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Corporate Litigation and Debt

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Abstract
This study examines the effect of litigation risk and litigation costs on firms' credit ratings and debt financing. The results show that litigation affects a firm's creditworthiness and debt costs in two stages. Before a lawsuit filing, firms at higher risk of litigation have lower credit ratings, are more likely to be rated speculative grade, pay higher yields on loans and bonds, and are less likely to rely on debt financing. At the time of the lawsuit resolution, settlement costs have an additional effect on firm credit quality. Companies facing larger settlement disbursements in relation to their available cash experience a decline in credit ratings and an increase in yield spread. The results are robust to endogeneity concerns and different proxies of litigation risk.

Keywords
Corporate debt, Credit ratings, Cost of debt, Litigation, Lawsuits

1. Introduction

As the Deepwater Horizon rig exploded and started sinking in the Gulf of Mexico in April 2010, British Petroleum (BP) experienced a significant increase in litigation risk. In the summer of 2010 Standard & Poor's downgraded BP long-term credit rating from AA, a rating that BP had maintained throughout its

corporate history, down a full letter rating to A. The downgrade had significant implications for BP's cost of debt.[1] Additionally, BP faced high reputational costs that manifested in a loss of customers and a decline in sales. As the case of BP clearly illustrates, litigation risk can have strong and lasting consequences on the creditworthiness and financing costs of corporations. This study contributes to the law and finance literature by thoroughly examining the effect of overall corporate litigation risk and lawsuit outcomes on firms' credit quality, cost of debt, and debt issuance.

After a small decline in lawsuits immediately following the ratification of the Private Securities Litigation Reform Act of 1995, the number of corporate litigation filings started rising again with an increase of more than 50% in the last decade. Over the same period corporate litigation costs grew twofold (Arena and Ferris, 2017). As litigation has grown to become a major source of risk and costs for corporations, researchers have started to provide empirical evidence of the effect of litigation on firms' policies and financial outcomes. Lowry and Shu (2002) and Arena and Julio (2015), among others, show that litigation risk has a significant effect on corporate financial decisions such as securities issuance, cash holdings, and capital expenditures. This study adds to the evidence by providing a thorough analysis of the relation between litigation and corporate debt to show that both litigation risk and the outcome of corporate lawsuits have a significant effect on a firm's creditworthiness and debt costs.

The plaintiffs of a corporate lawsuit compete with other firm's stakeholders in their claim for corporate cash. Because many lawsuits are resolved by large settlements, creditors are likely to be one of the main corporate stakeholders' groups affected by litigation. The effect of lawsuits on the ability of creditors to recover their lent funds from the defendant firm should lead to lower corporate credit ratings and higher firm's cost of debt. As firms rely more on corporate long-term debt (i.e., bonds and loans) than equity to raise capital (Henderson et al., 2006) litigation risk is likely to have strong implications on the firm's ability to raise funds and to invest in net present value opportunities.

This study presents the most complete analysis on the effects of litigation on corporate debt to date by examining for the first time all corporate lawsuits and all types of corporate debt. Moreover, this study is the first to analyze the implication of actual settlement costs on credit ratings and yield spread. Other papers in this area (Autore et al., 2014, Deng et al., 2016, Yuan and Zhang, 2015) present only a partial picture of this issue by restricting their analysis to bank loan spreads and security class action lawsuits and by not including an analysis of the resolution of litigation risk through settlements.

To fully understand the implication of litigation risk and costs on corporate debt policy, it is important to consider all types of debt companies have at their disposal as funding opportunities. As shown by Denis and Mihov (2003) and Arena (2011) about half of the corporate debt issues and more than half of the total debt volume come from corporate public bonds, 144-A debt placements and other non-bank private debt. Moreover, this study further contributes to our understanding of the effect of litigation risk on corporate debt by considering for the first time a comprehensive sample of lawsuits. In addition to security class action lawsuits, the sample of this study includes product liability, copyright, patent, fraud, antitrust, trade regulation, and labor law lawsuits among others. In many cases the requested damages by the plaintiffs and the resulting settlement for non-security lawsuits is in the hundreds of millions of dollars. These types of lawsuits also generate large indirect costs to corporations (e.g., Engelmann and Cornell 1988; Karpoff and Lott 1993), with strong negative effects on creditors' recovery prospects. By considering all types of lawsuits this study avoids potential biases in the estimation of litigation risk.

This paper is also the first to present an examination of the resolution of litigation risk by analyzing the effect of settlement costs on yield spread and credit ratings. While credit rating agencies and debtholders can estimate litigation risk and factor it in when evaluating the firms' creditworthiness, it is only at the time of the resolution of a lawsuit that the impact of litigation on firm's value can be fully evaluated. When settlements costs in comparison to available corporate cash holdings are higher than initially anticipated, company might need to raise additional debt capital to supplement their cash in hands to pay the plaintiffs. Credit ratings are likely to deteriorate and the cost of debt is likely to increase incrementally over the change that took place at the time of the filing of the lawsuit.[2]

The results of this study show that firms at higher risk of litigation have lower credit ratings, are more likely to be rated speculative grade, pay higher yields on debt, and are less likely to issue debt, everything else constant. As litigation risk increases, credit ratings decline and the cost of debt increases. At the time of the lawsuit resolution, settlement costs have a significant effect on the cost of debt. Companies facing larger settlement disbursements in relation to their available cash experience a larger decline in credit ratings and a greater increase in yield spread. I also find that the effect of litigation risk and large settlements on cost of debt and debt issuance is stronger for low credit quality firms. The results of this study suggests that litigation affects a firm's creditworthiness and cost of debt in two stages, first when litigation risk develops and then at the time of the resolution of the lawsuit. The results of this study are also economically significant. For instance, increasing the litigation probability variable from its 25th to its 75th percentile while retaining all other variables at their medians, decreases the probability of being rated investment grade from 51.4% to 39.7% and increases the yield spread by 18 basis points.

Omitted variables that could affect both a firm's credit quality and litigation risk might potentially have an endogenous effect on their relation. There is even the possibility of reverse causality between the incidence of litigation and cost of debt (or credit ratings). To control for these potential endogeneity issues, I apply a two-stage simultaneous equation model similar to the methodology used by Lowry and Shu (2002) and Kini et al. (2017). This test helps dispel endogeneity concerns and shows a causal relationship between litigation risk and cost of debt.

The rest of this paper is organized as follows. Section 2 presents the hypotheses. Section 3 outlines the sample selection requirements and variables. Section 4 provides summary statistics and the results of the univariate analysis. Section 5 presents the multivariate analysis results. Section 6 presents the simultaneous equation analysis and other robustness tests. Section 7 concludes.

2. Hypotheses

Settlements and attorneys' fees often represent significant direct costs for corporations with negative implications on corporate profits and value. Arena and Julio (2015) report an average settlement amount of $56 million for companies that disclose settlement costs in their sample. Even though many firms buy litigation insurance, as reported by the Towers Perrin Directors and Officers Liability Surveys, publicly traded firms have an average litigation insurance limit under $20 million, which does not cover for the full direct costs of litigation in most cases.

Besides direct costs, companies also face indirect costs of litigation that often affect a firm's debt and equity value more than direct costs. Indirect costs include an increase in the perceived uncertainty about the firms' prospects by investors, a reduction in firm's prestige, loss in the number of customers

and suppliers, and diversion of managers' time and resources (Engelmann and Cornell, 1988, Karpoff and Lott, 1993, Karpoff et al., 2008).

Due to these costs which have a significant effect on profitability and firm's value, debtholders are negatively affected by lawsuits and are likely to take into consideration litigation risk at the origination of the debt issue. Debtholders, therefore, might require a higher interest rate to offset the perceived litigation risk, everything else constant. Similarly, credit rating agencies are likely to include litigation risk in their assessment of the credit worthiness of the borrowing firm as a decline in profitability and firm value due to litigation has a direct effect on default risk. Bradley and Chen (2011) show that, when corporate directors are better protected by limited liability and indemnification provisions from possible lawsuits, firms enjoy higher credit ratings and lower yield spreads. Yuan and Zhang (2015) and Deng et al. (2016) find that companies with higher risk of class action litigation and after the filing of a litigation experience higher interest on their bank loans.

Hypothesis 1a
Firms at higher risk of litigation have lower credit ratings, everything else constant.

Hypothesis 1b
Firms at higher risk of litigation are more likely to be rated speculative grade, everything else constant.

Hypothesis 2
Higher litigation risk significantly increases a firm's cost of debt.

If litigation risk is likely to have a significant impact on cost of debt, firms that are more exposed to lawsuits are likely to reduce their reliance on debt financing. While there is no previous study on the effect of litigation risk on debt financing, Autore et al. (2014) show that, following severe lawsuits for which they incurred large costs, firms are less likely to seek external debt financing ex post.

Hypothesis 3
Firms at higher risk of litigation are less likely to rely on external debt financing, everything else constant.

The effects of litigation on corporate financing policy are long lasting. Firms tend to reduce their financing activities following costly lawsuits (Autore et al., 2014). Litigation risk affects firm value and firm financial policies due to managers' and stakeholders' expectations about future litigation costs. However, the full implications of litigation on firm value and liquidity are only known at the time of the lawsuit resolution. Arena and Julio (2016) show that litigation risk affects how firms design their payout policy. Corporations modify their payout policy when the lawsuit is resolved and the direct costs of litigation are incurred. If settlement costs in comparison to cash in hand are higher than anticipated, credit ratings therefore might decline and cost of debt might increase incrementally over the changes that took place at the time that the litigation risk was initially perceived. Moreover, if disclosed settlement costs are higher than expected firms will face additional reputational costs, which could further depress credit ratings and elevate debt financing costs.

Hypothesis 4

At the time of the lawsuit resolution, settlement costs have a significant negative effect on credit ratings and a significant positive effect of a firm's cost of debt. This effect is more pronounced for firms with smaller cash reserves in relation to settlement disbursements.

3. Sample formation and variables

3.1. Sample

The initial sample consists of the entire population of Compustat firms from 2000 to 2013 with no missing data for the financial statement variables used in the analysis. I match this initial sample with the CRSP database to retrieve stock data and exclude firms that CRSP does not cover. As in similar studies, utility and financial firms are excluded from the sample. I then merge this sample with corporate lawsuits retrieved from the Audit Analytics – Corporate Litigation database. The coverage provided by this dataset begins in 2000 and reports information on federal civil lawsuits with U.S. publicly-traded firms as defendants. Audit Analytics collects information from corporate disclosures, corporate newswires, and from legal disclosures, registrations and legal opinions filed with the SEC. The most common types of corporate lawsuits are security class action lawsuits, followed by products liability, copyright and patent, antitrust and trade regulation litigations. This litigation dataset contains information about the type of lawsuit, lawsuit filing dates, beginning and ending of each class period, type of resolution and settlement costs when available. The final sample containing firm characteristics, litigation information and credit ratings consists of 13,326 observations.

For the analysis about cost of debt, I merge this database with Thomson One-Banker (SDC Global Issues) to retrieve information about debt issue types, principal amount, maturity, and yield. Because many firms place debt securities with the same characteristics within a limited period, I aggregate similar issues by a firm within each year as in Denis and Mihov (2003). The principal of the aggregated debt is the sum of the principals of the single debt issues, while the maturity of the aggregated debt is the weighted average of the maturities of the single issues. The resulting debt cost database consists of 12,604 observations.

3.2. Variables

I measure litigation risk, one of the main independent variables of this study, using a variety of approaches. The first proxy of litigation risk, *Lawsuit dummy*, is an indicator variable equal to one for the firms involved in a litigation event in the following year and zero otherwise as in Lowry and Shu (2002) and Arena and Julio (2015). The second litigation risk proxy, *Litigation risk*, is a measure of ex ante litigation risk obtained by modeling the probability of being brought into litigation as a function of firm characteristics and stock performance variables that have been demonstrated to be related to litigation risk in the literature. The probit regression includes many of the variables used in the litigation risk estimation models of Kim and Skinner (2012) and Gande and Lewis (2009), such as stock return, stock volatility, and industry-specific indicator variables. To avoid the parameter identification problem, the litigation risk probit model of this study does not include any of the variables used in the main multivariate analysis. Appendix B reports the results of this probit regression. The third proxy, *Industry litigation risk*, is an industry measure of litigation risk calculated as the number of lawsuits filed each year against firms in the same three-digit SIC industry divided by the total number of firms in that industry.[3]

The other litigation variables relate to the outcome of the lawsuit. *Ln settlement* is the logarithm of the settlement amount plus one. The addition of one to the settlement amount allows the inclusion of lawsuits resolved with a dismissal for which the settlement amount is equal to zero. *Settlement cash*, is calculated as the settlement dollar amount paid by the defendant firm at the time of the resolution of the lawsuit, divided by cash and short-term securities. Having cash in the denominator allow for an estimation of the effective cost of the settlement as firms with lower quantities of cash at hand are more severely affected by a lawsuit settlement. The *Settlement dummy* is set to one for lawsuits resolved in a settlement and zero for lawsuits resolved in favor of the defendant firms with either a dismissal, withdrawal, or a favorable jury verdict. Finally, *Insufficient cash* is an indicator variable equal to one if the settlement costs exceed the firm's cash holdings, and zero otherwise.

I construct the main credit rating variable as in Ashbaugh-Skaife et al. (2006) and Arena (2011) by converting credit ratings into numerical scores (i.e., 7 for AAA rating, 6 for AA ratings, 5 for A ratings, etc.). I also generate an investment grade indicator variable equal to one if the firm is rated investment grade (BBB- or better) and zero otherwise.

The cost of debt variable, as in Arena and Dewally (2012), is calculated as the weighted average of the yield spread of corporate bonds and bank loans on the issuance year (bps over the Treasury security of comparable maturity).

The control variables are firm characteristics that previous studies find related to credit rating and cost of debt: total assets, net leverage, profitability, a net loss indicator variable, fixed assets, capital expenditures, and Altman's Z (e.g., Kaplan and Urwitz, 1979). The cost of debt regressions contains also the debt issue specific control variables maturity and deal size which are averaged annually for each firm. Appendix A provides a descriptions of all the variables.

4. Descriptive statistics and univariate analysis

Panel A of Table 1 presents descriptive statistics for firm, deal, and lawsuit variables. Debt issues have an average (median) principal of is $ 657 M ($ 300 M), an average (median) maturity of 6.35 years (5 years) and an average (median) spread over the yield of a treasury security of similar maturity of 2.02 % (1.63%). The average of the lawsuit dummy is 0.09, which implies that on average 9% of our sample firms are sued each year. Some firms in our sample are sued more than once per year as the average of the number of lawsuits per firm per year is 0.13. The average probability of getting sued, as measured by litigation risk, is 0.09. The average industry litigation risk is 0.17. About 38% percent of lawsuits for which resolution data is available terminate with a settlement. The rest are resolved in favor of the defendant firm usually through withdrawal or dismissal. The average (median) settlement amount for lawsuits that have reached a resolution by the end of 2014 is $ 192 M ($ 15 M). The average (median) settlement divided by the firm's cash holding is 3.20 (0.12).[4] The average (median) time that lapses from the date of the lawsuit filing to the lawsuit resolution (settlement, dismissal, withdrawal, or resolved in favor of the defendant firm) is 1.48 (1.10). The large reduction in sample size for the settlement data can be explained by the fact that the settlement paid by the defendant firm to the plaintiffs is not publicly disclosed in several cases. Moreover, many of the lawsuits filed towards the end of the sample period were not resolved yet at the time of the data collection.

Table 1. Descriptive statistics.

Panel A – Variables descriptive statistics				
	Mean	Median	St Dev	N
Total assets	4235.40	345.84	20,998.88	13,326
Leverage	0.19	0.13	0.30	13,326
ROA	0.02	0.03	0.88	13,326
Sales growth	0.03	0.05	1.22	13,326
Market-to-book	2.12	1.49	2.98	13,326
Altman's Z	6.67	2.59	16.56	13,326
Credit rating	3.44	3.00	1.19	12,604
Debt principal	657.32	300.00	1409.00	12,604
Debt maturity	6.35	5.00	8.24	12,604
Yield spread	202.24	162.50	166.77	13,046
Lawsuit dummy	0.09	0.00	0.28	13,326
N lawsuits	0.13	0.00	0.51	13,326
N outstanding lawsuits	0.42	0.00	1.26	13,326
Litigation Risk	0.09	0.06	0.09	13,326
Industry Litigation risk	0.17	0.14	0.19	13,326
Settlement dummy	0.36	0.00	0.21	2269
Settlement	191.73	15.00	484.58	2269
Settlement cash	3.20	0.12	32.36	2269
Years to resolution	1.48	1.10	2.56	2269
Panel B: Correlation between litigation proxies				
	Lawsuit dummy	Litigation risk	Industry litigation risk	
Lawsuit dummy	1.000	0.315	0.179	
		(0.000)	(0.000)	
Litigation risk		1.000	0.263	
			(0.000)	
Industry litigation risk			1.000	

Panel A presents descriptive statistics for the firm, deal, and lawsuit variables used throughout the study.
Panel B presents the correlation between the three litigation proxies. *p*-values are reported in parenthesis.

Panel B of Table 1 presents the Pearson correlation coefficients between the three proxies of litigation risk used in the study. While the three variables are significantly correlated, their correlation coefficients are all below 0.4, which confirms that the three proxies capture in part different dimensions of litigation risk.

Table 2 presents a univariate analysis of the effect of a lawsuit filing and lawsuit outcomes on the defendant firm's credit rating and yield spread. Panel A of Table 2 shows no significant difference in credit rating and spread between firms sued in the year of the lawsuit filing and firms not sued. However, both the mean and the median of the annual change in credit rating and yield spread are significantly different at the 10% or 5% level between sued and not sued firms. Specifically, in the year of the lawsuit filing the credit rating of the sued firm declines significantly more than for the non-sued control firm while the yield spread increase significantly more.

Table 2. Lawsuit initiation, lawsuit resolution, and debt characteristics.

	Panel A: Lawsuit filing and debt characteristics					
	Lawsuit dummy = 0		Lawsuit dummy = 1		*t*-test	Wilcoxon
	Mean	**Median**	**Mean**	**Median**	***p*-value**	***p*-value**
Credit rating	3.55	3	3.84	4	.534	.259
Δ Credit rating	−0.06	0	−0.10	0	.072	.095
Spread	206.11	164.33	192.42	160.80	.653	.782
Δ Spread	10.27	0	22.32	0	.039	.089
	Panel B: Lawsuit resolution and debt characteristics					
	Lawsuit dismissed		Defendant settled		*t*-test	Wilcoxon
	Mean	**Median**	**Mean**	**Median**	***p*-value**	***p*-value**
Credit rating	3.87	4	3.76	4	.534	.259
Δ Credit rating	−0.01	0	−0.07	0	.056	.096
Spread	142.54	121.55	214.56	179.52	.115	.135
Δ Spread	−10.65	0	19.76	0	.054	.098

This table presents univariate statistics for credit ratings and yield spread segmented by litigation events. Panel A presents mean, median, the p-value of the *t*-test of the difference of the mean, and of the Wilcoxon test for credit rating, change in credit rating, yield spread, and change in yield spread between firm-year observations at the time a lawsuit is filed and firm not subject to a lawsuit. Panel B presents mean, median, the *p*-value of the *t*-test of the difference of the mean and of the Wilcoxon test for credit rating, change in credit rating, yield spread, and change in yield spread between firm-year observations for the group of defendant firms that have their lawsuit dismissed or withdrawn and a group of firms that settle with the lawsuit plaintiffs. We calculate the change in credit rating as the credit rating in the year before the lawsuit filing (or lawsuit resolution) and the year after. We calculate the change in yield spread as the difference in spread of the debt issuance preceding the lawsuit filing (or lawsuit resolution) and the one following it.

Panel B of Table 2 presents analogous results by examining credit ratings and spread at the time of the lawsuit resolution. While the level of credit ratings and spread is not significantly different for defendant firms having their lawsuit dismissed versus firms settling with the plaintiffs, the difference is statistically significant for the change in credit rating and yield spread. The change in credit rating between the year before and the year of the lawsuit resolution is significantly more negative for firms that settle. Moreover, firms that settle experience an increase in yield spread from the previous year. Conversely, firms that see their lawsuit dismissed or withdrawn benefit from a decline in yield spread from the year before. The mean and median difference in the change of yield spread between these two groups of firm is statistically significant at the 10% level.

Table 3 presents credit ratings and yield spread by litigation risk and settlement quintiles. Quintiles 1 and 5 consist of firms in the lowest and highest litigation risk quintiles, respectively. Panel A of Table 3 shows that firms at higher risk of litigation have significantly lower credit ratings and higher yield spread. Even though firms at higher risk of litigation accumulate more cash in anticipation of future settlement costs (Arena and Julio, 2015), litigation risk has a negative effect of firms' creditworthiness even before controlling for other factors affecting it. These results provide preliminary support to Hypotheses 1 and 2.

Table 3. Litigation risk, settlement costs, and debt characteristics.

Panel A: Litigation risk quintiles							
	Q1	**Q2**	**Q3**	**Q4**	**Q5**	**Q5-Q1**	**Q5-Q1 (*p*-value)**
Credit rating	4.47	4.03	3.55	3.18	2.75	−1.72	(.050)
Spread	148.75	172.53	203.56	227.49	253.51	104.76	(.058)
Panel B: Industry litigation risk quintiles							
	Q1	**Q2**	**Q3**	**Q4**	**Q5**	**Q5-Q1**	**Q5-Q1**
Credit rating	3.70	3.72	3.60	3.74	3.83	0.13	(.911)
Spread	199.99	208.73	219.11	199.22	197.69	−2.30	(.892)
Panel C: Settlement cash quintiles							
	Q1	**Q2**	**Q3**	**Q4**	**Q5**	**Q5-Q1**	**Q5-Q1**
Credit rating	4.03	4.38	3.95	3.85	2.90	−1.13	(.052)
Spread	148.98	145.31	170.36	187.31	260.47	111.49	(.037)
Δ Credit rating	−0.02	−0.08	−0.08	−0.08	−0.11	−0.09	(.048)
Δ Spread	−10.8	−15.61	14.03	37.71	31.17	41.97	(.045)

This table presents the average credit ratings and yield spreads by quintiles. Panel A segments the sample by litigation risk quintiles from the lowest (Q1) to the highest (Q5). Panel B segments the sample by industry litigation risk quintiles. Panel C segments the sample by settlement cash quintiles at the time of the lawsuit resolution. The last two columns present the difference of the averages between the fifth and first quintile and the *p*-value of the t-statistics of the difference, respectively.

Panel B of Table 3 does not show a significant difference across litigation risk quintiles for credit ratings and spread when litigation risk is measured at the industry level. Panels C shows the distribution of credit ratings and yield spread by *settlement cash* quintiles. Credit ratings are significantly lower for firms that settle for the largest amount compared to their level of cash holdings than for firms that do not provide any monetary compensation to the plaintiffs (quintile 5 versus quintile 1). Contrary to litigation risk, settlement costs are associated with a time-specific event, the resolution of a lawsuit. The last two rows of Panel C show the change in credit ratings around the year of the settlement. The difference in the decrease in credit ratings in the year of the lawsuit resolution from the preceding year is statistically significant between quintile 5 and quintile 1. The results are also significant for yield spread. The yield spread is significantly higher and increases from the previous year for firms in the highest settlement quintile versus firms in the lowest settlement quintile. The results of Panel C of Table 3 provide preliminary evidence consistent with Hypothesis 3.

5. Multivariate analysis

The multivariate analysis consists of tests on the effect of litigation risk on the level of firm credit ratings, the change in credit ratings, the yield spread level, and the change in spread. I also investigate the effect of lawsuit outcomes on credit ratings and cost of debt.

5.1. Litigation risk and credit ratings
Panel A of Table 4 presents the results of ordered logistic regressions with the credit rating numerical variable as dependent variable. Each of the three regression specifications includes one of the three proxies of litigation risk. The regressions also include control variables related to credit ratings as

described in Section 3.2. All three proxies for litigation risk are negative and significant after controlling for corporate characteristics that affect firm credit ratings. Firms at higher risk of litigation are rated lower by credit rating agencies, ceteris paribus. This result has also strong economic significance. If the litigation probability in the second specification of Table 4 increases from its 25th to its 75th percentile, while retaining all other variables at their median values, the predicted percentage of firms rated A decreases from 8.61% to 6.87%, the percentage of firms rated BBB declines from 41.1% to 36.8%, while the percentage of being rated BB or B rises from 41.5% to 45.6% and from 7.9% to 10.0% respectively. This result provides strong support for Hypothesis 1. The sign and significance of the control variables is consistent with the extant literature on firm credit ratings determinants (e.g., Kaplan and Urwitz, 1979). Larger firms with lower leverage, higher profitability, lower market-to-book, more fixed assets, fewer capital expenditures, and a higher Altman's Z score benefit from higher credit ratings.

Table 4. Litigation risk and credit ratings.

| | Panel A: Credit ratings | | | | | |
| | (1) | | (2) | | (3) | |
	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value
Lawsuit dummy	−0.1402	.098				
Litigation risk			−1.5559	.000		
Industry litigation risk					−0.8005	.000
Ln assets	0.0426	.212	**0.1372**	.001	0.0338	0.322
Ln marketcap	**1.0057**	.000	**1.0072**	.000	**1.0287**	.000
Net leverage	**−2.4102**	.000	**−2.5553**	.000	**−2.4032**	.000
ROA	**1.5051**	.000	**1.5664**	.000	**1.4443**	.000
Market-to-book	**−0.0661**	.003	0.0251	.401	**−0.0649**	.004
Loss	**−1.1553**	.000	**−1.0919**	.000	**−1.1325**	.000
Fixed assets	**0.4848**	.000	**0.4031**	.000	**0.4576**	.000
Cap ex	**−4.6440**	.000	**−4.8124**	.000	**−4.6653**	.000
Altman's Z	**0.0152**	.082	**0.0176**	.075	**0.0165**	.071
Obs	13,326		12,598		13,326	
Generalized R^2	0.456		0.489		0.478	
	Panel B: Investment versus speculative grade					
	(1)		(2)		(3)	
	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value
Lawsuit dummy	−0.2056	.005				
Litigation risk			−3.8893	.000		
Industry litigation risk					−1.0863	.000
Ln assets	0.0190	.774	0.1166	.107	0.0025	.970
Ln marketcap	**1.2463**	.000	**1.3715**	.000	**1.2726**	.000
Leverage	**−3.6693**	.000	**−3.7772**	.000	**−3.6598**	.000
ROA	**2.8596**	.000	**2.8840**	.000	**2.8505**	.000
Market-to-book	**−0.2504**	.000	**−0.2052**	.000	**−0.2525**	.000
Loss	**−1.0115**	.000	**−0.8847**	.000	**−0.9892**	.000
Fixed assets	**1.1734**	.000	**1.0290**	.000	**1.1401**	.000

Cap ex	**−8.3284**	.000	**−9.3305**	.000	**−8.3066**	.000
Altman's Z	**0.0168**	.071	**0.0179**	.070	**0.0198**	.058
Intercept	**−8.9200**	.000	**−10.1741**	.000	**−8.8321**	.000
Obs	13,326		12,598		13,326	
Generalized R^2	0.4686		0.4753		0.4725	

This table presents multivariate tests about the relation between litigation risk and credit ratings, Panel A presents ordered logistic regressions with the credit rating numerical variable as the dependent variable. Panel B presents logistic regressions with a dependent indicator variable equal to one when a firm is rated investment grade, and zero when it is rated speculative grade. All variables are described in appendix. The regressions include year fixed effects. Statistically significant coefficients are reported in bold.

The results on the relation between litigation risk and the credit rating grade reported in Panel B of Table 4 present an analogous picture. The test consists of logistic regressions with a dependent indicator variable equal to one if the firm is rated investment grade and zero otherwise. All three proxies for litigation risk are negative and statistically significant at the 1% level. The relation between litigation risk and the credit rating grade has also strong economic significance. Increasing the litigation probability in the second specification of Panel B of Table 4 from its 25th to its 75th percentile while retaining all other variables at their medians, decreases the percentage of firms rated investment grade from 51.4% to 39.7%. All the control variables with the exclusion of the logarithm of assets are statistically significant and assume the sign consistent with the results presented in previous studies that analyze the relation between firm characteristics and credit ratings.

In addition to examining the effect of litigation risk on the level of a firm's credit rating, it is important to investigate the effect of the filing of a lawsuit or the change in litigation risk on a possible downgrade or upgrade in credit rating. Kisgen (2006) shows that corporate financial policies such as capital structure decisions are significantly influenced by the possibility of a rating downgrade or upgrade. The possible effect of litigation risk on changes in credit ratings can have therefore important implications on financial policies set by corporations.

Table 5 present the results of ordered logistic regressions that analyze the effect of a lawsuit filing or the change of litigation risk on possible credit rating changes when controlling for changes in firm characteristics from the previous year. The dependent indicator variable assumes the value of −1 when a firms is downgraded to a lower credit rating from the previous year, 0 if it maintains the same credit rating as the previous year, and +1 if it upgraded to a higher credit rating from the previous year. All the independent variables with the exception of *Lawsuit dummy* are calculated as the difference between the current and previous year values. The first specification of Table 5 shows that the filing of a lawsuit is significantly associated with a credit rating downgrade for the defendant firm. The second and third specification of Table 5 show that an increase in litigation risk either measured at the firm or industry level is significantly related to a credit rating downgrade. Increasing litigation probability from its 25th to its 75th percentile while keeping all other variables at their median increase the predicted probability of a downgrade from 8.4% to 10.1% while decreases the probability of an upgrade from 7.3% to 6.1%.

Table 5. Litigation risk change and credit rating upgrade/downgrade.

	(1)		(2)		(3)	
	Coeff.	*p*-value	Coeff.	*p*-value	Coeff.	*p*-value
Lawsuit dummy	−0.1248	.068				
Δ Litigation risk			−1.5889	.003		
Δ Industry litigation risk					−0.2759	.012
Δ Ln assets	0.5560	.000	0.6260	.000	0.5637	.000
Δ Ln marketcap	0.9107	.000	0.8967	.000	0.9142	.000
Δ Leverage	−2.4325	.000	−3.0547	.000	−2.4445	.000
Δ ROA	0.1043	.623	0.0194	.937	0.1075	.614
Δ Market-to-book	−0.0610	.099	−0.1052	.060	−0.0578	.117
Δ Loss	−0.4434	.000	−0.4609	.000	−0.4392	.000
Δ Fixed assets	0.0379	.884	0.0625	.819	0.0500	.848
Δ Cap ex	−1.2364	.150	−1.4425	.178	−1.2554	.165
Δ Altman's Z	0.0002	.371	0.0002	.370	0.0002	.361
Obs	9806		9270		9806	
Generalized R^2	0.402		0.414		0.407	

This table presents ordered logistic regressions with a dependent indicator variable equal to −1 when a firm is downgraded to a lower credit rating from the previous year, 0 if it maintains the same credit rating as the previous year, and +1 if it is upgraded to a higher credit rating from the previous year. All independent variables aside from the lawsuit dummy are the difference between the current and previous year values. All variables are described in the appendix. The regressions include year fixed effects. Statistical significant coefficients are reported in bold.

5.2. Litigation risk and cost of debt

Table 6 presents the results of year fixed effect regressions with the average spread of all debt issued annually by each firm as the dependent variable. In addition to the control variables contained in the regressions presented in the previous multivariate tables, these cost of debt regressions include also the logarithm of the debt principal and the logarithm of the debt maturity.

Table 6. Litigation risk and yield spread.

	(1)		(2)		(3)	
	Coeff.	*p*-value	Coeff.	*p*-value	Coeff.	*p*-value
Lawsuit dummy	16.4226	.095				
Litigation risk			82.3295	.000		
Industry litigation Risk					34.8889	.000
Ln assets	21.9425	.774	19.8503	.107	21.1466	.970
Ln marketcap	−40.1076	.000	−41.3180	.000	−40.5814	.000
Leverage	201.9057	.000	208.2030	.000	204.3611	.000
ROA	−18.5625	.000	−12.3463	.000	−14.7271	.000
Market-to-book	−3.3277	.000	−6.7315	.000	−3.8697	.000
Loss	64.3653	.000	63.8128	.000	63.2795	.000
Fixed assets	−5.1072	.000	−3.7518	.000	−4.5569	.000

Cap ex	**76.1127**	.000	**96.6928**	.000	**78.8885**	.000
Altman's Z	0.0003	.494	0.0004	.380	0.0003	.488
Ln principal	**5.2432**	.043	**6.2356**	.041	**5.7635**	.049
Ln maturity	−2.4343	.124	−2.1554	.234	−2.5432	.165
Intercept	**269.9882**	.000	**290.1838**	.000	**274.5672**	.000
Obs	12,604		11,905		12,604	
Adjusted R²	0.3355		0.3972		0.3741	

This table presents OLS regressions with the basis point yield spread as dependent variable. All variables are described in the appendix. The regressions include year fixed effects. Statistical significant coefficients are reported in bold.

All three proxies of litigation risk have a positive and significant coefficient. Consistent with Hypothesis 3, companies at higher risk of litigation sustain higher debt costs, everything else constant. Consistent with previous studies on the determinants of cost of debt, companies with higher leverage, lower profitability, lower market-to-book, fewer fixed assets, larger capital expenditures, and firms posting a loss bear a larger cost of debt. The results are also economically significant. In the year preceding a lawsuit, firms have a 16 basis point higher yield spread than firms that are not sued, everything else constant. Increasing litigation risk from its 25th to its 75th percentile, while keeping all other independent variables at their median, increases yield spread by 18 basis points from 175 to 193 basis points.

The results presented in Table 6 show that litigation risk is a significant determinant of cost of debt. According to Hypothesis 2, the change in litigation risk due to the filing of a new lawsuit or to a change in firm characteristics that underline risk of litigation, or to a change in the number of industry competitors facing lawsuits should cause a change in the cost of debt. I test this possibility by estimating regressions with change in spread as the dependent variable. The control variables of these regressions are the change in firm characteristics between the current and previous year. Table 7 presents the results. A change of litigation risk at the firm level, measured either with the *Litigation dummy* or a change in the *Litigation risk* variable has a significant effect on an increase on yield spread. A sued firm experience an increase in yield spread of 19 points over a firm that is not sued. This result supports Hypothesis 2. A change in industry litigation risk is instead not significantly related to a change in spread.

Table 7. Change in litigation risk and yield spread.

	(1)		(2)		(3)	
	Coeff.	***p*-value**	**Coeff.**	***p*-value**	**Coeff.**	***p*-value**
Lawsuit dummy	**18.5140**	.000				
Δ Litigation risk			**130.7992**	.006		
Δ Industry litigation risk					15.1676	.157
Δ Ln assets	**27.5790**	.017	**32.5540**	.008	**29.4429**	.011
Δ Ln marketcap	**−66.6494**	.000	**−66.0436**	.000	**−65.8219**	.000
Δ Leverage	**164.9215**	.000	**181.1192**	.000	**163.8228**	.000
Δ ROA	48.4190	.122	51.0210	.140	47.8018	.127
Δ Market-to-book	4.8355	.420	3.5603	.583	5.2151	.385

Δ Loss	**27.2618**	**.000**	**26.7485**	**.000**	**27.7137**	**.000**
Δ Fixed assets	23.2204	.245	22.6784	.278	26.8542	.178
Δ Cap ex	**279.6883**	**.000**	**267.9661**	**.000**	**278.9202**	**.000**
Δ Altman's Z	−0.0001	.370	−0.0001	.367	−0.0001	.360
Δ Ln principal	**7.3634**	**.065**	**8.5474**	**.049**	**7.3643**	**.068**
Δ Ln maturity	−3.5733	.145	−3.5675	.221	−3.5454	.163
Intercept	**25.1596**	**.000**	**21.7783**	**.000**	**21.3573**	**.000**
Obs	8801		8524		8801	
Generalized R^2	0.305		0.312		0.274	

This table presents regressions with the change in yield spread as dependent variable. We calculate the change in spread as the difference of the average spread of debt issued in the lawsuit year and the average spread of debt issued in the year before. All independent variables aside from the lawsuit dummy are the difference between the current and previous year values. All variables are described in the appendix. The regressions include year fixed effects. Statistical significant coefficients are reported in bold.

5.3. Litigation risk and debt issuance

The expectation of future lawsuits, which causes a decline in credit ratings and increase in debt costs as shown in the previous section, is likely to affect a firm's decision on issuing debt for investment or operating needs. I test this conjecture by estimating logistic regressions with a dependent indicator variable equal to one in the year a firm issues debt and zero otherwise. In addition to the control variables that are present in the other regressions of this study, the debt issuance logistic regressions include an equity issuance variable to control for the alternative use of equity as a form of corporate financing.

Table 8 presents the results of these regressions. The coefficients of all three proxies of litigation risk are negative and significant. This result shows that, consistent with Hypothesis 3, firms at higher risk of litigation are less likely to issue debt, everything else constant. The coefficients of the control variables show that larger, more leveraged, less profitable firms with larger capital expenditures are more likely to issue debt. Firms that issue more equity are less likely to issue debt, ceteris paribus.

Table 8. Litigation risk and debt issuance.

	(1)		(2)		(3)	
	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value
Lawsuit dummy	**−0.2239**	**.000**				
Litigation risk			**−0.6934**	**.000**		
Industry litigation risk					**−0.1901**	**.069**
Ln assets	**0.1420**	**.000**	**0.1498**	**.000**	**0.0931**	**.000**
Ln marketcap	−0.0058	.741	0.0033	.873	0.0454	.141
Leverage	**2.3125**	**.000**	**2.1692**	**.000**	**2.2200**	**.000**
ROA	**−0.1687**	**.000**	**−0.1269**	**.003**	**−0.1298**	**.000**
Market-to-book	**−0.0240**	**.008**	**−0.0262**	**.044**	**−0.0780**	**.000**
Loss	−0.0047	.869	0.0222	.483	0.0263	.411
Fixed assets	**−0.6646**	**.000**	**−0.7253**	**.000**	**−0.6750**	**.000**
Cap ex	**7.7100**	**.000**	**8.0611**	**.000**	**7.9294**	**.000**

Altman's Z	**−0.0015**	.000	**−0.0023**	.000	**−0.0022**	.000
Equity issuance	**−0.4212**	.000	**−0.4014**	.000	**−0.3300**	.000
Intercept	**−1.9459**	.000	**−1.9596**	.000	**−1.8943**	.000
Obs	13,326		12,598		13,326	
Pseudo R2	0.5112		0.5123		0.4877	

This table presents logistic regressions with a dependent indicator variable equal to 1 in the year firm issues debt and zero otherwise. All variables are described in the appendix. The regressions include year fixed effects. Statistical significant coefficients are reported in bold.

The litigation risk proxies have also strong economic significance. Increasing *Litigation risk* from its 25th to its 75th percentile while keeping all other independent variables at their median, for instance, decreases the probability for a firm to issue debt by 16%.[5]

5.4. Lawsuit outcome, credit ratings, and cost of debt

A portion of corporate lawsuits are based on frivolous matters and are often dismissed or withdrawn. By analyzing the lawsuit outcome, it is possible to isolate the effect of larger lawsuits with significant effect on the defendant firms from frivolous lawsuits and measure their effect on credit ratings and cost of debt. I analyze the effect of lawsuit outcome on corporate debt characteristics by focusing on the amount of cash that companies have to disburse to settle the lawsuit divided by their cash holdings in the previous fiscal year. This measure reflects the more severe impact that settlement costs have on firms with lower amounts of cash reserves readily available to pay plaintiffs. The most common resolutions for the lawsuits in the sample are settlements, withdrawals or dismissals. As in Arena and Julio (2015), no class action security lawsuit, the most common form of corporate lawsuit in the U.S., is fully litigated in court. In some occasions, other types of corporate civil lawsuits are fully litigated in court and reach a jury verdict. The settlement variable in the paper reports settlement amounts when a settlement is reached out of court and in the rare occasions that a jury verdict is reached against the defendant firm, the settlement observation reports the monetary damages reported in the jury verdict. If, in a given year, a firm settles more than one lawsuit, I compute the sum of all the settlement amounts for that year. Both *Settlement Cash* and *Ln settlement* assume the value of zero if all the lawsuits that are resolved in a given year for a defendant firm terminate with dismissals or are withdrawn. The only litigation cost considered in this test consists of settlement payments or damages. Firms face also other significant litigation costs for which there is no data availability, such as attorney's fees and indirect costs. If anything, limiting this analysis to settlement costs underplays the total costs faced by the firm.

Panel A of Table 9 presents regressions that analyze the effect of *Settlement cash* and *Ln settlement* on the magnitude of the change in credit rating, an upgrade or downgrade in rating, and a change in yield spread from the previous year. The two settlement variables are concurrently included in the specification to measure two different effects of the settlement announcement. *Ln settlement* proxy for the overall severity of the resolution and the possible readjustment of litigation risk. *Settlement cash* on the other hand measures more directly the effect of litigation costs on credit ratings and debt costs as the variable assumes larger values for companies with low level of cash holdings in relation to the settlement costs. *Settlement cash* has a negative and statistically significant coefficient in all specifications. Consistent with Hypothesis 4 companies that face larger settlements when compared to their cash holdings experience a decline in credit ratings and an increase in yield spread.

Table 9. Lawsuit settlements and debt.

Panel A: Settlement amount and debt characteristics						
	Change in rating		Upgrade/downgrade		Spread change	
	Coeff.	*p*-value	Coeff.	*p*-value	Coeff.	*p*-value
Settlement cash	**−0.0093**	.043	**−0.0197**	.073	**2.2126**	.071
Ln settlement	0.0038	.579	0.0144	.689	**5.9037**	.060
Δ Ln assets	0.0852	.294	0.4566	.269	42.3411	.333
Δ Ln marketcap	**0.2397**	.000	**1.0938**	.000	−29.6126	.241
Δ Leverage	**−0.6526**	.000	**−3.2444**	.000	**158.4048**	.018
Δ ROA	**0.2667**	.0976	**1.6872**	.034	**−169.4451**	.076
Δ Market-to-book	−0.0264	.315	−0.1389	.287	11.3503	.575
Δ Loss	**−0.0521**	.074	−0.1692	.376	−17.2409	.412
Δ Fixed assets	0.0690	.737	0.5793	.571	−69.2473	.496
Δ Cap ex	1.4314	.206	6.7823	.205	170.2072	.580
Δ Altman's Z	−0.0001	.254	−0.0008	.173	0.0027	.537
Obs	1938		1938		1373	
Generalized or Adjusted R^2	0.314		0.295		0.223	
Panel B: Cash poor firms, lawsuit outcome, and debt characteristics						
	Change in rating		Upgrade/downgrade		Spread change	
	Coeff.	*p*-value	Coeff.	*p*-value	Coeff.	*p*-value
Insufficient cash	**−0.1550**	.047	**−0.7715**	.041	**29.1220**	.085
Settlement dummy	−0.0383	.147	−0.1646	.241	**22.7151**	.044
Δ Ln assets	0.0893	.271	0.4753	.250	38.7155	.376
Δ Ln marketcap	**0.2391**	.000	**1.0861**	.000	−29.2347	.246
Δ Leverage	**−0.6529**	.000	**−3.2489**	.000	**157.1393**	.019
Δ ROA	**0.2765**	.095	**1.7420**	.030	**−160.5121**	.083
Δ Market-to-book	−0.0255	.331	−0.1323	.311	10.2203	.614
Δ Loss	−0.0536	.162	−0.1804	.346	−18.4117	.378
Δ Fixed assets	0.0765	.710	0.5917	.563	−71.3536	.483
Δ Cap ex	1.4083	.266	6.7116	.276	161.4849	.600
Δ Altman's Z	−0.0001	.276	−0.0007	.193	0.0027	.546
Obs	1938		1938		1373	
Generalized or Adjusted R^2	0.245		0.276		0.251	

This table presents regressions measuring the change in debt characteristics due to lawsuit outcomes. Panel A presents regressions measuring the change in debt characteristics due to settlement amounts in relation to firm liquidity. Panel B presents regressions measuring the change in debt characteristics in relation to the type of resolution (settlement or dismissal) and whether the defendant firm has enough cash to cover lawsuit costs. In both panels the first specification has the change in numerical rating between the year after and the year before the settlement as dependent variable. The second specification of both panels is an ordered logit with a dependent variable assuming the value of 1 if the rating is upgraded, 0 if the rating dos not change, and −1 f the rating is downgraded following the settlement. The third specification of both panels is a regression with the dependent variable as the change in yield spread form the debt issue following and the one preceding the settlement. All independent variables aside from the lawsuit variables are the difference between the current

and previous year values. All variables are described in the appendix. The regressions include year fixed effects. Statistical significant coefficients are reported in bold.

The change in rating regression shows that the settlement cash ratio is negative and statistically significant suggesting that companies facing larger settlement costs in comparison with their cash in hand experience a larger credit rating downgrade, the upgrade/downgrade ordered logit confirms that larger settlements are associated with a higher probability of a credit rating downgrade. If the settlement cash variable goes from 0 (case of dismissal) to its 75th percentile while retaining all other independent variables at the median, the probability of a rating downgrade increases by 12%. Companies that experience larger settlement disbursements in comparison to their cash holding level also experience a significant increase in the cost of debt. The *Settlement cash* variable in the change in yield spread regression has also strong economic significance. If the settlement cash variable goes from 0 (case of dismissal) to its 75th percentile while retaining all other independent variables at the median, the yield spread increases by 21 basis points. Yield spreads also significantly increase as settlement get larger independently from the cash held by the defendant firm.

Panel B of Table 9 presents similar specifications in which I measure the effect of lawsuit outcomes and scarcity of available cash in an alternative way. *Insufficient cash* measures the firm's ability to cover the litigation costs by assuming the value of 1 when the settlement costs are higher than the firm's cash holdings, and 0 otherwise. The analysis controls also for the litigation outcome independently of the firm's liquidity with the inclusion of *Settlement dummy*, an indicator equal to 1 when the lawsuits resolve into a settlement and 0 when is dismissed or withdrawn. Consistent with the results of Panel A and Hypothesis 4, the results of Panel B show that firms with insufficient cash to cover settlement costs experience a decline in credit ratings and increase in yield spread. The yield spread significantly increase as settlement get larger even controlling for the firm's liquidity.

6. Additional tests

6.1. The effect of litigation on corporate debt by firm creditworthiness

Arena and Julio (2015) show that firms at higher risk of litigation accumulate cash in anticipation of large settlement disbursements. Companies in financial distress do not have the ability to save cash and therefore are likely to be more affected by litigation than firms in good credit standing. To test this conjecture, I split the sample between firms rated investment grade (firms with a rating of BBB- of higher) and firms rated speculative grade (firms rated BB+ or lower). Table 10 shows the results.[6] For the debt issuance regressions, the litigation risk coefficient is negative and significant for both subsamples. However, the economic significance is stronger for the speculative grade firms subsample. Increasing litigation risk from its 25th to its 75th percentile while keeping all other independent variables at their median decreases the probability of an investment-grade firm issuing debt by 7% while it decreases the probability of speculative-grade firm issuing debt by 26%. The yield spread regressions provide additional evidence of the differential effect of litigation risk on firms with different credit quality. The litigation risk coefficient is positive and significantly related to yield spread for speculative grade firms but it is not significant for investment-grade firms. Litigation risk is significant in the difference in the yield spread regressions for both subsamples but the economic significance for the speculative-grade subsample is greater. Finally, the last regression specification shows that settlement cash is significantly related to a change in yield spread for speculative-grade firms but not for investment-grade firms. Overall, the results presented in Table 10 are consistent with

the conjecture of litigation risk and litigation costs having a more severe effect on debt issuance decisions and debt costs for low credit quality firms.

Table 10. The Effect of litigation on debt by firm credit worthiness.

	Panel A: Investment grade firms							
	Debt issuance		Yield spread		Δ Yield spread		Δ Yield spread	
	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value
Litigation risk	−0.6020	.017	25.2565	.207	76.1048	.089		
Settlement cash							16.9111	.310
Ln settlement							12.4402	.002
Ln assets	0.0341	.738	45.0642	.000	122.2184	.000	68.3867	.302
Ln marketcap	0.2764	.007	−54.4816	.000	−123.4549	.000	−113.4756	.009
Leverage	4.3617	.000	58.5845	.000	164.9493	.001	347.8940	.005
ROA	−1.0709	.180	140.9912	.002	−109.7911	.185	304.5066	.122
Market-to-book	−0.1513	.023	0.9058	.808	23.0646	.052	27.2480	.360
Loss	0.0728	.640	36.7343	.000	28.1839	.044	77.6414	.025
Fixed assets	−0.8830	.000	−9.0672	.102	104.1849	.146	62.8761	.623
Cap ex	9.1968	.000	−6.7270	.867	82.7736	.598	−93.8923	.849
Altman's Z	−0.0003	.517	−0.0428	.497	0.0494	.608	0.0041	.959
Equity issuance	−3.6255	.000						
Intercept	−3.6654	.000	182.0679	.000	8.4699	.002	5.9537	.305
Obs	5246		3956		3155		654	
Pseudo R2	0.354		0.246		0.218		0.112	
	Panel B: Speculative grade firms							
	Debt issuance		Yield spread		Δ Yield spread		Δ Yield spread	
	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value
Litigation risk	−2.4351	.000	130.5074	.001	201.7637	.000		
Settlement cash							29.0674	.045
Ln settlement							11.6244	.092
Ln assets	0.2869	.000	13.3659	.032	9.1519	.558	66.6112	.474
Ln marketcap	0.0656	.167	−24.1913	.000	−59.2617	.000	−16.8364	.731
Leverage	1.4416	.000	136.0262	.000	184.9437	.000	67.7784	.058
ROA	0.2669	.238	−20.7935	.584	−56.5228	.184	102.8506	.612
Market-to-book	−0.1237	.053	−14.7480	.061	4.2439	.619	34.3958	.563
Loss	0.1883	.008	53.8549	.000	23.5666	.014	64.9983	.077
Fixed assets	−0.8697	.000	26.5468	.000	0.5429	.983	−53.5441	.503

Cap ex	**9.2150**	.000	13.7594	.717	−29.4042	.234	399.0186	.503
Altman's Z	**−0.0126**	.018	−0.0038	.500	−0.0002	.944	0.0074	.645
Equity issuance	**−2.3872**	.000						
Intercept	**−3.0983**	.000	**296.3126**	.000	**35.1971**	.000	**35.3296**	.065
Obs	6262		4504		3754		945	
Pseudo R2	0.425		0.348		0.298		0.134	

This table presents debt issuance, yield spread and change in yield spread regressions. The independent variables for the change in yield spread regression are the difference between the current and previous year values. Panel A presents the regressions estimated on the sub-sample of firms rated investment grade (rating of BBB- or higher) while Panel B presents the regressions estimated on the sub-sample of firms rated speculative grade (rating of BB+ or lower) . All variables are described in the appendix. The regressions include year fixed effects. Statistical significant coefficients are reported in bold.

6.2. Joint estimation of yield spread and litigation risk

The results of this study show that litigation risk affects a firm's credit worthiness and cost of debt. It could be the case, however, that omitted variables might concurrently affect litigation risk and debt characteristics. For example, a defective product could cause operational losses and therefore affect the firm creditworthiness while at the same time increase the likelihood of a product liability lawsuit. Even if less likely, there could be also the possibility of reverse causality. The main multivariate analysis discussed in the previous sections of the paper in part addresses these issues by controlling for several variables that affect the firm's creditworthiness and the incidence of litigation.

In this section I address these endogeneity concerns through a 2SLS simultaneous equation system similar to Lowry and Shu, 2002, Field et al., 2005, Arena and Julio, 2015, and Kini et al. (2017).[7] Specifically, we use the following system of equations:

$$(1)\ \text{YieldSpread} = \lambda_1 \text{LitigationRisk} + \beta_1 X_1 + \gamma_1 X + e_1,$$

$$(2)\ \text{LitigationRisk} = \lambda_2 \text{YieldSpread} + \beta_2 X_2 + \gamma_2 X + e_2,$$

I use two proxies of litigation risk. The first proxy is the *Lawsuit dummy* that, as in Lowry and Shu (2002), assumes the value of one for the firms that are involved in a litigation in the following year, and zero otherwise. The second proxy is *Industry litigation risk*, which measure litigation risk at the industry level.[8] X_1 is leverage, the identifying variable of the first equation, an exogenous firm characteristic that is related to yield spread but not to litigation risk. Leverage has a direct effect of debt costs. However, litigation risk studies have not found a significant relation between leverage and litigation risk (e.g., Arena and Julio, 2015). X_2 is stock turnover, the identifying variable of the second equation, an exogenous variable that is directly related to the probability of a lawsuit but not to yield spread. Stock turnover is a significant predictor of future lawsuits as possible settlements tend to increase based on the number of shares traded during the period under litigation (Kim and Skinner, 2012). However, while in some situations stock turnover and bond yields might be affected by common factors, stock turnover does not have a direct causal effect on yield spreads. X consists of a vector of control variables that are potentially related to both debt costs and the risk of litigation.

The simultaneous equation model with the lawsuit dummy as proxy for litigation risk has both a continuous dependent variable (yield spread) and a dichotomous one (the lawsuit dummy). To estimate this model I apply the two-stage methodology introduced by Maddala (1983). The first stage regressions are an OLS and a probit regression with all the exogenous explanatory variables. In the second stage, I substitute the endogenous variables yield spread and litigation with their fitted values from the first stage. The simultaneous equation model with the industry litigation risk as litigation risk proxy is a traditional 2SLS as both first stage regressions are OLS.

Table 11 presents the results of the second-stage regressions. In Panel A the *Lawsuit dummy* instrument, the fitted value from the first stage, is positive and statically significantly related to yield spread. However, the yield spread instrument is not significantly related to the lawsuit dummy in the second equation. As expected, leverage and stock turnover, the two identifying variables are statistically significant and positively related to yield spread and the lawsuit dummy, respectively. The results presented in Panel B present a similar picture. The *Industry litigation risk* instrument is positive and statistically significant at the 1% level while the yield spread instrument is not significantly related to *Industry litigation risk*. Overall, the results presented in Table 11 confirm the findings presented in the previous sections of the paper and dispel to a greater degree the concerns about the relation between litigation risk and debt costs being spuriously driven by endogeneity issues.[9]

Table 11. Yield spread and litigation risk: simultaneous equations.

Panel A: Yield spread and lawsuit dummy				
Second stage dependent variable	Yield spread		Lawsuit dummy	
	Coeff.	p-value	Coeff.	p-value
Lawsuit dummy instrument	341.7438	.000		
Yield spread instrument			−0.0025	.389
Net leverage	388.8319	.000		
Stock turnover			0.0094	.000
Ln assets	−45.9754	.005	0.2174	.000
Ln marketcap	−80.9359	.000	0.0410	.353
ROA	−265.4611	.000	−0.8007	.000
Market-to-book	−39.4386	.000	0.0811	.001
Loss	−8.0479	.693	0.3334	.000
Fixed assets	15.0957	.381	−0.0416	.395
Cap ex	442.9097	.000	−1.2173	.154
Altman's Z	0.0023	.445	0.0000	.522
_cons	1489.0500	.000	−2.9574	.000
Adj. R²	0.3104			
Pseudo R²			0.1425	
N	12,604		12,604	
Panel B: Yield spread and industry litigation risk				
Second stage dependent variable	Yield spread		Ind. lit. risk	
	Coeff.	p-value	Coeff.	p-value
Ind. lit. risk instrument	3066.3780	.000		
Yield spread instrument			−0.0001	.476
Net leverage	288.4511	.000		

Stock turnover			**0.0008**	.000
Ln assets	**−30.5927**	.019	−0.0031	.488
Ln marketcap	**−92.0123**	.000	**0.0138**	.006
ROA	**−225.1049**	.005	**−0.0754**	.001
Market-to-book	−15.7503	.134	0.0023	.477
Loss	−19.4810	.408	**0.0320**	.000
Fixed assets	**62.7597**	.002	**−0.0203**	.000
Cap ex	**191.1722**	.039	−0.0558	.156
Altman's Z	−0.0007	.735	0.0000	.624
_cons	68.5254	.172	**0.0934**	.000
Adj. R^2	0.2754		0.1143	
N	12,604		12,604	

This table reports the estimation results for the following simultaneous equations model:

Yield spread = λ_1Litigation+$\beta_1 X_1$+$\gamma_1 X$ +e_1,
Litigation =λ_2Yield spread+$\beta_2 X_2$+$\gamma_2 X$ +e_2,

Litigation is the *Lawsuit dummy* in Panel A and *Industry litigation risk* in Panel B; X_1 is leverage, the identifying variable of the first equation, and X_2 is stock turnover, the identifying variable of the second equation. All variables are described in the appendix. The regressions include year fixed effects. Statistical significant coefficients are reported in bold.

6.3. Robustness test

The sample period of this study includes the years of the financial crisis and the great recession (2008–2009). During the recession, systematic and idiosyncratic risk significantly increased while debt issuance by firms significantly declined. Even though our sample excludes financial firms, which were the most affected by the financial crisis, there is the possibility that the relation between litigation risk and debt for those two years is biased by the large rise in other forms of risk and the relation between the incidence of lawsuits and other variables that are strongly influenced by the recessionary environment. As a robustness check, I replicate all the tests of this study excluding the recession years. All the coefficients of the regressions maintain their sign and significance.

7. Conclusions

The cost of debt financing is of great importance for corporations. Most corporate financial decisions including investment choices, capital structure policy, divisions' performance evaluations, and payout policy are heavily influenced by the cost of debt. Kisgen, 2006, Kisgen, 2009) shows that also capital structure decisions are directly affected by a firm's credit rating. As corporate litigation risk and litigation costs are ever increasing, it is important to fully understand how litigation affects a firm's creditworthiness and cost of debt. This study investigates this issue by looking at a comprehensive panel of U.S. lawsuits and by examining the impact of litigation on debt financing both at its risk inception and at its resolution when settlements costs are incurred.

The results of this study suggests that litigation affect firm's creditworthiness and debt costs in two steps. Firms experience a decline in credit ratings and increase in cost of debt as litigation risk increases, which in turn reduce the firms' reliance on debt financing. At the time of the lawsuit resolution, if settlement costs are high, credit rating agencies downgrade firms again, and cost of debt

increases further. The results are robust to endogeneity concerns, and the use of alternative proxies of litigation risk and settlement costs.

Appendix A. Variable definitions and sources

Variable	Definition	Source
Altman's Z	1.2 (Working Capital/Total Assets) + 1.4 (Retained Earnings/Total Assets) + 3.3 (Earnings Before Interest and Taxes/Total Assets) + 0.6 (Market Value of Equity/Book Value of Long-Term Debt) + (Net Sales/Total Assets).	Compustat
Asset growth	Percent growth in assets from year $t-1$ to year t.	Compustat
Cap ex	Capital expenditures divided by assets.	Compustat
Credit rating	Numerical score set to 7 for AAA ratings, 6 for AA ratings, 5 for A ratings, 4 for BBB ratings, 3 for BB ratings, 2 for B ratings, and 1 for C ratings	Compustat
Debt issuance	Debt issuance minus debt retirement divided by assets.	Compustat
Yield spread	Weighted average of the yield spread of corporate bonds and bank loans on the issuance year expressed as bps over the Treasury security of comparable maturity.	SDC
Equity issuance	Equity sales minus equity purchases divided by total assets.	Compustat
Fixed assets	Fixed assets divided by total assets.	Compustat
Industry litigation risk	Number of lawsuits filed each year against firms in the same three-digit SIC industry divided by the total number of firms in that industry.	Audit analytics
Insufficient cash	Indicator variable equal to 1 when the settlement costs are higher than the firm's cash holdings, and 0 otherwise.	Audit analytics and compustat
Leverage	Book value of total long-term debt plus the book value of total short-term debt scaled by the book value of the total assets.	Compustat
Lawsuit dummy	Indicator variable that assumes the value of one if a firm is sued in the following year, and zero otherwise.	Audit analytics
Litigation risk	Predicted probability of litigation estimated with a probit regression on a sample that includes all types of corporate lawsuits.	Compustat, CRSP, Audit analytics
Ln assets	Natural logarithm of the book value of total assets.	Compustat
Ln marketCap	Natural logarithm of the market value of equity.	CRSP
Ln maturity	Natural logarithm of the weighted average maturity of all debt issued each year by the firm. The weight is based on the principal of each debt issue.	SDC
Ln principal	Natural logarithm of the total principal amount of all debt issued each year by the firm.	SDC
Loss	Indicator variable equal to one if the firm posts a loss for the year, and zero otherwise.	Compustat
Market-to-book	Book assets minus book equity plus market equity all divided by book assets.	Compustat

		Compustat
ROA	Earnings before extraordinary items plus interest expense plus income statement deferred taxes divided by assets.	Compustat
Settlement	Lawsuit settlement paid by the defendant firms in millions of dollars. For lawsuits that are dismissed, withdrawn, or resolved in favor of the defendant firm, settlement assumes the value of zero.	Audit analytics
Ln settlement	Logarithm of (Settlement+1)	Audit analytics
Settlement cash	Lawsuit settlement paid by the defendant firms divided by the firm's cash holdings in the year before the settlement.	Audit analytics and compustat
Settlement dummy	Indicator variable equal to 1 if the lawsuits resolved into a settlement and 0 if it is resolved in favor of the defendant firm.	Audit analytics
Years to resolution	Number of years from the lawsuit filing date and the lawsuit resolution.	Audit analytics

Appendix B. Probit estimation of litigation risk

	Coeff.	p-value
Stock return	−0.3451	.000
Return volatility	0.4732	.015
Return skewness	−0.2143	.024
Stock turnover	1.4528	.000
NYSE	0.3534	.018
Previous litigation dummy	0.0489	.097
Litigation intensity	0.0785	.002
Regulated industry	0.0463	.234
HiTec dummy	0.2694	.048
Discretionary accruals	−0.0245	.573
Obs	13,326	
Pseudo R²	0.228	

This appendix table reports coefficient estimates and *p*-values of the probit regressions used to estimate the litigation risk variable used in the study. The left hand side variable is an event dummy set equal to one in the year a securities lawsuit is initiated against a firm. Stock return is the market-adjusted 12-month stock return. Return volatility is the standard deviation of the firm's 12-month return. Return skewness is the skewness of the firm's 12-month returns. Stock turnover is the trading volume accumulated over the previous 12 months scaled by the beginning of the year shares outstanding, all multiplied by 1000.NYSE equal 1 if the firm is listed on the New York Exchange. The previous litigation dummy is set equal to one if the firm has been the defendant of another litigation in the previous three years. Litigation intensity is the proportion of firms in a given 4-digit SIC industry that were brought into litigation in a given year. The regulated dummy is set equal to one for firms in regulated industries. The Hitech dummy assumes the value of one for firms in the biotech, computer, electronics or retail industry. The discretionary accruals are estimated from a modified Jones model for financial year preceding the lawsuit. Statistically significant coefficients are reported in bold.

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[1]BP issued a 10-year bond with a yield spread of 2.05% in the fall of 2010. The spread was 30 basis points higher than for a similar 10-year bond issued just before the oil spill (1.75%).

[2]Most corporate lawsuit settlements are paid as a lump sum. Settlements of injury and product liability cases can be "structured", i.e. paid over time in form of an annuity. Moreover, many companies buy C-side litigation insurance which can cover some of the settlement costs (Arena and Ferris, 2017). Even though these factors might reduce the full impact of settlement costs, out study is still likely to underestimate overall litigation costs due to non-measurable reputational costs associated with most corporate lawsuits.

[3]The three 3-digit SIC industries with the highest incidence of lawsuits in our sample are the software industry (14.5% of all sample lawsuits), the pharmaceutical industry (11.0% of all sample lawsuits), and the electronic components industry (7.6% of all sample lawsuits).

[4]For lawsuits that are dismissed, withdrawn, or resolved in favor of the defendant firm, settlement assumes the value of zero.

[5]In unreported regressions, I test the relation between litigation risk and equity issuance while including the same controls of the regressions of Table 8 along with debt issuance. The litigation risk proxies are not statistically significant in those tests.

[6]Table 10 presents only the results of regressions with *litigation risk* as proxy for risk of litigation. Specification with *lawsuit dummy* and *industry litigation risk* as litigation proxies generate similar results. The results for those alternative specification are available upon request.

[7]Another empirical approach to control for endogeneity is based on confining the analysis to a specific exogenous event that alters litigation risk. Gormley and Matsa (2011) focus their study on companies affected by the categorization of specific chemicals as carcinogens. Taillard (2013) uses asbestos legislation as an exogenous shock that alters litigation risk for a set of affected industries.

[8]Litigation Risk, the third proxy used in the rest of the paper, is excluded from this test because it is constructed with a probit regression that includes stock turnover, one of the two identifying variables of the simultaneous equation model.

[9]In an unreported analysis we estimate a simultaneous equation with industry litigation risk and credit ratings. The results are consistent with those presented in Table 11. Litigation risk affects credit ratings while a change in credit ratings does not affect litigation risk.