88	-0.178	-1.20
Industry FE	Yes		Yes		Yes		Yes		Yes		Yes	
Year FE	Yes		Yes		Yes		Yes		Yes		Yes	
Adjusted R^2	59.90%		60.53%		60.97%		57.29%		61.31%		58.62%	
N	633		498		415		326		415		326	

Regressions include industry and year indicator variables, which have not been tabulated. The t-statistics have been adjusted to control for the clustering by year and multiple firm observations. All variables are as defined in Appendix.

Table 7
The Effect of Private Ownership on Default Probability*

	DEFAULT		
	Coeff	z-stat	P-value
Intercept	-2.552	-9.46	0.000
PRIVATE	**0.326**	**2.54**	**0.011**
LEV_ADJ	0.267	1.88	0.060
INT_COV	-0.338	-11.37	0.000
Z_SCORE	-0.499	-8.66	0.000
ROA	-3.975	-8.42	0.000
LOSS	0.941	6.87	0.000
FCF	-1.348	-3.70	0.000
INTANG	-0.435	-2.07	0.038
PPE	-0.617	-3.49	0.000
GROWTH	0.186	2.15	0.032
FSIZE	-0.162	-5.27	0.000
Pseudo R^2	28.30%		
N	30,877		

*The sample consists of 2,094 observations belonging to private companies (of which 111, or 5.3% are default observations) and 29,142 observations belonging to public companies (of which 627, or 2.2% are default observations). All variables are as defined in Appendix.

Table 8
The Effect of Private Ownership on Recovery Rates of Debt*

	RECOVERY_RATE		
	Coeff	t-stat	P-value
Intercept	52.260	2.26	0.024
PRIVATE	**0.958**	**0.23**	**0.821**
EBITDA	32.015	2.59	0.010
TA	4.174	3.21	0.001
PPE	-0.299	-0.06	0.950
LEV_ADJ	-9.232	-1.99	0.047
DUR_DEFAULT	-0.255	-2.35	0.019
DISTRESS_EXCH	17.101	3.62	0.000
SECURED	3.080	1.10	0.274
Industry FE	Yes		
Year FE	Yes		
Adjusted R^2	23.53%		
N	333		

*The sample consists of 374 of the 738 distress observations for which recovery data are available. Further data requirements for estimating regression (3) reduced this sample to 333 observations, out of which 56 are of private companies and 318 of public companies. The t-statistics have been adjusted to control for the clustering by year and multiple firm observations. All variables are as defined in Appendix.

Table 9
The Effect of Private Ownership on the Yield Spread after Controlling for Rating

	Full sample		***Propsensity-matched sample***	
	Coeff	t-stat	Coeff	t-stat
Intercept	2.320	4.62	6.131	0.92
PRIVATE	**1.468**	**9.32**	**1.655**	**3.87**
LEV_ADJ	0.331	1.76	1.240	1.59
INT_COV	0.057	2.97	0.262	1.30
Z_SCORE	-0.082	-1.06	-0.173	-0.41
ROA	-2.743	-2.59	-4.347	-1.13
LOSS	1.259	9.68	1.683	2.46
FCF	-0.995	-3.43	-6.243	-2.20
INTANG	-0.657	-3.39	-1.138	-1.12
PPE	-0.506	-3.53	-1.309	-1.42
GROWTH	-0.374	-2.81	-1.165	-1.55
DURATION	-0.246	-6.67	-0.205	-0.60
SENIORITY	-0.315	-1.54	-0.624	-0.70
FSIZE	0.100	0.69	-0.466	-0.72
BIGAUDI	-0.136	-7.53	-0.281	-2.02
PUBLIC_NEW	-0.538	-4.86	-0.033	-0.06
RATING	0.417	21.67	0.734	4.32
Industry FE	Yes		Yes	
Year FE	Yes		Yes	
Adjusted R^2	60.59%		64.84%	
N	11,128		334	

Regressions include industry and year indicator variables, which have not been tabulated. The t-statistics have been adjusted to control for the clustering by year and multiple firm observations. All variables are as defined in Appendix.

Table 10
Results from the Sample of Transitioning Firms

	PUBLIC to PRIVATE transition				**PRIVATE to PUBLIC transition**			
	SPREAD		***RATING***		***SPREAD***		***RATING***	
	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat
Intercept	10.960	5.65	20.271	30.54	16.745	5.93	24.307	23.86
PRIVATE	**2.057**	**3.82**	**0.706**	**4.77**	**0.563**	**1.63**	**0.292**	**2.04**
LEV_ADJ	-0.693	-0.66	1.546	6.45	-0.150	-0.10	1.765	5.92
INT_COV	-0.343	-1.95	-0.436	-9.55	-0.020	-0.09	-0.481	-8.63
Z_SCORE	-0.935	-1.56	-0.582	-4.73	-1.552	-2.13	-0.962	-6.34
ROA	-6.115	-0.78	-0.335	-0.25	-7.092	-0.79	0.973	0.58
LOSS	0.882	1.37	0.153	0.95	0.845	1.03	0.125	0.59
FCF	-0.072	-0.03	1.168	2.10	-4.141	-0.97	0.559	1.11
INTANG	-0.511	-0.56	-0.898	-3.14	1.086	0.49	-0.742	-2.23
PPE	0.645	0.44	-0.777	-2.16	2.158	1.51	-1.069	-2.88
GROWTH	0.388	0.74	-0.092	-0.52	-0.419	-0.50	0.138	1.03
FSIZE	-0.596	-3.33	-0.713	-15.08	-0.792	-2.52	-1.124	-13.20
BIGAUDI	-2.858	-3.40	-0.836	-2.20	-0.565	-0.45	0.360	0.47
PUBLIC_NEW	0.912	1.44	0.640	3.81	-1.659	-2.83	-0.064	-0.41
Industry FE	Yes		Yes		Yes		Yes	
Year FE	Yes		Yes		Yes		Yes	
Adjusted R^2	61.07%		66.40%		65.78%		72.55%	
N	289		908		173		640	

Regressions include industry and year indicator variables, which have not been tabulated. The t-statistics have been adjusted to control for the clustering by year and multiple firm observations. All variables are as defined in Appendix.