The Impact of Institutional Shareholders and Corporate Governance on Strategic Default

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Abstract

This paper investigates whether overleverage identifies companies' strategic default incentives after accounting for institutional shareholders and corporate governance. The results show that overlevered firms have lower equity beta than their counterparts. The strategic default option becomes more valuable when the firms are overlevered. Firms are more likely to be overlevered when they have more strategic advantages over their debt holders (i.e. high liquidation costs, high shareholder's bargaining power, and low renegotiation frictions). Also, the intention of being overlevered increases with the institutional ownership concentration especially when firms are relatively less concentrated. However, institutional ownership concentration does not play a role in the strategic game when firms have high institutional ownership concentration. In addition, for bankrupt firms, overleverage successfully identifies the high probability of filing for the reorganization bankruptcy code and emerging from the reorganization plan.

Keywords: Institutional shareholdings, Corporate governance, Strategic default, Overleverage

JEL Classification: G10, G32, G33

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1 Introduction

Chapter 11, one of the US corporate bankruptcy codes[1], leaves significant scope for debt renegotiation upon default. It is controversial whether Chapter 11, which allows debt renegotiation to avoid an immediate liquidation, actually benefits the US economy as a whole. Chapter 11 enables an ideal debt renegotiation process to enhance the value of bankrupt firms (Brown (1989) and Gilson (1997)). However, critics of Chapter 11 claim that the debtor-friendly renegotiation process grants incumbent management excessive controlling power and fails to yield efficient liquidation for economically inefficient corporations (White (1989) and Aghion et al. (1992)). Instead, they suggest that a massive overhaul due to its inefficiency is necessary (Dick (2013)). The efficiency of this code has been debated among legislators, policymakers and financial economists for a long time without conclusion. Shareholders' ability to renegotiate debt contracts may deliberately lead to a pre-emptory bankruptcy announcement, which is hard to document. This paper introduces an endogenous deviation from optimal capital structure to identify such a strategic intention (or option) to default, relating the corporate strategic default action upon financial distress to the capital structure decision. This paper is also the first study to investigate companies' strategic default incentives within a financial distress and optimal capital structure setting after accounting for institutional ownership and corporate governance, using the most comprehensive dataset to date. Our data is collected from COMPUSTAT, CRSP, and Capital IQ that contain approximately 1.5 million stock-month observations and about 141 thousand firm-year observations from January 1961 to December 2014.

The presence of shareholder recovery alters the risk structure of equity when a firm approaches financial distress (Garlappi and Yan (2011) and Favara et al. (2012)). A

[1] A discussion of the US corporate bankruptcy procedures is detailed in the Appendix A.

firm usually defaults on its debt obligations when its shareholders are unable to make payments as contracted to the debtholders. The possibility of shareholder recovery upon default typically triggers a strategic option to default by shareholders. Shareholders, as the residual claimants, are the last to get paid when a firm goes into bankruptcy. Often, nothing is left to shareholders when a firm goes through a liquidation process. However, shareholder recovery upon financial distress enables shareholders to extract some fraction of firm value from debtholders. We adopt Davydenko and Strebulaev (2007) proxies for strategic factors to measure a firm's strategic advantages over their debtholders.

By defaulting strategically, shareholders maximize their own value at the expense of debtholders. The strategic default boundary is selected by shareholders to maximize *equity value* (Fan and Sundaresan (2000), Francois and Morellec (2004), and Garlappi and Yan (2011)). On the other hand, the choice of optimal capital structure is to maximize *firm value* in such a way that all the firm stakeholders are better off. Therefore, the actual capital structure decision and its optimal level affect the equity value differently in the presence of strategic default (Francois and Morellec (2004)). It is well documented that firms deviate from their optimal capital structures (van Binsbergen et al. (2010), Korteweg (2010) and Denis and McKeon (2012)). The trade-off theory implies a target capital structure hypothesis (Hovakimian (2004), Leary and Roberts (2005), and Kayhan and Titman (2007)) that suggests firms eventually rebalance their capital structures toward the targets. Such deviations from the target capital structures are attributed to high adjustment costs and therefore the literature documents a slow adjustment speed toward the target ratios. On the other hand, according to the equity value maximization, school of thought companies may not stay at the optimal levels of capital structure because shareholders are able to extract value from debtholders at the time of financial distress, particularly through renegotiating debt contracts with their creditors.

Broadie et al. (2007) show that debt relief by shareholders when encountering financial

distress results in higher leverage. It is possible that firms tend to be overleveraged[2] to take advantage of the value of the strategic default option. Such strategic incentive to deviate from optimal capital structure has not yet been explored in the literature, leading to the central question of this paper: does overleverage identify a firm's strategic intention to default? This question is particularly dependent on a country's bankruptcy law. Rajan and Zingales (1995) point out that different bankruptcy codes across countries may cause variations in corporate capital structures at the country level. When shareholders are given the option to default strategically, they are likely to deviate from the optimal level of debt to the level that maximizes their equity value. In doing so, they are likely to choose the default triggering level that optimizes the equity value. In this sense, both the capital structure decision and default decision are endogenous. Shareholders tend to borrow excessive debt to take advantage of the strategic default option, which means that firms are overleveraged. The US corporate bankruptcy codes contain such implicit strategic features.

This paper investigates the magnitude of deviations from corporate optimal capital structure and argues that such deviations can identify a strategic intention to default. The results address the concerns of corporate lenders that firms may play a strategic game when they excessively borrow from outsiders. The results also show that firms are more overleveraged when they have greater strategic advantages over their debtholders. In addition, the intention of being overlevered increases with the insitutional ownership concentration especially when firms are relatively less concentrated. However, institutional ownership concentration does not play a role in the strategic game when firms have high institutional ownership concentration. This paper can enable legislation and policy makers to be made aware of the potential weakness of Chapter 11. In addition, it also implies how corporate debtholders should take a thorough and effective assessment

[2]When the actual leverage is greater than the optimal level, we call it 'overleverage'; when the actual leverage is less than the optimal level, we call it 'underleverage'.

of their borrowers before initiating lending procedures.

One of the primary contributions of this paper is the introduction of an identifiable measure for the strategic intention to default, i.e. excess leverage. Previous literature on strategic default suggests that the intrinsic reasons for defaults cannot be observed directly, especially the intention of strategic defaults (Giroud et al. (2012) and Guiso et al. (2013)). As a result, there is a need to construct an effective measure to identify the true intention of corporate defaults. In addition, the importance of introducing excess leverage, calculated based on a model-implied optimal leverage, is due to its specific needs that are directly related to strategic default. Prior studies fail to distinguish this: instead, they use the level or change of leverage or categorize firms who have already gone bankrupt. Moreover, it is vital to measure excess leverage well before companies are bankrupt in order to avoid any inefficient and unnecessary loss of firm value, which impairs both shareholders and debtholders. This study proposes that in the presence of the strategic default option, firms are prone to being overleveraged to extract debtholders' value, resulting in a positive deviation from optimal capital structure. Such strategic incentive of being overleveraged has not yet been investigated in both the literature on capital structure and strategic default. As a result, we are the first to introduce excess leverage as an identifiable measure for an unobservable strategic default event and therefore fill the gap in the current literature by connecting optimal capital structure with strategic default, institutional investors and corporate governance. Furthermore, excess leverage gives a parsimonious measure of a firm's true nature of their debt obligation. Firms' debtholders can accordingly be aware of the borrowing firms' degree of being overleveraged and hence protect themselves from any strategic default by limiting their lending amount.

The rest of the paper is presented as follows. Section 2 reviews the related literature and develops the hypotheses. The methodology used to test the hypotheses is outlined in Section 3. Section 4 describes the data and all variables used in the analysis and followed by the main results in Section 5. Section 6 concludes.

2 Literature and Hypothesis Development

This section reviews the related literature on strategic default, financial distress, and the consequences of deviations from optimal capital structure. In addition, hypotheses are proposed on how deviation from optimal capital structure is related to strategic default.

2.1 Strategic Default and Financial Distress

Given the feasibility to renegotiate debt obligations with debtholders in the event of bankruptcy, shareholders are able to recover some fraction of firm value by deviating from the absolute priority rule (APR) (Franks and Torous (1989), Weiss (1990), Altman (1998), Garlappi and Yan (2011), and Hackbarth et al. (2015)). Upholding APR, any junior claimant is not given a stake in the securities of the bankrupt firm until the more senior claimants have been fully satisfied, i.e. APR requires any security being claimed at bankruptcy to be strictly from most senior to most junior. APR violation addresses the concern of shareholders' intentional declaration of default.

Hart and Moore (1994) point out the difference between *liquidity default* and *strategic default*. They define liquidity default as a firm's insolvency due to low cash flows. Strategic default is regarded as a firm's declaration of bankruptcy even though the firm has sufficient cash to pay the debt. High liquidation costs prevent firms from going into bankruptcy because debtholders will receive less from an asset fire sale, which gives shareholders some scope to renegotiate their debt contracts in a debtor-friendly system. As a result, in the event of default, shareholders are able to violate the APR and extract value from debtholders in a debtor-friendly system; this is in contrast to the strict adherence to APR required by shareholders and debtholders in a creditor-friendly system. Since liquidating a firm upon financial distress generates a loss in firm value relative to the going concern, debtholders may prefer to accept some debt forgiveness if doing so helps the troubled firm survive. This motivates shareholders to default strategically in order

to obtain some debt relief from their debtholders.

Several recent studies propose the notion of corporate strategic default that alters the equity risk structure, solving the seemingly contradictory empirical patterns of distress risk and equity returns, documented as the "distress puzzle" (Garlappi et al. (2008), Garlappi and Yan (2011), and Favara et al. (2012)). This is especially true in the US because the ability for shareholders to default strategically depends on a country's bankruptcy law (Davydenko and Franks (2008)) and therefore Chapter 11 (one of the US corporate bankruptcy procedures) gives the right to shareholders to reorganize their debt contracts at the time of default. Hence, option to default strategically arises from the likelihood of shareholder recovery upon default under Chapter 11. This new perspective helps explain the empirical regularities within the cross-sectional stock returns.

Deviation from APR in Chapter 11 reorganization occurs 75% of the time and shareholders receive, on average, 7.6% of the reorganized firm's value (Franks and Torous (1989), Weiss (1990), and Betker (1995)). Franks and Torous (1989) report that among the 27 US firms that defaulted on their outstanding bonds during 1970 through 1984, 21 firms exhibit deviations from APR. 18 of these 21 firms deviate in favor of shareholders, i.e. shareholders receive some consideration (and three of the 21 firms benefit unsecured creditors). Weiss (1990) finds that 29 out of 37 bankruptcy cases among US firms between 1979 and 1986 are in violation of APR. In a more recent study, Morellec et al. (2008) show that the average shareholder recovery among US firms from 1992 to 2004 is about 20% of the asset value during the financial distress period.

Strategic default is found to play an important role in asset pricing (Mella-Barral and Perraudin (1997), Davydenko and Strebulaev (2007), and Garlappi and Yan (2011)). Studies on US bankruptcy codes both numerically and empirically suggest that renegotiation under Chapter 11 influences equity value, *ex-ante* bankruptcy cost, credit spread and leverage ratios (Franks and Torous (1994), Bebchuk (2002), Francois and Morellec (2004) ,Bris et al. (2006), and Broadie et al. (2007)). Since the renegotiation option comes directly from Chapter 11, under which shareholders have an incentive to deviate from the

absolute priority rule and appropriate rents from bondholders, the shareholders' strategic behavior underscores the importance of a country's bankruptcy codes. In order to investigate the strategic intention to default, the sample of this paper focuses on US public companies, which are able to utilize the strategic default option available due to Chapter 11. Mella-Barral and Perraudin (1997) find that theoretically a large proportion of credit spread is attributed to the debtholders' anticipation of the risk of strategic default when debtholders have very weak bargaining power against shareholders. Empirically, Davydenko and Strebulaev (2007) show that the threat of strategic default is incorporated in credit spreads and that the spreads are larger when shareholders' bargaining power is more likely to be strong. On the other hand, Garlappi and Yan (2011) indicate a hump-shaped relationship between equity risk and default probabilities, implying that shareholders' option to default strategically lowers equity risk when default probabilities become very high.

Strategic options have significant intrinsic value and are only realized at the time of execution. Miller (1977) states "permitting stockholders to claim court protection and thereby retain control of a corporation in default would amount to giving them a call option at the expense of creditors." Garlappi et al. (2008) show that expected returns, in general, are not positively related to default probability. They argue that the result is consistent with the model that incorporates shareholders' ability to extract value from debt renegotiation. Garlappi and Yan (2011) find that the presence of shareholder recovery upon financial distress alters the risk structure of equity and causes stock returns to be hump-shaped in default probability. Favara et al. (2012) find that the threat of shareholders' strategic default can reduce equity risk, indicating that this strategic default behavior is priced. Relating the distress risk anomaly to corporate strategic default action explains

the seemingly contradictory results[3] on the relationship between distress risk and equity returns. Therefore, the distress risk anomaly is adapted to strategic default resulting from the possibility of shareholder recovery upon financial distress.

2.2 Financial Distress and Optimal Capital Structure

The trade-off theory of capital structure indicates that *firm value* is maximized at the optimal level of capital structure that balances the marginal benefits and marginal costs of debt. Therefore, excessive usage of debt beyond the optimal level leads to a decrease in firm value. In the absence of strategic default, equity risk increases with leverage, leading to a lower equity value. However, the strategic default option becomes more valuable when a firm is close to bankruptcy. Garlappi and Yan (2011) show that firms with high default probabilities have lower equity betas than those with median default risk, implying that the value of the strategic default option decreases equity risk for those with high default risk. In addition, Favara et al. (2012) document that this strategic behavior is more pronounced among firms with high leverage ratios and little strategic evidence in low-leveraged firms. Therefore, the strategic default option is not likely to have intrinsic value when default risk is low. Broadie et al. (2007)) find that the strategic default option increases debt capacity because of the ability to avoid inefficient liquidation. Therefore, the default decision is treated as endogenous. The default boundary is chosen by shareholders, which maximizes *equity value* at the time of default, unlike the optimal leverage ratio where *firm value* is maximized.

Since equity risk increases with leverage in low-leveraged or low-default-probability firms, the strategic default option does not play a role in equity returns. As financial distress

[3]Some studies show a positive relationship between equity returns and distress risk (Vassalou and Xing (2004) and Kapadia (2011)) whereas some evidence suggests that returns are lower in firms with higher distress intensity (Dichev (1998), Griffin and Lemmon (2002), and Campbell et al. (2008)), regarded as the distress risk anomaly.

risk increases with leverage, the valuable strategic default option starts to reduce equity risk. As a result, it is possible that companies initially make a decision to benefit all the stakeholders and maximize firm value by choosing the optimal capital structure. However, as they approach financial distress, equity value maximization becomes the first interest of shareholders at the expense of debtholders. This usually happens when a firm has excessive outstanding debt to repay, i.e. shareholders choose their capital structure beyond the optimal level.

2.3 Strategic Default and Deviation from Optimal Capital Structure

The strategic use of debt has been documented in Matsa (2010) regarding union bargaining power, which is also applied in the presence of bankruptcy. The idea of the strategic default option comes from the possibility of debt renegotiation upon financial distress to recover some of the shareholders' own value. The availability of the strategic default option increases shareholders' expected payoff and reduces equity risk. The presence of such an option relies heavily on a country's bankruptcy law. If a country prevents renegotiation, shareholders are hardly able to appropriate value from debtholders. However, US bankruptcy code Chapter 11 allows a renegotiation, which gives shareholders incentives to utilize the strategic default option. Favara et al. (2012) find that strategic default has impact on equity risk only in countries where the bankruptcy codes favor debt renegotiations. Garlappi and Yan (2011) document a hump-shaped relationship between equity returns and default probabilities on a sample of US companies. As a result, the strategic default option does have an empirical impact on equity pricing. The choice of the endogenous default threshold *ex-post* is to maximize *equity value* (Fan and Sundaresan (2000), Francois and Morellec (2004), and Davydenko and Strebulaev (2007)) whereas optimal capital structure is determined *ex-ante* to maximize *firm value*. In addition, Cornelli and Felli (1997) distinguish the *ex-ante* and *ex-post* efficienies of bankruptcy. Due to the conflict of interest between shareholders and debtholders, the actual capital

structure decision may not be in the best interest of all the corporate stakeholders and is instead likely to deviate from its optimal leverage, analogous to the argument by Jiang et al. (2012), .

Evidence for deviations from optimal capital structure have been documented in the literature. Leary and Roberts (2005) show that firms do engage in a dynamic rebalancing of their capital structures when allowing for adjustment costs. Fama and French (2002) argue that firms adjust their debt levels toward the optimum though the speed of such adjustment is slow. Flannery and Rangan (2006) also document that firms partially move their capital structures toward the target levels. DeAngelo et al. (2011) find that firms intentionally but temporarily deviate from long-term leverage targets by raising capital through transitory debt to fund investment. Such deviations from the optimum are most attributed to high transaction costs and investment opportunites (Gilson (1997), Fama and French (2002), Leary and Roberts (2005), and DeAngelo et al. (2011)). However, no study has been conducted from the strategic default perspective. Moreover, the previous studies on rebalancing capital structure focuses largely on the target capital structure, instead of the optimum.

In addition, most literature does not distinguish optimal and target capital structure and uses some firms' characteristics as the determinants of capital structure (Fama and French (2002), Leary and Roberts (2005), Uysal (2011), among others). Optimal capital structure and target capital structure are two different concepts although both of them have the same underlying intuition: the trade-off theory. Optimal capital structure is selected to maximize firm value whereas target capital structure is determined by a firm's characteristics. Some recent studies estimate the optimal capital structure for each firm at which firm value is maximized (Korteweg (2010) and van Binsbergen et al. (2010)). This paper considers deviations from optimal capital structure, not target, since deviation from optimal capital structure lowers firm value and therefore can be regarded as an intention to take advantage of the strategic default option by shareholders. Favara et al. (2012) find that the benefits from debt renegotiation have less impact on reducing equity

risk in low-leveraged firms compared with high-leveraged ones. This paper extends their study by investigating whether deviations from optimal capital structure have an impact on reducing equity risk, especially overleverage. In other words, overleveraged firms may be more likely to take advantage of the strategic default option. As a result, the main research question is: Can overleverage (i.e. leverage greater than the optimal level) identify a firm's strategic intention to default?

To answer this question, several sub-questions must necessarily be answered first. The existing literature on strategic default (Garlappi et al. (2008) and Garlappi and Yan (2011)) identifies that the presence of shareholder recovery upon default alters the equity risk structure, and the pattern of equity beta against default probability shows the impact of strategic default on the equity risk structure. Since shareholders' strategic default is a real option, it has all the option properties, such as "moneyness". To determine the value of an option, it is necessary to know whether the option is in the money, at the money, or out of the money. The most novel part of this paper is that we treat the point of optimal capital structure as the cutoff point for a strategic default option to be at the money. If a firm is overleveraged, it is regarded as in the money; if underleveraged, it is out of the money.

In the Garlappi and Yan (2011) model with no shareholder recovery as in Figure 1 (a), equity beta increases with default probability. With increasing shareholder recovery in Figure 1 (b), equity beta is hump-shaped responding to default probability. However, Garlappi and Yan (2011) do not discuss the turning point in Figure 1 (b) in any detail. This paper regards the turning point as closely related with optimal capital structure. At the turning point, a firm is optimally levered. Beyond the turning point, a firm is overleveraged, meaning that the firm's excess leverage[4] is greater than zero. Figure 2 assumes that as default probabilities increases, no matter whether there is a shareholder

[4]Excess leverage is defined as the actual leverage ratio minus the optimal leverage ratio. Excess leverage is positive when a firm is overleveraged and negative when it is underleveraged.

recovery rate or not, the default risk factor loading will always rise with excess leverage in the positive direction.

[*Figure 1 is about here.*]

[*Figure 2 is about here.*]

Two leading factors, market risk and default risk, affect stock returns. For underleveraged firms, these two factors affect share prices in the same direction. However, for overleveraged firms (positive excess leverage), the two factors influence share prices in the opposite directions. While the strategic default option adds value to equity, high default risk depresses equity. By combining these two factors, the return pattern for distressed stocks can be resolved. Based on the strategic debt service model, we know at least that equity value is not maximized at the turning point. When firms are playing the strategic game, they are assumed to act in the best interest of shareholders, i.e. equity value maximization, not firm value maximization. Hence, we arrive at Hypothesis 1:

Hypothesis 1 *Overlevered firms have lower equity beta than their counterparts.*

Favara et al. (2012) suggest that the strategic default impact on equity beta also depends on firm-level strategic factors such as shareholder bargaining power, renegotiation friction, and liquidation cost. Here we come to Hypothesis 2:

Hypothesis 2 *Firms with more strategic advantages tend to be overlevered.*

Shareholders tend to extract value from debtholders to maximize their wealth when faced with financial distress. As agents acting in the best interests of their shareholders, managers are expected to favor shareholders at the expense of debtholders when firms become financially distressed. Alignment of managers' and shareholders' interests suggests that a good corporate mechanism exists within the firm (Maher and Andersson (1999)). A recent study shows managerial incentives and strategic choices of firms with different ownership structures (Banerjee and Homroy (2018)). Institutional ownership is an especially good way to assess the quality of internal governance in a business as institutional

shareholders play a crucial role in monitoring management's performance in creating or safeguarding shareholder value (Shleifer and Vishny (1986), Hartzell and Starks (2003), Chen et al. (2007), Hartzell et al. (2014) among others). For example, Hartzell and Starks (2003) document a negative relationship between institutional ownership concentration and executive compensation, suggesting that institutional shareholders with large holdings are more likely to closely monitor their agents. Chen et al. (2007) also find that long-term institutional investors process information more efficiently by effectively monitoring managers' corporate decisions. When a firm is in default, the role of institutional shareholders becomes even more significant as they are more likely to protect their own wealth at the expense of outside creditors. This means that the agency conflict between managers and shareholders is minimized such that managers and shareholders are both better off during the period of financial distress at the cost of debtholders. Managers, acting as agents, represent their shareholders in renegotiating debt contracts with the debtholders. As a result, the incentive to file for bankruptcy as a strategic measure increases when companies become financially troubled due to the agency trade off being at its lowest during financial distress. Therefore, we propose Hypothesis 3 on the basis that institutional investors and managers are more likely to play a strategic game against debtholders upon default, when the interests of the two parties are more aligned.

Hypothesis 3 *Firms with aligned interest between managers and institutional shareholders tend to be overlevered.*

3 Methodology

This section first presents the pricing model of strategic debt service, followed by the estimations of financial distress risk, optimal capital structure and equity beta.

3.1 Modelling Strategic Default

This paper closely follows the pricing model of strategic debt service as in Favara et al. (2012), which considers liquidation cost, bargaining power, and renegotiation friction as the strategic factors. Davydenko and Strebulaev (2007) also apply the same model to study the strategic factors in relation to credit spread. The model of strategic debt service allows the existence of renegotiation friction[5]. A firm's equity beta can be derived as:

$$\beta_E = 1 + \frac{(1-\tau)\frac{c}{r}}{E} - \frac{(1-\tau)\frac{c}{r}}{E}(\frac{X}{X_S})^{\lambda}, \tag{1}$$

$$X_S = \frac{r-\mu}{r}\frac{\lambda}{\lambda-1}\frac{c}{1-(1-q)\eta\alpha}; \tag{2}$$

$$\lambda = (\frac{1}{2} - \frac{\mu}{\sigma_X^2}) - \sqrt{(\frac{1}{2} - \frac{\mu}{\sigma_X^2})^2 + \frac{2r}{\sigma_X^2}} \tag{3}$$

where τ is the corporate tax rate; c is a perpetual coupon payment; E is the firm's equity value; X is the cash flow from operations, is independent of capital structure choices and follows a geometric Brownian motion with a constant growth rate $\mu_X > 0$ and a constant volatility σ_X,

$$dX_t = \mu X_t dt + \sigma_X X_t dB_t \tag{4}$$

where B_t is a standard Brownian motion;

X_S is the endogenous default boundary; $(\frac{X}{X_S})^{\lambda}$ is the risk-neutral probability of default and renegotiation; α is liquidation cost; η represents shareholders' bargaining power; q stands for renegotiation friction.

Favara et al. (2012) investigate the relationship between the equity beta and liquidation cost, bargaining power and renegotiation friction both theoretically and empirically. Debt coupon payment c is treated as constant until the firm goes bankrupt. Since deviation

[5]See Favara et al. (2012) for the detailed model setup of strategic debt service.

from optimal capital structure leads to divergence from firm value maximization, this paper examines how equity beta varies with coupon payment (i.e. a firm's debt level) to capture the strategic intention of being overlevered.

3.2 Financial Distress

To measure a firm's financial distress risk, this paper follows the Vassalou and Xing (2004) distance-to-default (DD) method. Many studies on default risk apply the same process to evaluate a firm's default probability (Bharath and Shumway (2008), Campbell et al. (2008), Chava and Purnanandam (2010)). Though Vassalou and Xing (2004) and Campbell et al. (2008) employ different default probability measures, they provide similar results and the correlation between the two default measures is very high (Filipe et al. (2014)).

Following Vassalou and Xing (2004), the Merton (1974) DD is given by:

$$DD_t = \frac{ln(\frac{V_t}{F_t}) + (\mu - \frac{1}{2}\sigma^2)T}{\sigma\sqrt{T}} \tag{5}$$

and the corresponding expected default frequency (EDF) is expressed as

$$EDF = N(-DD) = N(\frac{ln(\frac{V_t}{F_t}) + (\mu_V - \frac{1}{2}\sigma_V^2)T}{\sigma_V\sqrt{T}}) \tag{6}$$

where V_t is the market value of a firm's underlying assets and follows a geometric Brownian motion with a constant growth rate μ_V and a constant volatility σ_V,

$$dV_t = \mu_V V dt + \sigma_V V dB_t \tag{7}$$

where B_t is a standard Brownian motion;
F_t is the face value of a firm's debt at time t. T is the time to maturity of debt.

A firm's market value of assets and its asset volatility need to be estimated to obtain the

DD and EDF. The calculation of σ_V is an iterative procedure. We apply the methodology of Vassalou and Xing (2004) to construct the daily EDF for the entire sample and obtain the monthly average of EDF for each firm[6].

3.3 Optimal Capital Structure

Both van Binsbergen et al. (2010) and Korteweg (2010) estimate an added 5% firm value from using debt although their approaches are different. van Binsbergen et al. (2010) simulate a tax benefit function for each firm from 1980 to 2007 and estimate the optimal level of debt for each firm-year. Korteweg (2010) uses a Bayesian statistical approach to obtain the model-implied optimal leverage for each firm-year on the sample from 1994 to 2004. This paper employs the methodology from Korteweg (2010) because the sample period can be extended as far as the first available year by using the Korteweg (2010) Bayesian estimates for the following specification of net benefits of debt relative to total firm value:

$$B_{it}/V_{it}^{L} = X_{0it}^{'}\theta_0 + (X_{1it}^{'} \cdot L_{it})\theta_1 + (X_{2it}^{'} \cdot L_{it}^{2})\theta_2 \tag{8}$$

where B_{it} is the net benefits of leverage; V_{it}^{L} is the market value of levered firm; vectors X_{0it}, X_{1it}, X_{2it} consist of a number of firm characteristics; θ_0, θ_1, and θ_2 are parameter vectors, which are common to all firms and time-invariant[7].

The model-implied optimal leverage maximizes the net benefit of leverage in Equation 8, which is computed for each firm every year[8]. The parameter vectors θ_0, θ_1, and θ_2 are directly obtained from the Korteweg (2010) estimates of these parameter vectors. The parameter vectors θ_0, θ_1, and θ_2 are common to all companies and time-invariant. Although the sample period of Korteweg (2010) is 1994-2004, the θ parameters can be

[6]Please see Vassalou and Xing (2004) for the DD estimation details.
[7]Please refer to Table 3 of Korteweg (2010) for the optimal leverage estimation details.
[8]In other words, our overleverage measure is in a dynamic setting.

adapted to any period as suggested in the Korteweg data website[9]. As a result, the use of the Korteweg (2010) parameter estimates is suitable for any sample period for all the US companies.

3.4 Strategic Default

Equity beta and some firm characteristics are related to evaluating a company's strategic default (Davydenko and Strebulaev (2007), Garlappi and Yan (2011), and Favara et al. (2012)). In particular, Garlappi and Yan (2011) argue that a hump-shaped relationship exists between beta and default probability, suggesting that the presence of the strategic default option plays an important role.

3.4.1 Equity Beta

Equity beta at the firm level is measured in two ways on a firm-month basis using daily stock returns, which is also employed by Garlappi and Yan (2011):

Firstly, we use the following equation using daily returns for each firm month to obtain monthly conditional beta:

$$r_{it} = \alpha_i + \beta_i r_{mt} \tag{9}$$

where r_{it} is the excess stock return on firm i and r_{mt} is the market excess return on the value-weighted CRSP index[10].

Secondly, using daily returns for each firm-month to obtain a sum of betas, we use the

[9] http://www-bcf.usc.edu/~korteweg/datacode.html

[10] Excess stock returns and excess market returns are calculated using 1-month T-bill rate. Both 1-month T-bill rate, excess market return on the value-weighted CRSP, and Fama-French size and value factors are obtained from Kenneth R. French data library: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/index.html.

following equations:

$$r_{it} = \alpha + \beta_{i1} r_{mt-1} + \beta_{i2} r_{mt} + \beta_{i3} r_{mt+1} \tag{10}$$

$$\beta_i = \sum_{k=1}^{3} \beta_{ik}. \tag{11}$$

Equation 10 includes one-period lead and one-period lag of excess market return besides the current-period excess market return, following Dimson (1979)[11]. The monthly firm equity beta is the sum of all three β_s on the current, one-period lead, and one-period lag of excess market returns as expressed in Equation 11. This paper uses the beta estimates from the first methodology as the main analysis. The Dimson beta estimates are applied for robustness checks.

3.4.2 Firm Strategic Factors

This paper employs Davydenko and Strebulaev (2007) strategic factor proxies to measure shareholders' strategic advantage over debtholders, namely in terms of costs of liquidation, shareholders' bargaining power and renegotiation friction. In addition to these individual strategic factors, we aggregate the effect of all three strategic factors on firm equity beta to examine how equity beta varies with the aggregated strategic advantage. The aggregated variable is constructed as follows.

First, all the sampled firms are ranked annually and individually on each of the three strategic factors. Since Favara et al. (2012) indicate that equity beta is negatively related with liquidation cost and shareholders' bargaining power and increases with renegotiation friction, the effect of liquidation cost and shareholders' bargaining power on equity beta is opposite to the effect of renegotiation friction. The individual effect of each of the strategic

[11] Scholes and Williams (1977) take multiple lags and leads, which is not necessary in our case, since a single lag and lead remove nonsynchronous trading problem.

factors on equity beta can be ambiguous due to the opposite impact. Moreover, Davydenko and Strebulaev (2007) and Favara et al. (2012) report an interacted effect of liquidation cost, shareholders' bargaining power, and renegotiation friction on strategic default. As a result, a construction of the aggregated effect is necessary to examine how equity beta varies with the total strategic advantage. Second, the aggregated strategic measurement for firm i is defined as: aggregated strategic advantage$_i$ = ln(liquidation cost rank$_i$$*$ shareholders' bargaining power rank$_i$/renegotiation friction rank$_i$).

4 Data

This paper consists of U.S. public companies that have both accounting records in COMPUSTAT and stock data in CRSP from 1961 to 2014 but excludes financial and regulated utilities companies with SIC between 6000-6999 and 4900-4999, respectively. Annual and quarterly accounting data are collected from COMPUSTAT and stock return files come from CRSP. The main analysis employs the annual financial information. Quarterly financial data, particularly the items *Debt in One Year* and *Long-term Debt*, are used for the estimation of DD and EDF. Firm-year observations with missing values for total asset, total debt and total market value and negative book equity are dropped. Research and development expense is replaced with zero if missing. Stock-month observations with missing values of beta and EDF are dropped. Leverage ratios are bounded between 0 and 1. All the variables are winsorized at the 1^{st} and 99^{th} percentiles of their pooled distributions across all firm-year observations and all firm-month observations, respectively[12]. To avoid accounting reporting delays, this paper applies the same approach per Vassalou and Xing (2004) in that accounting data is lagged by four months for annual

[12]We follow Campbell et al. (2008) for the winsorising procedure, except that we use 1^{st} and 99^{th} percentiles as this is sufficient to remove outliers.

data type and two months for quarterly data type to align with stock return data[13]. The final baseline sample contains 1,462,659 stock-month observations and 141,277 firm-year observations from January 1961 to December 2014.

In addition, CEOs, insiders and institutional shareholdings are collected from Capital IQ. Since Capital IQ began to maintain institutional ownership data in 2004, the subsample ranges from 2004 to 2014 in order to study the relationship between a firm's overleverage and the strategic advantage. The subsample of shareholdings consists of 16,391 firm-year observations. As an additional examination of a firm's capital structure decision to be overlevered, 109 bankrupt firms from 1990 to 2014 are extracted from the baseline sample. Their financial data, in particular the degree of overleverage, is observed commencing five years before the bankruptcy announcement, resulting in 370 firm-year observations[14]. The corporate bankruptcy information is obtained from Capital IQ, including the filing type and the consequent status[15].

A number of variables are chosen to study the strategic intention of a firm being overlevered. First, to estimate firm-year optimal leverage, we use the variables by Korteweg (2010) to obtain the model-implied optimal leverage. Second, equity beta and DD (or EDF) are estimated on the stock returns. Third, this paper follows Davydenko and Strebulaev (2007)'s empirical proxies for strategic factors. A list of these variables are detailed in Table 1 and the variables selection criteria are also presented in Table 2.

Table 3 presents summary statistics on all the variables that are used throughout the paper. Panel A gives the statistics of the entire sample on a firm-month basis including the monthly beta and EDF; and Panel B shows the statistics on the subsample with share

[13]The SEC deadlines for filing periodic reports: 90 days after the end of the fiscal year for 10-K annual reports and 45 days after the end of the fiscal quarter for 10-Q quarterly reports.

[14]Among the 370 firm-year observations, 89.4% of the overleveraged sample filed for Chapter 11 and the rest filed for Chapter 7; 71% of the overleveraged sample that filed for Chapter 11 were finally successfully emerging from Chapter 11.

[15]The status is classified into 'Announced', 'Case Consolidated', 'Dismissed', 'Emerged/Reorganized', and 'Liquidated/Out of Business'.

ownership information on a firm-year basis.

The correlation between the optimal leverage and the actual leverage is 0.09 at a 5% significance level despite the small magnitude, shown in Appendix Table B1. A firm's capital structure decision is positively related with the optimal level of debt, i.e. when managers are making decisions on capital structure, they take the firm value maximization objective into account. However, the correlation between optimal leverage and excess leverage is relatively negatively high (-0.30) at a 5% significance level, implying that firms close to their optimal leverage are less likely to be overleveraged. Consistent with the previous literature (for example, Broadie et al. (2007)), optimal leverage implies a firm's debt capacity, and firms with more debt capacity are able to borrow more and are less likely to overleverage themselves. On the other hand, actual leverage is positively related with excess leverage (0.92) at a 5% significance level. Ideally, firms should stay at the optimal level of capital structure whereas the positive relationship between actual leverage and excess leverage suggests that actual leverage may be endogenously determined by the company, which leads to deviation from the optimum leverage level to maximize firm value.

[*Table 1 is about here.*]

[*Table 2 is about here.*]

[*Table 3 is about here.*]

5 Analysis of Results

This section first outlines the simulated results from the strategic default model and then discusses the empirical results on the hypotheses in detail.

5.1 Model Predictions

Section 3.1 describes the strategic default model with liquidation cost, shareholders' bargaining power, and renegotiation friction. Previous literature on strategic default studies how the equity beta behaves against default probability in relation to liquidation cost, shareholders' bargaining power, and renegotiation friction but does not consider how equity beta varies with leverage. This paper aims to investigate the strategic intention regarding the capital structure decision. Applying Equations 1 to 2, Figure 3 shows the relationship between equity beta and default probability with constant leverage and variant strategic advantages as suggested by previous studies (Garlappi and Yan (2011) and Favara et al. (2012)).

When a firm's leverage ratio is low, shown in graph (a) of Figure 3, it shows a hump-shaped relation between equity beta and default probability as firm cash flow varies. As leverage rises to a high level, shown in graph (b) of Figure 3, the hump-shaped relation disappears and equity beta continuously decreases with default probabilities. Both scenarios suggest that the presence of the strategic default option begins to play a role in reducing equity beta as default probability increases. The value of the strategic default option is more pronounced in high-leveraged firms whereas the strategic default option for low-leveraged firms does not carry much value due to the firm having sufficient cash flows and therefore low default probabilities (i.e. Equity beta increases with default probability at low-levels of default probabilities.).

[*Figure 3 is about here.*]

Figure 4 reports the hump-shaped relationships between equity beta and leverage, and equity value and leverage, suggesting that equity beta starts falling as leverage increases. The hump shape between equity beta and leverage, shown in graph (a) of Figure 4, implies that a firm may have an optimal leverage ratio to reach the maximum equity beta and thereafter equity beta starts to decrease. In a general context of capital structure, equity beta always increases with financial leverage. The trade-off theory suggests that firm

value is maximized at the optimal level of leverage. The strategic default implies that shareholders choose an endogenous default threshold upon bankruptcy to maximize their own value at the expense of debtholders and therefore reduce equity risk, i.e. equity beta in this case. The hump-shaped relationship between equity beta and leverage strongly supports the main research question in this paper - a company's decision to overleverage can serve to identify the strategic intention to default.

[*Figure 4 is about here.*]

5.2 Empirical Results

5.2.1 Equity Beta and Overleverage: Univariate Analysis

A. The Effects of Overleverage and the Bankruptcy Reform

Using univariate t-tests, this paper compares equity beta for overlevered firms with their counterparts on various sorting groups: EDF-decile, excess leverage-decile, leverage-decile, and optimal leverage-decile respectively, to test Hypothesis 1 - whether overleveraged firms have lower equity beta than their counterparts. A significant difference in the equity beta would suggest that overleverage may help identify the strategic intention to default.

Table 4 reports how equity beta varies with default probability. All the stocks are sorted into deciles at the end of each month according to the monthly average of EDF for each firm. Stocks are also identified according to whether the corresponding firm is overleveraged or not and the results of equity betas are presented in Panel A. In addition, the 1978 Bankruptcy Reform Act becomes more favorable to shareholders in reorganization at bankruptcy. The effect of the bankruptcy reform on equity beta

is reported in Panel B. Prior to 1979[16], shareholders were in a weak position with regards to reorganization and therefore overleverage may not be a strategic action by the company. The difference in the equity beta between overleveraged firms and their counterparts may not be significant. Therefore, Panel C of Table 4 shows the interacted effect of overleverage and the bankruptcy reform on equity beta.

[*Table 4 is about here.*]

As Panel A Table 4 shows, the equity beta displays a hump shape in default probability measured by EDF, consistent with the findings of Garlappi and Yan (2011) that document equity beta in a quadratic relation with default probability. Equity beta increases up to the 5th EDF decile (decile mean = 0.871) and declines afterward. Even after separating the sample into overlevered and non-overlevered firms, the hump-shaped relationship between equity beta and default probability persists in each group. In each decile, equity betas for overlevered firms are consistently significantly lower than their counterparts from the lowest decile (Dif. = 0.165, t-stat. = 32.917) to the 8th decile (Dif. = 0.018, t-stat. = 2.249). Although the 9th and 10th deciles (Dif. = -0.014 and -0.009, t-stat. = -1.422 and -0.769, respectively) exhibit the opposite sign in the difference in equity beta between overlevered and non-overlevered firms, both the magnitude and significance are weak. The opposite results on the 9th and 10th deciles suggest that with high default probabilities, the strategic default option for overleveraged firms is not as valuable as those overlevered but with relatively low default probabilities. This may be due to the fact that the value of the strategic default option also depends on the extent to which the firm holds the strategic advantage over its debtholders.

Panel B Table 4 presents the effect of the 1978 Bankruptcy Reform Act on equity beta. The 1978 Bankruptcy Reform Act created a material change in the distribution

[16]The 1978 Bankruptcy Reform Act came into effect on October 1, 1978. As a result, the calender year 1979 is treated as the cut-off year to examine the impact of the bankruptcy.

of stakeholders' bargaining power under the reorganization code, i.e. Chapter 11, which makes it more likely for shareholders to survive the distressed reorganization process (Hackbarth et al. (2015)). Due to the favorable terms in Chapter 11 of the bankruptcy reform to shareholders, the strategic impact of overleverage on equity beta is expected to be larger after the reform. This means that we expect higher positive equity beta after the reform. As shown in Panel B Table 4, the bankruptcy reform significantly reduces the equity beta for stocks with relatively high default probabilities with an overall t-statistic of 40.188, as the reform gives the shareholders of distressed companies renegotiation advantages.

The interacted effect of the bankruptcy reform and overleverage on equity beta in relation with default probability is presented in Panel C Table 4. For the overleveraged firms, the reform effect consistently shows that the value of the strategic default option from Chapter 11 reduces equity risk with a strong overall t-statistic of 57.791. On the other hand, the strategic default option of Chapter 11 from the reform has a reduced pricing impact on the non-overlevered firms with an overall t-statistic of 1.653.

According to Figure 2, Table 5 compares the difference of distress risk between non-overlevered and overlevered firms and further includes the bankruptcy reform effect. Panel A Table 5 shows that overlevered firms have consistently higher default risk than their counterparts across all EDF-decile groups, with an overall t-statistic of -240.000. Moreover, Panel C Table 5 presents the joint effect of overleverage and the bankruptcy reform for non-overlevered and overlevered firms, respectively. The results show that financial distress risk for non-overleveraged firms is persistently lower than that for overleveraged firms regardless of the reform, with overall t-statistics of -110.000 and -230.000 for before the reform and after the reform, respectively. This is as expected in Figure 2, suggesting that the reform has no impact on financial distress risk on the overleveraged firms since financial distress risk always increases with leverage.

[*Table 5 is about here.*]

Panel A in Tables 4 and 5 suggest that overleveraged firms have lower equity beta but higher default risk. This is consistent with Garlappi and Yan (2011)'s argument that the possibility of shareholders' recovery upon default can reduce the equity risk, reflected in equity beta. Hypothesis 1 suggests that deviation from optimal capital structure in a positive direction may be an indication of capturing the value of the real option, which means that overleverage reduces equity beta.

B. Actual Leverage, Optimal Leverage, and Excess Leverage

Stocks are sorted into deciles according to actual leverage, optimal leverage and excess leverage, respectively. For each individual decile sorting, the averages of beta, excess leverage, optimal leverage, actual leverage, EDF, and institutional shareholder ownership in each decile group are reported in Table 6.

In Panels A and C of Table 6, actual leverage and excess leverage sortings display similar patterns to equity beta and EDF, respectively, as the decile increases. Equity beta is hump-shaped in both actual leverage and excess leverage. It increases until the 3rd decile of both actual leverage and excess leverage sortings (Beta = 0.868 and 0.879, respectively) and drops afterward. EDF consistently increases in both sortings as the decile increases. In addition, the averages of excess leverage in actual leverage sorting and actual leverage in excess leverage sorting move together and increase monotonically from the lowest decile to the highest decile (the former from -0.076 to 0.676 and the latter from 0.156 to 0.849). This highly consistent result in both sortings is likely due to the fact that the correlation between actual leverage and excess leverage is significantly high (corre.coef. = 0.902 as in Panel A of Appendix Table B1). On the other hand, the variations of optimal leverage among the deciles are not monotonic with the increase in either actual leverage or excess leverage. The correlations of optimal leverage with actual leverage and excess leverage, respectively, are relatively low compared with the correlation between actual leverage and excess leverage, suggesting that the capital structure decision may be endogenously determined by the managers to maximize shareholders' value at the expense of debtholders, i.e. managers act in the best interest of

shareholders. As Panel B of Table 6 shows, the variation patterns of equity beta, excess leverage, actual leverage and EDF in relation to optimal leverage are ambiguous. As a result, the value of the strategic default option largely depends on the actual capital decision, not the optimal capital structure that maximizes firm value. The companies' endogenous capital structure decisions, especially those being overleveraged, imply the presence of the strategic default option.

[*Table 6 is about here.*]

Panels A and C further suggest that on average equity beta starts to decrease when the firm becomes overlevered. Equity beta reaches a maximum at the 3rd decile in both sortings. Meanwhile, the decile averages of excess leverage in Panels A and C respectively, change from negative at the 3rd decile (-0.024 for actual leverage sorted and -0.029 for excess leverage sorted) to positive at the 4th decile (0.005 for actual leverage sorted and 0.032 for excess leverage sorted). This finding is in accordance with the model predictions shown in Figure 4 and supports the conjecture in Section 2.3 shown by Figures 1 and 2. The strategic default option starts to reduce equity risk when the firm becomes overleveraged. In other words, the strategic default option is more valuable when a firm is overleveraged than otherwise. Previous studies on the strategic default do not consider any deviation from the optimal capital structure, defined as excess leverage in this paper. Favara et al. (2012) document that the strategic default option does not affect the risk structure of equity for low-leveraged firms as much as that for high-leveraged firms. Without the measure of the deviation from the optimal leverage, the reason why equity beta starts to decrease in the 4th decile as Panels A and C of Table 6 show (Beta = 0.835 and 0.851, respectively) cannot be identified. However, excess leverage captures the turning point of equity beta in both actual leverage and excess leverage sortings. For underleveraged firms, the equity beta increases with the excess leverage. On the other hand, for overleveraged firms, the equity beta decreases as the excess leverage rises. The nonlinear relationship between equity beta and excess leverage is described in Figure 5 according to the decile averages of equity beta and

excess leverage in Panel C Table 6.

The quadratic shape of equity beta in relation to excess leverage implies that the presence of the strategic default option reduces equity beta when firms are overleveraged. In other words, a firm's option to default strategically, as a real option, is in the money when the firm is overleveraged. The strategic default option does not have a pricing effect on equity risk for the underleveraged firms, i.e. out of the money. As a result, excess leverage, the measure of deviation from optimal capital structure, sets the benchmark of the value of the strategic default option.

The quadratic shape of equity beta in relation to excess leverage implies that the presence of the strategic default option reduces equity beta when firms are overleveraged. In other words, similar to real options, a firm's option to default strategically is in the money when the firm is overleveraged. The strategic default option does not have a pricing effect on equity risk for underleveraged firms, i.e. it is out of the money. As a result, we conclude that excess leverage, measured as the amount of deviation from optimal capital structure, sets the benchmark for the value of the strategic default option.

[*Figure 5 is about here.*]

In relation to institutional shareholdings and strategic default, the last row in each panel of Table 6 shows the mean of institutional shareholder ownership in each decile group. The results on institutional ownership concentration in Panel C of Table 6 show that ownership concentration increases as firms become more over-levered, implying that firms with a better alignment of interest between managers and shareholders tend to take advantage of Chapter 11 and are more likely to extract wealth from their debtholders. These findings seem contradictory to the existing literature, which posits that companies with concentrated institutional ownership will have better governance or better monitoring within the firm (Smith (1996) and Guercio and Hawkins (1999)). More importantly, the sample mean of ownership concentration is 0.111, suggesting that the overall institutional ownership is in actual fact, not highly concentrated. Accordingly, we investigate

the effect different degrees of ownership concentration have on excess leverage later in our discussion.

C. Strategic Default and Financial Distress on Equity Returns

The financial distress anomaly can be reconciled within the context of the strategic default option theory (Garlappi and Yan (2011)). As default probability increases, equity beta exhibits a hump shape due to the presence of shareholders' recovery upon financial distress. Consequently, distressed stocks have low equity returns because of the low equity betas. According to this argument, overlevered firms have lower equity betas than their counterparts as shown in Table 4 and therefore would also have lower equity returns. However, Table 7 Panel A reports the seemingly contradictory results in return difference between overlevered and non-overlevered firms according to the EDF-sorted deciles.

[*Table 7 is about here.*]

As shown in Table 7 Panel A, overlevered firms consistently have lower equity betas than their counterparts from the 1st EDF decile to the 8th EDF decile. On the other hand, stock excess returns are higher for the overlevered firms than for the non-overlevered firms from the 4th EDF decile (Dif. Excess return = -0.003, t-stat. = -4.603) to the 9th EDF decile (Dif. Excess return = -0.001, t-stat. = -0.906), which is hard to explain under the theory of strategic default (Garlappi et al. (2008) and Garlappi and Yan (2011)). Although the strategic default option can reduce the riskiness of equity as default probability increases, financial distress risk also rises accordingly. The impact of the strategic default option on decreasing equity returns may be offset by the impact of the increasing financial distress risk on increasing equity returns[17]. As a result, as default probability rises, the change in stock returns may depend on whether the strategic

[17]Some studies find that investors are compensated with high stock returns for bearing additional financial distress risk (Vassalou and Xing (2004), Chava and Purnanandam (2010), and Kapadia (2011)).

default option or financial distress risk dominates equity returns. To examine the joint effect of the strategic default option, reflected in equity beta, and financial distress risk, we construct a variable, $Beta * EDF$, the natural logarithm of the interaction of equity beta and EDF, implying that a large value of $Beta * EDF$ can be caused by either large equity beta or large EDF (or both). Since EDF can be regarded as the financial distress risk factor loading (see for example Vassalou and Xing (2004)), a large EDF indicates high financial distress risk and therefore a high equity return. Meanwhile, equity beta reduces as EDF rises because of the value of the strategic default option, suggesting a low equity return. Therefore, a large $Beta * EDF$ implies a high equity return, which incorporates the benefit of the strategic default option and financial distress risk.

When taking financial distress risk into account, overleveraged firms have not only lower equity betas but also higher distress risk of 0.107 as measured by EDF, compared with distress risk for non-overleveraged firms (Dif. EDF = -0.077 with an overall t-statistic of -243.176). As a result, overleveraged firms with low equity risk do not earn low equity returns because they have higher financial distress risk than their counterparts. $Beta * EDF$ captures the net effect of strategic default and financial distress risk. In the 1st EDF decile, the difference in $Beta * EDF$ between non-overleveraged and overleveraged firms is 2.170 with a t-statistic of 8.996. The difference in excess stock returns in the 1st decile is also significantly positive at 0.001 with a t-statistic of 2.152. The return differences between non-overleveraged and overleveraged firms in the 2nd and 3rd deciles are not significant as shown in Table 7 Panel A despite higher $Beta * EDF$ for overleveraged firms. From the 4th decile to the 9th decile, overleveraged firms have higher $Beta * EDF$ than non-overleveraged firms and therefore earn higher excess returns. In the highest EDF decile, given that non-overleveraged firms have higher $Beta * EDF$ (Dif. Beta*EDF = 0.312, t-stat. = 7.929), they have also higher excess returns (Dif. Excess return = 0.007, t-stat. = 4.370).

Panel B of Table 7 presents the test results of over-levered and non-overlevered firms on an ownership concentration-sorted decile. Our results demonstrate that the equity

beta for both over-levered and non-overlevered companies first increases with the degree of ownership concentration, before peaking and decreasing once concentration reaches an inflection point (i.e. The 5th decile). Given equity beta is a measure that reflects strategic default intention, this concave relationship between equity beta and institutional ownership concentration suggests that the level of concentration influences the value of the strategic default option on a non-linear basis. Recall, we use the ownership concentration measure as a proxy for renegotiation friction between shareholders and debtholders and this proxy also represent the governance quality between management and shareholders. Therefore, a humped-shaped (concave) relationship implies that there is a competing force when using the same proxy to influence on the value of strategic default option.

5.2.2 Equity Beta and Overleverage: Multivariate Analysis

In the previous section, the strategic intention of being overleveraged is shown to reduce equity beta in a univariate way. This section conducts a series of firm-level regressions by including an overleveraged dummy variable and several year dummy variables. Table 8 shows the relationships between equity beta and the bankruptcy reform effect and the overleverage effect[18].

The interacted term of overleverage dummy and reform year dummy in Column (1) of Table 8 is significantly negative with a coefficient of -0.163 and a t-statistic of -19.879, suggesting that the joint effect of the bankruptcy reform and overleverage reduces equity beta. The overleverage alone, *Exl*, has a weak positive influence on equity beta (coef. = 0.012, t-stat. = 1.716), compared with the interacted effect. The results indicate that the individual effect of overleverage (without considering the bankruptcy reform effect)

[18] Annual equity beta takes the average of the monthly equity betas for each firm since the regressions in Table 8 are on an annual basis.

does not have a strong impact on equity beta. Columns (2) and (3) of Table 8 include the one-year post-reform effect and the two-year post-reform effect, respectively. The interacted terms of overleverage dummy and one-year and two-year post-reform dummies are insignificant with a coefficient of 0.001 and a t-statistic of 0.064 in Column (2) and with a coefficient of -0.018 and a t-statistic of -0.763 in Column (3). This suggests that the bankruptcy reform has an immediate effect on equity beta and as a result, the post-reform year effect interacted with overleverage does not show any significance.

[*Table 8 is about here.*]

The 1978 Bankruptcy Reform Act created a material change in the distribution of stakeholders' bargaining power under the reorganization code, i.e. Chapter 11, which makes it more likely for shareholders to survive the distressed reorganization process (Hackbarth et al. (2015)). Due to the favorable terms in Chapter 11 of the bankruptcy reform to shareholders, the significant and negative interaction term *Exl*ReformYear* (coef. = -0.163, t-stat. = -19.879) suggest that the reform gives shareholders more advantages in renegotiating with their debtholders and therefore equity beta is lower if firms are overleveraged after the reform. The reform effect on the equity beta of overleveraged firms suggests that firms that take excessive debt deliberately, particularly being overlevered, imply a strategic intention to default.

5.2.3 Overleverage and Strategic Advantages

The subsample with available corporate share ownership data tests Hypothesis 2, consisting of 16,391 firm-year observations. Firms are sorted into deciles according to *Nonfixed assets*, *CEO share ownership*, *1 - Herfindahl index of institutional ownership* and the aggregated strategic advantage *Aggregated Advantage* as discussed in section 3.4.2, respectively. The individual impact of each strategic factor and the aggregated strategic advantage influence on equity beta and excess leverage are shown in Table 9.

[*Table 9 is about here.*]

Panels A to C report the variations of *Non-fixed assets*, *CEO share ownership*, and *1 - Herfindahl index of institutional ownership*, respectively, across the decile groups. Neither equity beta nor excess leverage varies monotonically as the decile rises from low to high according to each strategic factor. This implies that the shareholders' strategic factors have a joint effect on equity beta and excess leverage. The results are consistent with the findings of Davydenko and Strebulaev (2007) and Favara et al. (2012) that the strategic factors are inter-related when determining the sensitivity to strategic actions. As a result, the aggregated strategic advantage *Aggregated Advantage* measures just such an interacted relationship. In Panel D of Table 9, the overall variation patterns of equity beta and excess leverage are monotonically decreasing and increasing respectively, as the decile of *Aggregated Advantage* rises from the lowest decile to the highest decile. The monotonic decline in equity beta is consistent with the findings in Favara et al. (2012) that the value of the strategic default option is reflected in the equity beta and depends on strategic factors such as costs of liquidation, shareholders' bargaining power, and renegotiation friction. Furthermore, the relationship between excess leverage and the aggregated strategic advantage suggests that strategic default positively affects the overleverage decision, i.e. overleverage can identify the strategic intention of bankruptcy announcements.

The multivariate analysis applies the Fama-MacBeth regression to test whether the advantageous proxies in strategic default increase a firm's propensity to be overlevered (and degree of overleverage). The independent variables are the strategic advantage proxies and some firm characteristics such as firm size and market-to-book are controlled. Table 10 presents the regression results of excess leverage on strategic advantage variables. *Nonfixed assets*, *CEO share ownership*, and *1 - Herfindahl index of institutional ownership* are the strategic proxies for liquidation cost, shareholders' bargaining power, and renegotiation frictions, respectively, as the base specification.

[*Table 10 is about here.*]

Hypothesis 2 states that firms with more strategic advantages tend to be overlevered,

implying excess leverage in positive relationships with liquidation costs and shareholders' bargaining power, respectively, and in a negative relationship with renegotiation frictions. The regression results in Table 10 Panel A support Hypothesis 2. All the coefficients on the strategic proxies have their expected signs and also show the statistical significance. Column (1) shows the results for the base specification. The coefficient on *Nonfixed assets* (coef. = 0.267), a proxy for liquidation costs, is positive and highly statistically significant (t-stat. = 12.391). This implies that firms with high liquidation costs tend to be overleveraged to extract the value from their debtholders. The results are aligned with the findings of credit spread (Davydenko and Strebulaev (2007)) and equity beta (Favara et al. (2012)) on the strategic default behavior that high liquidation costs imply a strong strategic advantage for shareholders. *CEO share ownership*, that represents the equity's bargaining power, is 0.0004998 with a t-statistic of 2.300. It suggests that the company capital structure decision to be overlevered is endogenous and strongly dependent on shareholders' bargaining power. Renegotiation friction is measured by *1 - Herfindahl index of institutional ownership*, the dispersion of institutional shareholdings. The difficulty in the distressed renegotiation with debtholders restricts shareholders' ability to deviate from APR and therefore lead to less strategic advantage. The negative sign on *1 - Herfindahl index of institutional ownership* (coef. = -0.285, t-stat. = -21.055) further confirms that overleverage displays a strategic intention to utilize the benefit of Chapter 11 when there are fewer obstacle for shareholders in the distressed renegotiation with debtholders. The results of the proxies for the strategic factors are consistent with the previous studies regarding the influence of strategic default on asset prices (Davydenko and Strebulaev (2007), Favara et al. (2012), and Hackbarth et al. (2015)). The results are consistent across the different measures of strategic factors in Columns (2) - (5) of Table 10 Panel A.

These strategic variables represent the extent to which shareholders have the overall strategic advantage over debtholders in the debt renegotiations upon financial distress. The regression results in Table 10 Panel A show that excess leverage increases with the firm's strategic advantage and therefore Hypothesis 2 is held. In other words, overleverage

is an indication of intentionally deviating from optimal capital structure to take advantage of debt renegotiation under Chapter 11 against debtholders. The firm's debt level is an endogenous decision to utilize the strategic default option and further maximize shareholders' value.

Flipped HHI measures renegotiation friction – in other words, the higher the concentration of institutional shareholders is, the lower the renegotiation friction. Table 10 Panel A shows the relationship between excess leverage and institutional ownership concentration without sorting. To further investigate the effect of institutional ownership concentration on the strategic intention to default, according to Hypothesis 3, Table 10 Panel B presents similar regressions on two subsamples with both high and low ownership concentration. Companies with high concentration are defined as having more than 80% institutional ownership concentration ratio while companies with low concentration have a concentration ratio between 0 and 20%. The results show that renegotiation friction plays a significant role in deterring firms from being overleveraged when companies have low institutional ownership concentration, which is in support of Hypothesis 3. However, the significance disappears for companies who have high levels of ownership concentration. The results are consistent across the different measures of renegotiation friction (e.g. flipped HHI and short-term debt). Columns (1), (3), (5), and (7) in Table 10 Panel B show that when companies are low in ownership concentration, they are less likely to be overleveraged as renegotiation friction increases. Columns (2), (4), (6), and (8) in Table 10 Panel B suggest that renegotiation friction does not play a role in determining the intention to strategically default when companies have high levels of ownership concentration. The findings are consistent with the existing literature to the extent that institutional shareholders with large stakes in companies closely monitor managers (Hartzell and Starks (2003)). This can be also extended to good corporate governance with the explanation provided earlier (Smith (1996) and Guercio and Hawkins (1999)). It implies that managers tend to get involved in value-added corporate events to avoid being insolvent. Nonetheless, if companies are already low in ownership concentration, our findings suggest that the intention to strategically default increases with ownership con-

centration, which is consistent with the theory of strategic default arguing that managers' and shareholders' interests are more aligned when the company encounters financial distress while having the strategic default option available (Valta (2016): Strategic Default, Debt Structure, and Stock Returns). Table 10 Panel B implies a nonlinear relationship between institutional ownership concentration and the intention to default strategically. Therefore, in order to empirically document such relationship, the results shown in Table 10 Panel C confirm our conjecture that different levels of ownership concentration have their distinct influences on the quality of corporate governance and therefore the strategic default intention. The coefficients on the squared terms of institutional ownership concentration presented in Columns (1) to (4) of Table 10 Panel C (coef. = -0.590, -0.534, -0.565, -0.512, respectively) appear significant at a 5% level with a t-statistics of -6.287, -6.541, -5.568, and -5.747, respectively.

As this study regards overleverage as a measure for identifying the strategic intention to default, it is particularly worthwhile to examine whether companies are taking advantage of Chapter 11 reorganization provisions during a crisis period. Consequently, the regressions in Table 10 Panel A are extended to include three year dummy variables that represent the global financial crisis from 2008 to 2010 and the corresponding results are presented in Table 10 Panel D. The effect of the financial crisis on firms being over-levered is consistent across all the specifications. For example, as shown in Column (1) of Table 10 Panel D, the coefficient on the 2008 year dummy variable is positively significant (coef. = 0.102, t-stat. = 17.036) and the coefficient on the 2010 year dummy is negatively significant (coef. = -0.016 , t-stat. = -2.720), suggesting that firms are more likely to be over-levered at the beginning of the crisis period to utilize the strategic default option and revert back to be conservative in capital structure decision-making at the end of the crisis time to avoid the high financial distress costs that destroy shareholder value. On the other hand, the year 2009 shows no significance on excess leverage, implying that the value of the strategic default option is more prominent at the beginning of the crisis period. The findings further confirm our theory that over-leverage can identify the strategic intention to default, which seems to be the case during the crisis time.

5.2.4 Strategic Overleverage: Bankruptcy Cases

To test the central research question that overleverage can identify a firm's strategic intention ot default in a more solid way, this section collects a list of bankrupt companies and examines the impact of oveleverage on the distressed filing type and the bankruptcy outcome by the court. All of the bankrupt companies on this list voluntarily filed for bankruptcy, under either Chapter 7 or Chapter 11. Table 11 reports the findings of the overleverage impact on the bankruptcy outcome using a probit model.

[*Table 11 is about here.*]

Columns (1) and (2) include excess leverage as the unique independent variable. The rationale of only one independent variable follows the previous findings in Table 10 that excess leverage is highly significantly and related to firm characteristics and strategic advantages. Therefore, in the probit regression tests, we do not include other variables to control for firm-level variations.

Column (1) gives the results on the likelihood of filing for Chapter 11 in relation with excess leverage. The dependent variable is a binary variable that equals to 1 if the bankrupt firm filed for Chapter 11 and 0 for Chapter 7. The results show that the firms with higher excess leverage are more likely to file for Chapter 11 (coef. = 0.555, t-stat. = 1.930), implying that the more a firm is overlevered, the greater chance the firm will file for bankruptcy under Chapter 11.

The relationship between excess leverage and the probability of emerging from Chapter 11 reorganization is presented in Column (2) of Table 11. The binary dependent variable is equal to 1 if the bankrupt firm successfully emerged from Chapter 11 reorganization and 0 for all other outcomes (see Footnote 15 for the detailed bankruptcy status). As the results show, higher excess leverage causes more frequent successful reorganizations (coef. = 0.463, t-stat. = 2.099). This confirms that overleverage takes the strategic advantage into account and therefore results in a higher probability of emerging from

Chapter 11 reorganization. Firms with more strategic advantages over debtholders tend to be overlevered. When coming to the real bankruptcy cases, the likelihood of a successful reorganization, to a large extent, can be identified by whether the firm is overlevered or not.

6 Concluding Remarks

Hart and Moore (1994) classify the default type into *liquidity default* and *strategic default*. However, in reality, strategic default is an unobservable event (Guiso et al. (2013)). This paper proposes a new perspective of strategic default according to the positive deviation from optimal capital structure, in particular. Overleverage helps identify the tendency towards strategic default. The results in this paper show that overleveraged firms have lower equity beta than their counterparts and equity beta also presents a hump-shaped relation with the excess leverage measure. It suggests that the strategic default option becomes valuable when a firm is overlevered and therefore reduces equity beta. In addition, firms are more likely to be overlevered when they have large strategic advantages in distress renegotiations with their debtholders. Also, this paper examines the filing type and the bankruptcy outcome of 109 bankrupt companies and their capital structure conditions (i.e. whether overlevered or not). The results indicate that overleveraged distressed firms are more likely to file for the reorganization bankruptcy code (Chapter 11) and are more able to emerge from a reorganization plan. This finding confirms that overleverage has a strategic implication for the capital structure decision, allowing for the identification of firms' strategic default incentives. Finally, the intention of being overlevered increases with the insitutional ownership concentration especially when firms are relatively less concentrated. However, institutional ownership concentration does not play a role in the strategic game when firms have high institutional ownership concentration.

This paper is the first to relate deviation from optimal capital structure to strategic default due to conflict of interest between shareholders and debtholders. By deviating

from optimal capital structure, shareholders are able to maximize equity value to obtain the value of the strategic default option. As a result, a firm's degree of overleverage implies the incentive to default strategically, which enables an unobservable event to become identifiable and measurable. In addition, knowing how far the borrowing firms are deviating from their optimal capital structures, firms' debtholders can restrict the amount that the firms can borrow and thus protect themselves from the violations of APR that occur at the time of default.

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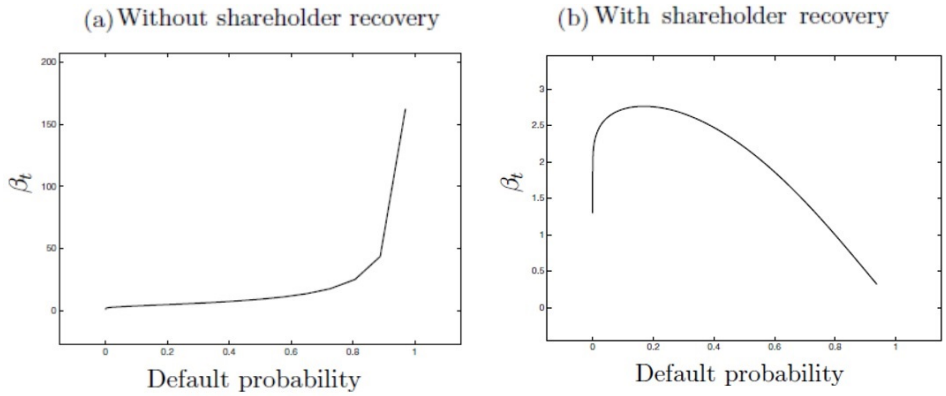
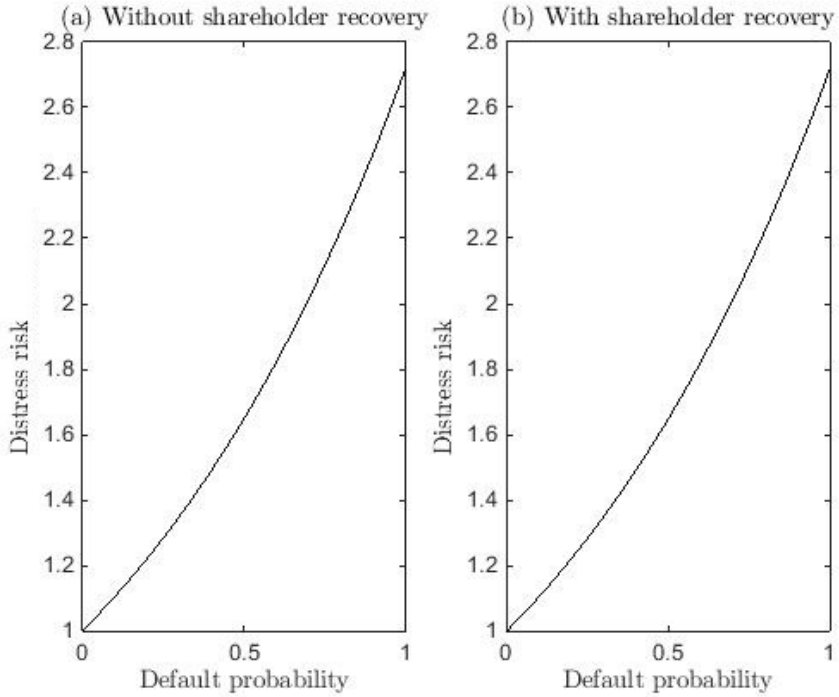
Figure 1. Equity Beta and Default Probability with Variate Shareholder Recovery



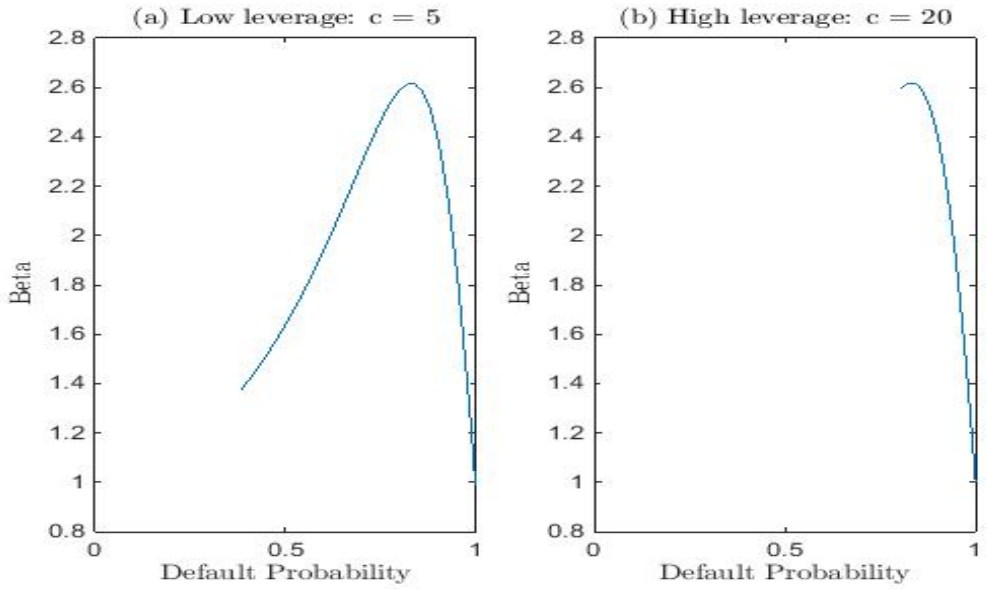
This figure comes from Figure 1 in Garlappi and Yan (2011).

Figure 2. Distress Risk and Default Probability



We assume that as default probabilities increases, no matter whether there is a shareholder recovery rate or not, the default risk factor loading will always rise with excess leverage in the positive direction.

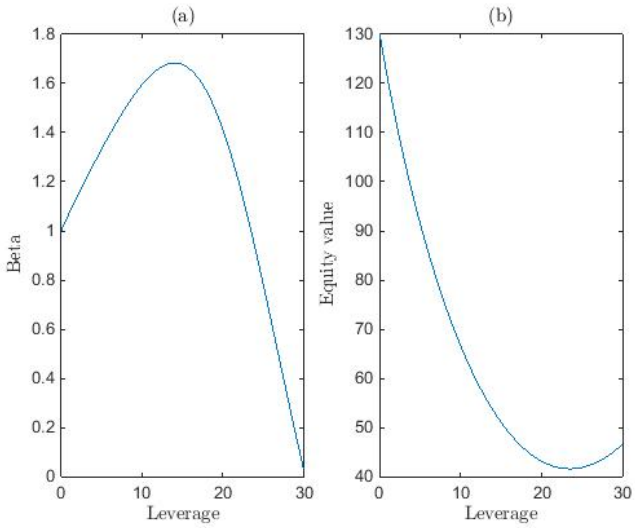
Figure 3. Equity Beta and Default Probability with Variate Leverage



This figure reports equity beta as a function of default probability. Equity beta and default probability are calculated according to Section 3.1. The parameters used for the graphs are: $\mu = 0.01$, $\sigma = 0.4$, $r = 0.06$, $\tau = 0.35$, $q = 0.5$, $\alpha = 0.5$, $\eta = 0.5$, $c = 5$ for (a) and $c = 20$ for (b). X ranges from 0 to 10[19].

[19] r is the risk-free interest rate; τ is the corporate tax rate; q is the probability of renegotiation failure; α is the liquidation costs as a proportion of firm value; η is the proportion of firm value that shareholders can recover; c is a perpetual coupon payment (not coupon rate), measured in unit; X is the cash flow from operations, also measured in unit, is independent of capital structure choices and follows a geometric Brownian motion with a constant growth rate $\mu_X > 0$ and a constant volatility σ_X.

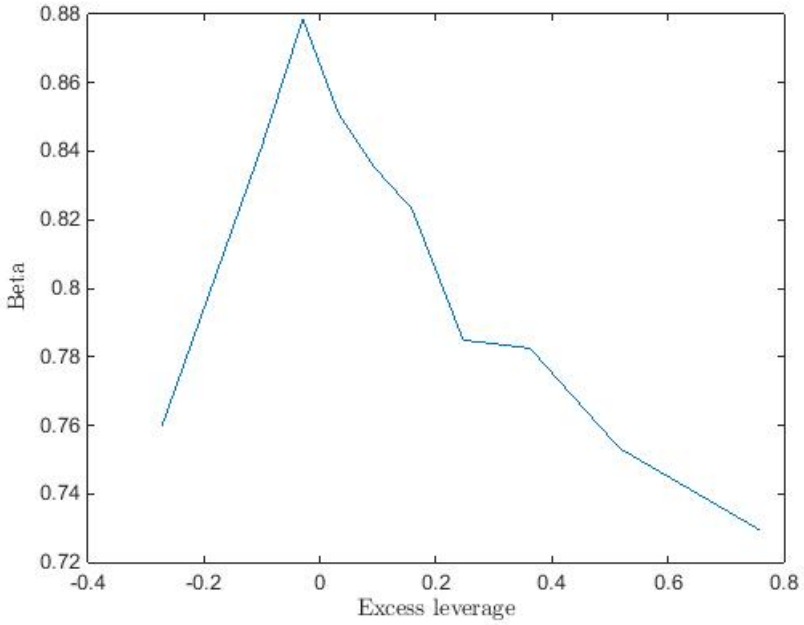
Figure 4. Leverage in Relation with Equity Beta and Equity Value



This figure reports equity beta as a function of leverage in (a) and equity value as a function of leverage in (b). Equity beta and equity value are calculated according to Section 3.1. The parameters used for the graphs are: $\mu = 0.01$, $\sigma = 0.4$, $r = 0.06$, $\tau = 0.35$, $q = 0.2$, $\alpha = 0.5$, $\eta = 0.8$, $X = 10$. c ranges from 0 to 30[20].

[20]Equity values is measured in unit.

Figure 5. Excess Leverage and Equity Beta



This figure shows equity beta as a quadratic function of excess leverage according to Panel C Table 6.

Table 1. Variables Description

This table outlines the variables used in the analysis.

Variable Name	Application	Description	Data Source
Leverage	Optimal leverage	Net debt/(Net debt + Market equity).	COMPUSTAT
Profitability	Optimal leverage	EBITDA/Sales.	COMPUSTAT
Depreciation	Optimal leverage	Depreciation expense/Total assets.	COMPUSTAT
Tangibility	Optimal leverage	Net PPE/Total assets.	COMPUSTAT
Growth	Optimal leverage	Market-to-book value of equity.	COMPUSTAT
Size	Optimal leverage	Log(Total assets).	COMPUSTAT
Volatility	Optimal leverage	Std.Dev.$\{(\text{Profitability}_t/\text{profitability}_{t-1})\}$.	COMPUSTAT
Optimal leverage	Optimal leverage	Model-implied optimal leverage.	Korteweg (2010) Bayesian estimation model
DD	Financial distress	Distance to default, estimated from Merton (1974) option model.	COMPUSTAT, CRSP
EDF	Financial distress	Expected default frequency, defined as N(-DD).	COMPUSTAT, CRSP
Beta	Equity beta	Estimated from CAPM using daily stock returns.	CRSP
Nonfixed assets	Costs of liquidation	1 - Net PPE/Total assets.	COMPUSTAT
R&D expense	Costs of liquidation	R&D/Total investments.	COMPUSTAT
CEO shareholdings	Shareholders' bargaining power	Proportion of shares held by CEO.	Capital IQ
Insider shareholdings	Shareholders' bargaining power	Proportion of shares held by insiders.	Capital IQ
Filpped HHI	Renegotiation frictions	1 - Herfindahl index of institutional shareholders; *Herfindahl index*$_i = \sum_j S_{ij}^2/(\sum_j S_{ij})^2$, where S_{ij} is the proportion of shares held by the jth institutional shareholder of firm i.	Capital IQ
Short-term debt	Renegotiation frictions	Short-term debt/Total debt.	COMPUSTAT
ln(ME)	Control variable	Log(Market equity).	COMPUSTAT

Table 2. Variables Selection Criteria

This table presents the selection criteria of the variables used in this paper.

Use	Selection Criteria
Korteweg (2010) Optimal Leverage	Equation 8 expresses that the net benefit of leverage is a quadratic function of a company's leverage. In addition to the leverage level, Korteweg (2010) includes some firm characteristics such as profitability, depreciation, tangibility, growth and firm size to control for firm-level variation. *Model-implied optimal leverage.* The optimal leverage is estimated using Equation 8 following Korteweg (2010). Excess leverage is defined as the actual leverage minus the model-implied optimal leverage to examine whether the firm is overlevered or underlevered. Optimal leverage is estimated based on two industry classifications, Fama-French 48 industry classification and two-digit SIC, respectively. This paper employs the model-implied optimal leverage based on the Fama-French 48 industry classification as the main analysis[21].
Distance to Default & Equity Beta	*Distance to default.* DD is estimated via COMPUSTAT quarterly data[22], short-term debt (item 'DLCQ') and long-term debt (item 'DLTTQ') and CRSP stock daily returns according to Section 3.2. Using quarterly data is better than using annual financial data to incorporate a firm's debt level into the Merton (1974) option model since quarterly data is more frequently updated and the stock price immediately reflects the accounting information once it is released publicly. *Equity beta.* Equity beta is estimated monthly for each stock using CRSP stock daily returns according to Section 3.4.1. The risk-free rate is 1-month T-Bill rate and the market excess return is the return of the CRSP value-weighted index in excess of the risk-free rate, collected from the Kenneth R. French data library (see Footnote 10).
Strategic Advantages	*Costs of liquidation.* At the time of default, debtholders that face high liquidation costs are willing to offer debt concession to shareholders, i.e. allow some debt relief. As a result, debtholders are deterred from an immediate liquidation due to high liquidation costs. On the other hand, shareholders of bankrupt firms have a greater advantage than debtholders in restructuring their debt contracts. As suggested by Davydenko and Strebulaev (2007), a firm's liquidation cost is measured by one minus the ratio of net property, plant, and equipment to total assets, and the ratio of R&D expenses to total investments. Alderson and Betker (1996) suggests that nonfixed assets and R&D expenses are the preferred variables to measure a firm's liquidation cost. *Shareholders' bargaining power.* Shareholders' bargaining power determines how large a deviation from APR they can obtain via debt renegotiation. One widely-used proxy for shareholders' bargaining power is insider ownership (Favara et al. (2012)), particularly CEO shareholdings (Davydenko and Strebulaev (2007)). This paper utilizes the proportion of shares held by insiders and CEO, respectively, as the proxies for shareholders' bargaining power.

[21] The results based on two-digit SIC estimated optimal leverage are similar and therefore not presented in the main text, which is available on request.

[22] Using COMPUSTAT quarterly items to calculate DD, which is finer than Vassalou and Xing (2004) and adopted by Campbell et al. (2008) and Bharath and Shumway (2008).

(*Table 2 Continued*)

Renegotiation frictions. Renegotiation frictions result in the possibility of unsuccessful renegotiation to help the distressed business out of trouble. A number of creditors cause the dispersion of debt ownerships and lead to difficulty in renegotiation since different parties have diverse interests and make it difficult to reach a consensus when coming to the renegotiation (Bolton and Scharfstein (1996)). Similarly, dispersion of shareholders can also create coordination problems, which impedes renegotiation with debtholders. Capital IQ provides all the institutional shareholders' identities and the corresponding percentages of shares to the number of total shares outstanding. Therefore, a *Herfindahl index* of institutional shareholdings measures the dispersion of institutional ownership

$$Herfindahl\ index_i = \sum_j S_{ij}^2 / (\sum_j S_{ij})^2 \tag{12}$$

where S_{ij} is the proportion of shares held by the jth institutional shareholder of firm i. This index equals to one when there is only one institutional shareholder, implying that the company's institutional share ownership is extremely concentrated. In other words, the higher the *Herfindahl index* is, the more concentrated the institutional shareholdings and the more easily shareholders can renegotiate with their debtholders. We use 1 - *Herfindahl index* to make positively related to renegotiation frictions for the actual tests, i.e. the higher 1 - *Herfindahl index* is, the more renegotiation frictions the firm encounter when going into bankruptcy renegotiation with the debtholders. Another proxy for renegotiation friction is short-term debt following Davydenko and Strebulaev (2007). They argue that short-term debtholders hardly offer debt relief when the concessions are first given to subordinated long-term debtholders, which creates an obstacle for renegotiations.

Table 3. Summary Statistics

This table reports summary statistics of 1,462,659 firm-month observations in Panel A and 16,391 firm-year observations in Panel B. Panel A covers the entire sample from 1961 to 2014 and Panel B selects the subsample with share ownership information from Capital IQ, ranging from 2004 to 2014. Definitions of all variables are listed in Table 1. Optimal leverage and excess leverage have the SIC and FF brackets, standing for the estimation of optimal leverage based on two-digit SIC and Fama-French 48 industries classifications, respectively.

Panel A: The Entire Sample

Variable	**Mean**	**Median**	**Std.Dev.**	**Min**	**Max**	**N**
Leverage	0.365	0.253	0.355	0.000	1.000	1,462,659
Profitability	0.091	0.105	0.264	-1.000	1.000	1,462,659
Depreciation	0.046	0.038	0.035	0.000	0.251	1,462,659
Tangibility	0.319	0.270	0.222	0.000	1.000	1,462,659
Size	5.051	4.831	2.239	-1.802	13.590	1,462,659
Volatility	0.495	0.299	0.533	0.000	9.012	1,462,659
Optimal leverage (SIC)	0.173	0.162	0.143	0.000	1.000	1,462,659
Optimal leverage (FF)	0.189	0.163	0.163	0.000	1.000	1,462,659
Excess leverage (SIC)	0.193	0.065	0.371	-1.000	1.000	1,462,659
Excess leverage (FF)	0.176	0.052	0.376	-1.000	1.000	1,462,659
Intangibility	0.682	0.730	0.222	0.000	1.000	1,462,659
Market-to-book	1.385	0.982	1.333	0.000	10.564	1,462,659
R&D	1.458	0.000	5.912	0.000	59.181	1,462,659
Short-term debt	0.309	0.183	0.319	0.000	1.000	1,462,659
ln(ME)	4.724	4.515	2.418	-4.308	13.139	1,462,659
Beta	0.804	0.742	1.178	-2.789	4.532	1,462,659
EDF	0.074	0.000	0.194	0.000	0.952	1,462,659

Panel B: The Shareholdings Subsample

Variable	**Mean**	**Median**	**Std. Dev.**	**Min**	**Max**	**N**
Leverage	0.178	0.094	0.225	0.000	1.000	16,391
Profitability	0.084	0.113	0.310	-1.000	1.000	16,391
Depreciation	0.044	0.037	0.032	0.000	0.251	16,391
Tangibility	0.272	0.191	0.240	0.000	1.000	16,391
Size	6.560	6.611	2.049	1.000	13.590	16,391
Volatility	0.480	0.288	0.503	0.000	6.017	16,391
Optimal leverage (SIC)	0.154	0.141	0.137	0.000	1.000	16,391
Optimal leverage (FF)	0.165	0.139	0.157	0.000	1.000	16,391
Excess leverage (SIC)	0.024	-0.006	0.234	-0.719	1.000	16,391
Excess leverage (FF)	0.013	-0.015	0.242	-0.896	1.000	16,391
Intangibility	0.728	0.809	0.240	0.000	1.000	16,391
Market-to-book	1.587	1.210	1.276	0.000	10.564	16,391
R&D	2.933	0.000	9.186	0.000	59.181	16,391
Short-term debt	0.245	0.096	0.315	0.000	1.000	16,391
ln(ME)	6.530	6.564	2.110	0.105	13.131	16,391
HHI	0.111	0.054	0.143	0.012	1.000	16,391
Flipped HHI	0.889	0.946	0.143	0.000	0.988	16,391
Insider shareholdings (%)	10.161	3.250	14.767	0.000	100.000	16,391
CEO shareholdings (%)	2.571	0.026	8.154	0.000	100.000	16,391

Table 4. Overleverage Effect and the Bankruptcy Reform Effect on Equity Beta

This table reports the effects of overleverage and the bankruptcy reform on equity beta according to EDF decile. Panel A gives the results on the differences in equity beta between underlevered and overlevered firms. Panel B shows the bankruptcy reform effect on equity beta. The joint effect of firms' overleverage and the bankruptcy reform is presented in Panel C. The overleverage measurement is based on Fama-French 48 industry classification.

EDF decile	Low 1	2	3	4	5	6	7	8	9	High 10	Total
Panel A: Overleverage Effect											
All firms											
Beta	0.705	0.793	0.827	0.856	0.871	0.869	0.854	0.813	0.764	0.686	0.804
Underlevered firms											
Beta	0.741	0.849	0.898	0.926	0.932	0.917	0.880	0.827	0.753	0.679	0.850
Overlevered firms											
Beta	0.576	0.660	0.718	0.779	0.821	0.840	0.843	0.809	0.767	0.688	0.768
Dif. Beta	0.165	0.189	0.180	0.147	0.111	0.077	0.037	0.018	-0.014	-0.009	0.082
t-stat.	32.917	37.655	35.399	27.441	19.275	12.210	5.236	2.249	-1.422	-0.769	41.821
Panel B: The Bankruptcy Reform Effect											
Before the reform											
Beta	0.653	0.768	0.818	0.879	0.932	0.967	0.972	0.945	0.908	0.774	0.862
After the reform											
Beta	0.729	0.805	0.832	0.845	0.843	0.824	0.800	0.753	0.699	0.647	0.778
Dif. Beta	-0.077	-0.037	-0.013	0.034	0.089	0.143	0.172	0.192	0.208	0.127	0.084
t-stat.	-17.068	-7.423	-2.480	5.916	14.543	21.853	24.664	25.686	25.699	14.089	40.188
Panel C: The Joint Effect of Overleverage and the Bankruptcy Reform											
Overlevered firms before the reform											
Beta	0.610	0.703	0.759	0.848	0.907	0.951	0.972	0.949	0.915	0.787	0.865
Overlevered firms after the reform											
Beta	0.536	0.618	0.683	0.726	0.761	0.767	0.762	0.726	0.685	0.636	0.705
Dif. Beta	0.075	0.085	0.076	0.122	0.146	0.184	0.210	0.222	0.230	0.151	0.160
t-stat.	8.216	10.460	10.314	16.739	19.891	24.579	27.067	27.393	26.580	15.522	57.791
Underlevered firms before the reform											
Beta	0.678	0.823	0.8982	0.939	0.998	1.029	0.976	0.916	0.819	0.604	0.855
Underlevered firms after the reform											
Beta	0.762	0.857	0.8981	0.922	0.916	0.893	0.863	0.813	0.744	0.691	0.849
Dif. Beta	-0.084	-0.034	0.0001	0.016	0.082	0.136	0.114	0.103	0.075	-0.087	0.006
t-stat.	-15.668	-5.209	0.020	1.702	7.125	9.631	6.548	4.888	2.782	-3.198	1.653

Table 5. Overleverage Effect and the Bankruptcy Reform Effect on Distress Risk

This table reports the effects of overleverage and the bankruptcy reform on distress risk according to EDF decile. Distress risk is represented by EDF. Panel A gives the results on the differences in distress risk between underlevered and overlevered firms. Panel B shows the bankruptcy reform effect on distress risk. The joint effect of firms' overleverage and the bankruptcy reform on distress risk is presented in Panel C. The overleverage measurement is based on Fama-French 48 industry classification.

EDF decile	Low 1	2	3	4	5	6	7	8	9	High 10	Total
Panel A: Overleverage Effect											
All firms											
EDF	1.72E-10	7.17E-7	3.67E-5	4.18E-4	0.002	0.007	0.020	0.053	0.149	0.506	0.074
Underlevered firms											
EDF	1.42E-10	5.49E-7	2.68E-5	3.11E-4	0.002	0.006	0.016	0.045	0.133	0.532	0.030
Overlevered firms											
EDF	2.80E-10	1.11E-6	5.19E-5	5.35E-4	2.43E-3	7.94E-3	0.022	0.056	0.152	0.501	0.107
Dif. EDF	-1.38E-10	-5.61E-7	-2.5E-5	-2.24E-4	-0.001	-0.002	-0.006	-0.011	-0.020	0.031	-0.077
t-stat.	-3.609	-8.231	-13.134	-14.473	-13.204	-15.385	-17.800	-16.768	-15.797	14.313	-240.000
Panel B: The Bankruptcy Reform Effect											
Before the reform											
EDF	4.49E-10	1.53E-6	6.15E-5	0.001	0.003	0.010	0.027	0.064	0.147	0.448	0.070
After the reform											
EDF	4.59E-11	3.42E-7	2.53E-5	3.07E-4	0.002	0.006	0.017	0.049	0.149	0.532	0.076
Dif. EDF	4.03E-10	1.19E-6	3.62E-5	3.53E-4	0.002	0.005	0.011	0.015	-0.002	-0.084	0.084
t-stat.	11.773	17.670	17.940	21.187	25.198	29.429	31.664	24.323	-1.648	-48.592	-18.357
Panel C: The Joint Effect of Overleverage and the Bankruptcy Reform											
Underlevered firms before the reform											
EDF	4.29E-10	1.27E-6	4.43E-5	4.04E-4	0.002	0.007	0.023	0.063	0.158	0.610	0.024
Overlevered firms before the reform											
EDF	4.81E-10	1.84E-6	7.41E-5	7.94E-4	0.004	0.011	0.028	0.064	0.147	0.435	0.087
Dif. EDF	-5.20E-11	-5.70E-7	-2.98E-5	-3.90E-4	-1.46E-3	-0.004	-0.005	-0.001	0.011	0.175	-0.063
t-stat.	-0.505	-3.056	-6.287	-10.810	-10.918	-10.178	-6.146	-0.404	3.187	29.654	-110.000
Underlevered firms after the reform											
EDF	4.58E-11	3.21E-7	2.19E-5	2.87E-4	0.002	0.005	0.015	0.042	0.129	0.520	0.032
Overlevered firms after the reform											
EDF	4.67E-11	4.14E-7	3.30E-5	3.38E-4	0.002	0.006	0.018	0.052	0.156	0.535	0.121
Dif. EDF	-9.00E-13	-9.30E-8	-1.11E-5	-5.07E-5	-9.06E-5	-7.16E-4	-0.003	-0.010	-0.027	-0.015	-0.089
t-stat.	-0.070	-2.337	-6.150	-3.062	-1.373	-4.083	-9.111	-13.444	-19.794	-6.619	-230.000

Table 6. Leverage, Optimal leverage, and Excess Leverage Sortings

This table presents the variations in equity beta, excess leverage, optimal leverage, leverage, EDF, and institutional shareholder ownership across decile groups according to leverage in Panel A, optimal leverage in Panel B, and excess leverage in Panel C, respectively. Since institutional ownership data availability period ranges from 2004 to 2014, the last row in each panel only considers this period. The overleverage measurement is based on Fama-French 48 industry classification.

	Low									High	
	1	2	3	4	5	6	7	8	9	10	Total
Panel A: Sorted by Leverage											
Beta	0.844	0.862	0.868	0.835	0.813	0.802	0.772	0.761	0.737	0.746	0.804
Excess leverage	-0.076	-0.051	-0.024	0.005	0.060	0.127	0.228	0.335	0.485	0.676	0.176
Optimal leverge	0.145	0.152	0.160	0.183	0.198	0.211	0.214	0.217	0.207	0.202	0.189
Leverage	0.069	0.100	0.137	0.188	0.257	0.338	0.442	0.552	0.692	0.877	0.365
EDF	0.028	0.027	0.030	0.034	0.042	0.057	0.080	0.110	0.152	0.180	0.074
Ownership concentration	0.114	0.120	0.114	0.103	0.097	0.092	0.095	0.100	0.125	0.147	0.111
Panel B: Sorted by Optimal Leverage											
Beta	0.768	0.792	0.816	0.843	0.851	0.836	0.801	0.774	0.769	0.790	0.804
Excess leverage	0.352	0.335	0.285	0.221	0.190	0.164	0.136	0.111	0.071	-0.100	0.176
Optimal leverge	0.009	0.034	0.076	0.116	0.149	0.178	0.209	0.250	0.324	0.544	0.189
Leverage	0.360	0.369	0.361	0.337	0.339	0.343	0.345	0.361	0.395	0.444	0.365
EDF	0.131	0.112	0.089	0.068	0.058	0.051	0.048	0.050	0.061	0.069	0.074
Ownership concentration	0.193	0.164	0.129	0.101	0.093	0.080	0.073	0.078	0.090	0.107	0.111
Panel C: Sorted by Excess Leverage											
Beta	0.760	0.841	0.879	0.851	0.836	0.823	0.785	0.783	0.753	0.729	0.804
Excess leverage	-0.272	-0.101	-0.029	0.032	0.093	0.159	0.247	0.362	0.516	0.758	0.176
Optimal leverage	0.428	0.246	0.203	0.173	0.149	0.130	0.161	0.162	0.145	0.091	0.189
Leverage	0.156	0.145	0.174	0.205	0.242	0.289	0.408	0.524	0.661	0.849	0.365
EDF	0.030	0.021	0.026	0.031	0.042	0.054	0.077	0.103	0.148	0.206	0.074
Ownership concentration	0.096	0.080	0.078	0.087	0.099	0.129	0.131	0.113	0.131	0.164	0.111

Table 7. Excess Leverage, Equity Beta, and Financial Distress Risk on Stock Returns

This table shows the results on the differences between underlevered and overlevered firms in stock excess return, equity beta, EDF, and the interaction term of equity beta and EDF, $Beta * EDF$ across the EDF-sorted deciles in Panel A and the ownership concentration-sorted deciles in Panel B. $Beta * EDF$ is calculated for each firm-month observation and the average of each decile is reported. Since institutional ownership data availability period ranges from 2004 to 2014, Panel B only considers this period. The overleverage measurement is based on Fama-French 48 industry classification.

Panel A: EDF Sorting

	Low									High	
EDF decile	1	2	3	4	5	6	7	8	9	10	Total
Underlevered firms											
Excess return	0.016	0.017	0.017	0.014	0.013	0.011	0.007	0.003	-0.004	-0.014	0.012
Beta	0.741	0.849	0.898	0.926	0.932	0.917	0.880	0.827	0.753	0.679	0.850
EDF	1.42E-10	5.49E-7	2.68E-5	3.11E-4	0.002	0.006	0.016	0.045	0.133	0.532	0.030
Beta*EDF	-61.341	-49.763	-36.240	-25.800	-18.727	-13.488	-9.547	-6.358	-3.714	-1.395	-27.921
Overlevered firms											
Excess return	0.015	0.017	0.016	0.017	0.015	0.013	0.010	0.005	-0.003	-0.021	0.005
Beta	0.576	0.660	0.718	0.779	0.821	0.840	0.843	0.809	0.767	0.688	0.768
EDF	2.80E-10	1.11E-6	5.19E-5	0.001	0.002	0.008	0.022	0.056	0.152	0.501	0.107
Beta*EDF	-63.511	-49.698	-34.529	-24.162	-17.392	-12.543	-8.874	-6.003	-3.632	-1.707	-14.309

(*Table 7 Continued*)

Dif. Excess return	0.001	1.47E-4	1.58E-4	-0.003	-0.003	-0.002	-0.004	-0.002	-0.001	0.007	0.006
t-stat.	2.152	0.221	0.231	-4.603	-3.663	-2.667	-3.850	-2.058	-0.906	4.370	22.977
Dif. Beta	0.165	0.189	0.180	0.147	0.111	0.077	0.037	0.018	-0.014	-0.009	0.082
t-stat.	32.917	37.655	35.399	27.441	19.275	12.210	5.236	2.249	-1.422	-0.769	41.821
Dif. EDF	-1.38E-10	-5.60E-7	2.51E-5	2.24E-4	-0.001	-0.002	-0.006	-0.011	-0.020	0.031	-0.077
t-stat.	-3.609	-8.231	-13.134	-14.473	-13.204	-15.385	-17.800	-16.768	-15.797	14.313	-243.176
Dif. Beta*EDF	2.170	-0.065	-1.711	-1.638	-1.334	-0.945	-0.673	-0.356	-0.082	0.312	-13.612
t-stat.	8.996	-0.510	-18.104	-23.745	-24.976	-22.129	-18.499	-10.614	-2.406	7.929	-363.452

(*Table 7 Continued*)

Panel B: Ownership Concentration Sorting

	Low									High	
Ownership concentration decile	1	2	3	4	5	6	7	8	9	10	Total
Underlevered firms											
Excess return	0.015	0.016	0.015	0.016	0.013	0.013	0.011	0.013	0.010	0.009	0.013
Beta	1.131	1.189	1.232	1.265	1.286	1.266	1.145	0.908	0.734	0.604	1.087
EDF	0.003	0.006	0.006	0.005	0.007	0.013	0.017	0.023	0.031	0.032	0.014
Beta*EDF	-41.102	-37.094	-36.148	-34.747	-33.513	-31.230	-29.182	-27.397	-23.447	-21.661	-31.961
Overlevered firms											
Excess return	0.009	0.009	0.009	0.005	0.004	0.002	0.004	0.002	0.001	0.004	0.005
Beta	1.090	1.212	1.307	1.330	1.354	1.319	1.182	0.909	0.687	0.574	1.079
EDF	0.025	0.038	0.048	0.054	0.068	0.086	0.106	0.110	0.116	0.138	0.083
Beta*EDF	-26.306	-22.463	-19.137	-18.644	-16.005	-14.453	-12.784	-12.092	-11.458	-9.836	-16.027
Dif. Excess return	0.006	0.007	0.006	0.011	0.009	0.011	0.007	0.010	0.010	0.005	0.009
t-stat.	3.816	3.984	3.323	5.826	4.551	5.134	2.742	3.983	3.345	1.865	12.139
Dif. Beta	0.041	-0.023	-0.074	-0.065	-0.068	-0.053	-0.037	-0.001	0.046	0.030	0.008

(*Table 7 Continued*)

t-stat.	4.031	-2.276	-7.071	-5.982	-5.923	-4.241	-2.651	-0.070	2.935	1.887	1.824
Dif. EDF	-0.022	-0.032	-0.042	-0.049	-0.061	-0.072	-0.089	-0.087	-0.085	-0.107	-0.070
t-stat.	-21.555	-24.063	-28.119	-31.255	-35.431	-35.224	-38.905	-36.683	-34.137	-40.736	-110.000
Dif. Beta*EDF	-14.796	-14.631	-17.011	-16.103	-17.508	-16.777	-16.399	-15.305	-11.988	-11.825	-15.934
t-stat.	-37.116	-40.991	-51.109	-49.320	-56.021	-55.544	-54.855	-48.750	-40.088	-41.419	-150.000

Table 8. Regressions for Excess Leverage and Strategic Advantages

This table reports the pooled OLS results on the whole sample covering the entire sample period from 1961 to 2014. Equity beta is the dependent variable. Exl is the overleverage dummy, 1 if overlevered and 0 otherwise. ReformYear is the year dummy, 1 if after 1979 and 0 otherwise. PostReform - 1 Year is the year dummy, 1 if after 1980 and 0 otherwise. PostReform - 2 Years is the year dummy, 1 if after 1981 and 0 otherwise. The variables with " Exl*" are the interaction terms with the year dummies. The overleverage measurement is based on Fama-French 48 industry classification. t-stats are reported in brackets. ***, **, and * signify results significant at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)
Exl	0.012*	0.012*	0.012*
	[1.716]	[1.716]	[1.716]
ReformYear	-0.044***	-0.051***	-0.051***
	[-6.825]	[-2.709]	[-2.709]
Exl*ReformYear	-0.163***	-0.165***	-0.165***
	[-19.879]	[-7.342]	[-7.342]
PostReform - 1 Year		0.008	0.030
		[0.408]	[1.101]
Exl*PostReform - 1 Year		0.001	0.018
		[0.064]	[0.575]
PostReform - 2 Years			-0.022
			[-1.118]
Exl*PostReform - 2 Years			-0.018
			[-0.763]
Constant	0.866***	0.866***	0.866***
	[152.717]	[152.716]	[152.715]
Observations	142,811	142,811	142,811
Adjusted R-squared	0.015	0.015	0.015

Table 9. Equity Beta, Excess Leverage, and Strategic Advantages

This table presents the variations in equity beta and excess leverage across decile groups according to non-fixed assets, CEO shareholdings, flipped HHI, and aggregated strategic advantage. The results are based on the shareholdings subsample from 2004 to 2014. Flipped HHI is 1 - Herfindahl index of institutional shareholdings. Aggregated strategic advantage is measured by aggregated strategic advantage$_i$ = ln(liquidation cost rank$_i$ $*$ shareholders' bargaining power rank$_i$/renegotiation friction rank$_i$). The overleverage measurement is based on Fama-French 48 industry classification.

	Low 1	2	3	4	5	6	7	8	9	High 10	Total
Panel A: Sorted by Non-fixed Assets											
Beta	1.082	1.085	1.074	1.085	1.091	1.091	1.023	1.067	1.036	1.042	1.067
Excess leverage	-0.152	-0.008	0.033	0.032	0.034	0.031	0.038	0.050	0.039	0.076	0.017
Panel B: Sorted by CEO Shareholdings											
Beta	1.072	1.065	1.026	1.045	1.063	1.095	1.183	1.139	1.032	0.954	1.067
Excess leverage	0.032	0.030	0.016	0.012	0.010	-0.002	-0.002	0.013	0.021	0.042	0.017
Panel C: Sorted by Flipped HHI											
Beta	0.580	0.675	0.871	1.134	1.271	1.278	1.295	1.258	1.181	1.132	1.067
Excess leverage	0.095	0.074	0.030	0.030	0.020	0.014	0.004	-0.004	-0.027	-0.063	0.017
Panel D: Sorted by Aggregated Strategic Advantage											
Beta	1.198	1.202	1.160	1.139	1.119	1.101	1.149	1.022	0.921	0.665	1.067
Excess leverage	-0.085	-0.038	-0.010	0.008	0.011	0.033	0.026	0.050	0.072	0.106	0.017

Table 10. Regressions for Excess Leverage and Strategic Advantages

This table reports the pooled OLS results for the shareholdings subsample from 2004 to 2014. Panels A, C, and D consider all the firm-year observations from 2004 to 2014. Panel B only considers companies with more than 80% institutional ownership concentration ratio, regarded as high concentration, and companies with a concentration ratio between 0 and 20%, regarded as low concentration. Excess leverage is the dependent variable. The overleverage measurement is based on Fama-French 48 industry classification. t-stats are reported in brackets. ***, **, and * signify results significant at the 1%, 5%, and 10% levels, respectively.

Panel A

	(1)	(2)	(3)	(4)	(5)
Market-to-book	-0.042***	-0.042***	-0.046***	-0.038***	-0.045***
	[-8.009]	[-7.837]	[-8.673]	[-7.263]	[-8.461]
Size	0.006***	0.007***	-0.006***	0.001	-0.004***
	[6.493]	[7.762]	[-7.871]	[1.254]	[-5.312]
Nonfixed assets	0.267***	0.270***	0.264***		0.268***
	[12.391]	[12.667]	[13.033]		[13.416]
R&D				0.0005685*	
				[1.947]	
CEO shareholdings	0.0004998**		0.0009082**		
	[2.300]		[2.895]		
Insider shareholdings		0.0007401***		0.0004474*	0.0010891***
		[3.756]		[2.140]	[4.541]
Flipped HHI	-0.285***	-0.281***		-0.240***	
	[-21.055]	[-20.458]		[-13.470]	
Short-term debt			-0.033***		-0.033***
			[-5.027]		[-5.198]
Constant	0.094**	0.073*	-0.066**	0.267***	-0.092***
	[2.657]	[2.047]	[-2.335]	[10.853]	[-3.197]
Observations	16,391	16,391	16,391	16,391	16,391
R-squared	0.141	0.143	0.123	0.066	0.126

Panel B

	low	high	low	high	low	high	low	high

(*Table 10 Continued*)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Market-to-book	-0.044***	-0.002	-0.039***	-0.020	-0.044***	-0.014	-0.039***	-0.024*
	[-7.556]	[-0.095]	[-7.279]	[-1.622]	[-7.410]	[-0.594]	[-7.206]	[-2.047]
Size	-0.002*	0.025	0.015***	0.031	-0.001	0.048*	0.015***	-0.003
	[-2.037]	[1.469]	[8.815]	[1.514]	[-1.455]	[2.169]	[8.984]	[-0.085]
Nonfixed assets	0.283***	0.302***	0.284***	0.315**	0.286***	0.310***	0.284***	0.271**
	[13.914]	[4.002]	[14.188]	[3.237]	[13.954]	[3.305]	[14.116]	[2.807]
CEO shareholdings	0.0004	0.016*	-0.00003	0.022*				
	[1.512]	[2.046]	[-0.115]	[1.838]				
Insider shareholdings					0.001**	0.014	0.0001	-0.004
					[2.500]	[1.245]	[0.481]	[-0.496]
Flipped HHI			-1.034***	-1.792*			-1.024***	1.981
			[-13.957]	[-1.851]			[-12.292]	[0.663]
Short-term debt	-0.051***	0.088			-0.051***	-0.033		
	[-8.100]	[1.307]			[-7.956]	[-0.176]		
Constant	-0.118***	-0.268***	0.712***	-0.102	-0.130***	-0.458**	0.703***	-0.137
	[-4.014]	[-3.631]	[9.247]	[-1.610]	[-4.197]	[-2.528]	[7.995]	[-1.657]
Observations	14,001	159	14,001	159	14,001	159	14,001	159
R-squared	0.127	0.555	0.144	0.550	0.128	0.528	0.145	0.540

Panel C

	(1)	(2)	(3)	(4)
Market-to-book	-0.040***	-0.036***	-0.040***	-0.036***
	[-7.828]	[-7.154]	[-7.726]	[-7.115]
Size	0.012***	0.006***	0.012***	0.006***
	[7.678]	[4.503]	[8.374]	[4.716]
Nonfixed assets	0.271***		0.274***	
	[12.787]		[13.089]	
R&D		0.0004		0.0005
		[1.254]		[1.513]
CEO shareholdings	0.0004	0.0001		

(*Table 10 Continued*)

	[1.735]	[0.278]		
Insider shareholdings			0.001**	0.0003
			[3.014]	[1.455]
HHI	0.719***	0.633***	0.698***	0.617***
	[10.076]	[9.756]	[9.160]	[8.940]
HHI_SQUARE	-0.590***	-0.534***	-0.565***	-0.512***
	[-6.287]	[-6.541]	[-5.568]	[-5.747]
Constant	-0.266***	-0.026	-0.277***	-0.030
	[-10.078]	[-1.702]	[-10.489]	[-1.786]
Observations	16,391	16,391	16,391	16,391
R-squared	0.151	0.073	0.152	0.074

Panel D

	(1)	(2)	(3)	(4)	(5)
Market-to-book	-0.039***	-0.039***	-0.042***	-0.035***	-0.041***
	[-27.573]	[-27.234]	[-29.420]	[-23.456]	[-28.877]
Size	0.006***	0.007***	-0.006***	0.001	-0.004***
	[5.871]	[6.776]	[-6.139]	[1.155]	[-3.922]
Nonfixed assets	0.267***	0.269***	0.262***		0.266***
	[35.751]	[35.984]	[34.083]		[34.475]
R&D				0.001**	
				[2.561]	
CEO shareholdings	0.0004*		0.001***		
	[1.915]		[3.154]		
Insider shareholdings		0.001***		0.0003**	0.001***
		[4.852]		[2.418]	[6.982]
Flipped HHI	-0.277***	-0.271***		-0.227***	
	[-18.878]	[-18.399]		[-14.906]	
D_2008	0.102***	0.102***	0.101***	0.101***	0.100***
	[17.036]	[16.948]	[16.616]	[16.169]	[16.513]
D_2009	0.003	0.002	0.003	0.001	0.002

(*Table 10 Continued*)

	[0.471]	[0.407]	[0.417]	[0.088]	[0.334]
D_2010	-0.016***	-0.016***	-0.016***	-0.016***	-0.016***
	[-2.720]	[-2.765]	[-2.692]	[-2.583]	[-2.750]
Short-term debt			-0.029***		-0.030***
			[-4.736]		[-4.880]
Constant	0.077***	0.057***	-0.076***	0.249***	-0.099***
	[6.075]	[4.221]	[-7.930]	[19.357]	[-9.648]
Observations	16,391	16,391	16,391	16,391	16,391
R-squared	0.142	0.143	0.124	0.075	0.126

Table 11. Overleverage in Bankruptcy Cases

This table shows 109 bankrupt firms during 1990-2014 collected from Capital IQ. Using a probit model, the overleverage effect on the likelihood of filing for Chapter 11 and the likelihood of successfully emerging from a reorganization plan is presented in Column (1) and Column (2), respectively. The dependent variable in Column (1) equals 1 if the bankrupt firm filed for Chapter 11 and 0 otherwise. The dependent variable in Column (2) equals 1 if the bankrupt firm emerged from a reorganization plan and 0 otherwise. The overleverage measurement is based on Fama-French 48 industry classification. t-stats are reported in brackets. ***, **, and * signify results significant at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)
Excess leverage	0.555*	0.463**
	[1.930]	[2.099]
Constant	1.048***	0.146*
	[9.846]	[1.673]
Observations	370	370
Pseudo R-squared	0.014	0.009

Appendix

A US Bankruptcy Procedure

The US corporate bankruptcy codes broadly comprise of a liquidation process (Chapter 7) and a reorganization process (Chapter 11), intended to help distressed firms in financial difficulties. US bankruptcy proceedings can be initiated by a firm's creditors. However, in cases of a public company's bankruptcy, it is often the firm that make the filing decision. The primary difference between Chapter 7 and Chapter 11 is the absolute priority rule (APR) violation. APR rejects any claimholder's stake in the securities of the bankrupt firm until the more senior claims have been fully satisfied. Table A1 lists the APR hierarchy of claims in order of decreasing seniority. Chapter 7 aims to liquidate the troubled firms immediately and distribute the remaining value of the total assets to the creditors according to APR. Under Chapter 7, APR is strictly followed. The main purpose of Chapter 11 is to preserve a firm as a going concern while it is in financial distress and therefore APR can be violated. As such, as we pointed out in the second study, in the presence of Chapter 11, shareholders are tempted to "play the game" at the expense of their bondholders.

The firm that files for Chapter 11 is referred to as "debtor-in-possession" (DIP). A reorganization plan is worked out under Chapter 11. The plan goes into effect if it is accepted by the creditors who hold two-thirds of the value of the aggregate debt claims against the firm. It additionally needs to be approved by two-thirds of the shareholders. The court usually approves the plan once it is agreed upon by both shareholders and creditors. Under Chapter 11, creditors who vote against the proposed reorganization plan or who do not vote can be forced to accept the terms that have been approved by the majority of other creditors.

Chapter 11 consists of three distinct phases. In the first phase, shareholders of a firm

Table A1. Absolute Priority Rule Hierarchy of Claims: from Senior to Junior

1.	Secured claims
2.	Superiority claims
3.	Priority claims
3a.	Administrative expenses (incl. legal and professional fees incurred in the case)
3b.	Wages, salaries, or commissions
3c.	Employee benefit claims
3d.	Claims against facilities that store grain or fish produce
3e.	Consumer deposits
3f.	Alimony and child support
3g.	Tax claims
3h.	Unsecured claims based on commitment to a federal depository institution's regulatory agency
4.	General unsecured claims
5.	Preferred stocks
6.	Common stocks

file for bankruptcy and propose a reorganization plan. In the meantime, the shareholders still have control of the corporation for up to 120 days after filing for the Chapter 11 proceeding. This 120-day provision is also known as the automatic stay. During this exclusive period, no interest or principal on the pre-petition debt is paid to creditors and interest only accrues on secured debt. Therefore, Chapter 11 offers troubled firms considerable savings, which gives shareholders the incentive to default early. In addition, bankrupt firms can obtain an extension of the exclusive period that is renewed by the court. However, shareholders must propose a reorganization plan within this first 120 days. To obtain finances to continue to operate per normal, firms can arrange for DIP financing. DIP financing represents a major source of funding to financially distressed firms so that these firms may be able to get rid of poor performance. Without the market for DIP financing, troubled firms hardly receive any funds for survival from other financing sources. DIP lenders under Chapter 11 will be given superior priority relative to the firm's pre-petition lenders and are among the first to be repaid when the firm leaves bankruptcy (i.e. emerges from Chapter 11). Due to this superiority, DIP lenders rarely fail to be fully repaid and the lending fees tend to be lucrative. The second phase is from plan to confirmation. In the second stage, control of the company is transferred from shareholders to creditors and the court. The last phase is to implement the plan. As

control in the third phase is under the firm's management and the court managers acting in their own self interest may have more incentive to delay the reorganization in the first two phases. In the last stage, they would be expected to be more cooperative with the new creditors and equityholders in order to retain their jobs. Shareholders also have the option to convert the filing case from Chapter 11 to Chapter 7 without showing cause; however, this is only available if no trustee has been appointed or if the case came into Chapter 11 voluntarily, i.e. the bankruptcy procedure was first initiated by shareholders. In addition, the court can either convert or dismiss whichever bankruptcy code is in the best interest of creditors.

Chapter 11 improves the efficiency of the bankruptcy process and offers firms some distinct benefits. Gilson (1997) shows that the transaction costs of reducing debt are much smaller under a Chapter 11 bankruptcy. Senior institutional lenders are more willing to make concessions in Chapter 11 because the bankruptcy rules restrict all impaired claimholders to participate in a reorganization plan. In contrast, when debt contracts are restructured out of court, the borrower's financial condition is hard to verify and all of the lenders have more discretion with respect to the amount or timing of the distressed loans to be written down. Asset sales are often forced by the court and no formal approval from shareholders or directors is required. Chapter 11 further reduces information asymmetries between a firm's insiders and the outsiders because the bankruptcy code requires the bankrupt firm to give out monthly financial reports and make other detailed disclosures. All the information is made public, thus making it less costly for troubled firms to issue new equity or exchange the new equity for debt. There are numerous other benefits available to firms under Chapter 11, including tax relief, allowing distressed firms to reject leases, licensing agreements and supply contracts and escape from some law suits. In addition, it helps firms raise cash by making it easier from them to sell assets. Under the protection of Chapter 11, firms can also seek for permission from the court to obtain the concession of bargaining agreements with unionized labor which provides firms with the flexibility to modify wage contracts, benefits and work rules.

B Tables

Table B1. Variables Correlation Coefficient Matrices

This table gives the correlation coefficients between variables in the analysis. Panel A presents the entire sample from 1961 to 2014. Panel B covers the shareholdings subsample and the subsample period covers from 2004 to 2014. Optimal leverage and excess leverage have the SIC and FF brackets, standing for the estimation of optimal leverage based on two-digit SIC and Fama-French 48 industries classifications, respectively.

Panel A: The Entire Sample

	Leverage	Optimal leverage (SIC)	Optimal leverage (FF)	Excess leverage (FF)	Excess leverage (SIC)	Intangibility	Market-to-book	R&D	Short-term debt	ln(ME)	Beta	EDF
Leverage	1											
Optimal leverage (SIC)	0.089*	1										
Optimal leverage (FF)	0.097*	0.979*	1									
Excess leverage (FF)	0.902*	-0.340*	-0.342*	1								

(*Table B1 Continued*)

Excess leverage (SIC)	0.923*	-0.301*	-0.285*	0.995*	1							
Intangibility	-0.175*	-0.596*	-0.677*	0.128*	0.062*	1						
Market-to-book	-0.277*	-0.206*	-0.176*	-0.186*	-0.186*	0.114*	1					
R&D	-0.167*	-0.196*	-0.192*	-0.075*	-0.084*	0.220*	0.239*	1				
Short-term debt	-0.029*	-0.268*	-0.264*	0.087*	0.076*	0.255*	0.094*	0.098*	1			
ln(ME)	-0.272*	0.199*	0.175*	-0.332*	-0.337*	-0.065*	0.223*	-0.019*	-0.223*	1		
Beta	-0.024*	-0.003*	-0.006*	-0.020*	-0.022*	0.017*	0.075*	0.018*	-0.041*	0.177*	1	
EDF	0.187*	-0.076*	-0.069*	0.207*	0.209*	-0.007*	-0.142*	-0.003*	0.078*	-0.190*	-0.041*	1

Panel B: The Shareholdings Subsample

	Leverage	Optimal leverage (SIC)	Optimal leverage (FF)	Excess leverage (FF)	Excess leverage (SIC)	Intangibility	Market-to-book	R&D	Short-term debt	ln(ME)	Flipped HHI	Insider shareholdings (%)	CEO shareholdings (%)
Leverage	1												
Optimal leverage (SIC)	0.237*	1											
Optimal leverage (FF)	0.234*	0.982*	1										

(*Table B1 Continued*)

Excess leverage (FF)	0.777*	-0.415*	-0.430*	1									
Excess leverage (SIC)	0.823*	-0.356*	-0.349*	0.990*	1								
Intangibility	-0.250*	-0.631*	-0.710*	0.227*	0.128*	1							
Market-to-book	-0.338*	-0.213*	-0.176*	-0.200*	-0.201*	0.124*	1						
R&D	-0.158*	-0.216*	-0.203*	-0.016*	-0.026*	0.247*	0.237*	1					
Short-term debt	-0.163*	-0.275*	-0.270*	0.024*	0.004	0.252*	0.107*	0.171*	1				
ln(ME)	-0.100*	0.252*	0.219*	-0.234*	-0.243*	-0.069*	0.169*	-0.187*	-0.293*	1			
Flipped HHI	-0.067*	0.148*	0.120*	-0.140*	-0.151*	0.011	0.021*	-0.089*	-0.193*	0.547*	1		
Insider share-holdings (%)	0.057*	-0.034*	-0.015	0.063*	0.075*	-0.036*	-0.033*	-0.040*	0.118*	-0.367*	-0.284*	1	
CEO share-holdings (%)	0.045*	0.020*	0.031*	0.022*	0.031*	-0.041*	-0.011	-0.043*	0.034*	-0.157*	-0.141*	0.599*	1