

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

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**ABSTRACT**

This study investigates how companies adjusted their investments in key strategic resources—i.e., 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.

Keywords: financial crisis; innovation; corporate social responsibility; employment; capital expenditures; financial performance.

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## 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, and 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.<sup>1</sup> The finance literature (e.g., Almeida et al., 2011; Campello, Graham, and Harvey, 2010; Duchin et al., 2010; Kahle and Stulz, 2013) shows that companies responded to the credit crunch by curtailing their investment in physical capital (i.e., their capital expenditures (CAPEX)).<sup>2,3</sup>

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 to create long-term value (Barney, 1991). Accordingly, from the perspective of strategic

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<sup>1</sup> 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).

<sup>2</sup> 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 and Scharfstein 2008; Puri, Rocholl, and Steffen, 2011; Santos 2011)—as an important mechanism explaining the increase in borrowing cost and ultimately the reduction in physical investment.

<sup>3</sup> Physical investment has a long tradition in the finance literature. For example, it examines how financing constraints affect physical investment (e.g., Fazzari, Hubbard, and Petersen, 1988; Hoshi, Kashyap, and Scharfstein, 1991; Kaplan and Zingales, 1997). For surveys of this literature, see Stein (2003) and Maksimovic and Phillips (2013).

management, an important question is how companies adjusted their investments in *all* of their strategic resources—i.e. 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, and 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.<sup>4</sup> 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.

-----Insert Figure 1 about here-----

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 ten years, i.e. 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. 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

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<sup>4</sup> 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.

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. This setup is similar in spirit to a regression discontinuity design (RDD). In an RDD, outcomes are compared just above versus below a discontinuity threshold, where the assignment on either side of the threshold is as good as random.<sup>5</sup>

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 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.<sup>6</sup> This suggests that innovative capability and stakeholder relationships were seen as instrumental in sustaining firms’ competitiveness during the crisis.

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

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<sup>5</sup> 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 and Lemieux, 2010, p. 282).

<sup>6</sup> 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).

industries where firms' competitiveness is less likely to depend on their innovative capability and stakeholder relationships, respectively.<sup>7</sup>

Alternative interpretations are unlikely to explain our results. First, it could be that R&D and CSR investments are “sticky” and hence difficult to undo in the short run. Nevertheless, we find that companies did reduce R&D and CSR in certain industries, which is inconsistent with this interpretation. Second—and 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). Yet, we find that companies maintained their R&D and CSR irrespective of the degree of uncertainty they faced.

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.

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<sup>7</sup> 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, the IRR from R&D and CSR projects is lower to begin with, 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.

The remainder of this manuscript is organized as follows. In the next section, we describe the methodology, along with the data used for the analysis. We then present the results. Finally, we discuss the implications for theory as well as avenues for future research.

## **DATA AND METHODOLOGY**

### **Data sources and variable definitions**

#### *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 5<sup>th</sup> and 95<sup>th</sup> 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 5<sup>th</sup> and 95<sup>th</sup> 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.<sup>8</sup> 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

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<sup>8</sup> 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."

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).<sup>9,10</sup>

*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 2007-2009, which we denote by  $\Delta \log(\text{employees})$ ,  $\Delta \text{CAPEX/PPE}$ ,  $\Delta \text{R\&D/Assets}$ , and  $\Delta \text{KLD-index}$ , respectively.<sup>11</sup>

### ***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. *Return on 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

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<sup>9</sup> 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 and Berman, 2006). Nevertheless, in robustness checks we show that we obtain similar results if we use the net KLD-index.

<sup>10</sup> 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., McWilliams and Siegel, 2000; Kacperczyk, 2009; Ioannou and Serafeim, 2015; Flammer and Bansal, 2017).

<sup>11</sup> For example,  $\Delta \log(\text{employees}) = \log(\text{employees}_{2009}) - \log(\text{employees}_{2007})$ .

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 5<sup>th</sup> and 95<sup>th</sup> 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.

### ***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 commercial banks and investment banks) to U.S. companies.<sup>12</sup> 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

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<sup>12</sup> 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).

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.

## **Methodology**

### ***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 mortgage-backed securities (MBS) and ultimately the collapse of the MBS market.<sup>13</sup>

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

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<sup>13</sup> See Acharya et al. (2009), Brunnermeier (2009), and Gorton (2010) for a description of the various factors that led to the financial crisis.

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 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. This design is equivalent 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.

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).<sup>14</sup> 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. 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 percentage points, corresponding to a 70% increase). Since the amount of debt rolled over by the treated firms was \$573M, this implies an increase in the annual interest expense by  $\$573\text{M} \times 4\% = \$23\text{M}$ . 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

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<sup>14</sup> 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. Our results are similar if we drop the latter firms.

7% of their profits per year.<sup>15</sup>

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

-----Insert Table 1 about here-----

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

Finally, in Panel C, we report sales growth from 2002-2006 (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.

### ***Difference-in-differences (DID) specification***

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

$$\Delta y_i = \alpha_j + \beta \times treatment_i + \gamma' \mathbf{X}_i + \varepsilon_i, \quad (1)$$

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<sup>15</sup> In auxiliary analyses we distinguish between large vs. small treatments, depending on whether the amount of debt that is rolled over (as a fraction of the firm’s assets) is above vs. 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.

where  $i$  indexes firms and  $j$  indexes industries (2-digit SIC major groups);  $\alpha_j$  are industry fixed effects;  $\Delta y$  is the change in the variable of interest—that is,  $\log(\text{employees})$ ,  $\text{CAPEX/PPE}$ ,  $\text{R\&D/Assets}$ ,  $\text{KLD-index}$ —from 2007-2009;  $\text{treatment}$  is the treatment dummy that is equal to one for companies in the treatment group (and zero for companies in the control group);  $\mathbf{X}$  is the vector of control variables, which includes  $\text{size}$ ,  $\text{cash holdings}$ ,  $\text{leverage}$ ,  $\text{ROA}$ , and  $\text{Tobin's } Q$  (all measured in 2006);  $\varepsilon$  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  $\beta$ , which captures the difference-in-differences, 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.<sup>16</sup>

## RESULTS

### 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.

-----Insert Table 2 about here-----

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<sup>16</sup> 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.

In column (1), we find that treated companies—i.e., companies that are hit more strongly by the sharp increase in borrowing costs during the financial crisis—laid off more employees. The coefficient of  $-0.023$  ( $p$ -value = 0.014) 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  $-0.021$  ( $p$ -value = 0.042) 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.<sup>17</sup> Both coefficients are small in economic terms and statistically insignificant ( $p$ -values of 0.677 and 0.838, 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 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 A, we present several robustness checks that are variants of the specification used in Table 2.<sup>18</sup> In Appendix B, we discuss the external validity of our findings.

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<sup>17</sup> However, note that the reduction in the workforce can be construed as “not socially responsible.” This dimension does not enter the KLD-index—the KLD index used to have “no layoffs” as one index point, but no longer include this dimension in the index since 1994—and hence is not reflected in our measurement of CSR.

<sup>18</sup> 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 “pre-trend”) in the dependent variables; d) estimate all four regressions jointly using the seemingly unrelated regressions (SUR) estimator; e) use alternative functional forms; f) use the “net” KLD-index (based on CSR strengths and CSR concerns); g) distinguish between “inputs” and “output” provisions of the KLD-index; and h) use the panel formulation of the DID. We further present placebo tests based on i) a “placebo panic” and j) the random assignment of firms whose debt does not mature during the relevant treatment window into arbitrary treatment and control groups.

## **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 vs. after the panic of August 2007.

In Panel A of Table 3, we distinguish between large vs. small treatments, depending on whether the amount of debt that is rolled over (as a fraction of the firm's assets) is above vs. 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.

-----Insert Table 3 about here-----

In Panel B of Table 3, 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 that are rolled over.<sup>19</sup>

## **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.”

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<sup>19</sup> Relatedly, in Appendix C, we show that the decrease in workforce and CAPEX is large and significant for “cash-poor” firms (i.e., firms with lower cash holdings), while it is insignificant for cash-rich firms.

We examine the role of consumer demand in Table 4. 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.

-----Insert Table 4 about here-----

### **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.

#### ***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 5.

-----Insert Table 5 about here-----

*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 = 0.012).

*CSR-sensitive industries.* Relatedly, the strategic value of CSR is likely lower in industries that are less CSR-sensitive—i.e., industries where stakeholder support plays a marginal role for firms' competitiveness and survival.<sup>20</sup> A prime example of industries that are less CSR-sensitive are B2B industries (e.g., Corey, 1991; Lev, Petrovits, and Radhakrishnan, 2010).<sup>21</sup> 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 = 0.034).

Overall, these results indicate that—although on average companies did not reduce their

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<sup>20</sup> 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).

<sup>21</sup> 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).

R&D and CSR during the crisis—they did curtail them in industries where innovation and stakeholder relations, respectively, are of lower strategic importance to firms' competitiveness.<sup>22</sup>

### *Stickiness of R&D and CSR*

Another potential explanation for our findings is that R&D and CSR investments are “sticky” and hence difficult to undo in the short run. Nevertheless, the evidence in Panel A of Table 5 is inconsistent with this argument. Under the “stickiness” argument, one should not observe any adjustment in R&D and CSR, even for companies operating in industries with low R&D intensity and low CSR sensitivity, respectively.

### *Real options*

Lastly—and 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 5. 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.

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<sup>22</sup> In the discussion section, we discuss several reasons as to why innovative capability and stakeholder relationships might be instrumental in sustaining firms' competitiveness during the crisis. In a nutshell, these reasons include i) finding innovative ways to weather the crisis; ii) adapting more easily to the shifting needs and demands of various stakeholders; and iii) enhancing organizational resilience.

## Firm performance

In Table 6, 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 competitiveness, companies that held on to them during the crisis may have benefited in the post-crisis period.

-----Insert Table 6 about here-----

To examine this question, we regress post-crisis performance—i.e., the average return on assets (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  $(2 \times 2)$  matrix of potential responses depending on whether companies i) reduced vs. maintained their workforce and CAPEX, and ii) reduced vs. 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  $\mathbf{X}$  used in regression (1). To mitigate the impact of outliers, we winsorize ROA at the 5<sup>th</sup> and 95<sup>th</sup> percentiles of its empirical distribution.<sup>23</sup>

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 = 0.019) corresponds to a 21% higher ROA compared to the base group.<sup>24</sup> This evidence suggests that R&D and CSR were indeed beneficial to firms in maintaining competitiveness during (and beyond) the crisis.

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<sup>23</sup> 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.

<sup>24</sup> 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.

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.

## **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.

Our study relates to the large body of work on organizational decline and corporate turnaround (for a review, see Trahms, Ndofor, and Sirmon, 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 et al., 2012; Anand and Singh, 1997; Barlevy, 2007; Fabrizio and 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 event: the Great Depression of 1929 and the financial crisis of 2007-2009.<sup>25</sup> This gap in the literature is highlighted by Agarwal et al.’s (2009) recent call for research that examines firms’ strategic

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<sup>25</sup> 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.

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.

While our paper's contribution is predominantly empirical, it has theoretical implications as well. In particular, from a strategic management perspective, one of the major challenges of the credit crunch is that it exacerbated the cost of financing at the worst possible time—at the time the economy entered the Great Recession, the most severe recession since the Great Depression. As a result, companies might have little choice but to divest from at least some of their resources to maintain the necessary liquidity and ensure survival in the short run. Doing so is a balancing act though, as divesting from too many resources (or not the “right” ones) could jeopardize a firm's ability to thrive in the long run. Moreover, economic meltdowns such as the Great Recession can disrupt all of the company's stakeholder relations by fundamentally changing their needs and expectations. For example, during the Great Recession, customers experienced a significant drop in their purchasing power (Mian et al., 2013), which altered customer demand not only quantitatively but also qualitatively. This, in turn, challenges firms to find innovative ways to swiftly adjust their product offerings and pricing policies.<sup>26</sup> Similarly, an economic meltdown of this magnitude disrupts the companies' suppliers (e.g., due to their own liquidity constraints). To

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<sup>26</sup> This shift in consumer needs and demands triggered a wide spectrum of companies—including, e.g., Applied Materials, General Motors, and Kraft Foods—to shift their focus away from product development during the crisis towards more effective delivery of products and solutions to their customers. Kraft Foods, for example, launched price-sensitive products to deal with the drop in consumers' purchasing power (Booz & Company, 2009).

mitigate such disruptions, companies may intensify their collaboration with them to more effectively address their needs and, in so doing, secure supply.<sup>27</sup> Moreover, the collapse of customer demand can result in excess capacity. To reduce excess capacity, companies may decrease their workforce, divest from physical assets (e.g., by closing loss-making facilities), and postpone investments in new buildings and equipment. Accordingly, during an economic meltdown, we might expect companies to decrease their workforce and CAPEX to reduce excess capacity and release financial resources that can be redeployed towards other purposes. The same however need not apply to other strategic resources such as R&D and CSR. While divesting from these resources might help reduce costs, doing so is less effective in reducing excess capacity.

In fact—and in line with the evidence presented in this paper—when faced with a sharp increase in financing costs during an economic meltdown, companies may decide to *maintain* their investments in R&D and CSR, as these resources may enable them to address other challenges that arise during the meltdown. From a theoretical perspective, there are at least three main reasons for why this might be the case. First, by maintaining their investments in R&D during the meltdown, companies may find innovative ways to become more efficient—i.e., do more with less—thereby enhancing their ability to maneuver through the meltdown.<sup>28</sup> Moreover, existing research finds that through experimentation companies are better positioned to rapidly adapt to changes in the

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<sup>27</sup> For example, during the crisis, Starbucks increased its commitment to subsistence coffee farmers in developing countries, offering them training and fair prices for sustainable coffee production, thereby ensuring quality and supply of coffee for Starbucks (Starbucks, 2009).

<sup>28</sup> A survey conducted by Booz & Company (2009) supports this argument—during the Great Recession, virtually all surveyed companies enhanced their innovation processes to align product development with the changing economic reality and increase the return on their R&D investments. Specifically, several companies—including, e.g., Pitney Bowes and Harman International—intensified communication and collaboration between research labs and development shops to save costs and more effectively deliver products and solutions to customers. Similarly, many innovative products ranging from Apple’s iPod to General Electric (GE)’s fuel-efficient aircraft engines resulted from investments made during the Great Recession (*Wall Street Journal*, 2009).

business environment and improve their technological capability (e.g., Eisenhardt and Martin, 2000).

Second, communication and collaboration with the firm's stakeholders are important factors in the firm's processes—e.g., in the innovation process (Eisenhardt, 1989; Flammer and Kacperczyk, 2016) and the supply chain process (Homburg, Stierl, and Bornemann, 2013). In this regard, firms that maintain their stakeholder relations are likely better positioned to understand the changing conditions inherent to an economic meltdown, identify concerns and opportunities, and adapt to the shifting needs, demands, and expectations of suppliers, consumers, and other stakeholders, compared to firms that curtail such investments.<sup>29</sup>

Third, CSR can benefit companies through a series of mechanisms. These may in turn help companies navigate through an economic meltdown. In particular, CSR can help firms differentiate themselves from their competitors (Bettinazzi et al., 2015; Flammer, 2015a), enhance firms' ability to recover from unfavorable situations (Bansal, Jiang, and Jung, 2015; Barnett, Darmall, and Hustedet, 2015; Choi and Wang, 2009; DesJardine, Bansal, and Yang, 2019), strengthen connections with the local communities (Tilcsik and Marquis, 2013), improve labor productivity (Flammer, 2015b; Flammer and Luo, 2017), enhance consumer loyalty (Du, Bhattacharya, and Sen, 2007; Kotler, Hessekiel, and Lee, 2012), improve access to government procurement contracts (Flammer, 2018), and lower capital constraints (Cheng, Ioannou, and

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<sup>29</sup> Anecdotal evidence is supportive of this argument. For example, Pitney Bowes adopted a new idea-generating process (called IdeaNet) during the Great Recession. This process provides an electronic meeting platform for its 35,000 employees to collaborate and provide comments and inputs on any idea that they think helps create new sources of revenue, improve profitability, or add value for customers. Within two years of including the entire workforce in innovative thinking, the company was able to realize \$8 million in revenues from employee-driven innovations (Dahl, 2011). Pitney Bowes is not the only company that views stakeholder engagement as an important determinant of the firm's ability to innovate. In fact, many companies—e.g., Audi, General Electric, IBM, Nike—include consumers, employees, suppliers, governments, and other stakeholders in their innovation process (*Computer Weekly News*, 2013; *New York Times*, 2012; see also Bogers, Afuah, and Bastian, 2010; Chatterji and Fabrizio, 2014; Fueller, Matzler, and Hoppe, 2008).

Serafeim, 2014). These mechanisms are likely to be especially important during an economic meltdown, as they can improve companies' resilience and, as a result, help companies maintain or even enhance their competitiveness.

Taken together, the above arguments are consistent with the empirical evidence presented in this study, suggesting that firms that adjust their resource base by simultaneously reducing their workforce and CAPEX while sustaining their investments in R&D and CSR are better able to adapt to the new and unique challenges brought about by the crisis.

Lastly, our study opens up several avenues for future research. In particular—while we briefly outlined potential implications for theory—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, our study focuses on exploring how firms adjusted their investment strategies and offers plausible rationales—firms might maintain their investments in R&D and CSR because doing so enables them to i) become more efficient and innovative, ii) adapt more easily to the shifting needs and demands of various stakeholders, and iii) enhance organizational resilience. Future research could build on these arguments and seek to empirically distinguish between these mechanisms. 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.

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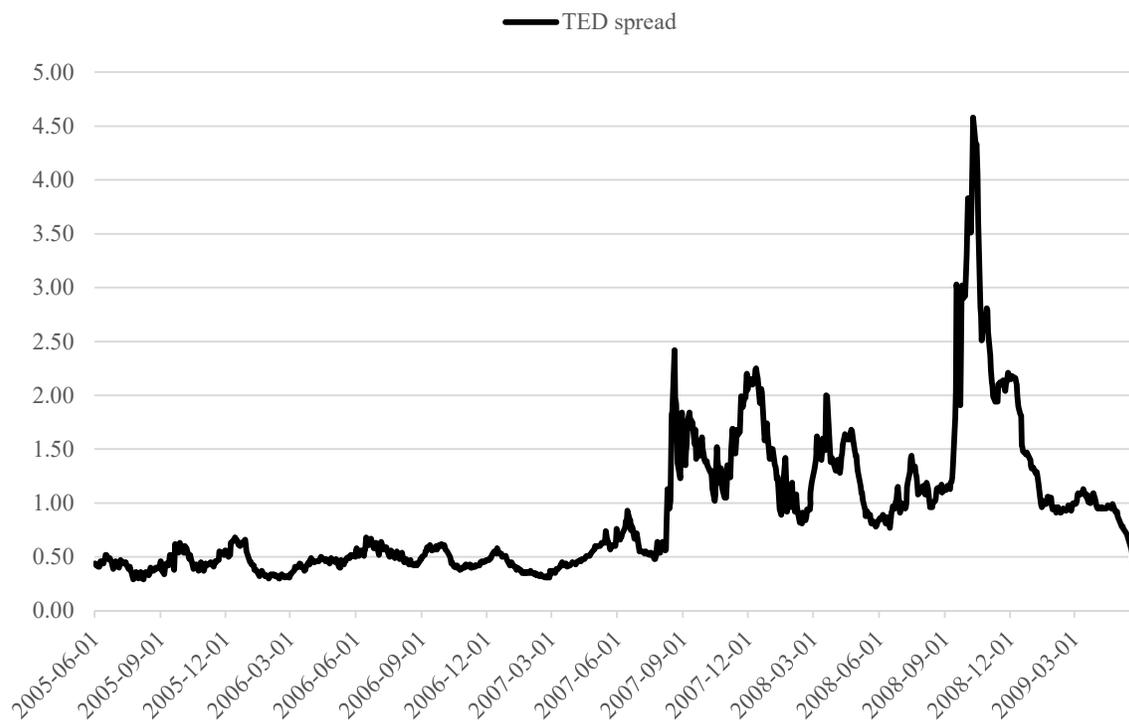
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**Figure 1. Evolution of financing costs**

Notes. 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.

**Table 1. Summary statistics**

		Obs.	Mean	Median	Std. Dev.	<i>p</i> -value (diff. in means)	<i>p</i> -value (diff. in medians)
Panel A. Pre-crisis characteristics							
Log(assets)	Treated	382	7.612	7.488	1.953	0.298	0.155
	Control	288	7.313	7.308	1.825		
ROA	Treated	382	0.132	0.121	0.086	0.764	0.192
	Control	288	0.130	0.126	0.115		
Tobin's Q	Treated	382	1.644	1.344	0.869	0.280	0.319
	Control	288	1.836	1.538	1.014		
Leverage	Treated	382	0.290	0.275	0.202	0.344	0.380
	Control	288	0.279	0.247	0.203		
Cash/Assets	Treated	382	0.088	0.046	0.110	0.356	0.207
	Control	288	0.104	0.055	0.128		
Log(employees)	Treated	382	1.507	1.508	1.728	0.303	0.168
	Control	288	1.392	1.303	1.834		
CAPEX/PPE	Treated	382	0.231	0.203	0.143	0.617	0.344
	Control	288	0.237	0.206	0.147		
R&D/Assets	Treated	161	0.030	0.008	0.068	0.220	0.174
	Control	134	0.042	0.017	0.068		
KLD-index	Treated	286	1.549	1.000	2.222	0.458	0.998
	Control	217	1.719	1.000	2.760		
Panel B. Amount of debt financing maturing around August 2007							
Amount (\$M)	Treated	382	573.9	200.0	1,452.7	0.546	0.253
	Control	288	512.2	150.0	1,725.9		
Panel C. Industry demand prior to the crisis (2002-2006)							
Sales growth (ind.)	Treated	382	0.067	0.065	0.046	0.414	0.923
	Control	288	0.070	0.065	0.047		

**Table 2. The effect of the credit crunch on firms' investment strategies**

	$\Delta \text{Log}(\text{Employees})$	$\Delta \text{CAPEX/PPE}$	$\Delta \text{R\&D/Assets}$	$\Delta \text{KLD-index}$
	(1)	(2)	(3)	(4)
Treatment	-0.023 (0.009)	-0.021 (0.010)	0.001 (0.001)	-0.013 (0.063)
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. Control variables include *size*, *ROA*, *Tobin's Q*, *leverage*, *cash holdings*, all measured in 2006. Standard errors (reported in parentheses) are clustered at the industry level.

**Table 3. Intensity of treatment**

## Panel A. Loan amount

	$\Delta \text{Log}(\text{Employees})$	$\Delta \text{CAPEX/PPE}$	$\Delta \text{R\&D/Assets}$	$\Delta \text{KLD-index}$
	(1)	(2)	(3)	(4)
Treatment $\times$ Above-median loan amount	-0.036 (0.012)	-0.031 (0.013)	0.002 (0.002)	-0.019 (0.074)
Treatment $\times$ Below-median loan amount	-0.013 (0.011)	-0.012 (0.013)	-0.001 (0.002)	-0.005 (0.079)
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 B. Loan maturity

	$\Delta \text{Log}(\text{Employees})$	$\Delta \text{CAPEX/PPE}$	$\Delta \text{R\&D/Assets}$	$\Delta \text{KLD-index}$
	(1)	(2)	(3)	(4)
Treatment $\times$ Above-median loan maturity	-0.031 (0.012)	-0.027 (0.014)	0.000 (0.001)	-0.016 (0.074)
Treatment $\times$ Below-median loan maturity	-0.016 (0.012)	-0.015 (0.013)	0.001 (0.002)	-0.011 (0.077)
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. Control variables include *size*, *ROA*, *Tobin's Q*, *leverage*, *cash holdings*, all measured in 2006. Standard errors (reported in parentheses) are clustered at the industry level.

**Table 4. The amplifying role of the drop in consumer demand**

	$\Delta \text{Log}(\text{Employees})$	$\Delta \text{CAPEX/PPE}$	$\Delta \text{R\&D/Assets}$	$\Delta \text{KLD-index}$
	(1)	(2)	(3)	(4)
Treatment	-0.017 (0.010)	-0.015 (0.010)	0.001 (0.001)	-0.012 (0.068)
Treatment $\times$ High drop in demand	-0.025 (0.013)	-0.024 (0.012)	-0.001 (0.002)	-0.005 (0.112)
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. Control variables include *size*, *ROA*, *Tobin's Q*, *leverage*, *cash holdings*, all measured in 2006. Standard errors (reported in parentheses) are clustered at the industry level.

**Table 5. Heterogeneity in firms' response**

Panel A. Strategic relevance of R&amp;D and CSR

	$\Delta$ R&D/Assets	$\Delta$ KLD-index
	(1)	(2)
Treatment	0.003 (0.003)	0.043 (0.068)
Treatment $\times$ Low R&D intensity	-0.012 (0.005)	
Treatment $\times$ B2B sector		-0.164 (0.077)
Controls	Yes	Yes
Industry fixed effects	Yes	Yes
Observations	295	503
R-squared	0.15	0.03

Panel B. Uncertainty

	$\Delta$ Log(Employees)	$\Delta$ CAPEX/PPE	$\Delta$ R&D/Assets	$\Delta$ KLD-index
	(1)	(2)	(3)	(4)
Treatment	-0.023 (0.010)	-0.020 (0.010)	0.001 (0.001)	-0.013 (0.071)
Treatment $\times$ High uncertainty	-0.002 (0.013)	-0.004 (0.012)	-0.000 (0.001)	0.002 (0.105)
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. Control variables include *size*, *ROA*, *Tobin's Q*, *leverage*, *cash holdings*, all measured in 2006. Standard errors (reported in parentheses) are clustered at the industry level.

**Table 6. Firm performance in the post-crisis years (2010-2011)**

	Analysts' recommendations				
	ROA	Tobin's Q	Buy	Hold	Sell
	(1)	(2)	(3)	(4)	(5)
No reduction in R&D and KLD-index, and reduction in workforce and CAPEX	0.028 (0.012)	0.041 (0.021)	0.130 (0.071)	0.034 (0.032)	-0.164 (0.048)
No reduction in R&D and KLD-index, and no reduction in workforce and CAPEX	0.016 (0.013)	0.017 (0.018)	0.077 (0.066)	0.010 (0.022)	-0.087 (0.052)
Reduction in R&D and KLD-index, and no reduction in workforce and CAPEX	0.004 (0.011)	0.004 (0.018)	0.006 (0.102)	0.017 (0.015)	-0.023 (0.078)
Controls	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	204	204	204	204	204
R-squared	0.38	0.53	0.08	0.08	0.07

Notes. Control variables include *size*, *ROA*, *Tobin's Q*, *leverage*, *cash holdings*, all measured in 2006. Standard errors (reported in parentheses) are clustered at the industry level.

## APPENDIX

### A. Robustness

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

*Alternative debt maturity cutoffs around August 2007.* In Table A1, 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.<sup>30</sup>

-----Insert Table A1 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 A2. 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.<sup>31</sup>

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<sup>30</sup> 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).

<sup>31</sup> 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.

-----Insert Table A2 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 A2 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  $\log(\text{employees})_{2006}$  and  $\Delta \log(\text{employees})_{2002-2006}$ . (We include analogous controls for the respective dependent 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 A2. As can be seen, the results are very similar to our baseline results.

*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,  $\Delta \text{KLD-index}$  is specified as an index change as opposed to a percentage change. In Panel D of Table A2, we consider alternative dependent variables that address these issues:  $\Delta \log(1 + \text{CAPEX})$ ,  $\Delta \log(1 + \text{R\&D})$ , and  $\Delta \log(1 + \text{KLD-index})$ , 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 E of Table A2, 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).<sup>32</sup> As is shown in the last two columns of Panel E of Table A2, our results are robust to using the input KLD-index (and output KLD-index, respectively).

*Panel specification.* In Table A3, 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.<sup>33</sup> We then estimate the following regression:

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<sup>32</sup> 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 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).

<sup>33</sup> 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).

$$y_{it} = \alpha_i + \alpha_t + \beta \text{treatment}_i \times \text{after}_t + \gamma' \mathbf{X}_{it-1} + \varepsilon_{it},$$

where  $i$  indexes firms and  $t$  indexes years;  $\alpha_i$  and  $\alpha_t$  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;  $\mathbf{X}$  is the vector of control variables (which includes *cash holdings*, *leverage*, *ROA*, and *Tobin's Q*, all lagged by one year);  $\varepsilon$  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 A3, the results obtained from the panel specification are similar to those we obtained in Table 2.

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

*Placebo panic.* In Panel A of Table A4, 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 A4 about here-----

*Placebo treatment and control groups.* Finally, in Panel B of Table A4, 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.<sup>34</sup> As

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<sup>34</sup> 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.

is shown, we find that all placebo terms are small and insignificant.

## **B. 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 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 A5, 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.

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.

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

### C. “Rich” companies

In Table A6, 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 A6 about here-----

**Table A1. Alternative cutoffs around the August 2007 discontinuity**

	$\Delta \text{Log}(\text{Employees})$	$\Delta \text{CAPEX/PPE}$	$\Delta \text{R\&D/Assets}$	$\Delta \text{KLD-index}$
Panel A. Three-month cutoff				
Treatment	-0.027 (0.010)	-0.023 (0.012)	0.001 (0.003)	-0.015 (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 (0.009)	-0.022 (0.010)	-0.001 (0.001)	-0.012 (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 (0.007)	-0.020 (0.009)	0.000 (0.001)	-0.013 (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. Control variables include *size*, *ROA*, *Tobin's Q*, *leverage*, *cash holdings*, all measured in 2006. Standard errors (reported in parentheses) are clustered at the industry level.

**Table A2. Robustness**

	$\Delta \text{Log}(\text{Employees})$	$\Delta \text{CAPEX/PPE}$	$\Delta \text{R\&D/Assets}$	$\Delta \text{KLD-index}$
Panel A. Common sample				
Treatment	-0.027 (0.012)	-0.023 (0.011)	0.001 (0.002)	-0.018 (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 $\Delta y_{2002-2006}$ )				
Treatment	-0.030 (0.010)	-0.019 (0.010)	-0.000 (0.002)	0.009 (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 (0.010)	-0.021 (0.010)	0.001 (0.002)	-0.013 (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 A2**  
**(continued)**

	$\Delta \text{Log}(1 + \text{CAPEX})$	$\Delta \text{Log}(1 + \text{R\&D})$	$\Delta \text{Log}(1 + \text{KLD-index})$
Panel D. Functional form			
Treatment	-0.061 (0.028)	0.004 (0.023)	-0.007 (0.016)
Controls	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Observations	670	295	503
R-squared	0.07	0.06	0.02
	$\Delta \text{KLD-index (net)}$	$\Delta \text{KLD-index(input)}$	$\Delta \text{KLD-index(output)}$
Panel E. Alternative CSR measures			
Treatment	-0.010 (0.047)	-0.004 (0.051)	-0.010 (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. Control variables include *size*, *ROA*, *Tobin's Q*, *leverage*, *cash holdings*, all measured in 2006. Standard errors (reported in parentheses) are clustered at the industry level.

**Table A3. Panel specification**

	Log(Employees)	CAPEX/PPE	R&D/Assets	KLD-index
	(1)	(2)	(3)	(4)
Treatment × after	-0.024 (0.010)	-0.026 (0.012)	0.001 (0.001)	-0.031 (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. Control variables include *ROA*, *Tobin's Q*, *leverage*, *cash holdings*, all lagged by one year. Standard errors (reported in parentheses) are clustered at the industry level.

**Table A4. Placebo tests**

## Panel A. Placebo “panic”

	$\Delta \text{Log}(\text{Employees})$	$\Delta \text{CAPEX/PPE}$	$\Delta \text{R\&D/Assets}$	$\Delta \text{KLD-index}$
	(1)	(2)	(3)	(4)
Placebo treatment	-0.001 (0.023)	-0.003 (0.018)	-0.001 (0.001)	0.004 (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

	$\Delta \text{Log}(\text{Employees})$	$\Delta \text{CAPEX/PPE}$	$\Delta \text{R\&D/Assets}$	$\Delta \text{KLD-index}$
	(1)	(2)	(3)	(4)
Placebo treatment	0.001 (0.010)	-0.006 (0.011)	0.000 (0.001)	0.002 (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. Control variables include *size*, *ROA*, *Tobin's Q*, *leverage*, *cash holdings*, all measured in 2006. Standard errors (reported in parentheses) are clustered at the industry level.

**Table A5. External validity**

		Obs.	Mean	Median	Std. Dev.	<i>p</i> -value (diff. in means)	<i>p</i> -value (diff. in medians)
Log(assets)	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/Assets	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 A6. “Rich” companies**

	$\Delta \text{Log}(\text{Employees})$	$\Delta \text{CAPEX/PPE}$	$\Delta \text{R\&D/Assets}$	$\Delta \text{KLD-index}$
	(1)	(2)	(3)	(4)
Treatment $\times$ Cash-rich companies	0.008 (0.014)	0.003 (0.017)	0.002 (0.002)	0.017 0.103
Treatment $\times$ Other companies	-0.027 (0.010)	-0.025 (0.011)	0.000 (0.002)	-0.024 (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. Control variables include *size*, *ROA*, *Tobin's Q*, *leverage*, *cash holdings*, all measured in 2006. Standard errors (reported in parentheses) are clustered at the industry level.