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RESEARCH ARTICLE

Strategic management during the financial crisis: How firms adjust their strategic investments in response to credit market disruptions

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Abstract

Research summary: This study investigates how companies adjusted their investments in key strategic resources—that is, their workforce, capital expenditures, R&D, and CSR—in response to the sharp increase in the cost of credit (the "credit crunch") during the financial crisis of 2007–2009. We compare companies whose long-term debt matured shortly before versus after the credit crunch to obtain (quasi-)random variation in the extent to which companies were hit by the higher borrowing costs. We find that companies that were adversely affected followed a "two-pronged" approach of curtailing their workforce and capital expenditures, while maintaining their investments in R&D and CSR. We further document that firms that followed this two-pronged approach performed better post-crisis.

Managerial summary: We study how companies adjusted their key strategic investments during the financial crisis of 2007–2009. As financial markets collapsed—and the cost of financing skyrocketed—managers had to rethink their strategic investments. We find that, on average, managers pursued a two-pronged approach of (i) "saving their way out of the crisis" by curtailing the company's workforce and capital expenditures and (ii) "investing their way out of the crisis" by maintaining the company's investments in R&D and CSR. Moreover, we find that firms that followed this two-pronged approach performed better in the post-crisis years. Overall, these findings suggest that investments in innovation and stakeholder relationships are instrumental in sustaining competitiveness during and beyond times of crisis.

KEYWORDS

capital expenditures, corporate social responsibility, employment, financial crisis, financial performance, innovation

1 | INTRODUCTION

The financial crisis of 2007–2009, which originated from the surge in defaults on subprime mortgages, disrupted the U.S. financial sector. It led to the liquidation of Bear Stearns, the bankruptcy of Lehman Brothers, the failure of several regional banks, and the failure of Washington Mutual—the largest bank failure in U.S. history. The collapse of the banking sector led to a credit crisis of historical dimension (known as the "credit crunch"), and an unprecedented increase in the cost of debt financing for companies (e.g., Duchin, Ozbas, & Sensoy, 2010).

As the cost of debt skyrocketed, companies faced higher financing constraints and were less able to finance their projects. The effect of the credit crunch was further amplified by the collapse of the economy—the so-called "Great Recession"—that fundamentally disrupted all aspects of the business environment.[1] The finance literature (e.g., Almeida, Campello, Laranjeira, & Weisbenner, 2011; Campello, Graham, & Harvey, 2010; Duchin et al., 2010; Kahle & Stulz, 2013) shows that companies responded to the credit crunch by curtailing their investment in physical capital (i.e., their capital expenditures [CAPEX]).[2,3]

Besides physical capital, the management literature has identified the firm's workforce, its innovative capability, and stakeholder relationships as key strategic resources that enable firms

[1]The economic crisis of 2007–2009 has been named the "Great Recession" because it was the worst postwar contraction on record. According to the U.S. Department of Labor, the U.S. gross domestic product (GDP) contracted by approximately 5.1% between December 2007 and June 2009. About 8.7 million jobs were lost, while the unemployment rate climbed from 5.0% in December 2007 to 9.5% by June 2009, and peaked at 10.0% by October of the same year. Ben Bernanke, the former head of the Federal Reserve, referred to the financial crisis as being "the worst financial crisis in global history, including the Great Depression" (Wall Street Journal, 2014).

[2]The finance literature further highlights the credit supply channel—linking how the collapse of the financial sector led to a contraction in lending (e.g., Ivashina & Scharfstein, 2010; Puri, Rocholl, & Steffen, 2011; Santos, 2011)—as an important mechanism explaining the increase in borrowing cost and ultimately the reduction in physical investment.

[3]Physical investment has a long tradition in the finance literature. In particular, numerous articles examines how financing constraints affect physical investment (e.g., Fazzari, Hubbard, & Petersen, 1988; Hoshi, Kashyap, & Scharfstein, 1991; Kaplan & Zingales, 1997). For surveys of this literature, see Stein (2003) and Maksimovic and Phillips (2013).

to create long-term value (Barney, 1991). Accordingly, from the perspective of strategic management, an important question is how companies adjusted their investments in *all* of their strategic resources—that is, not only their physical capital, but also their workforce, innovative capability, and stakeholder relationships—to sustain their competitiveness when the cost of debt skyrocketed during the crisis. Admittedly, the extreme nature of this event may have compelled companies to rethink and reshape their strategic investments to ensure survival and sustain their competitiveness.

Despite the severity of this event, we know little about its impact on firm-level decision-making and, in particular, on how firms adjusted their resource base in response. While there is a large literature in management that studies organizational decline and corporate turnaround (for a review, see Trahms, Ndofor, & Sirmon, 2013), this literature focuses on very different sources of organizational decline (e.g., business cycle fluctuations, technology shocks, and environmental jolts). Yet, credit crises of this magnitude—and, more broadly, system-level crises such as the Great Depression of 1929, the Great Recession of 2007–2009, and the current COVID-19 crisis—are fundamentally different as they bring about the collapse of the financial sector and impair firms' ability to undertake important investments to sustain their competitiveness.

In this paper, we examine how companies adjusted their resource base in response to the dramatic rise in the cost of debt during the financial crisis, that is, at the time of the biggest system-wide collapse since the Great Depression. Given the inherent complexity of this phenomenon, developing tightly argued hypotheses would be ambiguous at best. Hence, we follow Hambrick (2007) and Helfat's (2007) recommendation to adopt a fact-based approach, focusing our study on documenting the impact of this phenomenon on firm-level decision-making in the hope that it will stimulate follow-up studies and the eventual development of suitable theories. As such, this study is exploratory in nature (as opposed to hypotheses-driven).

From an empirical perspective, this analysis is difficult to conduct. The main challenge is to find a control group that provides a counterfactual of how companies would have behaved had they not been affected by the sharp increase in borrowing costs during the crisis. To obtain such a control group, we exploit the sudden nature of the credit crunch, which started with the "panic" of August 2007. The panic was triggered by the sudden collapse of the market for mortgage-backed securities (MBS), which led to a sharp reassessment of credit risk. As a result of the panic, the cost of credit skyrocketed. This is best seen in Figure 1, which plots the evolution of the TED spread around that period.[4] In July 2007, the TED spread was about 50 basis points. It jumped to about 200 basis points in August 2007 and remained high thereafter.

This sharp discontinuity in the TED spread—and hence in firms' cost of debt financing—provides a useful quasi-experiment that can be illustrated with a simple example. Consider two firms (firm A and firm B) that borrowed a large amount of debt around mid-1997. This long-term debt is scheduled to mature (and be rolled over) in 10 years, that is, around mid-2007. Assume that firm A's debt matures in July 2007, while firm B's debt matures in August 2007. Arguably, whether the firm contracted this debt in July or August 1997 is as good as random.

[4]The TED spread is the difference between the 3-month LIBOR rate (pertaining to short-term interbank debt) and the 3-month Treasury bill rate (pertaining to short-term U.S. government debt). It is the most commonly used benchmark in the pricing of commercial loans, as it provides an informative metric of credit risk in the corporate sector. Intuitively, the TED spread compares the return banks charge when they lend money to each other (which in turn reflects the credit risk of their corporate borrowers) to the return they charge for a risk-free loan (i.e., a loan to the U.S. government). The difference between the two isolates the risk premium charged by banks for bearing borrowers' default risk, which is then used as a benchmark for the pricing of loans.

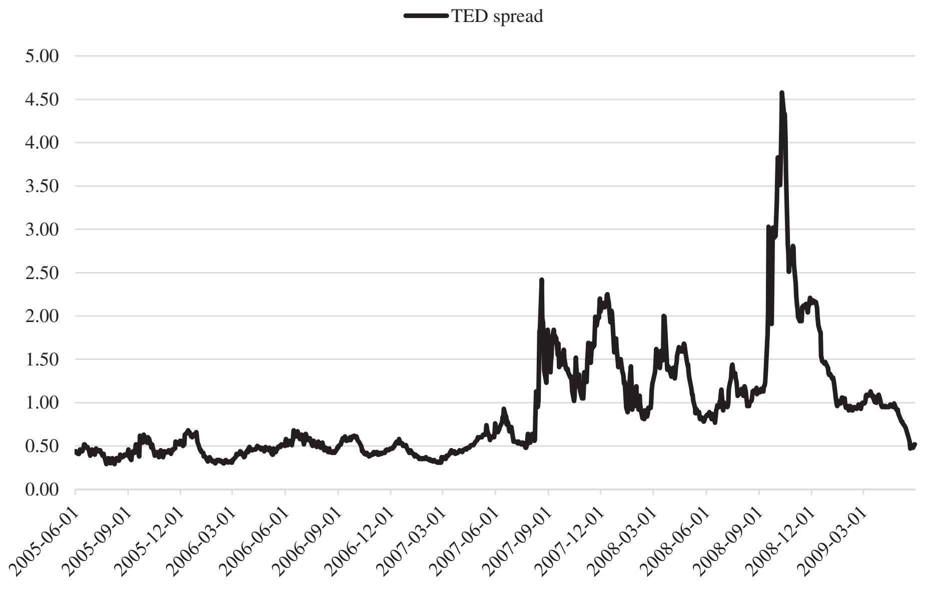

FIGURE 1 Evolution of financing costs. This figure plots the daily TED spread from June 2005 until June 2009. The TED spread is the difference between the 3-month LIBOR rate and the 3-month Treasury bill rate. The data are obtained from the St. Louis Fed

Yet, the sharp discontinuity in the borrowing costs after the panic of August 2007 has dramatic consequences for the financing costs faced by both companies when rolling over their debt. While firm A faces pre-crisis financing costs, firm B faces financing costs that are an order of magnitude higher. In other words, this setup provides a (quasi-)random assignment of high versus low financing costs—and hence the extent to which companies are hit by the disruption of credit markets—that can be used to identify the causal impact of the credit crunch on firms' investment strategies during the crisis.

In this setup, the control group consists of companies whose long-term debt matures shortly before August 2007 (such as firm A in the above example), while the treatment group consists of companies whose long-term debt matures shortly thereafter (such as firm B). Using a difference-in-differences (DID) specification, we then examine how companies adjusted their CAPEX, workforce, R&D, and CSR.

We find that companies significantly reduced their CAPEX and workforce in response to the treatment. Yet, and remarkably, they maintained their pre-crisis levels of R&D and CSR. These findings indicate that companies, on average, responded by following a "two-pronged" approach of simultaneously reducing their workforce and CAPEX, while sustaining their investments in R&D and CSR.[5] This suggests that innovative capability and stakeholder relationships were seen as instrumental in sustaining firms' competitiveness during the crisis.

[5]Anecdotal evidence is consistent with this two-pronged approach. In particular, commentators were puzzled as to why companies did not seem to reduce their R&D and CSR during the financial crisis. For example, the *Wall Street Journal* noted that "[m]ajor U.S. companies are cutting jobs and wages. But many are still spending on innovation." (Wall Street Journal, 2009). Similarly, *Fortune* noted that "[a]s companies cut costs, social responsibility may seem like an easy target. But many big names are sticking with the program" (Fortune, 2009).

Additional evidence is supportive of this interpretation. Specifically, while *on average* firms did not reduce their investments in R&D and CSR, we find that they did reduce R&D and CSR in industries that are less R&D-intensive and less CSR-sensitive, respectively—that is, in industries where firms' competitiveness is less likely to depend on their innovative capability and stakeholder relationships, respectively.[6]

Finally, we examine whether companies that sustained their investments in R&D and CSR performed better in the post-crisis years. We find that they did. Specifically, they achieved a higher return on assets (ROA), higher Tobin's Q, and analysts were more likely to issue a "buy" recommendation for their stock. In contrast, we find that companies that maintained their workforce and CAPEX did not achieve higher performance. Moreover, we find that firms that pursued the two-pronged approach of simultaneously maintaining their R&D and CSR while reducing their workforce and CAPEX achieved an even higher performance in the post-crisis years.

The remainder of this manuscript is organized as follows. In Section 2, we describe the methodology, along with the data used for the analysis. In Section 3, we present the results. Finally, in Section 4, we offer conclusions and discuss potential avenues for future research.

2 | DATA AND METHODOLOGY

2.1 | Data sources and variable definitions

2.1.1 | Dependent variables

The firm-level data are obtained from Standard & Poor's Compustat. Compustat compiles accounting data for U.S. publicly-traded companies, along with industry codes and information on the company's location. In the following, we describe the computation of the main dependent variables.

Workforce. We measure the size of the company's workforce annually by taking the natural logarithm of the number of employees.

CAPEX. To measure annual investments in physical capital, we compute the ratio of capital expenditures (CAPEX) to property, plant & equipment (PPE). To mitigate the impact of outliers, we winsorize this ratio at the 5th and 95th percentiles of its distribution.

R&D. We measure annual investments in R&D by computing the ratio of R&D expenses to total assets. We winsorize this ratio at the 5th and 95th percentiles of its distribution.

CSR. To measure CSR, we use the KLD-index, which is obtained from the Kinder, Lydenberg, and Domini (KLD) database. The KLD-index is widely used in the CSR literature.[7]

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[6]In the terminology of capital budgeting, companies invest in projects if the project's internal rate of return (IRR) exceeds the project's cost of capital (or, more precisely, the projects' weighted average cost of capital—the WACC—which is a weighted average of the cost of debt and equity used to finance the project). If the IRR from R&D and CSR projects is sufficiently high, it might remain above the cost of capital even after the massive rise in financing costs. Presumably, in industries that are less R&D-intensive and less CSR-sensitive—that is, in industries in which firms' competitiveness is less likely to depend on R&D and CSR—the IRR from R&D and CSR projects is lower to begin with (reflecting their lower strategic value), and hence more likely to fall below the cost of capital during the credit crunch. This is consistent with our finding that companies did curtail their R&D and CSR projects in industries that are less R&D-intensive and less CSR-sensitive, respectively.

[7]Chatterji, Levine, and Toffel (2009, p. 127) note that "KLD's social and environmental ratings are among the oldest and most influential and, by far, the most widely analyzed by academics."

KLD is an independent social choice investment advisory firm that compiles ratings on companies' performance in addressing the needs of their stakeholders. These ratings are based on multiple data sources including annual questionnaires sent to companies' investor relations offices, firms' financial statements, annual and quarterly reports, general press releases, government surveys, and academic publications. To construct the composite KLD-index, we add up the number of all CSR strengths with respect to employees, customers, the natural environment, and society at large (community and minorities).[8,9]

Changes during the Great Recession. In the empirical analysis, we examine how companies adjusted the four different types of strategic resources during the Great Recession. Accordingly, we compute the change in these variables from 2007 to 2009, which we denote by *Δ log(employees)*, *Δ CAPEX/PPE*, *Δ R&D/assets*, and *Δ KLD-index*, respectively.[10]

2.1.2 | Control variables

In our baseline specification, we control for numerous firm characteristics measured in 2006 (i.e., prior to the Great Recession), all of which are obtained from Compustat. *Size* is the natural logarithm of the book value of total assets. *ROA* is the ratio of operating income before depreciation to the book value of total assets. *Tobin's Q* is the ratio of the market value of total assets (obtained as the book value of total assets plus the market value of common stock minus the sum of the book value of common stock and balance sheet deferred taxes) to the book value of total assets. *Cash holdings* is the ratio of cash and short-term investments to the book value of total assets. *Leverage* is the ratio of debt (long-term debt plus debt in current liabilities) to the book value of total assets. To mitigate the impact of outliers, all ratios are winsorized at the 5th and 95th percentiles of their distribution. These covariates capture differences in firm size (*size*), profitability (*ROA*), investment opportunities (*Tobin's Q*), financing (*leverage*), and liquidity (*cash holdings*), which may affect subsequent investments in strategic resources.[11]

2.1.3 | Loan data

The loan information is obtained from Thomson Reuters Loan Pricing Corporation's (LPC) Dealscan, which contains detailed information on loans issued by financial institutions (such as

[8]In addition to CSR strengths, the KLD database also contains a list of CSR weaknesses, labeled "concerns." Accordingly, an alternative approach is to construct a "net" KLD index by subtracting the number of concerns from the number of strengths. However, recent research suggests that this approach is methodologically questionable. More specifically, KLD strengths and concerns lack convergent validity—using them in conjunction fails to provide a valid measure of CSR (e.g., Mattingly & Berman, 2006). Nevertheless, in robustness checks we show that we obtain similar results if we use the net KLD-index.

[9]Note that, the KLD-index is only an indirect measure of "investments in CSR." This caveat arises due to the fact that companies do not report CSR expenses as a separate item in their income statement. Rather CSR expenses are combined with other types of expenses (and listed as part of, e.g., selling, general, and administrative expenses (SG&A) or "other expenses"). For this reason, the common practice in the literature has been to rely on changes in CSR indices as proxies for "investments" in CSR (e.g., Flammer & Bansal, 2017; Ioannou & Serafeim, 2015; Kacperczyk, 2009; McWilliams & Siegel, 2000).

[10]For example, Δ *log(employees)* = *log(employees*$_{2009}$*)* − *log(employees*$_{2007}$*)*.

[11]Appendix A compiles the list of variables used in the analysis.

commercial banks and investment banks) to U.S. companies.[12] Dealscan' captures a substantial share of the loan market. Carey and Hrycray (1999) estimate that Dealscan loans cover between 50% and 75% of the volume of loans issued to U.S. corporations. For each loan, Dealscan provides a wealth of information including the issue date, maturity date, and loan amount. We match Dealscan to Compustat using the bridge of Chava and Roberts (2008).

The average loan in our sample has a principal amount of $547M, an interest of 6.1%, and a maturity of 4.3 years; 87% of the loans are amortizing loans (i.e., the amount of principal is paid down over the life of the loan), while the remaining 13% are bullet loans (i.e., the principal is repaid at maturity). Roberts and Sufi (2009) study the extent to which Dealscan loans are renegotiated ex post. They find that renegotiation is common, but "rarely a consequence of distress or default" (p. 159). Moreover, they find that, when the terms are renegotiated (such as the interest on the loan), this is usually done at the prevailing market conditions. Accordingly, renegotiation is unlikely to affect our results—firms whose long-term debt matures shortly before August 2007 are unlikely to renegotiate (as they would be facing post-crisis credit conditions), while firms whose long-term debt matures shortly after August 2007 are unlikely to obtain better terms.

2.2 | Methodology

2.2.1 | The (quasi-)experiment

The financial crisis started with a sharp drop in house prices in 2006, which in turn triggered a wave of default of subprime mortgages going into 2007. The increase in subprime defaults in the first half of 2007 led to massive losses on MBS and ultimately the collapse of the MBS market.[13]

One of the triggering events was the run on the assets of three MBS-based structured investment vehicles (SIV) of BNP Paribas at the beginning of August. This run informed investors that MBS were no longer safe, which led to a major reassessment of the risk of debt instruments and the "panic" of August 2007 (also known as the "credit crunch" of August 2007). Almost overnight, the cost of borrowing sky-rocketed. This is best seen in the aforementioned Figure 1 that shows a sharp discontinuity in the TED spread at the beginning of August. While the TED spread was around 40–50 basis points in the pre-crisis period, it jumped to about 200 basis points in August 2007 and remained high thereafter (peaking at about 460 basis points in October 2008).

This sharp discontinuity in borrowing costs during the panic of 2007 provides the (quasi-) experimental setting we exploit in this paper. Companies whose long-term debt matures shortly before August 2007 are able to roll over their debt at pre-crisis conditions, whereas companies whose long-term debt matures shortly after August 2007 face refinancing costs that are an order of magnitude higher. Importantly, there is no reason to expect any systematic differences between companies whose debt was set to mature shortly before versus shortly after August. In experimental terms, this implies that the "assignment to treatment" (i.e., to high versus low

[12]Many of these loans are syndicated (i.e., they are issued by a "syndicate" of two or more financial institutions). For a detailed description of the Dealscan dataset, see Chava and Roberts (2008).

[13]See Acharya, Philippon, Richardson, and Roubini (2009), Brunnermeier (2009), and Gorton (2010) for a description of the various factors that led to the financial crisis.

borrowing costs) is quasi-random. In turn, this allows us to study the causal impact of the credit crunch on firms' investments in their key strategic resources.[14]

Using this empirical setting, we define the *control group* as those firms in the matched Compustat-Dealscan universe who have debt that matures within 6 months prior to August 2007 (382 firms). Similarly, we define the *treatment group* as those firms whose debt matures within 6 months after August 2007 (288 firms).[15] In robustness checks, we show that our results are similar if we use different time windows (3, 9, and 12 months, respectively).

An advantage of using Dealscan is that it only includes large loans. By construction, this guarantees that the debt position that is rolled over is substantial.[16] As discussed above, the cost of debt skyrocketed following the panic of August 2007. For the treated firms, it increased from 5.8 percentage points prior to the treatment to 9.8 percentage points thereafter (i.e., it increased by 4% points, corresponding to a 70% increase). Since the amount of debt rolled over by the treated firms was $512M, this implies an increase in the annual interest expense by $512M × 4% = $20M.[17] While this increase may seem small in absolute terms, it was quite large compared to the treated firms' profits during the crisis. Specifically, the average annual earnings of the treated firms were $336M during the crisis period of 2007–2009. Hence, the higher cost of debt wiped out about 6% of their profits per year.[18,19]

2.2.2 | Covariate balance

The identifying assumption behind our analysis is that the assignment to the treatment versus control group is "as good as random." Importantly, this identifying assumption is testable—to the extent that the assignment is (quasi-)random, there should be no *ex ante* differences between firms in the treatment versus control group. To examine whether this is the case, in Panel A of Table 1, we contrast various characteristics measured in 2006 (i.e., prior to the crisis). As can be seen from the last two columns (which report the *p*-value of the difference-in-means

[14]This design is similar in spirit to a regression discontinuity design (RDD), in which we compare firms that are marginally above vs. below a discontinuity threshold—in our case, firms whose long-term debt matures marginally before vs. after the panic of August 2007. The RDD methodology is often seen as the sharpest tool of causal inference since it approximates very closely the ideal setting of randomized control experiments (see Lee & Lemieux, 2010, p. 282).

[15]If a company has loans that mature during both the control and treatment periods, we assign the firm to the control or treatment group depending on which amount is larger. In Appendix C, we show that our results are not sensitive to the coding of these firms.

[16]Notice that the loans are rolled over at a full principal amount, and hence the distinction between "loan amount" and "principal amount" is immaterial in our context.

[17]Note that for bullet loans (13% of the loans in our sample), no interest is paid until maturity. That said, these loans still entail a "hidden interest" in that the bullet payment at maturity will reflect the accumulated interest.

[18]Another informative benchmark is the pretreatment capital expenditures, which are on average $407M for the treated firms. Hence, the higher interest expense of $20M corresponds to about 5% of the firm's annual capital expenditures in noncrisis times.

[19]In auxiliary analyses we distinguish between large versus small treatments, depending on whether the amount of debt that is rolled over (as a fraction of the firm's assets) is above versus below the median across all treated firms. For above-median treatments, the higher debt burden wiped out about 18% of the treated firms' profits per year.

TABLE 1 Summary statistics

		Obs.	Mean	Median	*SD*	*p*-value (diff. in means)	*p*-value (diff. in medians)
Panel A. Pre-crisis characteristics							
Size	Treated	288	7.313	7.308	1.825	.298	.155
	Control	382	7.612	7.488	1.953		
ROA	Treated	288	0.130	0.126	0.115	.764	.192
	Control	382	0.132	0.121	0.086		
Tobin's Q	Treated	288	1.836	1.538	1.014	.280	.319
	Control	382	1.644	1.344	0.869		
Leverage	Treated	288	0.279	0.247	0.203	.344	.380
	Control	382	0.290	0.275	0.202		
Cash holdings	Treated	288	0.104	0.055	0.128	.356	.207
	Control	382	0.088	0.046	0.110		
Log (employees)	Treated	288	1.392	1.303	1.834	.303	.168
	Control	382	1.507	1.508	1.728		
CAPEX/PPE	Treated	288	0.237	0.206	0.147	.617	.344
	Control	382	0.231	0.203	0.143		
R&D/assets	Treated	134	0.042	0.017	0.068	.220	.174
	Control	161	0.030	0.008	0.068		
KLD-index	Treated	217	1.719	1.000	2.760	.458	.998
	Control	286	1.549	1.000	2.222		
Panel B. Amount of debt financing maturing around August 2007							
Amount ($M)	Treated	288	512.2	150.0	1,725.9	.546	.253
	Control	382	573.9	200.0	1,452.7		
Panel C. Industry demand prior to the crisis (2002–2006)							
Sales growth (ind.)	Treated	288	0.070	0.065	0.047	.414	.923
	Control	382	0.067	0.065	0.046		

and difference-in-medians, respectively), there is no significant difference between the two groups, which lends support to our identification.

In Panel B, we report the average loan amount in each group. As is shown, the amount is slightly smaller in the treatment group. Yet, and importantly, the difference is insignificant.

Finally, in Panel C, we report sales growth from 2002 to 2006 (i.e., during the run-up period leading up to the financial crisis) in the firm's industry to examine whether treated and control firms faced different demand conditions prior to the treatment. Again, we find no significant difference between the two groups.

2.2.3 | DID specification

We estimate companies' responses to the treatment by estimating the following regression:

$$\Delta y_i = \alpha_j + \beta \times \text{treatment}_i + \boldsymbol{\gamma}' \mathbf{X}_i + \varepsilon_i, \tag{1}$$

where i indexes firms and j indexes industries (2-digit SIC major groups); α_j are industry fixed effects; $\Delta\, y$ is the change in the variable of interest—that is, *log(employees)*, *CAPEX/PPE*, *R&D/Assets*, *KLD-index*—from 2007 to 2009; *treatment* is the treatment dummy that is equal to one for companies in the treatment group (and zero for companies in the control group); **X** is the vector of control variables, which includes *size*, *cash holdings*, *leverage*, *ROA*, and *Tobin's Q* (all measured in 2006); ε is the error term. Throughout the analysis, we cluster standard errors at the industry level to account for potential dependence across firms that have similar operations. The coefficient of interest is β, which captures the DID, that is, the difference between $\Delta\, y$ among the treated firms and $\Delta\, y$ among the control firms.

Note that, specification (1) is set up as a cross-sectional regression (in which $\Delta\, y$ captures the change in outcomes around the treatment). An alternative way to set up the DID is by pooling all firm-year observations before and after the treatment in a panel regression of y (in lieu of $\Delta\, y$) that includes firm and year fixed effects. In robustness checks, we show that we obtain similar results if we use this alternative specification.[20]

3 | RESULTS

3.1 | Main results

Table 2 reports estimates from the DID specification in Equation (1), that is, a regression of the four dependent variables (which all capture *changes* in firms' resources) on the treatment dummy.[21]

In Column (1), we find that treated companies—that is, companies that are hit more strongly by the sharp increase in borrowing costs during the financial crisis—laid off more employees. The coefficient of −.023 (p-value = .014) implies that treated firms reduced their workforce by 2.3% compared to control firms.

In Column (2), we observe a similar pattern for physical investment. Specifically, the coefficient of −.021 (p-value = .042) implies that treated firms reduced their capital expenditures by 2.1% of PPE compared to control firms. This indicates that employment and physical investment were adjusted in a similar manner during the financial crisis.

In contrast, in Columns (3) and (4), we find virtually no change in R&D spending and CSR. Both coefficients are small in economic terms and statistically insignificant (p-values of .677 and .838, respectively). Overall, the findings in Table 2 are consistent with a "two-pronged" response: companies responded to the sharp increase in borrowing costs during the financial

[20]The choice of the cross-sectional specification as baseline is guided by the economics literature on the financial crisis. In this literature—e.g., Mian and Sufi (2014), Mian, Rao, and Sufi (2013)—researchers typically use the cross-sectional setup to study how regional heterogeneity (e.g., county-level variation in house prices) affected changes in employment and consumption during the crisis.

[21]The full regression output with controls is provided in Appendix B.

TABLE 2 The effect of the credit crunch on firms' investment strategies

	Δ Log(Employees) (1)	Δ CAPEX/PPE (2)	Δ R&D/assets (3)	Δ KLD-index (4)
Treatment	−0.023	−0.021	0.001	−0.013
	(0.009)	(0.010)	(0.001)	(0.063)
Controls	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	670	670	295	503
R-squared	.06	.08	.15	.03

Note: Standard errors (reported in parentheses) are clustered at the industry level.

crisis by reducing their workforce and CAPEX, while they sustained their investments in R&D and CSR. This suggests that innovation and stakeholder relations were seen as instrumental in sustaining firms' competitiveness during the crisis.

In Appendix C, we present several robustness checks that are variants of the specification used in Table 2.[22] In Appendix D, we discuss the external validity of our findings.

3.2 | Substitution

The results in Table 2 suggest that companies responded to the credit crunch by substituting R&D and CSR for capital and labor. In Table 3, we provide direct evidence for this substitution. Specifically, we focus on the common sample in which all four dependent variables are available, and consider as dependent variables the change in four ratios, namely *R&D/employees*, *R&D/CAPEX*, *KLD-index/employees*, and *KLD-index/CAPEX*. As is shown, we find that all four ratios increase following the treatment (with *p*-values ranging from .000 to .047), consistent with the argument that firms substitute R&D and CSR for capital and labor.[23]

The substitution between CSR and labor warrants more discussion. Intuitively, employee layoffs may seem at odds with firms maintaining their CSR. In this regard, it is important to highlight that layoffs are not necessarily inconsistent with socially responsible practices—in

[22]Specifically, we obtain similar results if we (a) consider alternative debt maturity cutoffs for the quasi-experiment; (b) use the common sample in which none of the dependent variables is missing; (c) control for the 2006 level along with the 2002–2006 change (i.e., the "pretrend") in the dependent variables; (d) estimate all four regressions jointly using the seemingly unrelated regressions (SUR) estimator; (e) distinguish between the manufacturing sector and other sectors; (f) use an alternative definition of the treatment group; (g) use alternative functional forms; (h) use the "net" KLD-index (based on CSR strengths and CSR concerns); (i) distinguish between "inputs" and "output" provisions of the KLD-index; (j) use KLD subindices pertaining to different stakeholder groups; (k) use ASSET4 data (in lieu of KLD data) to measure CSR; and (l) use the panel formulation of the DID. We further present placebo tests based on m) a "placebo panic" and n) the random assignment of firms whose debt does not mature during the relevant treatment window into arbitrary treatment and control groups.

[23]Note that, since the four ratios are computed within firms (i.e., they capture the *within-firm* reallocation of resources), this analysis also mitigates concerns that our results may be driven by variation across firms.

TABLE 3 Substitution of R&D and CSR for capital and labor

	Δ R&D/ employees (1)	Δ R&D/ CAPEX (2)	Δ KLD-index/ employees (3)	Δ KLD-index/ CAPEX (4)
Treatment	0.661	0.135	0.069	0.012
	(0.269)	(0.037)	(0.026)	(0.006)
Controls	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	221	221	221	221
R-squared	.07	.15	.08	.11

Note: Standard errors (reported in parentheses) are clustered at the industry level.

fact, it is perfectly possible for a company to lay off employees to maintain cash flows during times of crisis while using some of those cash flows to sustain their investments in CSR, including employee-related dimensions of CSR. A case in point is the recent example of layoffs at Airbnb. Due to the recent COVID-19 crisis and a sharp drop in Airbnb's revenues, the company had to lay off around 1,900 employees out of a total workforce of about 7,500. However, Airbnb was widely praised for the responsible handling of these layoffs: the laid off employees not only kept their health insurance for 12 months and were allowed to keep their laptops forever, but also, Airbnb set up job support processes for them, including a placement and careers team, so as to enable them to find new job opportunities.[24] As this example highlights, a company can be socially responsible even when it is pushed to lay off employees due to a major crisis.

3.3 | Intensity of treatment

In Table 2, *treatment* was a binary variable indicating whether the company's long-term debt was scheduled to be rolled over shortly before versus after the panic of August 2007.

In Panel A of Table 4, we distinguish between large versus small treatments, depending on whether the amount of debt that is rolled over (as a fraction of the firm's assets) is above versus below the median across all treated firms. As can be seen, we find that the reduction in CAPEX and employment is large and significant for above-median treatments (while it is small and insignificant for below-median treatments). Interestingly, we continue to find no change in R&D and CSR investments regardless of the intensity of the treatment.

In Panel B of Table 4, we obtain similar results if instead of sorting treated firms based on the amount of debt that is rolled over, we sort them based on the maturity of the loans that are rolled over.[25]

[24]For more details about the CEO's justification and further benefits that laid off employees received, see their CEO's blog post, available at https://news.airbnb.com/a-message-from-co-founder-and-ceo-brian-chesky/.
[25]Relatedly, in Appendix E, we show that the decrease in workforce and CAPEX is mitigated for cash-rich firms.

TABLE 4 Intensity of treatment

Panel A. Loan amount	**Δ Log(Employees) (1)**	**Δ CAPEX/PPE (2)**	**Δ R&D/assets (3)**	**Δ KLD-index (4)**
Treatment × above-median loan amount	−0.036	−0.031	0.002	−0.019
	(0.012)	(0.013)	(0.002)	(0.074)
Treatment × below-median loan amount	−0.013	−0.012	−0.001	−0.005
	(0.011)	(0.013)	(0.002)	(0.079)
Controls	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	670	670	295	503
R-squared	.06	.08	.15	.03

Panel B. Loan maturity	**Δ Log(Employees) (1)**	**Δ CAPEX/PPE (2)**	**Δ R&D/ assets (3)**	**Δ KLD-index (4)**
Treatment × above-median loan maturity	−0.031	−0.027	0.000	−0.016
	(0.012)	(0.014)	(0.001)	(0.074)
Treatment × below-median loan maturity	−0.016	−0.015	0.001	−0.011
	(0.012)	(0.013)	(0.002)	(0.077)
Controls	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	670	670	295	503
R-squared	.06	.08	.15	.03

Note: Standard errors (reported in parentheses) are clustered at the industry level.

3.4 | The drop in consumer demand

While our quasi-experimental setup allows us to isolate the effect of the cost of debt during the financial crisis (holding constant the drop in consumer demand, as well as other macroeconomic disruptions), this is not to say that the collapse in consumer demand was not important. Indeed, what our empirical design captures is not merely a "quasi-random increase in the cost of debt" but instead a "quasi-random increase in the cost of debt at the time of the most severe recession since the Great Depression."

We examine the role of consumer demand in Table 5. Specifically, we interact *treatment* with a dummy variable that indicates whether the 2007–2009 drop in sales in the firm's industry was in the top quartile across all industries. We find that the reduction in CAPEX and employment is significantly larger in those industries. Interestingly, we continue to find no change in R&D and CSR investments.

3.5 | Why did firms maintain their R&D and CSR?

Our baseline results show that companies followed a two-pronged approach in response to the sharp increase in borrowing costs during the financial crisis: while they curtailed their workforce and CAPEX, they sustained their investments in R&D and CSR. While the reduction in workforce and CAPEX is intuitive—and consistent with the finance literature documenting a reduction in physical investment in response to the credit crunch (e.g., Almeida et al., 2011; Campello et al., 2010; Duchin et al., 2010)—it is unclear why companies maintained their R&D and CSR. In the following, we examine three potential mechanisms.

3.5.1 | Benefits of innovation and stakeholder relations during the crisis

One potential explanation is that R&D and CSR were seen as instrumental in sustaining firms' competitiveness during the financial crisis. To examine this argument, we exploit cross-industry variation in the strategic relevance of R&D and CSR for firms' competitiveness. In particular, in industries with low R&D intensity, firms' competitiveness is less likely to depend on their innovative capability, and hence companies may be more inclined to cut R&D budgets in response to the credit crunch. Similarly, companies operating in less CSR-sensitive industries might be more inclined to curtail their CSR. We explore these dimensions in Panel A of Table 6.

TABLE 5 The amplifying role of the drop in consumer demand

	Δ Log(Employees) (1)	**Δ CAPEX/PPE (2)**	**Δ R&D/ assets (3)**	**Δ KLD-index (4)**
Treatment	−0.017	−0.015	0.001	−0.012
	(0.010)	(0.010)	(0.001)	(0.068)
Treatment × high drop in demand	−0.025	−0.024	−0.001	−0.005
	(0.013)	(0.012)	(0.002)	(0.112)
Controls	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	670	670	295	503
R-squared	.06	.08	.15	.03

Note: Standard errors (reported in parentheses) are clustered at the industry level.

TABLE 6 Heterogeneity in firms' response

Panel A. Strategic relevance of R&D and CSR	Δ R&D/assets (1)	Δ KLD-index (2)
Treatment	0.003	0.043
	(0.003)	(0.068)
Treatment × low R&D intensity	−0.012	
	(0.005)	
Treatment × B2B sector		−0.164
		(0.077)
Controls	Yes	Yes
Industry fixed effects	Yes	Yes
Observations	295	503
R-squared	.15	.03

Panel B. Uncertainty	Δ Log(Employees) (1)	Δ CAPEX/PPE (2)	Δ R&D/assets (3)	Δ KLD-index (4)
Treatment	−0.023	−0.020	0.001	−0.013
	(0.010)	(0.010)	(0.001)	(0.071)
Treatment × high uncertainty	−0.002	−0.004	−0.000	0.002
	(0.013)	(0.012)	(0.001)	(0.105)
Controls	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	670	670	295	503
R-squared	.06	.08	.15	.03

Note: Standard errors (reported in parentheses) are clustered at the industry level.

R&D-intensive industries. In Column (1), we examine whether companies in less R&D-intensive industries reduced their R&D during the meltdown. We construct a measure of R&D intensity at the industry level by computing the ratio of R&D expenses to total assets for all Compustat firms in 2006. We then compute the average across all firms in any given 2-digit SIC industry (*R&D intensity*), and re-estimate our baseline R&D regression, interacting *treatment* with a dummy variable that indicates whether *R&D intensity* is in the bottom quartile across all industries. Consistent with the above argument, we find that companies in less R&D-intensive industries did significantly reduce their R&D (p-value = .012).

CSR-sensitive industries. Relatedly, the strategic value of CSR is likely lower in industries that are less CSR-sensitive—that is, industries where stakeholder support plays a marginal role for firms' competitiveness and survival.[26] A prime example of industries that are less CSR-sensitive are B2B industries (e.g., Corey, 1991; Lev, Petrovits, & Radhakrishnan, 2010).[27] We examine this dimension in Column (2), where we contrast B2B versus B2C industries. Specifically, we re-estimate our baseline CSR regression, interacting *treatment* with a dummy variable indicating whether the company operates in the B2B sector (the classification of B2B versus B2C industries is obtained from Lev et al., 2010, p. 188). As is shown, we find that firms in the B2B sector significantly decreased their CSR (p-value = .034).

Overall, these results indicate that—although on average companies did not reduce their R&D and CSR during the crisis—they did curtail them in industries where innovation and stakeholder relations, respectively, are likely to be of lower strategic importance to firms' competitiveness.

3.5.2 | Real options

Another potential explanation of our findings is that—in the spirit of the real option literature—it could be that the "option to delay" is less valuable for R&D and CSR projects, and hence companies prefer not to delay these projects. If the real option argument has bearing in our context, our findings should vary depending on the degree of uncertainty (as higher uncertainty increases the value of the option to delay).

We examine this argument in Panel B of Table 6. We use the firm's stock volatility as a measure of uncertainty. Following Gormley and Matsa (2016, p. 452), we compute a firm's stock volatility as the square root of the sum of the squared daily returns from CRSP (the Center for Research in Security Prices), normalized by the number of trading days during the year. We then interact *treatment* with a dummy that indicates whether the firm's stock volatility is in the top quartile across all firms prior to the treatment (i.e., in 2006). As is shown, we find that our results are unaffected by the degree of uncertainty, which is inconsistent with the real option argument.

3.5.3 | Stickiness

An alternative explanation of our nonresult for R&D is that R&D investments might be "sticky" and hence difficult to undo in the short run. This alternative is mitigated by the above finding that companies in less R&D intensive industries did curtail their R&D. Indeed, this finding implies that R&D is not always and inherently sticky, since we identify conditions under which

[26]Anecdotal evidence is consistent with this argument. Indeed, in commenting on the fact that companies seemed to hold on to their CSR programs during the Great Recession, Eric Biel, managing director of corporate responsibility at global public relations firm Burson–Marsteller stated that "[t]hose that still see environmental and social performance as largely divorced from their core business model and overall reputation are more likely to cut back in these tough times" (Fortune, 2009).

[27]Lev et al. (2010) show that individual consumers are more sensitive to companies' CSR engagement than industrial buyers, which reflects inherent differences in the purchasing decision-making process. More precisely, "[t]he purchasing decision of an individual consumer is affected not only by product attributes, but also by social group forces, psychological factors, and the consumer's situational forces. In contrast, in industrial purchasing, the decision-making process is highly formalized, using defined procurement procedures, and subject to economic (cost/value) analysis" (Lev et al., 2010, p. 186, adapted from Corey, 1991).

TABLE 7 Alternative rationales for maintaining R&D

	Δ R&D/assets (1)	Δ R&D/assets (2)	Δ R&D/assets (3)	Δ R&D/assets (4)
Treatment	0.004	0.004	0.003	0.003
	(0.004)	(0.004)	(0.004)	(0.003)
Treatment × low R&D intensity	−0.010	−0.011	−0.011	−0.012
	(0.005)	(0.005)	(0.006)	(0.005)
Treatment × short R&D cycle	−0.006			
	(0.004)			
Treatment × high R&D volatility		−0.002		
		(0.005)		
Treatment × high incremental R&D			−0.001	
			(0.005)	
Treatment × non-IDD state				−0.000
				(0.006)
Controls	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	295	295	295	295
R-squared	.15	.15	.15	.15

Note: Standard errors (reported in parentheses) are clustered at the industry level.

it did in fact decrease. Relatedly, our findings indicate that R&D is maintained precisely in those industries where R&D is relatively more important for competitiveness. Put differently, our findings indicate that the potential stickiness of R&D is linked to its importance for competitiveness, which suggests that the strategic importance of R&D may very well be an *antecedent* of its stickiness, at least to some extent.[28]

Nevertheless, it could be that R&D is sticky for reasons that are nonstrategic (and happen to be correlated with R&D intensity). For example, in industries with long R&D cycles, R&D may be difficult to adjust regardless of its strategic value. In Columns (1) and (2) of Table 7, we explore whether such "mechanical" sources of stickiness may explain our findings. To do so, we estimate a variant of our R&D regression in which, in addition to the interaction between the treatment and R&D intensity (which captures the strategic importance of R&D), we also include an interaction between the treatment and other variables that may capture mechanical

[28]As additional evidence in support of the strategic motive, we find that firms that did not drop their R&D had on average longer time horizons. To measure organizational time horizons, we use the long-term index of Flammer and Bansal (2017), and find that the long-term index of firms that did not drop their R&D is on average 12.3% higher (p-value = .000), consistent with a strategic motive in the R&D response.

forms of stickiness, namely (i) the length of R&D cycles in the firm's industry and (ii) R&D volatility at the firm level. (The latter captures the idea that, if a firm's R&D shows little fluctuations over time, it is likely to be stickier to begin with.) These regressions are informative in that, if our results were unrelated to the strategic importance of R&D, our interaction between the treatment and R&D intensity should become insignificant upon including these additional interaction terms.

To capture R&D cycles, we use the list of industries with short versus long product development cycles compiled by Bushman, Indjejikian, and Smith (1996). We then construct an indicator variable, *short R&D cycle*, that is equal to one if the firm operates in an industry with a short product development cycle. To capture R&D volatility at the firm level, we use quarterly accounting data from Compustat, and compute the standard deviation of the company's R&D to asset ratio over the 12 quarters that precede the treatment. We then construct an indicator variable, *high R&D volatility*, that is equal to one if R&D volatility is in the top quartile across all firms.

As is shown, we find that the coefficient of *treatment* × *short R&D cycle* (Column (1)) and *treatment* × *high R&D volatility* (Column (2)) are both negative (with *p*-values of .154 and .660, respectively), consistent with the notion that companies are more inclined to reduce R&D when it is less sticky to begin with. Importantly, however, accounting for these dimensions of stickiness does not overturn our previous finding. Indeed, the coefficient of *treatment* × *low R&D intensity* remains similar to before, consistent with the strategic motive.

In Columns (3) and (4), we examine two additional dimensions that may capture other forms of R&D stickiness. In Column (3), we distinguish between incremental versus exploratory R&D. To do so, we construct an indicator variable, *high incremental R&D*, that is equal to one if the share of the firm's patents that are incremental (computed as in Benner & Tushman, 2002, using data from the NBER patent database) is in the top quartile across all firms. In Column (4), we consider different knowledge appropriation regimes, which we capture through the indicator variable *non-IDD state* that is equal to one if the firm is located in a state that has rejected the inevitable disclosure doctrine (IDD).[29] As is shown, we find again that accounting for these characteristics does not overturn our finding that companies are more likely to curtail R&D in less R&D intensive industries.

Overall, the evidence from Table 7 reinforces our interpretation that, at least to some extent, firms maintaining their R&D is likely to reflect a strategic motive as opposed to being purely mechanical or reflective of other features of the R&D process.[30]

3.6 | Firm performance

In Table 8, we examine whether companies that maintained their investments in R&D and CSR in response to the credit crunch achieved higher performance during the recovery—to the extent that these strategies helped sustain their competiveness, companies that held on to them during the crisis may have benefited in the post-crisis period.

[29]The list of states that rejected the IDD is obtained from Flammer and Kacperczyk (2019). For a description of the IDD, see, for example, Gilson (1999) and Png and Samila (2015).

[30]Relatedly, our non-finding of a CSR response may reflect some form of stickiness in CSR. In this regard, the evidence provided in Panel A of Table 6 is again useful, as it shows that firms did curtail their CSR in industries where CSR is likely less relevant for firms' competitiveness. This again points at a strategic motive in the firms' response.

TABLE 8 Firm performance in the post-crisis years (2010–2011)

	ROA	Tobin's Q	Analysts' recommendations: Buy	Hold	Sell
	(1)	(2)	(3)	(4)	(5)
No reduction in R&D and KLD-index, and reduction in workforce and CAPEX	0.028	0.041	0.130	0.034	−0.164
	(0.012)	(0.021)	(0.071)	(0.032)	(0.048)
No reduction in R&D and KLD-index, and no reduction in workforce and CAPEX	0.016	0.017	0.077	0.010	−0.087
	(0.013)	(0.018)	(0.066)	(0.022)	(0.052)
Reduction in R&D and KLD-index, and no reduction in workforce and CAPEX	0.004	0.004	0.006	0.017	−0.023
	(0.011)	(0.018)	(0.102)	(0.015)	(0.078)
Controls	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	204	204	204	204	204
R-squared	.38	.53	.08	.08	.07

Note: Standard errors (reported in parentheses) are clustered at the industry level.

To examine this question, we regress post-crisis performance—that is, the average ROA in 2010–2011—on a set of dummy variables that indicate how the company responded to the credit crunch. These dummy variables span the (2×2) matrix of potential responses depending on whether companies (i) reduced versus maintained their workforce and CAPEX and (ii) reduced versus maintained their R&D and CSR. (The base group consists of firms that reduced all four resources.) The regression further includes industry fixed effects and the vector of control variables **X** used in regression (1). To mitigate the impact of outliers, we winsorize ROA at the 5th and 95th percentiles of its empirical distribution.[31]

As can be seen from Column (1), companies that maintained their R&D and CSR achieved higher performance post crisis, and even more so if they followed the two-pronged approach of maintaining their R&D and CSR while reducing their workforce and CAPEX. In the latter case, the reported coefficient of 0.028 (p-value = .019) indicates that ROA increased by 2.8 percentage points compared to the base group. Since the pretreatment ROA is 0.130 (Table 1), this implies

[31]We caution that the performance results presented in this section do not necessarily warrant a causal interpretation. Indeed, while the empirical setup used in Table 2 allows us to study how the sharp increase in the cost of debt affected firms' investment decisions, it does not allow us to establish a causal link between firms' investment decisions and performance. Doing so would require a separate instrument for firms' investment decisions.

that ROA increased by 0.028/0.130 = 21.5%.[32] This evidence suggests that R&D and CSR were indeed beneficial to firms in maintaining their competitiveness during (and beyond) the crisis.

There are two caveats of using ROA in this context. The first caveat is that, by construction, ROA includes expenses (such as R&D and employee costs). To the extent that expenses have some persistence over time, post-crisis ROA may mechanically reflect our baseline results. Second, ROA captures short-term performance, whereas the strategic investments made during the credit crunch may have longer-term implications.

To mitigate these caveats, we use alternative performance measures in Columns (2)–(5). In Column (2), we use Tobin's Q; in Columns (3)–(5), we use the percentage of analysts who formulate a buy, hold, and sell recommendation, respectively, for the company's stock. The analysts' recommendations are obtained from Thomson–Reuters' IBES (Institutional Brokers Estimate System). The benefit of these measures is that they are forward-looking and not mechanically related to firms' expenses. As can be seen, we obtain similar results when using these alternative metrics.[33]

4 | DISCUSSION AND CONCLUSION

How did companies adjust their resource base in response to the sharp increase in the cost of credit (the "credit crunch") during the financial crisis of 2007–2009? In this exploratory study, we shed light on this question by exploiting the sudden nature of the credit crunch as a source of (quasi-) random variation in the extent to which companies were hit by the higher cost of financing during the crisis.

Our findings indicate that, on average, companies responded by following a two-pronged approach: they significantly reduced their workforce and CAPEX, but sustained their investments in R&D and CSR. This suggests that investments in innovative capability and stakeholder relations were seen as instrumental in maintaining the firm's competitiveness during the financial crisis.

Consistent with this interpretation, we document that, although on average firms did not decrease their investments in R&D and CSR, they did curtail their R&D and CSR in industries with low R&D intensity and low CSR sensitivity, respectively—that is, in industries where innovative capability and stakeholder relations are less likely to contribute to the firm's competitiveness.

Finally, we find that companies that sustained their investments in R&D and CSR exhibit higher performance in the post-crisis years, consistent with the argument that such investments contribute to companies' competitiveness in times of crisis. In contrast, companies that only sustained their workforce and CAPEX did not perform better in the post-crisis years. What is more, we find that companies that pursued the two-pronged approach of simultaneously reducing their workforce and CAPEX while maintaining their investments in R&D and CSR achieved even higher performance in the post-crisis years.

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[32]The coefficient is larger, but not significantly larger, than the one we obtain for companies that maintained not only their R&D and CSR, but also their workforce and CAPEX.

[33]A limitation of the analysis provided in Table 8 is the lower sample size, which is further exacerbated by the decomposition in the (2 × 2) matrix. While we nevertheless observe noteworthy patterns, we note the lower power of the tests presented in this table.

Our study relates to the large body of work on organizational decline and corporate turnaround (for a review, see Trahms et al., 2013). While the adaptation to external changes has long been studied in this literature, the focus has been on more "traditional" disruptions in the firm's external environment such as industry decline and business cycle fluctuations (e.g., Aghion, Askenazy, Berman, Cette, & Eymard, 2012; Anand & Singh, 1997; Barlevy, 2007; Fabrizio & Tsolmon, 2014; Ouyang, 2011). In contrast, little is known of firm strategy when financial markets collapse. Such events are (fortunately) rare—the past century witnessed only two such events: the Great Depression of 1929 and the financial crisis of 2007–2009.[34] This gap in the literature is highlighted by Agarwal, Barney, Foss, and Klein's (2009) call for research that examines firms' strategic actions during the financial crisis. They highlight that none of the existing strategic management theories focuses on firms' adaptations to extreme events—such as the financial crisis of 2007–2009—that affect companies in complex ways. Given the limited guidance from theory, this study follows Hambrick (2007) and Helfat's (2007) recommendation to adopt a fact-based, exploratory approach, focusing on documenting the impact of this complex phenomenon on firm-level decision-making in the hope that it will stimulate follow-up studies and the eventual development of suitable theories.

Our study is also related to the growing literature that examines the various mechanisms through which companies can benefit from CSR. In particular, previous work has shown that CSR can help firms differentiate themselves from their competitors (Bettinazzi, Massa, Neumann, & Zollo, 2015; Flammer, 2015a), enhance their ability to recover from unfavorable situations (Bansal, Jiang, & Jung, 2015; Barnett, Darmall, & Husted, 2015; Choi & Wang, 2009; DesJardine, Bansal, & Yang, 2019), strengthen connections with the local communities (Tilcsik & Marquis, 2013), improve labor productivity (Flammer, 2015b; Flammer & Luo, 2017), improve firms' ability to engage in innovation (Flammer & Kacperczyk, 2016), enhance consumer loyalty (Du, Bhattacharya, & Sen, 2007; Kotler, Hessekiel, & Lee, 2012), improve access to government procurement contracts (Flammer, 2018), and lower capital constraints (Cheng, Ioannou, & Serafeim, 2014), among others. Our finding that companies did not curtail their CSR during the financial crisis echoes this literature, as it suggests that companies see CSR as an important aspect of corporate strategy that help them maintain or even enhance their competitiveness.

Lastly, our study opens up several avenues for future research. In particular, we hope that our fact-based study stimulates future work that builds on our results to develop an integrated theory of how (and why) companies adjust their resource base during financial crises. Such theories could be broadened to include other types of economy-wide crises such as the COVID-19 pandemic. In addition, more empirical evidence is needed. In particular, a finer-grained empirical analysis of the four strategic resources could shed light on the underlying theoretical mechanisms. For example, while our results show that companies laid off employees, an important question is *which* employees were laid off and why. Based on our results, one may expect companies to have laid off employees whose role is inessential for competitiveness and long-term survival. Relatedly, future work could examine which types of projects were discontinued and why. Examining these questions is a challenging task that requires detailed micro data on the companies' operations and processes. Making ground on them is a promising avenue for future research.

[34]This does not mean that financial crises are unlikely. In their review of financial crises over the past 800 years, Reinhart and Rogoff (2009) note that—over a long horizon—financial crises are surprisingly frequent, and will inevitably happen again.

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REFERENCES

Acharya, V., Philippon, T., Richardson, M., & Roubini, N. (2009). The financial crisis of 2007-2009: Causes and remedies. In V. Acharya & M. Richardson (Eds.), *Restoring financial stability: How to repair a failed system* (pp. 1–56). Hoboken, NJ: Wiley.

Agarwal, R., Barney, J. B., Foss, N. J., & Klein, P. G. (2009). Heterogeneous resources and the financial crisis: Implications of strategic management theory. *Strategic Organization*, *7*(4), 467–484.

Aghion, P., Askenazy, P., Berman, N., Cette, G., & Eymard, L. (2012). Credit constraints and the cyclicality of R&D investments: Evidence from France. *Journal of the European Economic Association*, *10*(5), 1001–1024.

Almeida, H., Campello, M., Laranjeira, B., & Weisbenner, S. (2011). Corporate debt maturity and the real effects of the 2007 credit crisis. *Critical Finance Review*, *1*(1), 3–58.

Anand, J., & Singh, H. (1997). Asset redeployment, acquisitions and corporate strategy in declining industries. *Strategic Management Journal*, *18*(S1), 99–118.

Bansal, P., Jiang, G. F., & Jung, J. C. (2015). Managing responsibly in tough economic times: Strategic and tactical CSR during the 2008–2009 global recession. *Long Range Planning*, *48*(2), 69–79.

Barlevy, G. (2007). On the cyclicality of research and development. *American Economic Review*, *97*(4), 1131–1164.

Barnett, M., Darmall, N., & Husted, B. W. (2015). Sustainability strategy in constrained economic times. *Long Range Planning*, *48*(2), 63–68.

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, *17*(1), 99–120.

Benner, M. J., & Tushman, M. L. (2002). Process management and technological innovation: A longitudinal study of the photography and paint industries. *Administrative Science Quarterly*, *47*(4), 676–706.

Bettinazzi, E. L. M., Massa, L., Neumann, K., & Zollo, M. (2015). Macro-economic crises and corporate sustainability. *Academy of Management Proceedings*.

Brunnermeier, M. K. (2009). Deciphering the liquidity and credit crunch 2007–2008. *Journal of Economic Perspectives*, *23*(1), 77–100.

Bushman, R. M., Indjejikian, R. J., & Smith, A. (1996). CEO compensation: The role of individual performance evaluation. *Journal of Accounting and Economics*, *21*(2), 161–193.

Campello, M., Graham, J. R., & Harvey, C. R. (2010). The real effects of financial constraints: Evidence from a financial crisis. *Journal of Financial Economics*, *97*(3), 470–487.

Carey, M., & Hrycray, M. (1999). *Credit flow, risk, and the role of private debt in capital structure* (Working paper). Washington, DC: Federal Reserve Board.

Chatterji, A. K., Levine, D. I., & Toffel, M. W. (2009). How well do social ratings actually measure corporate social responsibility? *Journal of Economics and Management Strategy*, *18*(1), 125–169.

Chava, S., & Roberts, M. M. (2008). How does financing impact investment? The role of debt covenants. *Journal of Finance*, *63*(5), 2085–2121.

Cheng, B., Ioannou, I., & Serafeim, G. (2014). Corporate social responsibility and access to finance. *Strategic Management Journal*, *35*(1), 1–23.

Choi, J., & Wang, H. (2009). Stakeholder relations and the persistence of corporate financial performance. *Strategic Management Journal*, *30*(8), 895–907.

Corey, E. R. (1991). *Industrial marketing cases and concepts*. Englewood Cliffs, NJ: Prentice Hall.

DesJardine, M. R., Bansal, P., & Yang, Y. (2019). Bouncing back: Building resilience through social and environmental practices in the context of the 2008 Global Financial Crisis. *Journal of Management*, *45*(4), 1434–1460.

Du, S., Bhattacharya, C. B., & Sen, S. (2007). Reaping relational rewards from corporate social responsibility: The role of competitive positioning. *International Journal of Research in Marketing*, *24*(3), 224–241.

Duchin, R., Ozbas, O., & Sensoy, B. A. (2010). Costly external finance, corporate investment, and the subprime mortgage credit crisis. *Journal of Financial Economics*, *97*(3), 418–435.

Fabrizio, K. R., & Tsolmon, U. (2014). An empirical analysis of R&D and innovation pro-cyclicality. *Review of Economics and Statistics*, *96*(4), 662–675.

Fazzari, S., Hubbard, R. G., & Petersen, B. C. (1988). Financing constraints and corporate investment. *Brookings Papers on Economic Activity*, *1988*(1), 141–195.

Flammer, C. (2015a). Does product market competition foster corporate social responsibility? Evidence from trade liberalization. *Strategic Management Journal*, *36*(10), 1469–1485.

Flammer, C. (2015b). Does corporate social responsibility lead to superior financial performance? A regression discontinuity approach. *Management Science*, *61*(11), 2549–2568.

Flammer, C. (2018). Competing for government procurement contracts: The role of corporate social responsibility. *Strategic Management Journal*, *39*(5), 1299–1324.

Flammer, C., & Bansal, P. (2017). Does a long-term orientation create value? Evidence from a regression discontinuity. *Strategic Management Journal*, *38*(9), 1827–1847.

Flammer, C., & Kacperczyk, A. J. (2016). The impact of stakeholder orientation on innovation: Evidence from a natural experiment. *Management Science*, *62*(7), 1982–2001.

Flammer, C., & Kacperczyk, A. J. (2019). Corporate social responsibility as a defense against knowledge spillovers: Evidence from the Inevitable Disclosure Doctrine. *Strategic Management Journal*, *40*(8), 1243–1267.

Flammer, C., & Luo, J. (2017). Corporate social responsibility as an employee governance tool? Evidence from a quasi-experiment. *Strategic Management Journal*, *38*(2), 163–183.

Fortune. (2009). Surprising survivors: Corporate do-gooders. January 20.

Gilson, R. J. (1999). The legal infrastructure of high technology industrial districts: Silicon Valley, Route 128, and covenants not to compete. *New York University Law Review*, *74*(3), 575–629.

Gormley, T. A., & Matsa, D. A. (2016). Playing it safe? Managerial preferences, risk, and agency conflicts. *Journal of Financial Economics*, *122*(3), 431–455.

Gorton, G. B. (2010). *Slapped by the invisible hand: The panic of 2007*. Oxford, GB: Oxford University Press.

Hambrick, D. C. (2007). The field of management's devotion to theory: Too much of a good thing? *Academy of Management Journal*, *50*(6), 1346–1352.

Helfat, C. E. (2007). Stylized facts, empirical research and theory development in management. *Strategic Organization*, *5*(2), 185–192.

Hoshi, T., Kashyap, A., & Scharfstein, D. (1991). Corporate structure, liquidity, and investment: Evidence from Japanese industrial groups. *Quarterly Journal of Economics*, *106*(1), 33–60.

Ioannou, I., & Serafeim, G. (2015). The impact of corporate social responsibility on investment recommendations: Analysts' perceptions and shifting institutional logics. *Strategic Management Journal*, *36*(7), 1053–1081.

Ivashina, V., & Scharfstein, D. (2010). Bank lending during the financial crisis of 2008. *Journal of Financial Economics*, *97*(3), 319–338.

Kacperczyk, A. J. (2009). With greater power comes greater responsibility? Takeover protection and corporate attention to stakeholders. *Strategic Management Journal*, *30*(3), 261–285.

Kahle, K. M., & Stulz, R. M. (2013). Access to capital, investment, and the financial crisis. *Journal of Financial Economics*, *110*(2), 280–299.

Kaplan, S. N., & Zingales, L. (1997). Do financing constraints explain why investment is correlated with cash flow? *Quarterly Journal of Economics*, *112*(1), 169–215.

Kotler, P., Hessekiel, D., & Lee, N. (2012). *Good works!: Marketing and corporate initiatives that build a better world … and the bottom line*. Hoboken, NJ: Wiley.

Lee, D. S., & Lemieux, T. (2010). Regression discontinuity designs in economics. *Journal of Economic Literature*, *48*(2), 281–355.

Lev, B., Petrovits, C., & Radhakrishnan, S. (2010). Is doing good good for you? How corporate charitable contributions enhance revenue growth. *Strategic Management Journal*, *31*(2), 182–200.

Maksimovic, V., & Phillips, G. M. (2013). Conglomerate firms, internal capital markets, and the theory of the firm. *Annual Review of Financial Economics*, *5*, 225–244.

Mattingly, J. E., & Berman, S. L. (2006). Measurement of corporate social action: Discovering taxonomy in the kinder Lydenberg Domini ratings data. *Business and Society*, *45*(1), 20–46.

McWilliams, A., & Siegel, D. S. (2000). Corporate social responsibility and financial performance: Correlation or misspecification? *Strategic Management Journal*, *21*(5), 603–609.

Mian, A., Rao, K., & Sufi, A. (2013). Household balance sheets, consumption, and the economic slump. *Quarterly Journal of Economics*, *128*(4), 1687–1726.

Mian, A., & Sufi, A. (2014). What explains the 2007-2009 drop in employment? *Econometrica*, *82*(6), 2197–2223.

Ouyang, M. (2011). On the cyclicality of R&D. *Review of Economics and Statistics*, *93*(2), 542–553.

Png, I. P. L., & Samila, S. (2015). *Trade secrets law and mobility: Evidence from "inevitable disclosure"* (Working paper). Singapore: National University of Singapore.

Puri, M., Rocholl, J., & Steffen, S. (2011). Global retail lending in the aftermath of the US financial crisis: Distinguishing between supply and demand effects. *Journal of Financial Economics*, *100*(3), 556–578.

Reinhart, C. M., & Rogoff, K. S. (2009). *This time is different: Eight centuries of financial folly*. Princeton, NJ: Princeton University Press.

Roberts, M. R., & Sufi, A. (2009). Renegotiation of financial contracts: Evidence from private credit agreements. *Journal of Financial Economics*, *93*(2), 159–184.

Santos, J. A. C. (2011). Bank corporate loan pricing following the subprime crisis. *Review of Financial Studies*, *24* (6), 1916–1943.

Stein, J. C. (2003). Agency, information and corporate investment. In G. M. Constantinides, M. Harris, & R. M. Stulz (Eds.), *Handbook of the economics of finance* (pp. 111–165). Amsterdam, Netherlands: Elsevier.

Tilcsik, A., & Marquis, C. (2013). Punctuated generosity: How mega-events and natural disasters affect corporate philanthropy in U.S. communities. *Administrative Science Quarterly*, *58*(1), 111–148.

Trahms, C. A., Ndofor, H. A., & Sirmon, D. G. (2013). Organizational decline and turnaround: A review and agenda for future research. *Journal of Management*, *39*(5), 1277–1307.

Wall Street Journal. (2009). R&D spending holds steady in slump. April 6.

Wall Street Journal. (2014). Bernanke: 2008 meltdown was worse than Great Depression. August 26.

SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

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ONLINE APPENDIX FOR

STRATEGIC MANAGEMENT DURING THE FINANCIAL CRISIS: HOW FIRMS ADJUST THEIR STRATEGIC INVESTMENTS IN RESPONSE TO CREDIT MARKET DISRUPTIONS

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Appendix A. List of variables

This appendix provides a description of the variables used in the analysis. Unless indicated otherwise, the variables are constructed from the annual file of Standard & Poor's Compustat.

TED spread	Difference between the 3-month LIBOR rate and the 3-month Treasury bill rate, obtained from the St. Louis Fed.
Log(employees)	Natural logarithm of the number of employees from (Compustat item EMP).
CAPEX/PPE	Ratio of capital expenditures (Compustat item CAPX) to property, plant, and equipment (PPENT), winsorized at the 5^{th} and 95^{th} percentiles of its distribution.
R&D/assets	Ratio of R&D expenses (Compustat item XRD) to the book value of total assets (AT), winsorized at the 5^{th} and 95^{th} percentiles of its distribution.
KLD-index	Number of all CSR strengths with respect to employees, customers, the natural environment, and society at large (community and minorities) from the Kinder, Lydenberg, and Domini (KLD) database.
Size	Natural logarithm of the book value of total assets (Compustat item AT).
Return on assets (ROA)	Ratio of operating income before depreciation (Compustat item OIBDP) to the book value of total assets (AT), winsorized at the 5^{th} and 95^{th} percentiles of its distribution.
Tobin's Q	Ratio of the market value of total assets, obtained as the book value of total assets (Compustat item AT) plus the market value of common stock (CSHO times PRCC_F) minus the sum of the book value of common stock (CEQ) and balance sheet deferred taxes (TXDITC) to the book value of total assets (AT), winsorized at the 5^{th} and 95^{th} percentiles of its distribution.
Leverage	Ratio of long-term debt (Compustat item DLTT) plus debt in current liabilities (DLC) to the book value of total assets (AT), winsorized at the 5^{th} and 95^{th} percentiles of its distribution.
Cash holdings	Ratio of cash and short-term investments (Compustat item CHE) divided by the book value of total assets (AT), winsorized at the 5^{th} and 95^{th} percentiles of its distribution.
Sales growth (ind.)	Average growth rate in sales (Compustat item SALE) across all companies in the firm's 2-digit SIC industry.
Amount ($M)	Amount of debt financing (in $M) that is rolled over within 6 months after (before) August 2007 for the treated (control) firms. The loan data are obtained from Dealscan.

Treatment	Indicator variable equal to one (zero) for companies whose long-term debt matures within 6 months after (before) August 2007. The loan data are obtained from Dealscan.
Above-median loan amount	Indicator variable equal to one if the amount of the loan that is rolled over is above the median across all firms. The loan data are obtained from Dealscan.
Below-median loan amount	Indicator variable equal to one if the amount of the loan that is rolled over is below the median across all firms. The loan data are obtained from Dealscan.
Above-median loan maturity	Indicator variable equal to one if the maturity of the loan that is rolled over is above the median across all firms. The loan data are obtained from Dealscan.
Below-median loan maturity	Indicator variable equal to one if the maturity of the loan that is rolled over is below the median across all firms. The loan data are obtained from Dealscan.
R&D/employees	Ratio of R&D expenses (Compustat item XRD) to the number of employees (EMP), winsorized at the 5th and 95th percentiles of its distribution.
R&D/CAPEX	Ratio of R&D expenses (Compustat item XRD) to capital expenditures (CAPX), winsorized at the 5th and 95th percentiles of its distribution.
KLD-index/employees	Ratio of the KLD-index to the number of employees (Compustat item EMP), winsorized at the 5th and 95th percentiles of its distribution.
KLD-index/CAPEX	Ratio of the KLD-index to capital expenditures (Compustat item CAPX), winsorized at the 5th and 95th percentiles of its distribution.
High drop in demand	Indicator variable equal to one if sales growth is in the bottom quartile across all industries. Sales growth is computed as the average growth rate in sales (Compustat item SALE) across all companies in the firm's 2-digit SIC industry.
Low R&D intensity	Indicator variable equal to one if R&D intensity is in the top quartile across all industries. R&D intensity is computed the average ratio of R&D expenses (Compustat item XRD) to total assets (AT) across all companies in the firm's 2-digit SIC industry.
B2B sector	Indicator variable equal to one if the company operates in the B2B sector. The list of B2B industries is obtained from Lev et al. (2010).
High uncertainty	Indicator variable equal to one if the firm's stock volatility is in the top quartile across all firms. Stock volatility is computed as the square root of the sum of the squared daily returns from CRSP, normalized by the number of trading days during the year.

Short R&D cycle	Indicator variable equal to one if the company operates in an industry with a short product development cycle. The list of short-cycle industries is obtained from Bushman, Indjejikian, and Smith (1996).
High R&D volatility	Indicator variable equal to one if the company' R&D volatility is in the top quartile across all firms. R&D volatility is computed as the standard deviation of the company's R&D to asset ratio (item XRDQ and ATQ, respectively) from Compustat's quarterly file over the preceding 12 quarters.
High incremental R&D	Indicator variable equal to one if the share of the firm's patents that are incremental (computed as in Benner and Tushman, 2002) is in the top quartile across all firms. The patent data are obtained from the NBER patent database.
Non-IDD state	Indicator variable equal to one if the company is located in a state that has rejected the inevitable disclosure doctrine (IDD). The list of states is obtained from Flammer and Kacperczyk (2019).
Buy	Percentage of analysts who formulate a buy recommendation for the company's stock. The data on analyst recommendations are obtained from Thomson-Reuters' IBES.
Hold	Percentage of analysts who formulate a hold recommendation for the company's stock. The data on analyst recommendations are obtained from Thomson-Reuters' IBES.
Sell	Percentage of analysts who formulate a sell recommendation for the company's stock. The data on analyst recommendations are obtained from Thomson-Reuters' IBES.

Appendix B. Full output with controls

Table A1 provides the full output corresponding to the baseline specifications in Table 2.

------Insert Table A1 about here------

Appendix C. Robustness

This appendix presents various robustness checks that are variants of the baseline specification used in Table 2.

Alternative debt maturity cutoffs around August 2007. In Table A2, we consider alternative debt maturity cutoffs around the panic of August 2007. Specifically, in lieu of considering debt maturing 6 months before and after August 2007, we consider windows of 3, 9, and 12 months, respectively. As is shown, our results are very similar for these alternative time windows.[1]

------Insert Table A2 about here------

Common sample. In our baseline regressions, the analysis of R&D spending and the KLD-index is based on a smaller number of observations (due to missing values of R&D in Compustat and the less comprehensive coverage of the KLD database). Hence, one potential concern is that companies with non-missing R&D and KLD data may systematically differ from the average firm in our sample. If these companies did not reduce employment and capital expenditures during the crisis, then our results might be driven by selection. To address this concern, we re-estimate our baseline regressions in the subsample for which none of the dependent variables is missing. The results are provided in Panel A of Table A3. As is shown, we find that these companies reduced their workforce and CAPEX to a similar extent compared to the average company in our full sample while, once again, the effect on R&D and the KLD-index remains small and insignificant.[2]

------Insert Table A3 about here------

Pre-crisis levels and pre-trends. Another potential concern is that firms may reduce their workforce and CAPEX during the Great Recession because they have expanded "too much" prior to the crisis. We address this point in Panel B of Table A3 by re-estimating our baseline regressions controlling for the 2006 level along with the 2002-2006 change (i.e., the "pre-trend") in the dependent variable—e.g., in the first column of Panel B, we include as controls $log(employees)_{2006}$ and $\Delta\ log(employees)_{2002\text{-}2006}$. (We include analogous controls for the respective dependent

[1] These tests are equivalent to considering narrower windows around the discontinuity in the RDD setting. Narrower windows provide a tighter identification (since the randomization assumption is more likely to hold), but at the cost of lower power (since fewer observations are used).
[2] The common sample analysis further alleviates the possibility that, in our baseline analysis, the effect on R&D and the KLD-index might be insignificant due to the smaller sample size (and hence the lower power of the test). Since the reduction in employment and capital expenditures remains significant in the common sample, this indicates that our non-results for R&D and CSR are indeed well-estimated zero effects.

variables in the other three columns.) As is shown, our results are robust to the inclusion of these additional controls as well.

Seemingly unrelated regressions (SUR). In the analysis so far, we examined each of the four dependent variables in a separate regression. That being said, to the extent that the credit crunch jointly affects all four investment decisions, there might be significant cross-equation dependence in the error term. This is confirmed by the Breusch-Pagan test, which rejects the null hypothesis of no cross-equation correlation at all conventional significance levels ($p = 0.000$). To examine how such cross-equation correlation may affect our results, we re-estimate our baseline regressions using the SUR estimator. The results are presented in Panel C of Table A3. As can be seen, the results are very similar to our baseline results.

Manufacturing vs. non-manufacturing sectors. The relative importance of the workforce, CAPEX, R&D, and CSR is likely to differ across industries. In our baseline analysis, we account for such differences by including industry fixed effects, thereby comparing firms that operate within the same industry. In Panel D of Table A3, we explore whether the treatment effect differs across broad industry sectors. Specifically, we distinguish between the manufacturing (SIC 2000-3999) and non-manufacturing sectors. As is shown, we find that the treatment effect is similar across both sectors.

Alternative definition of the treatment group. In our sample, 48 firms (about 7% of the sample) have loans that mature during both the before and after periods. In the baseline analysis, we assign these firms to the control or treatment group depending on which amount is larger. This approach is conservative—assigning potentially "treated" firms to the control group makes it harder for us to find an effect. In Panel E of Table A3, we show that moving these to the treatment group has no material impact on our findings.

Alternative functional forms. In the baseline analysis, capital expenditures and R&D expenses are scaled by PPE and assets, respectively. While such normalization is common in the literature, one potential concern is that the results may be affected by changes in the scaling variable. Moreover, *Δ KLD-index* is specified as an index change as opposed to a percentage change. In Panel F of Table A3, we consider alternative dependent variables that address these issues: *Δ log(1 + CAPEX)*, *Δ log(1 + R&D)*, and *Δ log(1 + KLD-index)*, which represent the growth in CAPEX, R&D expenses, and the KLD-index, respectively. Note that we add one to each variable to account for observations with a zero value of the respective variable. As is shown, the results based on these alternative dependent variables mirror those obtained in our baseline specification.

Net KLD-index. In the first column of Panel G of Table A3, we replace the KLD-index by the "net" KLD-index (i.e., the number of KLD strengths minus the number of KLD concerns). As can be seen, we obtain similar results when using this alternative measure of CSR.

Input versus output measures. A related issue is that, while the workforce, CAPEX, and R&D represent inputs in the firm's production function, the KLD-index may capture an output—the realized social performance. To address this potential inconsistency, we decompose the KLD-index into an "input KLD-index" and "output KLD-index." To do so, we review each of the KLD provisions and classify those pertaining to the implementation of stakeholder programs as "inputs" (e.g., the offering of childcare, elder care, or flextime—provision DIV-STR-D in the KLD database), and those pertaining to the company's social performance as "outputs" (e.g., showing superior performance as an employer for the disabled—provision DIV-STR-F in the KLD database).[3] As is shown in the last two columns of Panel G of Table A3, our results are robust to

[3] The majority of the KLD provisions are "output" provisions. The "input" provisions are charitable giving (COM-STR-A); non-U.S. charitable giving (COM-STR-F); CEO (DIV-STR-A); board of directors (DIV-STR-C); work/life

using the input KLD-index (and output KLD-index, respectively).

KLD-index by stakeholder groups. In columns (1)-(3) of Table A4, we decompose the KLD-index into three subindices that sum up CSR strengths with respect to employees (column (1)), consumers (column (2)), and society at large (communities and minorities) and the natural environment (column (3)), respectively. As can be seen, our results are robust across all three subindices.

------Insert Table A4 about here------

Alternative measures of CSR. In columns (4)-(6) of Table A4, we use the ESG ratings from Thomson Reuters' ASSET4 in lieu of the KLD-index. Specifically, we use the environmental score ("E"), social score ("S"), and governance score ("G"). Each of them is measured by ASSET4 on a 0-100 scale. As is shown, we find again no evidence that companies curtail their ESG programs following the treatment.[4]

Panel specification. In Table A5, we use a panel specification (instead of the cross-sectional specification in equation (1)). Specifically, we pool all firm-years observations of the treated and control firms for the years 2002-2009.[5] We then estimate the following regression:

$$y_{it} = \alpha_i + \alpha_t + \beta\ treatment_i \times after_t + \boldsymbol{\gamma}'\mathbf{X}_{\mathbf{it-1}} + \varepsilon_{it},$$

where i indexes firms and t indexes years; α_i and α_t are firm and year fixed effects, respectively; *treatment* is the treatment dummy that is equal to one for companies in the treatment group (and zero for companies in the control group); *after* is an indicator variable equal to one for the years following the panic of August 2007; **X** is the vector of control variables (which includes *cash*

benefits (DIV-STR-C); women and minority contracting (DIV-STR-E); no-layoff policy (EMP-STR-B); cash profit sharing (EMP-STR-C); communications (ENV-STR-E); management systems (ENV-STR-G).

[4] Note that the sample decreases due to the more restrictive coverage of ASSET4.

[5] We start in 2002, as this year is commonly seen as the beginning of the run-up period leading up to the crisis (e.g., Mian et al., 2013).

holdings, *leverage*, *ROA*, and *Tobin's Q*, all lagged by one year); ε is the error term. As in the baseline, standard errors are clustered at the industry level (similar results are obtained if standard errors are clustered at the firm level). As can be seen from Table A5, the results obtained from the panel specification are similar to those we obtained in Table 2.

------Insert Table A5 about here------

Placebo panic. In Panel A of Table A6, we re-estimate our baseline specifications but using a "placebo panic," doing as if the panic occurred in August 2006 (in lieu of August 2007). Figure 1 shows that the borrowing costs were essentially unchanged around August 2006. Hence, by comparing companies whose long-term debt matures six months before versus six months after August 2006, we are comparing companies that face similar borrowing conditions when rolling over their long-term debt. As can be seen, the placebo terms are small and insignificant, which confirms that our tests are well specified.

------Insert Table A6 about here------

Placebo treatment and control groups. Finally, in Panel B of Table A6, we draw companies (with replacement) from the set of firms of that have Dealscan loans outstanding, but not maturing, during the sample period, and randomly assign them to placebo treatment and control groups.[6] As is shown, we find that all placebo terms are small and insignificant.

Appendix D. External validity

Our setup is subject to the trade-off between external validity and internal validity that is inherent to RDD settings. While internal validity (i.e., identification) is obtained from the quasi-random assignment of firms on either side of the discontinuity, the downside is that only a subset of firms

[6] We generate 500 sets of randomly assigned treatment and control groups and re-estimate the regression for each of them (we match the number of observations in each regression to those in Table 2). The coefficients and standard errors provided in the table are averages across all 500 regressions.

contribute to the estimation (namely, those whose debt matures shortly before vs. after the panic of August 2007). These firms need not be representative of the broader population of public companies.

To assess the external validity of our findings, we benchmark firms in our sample against the broader population of Dealscan firms—specifically, firms that have Dealscan loans outstanding, but not maturing, during the sample period. We provide this comparison in Table A7, where we report the mean, median, and standard deviation for various characteristics (e.g., size, ROA, Tobin's Q, leverage, cash holdings) measured in 2006. As can be seen, we find no significant difference between the two groups (the *p*-values of the difference-in-means and difference-in-medians range between 0.106-0.653, and 0.134-0.994, respectively). As such, our results are likely to have external validity among the broader population of Dealscan firms.

------Insert Table A7 about here------

That being said, we caution that our results need not generalize to the whole universe of Compustat firms. Indeed, as previous research has shown, Dealscan firms tend to be larger and more highly levered than the average Compustat firm (Dichev and Skinner, 2002). This is because Compustat includes a large number of small, newly-listed companies that do not have access to the large commercial loans covered in Dealscan. As such, we caveat that our results need not have external validity among the set of Compustat firms without Dealscan coverage.

Appendix E. Cash-rich companies

In Table A8, we re-estimate our baseline specification, interacting the treatment dummy with two dummies that distinguish between cash-rich companies (i.e., companies whose cash-to-asset ratio is in the top quartile across all firms in 2006) vs. other companies. As can be seen, cash-rich companies did not curtail their CAPEX nor their workforce in response to the treatment.

Interestingly, they did not increase them either, which might reflect the lack of good investment opportunities during the crisis.

------Insert Table A8 about here------

References

Benner MJ, Tushman ML. 2002. Process management and technological innovation: a longitudinal study of the photography and paint industries. *Administrative Science Quarterly* **47**(4): 676–706.

Bushman RM, Indjejikian RJ, Smith A. 1996. CEO compensation: The role of individual performance evaluation. *Journal of Accounting and Economics* **21**(2): 161–193.

Flammer C, Kacperczyk AJ. 2019. Corporate social responsibility as a defense against knowledge spillovers: Evidence from the Inevitable Disclosure Doctrine. *Strategic Management Journal* **40**(8): 1243–1267.

Lev B, Petrovits C, Radhakrishnan S. 2010. Is doing good good for you? How corporate charitable contributions enhance revenue growth. *Strategic Management Journal* **31**(2): 182–200.

Mian A, Rao K, Sufi A. 2013. Household balance sheets, consumption, and the economic slump. *Quarterly Journal of Economics* **128**(4): 1687–1726.

Table A1. Control variables in baseline specification

	Δ Log(Employees)	Δ CAPEX/PPE	Δ R&D/assets	Δ KLD-index
	(1)	(2)	(3)	(4)
Treatment	-0.023	-0.021	0.001	-0.013
	(0.009)	(0.010)	(0.001)	(0.063)
Controls				
Size	-0.015	-0.010	-0.002	-0.009
	(0.009)	(0.004)	(0.004)	(0.030)
Return on assets	0.208	-0.452	0.054	-0.532
	(0.179)	(0.174)	(0.030)	(0.548)
Tobin's Q	0.062	0.060	0.001	-0.013
	(0.018)	(0.014)	(0.002)	(0.055)
Leverage	-0.148	-0.031	0.003	0.275
	(0.109)	(0.030)	(0.004)	(0.210)
Cash holdings	0.035	-0.077	-0.012	0.189
	(0.106)	(0.162)	(0.007)	(0.374)
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	670	670	295	503
R-squared	0.06	0.08	0.15	0.03

Notes. Standard errors (reported in parentheses) are clustered at the industry level.

Table A2. Alternative cutoffs around the August 2007 discontinuity

	Δ Log(Employees)	Δ CAPEX/PPE	Δ R&D/assets	Δ KLD-index
Panel A. Three-month cutoff				
Treatment	-0.027	-0.023	0.001	-0.015
	(0.010)	(0.012)	(0.003)	(0.094)
Controls	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	398	398	175	310
R-squared	0.06	0.07	0.13	0.06
Panel B. Nine-month cutoff				
Treatment	-0.021	-0.022	-0.001	-0.012
	(0.009)	(0.010)	(0.001)	(0.059)
Controls	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	883	883	396	650
R-squared	0.06	0.04	0.10	0.01
Panel C. Twelve-month cutoff				
Treatment	-0.016	-0.020	0.000	-0.013
	(0.007)	(0.009)	(0.001)	(0.052)
Controls	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	1,076	1,076	487	783
R-squared	0.05	0.04	0.08	0.02

Notes. Standard errors (reported in parentheses) are clustered at the industry level.

Table A3. Robustness

	Δ Log(Employees)	Δ CAPEX/PPE	Δ R&D/assets	Δ KLD-index
Panel A. Common sample				
Treatment	-0.027	-0.023	0.001	-0.018
	(0.012)	(0.011)	(0.002)	(0.073)
Controls	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	221	221	221	221
R-squared	0.10	0.09	0.09	0.04
Panel B. Controlling for pre-crisis levels and pre-trends (i.e., y_{2006} and $\Delta y_{2002\text{-}2006}$)				
Treatment	-0.030	-0.019	-0.000	0.009
	(0.010)	(0.010)	(0.002)	(0.082)
Controls	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	599	599	247	219
R-squared	0.07	0.09	0.29	0.02
Panel C. Seemingly unrelated regressions (SUR) estimation				
Treatment	-0.023	-0.021	0.001	-0.013
	(0.010)	(0.010)	(0.002)	(0.055)
Controls	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	670	670	295	503
R-squared	0.06	0.08	0.15	0.03

Table A3
(continued)

	Δ Log(Employees)	Δ CAPEX/PPE	Δ R&D/assets	Δ KLD-index
Panel D. Manufacturing vs. other sectors				
Treatment	-0.021	-0.020	0.001	-0.013
	(0.010)	(0.012)	(0.002)	(0.106)
Treatment × Manufacturing	-0.004	-0.003	-0.002	0.002
	(0.017)	(0.016)	(0.002)	(0.167)
Controls	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	670	670	295	503
R-squared	0.06	0.08	0.15	0.03
Panel E. Extending treatment group with all firms rolling over debt within the 6-month window post August 2007				
Treatment	-0.021	-0.020	0.000	-0.021
	(0.009)	(0.010)	(0.001)	(0.066)
Controls	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	670	670	295	503
R-squared	0.06	0.08	0.15	0.03

Table A3
(continued)

	Δ Log(1 + CAPEX)	Δ Log(1 + R&D)	Δ Log(1 + KLD-index)
Panel F. Functional form			
Treatment	-0.061	0.004	-0.007
	(0.028)	(0.023)	(0.016)
Controls	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Observations	670	295	503
R-squared	0.07	0.06	0.02
	Δ KLD-index (net)	**Δ KLD-index(input)**	**Δ KLD-index(output)**
Panel G. Alternative KLD measures			
Treatment	-0.010	-0.004	-0.010
	(0.047)	(0.051)	(0.082)
Controls	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Observations	503	503	503
R-squared	0.05	0.01	0.03

Notes. Standard errors (reported in parentheses) are clustered at the industry level.

Table A4. CSR with respect to different stakeholder groups

	KLD data			ASSET4 data		
	Δ KLD-index (employees)	Δ KLD-index (environment & society at large)	Δ KLD-index (consumers)	Δ Environmental score (ASSET4)	Δ Social score (ASSET4)	Δ Governance score (ASSET4)
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	-0.007	-0.002	-0.004	-0.749	-0.983	-1.824
	(0.055)	(0.033)	(0.041)	(2.450)	(2.236)	(1.169)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	503	503	503	181	181	181
R-squared	0.03	0.03	0.05	0.09	0.03	0.10

Notes. Standard errors (reported in parentheses) are clustered at the industry level.

Table A5. Panel specification

	Log(Employees)	CAPEX/PPE	R&D/assets	KLD-index
	(1)	(2)	(3)	(4)
Treatment × after	-0.024	-0.026	0.001	-0.031
	(0.010)	(0.012)	(0.001)	(0.056)
Controls	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	5,145	5,145	2,233	3,598
R-squared	0.98	0.66	0.94	0.91

Notes. Standard errors (reported in parentheses) are clustered at the industry level.

Table A6. Placebo tests

Panel A. Placebo "panic"

	Δ Log(Employees)	Δ CAPEX/PPE	Δ R&D/assets	Δ KLD-index
	(1)	(2)	(3)	(4)
Placebo treatment	-0.001	-0.003	-0.001	0.004
	(0.023)	(0.018)	(0.001)	(0.106)
Controls	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	791	791	394	556
R-squared	0.05	0.06	0.12	0.04

Panel B. Placebo treatment and control groups

	Δ Log(Employees)	Δ CAPEX/PPE	Δ R&D/assets	Δ KLD-index
	(1)	(2)	(3)	(4)
Placebo treatment	0.001	-0.006	0.000	0.002
	(0.010)	(0.011)	(0.001)	(0.093)
Controls	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	670	670	295	503
R-squared	0.05	0.07	0.05	0.02

Notes. Standard errors (reported in parentheses) are clustered at the industry level.

Table A7. External validity

		Obs.	Mean	Median	Std. Dev.	p-value (diff. in means)	p-value (diff. in medians)
Size	Sample	670	7.484	7.398	1.903	0.106	0.134
	Dealscan	1,746	7.106	7.009	1.859		
ROA	Sample	670	0.132	0.122	0.100	0.653	0.378
	Dealscan	1,746	0.130	0.127	0.116		
Tobin's Q	Sample	670	1.727	1.419	0.938	0.224	0.299
	Dealscan	1,746	1.898	1.566	1.123		
Leverage	Sample	670	0.285	0.261	0.203	0.168	0.190
	Dealscan	1,746	0.246	0.218	0.197		
Cash holdings	Sample	670	0.095	0.048	0.118	0.281	0.216
	Dealscan	1,746	0.114	0.062	0.138		
Log(employees)	Sample	670	1.457	1.427	1.774	0.184	0.172
	Dealscan	1,746	1.259	1.297	1.802		
CAPEX/PPE	Sample	670	0.233	0.205	0.145	0.246	0.301
	Dealscan	1,746	0.255	0.213	0.166		
R&D/assets	Sample	295	0.036	0.012	0.068	0.177	0.486
	Dealscan	849	0.040	0.015	0.079		
KLD-index	Sample	503	1.622	1.000	2.467	0.317	0.994
	Dealscan	1,265	1.421	1.000	2.349		

Table A8. "Rich" companies

	Δ Log(Employees)	Δ CAPEX/PPE	Δ R&D/assets	Δ KLD-index
	(1)	(2)	(3)	(4)
Treatment × Cash-rich companies	0.008	0.003	0.002	0.017
	(0.014)	(0.017)	(0.002)	0.103
Treatment × Other companies	-0.027	-0.025	0.000	-0.024
	(0.010)	(0.011)	(0.002)	(0.072)
Controls	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	670	670	295	503
R-squared	0.06	0.08	0.15	0.03

Notes. Standard errors (reported in parentheses) are clustered at the industry level.