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# The real effects of financial constraints: Evidence from a financial crisis<sup>☆</sup>

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## ABSTRACT

We survey 1,050 Chief Financial Officers (CFOs) in the U.S., Europe, and Asia to directly assess whether their firms are credit constrained during the global financial crisis of 2008. We study whether corporate spending plans differ conditional on this survey-based measure of financial constraint. Our evidence indicates that constrained firms planned deeper cuts in tech spending, employment, and capital spending. Constrained firms also burned through more cash, drew more heavily on lines of credit for fear banks would restrict access in the future, and sold more assets to fund their operations. We also find that the inability to borrow externally caused many firms to bypass attractive investment opportunities, with 86% of constrained U.S. CFOs saying their investment in attractive projects was restricted during the credit crisis of 2008. More than half of the respondents said they canceled or postponed their planned investments. Our results also hold in Europe and Asia, and in many cases are stronger in those economies. Our analysis adds to the portfolio of approaches and knowledge about the impact of credit constraints on real firm behavior.

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## 1. Introduction

In the fall of 2008, world financial markets were in the midst of a credit crisis of historic breadth and depth. In this paper, we provide a unique perspective on the impact of the crisis on the real decisions made by corporations around the world.

We survey 1,050 chief financial officers (CFOs) in 39 countries in North America, Europe, and Asia in December 2008. The crisis environment allows us to contrast the actions of firms that are financially constrained with those that are less constrained. We pursue several objectives. First, we develop a survey-based measure of financial constraint. We then study whether this constraint measure identifies meaningful cross-sectional variation in corporate behavior during the crisis. Our analysis starts by considering how companies' plans (employment, marketing, technology spending, etc.) are affected by the crisis conditional on constraint status. We then look at

companies' financial policies (in particular, cash savings and line of credit management). Finally, we examine corporate spending during the crisis, investigating circumstances in which firms' investment policies are altered due to credit constraints (including outright investment cancellation and asset sales).

Most previous research on financial constraints is based on financial statement data filed by U.S. public companies. The existing papers typically investigate the impact of constraints on investment policy, examining whether investment at constrained firms is tied more closely to cash flows.<sup>1</sup> With the exception of Kaplan and Zingales (1997), who look at CEOs' public statements about their firms' access to credit, papers in this literature customarily proxy for financial constraint with characteristics like small firm size, nondividend paying status, or poor credit ratings, all of which are gathered from standard archival sources. One distinguishing feature of our analysis is that we directly ask managers whether their firms are financially constrained. In particular, preserving the managers' anonymity, we inquire whether their companies' have been affected by the cost or availability of credit and how their future real and financial policies might be distorted as a result. Our sample includes both public and private companies from around the globe. Besides examining investment spending (like previous papers in the literature), we look at dimensions such as employment plans. This is important in the context of the current crisis because cuts in corporate sector employment have contributed to further declines in residential value and investment, which are at the root of the crisis.

Our analysis has several components. First, we examine the pro forma plans of companies conditional on whether they are financially constrained at the end of 2008. Based on our survey measure of constraint, we find that the average constrained firm in the U.S. planned to dramatically reduce employment (by 11%), technology spending (by 22%), capital investment (by 9%), marketing expenditures (by 33%), and dividend payments (by 14%) in 2009. Unconstrained firms planned, on average, significantly smaller cuts. Similar patterns are found in Europe and Asia.

We recognize that the responses of the "average" constrained and unconstrained firms in our survey may confound other factors and conduct our tests using the Abadie and Imbens (2002) and Dehejia and Wahba (2002) matching estimators. We match firms based on size, ownership form, credit rating, profitability, dividend payout status, growth prospects, and industry classification, and then contrast the behavior of firms that would "only differ" in the degree to which they say they have access to credit. Although not bullet-proof, the matching approach we implement pushes our tests closer to a setting in which one compares the impact of the crisis on firms that face more pronounced financial constraints

with that of "counterfactual" firms that are less constrained.

The matching analysis points to significant cross-sectional variation in every corporate policy we study both prior to and during the 2008 crisis, with differences between constrained and unconstrained firms becoming more significant as the credit crisis unfolds. Traditional constraint measures, in contrast, fail to identify any economically meaningful cross-sectional or time series patterns in corporate policies in our sample. Since the ability to identify those firms most vulnerable to credit supply shocks is of relevance for researchers and policy-makers, we believe that direct measures of constraints such as the one we study add to the portfolio of approaches that can be used to understand the impact of credit market imperfections.

Survey-based analyses have limitations that are important to consider (see also Section 2). One concern is whether some CFOs simply "perceive" credit to be scarce and invest less anticipating a demand contraction in the crisis. While we cannot ultimately rule out a "state of mind" story that could somehow affect some CFOs and not others, we verify that firms which say they are constrained also report tangible financing difficulties. For example, 81% of the CFOs that we categorize as financially constrained say they have experienced credit rationing (quantity constraint) in the capital markets, 59% complain about higher cost of borrowing (price constraint), and 55% cite difficulties in initiating or renewing a credit line. A related concern is that CFOs by themselves may not be able to separate economic from financial effects when responding to a survey. Admittedly, survey-based inferences will be compromised if CFOs misjudge the economic conditions of their firms and misunderstand the way credit markets respond—a possibility that we cannot rule out.

Yet another concern is whether uncontrolled firm heterogeneity could confound our inferences. Consider, for example, a company that performs poorly even before the crisis. It would not be surprising to find that this firm might both do worse during the crisis (e.g., invest less) and find less available credit. In our matching estimator approach, we pair-up constrained and unconstrained companies facing similar economic circumstances (e.g., profitability, credit ratings, dividend status, and industry), making it less likely that explanations related to financial distress or declining economic fundamentals could explain away our findings. Naturally, however, it is impossible to completely eliminate the possibility that these stories affect our results.

Our second area of analysis is related to liquidity management, in particular cash management and line of credit policy. Recent papers by Campello, Giambona, Graham, and Harvey (2009) and Lins, Servaes, and Tufano (2009) indicate that CFOs think of choices about cash and lines of credit as interconnected decisions. We start by documenting that the typical firm in the U.S. sample had cash and marketable securities equal to about 15% of total assets in 2007. Unconstrained firms are able to maintain this level of cash balances into late fall 2008. However, constrained firms burn through about one-fifth of their liquid assets over these months, ending the year with

<sup>1</sup> Hubbard (1998) and Stein (2003) provide reviews of this large body of research.

liquid assets equal to about 12% of asset value. The same pattern of cash burn for constrained firms is found in Europe and Asia. The evidence is consistent with the view that financially constrained firms build cash reserves as a buffer against potential credit supply shocks (see Almeida, Campello, and Weisbach, 2004).

We also study lines of credit. The typical U.S. firm has a prearranged credit line of approximately 19% (unconstrained firms) to 26% (constrained firms) of book asset value. We ask CFOs what they do with the proceeds they draw from lines of credit. About half of the firms around the world use those funds for daily operations or short-term liquidity needs. In addition, 13% of constrained U.S. firms indicate that they draw on their credit line now in order to have cash for future needs. Another 17% of constrained U.S. firms draw their credit down now just in case their banks might deny them credit in the future, compared to less than 6% of unconstrained who do so. This result is consistent with the evidence in Ivashina and Scharfstein (2009), who argue that much of the robust bank borrowing observed in 2008 was due to “just in case” draw downs on credit lines. Our analysis adds to their findings by documenting that constrained firms are significantly more likely (than unconstrained firms) to draw down in anticipation of banks restricting credit in the future.

Our third set of analyses examines the impact of credit conditions on corporate investment decisions. In this investigation, we specifically ask firms if they bypass attractive investment projects because of financial constraints. During the financial crisis, 86% of constrained U.S. firms said that they bypassed attractive investments due to difficulties in raising external finance, compared to 44% of unconstrained firms that said the same. These numbers are mirrored in Europe and Asia.

We also examine how firms finance attractive investments when they are unable to borrow. More than half of U.S. firms say that they rely on internally generated cash flows to fund investment under these circumstances, and about four in ten say that they use cash reserves. Notably, 56% of constrained U.S. firms say that they cancel investment projects when they are unable to obtain external funds, significantly greater than the 31% of unconstrained firms that may cancel investment. We find largely similar patterns in Europe and in Asia.

Not only is investment canceled due to tight credit markets; some firms sell assets to obtain cash. We find that the vast majority of financially constrained firms sold assets in order to fund operations in 2008, while unconstrained firms show no significant propensity to sell assets. Asset sales were also used to obtain funds in Europe and Asia. These findings suggest that financial constraints have significant effects on real asset markets.

Taken literally, one interpretation of our results would be that credit conditions led constrained firms to cut investment in suboptimal ways. Another interpretation, however, is that the firms that are cutting investment the most during the crisis are those that were overinvesting before it. In other words, the reduction in investment that we observe need not be suboptimal. The difficulties of empirically measuring investment opportunities are well-

known, and like previous papers in the literature, we are unable to ascertain whether the projects that are cut in the crisis were value-maximizing.

Our paper provides a new perspective on the effects of the financial crisis that began in 2008. It is important, however, that we contrast it with previous work on financing constraints. A distinguishing feature of our approach is that we gauge the impact of constraints by asking managers about their firms' access to credit. A related paper by Kaplan and Zingales (1997) predates ours. These authors also consider managers' views on their firms' access to credit (gleaned from managers' statements filed in corporate 10-Ks), and some of our results are similar to theirs: constrained firms invest less, grow less, and save less cash. We also note that the Kaplan–Zingales classification scheme is easier to replicate than ours. In contrast to their study, however, our paper shows how a large set of firms responds to a sharp, aggregate credit supply shift. We also have information on policy dimensions that their work does not cover (e.g., how firms manage their lines of credit, how much they plan to spend on employment and technology, how they relate savings and investment decisions, whether they cancel projects or sell assets). While Kaplan and Zingales collect information on constraints from managers' public statements, our data come from a private, anonymous inquiry. Finally, our approach allows us to make our findings available to researchers and policymakers as the crisis unfolds (before numbers are recorded in the books or in 10-Ks).

While not focusing on financial crises, related papers have considered other sources of exogenous variation to gauge the real-side implications of financial constraints. Blanchard, Lopez-de-Silanes, Shleifer (1994), for example, consider the effects of cash flow innovations that arise from corporate lawsuits. Lamont (1997) examines the impact of the 1986 oil price decline on the investment spending of non-oil segments of oil-based conglomerates. Rauh (2006) looks at discontinuity-like features of corporate pension funding obligations to establish a link between cash flows and investment. Our results deepen the literature by looking at a pronounced shift in the supply of credit brought about by the 2008 financial crisis.

The remainder of the paper is organized as follows. We provide details of our survey data in Section 2. Section 3 examines the interplay between firm demographic characteristics and corporate policies during the 2008 financial crisis. Section 4 introduces our measure of financial constraint and examines how it shapes corporate plans. Sections 5 and 6 discuss, respectively, liquidity management and investment policies during the crisis. Some conclusions are offered in the final section.

## 2. Data

We gather firm-level information using a survey of CFOs conducted in the fourth quarter of 2008. The survey approach provides the opportunity to directly ask managers whether their decisions have been constrained by the cost or availability of credit. Since we want to

**Table 1**

Survey invitations and U.S. response rates.

This table reports the firm size and industry breakdowns of the 10,000 survey E-mail invitations sent to U.S. firms by *CFO* magazine in 2008Q4. The table also reports the number of respondents and the response rates. The reported numbers reflect “bounce backs” (nearly 7%) and include financial firms (which are excluded from the main analysis).

Characteristic	Category	Survey invitations (N)	Surveys received (N)	Response rate (%)
Annual sales volume	< \$1 Billion	6,813	509	7.5%
	> \$1 Billion	3,187	170	5.3%
Industry	Retail/wholesale	1,112	87	7.8%
	Manufacturing	2,321	144	6.2%
	Transportation/energy	573	42	7.3%
	Communications/media	372	26	7.0%
	Technology	521	24	4.6%
	Banking/finance/insurance	2,308	105	4.5%
	Service/consulting	691	45	6.5%
	Healthcare/pharmaceutical	743	51	6.9%
	Other	1,226	141	11.5%

understand the role of financial markets in shaping corporate decisions when credit is tight, we investigate the relation between firm characteristics (such as size and credit rating) and whether managerial policies are influenced by access to credit. We surveyed CFOs in the U.S., Europe, and Asia. Many of these CFOs are subscribers of *CFO* magazine, *CFO Europe*, and *CFO Asia*; others are executives who have participated in previous surveys conducted by Duke University.

The U.S. survey was conducted via E-mail invitation on November 25, 2008, and a reminder E-mail was sent one week later. The survey closed on December 5, 2008. Due to logistical issues, the European and Asian surveys started and ended about one week earlier.<sup>2</sup> Most of those surveyed have the job title of CFO. Some have the title of Treasurer, Assistant Treasurer, Vice President of Finance, Comptroller, or a similar title. We refer to this group collectively as CFOs. In the U.S., *CFO* magazine sent out 10,000 E-mail invitations. The approximate failure (“bounce back”) rate of these invitations is 7%.<sup>3</sup> We know the distributions of firm size and industry breakdown of the *CFO* invitations. Combining *CFO*'s invitation figures with the information from our final sample, we can estimate the response rates in the U.S. **Table 1** shows that response rates are roughly between 5% and 8% across different size and industry categories. The middle columns imply that 68% of the population of companies that received the survey have annual sales of less than \$1 billion, compared to 75% of the respondent firms.

The sample we analyze in the remainder of the paper contains responses from 1,050 non-financial firms in the U.S. (574), Europe (192), and Asia (284). **Table 2** contrasts survey respondents with Compustat firms. Since the bulk of research in corporate finance is based on the Compustat universe, the comparisons in this table illustrate the representativeness of our survey data with respect to

firms in the U.S. To make these comparisons appropriate, we restrict attention to non-financial public firms. Our respondents include 130 non-financial public companies. We contrast these firms with 4,979 non-financial Compustat firms, for which we gather valid, comparable data on assets, sales, profits, and cash holdings available from the fourth quarter of 2008.

**Table 2** indicates that 56% of the non-financial public firms in our sample have annual sales of less than \$1 billion. This fraction is somewhat higher (69%) for the comparable Compustat sample. Conditional on having a rating, firms in our sample have better ratings than those in Compustat. Seventy-three percent of the non-financial public firms in our survey have investment-grade ratings, while for the Compustat sample this fraction is 48%. Differences are more pronounced, however, when one does not condition on the existence of a rating. In particular, note that 96 of the 130 public companies in our sample (or 74%) have a credit rating, compared to only 1,333 out of 4,979 (or 27%) in Compustat. Moreover, 70 of the 130 public companies (54%) in our sample have an investment-grade rating compared to 635 of 4,979 firms in Compustat (13%).

Profitability in the two samples appears to be more comparable: approximately four out of five companies in both samples were profitable in the previous fiscal year. Likewise, the propensity to pay dividends is similar across the two samples: 47% of the firms in our survey pay dividends, compared to 40% of those in Compustat. Finally, cash holdings are very similar across the two samples. The mean (median) cash-to-assets ratio is 16.3% (8.0%) for survey firms and 17.0% (8.3%) for Compustat firms.

Most of the statistics reported in **Table 2** suggest that the survey respondents are roughly comparable to those used in prior research in corporate finance. However, we note the potential for a selectivity bias with respect to credit ratings. In particular, a large proportion of the public firms in our survey have investment-grade ratings. This implies that firms in our sample could be of a “better quality” than the representative Compustat firm. It is

<sup>2</sup> The survey questions can be found at [http://faculty.fuqua.duke.edu/cfosurvey/09q1/HTML\\_US/Q4\\_08\\_1.htm](http://faculty.fuqua.duke.edu/cfosurvey/09q1/HTML_US/Q4_08_1.htm).

<sup>3</sup> Duke University issued additional invitations which roughly compensated for the initial bounce backs.

**Table 2**

Comparing public survey companies to Compustat.

This table contrasts observations (raw counts) and frequencies (in percentage terms) of firms in the U.S. survey sample and those in Compustat as of 2008Q4. The samples are restricted to non-financial public companies. Firms are considered to be “large” if their annual sales surpass \$1 billion, and “small” otherwise. “Speculative” firms are those with S&P credit ratings equal to BB+ or below. “Investment-grade” firms have ratings of BBB – or above. Dividends and profits refer to fiscal year 2008. Cash/Assets is the ratio of cash and liquid securities to total assets.

Observable	Category	Survey sample Obs. (N)/Freq. (%)	Compustat sample Obs. (N)/Freq. (%)
Size	Small	73/56%	3,436/69%
	Large	57/44%	1,543/31%
Credit rating	Speculative	26/27%	698/52%
	Investment	70/73%	635/48%
Profitability	Profits > 0	110/87%	3,961/80%
	Profits ≤ 0	16/13%	1,018/20%
Dividend payments	Dividends > 0	59/47%	1,977/40%
	Dividends = 0	67/53%	3,002/60%
		Mean/median	Mean/median
Cash/Assets		0.163/0.080	0.170/0.083

difficult to gauge the impact of this potential selectivity issue or to measure its magnitude, but we later point to how it could affect some of our results.

Our survey allows us to ask unique questions about the actions corporate managers plan to implement during the crisis. We discuss how their answers fit economic priors – in particular, whether and how financing frictions affect firm behavior. In this sense, what is unique about our paper is its approach. At the same time, we stress that there are potential concerns related to using surveys to gather data. While we consulted with experts and refined the survey questions, it is still possible that some of the questions were misunderstood or otherwise produce noisy measures of the desired variables of interest. In addition, when interpreting field studies, one needs to consider that market participants do not necessarily have to understand the reason they do what they do in order to make (close to) optimal decisions. Moreover, given its design and timeliness, the results we get are difficult to replicate (one would need to design and implement a similar instrument in a similar situation). Finally, our survey was conducted at one point in time, so we cannot exploit advantages that are sometimes available in panel data studies.<sup>4</sup>

### 3. Firm demographics and corporate policies during the crisis

We start by examining corporate plans for 2009 – plans that were made in the midst of the credit crisis of 2008. We are interested in gauging how firms respond to a contraction in aggregate credit and, in particular, how

characteristics that are usually associated with access to external financing may shape corporate responses.

Using December 2008 as a reference point, we study planned changes for the following 12 months (relative to the previous 12 months) in technology expenditures, capital expenditures, marketing expenditures, hiring (number of domestic employees), cash holdings, and dividend payments.<sup>5</sup> We begin with graphical analyses, conditioning the responses on firm demographics. These responses are reported in Fig. 1.

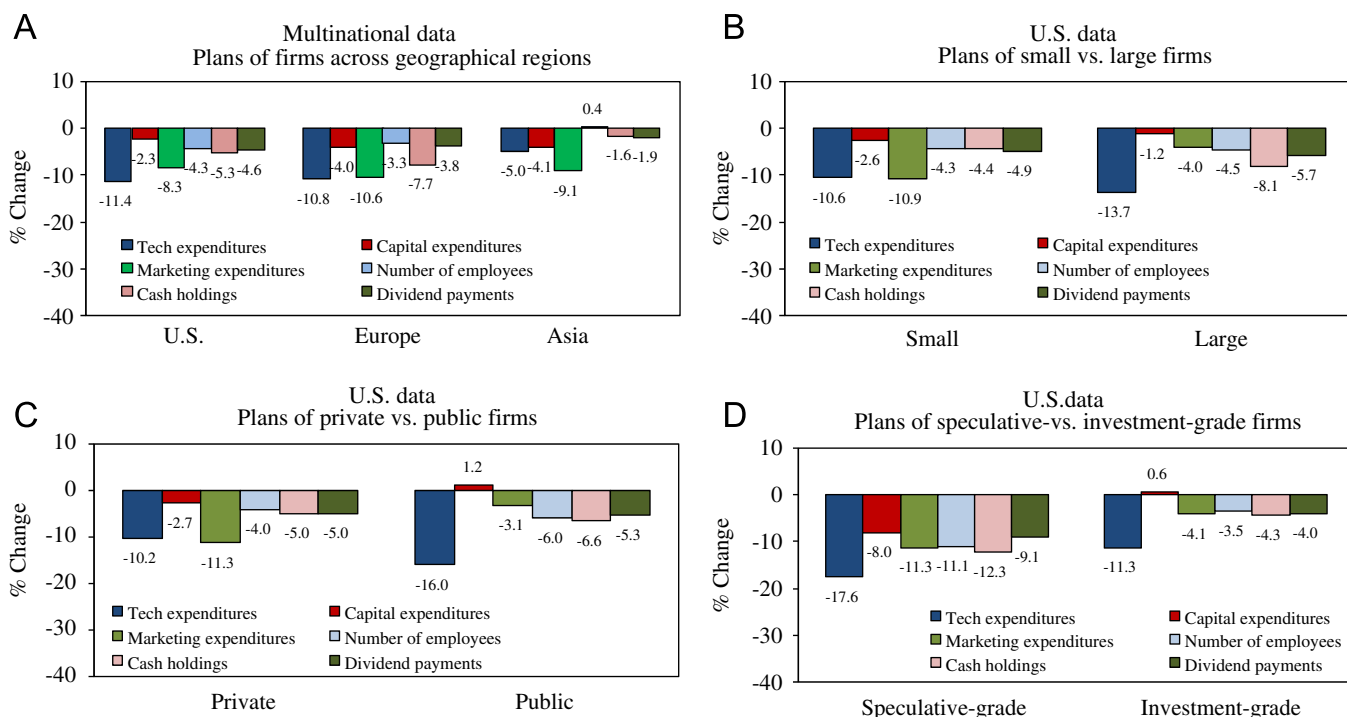
*Geographical region:* Panel A of Fig. 1 categorizes corporate policy responses by the geographical region in which the firm is headquartered. One salient result in Panel A is that, around the world, firms were planning major cuts in (almost) all the policy variables that we examine. For example, American and European companies planned to cut tech spending by over 10% during 2009. In addition, among the policies we examine, American firms expected the smallest cuts to occur in capital expenditures. Also noteworthy, European companies expected to significantly reduce cash holdings over the next year, while Asian companies planned to increase (albeit only slightly) employment.

These regional disparities suggest that we should not indiscriminately bundle together data from different regions when analyzing the impact of the financial crisis on corporate policies. Accordingly, we study each of the three regions separately.

*Size:* We split the companies into small and large categories according to sales revenue. Firms with total gross sales amounting to less than \$1 billion are

<sup>4</sup> As we discuss shortly, however, we can use previous surveys to better understand some issues. In that analysis, we work with a “rotating panel” and time series information to draw conclusions.

<sup>5</sup> Respondents are allowed to input numbers between –100% and 500% when answering this question and we observe some extreme outliers. To minimize the impact of these extreme entries, we winsorize responses in the 1% tails.



**Fig. 1.** This figure displays firms' planned changes (% per year) in technology expenditures, capital expenditures, marketing expenditures, total number of domestic employees, cash holdings, and dividend payments as of the fourth quarter of 2008 (crisis peak period). The data are from the 2008Q4 survey. The sample excludes non-financial, governmental, and non-profit organizations. Responses are averaged across firms within categories determined according to size (sales revenue), ownership form, and credit ratings.

categorized as “small,” and those with sales in excess of \$1 billion are “large.” There are 440 small firms and 134 large firms in the U.S. sample. Our results are largely insensitive to cut-offs for the size categorization. The same applies to using the number of employees (in lieu of sales) as a proxy for size. For example, experiments involving size yield the same inferences if we classify as “small” those companies with less than 500 employees and as “large” those with more than 500, employees.

Panel B of Fig. 1 suggests that differences between small and large company responses to the crisis were modest in the U.S. Large firms planned bigger cuts in technology expenditures, while small firms expected to implement larger capital spending cuts. Small firms also expected to cut marketing expenses more, and preserve cash. While suggestive, the figures do not reveal whether policy differences across small and large firms are statistically significant. Similar size-based patterns occur in Europe and Asia (not shown in figure).

**Ownership form:** U.S. public firms are those either traded on the NYSE or Nasdaq/Amex. We have 342 private firms and 130 public firms. As indicated by Panel C of Fig. 1, public firms' plans for 2009 implied, on average, sharper cuts in tech spending compared to private firms' plans (16% for public versus 10% for private). On the flip side, private firms planned to cut marketing and capital expenditures by more. Public and private firms seemed to pursue largely similar financial policies (cash holdings and dividend distributions) for 2009. Similar patterns across public and private firms exist in Europe and Asia, where the majority of companies are private.

**Credit ratings:** We categorize firms as “speculative-grade” and “investment-grade” if their Standard & Poors credit ratings are, respectively, BB+ or below, and BBB–

or above. The sample contains 26 speculative-grade and 70 investment-grade firms in the U.S. The differences between speculative and investment rated firms' policies are more pronounced than those based on size and ownership form. Speculative companies planned significant reductions across all expenditure categories (including employment). These firms also expected smaller cash reserves and greater dividend cuts for 2009. Investment-grade firms were also planning to cut most real and financial policy variables, but the cuts were smaller by comparison. We find similar patterns in non-U.S. markets.

#### 4. Assessing financial constraints from a survey

The survey instrument allows us to group firms by whether or not they indicate they are financially constrained. In this section, we describe and contrast these two groups of companies.

##### 4.1. What are financially constrained firms like?

A large literature examines the impact of capital market imperfections on corporate behavior. In this literature, the standard empirical approach is to gather archival data and use indirect metrics such as asset size, ownership form, and credit ratings to characterize a firm as either financially constrained or unconstrained.<sup>6</sup> Our instrument, in contrast,

<sup>6</sup> Other related archival measures include firm age (Oliner and Rudebusch, 1992), dividend payer status (Fazzari, Hubbard, and Petersen, 1988), and affiliation to conglomerates (Hoshi, Kashyap, and Scharfstein, 1991). One exception to the standard identification approach in this area is the work of Kaplan and Zingales (1997). Those

**Table 3**

Sample descriptives across constraint types.

This table reports the number of observations (raw counts) and frequencies (in percentage terms) of relevant characteristics of firms that declare themselves as *NotAffected*, *SomewhatAffected*, and *VeryAffected* by credit constraints and by firm types. Firms are considered to be “large” if their annual sales surpass \$1 billion, and “small” otherwise. “Speculative” firms are those with S&P credit ratings equal to BB+ or below. “Investment” firms have ratings of BBB– or above. Dividends and profits refer to fiscal year 2008. Growth prospects reflect CFOs’ views about the long-term growth prospects of their firms on a one-to-ten scale. The data are taken from the 2008Q4 U.S. survey and exclude non-financial, governmental, and non-profit organizations. Column 1, for example, shows that 179 (or 73%) of the firms in the *NotAffected* category are small, while 65 (27%) are large. For the *SomewhatAffected* category, 78% of the firms are small and 22% are large, while for the *VeryAffected* category the breakdown is 82% small and 18% large. The numbers in row 1 also describe the proportion of constraint-types “within” the size category. For the small category (436 firms), 41% of the firms are *NotAffected*, 37% are *SomewhatAffected*, and 22% are *VeryAffected*. For the large firms (133 firms), 49% of the observations are *NotAffected*, 35% are *SomewhatAffected* and 16% are *VeryAffected*.

Observable	Category	<i>NotAffected</i> N/% across/% within	<i>SomewhatAffected</i> N/% across/% within	<i>VeryAffected</i> N/% across/% within
Size	Small	179/73%/41%	163/78%/37%	94/82%/22%
	Large	65/27%/49%	47/22%/35%	21/18%/16%
Ownership	Private	142/70%/42%	121/73%/36%	74/76%/22%
	Public	61/30%/47%	45/27%/35%	24/24%/18%
Credit rating	Speculative	6/15%/23%	8/25%/31%	12/57%/46%
	Investment	35/85%/52%	24/75%/35%	9/43%/13%
Profitability	Profits > 0	208/90%/47%	156/80%/35%	82/71%/18%
	Profits ≤ 0	24/10%/25%	40/20%/41%	33/29%/34%
Dividend pay	Dividends > 0	76/36%/46%	60/35%/36%	30/30%/18%
	Dividends = 0	133/64%/43%	111/65%/35%	70/70%/22%
Growth prospects	Prospects > 5	193/79%/45%	161/77%/37%	77/67%/18%
	Prospects ≤ 5	50/21%/36%	49/23%/36%	38/33%/28%

directly asks whether a company’s operations are “not affected,” “somewhat affected,” or “very affected” by difficulties in accessing the credit markets. For the survey conducted in the fourth quarter of 2008 in the U.S., we have 244 respondents indicating that they are unaffected by credit constraints, 210 indicating that they are somewhat affected, and 115 indicating that they are very affected.<sup>7</sup> In what follows, we carefully document the characteristics of the respondents in each of these categories.

#### 4.1.1. Characterizing constrained firms based on standard observables

Table 3 reports relevant characteristics of U.S. firms that declare themselves as “not affected,” “somewhat affected,” or “very affected” by the cost or availability of credit (we denote these answers *NotAffected*, *SomewhatAffected*, and *VeryAffected*, respectively). The first breakdown is based on firm size, as measured by sales volume. Row 1 of Table 3 shows that 179 (or 73%) of the firms in the *NotAffected* category are small, while 65 (27%) are large. For the *SomewhatAffected* category, 78% of

the firms are small and 22% are large, while for the *VeryAffected* category the breakdown is 82% small and 18% large. These numbers point to a very small degree of correlation between size and firms’ propensity to declare themselves as either constrained or unconstrained. Another way to look at the numbers in row 1 is to consider the proportion of constraint-types by size category. In particular, for the small firms in our sample (a total of 436), we find that 41% of the firms are *NotAffected*, 37% are *SomewhatAffected*, and 22% are *VeryAffected*. For the large firms (133 firms), 49% are *NotAffected*, 35% are *SomewhatAffected*, and 16% are *VeryAffected*. As before, a small correlation between size and the degree to which firms say they are constrained is implicit in these relative percentages.<sup>8</sup>

There is virtually no correlation between constraint type and ownership form in our sample. Note from row 2 that among the 337 private firms in our sample, 42% are *NotAffected*, 36% are *SomewhatAffected*, and 22% are *VeryAffected*. For public firms, that same breakdown yields 47%, 35%, and 18%, respectively. There is more correlation between credit ratings and constraints. For example, row 3 indicates that 46% of speculative-grade firms are *VeryAffected*, while only 13% of firms that have investment-grade ratings fall in this constraint category.

(footnote continued)

authors review statements by firm managers that appeared in firms’ public records (e.g., 10-Ks) to gauge the degree of constraint. Kaplan and Zingales then use their own judgment to classify firms in categories of financial constraint.

<sup>7</sup> In Europe those numbers are, respectively, 92, 71, and 26. In Asia the same breakdown is 147, 112, and 24.

<sup>8</sup> A formal test of correlation between our measure of constraint and firm size confirms the intuition we gather from the numbers in Table 3 (the test is omitted from this version of the paper to save space).



Of the archival-type measures of constraint that we examine in the paper, credit ratings come closest to replicating the patterns we find for the behavior of financially constrained and unconstrained firms during the crisis.

The CFOs also assess the financial status and economic prospects of their firms. In particular, we ask whether respondent firms realized (or expected to realize) a positive profit in fiscal year 2008. We also inquire whether they paid a dividend. Finally, we ask CFOs to quantify the long-term growth prospects of their firms on a one-to-ten scale. To facilitate our tests, we dichotomize their responses depending on whether the CFO answers six and above, or five and below.

Row 4 of Table 3 shows that 18% of the profitable firms are *VeryAffected*, compared to 34% of unprofitable firms. Roughly one-third of the sample firms pay dividends, regardless of their constraint status. Finally, while most CFOs expect very positive growth prospects, there is some cross-sectional variation across and within groups. Seventy-nine percent of *NotAffected* firms have very positive growth prospects (prospects > 5), compared to 67% of *VeryAffected* firms. At the same time, 18% of firms with very positive prospects are *VeryAffected*, compared to 28% of companies with less positive growth prospects.

#### 4.1.2. What kinds of credit frictions do constrained firms face?

We ask CFOs to elaborate on the types of frictions they have encountered when trying to raise external finance during the crisis. In particular, we ask CFOs who indicate that they have experienced financial constraints—i.e., *SomewhatAffected* and *VeryAffected* firms—whether they have experienced: (1) quantity constraints (limited credit availability); (2) higher costs of external funds; or (3) difficulties in originating or renewing a line of credit with their banks. Understanding the *exact nature* of the difficulties CFOs face when trying to raise external funds when credit is tight is key for research about financial

constraints. This information is not found in standard sources.

Table 4 shows that 81% of the *VeryAffected* firms say that they experienced less access to credit (which we denote “quantity constraint”), 59% say they experienced higher cost of funds (“price constraint”), and 55% say they experienced difficulties in accessing a credit line (“LC access”). For *SomewhatAffected* firms, only 50% cite quantity constraints, 40% cite price constraints, and 20% cite difficulties with lines of credit. We interpret these numbers as an indication that a CFO’s statement that his/her company is financially constrained is a reflection of concrete, tangible experiences that are related to difficulties in raising funds in the credit markets. Importantly, the results in Table 4 help better describe what CFOs mean when they say their firms are financially constrained. Throughout the paper we conduct supplemental tests based on these categories of constraint, reporting the associated results.

#### 4.2. Financial constraints and corporate policies during the financial crisis

To illustrate how the survey-based measure of constraint is related to corporate policy choices during the financial crisis, we replicate the graphs in Fig. 1, conditioning on whether firms are constrained or unconstrained (see Fig. 2). We classify *NotAffected* and *SomewhatAffected* firms as “unconstrained firms,” while the *VeryAffected* firms are referred to as “constrained firms.” Our inferences are not affected by how we classify the middle *SomewhatAffected* category. Keeping all the observations preserves information and testing power, and having just two constraint categories facilitates the use of different econometric techniques later implemented and also aids the exposition.<sup>9</sup>

The numbers in Fig. 2 allow us to perform mean comparison tests that compare the policy averages of constrained and unconstrained firms. These tests confirm that the firms that we classify as credit constrained plan to contract policies in a pronounced manner, while unconstrained firms plan much smaller cuts (sometimes statistically indistinguishable from zero). To illustrate this contrast, note that financially constrained firms planned to reduce their capital spending, on average, by 9% in 2009. Unconstrained firms, in contrast, planned to keep their capital spending rates nearly constant (a negligible 0.6% decline). Constrained firms planned to cut 10.9% of their employees in 2009, compared to 2.7% at unconstrained firms. Differences across groups are highly statistically significant for *all* of the real and financial policies in the figure (statistical tests not shown to save space).

The European data (not shown in the figure) reveal slightly milder policy contrasts between constrained and unconstrained firms, with all firms signaling significant

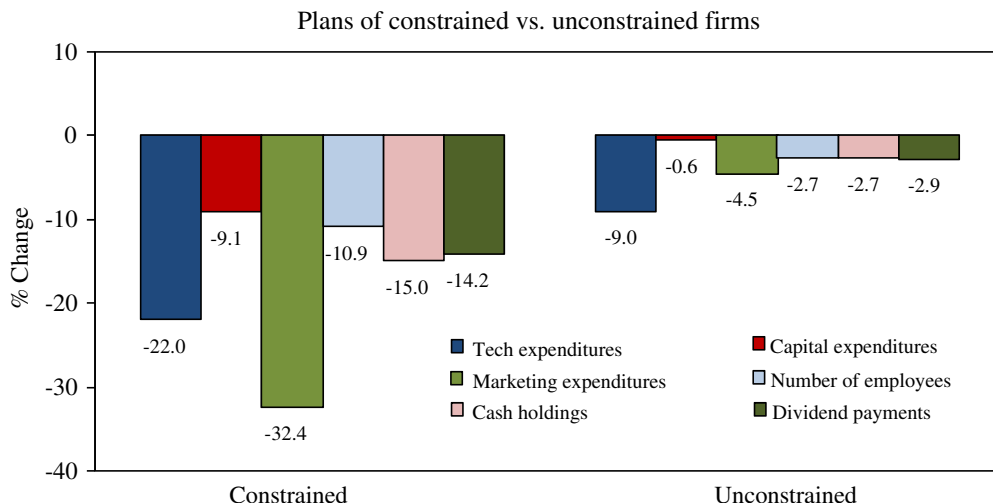
**Table 4**

Characterizing financing frictions across constraint types.

This table reports the number of observations (raw counts) and frequencies (in percentage terms) of different forms of credit frictions faced by firms that declare themselves as *SomewhatAffected* and *VeryAffected* by credit constraints. Quantity constraint indicates whether the firm has experienced less access to credit. Price constraint indicates whether the firm has experienced higher cost of funds. Difficult access to LC indicates whether the firm has found difficulties in obtaining new lines of credit or renewing existing ones. The data are from the 2008Q4 U.S. survey.

Observable	Category	<i>SomewhatAffected</i> Obs. (N)/Freq. (%)	<i>VeryAffected</i> Obs. (N)/Freq. (%)
Quantity constraint	No	105/50%	22/19%
	Yes	105/50%	93/81%
Price constraint	No	125/60%	47/41%
	Yes	85/40%	68/59%
Difficult access to LC	No	169/80%	52/45%
	Yes	41/20%	63/55%

<sup>9</sup> Throughout the analysis, we also examine results from median tests (rank-sum Mann-Whitney two-tail tests). In every estimation, our inferences are the same whether we use mean or median comparisons.



**Fig. 2.** This figure displays U.S. firms' planned changes (% per year) in technology expenditures, capital expenditures, marketing expenditures, total number of domestic employees, cash holdings, and dividend payments as of the fourth quarter of 2008 (crisis peak period). The data are taken from the 2008Q4 U.S. survey. The sample excludes non-financial, governmental, and non-profit organizations. Responses are averaged within sample partitions based on the survey measure of financial constraint.

cuts in their policies. Asian firms show very pronounced differences in business plans for constrained versus unconstrained firms.

#### 4.3. Financial constraints and corporate policies: a matching approach

One issue we investigate is whether the survey measure of financial constraint has a significant relation with corporate policies that is not subsumed by standard measures of constraint. Our data allow us to test this idea both for the crisis peak period of 2008Q4 as well as for the quarters preceding it. In particular, prior rounds of the U.S. quarterly survey allow us to produce a rotating panel containing policy and demographic information for hundreds of companies in each of the following quarters: 2007Q3, 2007Q4, 2008Q1, 2008Q2, and 2008Q3 (a total of 2,226 observations). These data are interesting because they precede the Lehman debacle (which happened at the very end of 2008Q3). For ease of exposition, we label this period the “pre-crisis period.” We employ two matching estimator approaches to make comparisons across time.

Our variables are largely categorical and fit well with the full-covariate matching procedure of Abadie and Imbens (2002).<sup>10</sup> For every firm identified as financially constrained (or “treated”), we find an unconstrained match (a “control”) that is in the same size category, the same ownership category, and the same credit rating category. We also require that the matching firm is in the same industry and survey quarter. The procedure then estimates the differences in corporate policies (“outcomes”) for constrained firms relative to those that

are unconstrained, conditional on matching on each and all of the aforementioned characteristics. Generally speaking, instead of comparing the average difference in policy outcomes across all of the constrained and all of the unconstrained firms (as in Figs. 1 and 2), we now compare the differences in average outcomes of firms that are quite similar (i.e., matched) except for the “marginal” dimension of CFO-reported financial constraints. This yields an estimate of the differential effect of financial constraints on corporate policies across “treated” firms and their “counterfactuals.”<sup>11</sup>

Table 5 shows how the survey measure fares in gauging the effects of financial constraints on firm policies prior to the crisis (2007Q3 through 2008Q3) and during the crisis (2008Q4). For now, we focus on columns 1 and 3, which present the results from the Abadie-Imbens estimator for the pre-crisis and crisis periods, respectively. A number of patterns stand out. First, even for the pre-crisis periods, our measure of financial constraint picks up significant differences in policy outcomes for constrained vis-à-vis unconstrained firms. Column 1 shows that firms that report themselves as being financially constrained systematically planned to invest less in technology (an average differential of –5% per year), invest less in fixed capital (–8%), cut marketing expenditures by more (–6%), reduce employment by more (–6%), conserve less cash (–3%), and pay fewer dividends (–8%). These numbers are economically and statistically significant.<sup>12</sup>

<sup>10</sup> See Abadie and Imbens for a detailed discussion of their matching estimator. Here we apply the bias-corrected, heteroskedasticity-consistent estimator implemented in Abadie, Drukker, Herr, and Imbens (2004).

<sup>11</sup> In the treatment evaluation literature, this difference is referred to as the average treatment effect for the treated firms, or ATT [see Imbens (2004) for a review].

<sup>12</sup> Because the troubles with Lehman could have been anticipated in 2008Q3 and the economy had already notably slowed down, we conducted robustness checks excluding 2008Q3 from the analysis. Our inferences are unaffected by that sample restriction.

**Table 5**

Corporate policies: average treatment effects (matching estimators) for the direct measure of financial constraint over pre-crisis and crisis periods.

This table reports differences in planned annual percentage changes of real and financial corporate policies according to whether firms are financially constrained or financially unconstrained. The financial constraint measure is based on self-reported difficulty in accessing credit. Differences are computed as average treatment effects via matching estimators (ATT). Firms are matched across the demographics of asset size, ownership form, and credit ratings. Columns 1 and 2 report results for the pre-crisis period (2007Q3 through 2008Q3). Columns 3 and 4 report results for the crisis period (2008Q4). The data are from the U.S. surveys. The Abadie and Imbens (2002) estimates are obtained from the bias-corrected, heteroskedasticity-consistent estimator implemented in Abadie et al. (2004). The Dehejia and Wahba (2002) estimates are obtained from the nearest neighbor matching estimator implemented in Becker and Ichino (2002), imposing the common support condition and using bootstrapped errors. *t*-Statistics are in parentheses.

Policy	Difference between constrained and unconstrained firms			
	Pre-crisis period		Crisis period	
	Abadie-Imbens	Dehejia-Wahba	Abadie-Imbens	Dehejia-Wahba
% Change in technology expenditures	−5.467*** (−2.61)	−5.369*** (−2.72)	−11.160*** (−3.09)	−11.278*** (−3.00)
% Change in capital expenditures	−7.706*** (−2.57)	−7.813*** (−2.63)	−8.494*** (−3.79)	−8.054*** (−2.73)
% Change in marketing expenditures	−5.878*** (−3.19)	−5.843*** (−3.19)	−11.709*** (−4.05)	−11.866*** (−3.75)
% Change in employees	−5.603*** (−4.04)	−5.541*** (−3.43)	−8.431*** (−4.18)	−8.495*** (−3.89)
% Change in cash holdings	−3.467 (−1.39)	−3.589 (−1.58)	−8.536* (−1.87)	−8.496** (−2.03)
% Change in dividend payout	−7.559** (−1.98)	−7.172* (−1.70)	−28.412** (−2.09)	−27.941** (−1.97)

Note: \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels.

These constrained–unconstrained differences *increase* quite noticeably during the peak of the crisis. In particular, column 3 of Table 5 shows that differences in planned technology cuts between constrained and unconstrained firms double in 2008Q4 (up to −11%). Likewise, the marginal reduction in marketing expenditures across the two types of firms is nearly twice as large during the crisis (−12%). Their expected “cash burn” differential (or dissavings) is nearly three times larger during the crisis (about −9%), and their dividend reduction differential is four times larger in the crisis (−28%). These comparisons indicate that the crisis aggravated the differences in planned corporate policies of constrained and unconstrained firms.

The Abadie-Imbens estimator requires exact matches for constrained and unconstrained firms in every category of the control variables—in our case, industry classification, small and large, private and public, speculative- and investment-grade firm groups—within each individual survey. Given the relatively limited size of our data set for some periods, exact matches are sometimes unavailable. One way to deal with the problem of dimensionality in this setting is to use propensity score matching (Rosenbaum and Rubin, 1983). We implement the estimator proposed by Dehejia and Wahba (2002), which uses observed characteristics (size, ownership, ratings, and industry) as inputs in a probit regression determining

whether the firm is financially constrained.<sup>13</sup> Once firms are projected in this propensity score space, for each constrained firm, the procedure looks for the nearest unconstrained match. After partitioning the propensity score vector into “bins,” it is checked whether the constrained and unconstrained firms in each bin have the same average propensity score (else the process is restarted with a “rebalancing” of the bins or a new selection model). The procedure also ensures that firms that are matched in the same propensity categories also have similar averages of the covariates in the probit estimation. Once assignment to treatment is determined in this way, we can measure the average treatment effect on policy outcomes of constrained and unconstrained firms in a fashion analogous to the matching procedure performed just above.

Columns 2 and 4 of Table 5 report the results associated with this alternative matching estimator. The propensity score estimator suggests that the self-reported measure of financial constraint captures significant cross-sectional differences in real and financial plans for 2009, with constrained firms planning significantly larger policy

<sup>13</sup> We apply the nearest neighbor matching estimator implemented in Becker and Ichino (2002), imposing the common support condition and using bootstrapped errors.

**Table 6**

Firm heterogeneity and the impact of financial constraints on firm plans during the financial crisis.

This table reports differences in planned annual percentage changes of real and financial policies of firms according to whether they are financially constrained or financially unconstrained. The financial constraint measure is based on self-reported difficulty in accessing credit. Differences are computed as average treatment effects via matching estimators (ATT). Firms are matched across demographic, financial, and economic characteristics: asset size, ownership form, credit ratings, profitability, dividend payout, long-term investment prospects, and industry. The data are collected from the 2008Q4 U.S. survey. The Abadie and Imbens (2002) estimates are obtained from the bias-corrected, heteroskedasticity-consistent estimator implemented in Abadie et al. (2004). The Dehejia and Wahba (2002) estimates are obtained from the nearest neighbor matching estimator implemented in Becker and Ichino (2002), imposing the common support condition and using bootstrapped errors (500 repetitions). *t*-Statistics are in parentheses.

Policy	Diff. between constrained and unconstrained firms Crisis period	
	Abadie-Imbens	Dehejia-Wahba
% Change in technology expenditures	−11.468*** (−2.69)	−12.955*** (−2.89)
% Change in capital expenditures	−7.581*** (−2.59)	−6.822** (−2.21)
% Change in marketing expenditures	−12.424*** (−4.15)	−13.240*** (−3.88)
% Change in employees	−5.977*** (−3.90)	−5.326*** (−2.65)
% Change in cash holdings	−7.666* (−1.69)	−9.006** (−2.07)
% Change in dividend payout	−28.640** (−2.28)	−28.392** (−1.99)

Note: \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels.

cuts. Similarly to our previous tests, the new results also imply that constrained–unconstrained differences become much more pronounced in the 2008Q4 crisis peak.<sup>14</sup>

#### 4.4. Finer matching during the crisis

We note that the constrained–unconstrained comparisons in Table 5 condition only on firm size, ownership form, and credit quality. We do this because we have information on these characteristics for all quarters from 2007Q3 to 2008Q4, which allows us to gauge the

<sup>14</sup> We also replicate Table 5 using each of the three alternative measures of constraint described in Section 4.1.2 (“quantity,” “price,” and “LC access”) and find that our inferences hold for each of these specific kinds of constraints.

importance of constraints over time (e.g., gauge the incremental effect of the financial crisis). The 2008Q4 survey gathers extra information on observables such as profitability, dividend payer status, and the CFO’s assessment of his firm’s long-term growth prospects (these variables are described in Table 3). Using these data, we perform the tests of Table 5 matching on size, ownership, credit rating, profitability, dividend payout status, growth prospects, and industry. Although still not perfect, these added controls help ameliorate concerns about other effects (e.g., financial distress) that could confound our inferences.

The new estimates are reported in Table 6. Some suggest slightly stronger economic magnitudes for the differences in outcomes across constrained and unconstrained firms (e.g., higher expected cuts for marketing and technology expenditures for constrained firms), while other policy differentials are slightly weaker (capital expenditures and employment). The conclusion is that even after controlling for profitability and for long-term investment demand, we still find that the firm’s difficulty in obtaining credit is a key determinant of differential policymaking over the financial crisis.<sup>15</sup>

#### 4.5. Comparisons with standard proxies for financial constraint

To gauge the relative performance of the survey measure, we replicate the tests of Table 5 using the standard measures of constraints—size, ownership, and ratings—as the relevant treatments. For each one of these standard measures, we match across the other two plus our survey-based measure of constraint and check whether we find policy differences across these (newly assigned) financially “constrained” and “unconstrained” firms. We restrict this analysis to the Abadie-Imbens estimator.

For each of the standard alternative measures of financial constraints, Table 7 presents tests for the period prior to the crisis (columns 1 through 3) and for the crisis period (columns 4 through 6). For the pre-crisis period, size often returns the “wrong” (positive) sign for the effect of financial constraints. The results for ownership are indistinguishable from zero. The credit ratings proxy sometimes returns the expected negative relation between financial constraints and corporate policies, but with low statistical reliability. The estimates for the crisis period are noisy and counterintuitive. We find, for example, that small firms’ dividend payouts increase during the crisis, that private firms’ capital expenditures are less affected by the crisis, and that speculative-grade firms’ technology spending, capital expenditures, and cash savings surpass that of investment-grade firms in the crisis. This analysis suggests that the survey measure of

<sup>15</sup> In a survey conducted in the first quarter of 2009, we gathered more refined measures of firm characteristics: a continuous measure of investment opportunities, profitability ratio (ROA), dividend payout ratio, and firm age. Including these additional variables in the matching analysis does not alter the qualitative implications of Table 6 (results available upon request).

**Table 7**

Corporate policies: average treatment effects (matching estimators) for traditional measures of financial constraints over pre-crisis and crisis periods.

This table reports differences in planned annual percentage changes of real and financial corporate policies according to whether firms are financially constrained or financially unconstrained. Three traditional financial constraint measures are considered: firm size (small minus large), ownership form (private minus public), and credit ratings (speculative minus investment grade). Differences are computed as average treatment effects via matching estimators (ATT). Columns 1 through 3 report results for the pre-crisis period (2007Q3 through 2008Q3). Columns 4 through 6 report results for the crisis period (2008Q4). The data are from the U.S. surveys. The table uses Abadie and Imbens (2002) estimates that are obtained from the bias-corrected, heteroskedasticity-consistent estimator implemented in Abadie et al. (2004). *t*-Statistics are in parentheses.

Policy	Difference between “constrained” and “unconstrained” firms					
	Pre-crisis period			Crisis period		
	Size	Ownership	Ratings	Size	Ownership	Ratings
% Change in technology expenditures	2.304 (1.21)	−1.547 (−1.03)	−4.877** (−2.04)	5.775 (0.87)	0.028 (0.01)	12.601 (1.10)
% Change in capital expenditures	3.646 (1.24)	−2.034 (−0.79)	−7.621** (−2.24)	2.246 (0.24)	8.902* (1.80)	15.903 (1.26)
% Change in marketing expenditures	2.528* (1.92)	−0.034 (−0.03)	−2.980 (−1.24)	15.259 (0.91)	−7.873 (−0.67)	−12.763 (−1.04)
% Change in employees	2.640*** (2.79)	0.426 (0.52)	1.723 (1.29)	−6.479 (−1.54)	2.074 (0.79)	−9.202* (−1.73)
% Change in cash holdings	4.885* (1.86)	−3.738 (−1.71)	−2.399 (−0.79)	2.372 (0.11)	−5.801 (−0.47)	24.826 (0.67)
% Change in dividend payout	−0.615 (−0.18)	0.022 (0.14)	−4.508 (−1.59)	28.022* (1.96)	−6.183 (−1.04)	−13.041 (−0.44)

Note: \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 0% (two-tail) test levels.

constraints offers a more refined identification of constrained and unconstrained firms than the traditional proxies in our setting.<sup>16</sup>

## 5. Liquidity management in the financial crisis

The previous section links our survey measure of financial constraint to corporate spending plans during the financial crisis. In this section, we investigate how firms manage cash reserves and bank lines of credit to minimize the impact of the crisis on their business operations.<sup>17</sup> We examine data from many countries, but to streamline exposition we often benchmark on U.S. data. We only examine the December 2008 survey for the remainder of the paper because the earlier surveys do not

have detailed information about liquidity management or investment behavior.

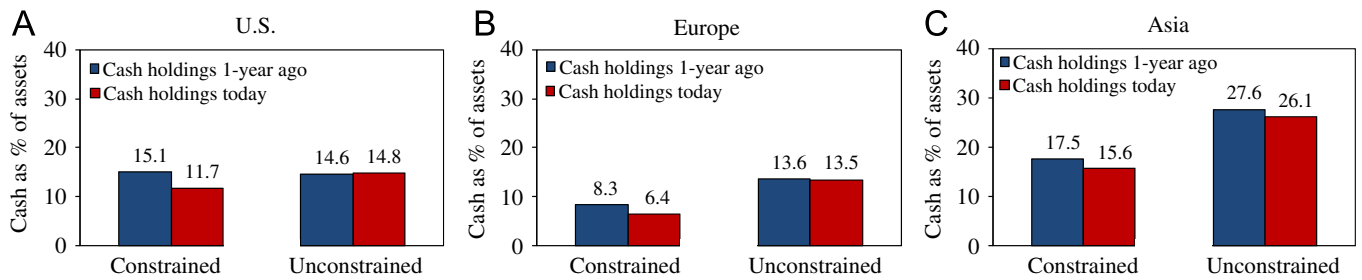
### 5.1. Cash management

Previous research suggests that firms manage their cash as a way to deal with credit frictions (Almeida, Campello, and Weisbach, 2004). We first document how much cash companies had on their balance sheets when the survey was conducted in December 2008, and how much they had one year before. We compute the average cash-to-assets ratio conditioned on our measure of financial constraint. Fig. 3 depicts the cash holdings of firms in the U.S., Europe, and Asia.

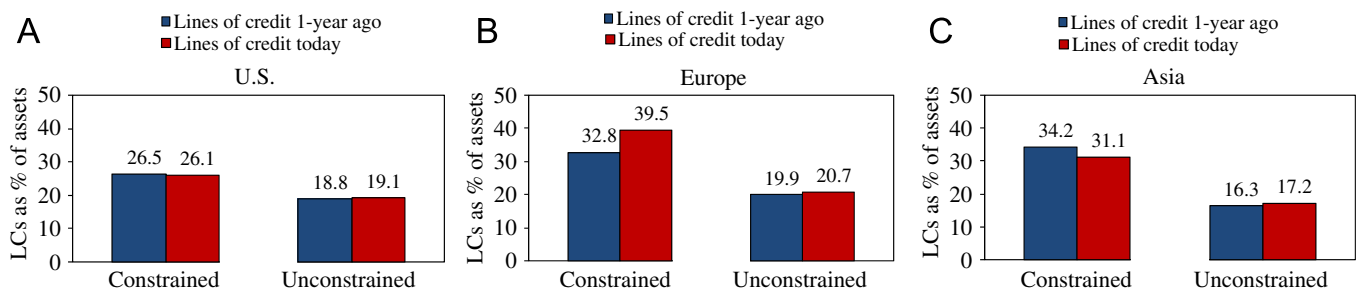
There is a wide degree of variation in the *levels* of cash holdings of firms in different categories and countries. The first panel of Fig. 3 presents U.S. data. According to our survey, the cash holdings of constrained and unconstrained firms in the U.S. were roughly similar one year prior to the financial crisis. The 2008 crisis did not affect unconstrained firms' cash levels, but constrained firms burned through a substantial fraction of their cash reserves by year-end 2008. Cash reserves at constrained companies fell by one-fifth, from about 15% to about 12% of book assets. In other words, there are noticeable differences between the two groups of firms in terms of

<sup>16</sup> As discussed in Section 2, one concern about our data is that the public firms in our sample might be of an “overall better quality.” The weak results we find for credit ratings could then be due to the possibility that public firms in our sample have low cross-sectional variation in their access to credit.

<sup>17</sup> Lins, Servaes, and Tufano (2009) also use survey data to study how firms manage cash and lines of credit. Looking at responses from a 2005 survey, the authors differentiate between various determinants of corporate liquidity choices, such as credit market development, insurance against profit shortfalls, and investment needs. Our findings add to those of Lins et al. in that we examine liquidity management during a credit crisis, focusing on the role of financial constraints.



**Fig. 3.** This figure displays cash savings (the ratio of cash and liquid securities to total assets) at the time of the crisis peak (2008Q4) and one year prior. The data are taken from the 2008Q4 U.S. survey. The sample excludes non-financial, governmental, and non-profit organizations. Responses are averaged within sample partitions based on the survey measure of financial constraint.



**Fig. 4.** This figure displays line of credit management (the ratio of LC to total assets) at the time of the crisis peak (2008Q4) and one year prior. The data are taken from the 2008Q4 U.S. survey. The sample excludes non-financial, governmental, and non-profit organizations. Responses are averaged within sample partitions based on the survey measure of financial constraint.

changes in cash. Similar cash burn patterns are observed in Europe and, to a lesser extent, in Asia.

To gauge statistical significance, we compute the difference in average change in cash holdings across constrained and unconstrained firms. This difference is highly statistically significant. Since the cash holdings of unconstrained firms stay constant, our test suggests that financially constrained firms have been forced to draw down their cash reserves to cope with the financial crisis. In particular, there is a pronounced reduction in cash levels among financially constrained firms over the previous year (3.3% of total assets). This magnitude is startling when combined with our previous result that constrained firms expected to burn through another 15% of cash holdings during 2009 (see Fig. 2).

One concern is whether constrained firms performed more poorly in the second half of 2008 and that poor performance—not difficult access to credit—may have led them to hold lower cash stocks. This concern is similar to the heterogeneity issue we dealt with in Section 4 via the use of matching estimators. We apply those same estimators here and find that inferences are insensitive to controlling for cash flows. The Abadie and Imbens (2002) estimator suggests that the cash holdings of constrained firms are 2.8 percentage points lower than that of unconstrained firms following the crisis (*t*-statistic of  $-2.9$ ).

### 5.2. Managing lines of credit

We also investigate how firms manage their bank lines of credit (LCs). The CFOs report their available lines of

credit at the time of the survey (during the crisis) and also one year prior. As indicated in Panel A of Fig. 4, constrained U.S. firms have, on average, higher LC-to-asset ratios than their unconstrained counterparts. Despite differences in the levels of LC-to-assets across different categories, firms do not display pronounced changes in the amount of their outstanding LCs over the year. These inferences are confirmed in formal mean comparison tests (output omitted). We find roughly similar patterns in Europe (Panel B) and Asia (Panel C), with the exception that constrained firms in Europe increase the size of their LCs during the crisis.

Next, we examine the factors that prompt companies to draw cash from their outstanding LCs over the period leading up to the crisis. To understand their motivations, we compute the proportion of respondents that point to any of the following reasons for drawdowns: “to manage immediate liquidity needs,” “to fund normal daily operations,” “to build cash for the future, as a precaution,” and “to obtain cash now in case the bank restricts LC access in the future.” Respondents are allowed to check all options that apply, so that for each available category we use the following code: unchecked = 0 and checked = 1. The first two options capture the link between firms’ regular use of LC facilities and their business operations, while the last two capture the “strategic” aspect of LC management in the relationship between firms and their banks. Table 8 presents standard mean comparison tests (via OLS) for U.S. data to help establish which of these considerations (business-related or strategic reasons) determine corporate line of credit management.

**Table 8**

Why do firms draw down their lines of credit?

This table displays standard mean comparison tests (OLS) for the proportion of constrained and unconstrained firms reporting each of the rationales listed as a reason for using their LCs. The strategic timing row shows the portion of respondents that draw down on their credit lines in December 2008 because they were afraid their banks would limit credit line access in the future. The data are collected from the 2008Q4 U.S. survey. *t*-Statistics are in parentheses.

Policy	Constrained	Unconstrained	Diff. const. – unconst.
Liquidity needs	0.504*** (10.77)	0.282*** (13.34)	0.222*** (4.62)
Daily operations	0.548*** (11.75)	0.421*** (18.14)	0.127** (2.46)
Precautionary	0.130*** (4.14)	0.068*** (5.76)	0.062** (2.19)
Strategic timing	0.165*** (4.75)	0.059*** (5.35)	0.106*** (3.76)

Note: \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels.

The results in the table point to significant differences in LC management conditional on financial constraint. Constrained companies rely on LCs more heavily for liquidity needs and to fund daily operations. Constrained firms also exhibit the highest propensity to draw from their LC accounts as a way to build cash stocks (precautionary motive) and due to concerns about future access to their LCs. In particular, a significant fraction of constrained firms (17%) withdrew funds during the crisis because of concerns that banks would limit their access to their LC facilities in the near future. This latter finding is consistent with recent work of Ivashina and Scharfstein (2009), who document a “draw now, just in case” phenomenon during 2008. Our analysis provides new insight into those authors’ findings by tying this behavior to financially constrained borrowers.

We look overseas to determine whether companies worldwide manage their LCs in ways consistent with their American counterparts. We find very similar patterns abroad (not in table). Companies around the world rely heavily on LCs for their immediate liquidity needs and daily operations. More interestingly, we find that constrained Asian firms manage their lines of credit with an eye on building precautionary savings, while constrained European firms do not. Regarding the issue of strategic behavior of LC withdrawals, we find that, just like in the U.S., constrained European and Asian firms draw funds for fear that their banks will restrict access to credit lines in the future.

Finally, we ask managers whether they voluntarily limit their use of lines of credit, and if so why. We compute the proportion of respondents checking any of the options: “to avoid paying fees,” “interest rate is too high,” “to preserve reputation amongst bankers and credit markets,” and “to save borrowing capacity.” The first two options capture regular business concerns with the cost of

LC facilities. The last two capture strategic aspects of LC management. In untabulated analysis, we find that firms very rarely report concerns about the costs associated with LCs as a main driver for limiting the use of those facilities. However, they are interested in saving future borrowing capacity by restricting current usage of available LCs. To a lesser extent, companies are also concerned with reputational costs associated with the use of funds from LCs.

## 6. Investment spending during the financial crisis

Researchers and economic policymakers are generally interested in the real-side implications of credit market imperfections. In other words, they worry about whether capital market frictions may trigger adverse effects on corporate investment, revenues, employment, tech spending, asset growth, and acquisitions. The timing of our survey allows for unique insights into how corporate managers react to constrained capital markets in terms of how they plan to operate and invest.

### 6.1. Access to external finance and investment

A well-known line of research examines whether constrained access to external finance affects the optimality of corporate investment decisions. While most researchers agree that capital market imperfections can distort corporate investment, there is dispute about the type of evidence used to support this claim. Much of this research is based on archival financial statement data for public U.S. companies, and the econometrician ultimately has to “estimate” whether corporate managers make investment decisions that reflect difficulties in raising external funds. In contrast to the previous literature, we are able to study whether capital markets affect corporate investment using information gathered directly from those in charge of making corporate decisions. We do this via a series of survey questions.

We first ask CFOs to quantify the degree to which their firm’s access to external financing limits their ability to fund attractive investment projects. The answer reveals whether the availability of financing—as opposed to the availability of investment opportunities—drives observed investment. To gain additional insights on the effect of credit shocks, we differentiate between difficulties in accessing external funds when credit markets are “operating normally” versus in the “current situation,” when credit markets were experiencing a severe crisis.

When indicating the effect of external financing on investment spending, managers are allowed to check one of four possible answers: “no effect,” “small effect,” “moderate effect,” and “large effect.” We categorize these answers as follows: “no effect”/“small effect” = 0; “moderate effect”/“large effect” = 1. We average these 0–1 responses across firms and compare averages across firms grouped by different measures of constraint.

The answers from U.S. CFOs are reported in Table 9, where for comparison purposes we consider breakdowns based on size, ownership, ratings, and self-declared

**Table 9**

The effects of credit frictions on corporate investment: “Normal times” and the “crisis period”.

This table displays standard mean comparison tests (OLS) for the proportion of firms reporting that their ability to invest in attractive investment projects is limited by their access to the capital markets across different group categories. Category 1 groups firms that are small, private, speculative-grade rated, and financially constrained. Category 2 groups firms that are large, public, investment-grade rated, and financially unconstrained. The data are from the 2008Q4 U.S. survey. *t*-Statistics are in parentheses.

Criteria	Category 1	Category 2	Diff. categories
Panel A: Normal times			
By size	0.255*** (12.19)	0.236*** (6.241)	0.019 (0.43)
By ownership	0.246*** (10.47)	0.272*** (6.81)	−0.026 (−0.58)
By ratings	0.533*** (5.76)	0.190*** (5.19)	0.344*** (4.00)
By fin. constraint	0.464*** (9.81)	0.200*** (10.53)	0.265*** (5.93)
Panel B: Crisis period			
By size	0.514*** (21.35)	0.539*** (12.19)	−0.025 (0.50)
By ownership	0.512*** (18.74)	0.544*** (12.16)	−0.032 (0.61)
By ratings	0.800*** (10.77)	0.487*** (10.41)	0.313*** (3.15)
By fin. constraint	0.857*** (25.81)	0.438*** (18.61)	0.419*** (8.41)

Note: \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels.

financial constraint. Panel A shows the answers for “normal times.” The numbers imply very little size and ownership variation regarding how U.S. firms normally associate their access to capital markets and their ability to invest (see rows 1 and 2, respectively). About one-in-four small, large, private, and public firms state that in normal times their access to the capital markets affects their ability to pursue profitable projects. Things are different when we consider credit ratings (row 3) and the direct measure of financial constraint (row 4). In particular, we observe that speculative and financially constrained companies report a markedly higher propensity to link the availability of external financing to the ability to pursue attractive projects.

Panel B shows the degree to which credit constraints limit the pursuit of attractive investments during the credit crisis. More firms (overall) report difficulties in funding profitable investment during the crisis, but as in Panel A, there is limited variation in the answers conditional on size and ownership classifications. In contrast, credit ratings and, especially, the direct measure

of financial constraint, are more discriminating. We find that speculative-rated firms and financially constrained firms report a much higher propensity to link the availability of external financing to the ability to pursue attractive projects. Indeed, 86% of financially constrained firms indicate that their ability to invest in positive NPV projects in the current period is tied to their ability to raise external funds in the capital markets. This represents a significant increase from the 46% rate reported in normal times, suggesting that the firms we identify as financially constrained are the likely “marginal borrowers” of the economy; i.e., those that suffer the most from an inward shift in the supply of credit. Similar findings obtain when we classify firms as constrained or unconstrained based on the “quantity” or “price” metrics discussed in Section 4.1.2. Our inferences are further supported by additional tests based on European and Asian data (tables omitted).<sup>18</sup>

Our findings suggest that the crisis *exacerbates* the degree to which firms link the availability of funds with the ability to pursue attractive opportunities, with differential effects across firms. Because a financial crisis drains credit from the financial markets, we document the unfortunate result that financial markets seem to matter most for corporate investment precisely when they fail.

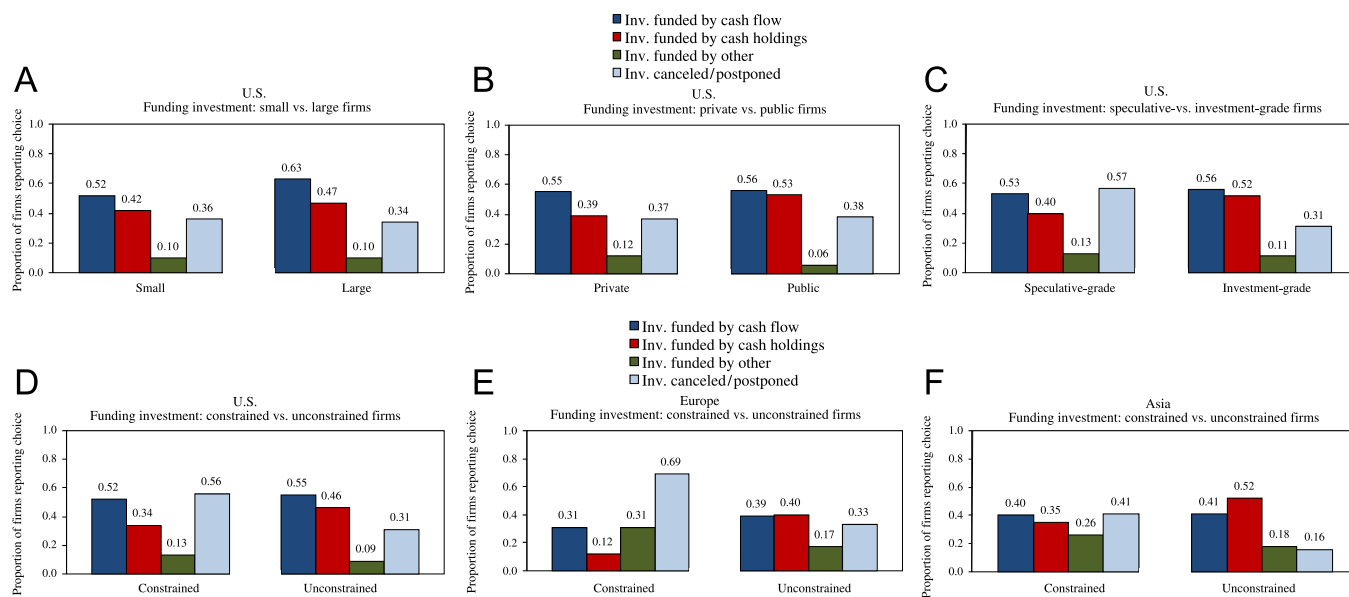
## 6.2. The relation between investment and internal liquidity

A question of much debate in the literature concerns the degree to which firms use internal funds to finance investment when they face credit frictions (see Stein, 2003). Researchers have examined this question by looking at empirical correlations between investment and cash flows, reporting mixed results. Under the standard testing approach, researchers’ gauge “neoclassical” estimates of firms’ financing needs, constraints, investment demand, and growth opportunities, among others. Our approach is different. We start from the premise that each CFO has her own “hard-to-specify” investment model, and instead of engaging in an econometric exercise that approximates that model, we directly ask managers whether they use their firms’ internal resources to finance profitable investment opportunities when access to external credit is limited.

We compute the proportion of respondents checking each of the following answers to our question about investing in profitable projects under credit constraints: “investment funded by cash flows,” “investment funded by cash holdings,” “investment funded by other sources (including partnerships),” and “investment is canceled or postponed.” Respondents are allowed to check all options that apply, so that for each available category we use the following code: unchecked = 0 and checked = 1. As in previous analyses, we average these 0–1 responses across the four firm categorizations (size, ownership, ratings, and financial constraint). Fig. 5 summarizes the results.

<sup>18</sup> Noteworthy, while in the U.S. the credit ratings proxy has some explanatory power over investment decisions, the same does not apply to non-U.S. markets.





**Fig. 5.** This figure displays the proportion of firms indicating how they fund their investment when external capital is limited. The data are taken from the 2008Q4 U.S. survey. The sample excludes non-financial, governmental, and non-profit organizations. Responses are averaged within sample partitions based on size, ownership, credit ratings, and financial constraint.

Fig. 5 indicates that firms across all categories are likely to use internal sources of funding for their investment when access to external capital markets is limited. The figure supports the notion that, in the face of a negative credit supply shock, companies consider their internal resources—both operating income and cash savings—as a way to finance future investment. Likewise, firms across all categories indicate that they are likely to postpone or cancel investment plans when the capital markets are tight.

Some cross-sectional differences stand out in Fig. 5. For example, large, public, investment-grade, unconstrained U.S. firms indicate they are relatively more likely to rely on cash reserves to finance future investment. This is in line with our previous findings that more constrained firms have already burned through a significant fraction of their internal cash reserves during the crisis. The graphs also suggest that firms with low credit quality and those that are financially constrained show particularly strong propensity to *cancel* their investments. Indeed, some 56% of constrained companies in the U.S. indicate that they would cancel investment when external funding is limited, compared to about 31% of investment-rated and unconstrained firms. In Europe, 69% of financially constrained firms say they are inclined to cancel their investment. These results are notable, given how little data are available on investment cancellation.

Assuming that firms would prefer to draw on their cash reserves before canceling their planned investments (which is, presumably, a very costly course of action), we further condition the decision to cancel investment on whether CFOs indicate they are able to use cash to fund investment if external financing sources are inadequate. For those constrained firms for which using internal cash is not an option (perhaps because cash stocks are already depleted), the rate of investment cancellation goes up to

71% in the U.S.; for unconstrained firms the rate is 39%. In Europe, the cancellation rate of constrained firms that cannot use cash to fund investment is as high as 80% (64% in Asia). Notice that archival data do not allow for direct insights into whether investment is canceled when access to credit markets is tightened. In particular, the financial statement data used in prior studies only capture information relative to *observed* investment spending. That limitation makes it difficult to fully measure the effective trade-off between investment and constrained financing.<sup>19</sup>

We check whether the inferences we gather from Fig. 5 are statistically meaningful. Group means comparison tests show no significant cross-group differences in the propensity to use cash flows and cash stocks to fund investment when capital markets tighten (table omitted). The degree to which firms that have low credit ratings or are financially constrained cancel their investments is significantly greater than that of other groups of firms. The statistical significance and implications of our U.S. results are confirmed in the European and Asian surveys.

### 6.3. Asset sales

Related to the question of whether firms cancel investment plans due to credit constraints, we inquire whether they *sell* existing assets because of these constraints. In particular, our survey asks managers whether they were selling more corporate assets during the crisis than in the recent past. The analysis of those

<sup>19</sup> Note that unobserved (constraint-caused) investment cancellation could make it difficult to interpret standard investment-cash flow sensitivity coefficients. For example, among constrained firms, investment might be canceled for several years, which can alter the relation between investment and other variables.

**Table 10**

Do firms sell assets to obtain funding during the crisis?

This table displays mean comparisons for the proportion of firms reporting that they are currently selling more assets than in previous years across group categories. Category 1 groups firms that are small, private, speculative-grade rated, and financially constrained. Category 2 groups firms that are large, public, investment-grade rated, and financially unconstrained. The data are collected from the 2008Q4 U.S. survey. *t*-Statistics are in parentheses.

Criteria	Category 1	Category 2	Diff. categories
By size	0.476*** (9.72)	0.478*** (6.42)	−0.002 (−0.02)
By ownership	0.489*** (9.23)	0.489*** (6.49)	−0.001 (−0.01)
By ratings	0.588*** (4.78)	0.415*** (5.32)	0.174 (1.20)
By fin. constraint	0.700*** (10.69)	0.366*** (7.60)	0.334*** (4.04)

Note: \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels.

responses, reported in Table 10, provides further insight into the real-side consequences of the credit crisis.

To estimate the propensity to engage in asset sales, the number of respondents indicating an increase in the sale of assets is averaged across firms classified according to each of our four partition schemes. Exactly 70% of the constrained CFOs said that they sold more assets in the crisis than before—compared to 37% of the unconstrained CFOs—in order to obtain funds. Notably, the traditional measures of constraint (e.g., size and credit ratings) do not detect economically and statistically significant cross-sectional variation in the degree to which different firms are selling assets to cope with the financial crisis. We find similar patterns in non-U.S. economies.

## 7. Conclusions

While the financial crisis of 2008 and the associated recession led to severe hardship, it also provided an opportunity to learn about the impact of financial constraints on corporate policies. We survey 1,050 chief financial officers (CFOs) in 39 countries in December 2008 and gather a number of interesting insights from the answers to our questionnaire. Our survey approach allows us to collect information that cannot be deduced from archival data. For instance, it allows us to measure investment plans (as opposed to ex post investment) and gauge whether investment is canceled altogether because of credit constraints. At the same time, as we discuss, that approach has its own limitations (e.g., replicability and selection biases).

We find that financially constrained firms planned to cut more investment, technology, marketing, and employment relative to financially unconstrained firms during the crisis. We also show that constrained firms

were forced to burn a sizeable portion of their cash savings during the crisis and to cut more deeply their planned dividend distributions. In contrast, unconstrained firms do not display this behavior. Among other results, we find that constrained firms accelerate the withdrawal of funds from their outstanding lines of credit because of concerns that their banks may restrict future access to those lines. Unconstrained firms rarely engage in this strategic behavior. Nearly 90% of constrained companies say that financial constraints restrict their pursuit of attractive projects, and more than half of these firms are forced to cancel valuable investments. Constrained firms also display a much higher propensity to sell off assets in place as a way to generate funds during the crisis. These results are shown to hold in the U.S., Europe, and Asia.

A large literature studies how credit constraints affect firms in normal times. Our study is different in that we gather information on firms' responses to the sharpest credit shortage in nearly a century. Our results indicate that the financial crisis systematically affected real investment—but unequally across firms. The bypassing of positive NPV projects reduces the strength of future economic growth. In this context, one can better understand why policymakers undertook unprecedented actions to unfreeze credit markets. Looking beyond the crisis, our paper provides new evidence that financial constraints hamper investment in valuable projects. Relaxing these constraints would produce additional long-term growth opportunities in the economy.

## References

- Abadie, A., Drukker, D., Herr, J., Imbens, G., 2004. Implementing matching estimators for average treatment effects in stata. *Stata Journal* 4, 290–311.
- Abadie, A., Imbens, G., 2002. Simple and bias-corrected matching estimators for average treatment effects. NBER Working Paper T0283.
- Almeida, H., Campello, M., Weisbach, M., 2004. The cash flow sensitivity of cash. *Journal of Finance* 59, 1777–1804.
- Becker, S., Ichino, A., 2002. Estimation of average treatment effects based on propensity scores. *Stata Journal* 4, 358–377.
- Blanchard, O., Lopez-de-Silanes, F., Shleifer, A., 1994. What do firms do with cash windfalls? *Journal of Financial Economics* 36, 337–360.
- Campello, M., Giambona, E., Graham, J., Harvey, C., 2009. Liquidity management and corporate investment during a financial crisis. Unpublished working paper, University of Illinois and Duke University.
- Dehejia, R., Wahba, S., 2002. Propensity score-matching methods for nonexperimental causal studies. *Review of Economics and Statistics* 84, 151–161.
- Fazzari, S., Hubbard, R.G., Petersen, B., 1988. Financing constraints and corporate investment. *Brookings Papers on Economic Activity* 1, 141–195.
- Hoshi, T., Kashyap, A., Scharfstein, D., 1991. Corporate structure, liquidity, and investment: evidence from Japanese industrial groups. *Quarterly Journal of Economics* 106, 33–60.
- Hubbard, R.G., 1998. Capital market imperfections and investment. *Journal of Economic Literature* 36, 193–227.
- Imbens, G., 2004. Nonparametric estimation of average treatment effects under exogeneity: a review. *Review of Economics and Statistics* 86, 4–29.
- Ivashina, V., Scharfstein, D., 2009. Bank lending during the financial crisis of 2008. Unpublished working paper, Harvard Business School.
- Kaplan, S., Zingales, L., 1997. Do financing constraints explain why investment is correlated with cash flow? *Quarterly Journal of Economics* 112, 169–215.

- Lamont, O., 1997. Cash flow and investment: evidence from internal capital markets. *Journal of Finance* 52, 83–110.
- Lins, K., Servaes, H., Tufano, P., 2009. What drives corporate liquidity? An international survey of cash holdings and lines of credit. Unpublished working paper, Harvard Business School.
- Oliner, S., Rudebusch, G., 1992. Sources of the financing hierarchy for business investment. *Review of Economics and Statistics* 74, 643–654.
- Rauh, J., 2006. Investment and financing constraints: evidence from the funding of corporate pension plans. *Journal of Finance* 61, 33–75.
- Rosenbaum, P., Rubin, D., 1983. The central role of the propensity score in observational studies for causal effects. *Biometrika* 70, 41–55.
- Stein, J., 2003. Agency information and corporate investment. In: Constantinides, G., Harris, M., Stulz, R. (Eds.), *Handbook of the Economics of Finance*. Elsevier/North-Holland, Amsterdam, pp. 111–165.