

# Strategic Default, Debt Structure, and Stock Returns

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## Abstract

This paper theoretically and empirically investigates how debt structure and strategic interaction among shareholders and debt holders in the event of default affect expected stock returns. The model predicts that expected stock returns are higher for firms that face high debt renegotiation difficulties and that have a large fraction of secured or convertible debt. Using a large sample of publicly traded U.S. firms for the period 1985–2012, the paper presents new evidence on the link between debt structure and stock returns that is supportive of the model's predictions.

## I. Introduction

A firm typically defaults when shareholders are unable to make contractual payments to debt holders. Shareholders can, however, also have incentives to strategically induce default because they can sometimes recover a substantial fraction of firm value even though they are residual claimants. Recent papers explicitly consider this strategic default incentive and analyze the implications for the cross sections of stock returns (Garlappi, Shu, and Yan (2008), Garlappi and Yan (2011), and Hackbarth, Haselmann, and Schoenherr (2015)), equity risk (Favara, Schroth, and Valta (2012)), and yield spreads (Davydenko and Strebulaev (2007)). Although these papers provide important insights on the pricing implications of strategic default, they remain silent on how the heterogeneity of firms' debt structure affects firms' default incentives. Specifically, corporate debt often includes security provisions and conversion rights that can significantly alter shareholders'

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incentives to default.<sup>1</sup> In this paper, I address this issue by investigating how such covenants affect shareholders' default incentives and expected stock returns.

Shareholders have decision rights regarding the firm's policy choices and make operating decisions. To the extent that these operating decisions affect the risk of a firm's cash flow, these decisions should impact a firm's equilibrium rate of return. One important such decision is whether or not to pay interest on debt and to make debt repayments. If shareholders decide not to honor the debt contract even though they could, they default strategically. Shareholders will, however, default strategically only if they are better off in default than they would be if the firm were to remain a going concern. Therefore, depending on the amount of cash flow that shareholders expect to receive in default, they will decide whether or not to default strategically.<sup>2</sup> Because debt structure and the possibility to renegotiate debt contracts directly affect the decision to default, these characteristics should also affect firms' equilibrium rate of return.

To shed new light on the relation between debt structure and stock returns, I extend a contingent-claims model by introducing secured and convertible debt. The model also allows for the renegotiation of debt contracts between shareholders and debt holders and hence permits analysis of the role of debt structure and renegotiation frictions on expected stock returns. The predictions of the model regarding renegotiation frictions and expected stock returns are consistent with the available empirical evidence (Favara et al. (2012)). In addition, the model generates new predictions on the relation between secured and convertible debt and expected stock returns. More specifically, the model predicts that expected stock returns are higher for firms that have a greater fraction of secured or convertible debt. Intuitively, a large fraction of secured debt reduces the ability of shareholders to extract firm value from debt holders in renegotiation. As a result, the strategic default option becomes less valuable, and equity risk and expected stock returns increase. For convertible debt, the intuition is as follows: Because payments to convertible debt holders increase with a higher fraction of convertible debt, and debt holders delay the decision to convert, shareholders have to pay the higher coupon for a longer time. Moreover, shareholders face the risk of having to share their upside with convertible debt holders if debt holders exercise their option to convert their claims into existing shareholders' equity. Consequently, equity risk and expected stock returns increase.

To test the model's predictions, I form a large sample of publicly traded U.S. firms for the period 1985–2012. I then test the predictions using the Fama–MacBeth (1973) method and portfolio analysis. Overall, the data are consistent with the model's predictions. First, using the normalized number of institutional shareholders as a proxy for renegotiation frictions, I find that average stock returns are increasing with renegotiation frictions, consistent with recent evidence from Favara et al. (2012). As predicted by the model, this effect is stronger for firms

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<sup>1</sup>The recent papers by Rauh and Sufi (2010) and Colla, Ippolito, and Li (2013) provide evidence on the heterogeneity of firms' debt structure.

<sup>2</sup>A number of empirical papers provide evidence that shareholders receive a considerable fraction of firm value upon default. Early contributions include Gilson, John, and Lang (1990), Franks and Torous (1989), and Asquith, Gertner, and Scharfstein (1994).

closer to the renegotiation threshold. Intuitively, when it becomes more difficult to renegotiate the debt contract, the strategic default option becomes less valuable. As a result, shareholders will require a higher return. Second, average stock returns are increasing with the fraction of firms' secured debt. This effect is also stronger for firms closer to the renegotiation threshold, as predicted by the model. Finally, I find supporting evidence for the prediction that stock returns are increasing with the fraction of firms' convertible debt.

To provide further support for these results, I subject the main findings to a number of robustness checks. First, I address a possible endogeneity bias regarding secured and convertible debt. Second, I use an alternative proxy for renegotiation frictions. Third, I investigate average returns around Chapter 11 filings. Finally, I examine whether the results hold with alternative proxies for financial distress. Overall, the main results are robust to these additional tests.

This paper makes two contributions to the literature. First, whereas prior research offers important insights on the implications of bargaining in default, liquidation costs, and renegotiation frictions for the stock returns and equity risk of firms with a simple capital structure (e.g., Garlappi et al. (2008), Garlappi and Yan (2011), Favara et al. (2012), and Hackbarth et al. (2015)), this paper analyzes the pricing implications of more complex capital structures, including secured and convertible debt. Specifically, this study investigates how the *type* of debt affects expected stock returns and shows that the allocation of property rights implicit in debt covenants is important for the pricing of equity.

Second, this paper continues a line of research that generally investigates how strategic default incentives affect corporate choices and asset prices. This research relates strategic default to optimal debt structure (Berglöf and von Thadden (1994), Bolton and Scharfstein (1996), and Hackbarth, Hennessy, and Leland (2007)), multiple creditors (Hege and Mella-Barral (2005)), credit spreads (Anderson and Sundaresan (1996)), dividend policy (Fan and Sundaresan (2000)), and debt and equity valuation (Mella-Barral and Perraudin (1997), Davydenko and Strebulaev (2007), Garlappi et al. (2008), Garlappi and Yan (2011), Favara et al. (2012), Hackbarth et al. (2015), and Zhang (2012)). In establishing a link between a firm's debt *structure*, debt renegotiation, and stock returns, this paper highlights the importance of breaking up firms' debt structure and proposes one specific channel relating debt structure to equity risk and expected stock returns.

The paper proceeds as follows: Section II presents the model and derives empirical predictions. Section III discusses the data and descriptive statistics. Section IV presents the main results. Section V contains robustness checks. Section VI concludes.

## II. Model and Predictions

Corporate debt often includes features such as conversion rights or debt covenants that secure part of the debt (see, e.g., Mikkelsen (1981), Leeth and Scott (1989), Rauh and Sufi (2010), and Colla et al. (2013)). This paper extends the contingent-claims model of Fan and Sundaresan (2000) to account for this evidence, and derives testable implications on how these features relate to expected stock returns.

## A. Model Setup

In the model setup, investment policy is fixed, and managers act in shareholders' best interest. Assets are traded continuously in arbitrage-free markets. The term structure is flat, with a risk-free rate  $r$  at which investors can borrow and lend. Cash flows from operations,  $X$ , are independent of capital structure choices and evolve according to a geometric Brownian motion with a constant growth rate  $\mu^P > 0$  and a constant volatility  $\sigma$ , so that

$$(1) \quad dX_t = \mu^P X_t dt + \sigma X_t dB_t^P,$$

where  $B_t^P$  is a standard Brownian motion under the physical measure  $P$ .<sup>3</sup>

The firm pays taxes  $\tau \in [0, 1]$  on corporate income and therefore has an incentive to issue debt. Shareholders have the option to default strategically on the firm's debt obligation, and will do so if the cash flow falls below an endogenous default (renegotiation) threshold,  $X_B$ . In default, a fraction  $\alpha \in [0, 1]$  of asset value is lost as a frictional cost. Because liquidation is costly, there exists a surplus associated with renegotiation, in which shareholders get a fraction  $\eta \in [0, 1]$  of the renegotiation surplus through Nash bargaining.<sup>4</sup> As such, shareholders can extract rents from debt holders in renegotiation.<sup>5</sup>

Finally, to account for renegotiation frictions, I follow Davydenko and Strebulaev (2007) and assume that debt renegotiations fail with probability  $q$ .<sup>6</sup> In the case of failure, the firm is liquidated and priority rules are enforced. Debt holders receive  $(1 - \alpha)$  of the value of the unlevered firm in default, and shareholders receive nothing. As such, the parameter  $q$  measures the likelihood of a failure of an out-of-court workout, or the possibility that a Chapter 11 reorganization is converted into a liquidation procedure according to Chapter 7.

## B. Straight Debt

This section considers the case of a firm with outstanding equity and straight debt. Debt payments consist of a perpetual constant coupon payment,  $c$ . Shareholders choose the renegotiation threshold,  $X_B$ , that maximizes the value of equity, taking into account the anticipated renegotiation outcome. This optimization problem of the shareholders yields the following proposition (see the Appendix for details).

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<sup>3</sup>Under the risk-neutral measure,  $Q$ , the evolution of the cash-flow process,  $X_t$ , is

$$dX_t = \mu^Q X_t dt + \sigma X_t dB_t^Q,$$

where  $\mu^Q$  is the risk-adjusted drift, and  $B_t^Q$  is a Brownian motion under the risk-neutral measure  $Q$ .

<sup>4</sup>Introducing proportional renegotiation costs does not change the qualitative results as long as liquidation costs are larger than renegotiation costs. Intuitively, renegotiation costs simply reduce the cash flow that is shared between shareholders and debt holders in renegotiation.

<sup>5</sup>Because debt holders give up some firm value to shareholders in renegotiation, this situation represents a deviation from the absolute priority rule, a fact that has been empirically documented (early contributions include Gilson et al. (1990), Franks and Torous (1989), and Asquith et al. (1994)).

<sup>6</sup>See Francois and Morellec (2004) for alternative specifications to incorporate such frictions.

*Proposition 1.* Assume that the cash-flow process evolves according to equation (1). When shareholders choose the value-maximizing renegotiation threshold,  $X_B$ , the value of equity under the risk-neutral pricing measure is

$$E(X) = (1 - \tau) \left[ \left( \frac{X}{r - \mu^Q} - \frac{c}{r} \right) + \left( \frac{c}{r} \frac{1}{1 - \lambda} \right) \left( \frac{X}{X_B} \right)^\lambda \right],$$

the endogenous renegotiation threshold,  $X_B$ , is,

$$X_B = \frac{r - \mu^Q}{r} \frac{\lambda}{\lambda - 1} \frac{c}{1 - (1 - q)\eta\alpha},$$

and  $\lambda$  is

$$\lambda = \left( \frac{1}{2} - \frac{\mu^Q}{\sigma^2} \right) - \sqrt{\left( \frac{1}{2} - \frac{\mu^Q}{\sigma^2} \right)^2 + \frac{2r}{\sigma^2}} < 0.$$

Proposition 1 shows that the equity value in square brackets consists of two parts. The first part is the after-tax present value of cash flows to shareholders ignoring the option to default strategically. The second term captures the after-tax present value of the option to default. This option has positive value for shareholders. The term  $(X/X_B)^\lambda$  is the risk-neutral probability of strategic default and renegotiation.

The goal of this paper is to understand the implications of renegotiation frictions and of different types of debt for expected stock returns. In this model, the instantaneous expected return is a linear function of the equity beta,  $\beta_E$ , and given by

$$(2) \quad ER = r + \xi\beta_E,$$

where  $\xi = \mu^P - \mu^Q$  denotes the constant risk premium associated with the cash-flow process  $X$  (see, e.g., Garlappi and Yan (2011)). If the cash-flow shock is perfectly correlated with market risk,  $\xi$  corresponds to the market risk premium, and  $\beta_E$  is the market beta. More generally, however, the equity beta,  $\beta_E$ , corresponds to the elasticity of the equity value with respect to the cash-flow shock,  $X$ ,

$$(3) \quad \beta_E = \frac{\partial E X}{\partial X E} = 1 + \frac{(1 - \tau) \frac{c}{r}}{E} - \frac{(1 - \tau) \frac{c}{r}}{E} \left( \frac{X}{X_B} \right)^\lambda.$$

In equation (3), the equity beta consists of three terms. The first term is the firm's cash-flow beta normalized to 1. The second term measures the effect of financial leverage on equity risk. Holding everything else constant, a higher financial leverage increases the equity beta. The third term captures the equity's option value to default. This option's value increases with shareholders' ability to extract rents at the expense of creditors in renegotiation. Hence, a higher value of the default option lowers the equity beta, *ceteris paribus*.

I first address the question of how renegotiation frictions affect expected stock returns. Differentiating ER with respect to  $q$  yields

$$\frac{\partial ER}{\partial q} > 0,$$

implying that more renegotiation frictions are associated with higher expected returns. The intuition for this result is as follows: If renegotiation is difficult and likely to fail, chances increase that the firm is liquidated and the absolute priority rule followed. As a result, shareholders expect to extract less firm value at the expense of debt holders in renegotiation, leading to a decrease in the equity value ( $\partial E/\partial q < 0$ ). Consequently, shareholders have less incentive to default strategically and will delay their strategic default decision ( $\partial X_B/\partial q < 0$ ). As such, renegotiation frictions make shareholders' default option less valuable. As a result, the equity beta and expected stock returns increase. Note that this prediction holds unconditionally, regardless of the firm's distance to strategic default and renegotiation. However, because the main economic effect operates through the renegotiation threshold, the model implies that the effect should be stronger for firms closer to the renegotiation threshold.

*Prediction 1.* Firms facing higher renegotiation frictions have higher expected stock returns. This effect is stronger for firms closer to the renegotiation threshold.

### C. Secured Debt

Secured debt represents a large part of corporate debt and has received considerable attention in the literature. It has been argued that secured debt can increase firm value by limiting possible legal claims in bankruptcy (Scott (1977), (1979)) and that it reduces administrative and enforcement costs, prevents asset substitution, and alleviates the underinvestment problem (Smith and Warner (1979), Johnson and Stulz (1985)). Moreover, Morellec (2001) shows that pledging part of the firm's assets as collateral to the debt contract by issuing secured debt increases firm value.

The wide use of secured debt has also been empirically documented. Barclay and Smith (1995), for instance, document that, on average, one-third of firms' debt is secured. Leeth and Scott (1989) report for a sample of small business loans that about 60% of the loans are secured by some type of collateral, and Houston and James (1996) find that about 30% of debt is secured. Despite the fact that firms hold a considerable fraction of secured debt, existing models remain silent on the implications of security provisions for equity risk and expected stock returns. However, the proportion of secured debt is likely to be an important determinant of what shareholders can expect to recover in debt renegotiations. In this section, I therefore consider the case of a firm with outstanding equity, straight debt, and secured debt to address this question.

When debt is secured, debt holders require the firm to pledge a part of the firm's assets as collateral. Shareholders cannot sell the collateral or increase its risk without the agreement of the debt holders. Suppose that the debt holders secure part of their debt with existing assets as collateral. The contract specifies that in renegotiation, debt holders get a fraction  $\pi \in [0, 1]$  of the unlevered firm value for sure, and they negotiate the residual value with shareholders. In such a setup, the amount of collateral naturally relates to the proportion of secured debt. The higher the collateral specified by  $\pi$ , the greater the firm's fraction of secured debt.

Denote by  $X_S$  the endogenous renegotiation threshold in the presence of secured debt. Suppose furthermore that other frictions make renegotiations difficult. Because shareholders have no claim on the assets that are used as collateral for the secured debt, the expected value of equity in renegotiation is reduced by the fraction of the firm's secured assets. Compared with the straight debt case, shareholders receive a smaller cash flow (by  $(1 - \pi)$ ) in renegotiation, all else equal.

As in the previous section, the shareholders' objective is to choose the renegotiation threshold,  $X_S$ , that maximizes the value of equity. Solving the optimization problem yields Proposition 2.

*Proposition 2.* Assume that the cash-flow process evolves according to equation (1). When a firm has secured debt outstanding, and shareholders choose the value-maximizing renegotiation threshold,  $X_S$ , the value of equity under the risk-neutral pricing measure is

$$E^S(X) = (1 - \tau) \left[ \left( \frac{X}{r - \mu^Q} - \frac{c}{r} \right) + \left( \frac{c}{r(1 - \lambda)} \right) \left( \frac{X}{X_S} \right)^\lambda \right],$$

and the endogenous renegotiation threshold,  $X_S$ , is

$$X_S = \frac{r - \mu^Q}{r} \frac{\lambda}{\lambda - 1} \frac{c}{1 - (1 - q)\eta\alpha(1 - \pi)}.$$

Moreover, the expected return is given by

$$ER^S = r + \xi\beta_E^S = r + \xi \left( 1 + \frac{(1 - \tau)\frac{c}{r}}{E^S} - \frac{(1 - \tau)\frac{c}{r}}{E^S} \left( \frac{X}{X_S} \right)^\lambda \right).$$

Note that the equity value, equity beta, and expected stock returns are the same as in the previous section. The only difference comes from the renegotiation threshold,  $X_S$ , that now contains the additional component  $(1 - \pi)$  in the denominator. As such, the proportion of secured debt affects equity risk and expected stock returns only through the renegotiation threshold  $X_S$ .

Specifically, if a larger proportion of debt is secured, shareholders will be able to extract less from debt holders in a potential renegotiation. As a result, the expected equity value in renegotiation is smaller ( $\partial E/\partial\pi < 0$ ), and shareholders will wait longer before they default strategically ( $\partial X_S/\partial\pi < 0$ ). Hence, a higher fraction of secured debt reduces the ability of shareholders to extract firm value from debt holders in renegotiation and decreases the value of the strategic default option. As a result, the equity beta and expected stock returns increase with the fraction of secured debt ( $\partial ER^S/\partial\pi > 0$ ). This prediction holds unconditionally, regardless of the firm's distance to strategic default and renegotiation. However, similar to the case for renegotiation frictions, the model implies that the effect should be stronger for firms closer to the renegotiation threshold.

*Prediction 2.* Firms with a larger proportion of secured debt have higher expected stock returns. This effect is stronger for firms closer to the renegotiation threshold.



#### D. Convertible Debt

Corporate debt routinely incorporates conversion options, and firms with capital structures that include convertible debt claims represent a broad spectrum of firm sizes and industries (Mikkelsen (1981)). There are numerous theoretical explanations for the use of convertible debt, including, among others, information asymmetry problems (Stein (1992)), agency costs (Jensen and Meckling (1976)), and the need for sequential financing (Mayers (1998)).

A standard approach for valuing convertible debt is to decompose the convertible debt value into investment and option components (Ingersoll (1977)). The idea behind this decomposition is that both components can be priced separately, such that the investment component is typically obtained as the value of straight debt of an appropriate benchmark firm. This practical approach, however, assumes that the conversion strategy does not affect the default strategy. Because the goal of this paper is to analyze the economic mechanism of shareholders' choice to default strategically, the interaction between debt holders' conversion strategy and shareholders' default strategy must be considered. In this section, I analyze the implications of this interaction for expected stock returns and extend the straight debt model by adding convertible debt to the capital structure.

Consider a firm with outstanding equity, perpetual straight debt with coupon (CS), and perpetual convertible debt with coupon (CC), as long as the firm's cash flow is above the renegotiation threshold and no conversion takes place. I assume for simplicity that straight and convertible debt have the same priority. This assumption is not critical for the subsequent analysis, and other types of seniority could be incorporated and lead to qualitatively similar results (Lyandres and Zhdanov (2014)). Moreover, I assume that there is no call provision, that the whole debt issue is converted at the same point in time, and that in renegotiations, the holders of convertible and straight debt are negotiating side by side against shareholders.

In this setup, shareholders will default strategically if the firm's cash flow,  $X$ , hits the endogenous renegotiation threshold,  $X_D$ . On the other hand, debt holders will convert their claim into a fraction  $\gamma$  of equity if the firm's cash flow crosses the conversion threshold  $X_C$ . Hence, to determine the equity value, lower and upper boundary conditions are needed.

The lower value-matching condition for the value of equity in renegotiation is identical to the case of straight debt, because convertible and straight debt holders are negotiating side by side against shareholders, and therefore the expected value in renegotiations for shareholders remains unchanged (see the Appendix). Alternatively, if the cash flow crosses the conversion threshold, convertible debt holders lose their coupon claim, and the firm becomes a levered firm with straight debt only. Existing shareholders receive  $(1 - \gamma)$  of the equity value after conversion, namely,  $(1 - \gamma)E'(X_C) = (1 - \gamma)(v'(X_C) - D'(X_C))$ , where  $E'(X_C)$  is the equity value at the conversion threshold right after conversion has taken place (with equity and only straight debt outstanding),  $v'(X_C)$  is the value of the firm right after conversion, and  $D'(X_C)$  is the value of straight debt right after conversion.



The proportion of convertible debt as a function of the two coupons CC and CS is defined as  $\varphi = \text{CC}/(\text{CS} + \text{CC})$ . In this setting, the expected recovery of convertible debt holders in liquidation and renegotiation is  $[\varphi q(1 - \alpha) + \varphi(1 - q)(1 - \eta\alpha)] [X_D/(r - \mu)] (1 - \tau)$  (value-matching condition). Upon conversion, convertible debt holders obtain a fraction  $\gamma$  of the value of equity at the conversion threshold right after conversion,  $\gamma E'(X_C)$ .

Shareholders choose the renegotiation threshold,  $X_D$ , that maximizes the value of equity, taking into account the anticipated renegotiation outcome and convertible debt holders' optimal conversion strategy. Solving the optimization problem yields Proposition 3 (see the Appendix).

*Proposition 3.* Assume that the cash-flow process evolves according to equation (1). A firm has convertible and straight debt outstanding, shareholders choose the equity value-maximizing renegotiation threshold,  $X_D$ , and convertible debt holders choose the debt value-maximizing conversion threshold,  $X_C$ . For  $X_D < X < X_C$ , the value of equity under the risk-neutral pricing measure is given by

$$\begin{aligned} E^C(X) = & (1 - \tau) \left[ \frac{X}{r - \mu^Q} - \frac{(\text{CS} + \text{CC})}{r} \right] \\ & + \text{AR} (1 - \tau) \left( \frac{X_D}{r - \mu^Q} ((1 - q)\alpha\eta - 1) + \frac{(\text{CS} + \text{CC})}{r} \right) \\ & + \text{AC} \left( (1 - \gamma) E'(X_C) - (1 - \tau) \left( \frac{X_C}{r - \mu} - \frac{(\text{CS} + \text{CC})}{r} \right) \right), \end{aligned}$$

where AR and AC are

$$\begin{aligned} \text{AR} &= \left( \frac{X}{X_D} \right)^{\lambda_2} \frac{(X^{\lambda_1 - \lambda_2} - X_C^{\lambda_1 - \lambda_2})}{(X_D^{\lambda_1 - \lambda_2} - X_C^{\lambda_1 - \lambda_2})}, \\ \text{AC} &= \left( \frac{X}{X_C} \right)^{\lambda_2} \frac{(X^{\lambda_1 - \lambda_2} - X_D^{\lambda_1 - \lambda_2})}{(X_C^{\lambda_1 - \lambda_2} - X_D^{\lambda_1 - \lambda_2})}, \end{aligned}$$

and  $\lambda_1$  and  $\lambda_2$  are

$$\begin{aligned} \lambda_2 &= \left( \frac{1}{2} - \frac{\mu^Q}{\sigma^2} \right) - \sqrt{\left( \frac{1}{2} - \frac{\mu^Q}{\sigma^2} \right)^2 + \frac{2r}{\sigma^2}} < 0, \\ \lambda_1 &= \left( \frac{1}{2} - \frac{\mu^Q}{\sigma^2} \right) + \sqrt{\left( \frac{1}{2} - \frac{\mu^Q}{\sigma^2} \right)^2 + \frac{2r}{\sigma^2}} > 0. \end{aligned}$$

The value of equity consists of three parts. The first row represents the after-tax present value of cash flows to shareholders ignoring the shareholders' option to default strategically and convertible debt holders' option to convert. The AR term in the second row corresponds to the present value of a claim (barrier option) that pays 1 unit at a future point in time when the cash flow  $X$  crosses the constant renegotiation threshold  $X_D$  without first crossing the constant conversion threshold  $X_C$ . Because the expression in parentheses following the AR term is positive,

the overall second row is positive and corresponds to the after-tax value of the option to default strategically. Accordingly, the AC term in the third row represents the present value of a claim that pays 1 unit only if  $X$  crosses the conversion threshold  $X_C$  and no renegotiation has occurred. Because the expression in parentheses following the AC term is negative, the third row is overall negative and captures the value loss to shareholders due to debt holders' option to convert their claim into equity.

As in the previous sections, the equity beta is defined as the elasticity of the equity value with respect to the cash-flow shock. Hence, the equity beta and expected stock returns are given by

$$\begin{aligned}\beta_E^C &= \frac{\partial E^C}{\partial X} \frac{X}{E^C} \\ &= \left[ \begin{aligned} &(1 - \tau) \frac{1}{r - \mu^Q} \\ &+ \frac{\partial \text{AR}}{\partial X} (1 - \tau) \left( \frac{X_D}{r - \mu^Q} ((1 - q) \alpha \eta - 1) + \frac{(\text{CS} + \text{CC})}{r} \right) \\ &+ \frac{\partial \text{AC}}{\partial X} \left( (1 - \gamma) E'(X_C) - (1 - \tau) \left( \frac{X_C}{r - \mu^Q} - \frac{(\text{CS} + \text{CC})}{r} \right) \right) \end{aligned} \right] \times \frac{X}{E^C}\end{aligned}$$

and

$$\text{ER} = r + \xi \beta_E^C,$$

where

$$\frac{\partial \text{AR}}{\partial X} = \left( \frac{X}{X_D} \right)^{\lambda_2} \frac{1}{X} \frac{(\lambda_1 X^{\lambda_1 - \lambda_2} - \lambda_2 X_C^{\lambda_1 - \lambda_2})}{(X_D^{\lambda_1 - \lambda_2} - X_C^{\lambda_1 - \lambda_2})}$$

and

$$\frac{\partial \text{AC}}{\partial X} = \left( \frac{X}{X_C} \right)^{\lambda_2} \frac{1}{X} \frac{(\lambda_1 X^{\lambda_1 - \lambda_2} - \lambda_2 X_D^{\lambda_1 - \lambda_2})}{(X_C^{\lambda_1 - \lambda_2} - X_D^{\lambda_1 - \lambda_2})}.$$

In the equity beta expression, the terms  $\partial \text{AR} / \partial X$  and  $\partial \text{AC} / \partial X$  are the sensitivities of the barrier options with respect to the cash-flow shock,  $X$ , and are interpreted similarly to the delta of an option. Because the AR term represents a put option, its derivative with respect to  $X$  is negative. Conversely, the  $\partial \text{AC} / \partial X$  term is positive, like the delta of a plain vanilla call option. Overall, the second row captures the effect of shareholders' strategic default option on the equity beta. Accordingly, the third row measures the effect of debt holders' option to convert their claims into equity on the equity beta.

As noted by Hennessy and Tserlukevich (2008), endowing debt holders with an option to convert their debt into equity results in additional strategic interdependence between shareholders and debt holders. The optimal renegotiation and conversion barriers result from a Nash equilibrium between shareholders and convertible debt holders. Shareholders choose the equity-value-maximizing renegotiation strategy given their beliefs about the debt holders' conversion strategy.

Accordingly, debt holders select an optimal conversion strategy to maximize the convertible debt value given their beliefs about shareholders' renegotiation strategy.

These restrictions are expressed by the two smooth-pasting conditions

$$\left. \frac{\partial E}{\partial X} \right|_{X=X_D} = (1 - q) \eta \alpha (1 / (r - \mu^Q)) (1 - \tau)$$

and

$$\left. \frac{\partial D^C}{\partial X} \right|_{X=X_C} = \gamma \frac{\partial E'(X_C)}{\partial X_C}.$$

I obtain the optimal renegotiation and conversion thresholds by jointly solving the two smooth-pasting conditions numerically. I solve for these thresholds using the following baseline assumptions:  $\alpha = 5\%$ ,  $\gamma = 0.1$ ,  $r = 6\%$ ,  $\mu^Q = 2\%$ ,  $CS = 5$ ,  $\sigma = 30\%$ ,  $q = 0.5$ ,  $\eta = 0.5$ , and  $\tau = 0.35$ . In this base-case environment, renegotiation fails half of the time, shareholders and debt holders have the same amount of bargaining power, and debt holders receive 10% of shareholders' equity at conversion ( $\gamma = 0.1$ ). I have verified that the results are not sensitive to the choice of these parameter values.

Figure 1 shows how the optimal renegotiation and conversion thresholds vary with the proportion of convertible debt. Interestingly, the renegotiation threshold increases with a higher fraction of convertible debt  $\varphi$ . The main intuition for this result is that a higher proportion of convertible debt increases the value of convertible debt at the expense of the existing shareholders. As a result, shareholders have incentives to default strategically earlier, implying a higher renegotiation threshold. Similarly, the conversion threshold also increases with the fraction of convertible debt. The reason for this effect is that convertible debt holders receive larger cash flows in the form of coupon payments and hence have fewer incentives to convert and forgo these payments.

FIGURE 1  
Renegotiation and Conversion Thresholds

Figure 1 shows the renegotiation and conversion thresholds for various proportions of convertible debt to total debt  $\varphi$ . The model's parameters are set to  $\tau = 0.35$ ,  $r = 0.06$ ,  $\mu^Q = 0.02$ ,  $\xi = 0.02$ ,  $\sigma = 0.3$ ,  $X = 10$ ,  $\gamma = 0.1$ ,  $q = 0.5$ ,  $\eta = 0.5$ , and  $\alpha = 0.05$ .

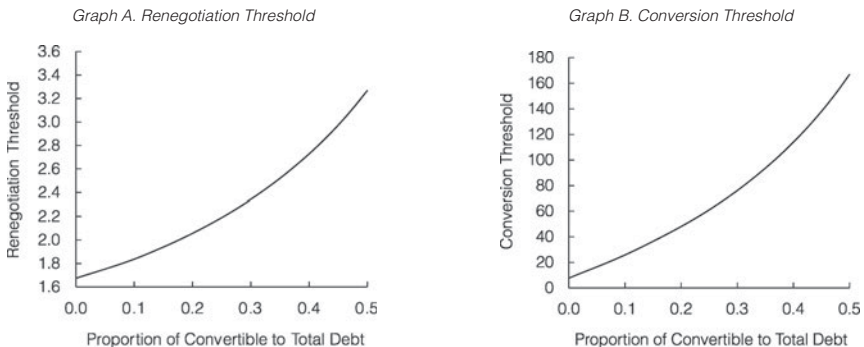
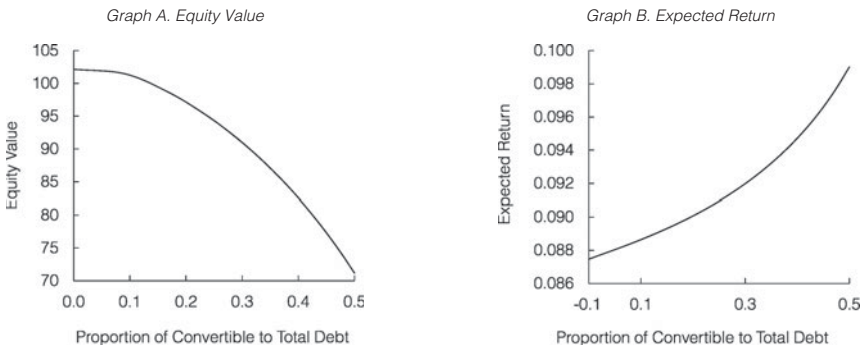


Figure 2 displays comparative statics for the equity value and the equity beta for varying proportions of convertible debt  $\varphi$ . Although the strategic default mechanism from the previous sections is still working in the presence of convertible debt, there is now an additional subtle interaction between shareholders' and convertible debt holders' optimal decisions. In particular, shareholders will default strategically if they believe that they are better off in renegotiation than if the firm continues its operations. Simultaneously, shareholders have to guess debt holders' optimal conversion strategy. This interaction between shareholders and convertible debt holders has several implications for the effect of a higher fraction of convertible debt on the equity value and the equity beta. First, the equity value decreases with the proportion of convertible debt  $\varphi$ . The intuition for this effect is that convertible debt becomes more valuable as the proportion of convertible debt increases. This value increase of convertible debt comes at the expense of existing shareholders, implying a decrease in the equity value.

FIGURE 2  
Equity Value and Expected Stock Return

Figure 2 shows the value of equity and the expected stock return for various proportions of convertible debt to total debt  $\varphi$ . The model's parameters are set to  $\tau = 0.35$ ,  $r = 0.06$ ,  $\mu^Q = 0.02$ ,  $\xi = 0.02$ ,  $\sigma = 0.3$ ,  $X = 10$ ,  $\gamma = 0.1$ ,  $q = 0.5$ ,  $\eta = 0.5$ , and  $\alpha = 0.05$ .



Second, an increasing fraction of convertible debt also represents a risk for shareholders' cash flows. Specifically, because payments to convertible debt holders increase with a higher  $\varphi$ , and debt holders delay the decision to convert, shareholders have to pay the higher coupon for a longer time. Moreover, shareholders face the risk of having to share their upside with convertible debt holders if debt holders exercise their option to convert their claims into existing shareholders' equity. As a result, the equity beta and hence expected stock returns increase.

*Prediction 3.* Firms with a larger proportion of convertible debt have higher expected stock returns.

### III. Data and Descriptive Statistics

This section describes the variables used in the analysis and presents descriptive statistics.

## A. Secured and Convertible Debt

Secured and convertible debt are directly observable in the Compustat database. Hence, secured debt is the proportion of secured debt (DM) to total debt (DLC + DLTT), and convertible debt is the proportion of convertible debt (CVD) to total debt.

## B. Renegotiation Frictions

Renegotiation frictions are related to how easily debt renegotiations are carried out. Debt renegotiations are especially difficult when they involve many parties with diverse interests (Bolton and Scharfstein (1996), Hege and Mella-Barral (2005)). Bolton and Scharfstein (1996) argue, for instance, that dispersed public debt makes debt more difficult to renegotiate because of free-rider problems. Moreover, Bris, Welch, and Zhu (2006) find that the time that a Chapter 11 firm needs to confirm a reorganization plan is positively and significantly related to the number of creditors. Much like the dispersion of debt holders, the dispersion of shareholders also hinders renegotiation due to coordination problems. To capture this idea, I follow Davydenko and Strebulaev (2007) and use the number of institutional shareholders as a proxy for renegotiation frictions. More specifically, I use the normalized number of shareholders (SHAREHOLDERS), defined as the logarithm of the number of different institutional shareholders divided by the logarithm of the market value of the firm's equity.<sup>7</sup> In a robustness test, I use a Herfindahl–Hirschman index (HHI) based on the proportion of ownership by each institutional investor as an alternative proxy for renegotiation frictions.

## C. Distance from the Renegotiation Threshold

The model predicts that the effects of renegotiation frictions and secured debt on expected stock returns are stronger for firms close to the renegotiation threshold. Following the literature on bankruptcy prediction, I use Altman's (1968) Z-score to identify firms close to the renegotiation threshold. I calculate the Z-score for every firm-month observation. Next, I pool all observations and split the sample into quartiles based on the Z-score. Accordingly, the group of firms in the lowest Z-score quartile contains firms close to the renegotiation threshold, and the group of firms in the highest Z-score quartile contains firms far away from the renegotiation threshold.<sup>8</sup> For robustness, and to provide further support for the results, I redo part of the analysis using two alternative measures of distress. The first measure is the probability of bankruptcy based on Zmijewski's

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<sup>7</sup>Favara et al. (2012) use an international cross section of firms and measure renegotiation frictions with bankruptcy-code data at the country level.

<sup>8</sup>Splitting the sample into four groups is admittedly arbitrary. This choice, however, tries to balance two offsetting concerns. On the one hand, I wish to capture firms with a Z-score low enough to identify firms that are close to the renegotiation threshold. On the other hand, making too many groups reduces the sample significantly and makes the portfolio construction unreliable. Choosing four groups strikes a balance between the two concerns. Although the results in the paper are presented with splits into four groups, in unreported tables I replicate most findings using more or fewer groups, and the results are qualitatively similar.

(1984) multiple-choice analysis. The second proxy is the default probability estimate constructed along the lines of Vassalou and Xing (2004) and Bharath and Shumway (2008). The results using these two alternative measures of distress generally support those I obtain using the Z-score.

#### D. Data

The sample is based on a panel of U.S. firms over the period 1985–2012. Monthly stock market data come from the Center for Research in Security Prices (CRSP), annual financial statement data are from Standard & Poor's Compustat, and institutional ownership data come from the Thomson Financial Ownership Database.

The sample includes all firms listed on the NYSE, AMEX, and NASDAQ with share codes 10 and 11 that are contained in the intersection of the CRSP monthly returns file and the Compustat industrial annual file. To ensure that the accounting variables are known before the returns they are used to explain, I match the accounting data for all fiscal year-ends in calendar year  $t - 1$  with the returns for July of year  $t$  to June of year  $t + 1$  (Fama and French (1992)).

SIZE is CRSP market equity. BOOK\_EQUITY is total assets (AT) minus total liabilities (DLC + DLTT). BOOK-TO-MARKET is calculated by dividing BOOK\_EQUITY by Compustat market equity, which is Compustat stock price (PRCC.F) times shares outstanding at fiscal year-end (CSHO). LEVERAGE is the ratio of book liabilities (total assets (AT) minus book equity) to total market value of the firm. MOMENTUM is the firm's past 12-month average return, skipping the most recent month.

I exclude financial firms (Standard Industrial Classification (SIC) codes between 6000 and 6999) and regulated firms (SIC codes above 9000). Moreover, a firm must have information on the book value of assets, the market value of equity, momentum, total debt (DLC + DLTT), secured debt (DM), convertible debt (CVD), and institutional ownership to be included in the sample. I also require that the sample contains at least 12 monthly observations per firm. Finally, I winsorize all variables at the 1% level in each tail to reduce the impact of outliers. Table 1 contains a summary and the definitions of the variables used in the empirical analysis.

#### E. Descriptive Statistics

The final sample consists of 638,593 firm-month observations. Table 2 contains summary statistics for the main variables.

The mean return is positive with 0.96%, and the median return is 0. This indicates a positively skewed distribution of stock returns, which is consistent with empirical findings. On average, firms have 90 institutional shareholders, with a median value of 38. The average amount of secured debt held by firms is 36%, which is consistent with the number reported by Barclay and Smith (1995). On average, firms have 7% convertible debt outstanding, and 42% of firms' total debt is maturing within 3 years (short-term debt). The average return over the past 12 months is 1.25%.

TABLE 1  
Definition of Variables

Table 1 describes the variables used in the empirical analysis. CRSP is the University of Chicago's Center for Research in Security Prices database. TF Owner is the Thomson Financial Ownership Data of quarterly institutional stock holdings taken from U.S. Securities and Exchange Commission (SEC) Form 13F. FSD is the Fixed Income Securities Database provided by Mergent. Compustat is Standard & Poor's Compustat database.

Variable	Factor	Variable Description	Data Source
Frictions	SHAREHOLDERS	$\log(\text{Number of institutional shareholders}) / \log(\text{Market equity})$	TF Owner and Compustat
Frictions	1 – HHI	Herfindahl–Hirschman index (HHI) computed using the percentage of ownership by each institutional investor	TF Owner
Secured debt	SECURED_DEBT	Secured debt divided by total debt	Compustat
Convertible debt	CONVERTIBLE_DEBT	Convertible debt divided by total debt	Compustat
Short-term debt	SHORT-TERM_DEBT	Proportion of total debt maturing within 3 years	Compustat
Control	SIZE	$\log(\text{Market value of equity})$	CRSP
Control	BOOK-TO-MARKET	$\log((\text{Total assets} - \text{total debt}) / \text{Market value of equity})$	Compustat
Control	MOMENTUM	Average stock return over the past 12 months, skipping the most recent month	CRSP
Distress	ZSCORE	$1.2 \times \text{WCap.} / \text{TA} + 1.4 \times \text{RetEarn} / \text{TA} + 3.3 \times \text{EBIT} / \text{TA} + 0.6 \times \text{ME} / \text{TL} + \text{Sales} / \text{TA}$	CRSP and Compustat
Distress	ZMIJEWSKI_SCORE	$N(-4.3 - 4.5 \times \text{NetIncome} / \text{TA} + 5.7 \times \text{TotalLiab} / \text{TA} - 0.004 \times \text{CurrAssets} / \text{CurrLiab})$	Compustat
Distress	DEFAULT_PROBABILITY	Default probability estimate from a structural model following Bharath and Shumway (2008)	CRSP and Compustat

TABLE 2  
Descriptive Statistics

Table 2 reports summary statistics for the variables in the sample. The sample period is 1985–2012. RETURN is the monthly stock return, SHAREHOLDERS is the normalized number of institutional shareholders, HHI is the Herfindahl–Hirschman index measuring the ownership concentration of institutional investors, SHORT-TERM\_DEBT is the proportion of total debt maturing within 3 years, SECURED\_DEBT is the proportion of secured to total debt, CONVERTIBLE\_DEBT is the proportion of convertible to total debt, SIZE is the logarithm of the market value of equity, BOOK-TO-MARKET is the book-to-market ratio, MOMENTUM is the average stock return over the past 12 months, ZSCORE is Altman's (1968) Z-score, ZMIJEWSKI\_SCORE is the default probability based on Zmijewski (1984), and DEFAULT\_PROBABILITY is a default probability estimate from a structural model. Please refer to Table 1 for a definition of the variables.

	Mean	25%	Median	75%	Std. Dev.	N
RETURN (%)	0.96	–7.35	0.00	7.97	15.70	638,593
No. of shareholders	90.05	12.00	38.00	113.00	140.40	638,593
SHAREHOLDERS	0.67	0.62	0.68	0.75	0.18	638,593
HHI	0.02	0.00	0.01	0.03	0.02	638,593
SECURED_DEBT	0.36	0.00	0.21	0.72	0.38	638,593
CONVERTIBLE_DEBT	0.07	0.00	0.00	0.00	0.22	638,593
SHORT-TERM_DEBT	0.42	0.10	0.32	0.74	0.35	537,589
SIZE	5.24	3.72	5.14	6.67	2.05	638,593
BOOK-TO-MARKET	1.19	0.49	0.84	1.41	1.33	638,593
MOMENTUM (%)	1.25	–1.43	1.05	3.58	4.90	638,593
ZSCORE	4.22	2.02	3.27	5.01	5.86	620,827
ZMIJEWSKI_SCORE	0.20	0.01	0.07	0.29	0.28	621,349
DEFAULT_PROBABILITY	0.24	0.00	0.08	0.44	0.29	638,593

Because the type of debt financing plays an important role in this paper, Table 3 presents summary statistics by subsamples based on whether or not firms have secured or convertible debt outstanding.

Panel A of Table 3 contains descriptive statistics for firms without secured debt, and Panel B for firms with a positive amount of secured debt. Firms with no



TABLE 3  
Descriptive Statistics by Subsamples

Table 3 reports summary statistics for firms with and without secured and convertible debt, respectively. The sample period is 1985–2012. RETURN is the monthly stock return, TOTAL\_ASSETS is total book assets, BOOK-TO-MARKET is the book-to-market ratio, ZSCORE is Altman's (1968) Z-score, and DEFAULT\_PROBABILITY is a default probability estimate from a structural model. Please refer to Table 1 for a definition of the variables.

	Mean	25%	Median	75%	Std. Dev.	N
<i>Panel A. Firms with No Secured Debt</i>						
RETURN (%)	0.96	-6.49	0.25	7.41	14.46	165,682
TOTAL_ASSETS	1,924.78	82.22	371.71	1,436.18	4,659.64	165,682
BOOK-TO-MARKET	1.00	0.44	0.74	1.19	1.09	165,682
ZSCORE	4.50	2.41	3.70	5.48	5.90	161,589
DEFAULT_PROBABILITY	0.20	0.00	0.02	0.41	0.26	165,682
<i>Panel B. Firms with Secured Debt</i>						
RETURN (%)	0.96	-7.69	0.00	8.21	16.12	472,911
TOTAL_ASSETS	1,221.27	45.28	155.37	650.54	3,792.26	472,911
BOOK-TO-MARKET	1.25	0.50	0.88	1.49	1.39	472,911
ZSCORE	4.12	1.89	3.11	4.82	5.84	459,238
DEFAULT_PROBABILITY	0.25	0.00	0.10	0.46	0.30	472,911
<i>Panel C. Firms with No Convertible Debt</i>						
RETURN (%)	1.00	-7.27	0.00	7.94	15.63	542,784
TOTAL_ASSETS	1,289.35	47.22	166.11	717.44	3,879.60	542,784
BOOK-TO-MARKET	1.19	0.49	0.85	1.41	1.33	542,784
ZSCORE	4.52	2.16	3.44	5.26	6.02	528,142
DEFAULT_PROBABILITY	0.22	0.00	0.05	0.42	0.28	542,784
<i>Panel D. Firms with Convertible Debt</i>						
RETURN (%)	0.74	-7.82	0.00	8.15	16.08	95,809
TOTAL_ASSETS	2,052.18	96.18	428.97	1,562.78	4,837.55	95,809
BOOK-TO-MARKET	1.15	0.45	0.82	1.39	1.29	95,809
ZSCORE	2.53	1.43	2.45	3.63	4.43	92,685
DEFAULT_PROBABILITY	0.33	0.00	0.32	0.55	0.31	95,809

secured debt tend to be larger and have a higher Z-score, a lower default probability, and a lower book-to-market ratio.

Panels C and D of Table 3 contain the same statistics for convertible debt. Firms without any convertible debt are smaller, and they have a higher Z-score and a lower default probability. The book-to-market ratio is slightly higher for firms without convertible debt outstanding.

## IV. Results

### A. Fama–MacBeth Analysis

To examine the relation between renegotiation frictions, debt structure, and stock returns, I perform a regression analysis using the Fama–MacBeth (1973) method.<sup>9</sup> In each estimation, I control for firm characteristics that are known to affect stock returns. These characteristics include the size of a firm, the book-to-market ratio, and momentum returns (see Fama and French (1992), Carhart (1997)). Table 4 presents the estimation results.

Panel A of Table 4 presents the coefficient estimates for the full sample, absolute values of *t*-statistics in parentheses, and in square brackets the changes in average monthly returns when the independent variable increases by

<sup>9</sup>I also estimate pooled regressions with monthly dummy variables and obtain very similar results.

TABLE 4  
Fama–MacBeth Analysis

Table 4 presents estimates from the Fama–MacBeth (1973) regressions. The dependent variable is the monthly stock return. SHAREHOLDERS is the normalized number of institutional shareholders, SECURED is the proportion of secured to total debt, CONVERTIBLE is the proportion of convertible to total debt, and DCONV is a dummy equal to 1 if the firm has convertible debt outstanding, and 0 otherwise. The sample period is 1985–2012. Please refer to Table 1 for a definition of the variables. Panel A presents results for the full sample. In Panel B, columns 1–3 show results for firms in the lowest Z-score quartile, and columns 4–6 show results for firms in the highest Z-score quartile. The Newey–West (1987) *t*-statistics adjusted for autocorrelation for up to 6 lags are reported in parentheses below the coefficient estimates. The numbers in square brackets are the changes in average monthly returns when the independent variable increases by 1 standard deviation. \*\*\*, \*\*, and \* indicate coefficients significant at the 1%, 5%, and 10% levels, respectively.

*Panel A. Full Sample*

	1	2	3	4	5	6
SHAREHOLDERS	0.984*** (0.298) [0.17]		0.981*** (0.298) [0.17]		0.978*** (0.294) [0.17]	0.971*** (0.294) [0.17]
SECURED		0.001** (0.001) [0.05]	0.001** (0.001) [0.05]			0.002** (0.001) [0.06]
CONVERTIBLE				0.007*** (0.002) [0.14]	0.006** (0.002) [0.13]	0.006*** (0.002) [0.14]
DCONV				−0.522*** (0.116)	−0.492*** (0.116)	−0.500*** (0.116)
SIZE	0.073 (0.046)	0.091* (0.047)	0.081* (0.047)	0.090* (0.047)	0.080* (0.047)	0.089* (0.047)
log(BOOK-TO-MARKET)	0.316*** (0.108)	0.360*** (0.105)	0.318*** (0.108)	0.373*** (0.102)	0.329*** (0.105)	0.333*** (0.105)
MOMENTUM	0.062*** (0.020)	0.064*** (0.020)	0.061*** (0.020)	0.064*** (0.020)	0.061*** (0.020)	0.060*** (0.020)
CONSTANT	−0.140 (0.455)	0.393 (0.499)	−0.231 (0.450)	0.474 (0.500)	−0.142 (0.456)	−0.239 (0.449)
No. of obs.	638,593	638,593	638,593	638,593	638,593	638,593
$R^2$	0.03	0.03	0.03	0.03	0.03	0.03
No. of months	324	324	324	324	324	324

*Panel B. Firms in the Lowest or Highest Z-Score Quartile*

	Lowest Z-Score Quartile			Highest Z-Score Quartile		
	1	2	3	4	5	6
SHAREHOLDERS	1.136*** (0.410) [0.24]		1.163*** (0.407) [0.25]	0.684* (0.409) [0.09]		0.677* (0.411) [0.10]
SECURED		0.002* (0.001) [0.09]	0.003** (0.001) [0.11]		−0.001 (0.001) [0.02]	−0.001 (0.001) [0.03]
SIZE	0.025 (0.062)	0.043 (0.060)	0.035 (0.064)	0.132*** (0.049)	0.157*** (0.046)	0.128*** (0.048)
log(BOOK-TO-MARKET)	0.222** (0.109)	0.264** (0.104)	0.210* (0.109)	0.514*** (0.145)	0.546*** (0.141)	0.506*** (0.143)
MOMENTUM	0.073*** (0.019)	0.075*** (0.019)	0.072*** (0.019)	0.054** (0.027)	0.060** (0.027)	0.056** (0.027)
CONSTANT	−0.230 (0.527)	0.389 (0.603)	−0.411 (0.534)	−0.079 (0.509)	0.247 (0.449)	−0.023 (0.501)
No. of obs.	155,229	155,229	155,229	155,200	155,200	155,200
$R^2$	0.04	0.04	0.04	0.04	0.04	0.05
No. of months	324	324	324	324	324	324

1 standard deviation. The model predicts that firms that face high renegotiation frictions have higher expected returns. The sign for the coefficient of renegotiation frictions should therefore be positive. Using the proxy SHAREHOLDERS for renegotiation frictions, the estimate in column 1 supports this prediction. The coefficient of SHAREHOLDERS has a value of 0.984 and is statistically significant

at the 1% level. This finding corroborates the findings of Favara, Schroth, and Valta (2012) using a different sample and an alternative, firm-specific proxy for renegotiation frictions.

A similar result holds for secured debt. In column 2 of Table 4, the coefficient of SECURED is positive and statistically significant. Adding SHAREHOLDERS (column 3) does not change the coefficient nor the significance. This result supports the model's prediction that firms with a higher proportion of secured debt have higher returns. The results in Panel A also support the model's third prediction regarding convertible debt.<sup>10</sup> The coefficient of CONVERTIBLE is positive and statistically significant in columns 4–6, indicating that firms with a higher proportion of convertible debt earn, on average, higher stock returns.

Although the effects are statistically significant for all variables of interest, the economic impact is rather moderate for the full sample. An increase of 1 standard deviation in the variable SHAREHOLDERS increases average stock returns by 17 basis points (bps) per month. Similarly, increasing the fraction of secured debt by 1 standard deviation leads, on average, to a 5- to 6-bp increase in monthly stock returns. Finally, increasing the fraction of convertible debt by 1 standard deviation increases average stock returns by 14 bps per month.

Regarding the control variables, BOOK-TO-MARKET has a strong positive effect on stock returns, reflecting the value premium. MOMENTUM is also positive and significant, whereas SIZE is only weakly related to stock returns.

The model further predicts that the effects of renegotiation frictions and secured debt are stronger for firms close to the renegotiation threshold. To investigate this additional prediction, I reestimate the specification in columns 1, 2, and 3 of Table 4 for firms in the lowest and highest Z-score quartile, respectively. Panel B presents the results for both groups of firms.

Columns 1–3 of Panel B in Table 4 present the results for firms close to the renegotiation threshold. Notably, the coefficient of SHAREHOLDERS is positive with a value of 1.136 and is statistically significant. Compared to the full sample estimate, the coefficient is larger. In particular, the economic significance increases to 24 bps per month. Similarly, the coefficient of SECURED is also positive and significant. Notably, the economic significance doubles to 11 bps per month.

Columns 4–6 of Table 4 show results for firms farther away from the renegotiation threshold. The coefficient of SHAREHOLDERS is much smaller and barely statistically significant. The economic significance also decreases to 10 bps per month. The coefficient of SECURED is also smaller and becomes statistically insignificant. These results support the prediction that the effects of renegotiation frictions and secured debt on stock returns are stronger for firms close to the renegotiation threshold. Taken together, the analyses in this section provide evidence that renegotiation frictions and debt structure are systematically related to stock returns.

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<sup>10</sup>Because a large proportion of firms reports 0 convertible debt, I include a dummy variable equal to 1 if a firm has convertible debt outstanding, and 0 otherwise. I do this to isolate the effect of a higher *proportion* of convertible debt on stock returns (as predicted by the model).

## B. Factor Model Regressions

In this section, I investigate the relation between renegotiation frictions, debt structure, and stock returns by computing abnormal returns (alphas) from factor models. These models are the Fama–French (1993) 3-factor model, which includes the market return, size, and book-to-market factors; the 4-factor model, which includes the Carhart (1997) momentum factor; and the 5-factor model, which includes the Pastor and Stambaugh (2003) liquidity factor.<sup>11</sup>

To compute these abnormal returns, I sort stocks, at the beginning of each calendar month, into 5 quantiles based on either the proxy for renegotiation frictions, the proportion of secured debt, or the proportion of convertible debt. For each quantile, I then compute the alpha as the intercept on a regression of monthly excess returns (over the risk-free rate) on explanatory variables that include the monthly returns from the Fama–French (1993) mimicking portfolios, the Carhart (1997) momentum factor, and the Pastor–Stambaugh (2003) liquidity factor. I compute these alphas using all the individual stocks by quantile. Alternatively, I collapse the data at the monthly frequency and compute equal- or value-weighted returns for each quantile. These equal- or value-weighted returns are then in turn regressed on the factor-mimicking portfolios. I also compute the difference in alphas between the highest and lowest quantile as a zero-cost long-short (LS) portfolio.

Table 5 reports the results for the portfolio analysis. Panel A contains the results for SHAREHOLDERS as a proxy for renegotiation frictions for firms in the lowest and highest Z-score quartiles, respectively. The model predicts that firms that face high renegotiation frictions have higher expected returns. The average return should thus increase from quantile 1 (lowest renegotiation frictions) to quantile 5 (highest renegotiation frictions). Moreover, this effect should be stronger for firms close to the renegotiation threshold. The results in Panel A support this prediction. In particular, in the upper part of Panel A, which contains firms in the lowest Z-score quartile, the monthly excess return (column 1) increases from 0.31% in the first quantile to 1.13% in the fifth quantile. A simple strategy that holds the firms in the highest quantile and sells short the firms in the lowest quantile (LS) yields a return of 82 bps per month ( $t = 7.64$ ), or roughly 9.8 percentage points per year. This result remains unaffected by the inclusion of well-known factors. In all columns, the strategy of going long the fifth quantile and selling short the firms in the lowest quantile yields positive and significant alphas between 59 (3-factor alpha) and 74 bps (equal-weighted portfolio 5-factor alpha) per month.

The lower part of Panel A in Table 5 reports excess returns and alphas from the same models but for firms in the highest Z-score quartile. The results show that a portfolio that holds the firms in the highest quantile and sells short the firms in the lowest quantile still yields a positive abnormal return. However, the numbers are economically much smaller compared to those where firms are close to the renegotiation threshold. For instance, the LS 5-factor alpha portfolio yields an abnormal return of 71 bps per month for distressed firms, whereas the same strategy yields only 35 bps per month for firms farther away from the renegotiation

<sup>11</sup>I thank Kenneth French for providing the data on factor-mimicking portfolios in his data library ([http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data\\_library.html](http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html)).

threshold. Moreover, for the equal- and value-weighted portfolio, the LS strategy does not yield statistically significant alphas for firms farther away from the renegotiation threshold.

A similar result holds for secured debt. In the upper part of Panel B of Table 5, the alpha of the fifth quantile is positive and statistically significant in four out of six cases. Similarly, the strategy of holding the firms in the fifth quantile and shorting the firms in the lowest quantile yields abnormal returns between 20 bps and 38 bps per month. By contrast, the alpha of the fifth quantile for firms with a high Z-score is often negative and/or statistically insignificant (lower part of Panel B).

Panel C of Table 5 shows the results for convertible debt. Because the model predicts an unconditional relation between the proportion of convertible debt and

TABLE 5  
Abnormal Returns from Factor Models

Table 5 reports calendar-time portfolio abnormal returns. At the beginning of every calendar month, stocks are sorted into 5 quantiles based on SHAREHOLDERS, SECURED, or CONVERTIBLE. For secured and convertible debt, firms are grouped conditional that a firm has secured or convertible debt outstanding, respectively. XRET is the return in excess of the risk-free rate. Alpha is the intercept on a regression of monthly excess returns on explanatory variables that include the monthly returns from the Fama–French (1993) mimicking portfolios, the Carhart (1997) momentum factor, and the Pastor–Stambaugh (2003) liquidity factor. These alphas are computed using all individual stocks by quantile, or using equal- (EW) and value-weighted (VW) monthly portfolio returns by quantile. LS is the alpha of a zero-cost portfolio of firms that holds the firms in the highest quantile and sells short the firms in the lowest quantile. N/months is either the average number of observations per quantile or the number of months with portfolio returns. The sample period is 1985–2012. Please refer to Table 1 for a definition of the variables. *t*-statistics are shown in parentheses below the coefficient estimates.

Quantile	Individual Stocks				EW Portfolio	VW Portfolio
	XRET	3-Factor $\alpha$	4-Factor $\alpha$	5-Factor $\alpha$	5-Factor $\alpha$	5-Factor $\alpha$
<i>Panel A. Shareholders as a Proxy for Renegotiation Frictions</i>						
<i>Lowest Z-Score Quartile</i>						
1 (low)	0.31% (2.93)	-0.35% (3.36)	-0.21% (1.98)	-0.28% (2.71)	-0.29% (1.41)	-0.34% (1.48)
2	0.70% (7.54)	-0.03% (0.35)	0.13% (1.50)	0.06% (0.63)	0.01% (0.03)	0.27% (1.68)
3	0.79% (8.46)	-0.02% (0.24)	0.12% (1.39)	0.06% (0.64)	-0.01% (0.03)	0.03% (0.18)
4	0.75% (7.32)	-0.14% (1.53)	-0.01% (0.05)	-0.06% (0.63)	-0.04% (0.33)	-0.11% (0.60)
5 (high)	1.13% (9.19)	0.24% (2.01)	0.46% (3.83)	0.42% (3.45)	0.45% (1.78)	0.30% (1.27)
LS	0.82% (7.64)	0.59% (5.64)	0.67% (6.29)	0.71% (6.62)	0.74% (2.27)	0.64% (1.95)
N/months	30,980	30,980	30,980	30,980	324	324
<i>Highest Z-Score Quartile</i>						
1 (low)	-0.06% (0.67)	-0.50% (5.37)	-0.22% (2.40)	-0.23% (2.39)	-0.13% (0.79)	0.18% (0.88)
2	0.25% (2.98)	-0.23% (2.96)	-0.01% (0.05)	-0.02% (0.22)	0.04% (0.40)	0.24% (1.91)
3	0.55% (6.77)	0.05% (0.63)	0.21% (2.78)	0.23% (3.01)	0.21% (2.14)	0.47% (3.85)
4	0.55% (6.68)	-0.02% (0.31)	0.13% (1.76)	0.14% (1.78)	0.08% (0.71)	0.13% (0.95)
5 (high)	0.54% (6.05)	-0.06% (0.68)	0.12% (1.45)	0.12% (1.45)	0.13% (0.99)	0.36% (2.49)
LS	0.60% (6.14)	0.44% (4.76)	0.35% (3.69)	0.35% (3.67)	0.26% (1.23)	0.18% (0.73)
N/months	31,090	31,090	31,090	31,090	324	324

(continued on next page)

TABLE 5 (continued)  
Abnormal Returns from Factor Models

Quantile	Individual Stocks				EW Portfolio	VW Portfolio
	XRET	3-Factor $\alpha$	4-Factor $\alpha$	5-Factor $\alpha$	5-Factor $\alpha$	5-Factor $\alpha$
<i>Panel B. Proportion of Secured Debt</i>						
<i>Lowest Z-Score Quartile</i>						
1 (low)	0.65% (5.84)	-0.11% (1.06)	0.04% (0.39)	-0.04% (0.35)	-0.17% (1.05)	0.15% (0.86)
2	0.72% (6.10)	-0.06% (0.54)	0.13% (1.16)	0.07% (0.62)	0.11% (0.64)	0.02% (0.11)
3	0.67% (5.65)	-0.15% (1.41)	0.03% (0.24)	-0.04% (0.38)	-0.08% (0.48)	0.15% (0.68)
4	0.74% (6.34)	-0.02% (0.19)	0.15% (1.33)	0.11% (1.01)	0.06% (0.33)	-0.03% (0.13)
5 (high)	0.98% (8.43)	0.14% (1.24)	0.27% (2.40)	0.19% (1.68)	0.21% (1.13)	0.35% (1.70)
LS	0.33% (2.88)	0.25% (2.35)	0.23% (2.12)	0.23% (2.10)	0.38% (1.55)	0.20% (0.72)
N/months	25,150	25,150	25,150	25,150	324	324
<i>Highest Z-Score Quartile</i>						
1 (low)	0.50% (5.18)	0.05% (0.55)	0.21% (2.30)	0.20% (2.20)	0.20% (1.85)	0.26% (2.02)
2	0.40% (3.60)	-0.07% (0.71)	0.19% (1.83)	0.19% (1.80)	0.17% (1.35)	0.14% (0.73)
3	0.21% (1.78)	-0.31% (2.89)	-0.09% (0.9)	-0.07% (0.69)	-0.09 (0.63)	0.23% (1.09)
4	0.25% (2.23)	-0.22% (2.10)	0.02% (0.16)	0.01% (0.09)	0.04% (0.30)	0.25% (1.20)
5 (high)	0.23% (2.19)	-0.32% (3.31)	-0.16% (1.64)	-0.13% (1.38)	-0.08% (0.66)	0.46% (2.26)
LS	-0.28% (2.83)	-0.37% (4.08)	-0.37% (4.04)	-0.34% (3.65)	-0.28% (1.72)	0.20% (0.87)
N/months	21,292	21,292	21,292	21,292	324	324
<i>Panel C. Proportion of Convertible Debt</i>						
<i>Full Sample</i>						
1 (low)	0.52% (4.66)	-0.26% (2.49)	-0.12% (1.09)	-0.14% (1.28)	-0.14% (0.96)	0.07% (0.49)
2	0.32% (2.86)	-0.41% (3.93)	-0.24% (2.31)	-0.30% (2.80)	-0.30% (2.01)	-0.18% (1.04)
3	0.31% (2.69)	-0.40% (3.68)	-0.24% (2.19)	-0.29% (2.63)	-0.21% (1.45)	-0.14% (0.75)
4	0.31% (2.60)	-0.34% (3.10)	-0.14% (1.23)	-0.21% (1.85)	-0.21% (1.28)	0.23% (1.15)
5 (high)	0.72% (5.88)	0.06% (0.54)	0.29% (2.54)	0.32% (2.78)	0.34% (1.93)	0.75% (3.20)
LS	0.20% (1.73)	0.32% (3.02)	0.40% (3.74)	0.45% (4.18)	0.48% (2.10)	0.68% (2.43)
N/months	19,034	19,034	19,034	19,034	324	324

expected stock returns, Panel C presents the results for the full sample. In all specifications, the alpha is larger for the fifth quantile compared to the first quantile. Importantly, the alpha of firms in the fifth quantile is positive and significant in all cases. Moreover, the strategy of going long the firms in the fifth quantile and short the firms in the first quantile yields abnormal returns between 32 bps and 68 bps per month. These numbers are statistically significant and economically large.

### C. Discussion

So far, the analysis has shown that the variables SHAREHOLDERS, SECURED, and CONVERTIBLE affect stock returns even after taking into account other factors (size, book-to-market ratio, and momentum). The reason put forth in this paper regarding why these variables are relevant in explaining stock returns is that they capture a specific dimension of a firm's exposure to risk factors. From the model, we know that this dimension relates to the strategic behavior of shareholders in default, and their possibilities to extract rents from creditors. This dimension becomes most relevant for firms close to the default threshold, and it seems that this effect is not correctly measured by the other variables accounting for the cross section of expected stock returns. Thus, the effect explored in this paper does not necessarily identify a new priced factor, but rather points to an important economic mechanism that relates renegotiation frictions, debt structure, and strategic default to stock returns.

## V. Robustness and Further Evidence

This section contains robustness checks to further support the main results.

### A. Instrumental Variables Estimation

A potential concern with the inference so far is that the proportion of secured and convertible debt could be endogenously determined. In this section, I address this issue by using an instrumental variable regression. I use instruments for secured and convertible debt that are likely to meet the relevance and exclusion restrictions.<sup>12</sup> The relevance restriction requires that the instrument has a clear effect on the endogenous variables (secured or convertible debt). The exclusion restriction requires that the instrument should be uncorrelated with any other determinants of the dependent variable in the second stage (stock returns). In other words, and in the context of this paper, the instrument has no effect on stock returns other than indirectly through the first-stage channel (i.e., through its effect on secured or convertible debt).

My first instrument for secured and convertible debt is a dummy variable equal to 1 for utility industries (4-digit SIC codes between 4900 and 4999), and 0 otherwise. Recent research suggests that collateral is a first-order determinant of capital structure (see, e.g., Rampini and Viswanathan (2013)). Because utility firms typically have valuable tangible assets that can serve as collateral and increase the firm's debt capacity, the utility industry dummy is likely to be significantly related to debt capacity and hence to the firm's ability to raise secured or convertible debt. Furthermore, I do not expect the utility industry dummy to be systematically related to stock returns other than through its effect on debt capacity and capital structure. As a result, the exclusion restriction is likely to be satisfied.

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<sup>12</sup>See, for instance, Angrist and Pischke (2009) for a discussion of these restrictions.



The second instrument for secured debt is the 1-year lagged secured debt. Indeed, the lag of secured debt should capture systematic differences in the level of secured debt and is likely to be positively related to the level of secured debt in the next year. At the same time, there is no reason to believe that the *lagged* accounting value of secured debt has a systematic effect on *contemporaneous* stock returns other than through its effect on the contemporaneous level of secured debt.

For convertible debt, I also use the utility industry dummy and the 1-year lagged proportion of convertible debt as instruments. Because the convertible debt regression includes the additional dummy variable DCONV, which equals 1 if the firm has convertible debt outstanding, and 0 otherwise, I add a third instrumental variable to have an overidentified system. Specifically, I use as an instrument a dummy variable equal to 1 if the firm has a credit rating, and 0 otherwise. Indeed, research suggests that the presence of a credit rating is positively and significantly related to financial leverage (Faulkender and Petersen (2006)). Furthermore, it seems implausible that the presence of a credit rating would systematically impact stock returns other than through its impact on the firm's level of debt.

Table 6 reports the first- and second-stage estimation results of these instrumental variable regressions for secured and convertible debt. The results confirm the findings of the previous sections. The coefficient of secured debt is significantly positive for firms close to the renegotiation threshold (column 2). The coefficient is also significantly larger compared to the Fama–MacBeth (1973) estimates (the coefficient increases from 0.002 to 0.005). Furthermore, the results from the first-stage regression suggest that the instruments are significantly related to the proportion of secured debt. Finally, the  $p$ -value from a test of overidentifying restrictions shows that the joint null hypothesis that the instruments are valid cannot be rejected. Noteworthy, and as expected, the coefficient of SECURED is not significantly different from 0 for firms in the highest Z-score quartile (column 4).

The coefficient estimates for convertible debt are also positive and statistically significant (column 7 of Table 6), supporting the results of the Fama–MacBeth (1973) estimations and the portfolio analysis. Also, the  $p$ -value of the test of overidentifying restrictions is above the critical level to reject instrument validity. Overall, the results using instrumental variable regressions provide further support for the model's predictions and the main results.

## B. Alternative Proxy for Renegotiation Frictions

This section explores the relation between an alternative proxy for renegotiation frictions and stock returns. Specifically, I compute an HHI based on the equity ownership by each institutional investor. This measure should take into account the voting power differences among institutional shareholders. It has a high value when institutional ownership is concentrated, and a low value when there are many institutional investors with relatively small ownership stakes. Admittedly, debt renegotiation will be easier with a more concentrated ownership structure, as coordination among relatively few large shareholders is easier than among many small shareholders (see also Davydenko and Strebulaev (2007)).

TABLE 6  
Instrumental Variable Regressions

Table 6 presents the first- and second-stage estimates from instrumental variable regressions. The dependent variable in columns 2, 4, and 7 is the monthly stock return. SHAREHOLDERS is the normalized number of institutional shareholders, SECURED is the proportion of secured to total debt, CONVERTIBLE is the proportion of convertible to total debt, and DCONV is a dummy equal to 1 if the firm has convertible debt, and 0 otherwise. The sample period is 1985–2012. Please refer to Table 1 for a definition of the variables. The instruments for secured debt are a utility industry dummy and 1-year lagged secured debt. The instruments for convertible debt are a utility industry dummy, 1-year lagged convertible debt, and the presence of a credit rating. The Sargan  $\chi^2$ -statistic of overidentifying restrictions and its  $p$ -values are presented at the bottom of the table. All specifications include monthly dummies. Robust standard errors are reported in parentheses below the coefficient estimates. \*\*\*, \*\*, and \* indicate coefficients significant at the 1%, 5%, and 10% levels, respectively.

	Lowest Z-Score Quartile		Highest Z-Score Quartile		Full Sample		
	SECURED		SECURED		CONVERTIBLE	DCONV	
	Stage 1	Stage 2	Stage 1	Stage 2	Stage 1	Stage 1	Stage 2
	1	2	3	4	5	6	7
SECURED		0.005*** (0.002)		-0.001 (0.001)			
CONVERTIBLE							0.042*** (0.009)
DCONV							-3.223*** (0.654)
SHAREHOLDERS	-2.888*** (0.339)	1.167*** (0.228)	0.023 (0.550)	0.114 (0.303)	3.309*** (0.131)	0.005** (0.003)	0.821*** (0.140)
SIZE	-0.919*** (0.036)	0.084*** (0.024)	-1.551*** (0.043)	0.150*** (0.024)	-0.283*** (0.013)	-0.003*** (0.001)	0.106*** (0.014)
log(BOOK-TO-MARKET)	1.376*** (0.076)	0.282*** (0.051)	-0.248** (0.107)	0.591*** (0.059)	-1.467*** (0.027)	0.009*** (0.001)	0.477*** (0.038)
MOMENTUM	0.037*** (0.012)	0.067*** (0.008)	0.151*** (0.017)	0.012 (0.009)	-0.009** (0.004)	-0.001*** (0.000)	0.047*** (0.005)
UTILITY_DUMMY	0.895*** (0.322)		-2.303** (1.170)		-0.165 (0.149)	0.062*** (0.003)	
LAGGED_SECURED	0.711*** (0.002)		0.733*** (0.002)				
LAGGED_CONVERTIBLE					0.801*** (0.001)	0.011*** (0.000)	
CREDIT_RATING					2.180*** (0.054)	0.110*** (0.001)	
Monthly dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	139,860	139,860	127,829	127,829	503,374	503,374	503,374
Adj. $R^2$	0.54	0.13	0.58	0.17	0.64	0.46	0.14
Sargan $\chi^2$ -statistic		0.37		0.43			2.12
$p$ -value ( $\chi^2$ )		0.55		0.51			0.15

Hence, low values of the HHI should be related to high renegotiation frictions, and vice versa.

To construct the proxy, I extract the proportion of shares held by every institutional investor in each quarter from the Thomson Financial Ownership database, and then compute the HHI for every firm in my sample. Because these voting-power differences are more important for firms with a higher fraction of institutional ownership, the tests in this section consider only firms with at least 15% of shares held by institutional investors. The results are robust to variations in this cutoff level.

I sort stocks into 5 quantiles based on this HHI, and then estimate abnormal returns from factor models. Table 7 presents the abnormal returns from these estimations for firms in the lowest and highest Z-score quartiles, respectively. The results largely confirm the results from the previous sections. Notably, the

TABLE 7  
Alternative Proxy for Renegotiation Frictions

Table 7 reports calendar-time portfolio abnormal returns. At the beginning of every calendar month, stocks are sorted into 5 quantiles based on the HHI measuring institutional ownership concentration. Alpha is the intercept on a regression of monthly excess returns on explanatory variables that include the monthly returns from the Fama–French (1993) mimicking portfolios, the Carhart (1997) momentum factor, and the Pastor–Stambaugh (2003) liquidity factor. These alphas are computed using all individual stocks by quantile, or using equal- (EW) and value-weighted (VW) monthly portfolio returns by quantile. LS is the alpha of a zero-cost portfolio of firms that holds the firms in the highest quantile and sells short the firms in the lowest quantile. N/months is either the average number of observations per quantile or the number of months with portfolio returns. The sample period is 1985–2012. Please refer to Table 1 for a definition of the variables. *t*-statistics are shown in parentheses below the coefficient estimates.

Quantile	Lowest Z-Score Quartile				Highest Z-Score Quartile			
	Individual Stocks		EW Portfolio	VW Portfolio	Individual Stocks		EW Portfolio	VW Portfolio
	4-Factor $\alpha$	5-Factor $\alpha$	5-Factor $\alpha$	5-Factor $\alpha$	4-Factor $\alpha$	5-Factor $\alpha$	5-Factor $\alpha$	5-Factor $\alpha$
1 (low)	0.52% (4.55)	0.44% (3.82)	0.41% (2.33)	0.45% (1.88)	0.29% (3.25)	0.29% (3.27)	0.36% (3.33)	0.49% (3.97)
2	0.36% (3.19)	0.28% (2.44)	0.17% (1.06)	−0.02% (0.11)	0.07% (0.85)	0.05% (0.63)	0.09% (0.81)	0.31% (2.32)
3	0.03% (0.27)	−0.04% (0.39)	−0.02% (0.13)	0.06% (0.30)	0.12% (1.39)	0.13% (1.50)	0.14% (1.21)	0.20% (1.33)
4	0.11% (1.09)	0.03% (0.25)	0.11% (0.67)	0.07% (0.35)	0.18% (2.16)	0.19% (2.22)	0.15% (1.29)	0.32% (2.00)
5 (high)	0.10% (0.94)	0.04% (0.40)	0.15% (0.93)	0.13% (0.69)	0.13% (1.55)	0.15% (1.72)	0.14% (1.26)	0.50% (3.11)
LS	−0.42% (3.65)	−0.40% (3.43)	−0.26% (1.10)	−0.32% (1.04)	−0.16% (1.77)	−0.14% (1.63)	−0.22% (1.39)	0.01% (0.06)
N/months	20,878	20,878	324	324	24,991	24,991	324	324

alphas are significantly higher in the lowest quantile (high renegotiation frictions) compared to the highest quantile (low renegotiation frictions). For instance, in column 1, the alpha from a 4-factor model is 52 bps per month and statistically significant in the lowest quantile, whereas the alpha is 10 bps (insignificant) in the highest quantile. As a result, the strategy of going long the stocks in the *lowest* quantile and selling short the firms in the *highest* quantile yields a positive and significant alpha of 42 bps per month. This result becomes slightly weaker for the equal- and value-weighted portfolio abnormal returns. The return difference between highest and lowest quantile drops to around 30 bps and loses statistical significance. However, the alphas in the lowest HHI quantile are positive and significant across all factor models. By contrast, the results are much weaker for firms farther away from the renegotiation threshold. In particular, the return difference of an LS portfolio is economically smaller and statistically not significant.

### C. Renegotiation Frictions around Chapter 11 Filings

To provide further supporting evidence of the effect of renegotiation frictions on distressed stock returns, I collect data on actual Chapter 11 filings from the UCLA–LoPucki Bankruptcy Research Database (BRD).<sup>13</sup> The BRD provides information on each bankrupt firm, such as which chapter was filed, whether or not the filing was voluntary, the length of the procedure, and so forth. I match

<sup>13</sup>This database can be obtained through [http://lopucki.law.ucla.edu/request\\_download.htm](http://lopucki.law.ucla.edu/request_download.htm).

these data with my sample of firms and identify 417 Chapter 11 filings. For each firm, I keep observations from a maximum of 5 years before and 3 years after Chapter 11 filing, and sort firms into two groups based on the median time spent in bankruptcy. Next, I split the sample at the median based on the main proxy for renegotiation frictions, SHAREHOLDERS. I then estimate 5-factor models and investigate the return premium for firms with high relative to low renegotiation frictions.<sup>14</sup> Table 8 reports the results.

TABLE 8  
Renegotiation Frictions and Distress Premia around Chapter 11 Filings

Table 8 reports calendar-time abnormal returns for firms that filed for Chapter 11 bankruptcy. For a maximum of 5 years before to 3 years after the filing, stocks are sorted, at the beginning of every calendar month, into two groups based on the median time a firm has spent in Chapter 11. In addition, each of these two groups is split into two groups based on the median of SHAREHOLDERS. Alpha is the intercept on a regression of monthly excess returns on explanatory variables that include the monthly returns from the Fama–French (1993) mimicking portfolios, the Carhart (1997) momentum factor, and the Pastor–Stambaugh (2003) liquidity factor. These alphas are computed using all individual stocks by quantile, or using equal- (EW) and value-weighted (VW) monthly portfolio returns by quantile. LS is the alpha of a zero-cost portfolio of firms that holds the firms in the highest quantile and sells short the firms in the lowest quantile. N/months is either the average number of observations per quantile or the number of months with portfolio returns. The sample period is 1985–2012. Please refer to Table 1 for a definition of the variables. *t*-statistics are shown in parentheses below the coefficient estimates.

SHAREHOLDERS	5-Factor $\alpha$					
	Long Bankruptcies			Short Bankruptcies		
	Individual Stocks	EW Portfolios	VW Portfolios	Individual Stocks	EW Portfolios	VW Portfolios
Below median	−3.36% (10.96)	−4.21% (3.32)	−6.40% (4.05)	−3.73% (11.05)	−4.87% (4.09)	−4.83% (2.74)
Above median	−2.82% (9.16)	−2.72% (2.39)	−3.47% (2.62)	−3.58% (10.84)	−2.56% (3.20)	−1.09% (0.95)
LS	0.53% (1.74)	1.49% (0.87)	2.93% (1.42)	0.15% (0.43)	2.31% (1.65)	3.74% (1.78)
N/months	3,660	97	97	3,645	97	97

The first pattern to note from Table 8 is that abnormal returns are negative for all groups. This finding is consistent with the fact that firms around bankruptcy filings experience important value losses. Furthermore, it turns out that the abnormal returns on the LS portfolio are positive and economically large, ranging from 15 bps to 3.74 percentage points. This result suggests that firms with higher renegotiation frictions (SHAREHOLDERS is above the median) earn reliably higher returns around Chapter 11 filings. Thus, it seems that shareholders of firms that expect renegotiations to be more difficult demand higher distress premia. Interestingly, the length of the bankruptcy procedure does not seem to have an important effect on this result. Overall, the tests in this section further support the view that renegotiation frictions are relevant determinants of distress premia in the cross section of stocks.

<sup>14</sup>Baldwin and Mason (1983) investigate the dynamics of the equity beta around the bankruptcy of one particular firm and find evidence consistent with deviations from the absolute priority rule. Similarly, Hackbarth et al. (2015) analyze the distress return premium for firms with and without deviations from the absolute priority rule and find evidence consistent with the view that shareholders' recovery and bargaining in default are important factors in explaining distress return premia.

#### D. Alternative Measures of Distress

In an additional robustness test, I use two alternative measures for firms' distance to the renegotiation threshold. The first proxy is based on Zmijewski's (1984) probit model for predicting bankruptcy.<sup>15</sup> I construct two groups of firms based on the median Zmijewski score. Firms with a score above the median are considered to be closer to the renegotiation threshold, and firms with a score below the median are considered to be farther away from the renegotiation threshold. Panel A of Table 9 reports abnormal returns from 5-factor models for quantiles based on SHAREHOLDERS and SECURED.

The results in Panel A of Table 9 show that, for SHAREHOLDERS, abnormal returns are economically larger for firms closer to the renegotiation threshold. For instance, whereas the value-weighted LS portfolio yields an abnormal return of 40 bps for firms with a Zmijewski score above the median, the abnormal return of the same portfolio for firms with a score below the median is only 28 bps. The results for secured debt are slightly weaker, but still support the idea that the effect is larger for firms closer to the renegotiation threshold.

The second additional measure is a default probability estimate, constructed along the lines of Bharath and Shumway (2008). As before, I make two groups of firms based on the below- and above-median probability of default. Panel B of Table 9 presents the results. The results are broadly consistent with the results in Panel A, again with slightly weaker results for secured debt. Taken together, these results suggest that the main findings of this paper are not very sensitive to a specific measure of financial distress.

#### E. Short- and Long-Term Debt

So far, the evidence in this paper suggests that the proportions of secured and convertible debt are positively related to average stock returns. As such, the paper's focus has been on specific *types* of debt. However, another natural dimension of debt structure to investigate is the split between short- and long-term debt. Indeed, theoretical research (see, e.g., Gertner and Scharfstein (1991), Berglöf and von Thadden (1994)) suggests that the presence of short-term debt makes debt renegotiation more difficult, because short-term lenders have little incentive to forgive debt when the concessions accrue to subordinated long-term debt holders. Thus, recent empirical research uses the firm's proportion of short-term debt as a proxy for renegotiation frictions and relates it to the pricing of debt and equity (see Davydenko and Strebulaev (2007) and Zhang (2012)).

To investigate the relation between short-term debt and stock returns in the context of this paper's research design, I follow the aforementioned papers and compute each firm's short-term debt as debt maturing within 3 years divided by

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<sup>15</sup>The probability of default based on the Zmijewski (1984) model is

$$N\left(-4.3 - 4.5\left(\frac{\text{Net income}}{\text{Total assets}}\right) + 5.7\left(\frac{\text{Total liabilities}}{\text{Total assets}}\right) - 0.004\left(\frac{\text{Current assets}}{\text{Current liabilities}}\right)\right),$$

where  $N$  is the standard cumulative normal distribution function.

TABLE 9  
Alternative Proxies for Distress

Table 9 reports calendar-time portfolio abnormal returns from a 5-factor  $\alpha$  model. At the beginning of every calendar month, stocks are sorted into 5 quantiles based on SHAREHOLDERS or SECURED. For secured debt, firms are grouped conditional that a firm has secured debt outstanding. The 5-factor  $\alpha$  is the intercept on a regression of monthly excess returns on explanatory variables that include the monthly returns from the Fama-French (1993) mimicking portfolios, the Carhart (1997) momentum factor, and the Pastor-Stambaugh (2003) liquidity factor. These alphas are computed using all individual stocks by quantile, or using equal- (EW) and value-weighted (VW) monthly portfolio returns by quantile. LS is the alpha of a zero-cost portfolio of firms that holds the firms in the highest quantile and sells short the firms in the lowest quantile. N/months is either the average number of observations per quantile or the number of months with portfolio returns. The sample period is 1985–2012. Please refer to Table 1 for a definition of the variables. *t*-statistics are shown in parentheses below the coefficient estimates.

Quantile	Above Median Zmijewski Score			Below Median Zmijewski Score		
	Individual Stocks	EW Portfolios	VW Portfolios	Individual Stocks	EW Portfolios	VW Portfolios
<i>Panel A. Zmijewski Score</i>						
SHAREHOLDERS						
1 (low)	−0.25% (3.52)	−0.30% (1.76)	−0.09% (0.48)	0.06% (1.04)	0.06% (0.38)	0.10% (0.61)
5 (high)	0.32% (4.19)	0.28% (1.51)	0.31% (1.94)	0.39% (6.27)	0.46% (3.65)	0.38% (2.29)
LS	0.57% (8.02)	0.58% (2.30)	0.40% (1.67)	0.33% (5.22)	0.40% (2.07)	0.28% (1.36)
N/months	62,070	324	324	62,010	324	324
SECURED						
1 (low)	0.11% (1.65)	0.03% (0.35)	0.28% (2.66)	0.14% (2.28)	0.14% (1.56)	0.24% (2.25)
5 (high)	0.20% (2.57)	0.13% (0.90)	0.43% (2.44)	0.14% (1.92)	0.14% (1.18)	0.37% (2.08)
LS	0.09% (1.31)	0.10% (0.54)	0.15% (0.71)	0.00% (0.01)	0.00% (0.04)	0.13% (0.61)
N/months	48,380	324	324	43,388	324	324
<i>Panel B. Default Probability</i>						
SHAREHOLDERS						
1 (low)	−0.19% (3.55)	−0.18% (1.10)	−0.21% (1.08)	0.01% (0.11)	−0.02% (0.11)	−0.07% (0.44)
5 (high)	0.27% (3.55)	0.29% (1.65)	0.46% (2.84)	0.44% (7.00)	0.44% (3.43)	0.33% (2.37)
LS	0.46% (6.68)	0.47% (1.96)	0.66% (2.65)	0.43% (6.82)	0.46% (2.37)	0.40% (1.95)
N/months	62,270	324	324	62,340	324	324
SECURED						
1 (low)	−0.04% (0.58)	−0.09% (0.71)	0.20% (1.51)	0.10% (1.69)	0.06% (0.56)	0.26% (2.19)
5 (high)	0.02% (0.31)	0.09% (0.59)	0.35% (2.19)	0.24% (3.55)	0.16% (1.44)	0.47% (2.48)
LS	0.06% (0.93)	0.18% (0.91)	0.15% (0.72)	0.14% (2.48)	0.10% (0.68)	0.21% (0.92)
N/months	48,330	324	324	43,860	324	324

total debt. Next, each calendar month, for firms with a low and high Z-score, respectively, I sort stocks into 5 quantiles based on the firm's short-term debt. I then estimate factor models to compute abnormal returns. Table 10 shows the results.

Interestingly, for firms located in the lowest Z-score quartile, the abnormal returns for firms with the highest proportion of short-term debt (quantile 5) are significantly higher compared to the abnormal returns of firms with the lowest proportion of short-term debt (quantile 1). For instance, for the value-weighted portfolio, the abnormal return is −29 bps per month for the lowest short-term debt quantile, and +29 bps per month for the highest short-term debt quantile.

TABLE 10  
Short-Term Debt and Average Stock Returns

Table 10 reports calendar-time portfolio abnormal returns. At the beginning of every calendar month, stocks are sorted into 5 quantiles based on the proportion of short-term debt. Alpha is the intercept on a regression of monthly excess returns on explanatory variables that include the monthly returns from the Fama–French (1993) mimicking portfolios, the Carhart (1997) momentum factor, and the Pastor–Stambaugh (2003) liquidity factor. These alphas are computed using all individual stocks by quantile, or using equal- (EW) and value-weighted (VW) monthly portfolio returns by quantile. LS is the alpha of a zero-cost portfolio of firms that holds the firms in the highest quantile and sells short the firms in the lowest quantile. N/months is either the average number of observations per quantile or the number of months with portfolio returns. The sample period is 1985–2012. Please refer to Table 1 for a definition of the variables. *t*-statistics are shown in parentheses below the coefficient estimates.

Quantile	Lowest Z-Score Quartile				Highest Z-Score Quartile			
	Individual Stocks		EW Portfolio	VW Portfolio	Individual Stocks		EW Portfolio	VW Portfolio
	4-Factor $\alpha$	5-Factor $\alpha$	5-Factor $\alpha$	5-Factor $\alpha$	4-Factor $\alpha$	5-Factor $\alpha$	5-Factor $\alpha$	5-Factor $\alpha$
1 (low)	−0.04% (0.39)	−0.12% (1.16)	−0.27% (1.29)	−0.29% (1.25)	0.02% (0.28)	0.01% (0.17)	−0.14% (0.82)	0.18% (0.85)
2	0.11% (1.17)	0.02% (0.24)	−0.06% (0.38)	0.19% (1.21)	0.09% (1.09)	0.08% (1.02)	0.05% (0.42)	0.24% (1.92)
3	0.05% (0.53)	0.01% (0.07)	−0.01% (0.05)	0.02% (0.16)	0.03% (0.41)	0.01% (0.16)	0.21% (2.13)	0.46% (3.84)
4	0.27% (2.36)	0.21% (1.85)	−0.04% (0.28)	−0.10% (0.57)	0.10% (1.25)	0.08% (0.96)	0.08% (0.75)	0.12% (0.94)
5 (high)	0.27% (2.14)	0.19% (1.49)	0.45% (1.76)	0.29% (1.26)	−0.01% (0.08)	0.06% (0.39)	0.13% (0.98)	0.38% (2.58)
LS	0.31% (2.93)	0.31% (2.93)	0.72% (2.18)	0.58% (1.77)	−0.03% (0.29)	0.05% (0.35)	0.27% (1.24)	0.20% (0.80)
N/months	25,880	25,880	324	324	25,680	25,680	324	324

As a result, the LS strategy yields an economically large abnormal return of 58 bps per month. For firms in the highest Z-score quartile, the differences in abnormal returns between the lowest and highest short-term debt quantile are much smaller in magnitude and not systematically different from 0. Hence, the results in this section somewhat mirror the results using SHAREHOLDERS or the HHI as a proxy for renegotiation frictions. Therefore, and as suggested by the literature, the proportion of short-term debt could be used as an additional proxy for frictions in the debt renegotiation process.

## VI. Conclusion

This paper analyzes whether renegotiation frictions and the firm's debt structure affect expected stock returns. In the model, shareholders can act strategically to induce default and recover a substantial fraction of firm value in renegotiation. The model generates predictions on the relation between renegotiation frictions, secured and convertible debt, and stock returns. In particular, the model predicts that firms that face more renegotiation frictions and that have a greater fraction of secured debt or convertible debt have higher expected stock returns.

Using a large sample of publicly traded U.S. firms between 1985 and 2012, I find strong support for the model's predictions. Moreover, the main results are robust to a possible endogeneity bias and to alternative measures of renegotiation frictions and distress. Overall, these new results highlight an important link between debt structure and stock returns, and suggest that the allocation of property rights implicit in debt covenants is an important determinant of stock returns.



One dimension of firms' debt structure not explored in this paper is the firms' proportion of public to total debt. Hence, a potential avenue for further research is to explore how the proportion of public to total debt relates to stock returns, either through the channel proposed in this paper or through another mechanism. I leave this question for future research.

## Appendix. Derivation

### 1. Straight Debt

Given the dynamics of the cash-flow shock,  $X$ , in equation (1), the after-tax cash flow to shareholders is  $\pi(X_t) = (X_t - c)(1 - \tau)$ . In equilibrium, this after-tax cash flow plus the expected change in the value of equity,  $\pi(X_t) + dE$ , must be equal to the risk-free return. Applying Itô's (1944) lemma, the value of equity,  $E(X)$ , satisfies the following ordinary differential equation (ODE):

$$\frac{1}{2}\sigma^2 X^2 E_{XX} + \mu^Q X E_X + (1 - \tau)(X - c) = rE,$$

where  $E_X$  and  $E_{XX}$  are the first and second derivatives, respectively, of the equity value with respect to the cash flow  $X$ . The ODE is solved subject to the value-matching, smooth-pasting, and no-bubbles condition:

$$\begin{aligned} \lim_{X \downarrow X_B} E(X) &= (1 - q)\eta\alpha \frac{X_B}{r - \mu^Q} (1 - \tau), \\ \lim_{X \downarrow X_B} E_X(X) &= (1 - q)\eta\alpha \frac{1}{r - \mu^Q} (1 - \tau), \\ \lim_{X \uparrow \infty} E(X)/X &\leq \infty. \end{aligned}$$

The general solution to the ODE is

$$E(X) = AX^{\lambda_1} + BX^{\lambda} + (1 - \tau) \left( \frac{X}{r - \mu^Q} - \frac{c}{r} \right),$$

where  $\lambda_1$  and  $\lambda$  are given by

$$\begin{aligned} \lambda_1 &= \left( \frac{1}{2} - \frac{\mu^Q}{\sigma^2} \right) + \sqrt{\left( \frac{1}{2} - \frac{\mu^Q}{\sigma^2} \right)^2 + \frac{2r}{\sigma^2}} > 0, \\ \lambda &= \left( \frac{1}{2} - \frac{\mu^Q}{\sigma^2} \right) - \sqrt{\left( \frac{1}{2} - \frac{\mu^Q}{\sigma^2} \right)^2 + \frac{2r}{\sigma^2}} < 0. \end{aligned}$$

The last boundary condition implies that  $A = 0$ . Using the value-matching condition in combination with the general solution yields

$$B = \left[ (1 - q)\eta\alpha \frac{X_B}{r - \mu} (1 - \tau) - (1 - \tau) \left( \frac{X_B}{r - \mu^Q} - \frac{c}{r} \right) \right] \left( \frac{1}{X_B} \right)^{\lambda}.$$

Replacing  $B$  in the general solution, solving for the endogenous renegotiation threshold,  $X_B$ , and simplifying yields the expression for equity value,  $E(X)$ , in Proposition 1.

Using the same techniques, the value of debt is given by

$$D(X) = \frac{c}{r} \left[ 1 - \left( \frac{X}{X_B} \right)^{\lambda} \right] + \left[ (1 - (1 - q)\eta\alpha - \alpha q) \frac{X_B}{r - \mu^Q} (1 - \tau) \right] \left( \frac{X}{X_B} \right)^{\lambda}.$$

Applying Itô's (1944) lemma to the value of equity and dividing by  $E_t$  yields

$$\frac{dE_t}{E_t} = \frac{1}{E_t} \left( \mu^Q X_t \frac{\partial E}{\partial X} + \frac{1}{2} \sigma_X^2 X_t^2 E_{XX} \right) dt + \sigma \frac{\partial E}{\partial X} \frac{X_t}{E_t} dB_t,$$

where the term  $(\partial E / \partial X)(X_t / E_t)$  corresponds to the equity beta,  $\beta_E$ , in equation (3). Next, taking the derivative of the equity beta,  $\beta_E$ , with respect to  $q$ , yields

$$\frac{\partial \beta_E}{\partial q} = \frac{\partial \beta_E}{\partial E} \frac{\partial E}{\partial q} = \underbrace{-\frac{\Omega(1-\tau)}{E^2}}_{-} \underbrace{\frac{\partial E}{\partial q}}_{-} > 0,$$

where  $\beta_E$  can be rewritten as

$$\beta_E = \frac{\Omega(1-\tau)}{E} + \lambda,$$

and

$$\Omega = X / (r - \mu^Q) - \lambda (X / (r - \mu^Q) - c/r) > 0.$$

Because the expected return, ER, is a linear function of the equity beta, it follows that  $\partial ER / \partial q > 0$ .

## 2. Secured Debt

The value of equity satisfies the same ODE as in the straight debt case. The value-matching, smooth-pasting, and no-bubbles conditions are given by

$$\begin{aligned} \lim_{X \downarrow X_B} E^S(X) &= (1-q)\eta\alpha(1-\pi) \frac{X_B}{r-\mu^Q} (1-\tau), \\ \lim_{X \downarrow X_B} E_X^S(X) &= (1-q)\eta\alpha(1-\pi) \frac{1}{r-\mu^Q} (1-\tau), \\ \lim_{X \uparrow \infty} E^S(X)/X &\leq \infty. \end{aligned}$$

Using the same form of general solution in combination with the value-matching and smooth-pasting conditions, algebraic derivations yield the expressions for the equity value,  $E^S$ , and the renegotiation threshold,  $X_S$ , in Proposition 2. The debt value is given by

$$\begin{aligned} D^S(X) &= \frac{c}{r} \left[ 1 - \left( \frac{X}{X_S} \right)^\lambda \right] \\ &+ \left[ (1 - (1-q)\eta\alpha(1-\pi) - \alpha q(1-\pi)) \frac{X_S}{r-\mu^Q} (1-\tau) \right] \left( \frac{X}{X_S} \right)^\lambda. \end{aligned}$$

## 3. Convertible Debt

The value of equity satisfies the same differential equation as in the straight and secured debt cases. The lower and upper boundary conditions to price equity in the presence of convertible debt are as follows:

$$\begin{aligned} \lim_{X \downarrow X_B} E(X) &= (1-q)\eta\alpha \frac{X_D}{r-\mu^Q} (1-\tau), \\ \lim_{X \downarrow X_B} E_X(X) &= (1-q)\eta\alpha \frac{1}{r-\mu^Q} (1-\tau), \\ \lim_{X \uparrow X_C} E(V) &= (1-\gamma) E'(X_C). \end{aligned}$$

Using the first and third boundary condition and same form of general solution as in the straight debt case, algebraic manipulation yields the value of equity in Proposition 3.

The boundary conditions for pricing convertible debt are:

$$\begin{aligned}\lim_{X \downarrow X_B} D^C(X) &= [\varphi(1-q)(1-\eta\alpha) + \varphi q(1-\alpha)] \frac{X_D}{r - \mu\varrho} (1 - \tau), \\ \lim_{X \uparrow X_C} D^C(X) &= \gamma E'(X_C), \\ \lim_{X \uparrow X_C} D_X^C(X) &= \gamma \frac{\partial E'(X_C)}{\partial X_C}.\end{aligned}$$

Similarly, using the first and third boundary conditions and the general solution to the differential equation yields the following value of convertible debt:  $D^C(X)$ ,

$$\begin{aligned}D^C(X) &= \frac{CC}{r} + AR \left( (1 - (1-q)\alpha\eta - q\alpha)\varphi \frac{X_D}{r - \mu\varrho} (1 - \tau) - \frac{CC}{r} \right) \\ &\quad + AC \left( \gamma E'(X_C) - \frac{CC}{r} \right),\end{aligned}$$

where AR and AC are given in Proposition 3.

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