The Real Effects of Financial Constraints: Evidence from a Financial Crisis*

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This Draft: May 15, 2009

Abstract

The global credit crisis of 2008 provides a unique opportunity to study the effects of financing constraints on corporate behavior. Based on standard economic priors, we investigate whether this credit supply shock has a differential impact on the real and financial policies of credit constrained firms. In contrast to previous research, which has used proxies such as firm size and credit ratings to measure constraint, we survey 1,050 CFOs in the U.S., Europe, and Asia and directly assess whether their firms are credit constrained. Our evidence shows that the impact of the financial crisis is severe on credit constrained firms, leading to deeper cuts in planned R&D spending, employment, and capital spending. These firms also burn through more cash, draw more heavily on lines of credit for fear banks will restrict access in the future, and sell more assets to fund their operations. Using our direct measure of constraint, we also find that the inability to borrow externally causes many firms to bypass attractive investment projects, with 86% of constrained U.S. CFOs saying their investment in attractive projects has been restricted during the credit crisis of 2008 and more than half outright cancelling or postponing their investment plans. Our results also hold in Europe and Asia, and in many cases are stronger in those economies.

Key words: Financial crisis, financing constraints, investment spending, liquidity management, matching estimators

JEL classification: G31.

*We thank Steve Kaplan, Jeremy Stein, and Luigi Zingales for suggesting questions that we included in the survey instrument. Comments from seminar participants at the Chicago/London Conference on Financial Markets, Mannheim University, and University of Amsterdam are also appreciated. We thank *CFO* magazine for helping us conduct the survey, though we note that our analysis and conclusions do not necessarily reflect those of *CFO*. We thank Andrew Frankel and two anonymous referees for their helpful comments on the first draft of the paper.

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Abstract

The global credit crisis of 2008 provides a unique opportunity to study the effects of financing constraints on corporate behavior. Based on standard economic priors, we investigate whether this credit supply shock has a differential impact on the real and financial policies of credit constrained firms. In contrast to previous research, which has used proxies such as firm size and credit ratings to measure constraint, we survey 1,050 CFOs in the U.S., Europe, and Asia and directly assess whether their firms are credit constrained. Our evidence shows that the impact of the financial crisis is severe on credit constrained firms, leading to deeper cuts in planned R&D spending, employment, and capital spending. These firms also burn through more cash, draw more heavily on lines of credit for fear banks will restrict access in the future, and sell more assets to fund their operations. Using our direct measure of constraint, we also find that the inability to borrow externally causes many firms to bypass attractive investment projects, with 86% of constrained U.S. CFOs saying their investment in attractive projects has been restricted during the credit crisis of 2008 and more than half outright cancelling or postponing their investment plans. Our results also hold in Europe and Asia, and in many cases are stronger in those economies.

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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. While the crisis is dramatic and unfortunate, it provides an opportunity to study how financial constraints impact corporate behavior.

We survey 1,050 chief financial officers (CFOs) in the U.S., Europe, and Asia — a total of 39 countries — in December 2008. The crisis environment allows us to draw sharp contrasts between firms that are financially constrained versus those that are less so. We use this experimental design to achieve a number of objectives. First, we develop a new, direct measure of financial constraint. We then study whether our measure identifies meaningful cross-sectional variation in corporate behavior during the crisis. Our analysis first considers how companies' pro forma plans (employment, marketing, R&D, etc.) are affected by the crisis conditional on constraint status. We then look at companies' financial policies (in particular, cash savings behavior and line of credit management). Finally, we examine corporate spending during the crisis, investigating circumstances in which firms' investment policies might be distorted 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 more likely to be tied to cash flows (because constrained firms are unable to borrow to pursue value-enhancing projects, and hence rely on funds from cash flows).[1] Papers in this literature customarily proxy for financial constraint with characteristics like small firm size, nondividend paying status, or poor credit ratings. One distinguishing feature of our experiment is that we *ask directly* whether a firm is financially constrained. In particular, we ask whether a company's operations have been affected by the cost or availability of credit. As we discuss below, this direct measure of financial constraint leads to more powerful contrasts of constrained versus unconstrained activity than do the traditional proxies for financial constraint. Other unique features of our empirical design are that we are able to examine both public and private companies, and are also able to study European and Asian firms in addition to those in the U.S.

Our analyses can be grouped into several main parts. First, we examine the pro forma plans of companies conditional on whether they are financially constrained. Due to the credit crisis and ensuing recession, we accordingly find that the typical sample company expects to cut employment, technology spending (R&D), capital investment, marketing expenditures, and dividends. Using prox-

[1] Hubbard (1998) and Stein (2003) provide reviews of this large body of research.

ies based on traditional measures of financial constraint, such as firm size and credit ratings, as well as a contrast based on public versus private ownership, we find that small, private, speculative "constrained" firms were somewhat more affected by the credit crisis. That is, these firms plan somewhat larger cuts in 2009. However, none of the cross-sectional comparisons that are based on these traditional proxies are statistically significant. In stark contrast, based on the direct measure of financial constraint from the survey, we find stronger and statistically significant results that constrained U.S. firms plan to dramatically reduce employment (by 11%), R&D (by 22%), capital investment (by 9%), marketing expenditures (by 33%), and dividends (by 14%) in 2009. We also find strong support for these implications in the European and Asian data.

In this first part of our analysis, we implement a number of formal tests comparing the traditional archival measures of constraints (firm size, ownership form, and credit ratings) with our direct measure (based on managers' responses). The key idea we examine is whether our proposed measure has explanatory power over corporate policies that is not subsumed by traditional measures of constraint. Using previous (more limited) surveys, we are able to compare the relative merits of our constraint measure for the crisis period as well as for the one-year period preceding it. We do this via standard group mean comparison tests (implemented via OLS) and using the Abadie and Imbens (2002) and Dehejia and Wahba (2002) matching estimator approaches. Our measure of financial constraint reveals a significant cross-sectional wedge in every corporate policy we look at both *prior to* and *during* the 2008 crisis, with differences between constrained and unconstrained firms becoming *more significant* as the credit crisis unfolds. The 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 (the "marginal borrowers" in the economy) is of great importance for researchers and economic policy makers, this implies that our measure of constraint can be useful.

Our analysis considers alternative explanations for why firms might indicate that they are constrained and implement the policies we document. 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 in our survey that firms which say they are constrained do report tangible experiences related to difficulties in raising external funds.[2] Another concern is whether uncontrolled firm heterogeneity could be the source of confounding explanations for our results. Consider, for example, a firm that performs poorly even before the crisis. It would not be surprising to find that this firm

[2]For example, 81% of the CFOs that we categorize as financially constrained say they have experienced limited access to credit and 55% cite difficulties in initiating or renewing a credit line.

might both do worse during the crisis (e.g., invest less) and find less available credit. The survey contains questions about firm financial conditions and economic prospects that help ameliorate concerns about heterogeneity. In particular, we can measure differences in investment spending across constrained and unconstrained firms based on matched firm-pairs that are (simultaneously) in the same size category, the same ownership category, the same ratings category, the same profitability category, the same dividend payout category, the same growth prospects category, and in the same industry. Given this matching, it is unlikely, though not impossible, that explanations related to financial distress or declining economic fundamentals could explain away our findings.

Our second area of analysis is related to liquidity management, in particular cash management and line of credit policy. We start by documenting that the typical firm in the U.S. sample had cash and liquid 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 liquid assets equal to about 12% of asset value. The same pattern of cash burn for constrained firms is found in Europe and Asia. This evidence is consistent with the view that financially constrained firms build cash reserves to insulate themselves from credit supply shocks. We also examine where firms hold their cash balances during a credit crisis. Perhaps due to few other choices, bank and money market accounts are used heavily. We also document a flight to quality, with a significantly larger share of cash balances being held as Treasury Securities among unconstrained U.S. firms.

We also study lines of credit. The typical U.S. firm has a pre-arranged line of credit of approximately 19% (unconstrained firms) to 26% (constrained firms) of book asset value. The differences are more dramatic in Europe and Asia, where constrained firms have committed credit lines well in excess of 30% of asset value. We ask CFOs what they do with the proceeds when they draw down 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 down on their credit lines now just in case their banks might deny them a line of credit in the future, compared to less than 6% of unconstrained. This result is consistent with the evidence in Ivashina and Scharfstein (2008), 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. This effect is even stronger in Asian countries.

We also inquire why some firms have not drawn on their credit lines. The most common response is that the CFOs want to preserve borrowing capacity in case it is needed in the future. The second

most common explanation for not fully drawing the credit line is to maintain a strong reputation in the eyes of financial institutions. This preserving reputation explanation is significantly stronger among public firms and speculative U.S. firms. In Europe, preserving reputation is significantly stronger among constrained companies.

Our third set of analyses examines in detail the impact of credit market conditions on corporate investment decisions. We start by benchmarking how often companies say they have to bypass profitable investment projects because of financial constraints. In the U.S., in normal credit markets, 46% of constrained companies say that they pass up attractive investment opportunities due to financial constraints, which is significantly greater than the 20% of unconstrained firms who say the same. In Europe and Asia, too, more than twice as many constrained firms pass up value-enhancing projects due to credit constraints.

Because we conducted the survey during a severe credit crisis, we are able to investigate this same issue during extreme circumstances. Fully 86% of constrained U.S. firms said that they bypassed attractive investments during the credit crisis due to difficulties in raising external finance, compared to 44% of unconstrained firms that say the same. Again, these numbers are mirrored in Europe and Asia.

We next inquire about how firms finance attractive investments when they are unable to borrow in credit markets. 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 finance them with external funds, significantly greater than the 31% of unconstrained firms that cancel investment. We find largely similar patterns in Europe and in Asia. To our knowledge, this is the first time that constraint-driven project cancellation has been directly documented in the literature.

Not only do some firms cancel investment due to tight credit markets, some *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. We also find evidence of heavy use of asset sales to obtain funds in Europe and Asia. Our findings imply that financial constraints may have significant effects on real asset markets.

Finally, we closely examine firms' propensity to use internal cash flows to finance investment when they face credit constraints. Instead of looking at investment–cash flow sensitivities, we directly ask managers if they use cash flows to fund investment. We find that the reliance on cash flows is an increasing function of the likelihood that the firm may be forced to bypass positive NPV projects given credit market conditions effect on the ability to obtain external financing.

Our paper is timely in reporting the effects of the financial crisis that began in 2008, but it is important that we highlight its methodological contributions. While previous papers in the literature

have relied on archival information, we propose a new way to assess the impact of financing constraints on firm decisions. While previous papers have imposed (largely neoclassical) models onto the data, and used econometric techniques to estimate whether a firm's decision maker acts as if her firm is financially constrained,[3] we take a different approach: we ask the decision maker if her firm faces difficulties in assessing external credit. At the same time, we ask about the actions the decision-maker is planning to implement in her firm. We analyze how these pieces jointly fit economic priors; in particular, whether financing frictions are relevant to real firm outcomes. In this sense, what is unique about our paper is its approach. Given that the economic magnitudes of the answers we get using our measure of financial constraint are larger than those we obtain using standard proxies, we believe our method may be of interest for future researchers.[4]

The remainder of the paper is organized as follows. We provide details of our survey data in Section 2. Section 3 examines the interplay of 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 decisions. Section 5 and 6 discuss, respectively, liquidity management and investment policies during the crisis. Section 7 concludes the paper.

2 Data

We use information from a survey of CFOs conducted in the fourth quarter of 2008. Our final analysis considers responses from 1,050 non-financial firms in the United States (574), Europe (192), and Asia (284). These responses come from companies in 39 different countries. In this section, we describe our data gathering process.

The survey approach gives us the unique opportunity to directly ask managers whether their corporate decisions have been constrained by the cost or availability of credit. Since we want to understand the role of financial markets in shaping corporate decisions during credit crises, we set out to investigate the relation between firm characteristics (such as size and credit rating) and whether managerial policies are influenced by access to credit. Accordingly, we created a survey instrument based on existing theoretical and empirical research. 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.

[3] See Kaplan and Zingales's (1997) use of multinomial logit regressions and Cleary's (1999) use of discriminant analysis.

[4] For example, if we were to use firm size to try to understand the effect of financial constraints in the current crisis, we would conclude that constrained and unconstrained firms are equally affected by the credit shock. The same applies for the use of credit ratings as a financial constraint criterion. It is worth noting that these are the most frequently used proxies for constraints used in the literature.

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 figures include "bounce backs" (nearly 7%) and financial firms (excluded from the final 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%
	R&D	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%

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 were started and ended about one week earlier.[5] Most of those surveyed have the job title of CFO. Some have the title of Treasurer, Assistant Treasurer, V.P. 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%.[6] We know the distributions of firm size and industry breakdown of the invitations (these population numbers do not account for bounce backs and include financial institutions). Combining *CFO*'s invitation figures with the information from our final sample, we can estimate the response rates in the U.S. (See Table 1). Generally speaking, response rates are between 5 and 8% across different size and industry categories.

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 can be seen as an illustration of the representativeness of the firms in our sample. To make these comparisons appropriate, we restrict attention to non-financial public firms. Our respondents include 130 non-financial public firms. We contrast these firms with 4,979 non-financial Compustat firms, for which we gather data on assets, sales, profits, and cash holdings from the fourth quarter of 2008 (the time of our survey).

[5] The survey questions can be found at http://faculty.fuqua.duke.edu/cfosurvey/09q1/HTML_US/Q4_08_1.htm. The Asian and European surveys are also available upon request. Note that European CFOs were given the opportunity to take the survey in any of four languages: English, French, German, or Dutch. The Asian survey was only available in English.

[6] Duke University also issued additional invitations; however, we do not have information about the sales and industry breakdown for those invitations. For the sake of this exercise, we assume that those invitations approximately offset the E-mail bounce backs from *CFO* magazine.

Table 2. Comparing Survey and Compustat Samples: Non-Financial Public Firms as of 2008 Q4

This table contrasts observations (raw counts) and frequencies (in percentage terms) of firms in the survey instrument and those in Compustat as of 2008 Q4. 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" 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. The data are collected from the 2008Q4 U.S. survey.

Observable	Category	Survey Sample Obs. (N) / Freq. (%)	Compusat Sample Obs. (N) / Freq. (%)
Size	Small	73 / 56%	3,436 / 69%
	Large	57 / 44%	1,543 / 31%
Credit Rating	Speculative	26 / 27%	698 / 48%
	Investment	70 / 73%	635 / 52%
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

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 52%. The profitability of firms in the two samples is similar: approximately four out of five firms in both samples were profitable in the last 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, summary statistics for cash holdings behavior reveals similarities across the two samples. The mean (median) cash-to-assets ratio is 16.3% (8.0%) for firms in our survey sample and 17.0% (8.3%) for Compustat firms.

Overall, the numbers in Table 2 suggest that the firms in our survey are roughly comparable to those used in prior research in corporate finance. At the same time, it is important to emphasize that most of the firms in our survey are private (hence not well represented in databases like Compustat). As such, our analysis also adds to the literature by documenting the behavior of firms that are under-represented in standard empirical work.

Our survey allows us to ask unique questions, but we stress that there are potential issues 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 variable 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. Finally, our survey was conducted at one point in time, so we can not exploit advantages that are sometimes available in panel data sets.[7] Even with these considerations, we believe that our study provides a fresh measure of financial constraint, gauging its effects on firms.

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.

We study *planned changes* for the next 12 months (relative to the previous 12 months) in firms' R&D expenditures, capital expenditures, marketing expenditures, hiring (number of domestic employees), cash holdings, and dividend payments. We begin with graphical analyses, breaking down the responses to the crisis by firm demographics. These responses are reported in Figure 1.[8]

Geographical Region The first panel of Figure 1 categorizes corporate policy responses by the geographical region in which the firm is headquartered. Panel A of Figure 1 has many notable features. One salient result is that, around the world, firms are planning major cuts in (almost) all the policy variables that we examine. For example, American and European companies in the survey are planning to cut R&D spending by over 10% during 2009. In addition, American firms are expecting the smallest cuts in capital expenditures. Also noteworthy, European companies plan to significantly reduce their cash holdings over the next year, while Asian companies will actually increase (albeit only slightly) employment.

FIGURE 1 ABOUT HERE

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, for the most substantive parts of the analysis, we study each of these three regions separately.

[7] As we discuss shortly, however, we are able to use previous surveys to better understand some aspects of our findings. In that analysis, we are able to work with a "rotating panel" and benefit from time series information to draw our main conclusions.

[8] Respondents are allowed to input numbers between –100% and 500% when responding to this question and we observe some extreme outliers. To minimize the impact of these extreme entries, we winsorize responses in the 1% tails.

Size We split the companies into small and large categories according to their sales revenue. Firms with total gross sales amounting to less than $1 billion are categorized as "small," and those with sales in excess of $1 billion are classified as "large." We have 440 small firms and 134 large firms in the U.S. sample. Our results are largely insensitive to how we choose cut-offs for the size categorization. The same applies to using the number of employees (in lieu of sales figures) 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 5,000 employees.

Panel B of Figure 1 suggests that differences between small and large company policy responses to the current economic environment are modest in the U.S. Large firms plan bigger cuts in R&D expenditures, while small firms expect to implement larger cuts in capital expenditures. Small firms also expect to cut marketing expenses more, and save less cash. While suggestive, the figures do not reveal whether policy differences across small and large firms are statistically significant (we show this shortly). Similar patterns emerge in Europe and Asia (not shown in figure), where the splits between small and large firms resemble that of the U.S.

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. Public firms' plans for the next 12 months imply, on average, sharper cuts in R&D spending compared to private firms' plans (16% for public versus 10% for private). On the flip side, private firms plan to cut marketing and capital expenditures by more. Public and private firms seem to be adopting similar financial policies (cash holdings and dividend distributions) for 2009. Again, similar patterns across public and private firms emerge in Europe and Asia, where the majority of firms are private.

Credit Ratings We categorize firms as "speculative grade" and "investment grade" if their S&P credit ratings are, respectively, BB+ or below, and BBB– or above. We only consider firms with ratings assigned by rating agencies and reported in the survey. We have 26 speculative grade and 70 investment grade firms in the U.S. sample. The differences between speculative and investment firms' policies are more pronounced than those based on size and ownership form. Speculative companies plan significant reductions across all expenditure categories (including employment). These firms also plan for smaller cash reserves and greater dividend cuts over the next 12 months. Investment grade firms also plan to cut across most real and financial policy variables, but the cuts are smaller by comparison. We find similar patterns in non-U.S. markets.

4 Assessing Financial Constraints before and during the Financial Crisis

Characteristics such as size, ownership, and credit ratings are traditionally used to gauge the ease of access to credit markets. If access to external finance is important for corporate policies during a time of crisis, we would expect to see pronounced differences in pro forma planning of small, private, low-rated firms relative to large, public, highly rated ones. Our survey also allows for an alternative, direct way to gauge the extent to which firms' access to credit might influence their policies. It is important to highlight the novelty of our approach, and the extent to which we can gather new insights into the connections between capital market frictions and corporate policies. For example, since the opinions that we gather are expressed in a private, anonymous setting (an academic survey), our data are unlikely to be tainted by CFOs' concerns about market reactions to their assessment regarding difficulties in obtaining credit.

4.1 Gathering Information on Financial Constraints via a Survey Instrument

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 metrics such as asset size, ownership form, and credit ratings to characterize a firm as either financially constrained or unconstrained.[9] In theory, financially constrained firms are unable to optimize policies such as investment and savings, and as the marginal borrowers in the economy, are expected to absorb much of the toll of a credit supply shock (see Gertler and Gilchrist (1994)).

In contrast to the existing literature, we directly ask managers about their degree of constrainedness. More precisely, our survey asks managers to indicate whether their companies' 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.[10] It is important that we characterize what respondents in each of these categories look like in terms of basic observables. As we later discuss, our analysis must control for characteristics that could influence *both* a CFO's propensity to indicate that her firm is constrained and the CFO's plans for the firm. We summarize those observables in Table 3.

[9] Other related archival measures include firm age (Oliner and Rudebush (1992)), dividend payout ratios (Fazzari et al. (1988)), and affiliation to a conglomerate structure (Hoshi et al. (1991)). One exception to the standard identification approach in this area is the work of Kaplan and Zingales (1997). Those authors review statements by firm managers that were entered in 49 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 (see also Hadlock and Pierce (2009)).

[10] In Europe those numbers are, respectively, 92, 71, and 26. In Asia the same breakdown is 147, 112, and 24.

Table 3 reports relevant characteristics of U.S. companies 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 we consider is firm size, as measured by sales volume. Table 3 shows that 27% of the firms in the *NotAffected* category are small, while 73% are large. For the *SomewhatAffected* category, 22% of the firms are small and 78% are large, while for the *VeryAffected* category the breakdown is 18% small and 82% large. These numbers show little correlation between size and firms' propensity to declare themselves as either constrained or unconstrained. The same applies for the second observable that we consider, which is ownership form. The table shows that 70% of *NotAffected* firms are private, while for the *SomewhatAffected* and *VeryAffected* categories that proportion is 73% and 76%, respectively. Not surprisingly, the table suggests that there is some cross-sectional variation in credit ratings. While the vast majority of *NotAffected* and *SomewhatAffected* have an investment rating (85% and 75%, respectively), fewer than one-half (43%) of *VeryAffected* firms receive a high-quality grade.[11]

We also ask CFOs a set of questions that help us assess the financial status and economic prospects of their firms. Stein (2003) discusses the importance of this type of information in understanding the effects of financing constraints. In particular, we ask whether their firms realized (or expected to realize, depending on the fiscal year-end) a positive profit in fiscal year 2008. We also ask whether their firms pay a dividend. Finally, we ask CFOs to indicate how they see the long-term growth prospects of their firms. CFOs can use a 1 to 10 scale to indicate their views, and in the analysis of this section we classify their responses in two categories, depending on whether the CFO answers 6 and above, or 5 and below, respectively.[12] Table 3 shows that the majority of firms in the three constraint categories have positive profits, though the proportion of profitable firms is highest amongst *NotAffected* (90%) and lowest amongst *VeryAffected* firms (71%). Roughly one-third of the firms in the survey pay dividends, regardless of their constraint status. Finally, while most CFOs point to positive growth prospects, there is some cross-sectional variation within and across groups. Seventy-nine percent of *NotAffected* firms have positive prospects, compared to 67% of *VeryAffected* firms. The cross-sectional differences in financial status and economic prospects that we document in this table are considered in our subsequent analysis.

Finally, we elaborate on the types of constraints sample firms have encountered. In particular, our survey asks those CFOs that reveal concerns with financial constraints — i.e., *SomewhatAffected* and *VeryAffected* firms — whether they: (1) have experienced less access to credit; (2) have experienced

[11] A more formal test for correlation between our measures of constraint and firm size trivially confirms the intuition from row 1 of Table 3 and is omitted from this version of our paper. The same applies for ownership and credit ratings.

[12] In the regressions later estimated, we allow for answers in the 1–10 range. The tests of this section, however, use matching estimators and we have to group the answers to make the estimations feasible.

Table 3. Sample Descriptives across Constraint Types

This table reports the number of observations (raw counts) and frequencies (in percentage terms) of relevant charcteristics of firms that declare themselves as $NotAffected$, $SomewhatAffected$, and $VeryAffected$ by credit constraints. 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 reflects CFOs' views about the long-term growth prospects of their firms on a 1 to 10 scale. Quantity constraint indicates whether the firm has experienced less access to credit. Price constraint indicates whether the firm has experienced higher cost of funds. The data are collected from the 2008Q4 U.S. survey.

Observable	Category	$NotAffected$	$SomewhatAffected$	$VeryAffected$
		Obs. (N) / Freq. (%)	Obs. (N) / Freq. (%)	Obs. (N) / Freq. (%)
Size	Small	65 / 27%	47 / 22%	21 / 18%
	Large	179 / 73%	163 / 78%	94 / 82%
Ownership	Private	142 / 70%	121 / 73%	74 / 76%
	Public	61 / 30%	45 / 27%	24 / 24%
Credit Rating	Speculative	6 / 15%	8 / 25%	12 / 57%
	Investment	35 / 85%	24 / 75%	9 / 43%
Profitability	Profits > 0	208 / 90%	156 / 80%	82 / 71%
	Profits ≤ 0	24 / 10%	40 / 20%	33 / 29%
Dividend Payments	Dividends > 0	76 / 36%	60 / 35%	30 / 30%
	Dividends $= 0$	133 / 64%	111 / 65%	70 / 70%
Growth Prospects	Prospects > 5	193 / 79%	161 / 77%	77 / 67%
	Prospects ≤ 5	50 / 21%	49 / 23%	38 / 33%
Quantity Constraint	No	N.A.	105 / 50%	22 / 19%
	Yes	N.A.	105 / 50%	93 / 81%
Price Constraint	No	N.A.	125 / 60%	47 / 41%
	Yes	N.A.	85 / 40%	68 / 59%
Difficult Access to LC	No	N.A.	169 / 80%	52 / 45%
	Yes	N.A.	41 / 20%	63 / 55%

higher costs of external funds, or (3) have experienced difficulties in originating or renewing a line of credit with their banks. Eighty-one percent of the *VeryAffected* firms say that they experienced less access to credit ("quantity constraint"), 59% say they have experienced higher cost of funds ("price constraint"), and 55% say they have experienced difficulties in accessing a credit line. 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 a strong indication that a CFO's statement that he/she is financially constrained is likely to be determined by concrete, tangible experiences that are related to facing difficulties in raising funds in the credit markets.

To ease exposition, for much of the analysis we denote the *NotAffected* firms as "unconstrained firms," while the *VeryAffected* firms are considered the "constrained firms." It does not affect our inferences how we classify the *SomewhatAffected* firms. We choose not to discard the middle category, so as to preserve information and testing power. Instead, we combine it with the "unconstrained"

category — Table 3 suggests that the *SomewhatAffected* firms are more similar to the *NotAffected* firms according to some key metrics. Having two — as opposed to multiple — constraint categories facilitates the use of different econometric techniques later implemented (e.g., mean comparison tests and matching estimators) and also aids the exposition.[13]

4.2 Financial Constraints and Firm Policies during the Financial Crisis

To illustrate how the survey-based measure of constraint affects corporate policies during the financial crisis, we replicate the graphs presented above (describing corporate policies), conditioning on two partitioning schemes. The first displays the survey's original multiple categorizations of financial constraints: *NotAffected*, *SomewhatAffected*, and *VeryAffected*. Panel A of Figure 2 shows an interesting, "monotonic" relation between the degree to which firms are financially constrained and how much they plan to reduce their expenditures (R&D, fixed capital, marketing, and employment) as well as distributions (dividend payments) in 2009. The second panel, in turn, shows that those sharp policy contrasts between constrained and unconstrained firms are preserved if we merge the two least constrained categories (i.e., *NotAffected* and *SomewhatAffected*).

FIGURE 2 ABOUT HERE

We consider the same contrast using data collected in Europe and Asia (not reported). Compared to the U.S., the results indicate slightly milder policy contrasts between constrained and unconstrained firms in Europe, with all firms signaling significant cuts in their policies. Asian firms show very pronounced differences in business plans for constrained versus unconstrained firms. Constrained Asian firms respond to the crisis with cuts in all fronts, except hiring. Unconstrained Asian firms, on the other hand, plan to spend more on capital acquisition, marketing, and employment over the next 12 months.

While Figure 2 suggests that corporate policy plans are quite different across financially constrained and unconstrained firms, the graphs do not provide a formal test for those differences. A direct way to do this is to perform a standard mean comparison test, whereby we compare the policy averages of constrained and unconstrained groups. Table 4 confirms the intuition from Panel B of Figure 2: firms that we classify as credit constrained plan to contract policies in a pronounced manner, while firms that are unconstrained plan much smaller cuts (sometimes statistically indistinguishable from zero). To illustrate this contrast, note that financially constrained firms plan to reduce their capital spending, on average, by 9% in the next 12 months alone. Unconstrained firms,

[13] Throughout the analysis we also look at 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.

Table 4. Do Financially Constrained and Unconstrained Firms Adopt Different Policies During the Financial Crisis?

This table displays mean comparison tests (implemented via OLS) of planned annual percentage changes in various real and financial policies according to whether firms are financially constrained or financially unconstrained using the survey-based measure of financial constraint. The data are collected from the 2008Q4 U.S. survey. t-statistics in (parentheses).

Policy	Constrained	Unconstrained	Difference Const. – Unconst.
% Change in R&D Expenditures	-21.954***	-8.980***	-12.974***
	(-5.31)	(-6.13)	(-3.58)
% Change in Capital Expenditures	-9.062**	-0.610	-8.452***
	(-2.38)	(-0.46)	(-2.59)
% Change in Marketing Expenditures	-32.375**	-4.520*	-27.855***
	(-2.49)	(-1.78)	(-3.41)
% Change in Employees	-10.867***	-2.720***	-8.148***
	(-5.81)	(-4.81)	(-5.56)
% Change in Cash Holdings	-14.988***	-2.740***	-12.249***
	(-5.85)	(-3.03)	(-5.56)
% Change in Dividend Payout	-14.176***	-2.926***	-11.251***
	(-4.05)	(-3.44)	(-4.62)

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

in contrast, are likely to keep their capital spending rates nearly constant (a negligible 0.6% decline). Importantly, notice from column 3 in the table that differences across groups are highly statistically significant for *all* of the real and financial policies examined.

4.3 Financial Constraints and Firm Policies prior to the Financial Crisis

Prior rounds of the U.S. quarterly survey allow us to produce a rotating panel containing firm 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). While the overlap in questions is limited, with this expanded dataset we can examine how our measure relates to standard measures of constraint in periods other than the crisis.

A key idea we want to test is whether our proposed measure of financial constraint has significant correlation with corporate policies in a way that is not subsumed by standard measures of constraint. Our data allow us to test this idea both for the crisis period as well as for the quarters preceding it. In doing this, we employ two matching estimator approaches.

Our variables are largely categorical and the matching procedure that most naturally deals with

these type of data is that of Abadie and Imbens (2002).[14] In short, 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, as well as the same credit rating category. We also require that the matching firm comes from the same industry and survey period. The procedure then estimates the mean differences in corporate policies ("outcomes") for firms that are constrained *relative* to those that are unconstrained, conditional on matching on 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 we did in Table 4), we now compare the differences in average outcomes of firms that are similar (i.e., matched) across the relevant demographics (size, ownership, and ratings) 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 "counter-factuals."[15]

Table 5 shows how our proposed measure fares in gauging the effects of financial constraints on firm policies prior to the crisis (2007Q3 through 2008Q3) and during the crisis (2008Q4) when we use matching estimators. For now we focus on columns 1 and 3, which present the results from the Abadie-Imbens estimator for the non-crisis and crisis periods, respectively. A number of patterns stand out. Firstly, even for the non-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 plan to invest less in R&D (an average differential of –5% per year), invest less in fixed capital (–8%), cut down marketing expenditures by more (–6%), employ less (–6%), conserve less cash (–3%), and pay fewer dividends (–8%). These numbers are economically and statistically significant.

These constrained–unconstrained differences *increase* quite noticeably during the crisis. In particular, column 3 of Table 5 shows that differences in planned R&D cuts between constrained and unconstrained firms double during the crisis (they drop 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 make it clear that the crisis aggravated the differences in planned corporate policies of constrained and unconstrained firms.

One concern with the Abadie-Imbens estimator is that it requires exact matches for constrained

[14] See Abadie and Imbens for a detailed discussion of their matching estimator. Here we apply the bias-corrected, heteroskedasticity-consistent estimator implemented in Abadie et al. (2004).

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

Table 5. Corporate Polices: 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 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 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 collected 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 (500 repetitions). t-statistics in (parentheses).

Policy	Difference Between Constrained and Unconstrained Firms			
	Pre-Crisis Period		Crisis Period	
	Abadie-Imbens	Dehejia-Wahba	Abadie-Imbens	Dehejia-Wahba
% Change in R&D Expenditures	-5.467***	-5.369***	-11.160***	-11.278***
	(-2.61)	(-2.72)	(-3.09)	(-3.00)
% Change in Capital Expenditures	-7.706***	-7.813***	-8.494***	-8.054***
	(-2.57)	(-2.63)	(-3.79)	(-2.73)
% Change in Marketing Expenditures	-5.878***	-5.843***	-11.709***	-11.866***
	(-3.19)	(-3.19)	(-4.05)	(-3.75)
% Change in Employees	-5.603***	-5.541***	-8.431***	-8.495***
	(-4.04)	(-3.43)	(-4.18)	(-3.89)
% Change in Cash Holdings	-3.467	-3.589	-8.536*	-8.496**
	(-1.39)	(-1.58)	(-1.87)	(-2.03)
% Change in Dividend Payout	-7.559**	-7.172*	-28.412**	-27.941**
	(-1.98)	(-1.70)	(-2.09)	(-1.97)

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

and unconstrained firms in every category of the control variables — in our case, 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 our observed characteristics (size, ownership, ratings, and industry) as inputs in a probit regression determining whether the firm is financially constrained.[16] 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,"

[16] See Dehejia and Wahba for a detailed discussion of their matching estimator. Here we apply the nearest neighbor matching estimator implemented in Becker and Ichino (2004), imposing the common support condition and using bootstrapped errors.

it is verified 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 "randomized" in this way, we can measure the ATT concerning policy outcomes of constrained and unconstrained firms in a fashion that resembles the matching procedure performed just above.

Columns 2 and 4 of Table 5 report the results associated with this alternative matching estimator. As it turns out, the propensity score estimator also suggests that the self-reported measure of financial constraint captures significant cross-sectional differences in firm behaviors regarding variables related to real and financial decisions. The results for the Dehejia-Wahba approach also suggest that policy differentials — for constrained versus unconstrained firms — are much larger during the 2008 crisis.

An important question is how our proxy fares compared to the standard alternative measures at differentiating the impact of financial constraints on corporate policies. The answer to this question depends on one's economic priors. Here, we presume that credit constraints negatively affect corporate policies and that those effects are aggravated during the crisis. The results from Table 5 already suggest that these types of policy outcomes are associated with direct survey-based measures of constraint. However, the tests thus far have not shown how the other measures perform in gauging the impact of financial constraints on firms. To gauge the relative performance of our measure we replicate the tests of Table 5 using the standard measures of constraints (size, ownership, and ratings) as the relevant treatments. That is, for each of one of those standard measures, we find matches across the other two plus our own measure of constraint and study the data to determine whether there are significant differences between these (newly-assigned) financially "constrained" and "unconstrained" firms. If these tests can replicate our earlier findings, then our argument for a unique, valuable measure of financial constraint derived from self-reported data should be questioned. To save space, we limit this analysis to the use of the Abadie-Imbens procedure.

For each of the standard alternative measures of financial constraints (size, ownership, and ratings), Table 6 replicates our 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 generally returns the "wrong" (positive) sign for the effect of financial constraints. The results for ownership are generally indistinguishable from zero. The credit ratings proxy, in contrast, sometimes returns the expected negative association between financial constraints and corporate policies. For example, low rated (constrained) firms, on average, plan to invest 5% less than highly rated (unconstrained) firms. However, the statistical significance of the estimates is quite low (4 out of 6 coefficients are statistically insignificant at 10% test levels).

Table 6. Corporate Polices: 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 policies of firms according to whether they 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 collected 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 in (parentheses).

Policy	Difference Between "Constrained" and "Unconstrained" Firms					
	Pre-Crisis Period			Crisis Period		
	Size	Ownership	Ratings	Size	Ownership	Ratings
% Change in R&D Expenditures	2.304	-1.547	-4.877**	5.775	0.028	12.601
	(1.21)	(-1.03)	(-2.04)	(0.87)	(0.01)	(1.10)
% Change in Capital Expenditures	3.646	-2.034	-7.621**	2.246	8.902*	15.903
	(1.24)	(-0.79)	(-2.24)	(0.24)	(1.80)	(1.26)
% Change in Marketing Expenditures	2.528*	-0.034	-2.980	15.259	-7.873	-12.763
	(1.92)	(-0.03)	(-1.24)	(0.91)	(-0.67)	(-1.04)
% Change in Employees	2.640***	0.426	1.723	-6.479	2.074	-9.202*
	(2.79)	(0.52)	(1.29)	(-1.54)	(0.79)	(-1.73)
% Change in Cash Holdings	4.885*	-3.738	-2.399	2.372	-5.801	24.826
	(1.86)	(-1.71)	(-0.79)	(0.11)	(-0.47)	(0.67)
% Change in Dividend Payout	-0.615	0.022	-4.508	28.022*	-6.183	-13.041
	(-0.18)	(0.14)	(-1.59)	(1.96)	(-1.04)	(-0.44)

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

The crisis period results contrast somewhat with those of the pre-crisis period. They are noisier and often economically counterintuitive. For instance, the matching estimator suggests that small firms' dividend payout ratios increase during the crisis. It also suggests that private firms' capital expenditures are, on the margin, less affected (or even benefit) from the financial crisis. The credit ratings results resemble those from our direct measure of constraint for planned changes in employment during the crisis. But for the other policies of the firm, such as R&D investment, capital expenditures, and cash savings, the results in column 6 of Table 6 suggest that speculative-grade companies fare much better than investment-grade firms during the credit crisis. In addition to the noise associated with these estimates, it is fair to say that these results are counterintuitive.

To sum up, the survey-based measure of financial constraint reveals an economically meaningful and statistically significant cross-sectional wedge in every corporate policy we look at *both* prior to and during the 2008 credit supply shock. The traditional constraint measures, in contrast, fail to

reveal meaningful cross-sectional or time series patterns.

4.4 Firm Heterogeneity and Financing Constraints Effects during the Crisis

The estimators used in the previous section ensure that comparisons are conditioned on demographics such as firm size, ownership form, and credit quality. Despite these controls, one could argue that other considerations might both affect a firm's propensity to be classified as constrained before the crisis as well as its behavior during the crisis. It is important that we discuss these possibilities.

One identification challenge to consider is whether our financial constraint measure is simply capturing other factors, and whether those factors — rather than constraints — are driving our results. For example, one can envision a scenario in which a firm with low cash flow and high debt might be unable to obtain credit prior to the crisis, and then fare more poorly (say, cut investment by more) during the crisis. While this financial distress story is interesting on its own, it is not the phenomenon we are trying to study. Another possibility to consider is that firms in our sample have different growth prospects, hence different demand for external funding. Firms with limited growth prospects may invest much less when aggregate demand falls, regardless of financing constraints. Our results will be hard to interpret if managers of firms with poor fundamentals also claim to face difficulties in raising external funds.

This discussion illustrates that there might be cross-sectional variation in firms' current financial status and economic conditions that should be further considered by our analysis. There are limitations to the types of questions we can ask in a survey, especially those requiring exact quantities (such as profit margins and leverage ratios). However, the 2008Q4 survey contains a set of questions that may help us deal with concerns about firm heterogeneity. In particular, we ask the CFOs: (1) whether their firms were profitable in 2008, (2) whether their firms paid dividends in 2008, and (3) their assessment of their firms' long-term growth prospects. The variables that we construct based on these questions are described in Table 3 above. With this information in hand, we can measure differences in investment spending across constrained and unconstrained firms based on matched firm-pairs that are (simultaneously) in the same size category, the same ownership category, the same ratings category, the same profitability category, the same dividend payout category, the same growth prospects category, and in the same industry. Although still not bullet-proof, these added controls help ameliorate concerns about effects that could confound our tests.

Table 7 reports the impact of financial constraints on firm policies over the crisis period. Its design follows that of Table 5, but the estimations include added controls for financial and economic conditions. The new estimates deviate only marginally from those in Table 5. Some suggest slightly stronger economic magnitudes for the differences in outcomes across constrained and unconstrained

Table 7. Corporate Polices: 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 in (parentheses).

Policy	Diff. Between Constrained and Unconstrained Firms	
	Crisis Period	
	Abadie-Imbens	Dehejia-Wahba
% Change in R&D Expenditures	-11.468***	-12.955***
	(-2.69)	(-2.89)
% Change in Capital Expenditures	-7.581***	-6.822**
	(-2.59)	(-2.21)
% Change in Marketing Expenditures	-12.424***	-13.240***
	(-4.15)	(-3.88)
% Change in Employees	-5.977***	-5.326***
	(-3.90)	(-2.65)
% Change in Cash Holdings	-7.666*	-9.006**
	(-1.69)	(-2.07)
% Change in Dividend Payout	-28.640**	-28.392**
	(-2.28)	(-1.99)

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

firms (e.g., higher expected cuts for marketing and R&D expenditures for constrained firms), while other policy differentials are slightly weaker (capital expenditures and employment). The implication from this test is that even after controlling for current profitability and for long-term investment demand, we still conclude that the firm's difficulty in obtaining credit in the financial markets is a key determinant of differential firm policy-making over the financial crisis.

In what follows, we dig deeper into the implications of financial constraints during the 2008 crisis. We first look at the impact of financing constraints on liquidity management (cash and lines of credit) during the credit crisis. We then look at corporate investment decisions (whether to invest and how much to invest). We examine data from many countries, but to make the analysis manageable we benchmark our exposition on the responses of U.S. CFOs when discussing corporate policies on the basis of characteristics such as size, ownership, and ratings. To highlight the pervasiveness of our proposed measure of constraint, we report results for European and Asian CFOs — in addition

to U.S. CFOs — when drawing inferences about the impact of financial constraints on corporate behavior. We only examine the December 2008 survey for the remainder of the analysis because our past surveys do not have detailed information about liquidity management or investment behavior.

5 Liquidity Management in the Financial Crisis

The previous section shows that our direct measure of constraint can identify significant cross-section and times series differences in the way corporate plans are impacted by the financial crisis. In this section we investigate how firms manage liquid assets such as cash reserves and bank lines of credit in order to minimize the impact of the crisis on their business operations.[17]

5.1 Cash Management

We examine central issues governing corporate cash policies. Our first question benchmarks how much cash companies had on their balance sheets when the survey was conducted, and how much they had one year prior to the survey. We compute the average cash-to-assets ratio for firms across different categories according to size, ownership, ratings, and the direct measure of financial constraint.

We first employ graphical analysis to summarize how much cash is held by the respondent companies near year-end 2008, as well as how much they held in late 2007. These graphs are broken-down by standard firm characteristics as well as self-declared degree of financial constraint. Figure 3 depicts the cash holdings of firms in the U.S., Europe, and Asia.

FIGURE 3 ABOUT HERE

Figure 3 shows a wide degree of variation in the *levels* of cash holdings of firms in different categories and countries. The first four panels refer to U.S. data. The average ratio of cash to total assets is slightly higher across small vis-à-vis large firms (see Almeida et al. (2004)), and public firms hold much more cash on their balance sheets than private firms. At the same time, investment grade companies hold twice as much cash as speculative companies.

The fourth panel of Figure 3 suggests something particularly interesting. According to our survey, the cash holdings of constrained and unconstrained firms in the U.S. were very 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

[17] Lins et al. (2008) also use survey data to study how firms manage cash and lines of credit. Looking at responses from a 2005 survey featuring 204 firms in 29 countries, the authors differentiate between various determinants of firm liquidity choices, such as credit market development, insurance against profit shortfalls, and investment needs. Our findings complement those of Lins et al. in that we examine liquidity management during a credit supply shock (the financial crisis), focusing on the role of financial constraints.

Table 8. Changes in Cash Holdings over Pre-Crisis Period

This table displays mean comparison tests (implemented via OLS) for changes in the ratio of cash to total assets over the year before the crisis for firms 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 collected from the 2008Q4 U.S. survey. t-statistics in (parentheses).

Criteria	Category 1	Category 2	Diff. Categories
By Size	-0.443	-0.413	-0.031
	(-1.05)	(-0.89)	(-0.04)
By Ownership	0.188	-1.177	1.365
	(0.41)	(-1.51)	(1.51)
By Ratings	0.017	-0.687	0.704
	(0.02)	(-1.08)	(0.54)
By Fin. Constraint	-3.325***	0.195	-3.520***
	(-3.13)	(0.59)	(-4.16)

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

at constrained companies have fallen 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 *changes* in cash. Similar cash burn patterns are observed in Europe and to a lesser extent, in Asia.[18] To investigate this issue in more detail, for each firm, we compute the difference between the ratio of cash to assets in December 2008 and one year prior. We then compare those changes conditional on size, ownership, credit ratings, and financial constraint. The mean comparison tests are similar in nature to those performed in previous sections. Table 8 reports the findings using U.S. data.

One would conclude that there were no systematic changes in cash policies over the last year if one were to rely on standard, observable financial constraint measures such as size, ownership, and credit ratings. However, once we partition firms according to their reported degree of constraint (row 4 of the table), we observe a pronounced reduction in cash levels among financially constrained firms over the last year (–3% of total assets). This finding is worrisome when linked to the Table 4 result that constrained firms expect to burn through another 15% of cash holdings during 2009. Over the same time period, there were virtually no changes in the holdings of financially unconstrained firms. The different change in cash holdings across the two groups is highly statistically significant. The numbers in the table suggest that financially constrained firms have been forced to draw down their cash reserves to cope with the financial crisis. This agrees with intuition, but notice that this phenomenon is not captured by archival measures of constraint, nor to our knowledge has it been

[18] Comparing cash levels across countries, it is interesting to note that constrained European firms tend to hold relatively low levels of cash in their balance sheets, while unconstrained Asian firms hold high levels of cash.

reported previously in the literature. Finally, though not shown in the table, we find similar patterns of pronounced reduction in cash holdings of constrained firms during the crisis in Europe and Asia. Moreover, unconstrained firms on those two continents, just like in the U.S., do not change their cash-to-asset ratios.[19]

5.2 Managing Lines of Credit

We also investigate how firms manage their bank lines of credit (LCs). We ask CFOs about their available lines of credit at the time of the survey (during the crisis) and also ask them to compare it with the availability of those lines one year prior. A graphical analysis summarizes what we find.

As suggested in panels A through D of Figure 4, U.S. firms that are small, private, and financially constrained appear to have, on average, higher LC-to-asset ratios than large, public, and unconstrained firms. Panels E and F show that constrained firms in Europe and Asia also hold more LCs than unconstrained firms. 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. Mean comparison tests for changes in LC-to-asset ratios across firms in those categories confirm this inference (output omitted). We find similar behaviors in Europe and Asia, with the exception that constrained firms in Europe increase the size of their LCs during the crisis.

We note that data on firms' lines of credit balances are not readily available from standard data sources. For example, Compustat does not have this information and LPC-Dealscan only has originations (not balances) for larger firms and banks. Not surprisingly, empirical work on this important source of financing is very limited (one exception is Sufi (2009)). More interestingly, we note that our results are consistent with theoretical priors (Holmstrom and Tirole (1998)). A line of credit can be seen as a "cheap" insurance policy against liquidity shortages in bad times. They work particularly well for firms that have limited access to the public organized markets, and differently from cash, they traditionally have very low carry costs.

FIGURE 4 ABOUT HERE

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 check any of the following options on a question about the reasons for drawdowns:

[19] 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 to lower cash stocks. This concern is similar to the heterogeneity-type of challenge 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 cash flows. In particular, the Abadie-Imbens (2002) estimator suggests that the cash holdings of constrained firms are –2.77% lower than that of unconstrained firms following the crisis (t-statistic of –2.96).

"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. We first report a graphical analysis.

Panels A through D of Figure 5 indicate that U.S. companies that are small, private, speculative-rated, and financially constrained use their LCs significantly more than do their counterparts (i.e., large, public, investment-rated, unconstrained firms) as a way to fund normal business activities. It is harder to distinguish clear patterns in terms of which types of companies manage their LCs motivated by strategic reasons. Focusing on U.S. data, we use mean comparison tests to help establish whether these later considerations determine corporate line of credit management. These are presented in Table 9.

FIGURE 5 ABOUT HERE

The results in Table 9 suggest that firm size and credit ratings are not powerful determinants of how companies use funds from their lines of credit. Perhaps counter to intuition, relative to small and private firms, large and public firms seem more inclined to draw cash from their LCs because of precautionary motives. Private firms also claim to be actively drawing funds now for fear of imminent restrictions by their banks on LC access ("Strategic Timing").

We also find significant differences in LC management across financially constrained and unconstrained firms. Unconstrained firms show the lowest propensity to draw from their LC accounts as a way to build cash stocks or due to concerns about future access to their LCs. In contrast, constrained firms are among those most likely to say that their withdrawal policies are guided by the desire to build precautionary savings. In addition, 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 (2008), who document a "draw now, just in case" phenomenon during 2008. Our analysis adds to those authors' findings by tying this behavior to financially constrained firms.

We look overseas to determine whether companies world-wide manage their LCs in ways consistent with their American counterparts. We find very similar patterns abroad. These are depicted in Panels E and F of Figure 5. Foreign firms 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

Table 9. Why Do Firms Draw Down their Lines of Credit?

This table displays mean comparison tests (implemented via OLS) for the proportion of firms reporting each of the rationales listed as a reason for using their LCs 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 collected from the 2008Q4 U.S. survey. t-statistics in (parentheses).

Criteria	Policy	Category 1	Category 2	Diff. Categories
By Size	Liq. Needs	0.334***	0.299***	0.036
		(14.84)	(7.52)	(0.77)
	Daily Opers.	0.464***	0.373***	0.091*
		(19.48)	(8.90)	(1.85)
	Precautionary	0.061***	0.142***	-0.080***
		(5.36)	(4.69)	(-3.02)
	Strategic Timing	0.070***	0.112***	-0.041
		(5.77)	(4.09)	(-1.55)
By Ownership	Liq. Needs	0.377***	0.246***	0.131***
		(14.37)	(6.49)	(2.70)
	Daily Opers.	0.535***	0.315***	0.220***
		(19.81)	(7.71)	(4.35)
	Precautionary	0.061***	0.138***	-0.077***
		(4.72)	(4.55)	(-2.73)
	Strategic Timing	0.064***	0.131***	-0.066**
		(4.84)	(4.41)	(-2.35)
By Ratings	Liq. Needs	0.433***	0.288***	0.145
		(4.71)	(6.88)	(1.53)
	Daily Opers.	0.567***	0.314***	0.253***
		(6.16)	(7.31)	(2.61)
	Precautionary	0.233***	0.110***	0.123*
		(2.97)	(3.81)	(1.77)
	Strategic Timing	0.133**	0.110***	0.023
		(2.11)	(3.81)	(0.35)
By Fin. Constraint	Liq. Needs	0.504***	0.282***	0.222***
		(10.77)	(13.34)	(4.62)
	Daily Opers.	0.548***	0.421***	0.127**
		(11.75)	(18.14)	(2.46)
	Precautionary	0.130***	0.068***	0.062**
		(4.14)	(5.76)	(2.19)
	Strategic Timing	0.165***	0.059***	0.106***
		(4.75)	(5.35)	(3.76)

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

with an eye on building precautionary savings, while constrained European firms do not. Regarding the issue of strategic "in case of future restriction" timing behavior of LC withdrawals, we find that, just like in the U.S., constrained European and Asian firms draw down much larger amounts of funds than unconstrained firms for fear that their banks will restrict access to credit lines in the future.

Finally, we ask managers whether they have recently voluntarily limited their use of lines of credit, and inquire about the reasons behind limiting LC draw downs. To understand these reasons 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 unused borrowing capacity." Again, 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 regular business concerns with the cost of LC facilities. The last two capture strategic aspects of LC management. As before, we first present a graphical analysis.[20]

FIGURE 6 ABOUT HERE

A number of patterns emerge in Figure 6. Firms very rarely report concerns about the costs associated with LCs as a main driver for limiting the use of those facilities. At the same time, they seem interested in saving future borrowing capacity by restricting current usage of available LCs. To a lesser extent, companies seem concerned with reputational costs associated with the use of funds from LCs.

For the most part, mean comparisons across size, ownership, ratings, and financing constraint categories do not reveal significant systematic patterns in firms' rationales to limit their use of LCs. The only exception is that firms that are larger and public are significantly more concerned about damaging their reputation in the credit markets with the use of their available LCs; that is, these companies limit their use of LCs in order to preserve their reputations. (We omit the output of this test.)

6 Investment Spending during the Financial Crisis

Corporate executives and economic policy-makers are ultimately 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, R&D expenditures, 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. Our analysis turns to the examination of these connections.

[20] Due to space and logistical limitations, this question was not included in the Asian survey. We omit the results from the European survey for simplicity, as they mirror that of the U.S. survey.

6.1 Access to External Financing and Investment Distortions

A well-known line of research examines whether constrained access to external funding affects the optimality of corporate investment decisions. While most researchers agree that capital market imperfections can distort corporate investment, there is some dispute about the type of evidence used to support that 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. The existing evidence of a relation between investment distortions and capital markets frictions is only as good as the estimation method and the data used to back out that relation. In contrast to the traditional approach, we obtain information about whether capital markets affect corporate investment directly from those in charge of making investment 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 positive NPV investment projects. The answer to this question tells us whether the availability of financing — as opposed to the availability of investment opportunities — drives observed investment. This question is at the heart of the issue of whether financing frictions have real consequences for investment efficiency.[21]

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 are experiencing a severe crisis.

In answering the question about the effect of external financing on investment spending, managers are allowed check one of four possible answers: "no effect," "small effect," "moderate effect," and "large effect." For now, we categorize these answers as follows: "no effect"/"small effect" = 0; "moderate effect"/"large effect" = 1.[22] To gauge the relation between the answer to this question and the four classifications that we examine (size, ownership, ratings, and financial constraint), we average these 0–1 responses across firms in each of the four partitions pairs that we consider.

We first discuss the answers pertaining to "normal times." Figure 7 suggests some cross-sectional variation regarding how U.S. firms normally associate their access to capital markets and their ability to invest when we consider size and ownership classifications (see panels A and B, respectively). Simply put, 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. Similar patterns

[21] Arguably, this is a more pointed, richer question about the impact of credit constraints on investment spending than the question we have used thus far to identify constraints. In Section 6.2.1 we will explore this question to study the relation between firms' investment and cash flows.

[22] We use the original (finer) answers to this question in the regression analysis performed in Section 6.2.1.

Table 10. Do Credit Frictions Affect Corporate Investment in "Normal Times"?

This table displays mean comparison tests (implemented via OLS) for the proportion of firms reporting that their ability to invest is conditioned by their access to the capital markets across different group categories (when markets operate normally). 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 in (parentheses).

Criteria	Category 1	Category 2	Diff. Categories
By Size	0.255***	0.236***	0.019
	(12.19)	(6.241)	(0.43)
By Ownership	0.246***	0.272***	-0.026
	(10.47)	(6.81)	(-0.58)
By Ratings	0.533***	0.190***	0.344***
	(5.76)	(5.19)	(4.00)
By Fin. Constraint	0.464***	0.200***	0.265***
	(9.81)	(10.53)	(5.93)

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

emerge in Europe and Asia (graphs omitted). Things are quite different when we consider credit ratings (panel C) and the direct measure of financial constraint (panels D through F). In particular, we observe that speculative and financially constrained companies (in the U.S. and abroad) report a markedly higher propensity to link the availability of external financing to the ability to pursue profitable projects; particularly when compared to investment-grade firms and financially unconstrained firms. These inferences are supported by mean comparison tests reported in Table 10.

FIGURE 7 ABOUT HERE

We now examine the degree to which credit constraints limit the pursuit of attractive investments during the 2008 credit crisis. Figure 8 resembles the equivalent figure for "normal times" in that there is limited variation regarding how companies associate their access to capital markets and their ability to invest based on size and ownership classifications. However, when we consider credit ratings and, especially, the direct measure of financial constraint, 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 profitable projects. Indeed, 86% of financially constrained firms in the U.S. 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 who suffer the most from a inward shift in the supply of credit. These inferences are supported by the tests reported in Panel A of Table 11.

Our findings show that the crisis *greatly exacerbates* the degree to which firms link the availability of funds with the ability to pursue profitable opportunities. In that fashion, the credit crisis highlights starkly how the availability of financing affects investment efficiency. Because a financial crisis drains credit from the financial markets, we get the unfortunate result that financial markets seem to matter most for corporate investment precisely when they fail.

FIGURE 8 ABOUT HERE

We cross-check our findings about the effect of the crisis on the relation between investment and financing by studying data from Europe and Asia. In addition to the graphs we report in panels E and F of Figure 8, we present results for those regions in Panels B and C of Table 11. The results from Europe and Asia provide strong evidence that the managers' self-declared measure of constraint identifies quite well those firms whose investment decisions are particularly affected by their ability to obtain external financing during a credit crisis. More than twice as many constrained firms bypass attractive investment projects than do unconstrained firms. Noteworthy, whereas in the U.S. this connection was captured to some extent by the credit ratings proxy, the same *does not* occur in non-U.S. markets. That is, compared to credit ratings, our measure of constraint points to larger investment differentials across all regions, particularly those outside of the U.S.

6.2 The Relation between Investment and Internal Liquidity

A question of much debate in the literature concerns the degree to which firms are able to use internally generated 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 on those correlations. Our survey allows us to investigate this issue from a different perspective. We directly ask managers if they use their firms' internal resources to finance investment when access to external credit is limited. In what follows, we analyze several aspects of their answers. In particular, we examine whether companies use internal liquidity (cash flow from operations and cash stocks) as a buffer against external credit shocks. We also look at the impact of those credit shocks on investment postponement and asset sales.

6.2.1 The Use of Internal Liquidity and the Decision to Forego Investment

We investigate how companies fund investment when external financing is limited. We do so by computing the proportion of respondents checking each of the following answers to our question about investment under credit constraints: "investment funded by cash flows," "investment funded by cash holdings," "investment funded by other sources (including partnerships)," and "investment

Table 11. Do Credit Frictions Affect Corporate Investment during the Crisis?

This table displays mean comparison tests (implemented via OLS) for the proportion of firms reporting that their ability to invest is conditioned by their access to the capital markets across different group categories (under the current market conditions). 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., European, and Asian surveys. t-statistics in (parentheses).

Criteria	Category 1	Category 2	Diff. Categories
Panel A: U.S.			
By Size	0.514***	0.539***	-0.025
	(21.35)	(12.19)	(0.50)
By Ownership	0.512***	0.544***	-0.032
	(18.74)	(12.16)	(0.61)
By Ratings	0.800***	0.487***	0.313***
	(10.77)	(10.41)	(3.15)
By Fin. Constraint	0.857***	0.438***	0.419***
	(25.81)	(18.61)	(8.41)
Panel B: Europe			
By Size	0.352***	0.582***	-0.229***
	(8.12)	(8.67)	(-2.91)
By Ownership	0.417***	0.452***	-0.035
	(8.74)	(7.09)	(-0.44)
By Ratings	0.353***	0.400***	-0.047
	(2.95)	(5.72)	(-0.34)
By Fin. Constraint	0.800***	0.358***	0.442***
	(9.80)	(9.14)	(4.34)
Panel C: Asia			
By Size	0.471***	0.523***	-0.051
	(14.20)	(6.86)	(-0.62)
By Ownership	0.480***	0.483***	-0.003
	(12.52)	(8.96)	(-0.05)
By Ratings	0.286	0.547***	-0.261
	(1.55)	(8.72)	(-1.31)
By Fin. Constraint	0.690***	0.293***	0.397***
	(16.88)	(7.59)	(7.07)

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

is cancelled 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 we did in previous analyses, we average these 0–1 responses across the four firm categorizations (size, ownership, ratings, and financial constraint). Figure 9 illustrates our findings.

FIGURE 9 ABOUT HERE

Figure 9 suggests 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 do 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 tightened.

Some cross-sectional differences stand out in Figure 9. For instance, large, public, investment-grade, unconstrained U.S. firms indicate they are 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 in recent months. 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.

Assuming that firms would prefer to draw on their cash reserves before cancelling their planned long-term investments (which is, presumably, a 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 goes up to 39%. In Europe, the cancellation rate of constrained firms that can not use cash to fund investment is as high as 80% (64% in Asia). To our knowledge, this finding is new to the literature. Critically, archival data do not allow for direct insights into whether investment is cancelled 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 data limitation makes it difficult for one to fully measure the effective trade-off between investment and constrained financing. Our analysis, in contrast, provides some new, direct insights into the link between credit constraints and the ability to invest.

We check whether the inferences we gather from Figure 9 are statistically meaningful via group means comparison tests. We omit the associated table to save space, but our estimates show no significant cross-group differences in firms' propensity to use cash flows to fund investment when capital markets tighten (the use of cash flows is high across all categories). The use of cash reserves as an alternative financing source is also widespread (significantly different from zero in all categories). The degree to which firms that have low credit ratings or are financially constrained cancel their investments is significantly greater (in both economic and statistical terms) than that of other groups of firms: nearly 60% of these firms cancel investment when external funding is not available. These findings are confirmed in the European and Asian surveys.

6.2.2 The Sale of Assets

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 are selling more corporate assets during the crisis than in the recent past. The analysis of those responses, reported in Table 12, provides further insight into the real-side distortions of the credit crisis.

To estimate firms' 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. The group comparisons reported in Table 12 reinforce the notion that our non-archival measure of financial constraint captures more fully the severe real-side effects of the credit crisis. Exactly 70% of the constrained CFOs say that they are selling more assets now than before — compared to 37% of the unconstrained CFOs — in order to obtain funds. We find very similar patterns in non-U.S. economies. The constrained/unconstrained contrast is the only treatment that captures significant cross-sectional variation in the degree to which different firms are selling assets to cope with the financial crisis.

6.2.3 On the Link between Investment and Cash Flows

Earlier researchers found a significant relation between investment and cash flows via the econometric estimation of investment models (these build on the original work of Fazzari et al. (1988)). Recent work, however, questions that evidence on grounds that model misspecification and poor data quality might introduce biases in the estimates of the sensitivity of investment to cash flows, biases that exaggerate that sensitivity (see, e.g., Gomes (2001) and Cummins et al. (2006)). Our survey allows us to provide a completely fresh appraisal of the usefulness of the correlations between investment and cash flow in terms of gauging the impact of credit constraints on corporate policies. Let us

Table 12. Do Firms Sell Assets to Obtain Funding in 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 in (parentheses).

Criteria	Category 1	Category 2	Diff. Categories
By Size	0.476***	0.478***	-0.002
	(9.72)	(6.42)	(-0.02)
By Ownership	0.489***	0.489***	-0.001
	(9.23)	(6.49)	(-0.01)
By Ratings	0.588***	0.415***	0.174
	(4.78)	(5.32)	(1.20)
By Fin. Constraint	0.700***	0.366***	0.334***
	(10.69)	(7.60)	(4.04)

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

discuss this point in further detail.

The common approach in the literature is to impose a uniform investment model to fit all firms examined. This approach stems from the use of archival data as a means of gauging basic estimates of investment demand and growth opportunities, among others, for the representative firm in a neoclassical framework. Our survey approach is fundamentally 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 gauge the importance of cash flows in driving firm's investment decisions by simply asking the CFO about that "sensitivity." Our survey instrument also allows us to ask the CFO if financing constraints cause her to make suboptimal investment decisions. In particular, as explained in Section 6.2.1, we obtain the CFO's direct assessment of whether — and to what extent — her firm is likely to turn down attractive investment opportunities due to limited ability to access external capital.

In addition to direct estimates of the association between investment and cash flow, and estimates of the degree to which the firm is constrained, our survey gathers information about whether the company may *cancel* its investment. This is an important piece of information, and may shed light on an important aspect of the relation between financing constraints and investment–cash flow sensitivities — in particular, whether those sensitivities increase with the degree of constraints. To see this, suppose two constrained firms have identical cash flows. One firm is very constrained and cancels its investment outright (observationally, its investment spending equals zero). The other is less constrained and invests some amount. A standard investment regression using observable

archival data on a sample of firms of this type will indicate that the less financially constrained firm has a higher investment–cash flow sensitivity than the more financially constrained firm. Our data, in contrast, allow us to relate investment–cash flow sensitivities and financial constraints after controlling investment cancellations — though this data is not achieved, we have private information provided by the CFOs on investments that were planned but never took place.

Another issue of much contention in the empirical literature on the relation between investment and cash flows is the measure of controls for growth opportunities. These sorts of controls are needed because the occurrence of positive cash flows might be correlated with the existence of growth opportunities, opportunities that may spur investment. If those opportunities are not accounted for, one may mistakenly infer that cash flows affect observed investment spending because of credit frictions alone. Much of the debate on this particular point has revolved around the empirical proxy for investment opportunities used by the large majority of studies: Tobin's Q. A common criticism concerning Q is that it is measured with error (see Cummins et al. (2006)). In particular, the market value of a firm's assets — the numerator in Q — is plagued by imperfections such as non-transitory mispricing and bubbles.[23]

On that front, too, we have an alternative approach. We ask managers to tell us how they rate their firm's long-term investment prospects on a 1 to 10 scale.[24] Although our measure has its own limitations, it is worth noting that it has some novel, desirable features. First, it reflects an investment demand forecast that is made by someone that arguably has a larger information set than market participants (consider, for example, manager's knowledge of a new product line, or patent, or merger that no else knows about). Second, differently from any other study we are aware of, it captures growth prospects for private firms (those without market value information). Third, this is the measure that is ultimately going to determine the decision-maker's policy choice regarding investment spending and the demand for external funds. Finally, it is by definition forward-looking.

With this information in hand, we perform a few simple tests regarding the association between investment–cash flow correlations and financing frictions. First, we regress our measure of the association between investment and cash flow (which we call *CashFlowFunding*) on a set of categorical variables reflecting CFOs' responses to the question of whether they are likely to turn down profitable investment opportunities because of their firms' limited access to external funds (described in Section

[23] Another critique is that theory suggests the use of *marginal* Q, while empiricists use *average* Q (see Hayashi (1982) and Poterba (1988)).

[24] One possible issue is that CFOs could be too overconfident and provide answers that would yield a very skewed and/or clustered response distribution. As it turns out, the long-term growth proxy we obtain has a well-behaved, informative distribution: the mean is 6.7, the median (and mode) is 7.0, the variance is 4.3, and the skewness is only –0.5. A simple regression of planned investment (from Section 4.2 in the paper) on our measure of long-term growth prospects returns a coefficient of 3.88 (t-statistic of 5.63).

6.1). This regression is intended to answer the question: "Is a firm's self-declared investment–cash flow sensitivity related to the effects of financial constraints on the ability to pursue attractive investments?" While in the group comparison tests performed in Section 6.1 we collapsed the set of available responses into two categories, here we use the original answers to our survey question, which yields four dummy variables. For ease of reference we denote them as: *NoEffect*, *SmallEffect*, *ModerateEffect*, and *LargeEffect*.[25]

In a second specification, we introduce a number of controls in the regression. The first set of controls account for growth prospects. In particular, we introduce in the estimation the log of the CFOs' forecast of future long-term prospects discussed above (denoted by *Growth*). We also include variables examined in Section 3 of the paper: planned investment expenditures (*InvestmentPlans*) and planned employment growth (*EmploymentPlans*).[26] The second set of controls accounts for alternative sources of internal funding for investment (which on the margin are expected to reduce the association between investment and cash flow from operations). In particular, we include as controls whether the firm indicates it will use existing cash stocks to finance investment (*CashStockFunding*) and whether it would use other sources, such as partnerships and inter-affiliate funding, to achieve that same goal (*OtherFunding*).

The most important control of our analysis is whether the firm is willing to cancel investment. As discussed before, financing frictions may lead to outright investment cancellation. In archival work, the lack of data on the cancellation decision my lead to mistaken inferences on the relevance of the association between a firm's real and financial policies (namely, the sensitivity of a firm's investment to its cash flows). The last part of our experiment examines the subsample of firms that are not likely to cancel investment. In particular, we disregard the firms that cancel investment because of the ambiguity of interpreting their degree of investment cash flow sensitivity (which is our dependent variable). Because aspects such as access to credit, use of internal liquidity, and costs or ability to cancel investment (e.g., investment irreversibility) may vary across industries, we add industry-fixed effects to these estimations. In all of our regressions, a robust error structure estimator corrects for heteroskedasticity (see Rogers (1993)).

Column 1 of Table 13 presents the results from the first estimation. Using the entire set of firms in the U.S. sample, we regress *CashFlowFunding* on the set of indicator variables *SmallEffect*, *ModerateEffect*, *LargeEffect*, plus a constant term. The results in the table indicate that firms are generally inclined to use cash flow from operations to fund investment: even those firms reporting no

[25] Because this is a regression on a set of fully spanning categorical variables, the first variable (*NoEffect*) is absorbed by the constant term in the regression.

[26] Including the other expenditure categories we discuss in Section 4.2 (marketing and R&D spending) reduces the sample size significantly. Yet, their inclusion yields similar results.

difficulties in finding external funding (51.1% of them) are likely to use internal cash flows to finance investment. While this lack of cross-sectional variation was already noted earlier, we now have the ability to more finely assess, in the cross-section, whether increases in external credit imperfections affect the association between observed spending and internal cash flows. This can be gauged from the estimates associated with the three indicator variables. As it turns out, none of them is significantly different from zero. For example, only an additional 2.4% of firms reporting "small effects" of external financing costs are more likely to use cash flow to finance investment (a total of 53.5%). The same number obtains for firms that are "moderately affected" by external financing costs (53.4%), while those that are "largely affected" by those costs are only 6.6% more likely than "unaffected" firms to use cash flows to finance their investment under constraints (i.e., a total of 57.7%). The exclusion F-test reported at the bottom of Table 13 shows that, as a group, these indicator variables add no significant explanatory power to the regression. Finally, and trivially in this case, additional tests for parameter restrictions at the bottom of the table show that the coefficients returned for these variables are not significantly different from each other.

Column 2 of Table 13 reports a similar estimation, but now with more controls. As it turns out, those controls enhance the overall explanatory power of the model (the adjusted R^2 goes from 2% to 12%). The regressors for which we had anticipated negative coefficients (*CashStockFunding* and *OtherFunding*) do return strongly negative estimates. The variables that control for differential growth prospects across firms come in largely insignificant, with the exception of *EmploymentPlans*. More importantly, none of the proxies capturing variation in the degree to which capital market frictions may lead to suboptimal investment are significant drivers of the relation between a firm's investment and use of internal cash flows. They are insignificant as a group, and are not statistically distinguishable from each other.

Next, we account for investment cancellation. In other words, we now examine a set of firms for which observed investment better approximates investment demand. Once we only examine firms for which investment cancellation is not an option, we obtain very different results (see columns 3 and 4 of Table 13). Column 3 suggests that a firm that is only "slightly affected" by capital market inefficiencies is not necessarily more likely (relative to "unaffected firms") to rely on cash flow to fund investment. However, a firm that is "moderately affected" by those inefficiencies is significantly more likely to use internal cash flows as a funding source (nearly 76% of those firms do so), and a firm that is "largely affected" by those frictions is much more likely to use cash flows to fund its investment (around 89%). In other words, there is a *pronounced, monotonic* association between the degree to which firms are exposed to the distortionary effects of credit frictions and the rate at which they use cash flows to fund their investment. This monotonic relation is both statistically and

economically significant (as suggested by the coefficients returned for *SmallEffect*, *ModerateEffect*, and *LargeEffect*). This is evident in the t-statistics associated with the proxies for constraints, and also in the p-values associated with the F-tests for variable exclusion and coefficient restrictions presented at the bottom of Table 13. The test statistic for the restriction *SmallEffect* = *ModerateEffect* has a p-value of 5.8%, while for *ModerateEffect* = *LargeEffect* the p-value is 4.9%.

Most of the same results are found when we add the larger set of controls to the regression (see column 4), except that now the *SmallEffect*, too, has a coefficient that differentiates firms in that category from those in the *NoEffect* group (p-value of 1.2%). This last result reinforces the notion of a positive, monotonic association between financing imperfections and firms' propensity to use internal funds as a way to finance their investment demand. The explanatory power of this last regression is 24%.

To sum up, our evidence suggests that constraints on external financing are likely to increase the relation between a firm's investment decisions (including the cancellation of investment and asset sales) and its internal resources. The novelty of our instruments, we believe, sheds interesting new light on the much debated empirical relations between corporate investment and financing decision. Nevertheless, our approach is fundamentally different from that of the existing literature and our findings should be interpreted with this difference in mind.

7 Conclusions

While the financial crisis of 2008 and the associated recession led to severe hardship, it also provided a historic opportunity to learn about the impact of financial constraints on corporate policies. Using a survey of 1,050 CFOs in the U.S., Europe, and Asia, we are able to directly identify firms that are financially constrained. Examining our novel measure of constraint during an extraordinary financial crisis, we have a powerful test of the impact of financial constraints on real corporate actions.

Our research design offers a number of advantages over previous attempts to examine the impact of constraints. First, we collect information on corporate planning precisely when all firms in the economy are affected by an acute credit crisis. This exogenous, structural shift makes cross-sectional variation particularly informative.

Second, past research has employed ad hoc proxies for financial constraints (such as firm size). In contrast, we measure whether a firm is constrained by polling its CFO (the person overseeing decisions concerning investment and financing). We also collect information on proxies that were used in prior research on financial constraints (size, ownership, credit ratings). We show that our direct measure of constraint is associated with significant cross-sectional variation in both real and

Table 13. Credit Market Frictions, Corporate Financing, and Investment: The Relation between Firm Investment and Internal Cash Flows

This table reports OLS estimations where the dependent variable is the firm's propensity to use internal cash flows to fund investment ($CashFlowFunding$). $SmallEffect$ is a categorical variable specifying whether the current credit conditions have only an "small effect" on the likelihood that the firm will not pursue profitable investment opportunities due to its ability to raise funds in the external capital market ($CashFlowFunding$). $ModerateEffect$ and $LargeEffect$ are similarly defined for firms pointing to "moderate" and "large effects" of access to outside credit on their ability to pursue profitable investments. $Growth$ is the log of the firm's CFO forecast of future long-term prospects. $InvestmentPlans$ is the change in the firm's planned investment expenditures for next year (in percentage terms). $EmploymentPlans$ is similarly defined for the firm's planned employment growth. $CashStockFunding$ is an indicator variable capturing whether the firm will use existing cash stocks to finance investment. $OtherFunding$ is similarly defined for firms that will use "other" sources of internal funding. Columns 1 and 2 report results for the entire sample. Columns 3 and 4 restrict the sample to those firms that will not cancel investment. The data are collected from the 2008Q4 U.S. survey. Industry-fixed effects are included in all estimations. Heteroskedasticity-consistent t-statistics are reported (in parentheses). p-values for F-tests on coefficient exclusion and equality restrictions are presented at the bottom of the table [in square brackets].

	All Sample Firms		Firms not Cancelling Investment	
Independent Variables	(1)	(2)	(3)	(4)
$SmallEffect$	0.024	0.071	0.007	0.102**
	(0.68)	(1.59)	(0.14)	(2.55)
$ModerateEffect$	0.023	0.023	0.097**	0.150***
	(0.87)	(0.76)	(1.97)	(4.11)
$LargeEffect$	0.066	0.018	0.234***	0.258***
	(1.08)	(0.25)	(5.83)	(4.53)
$Growth$		0.018		0.024
		(0.25)		(0.22)
$InvestmentPlans$		-0.001		0.001
		(-0.96)		(0.52)
$EmploymentPlans$		0.005***		0.002
		(3.86)		(1.11)
$CashStockFunding$		-0.241***		-0.325***
		(-4.47)		(-6.92)
$OtherFunding$		-0.338***		-0.516***
		(-3.22)		(-5.72)
constant	0.511***	0.639***	0.659**	0.681***
	(23.86)	(3.19)	(27.24)	(4.98)
Exclusion F-test:				
$\{SmallEffect, ModerateEffect, LargeEffect\}$	[0.60]	[0.17]	[0.00]	[0.01]
Restriction F-tests:				
$SmallEffect = ModerateEffect$	[0.87]	[0.41]	[0.06]	[0.26]
$ModerateEffect = LargeEffect$	[0.51]	[0.95]	[0.05]	[0.04]
N	446	339	282	213
Adj-R^2	0.02	0.12	0.07	0.24

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

financial corporate policies during the crisis. At the same time, on our sample, standard measures of constraints do not identify meaningful variation in firm policies during the crisis.

Third, our survey approach allows us to gather information that cannot be deduced from archival data. For example, we are able to detail managerial strategies related to the use of lines of credit, and describe how withdrawal policies are related to a company's desire to maintain its reputation in the credit market. We also learn about CFOs' planned investments, cash management styles, and savings strategies.

Fourth, we obtain synchronous data from other regions of the world. Those regions, too, suffer from the crisis, but their circumstances differ from those of the U.S., bringing additional (exogenous) variation to the relations we examine.

Our direct measure of financial constraint allows us to use simple methods to document first-order effects in the data. Using mean comparison tests, for example, we show that financially constrained firms plan to cut more investment, R&D, marketing, and employment relative to financially unconstrained firms during the crisis. We also show that constrained firms are forced to burn a sizeable portion of their cash savings during the crisis and to cut deeply into their dividend distribution policies. 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 access to those lines. Unconstrained firms do not engage in this strategic behavior. In contrast, unconstrained firms avoid using their lines of credit, with the goal of preserving their reputation among banks and in the financial markets in general.

In perfect capital markets, all positive NPV projects are pursued. While it is well known that markets are not perfect, the more interesting question is how imperfect are they? Our results document large real effects ensuring from financial markets imperfections. Nearly 90% percent of constrained firms say that financial constraints restrict their pursuit of valuable projects, and more than half of these firms are forced to cancel valuable investments. During the crisis, among firms that do not plan to cancel investment, constrained firms also display a much higher propensity to use internal funds to finance investment. To generate those funds, firms often sell off productive assets.

There are both short-term and long-term implications of our research. Our results indicate that the financial crisis systematically affected real investment — but unequally across firms. Bypassing positive NPV projects reduces the chance of an economic recovery. In this context, we can understand why policy-makers are undertaking unprecedented actions to unfreeze credit markets. Looking beyond the crisis, our paper provides evidence that financial constraints hamper investment in valuable projects. Relaxing these constraints produces additional long-term growth opportunities in the economy.

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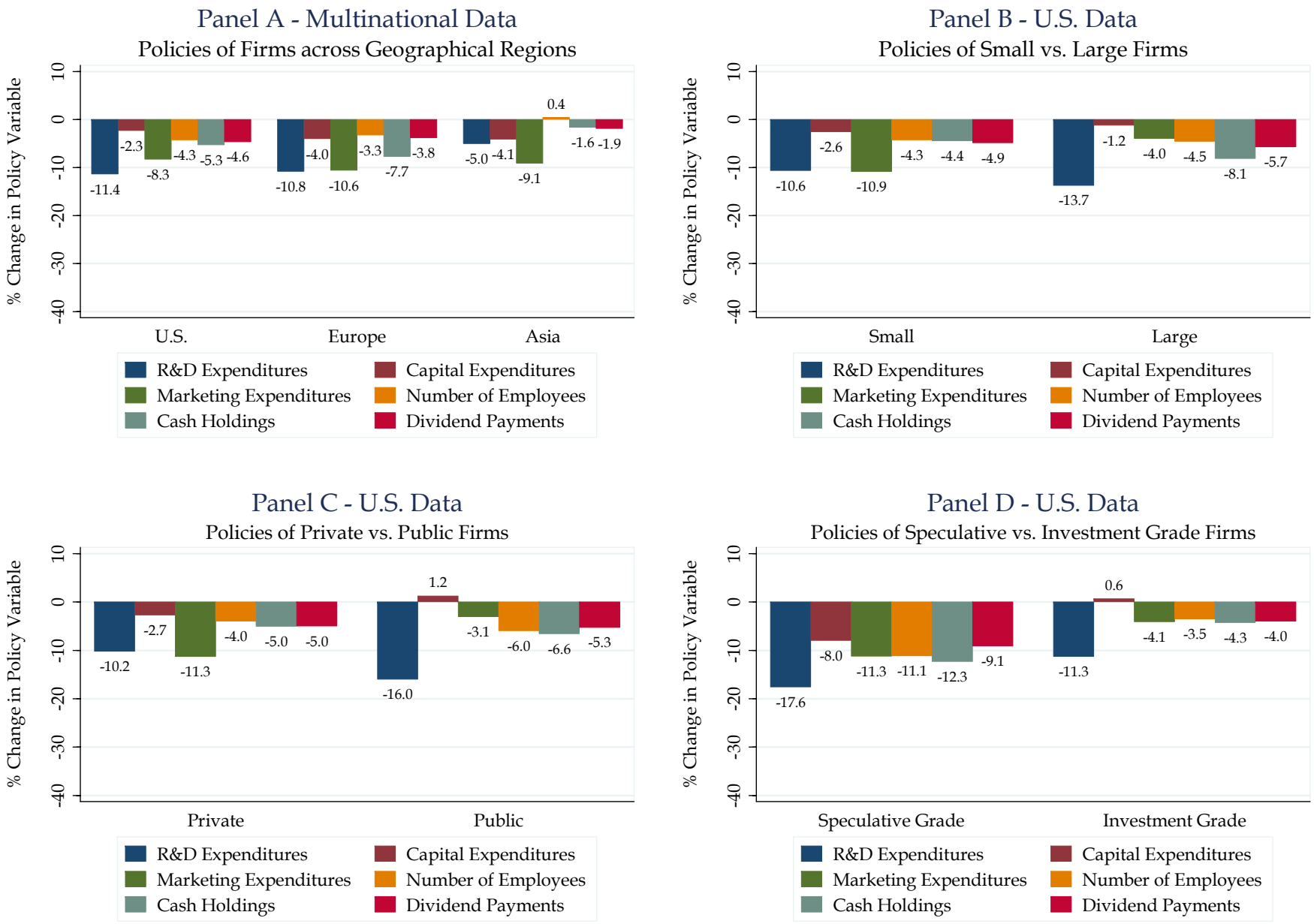

Figure 1: This figure displays firms' planned changes (% per year) in R&D expenditures, capital expenditures, marketing expenditures, total number of domestic employees, cash holdings, and dividend payments as of the fourth quarter of 2008 (crisis period). Responses are averaged across firms within categories determined according to size (sales revenue), ownership form, and credit ratings. See text for additional details.

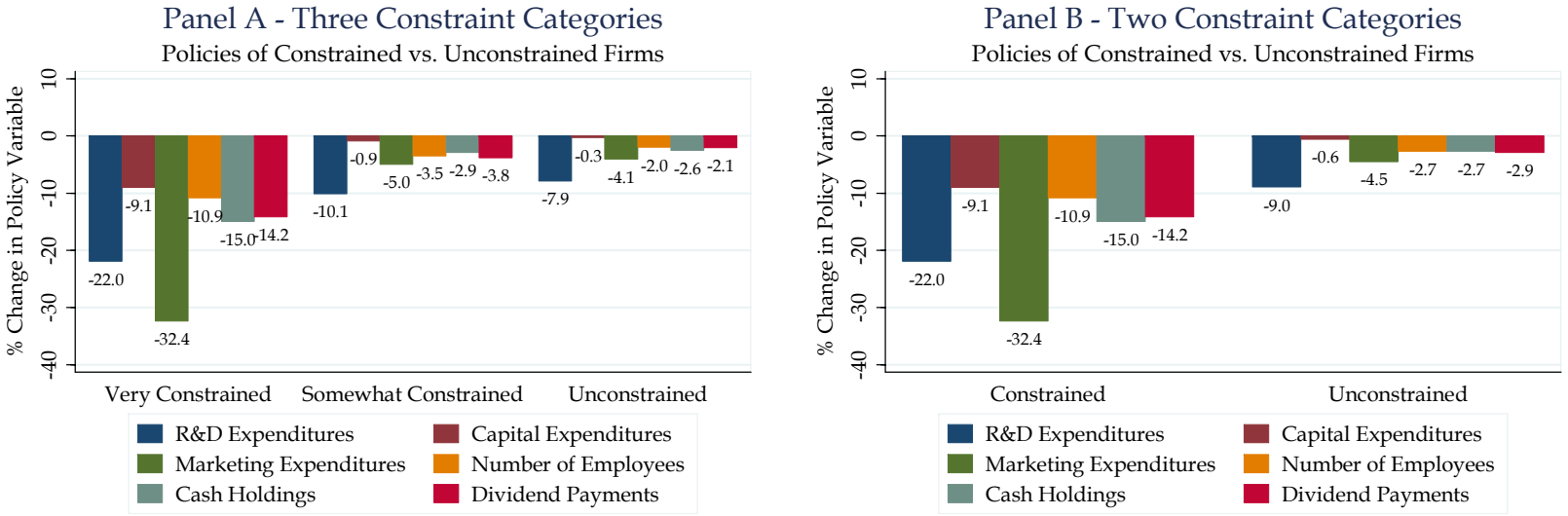

Figure 2: This figure displays U.S. firms' planned changes (% per year) in R&D expenditures, capital expenditures, marketing expenditures, total number of domestic employees, cash holdings, and dividend payments as of the fourth quarter of 2008 (crisis period). Responses are averaged across different degrees of financial constraint. See text for additional details.

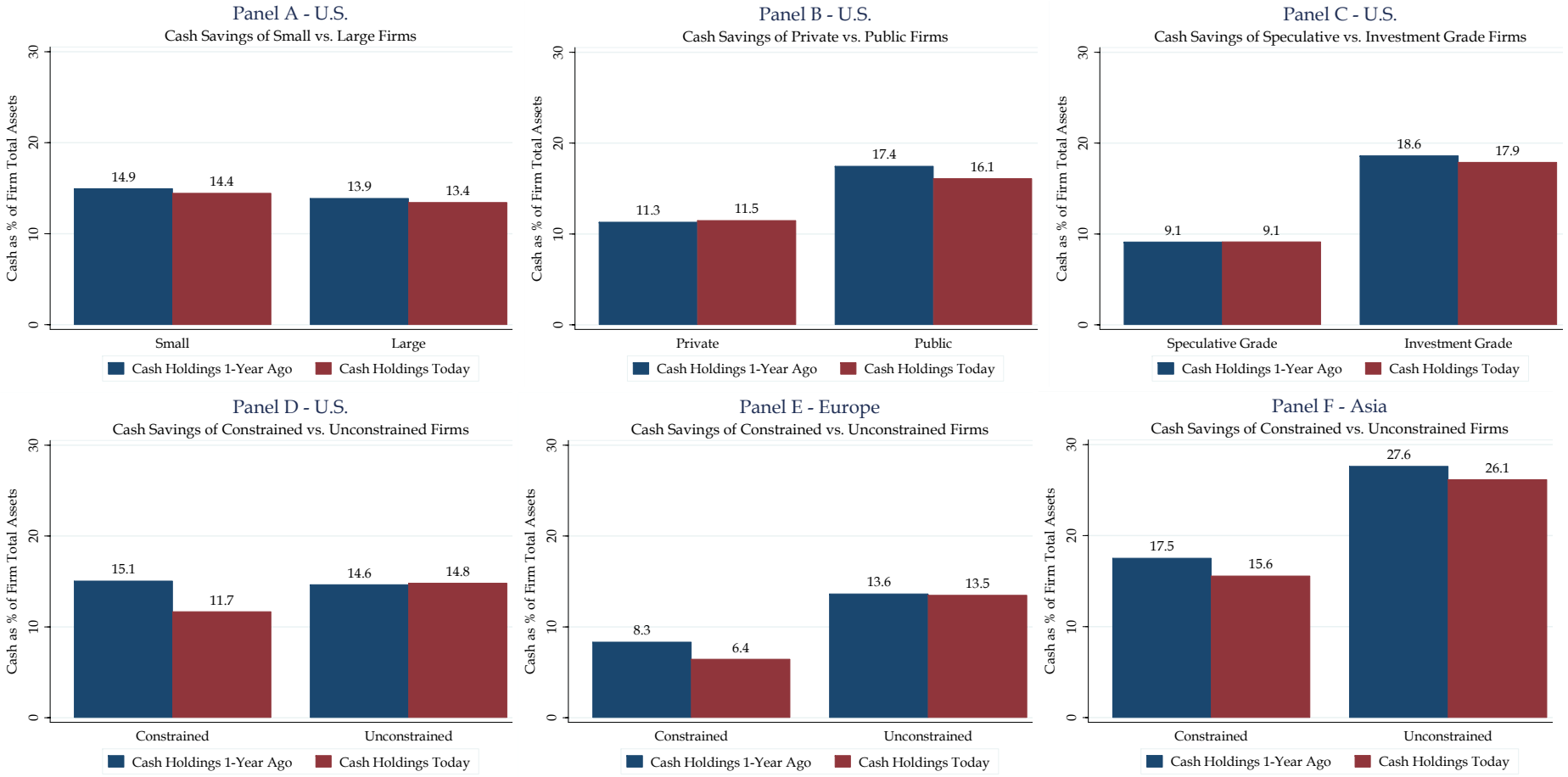

Figure 3: This figure displays firms' cash savings (the ratio of cash and liquid securities to total assets) at the time of the crisis (2008Q4) and one year prior. Responses are averaged within sample partitions based on size, ownership, credit ratings, and financial constraint. See text for additional details.

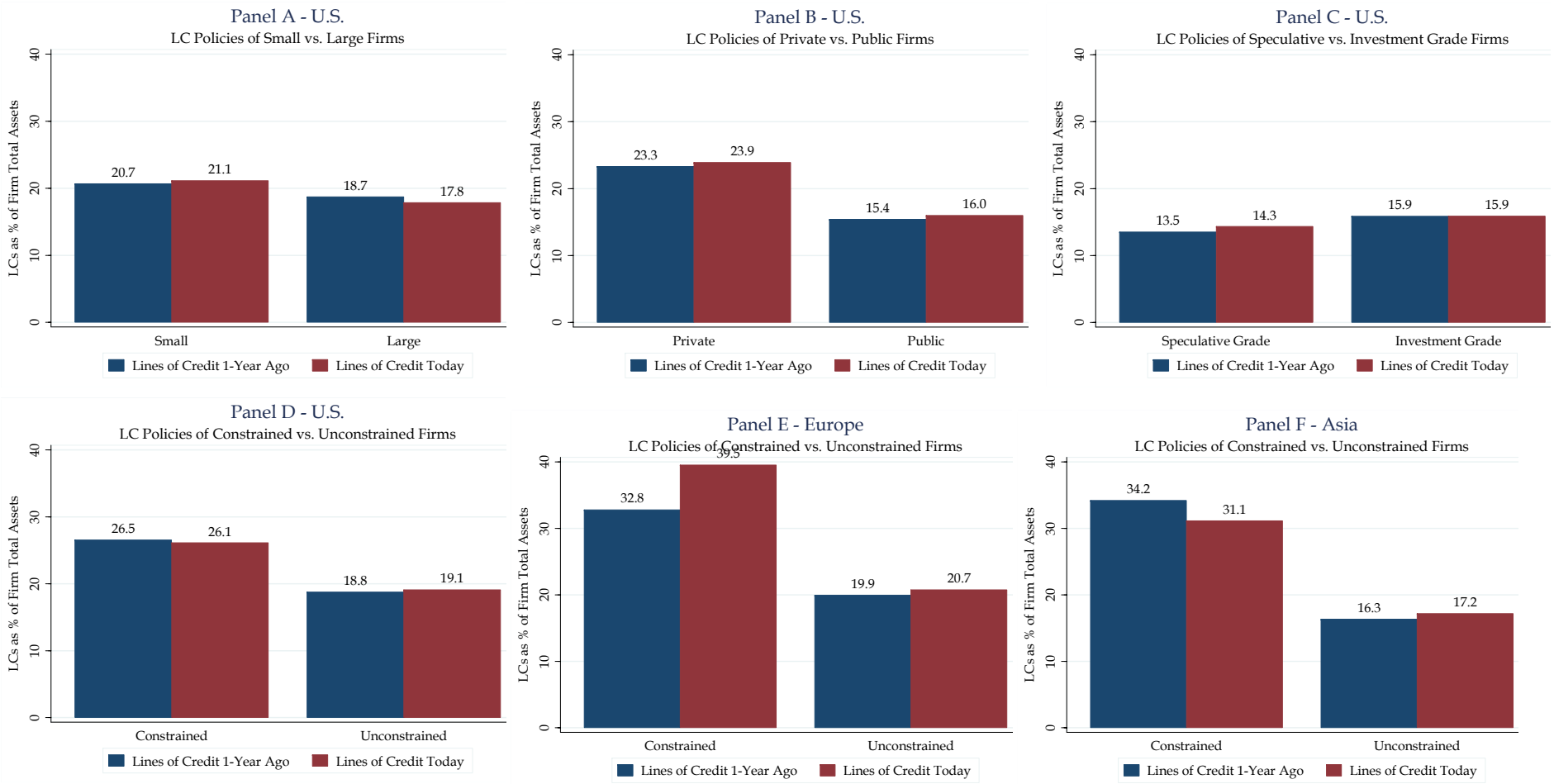

Figure 4: This figure displays firms' line of credit management (the ratio of LC to total assets) at the time of the crisis (2008Q4) and one year prior. Responses are averaged within sample partitions based on size, ownership, credit ratings, and financial constraint. See text for additional details.

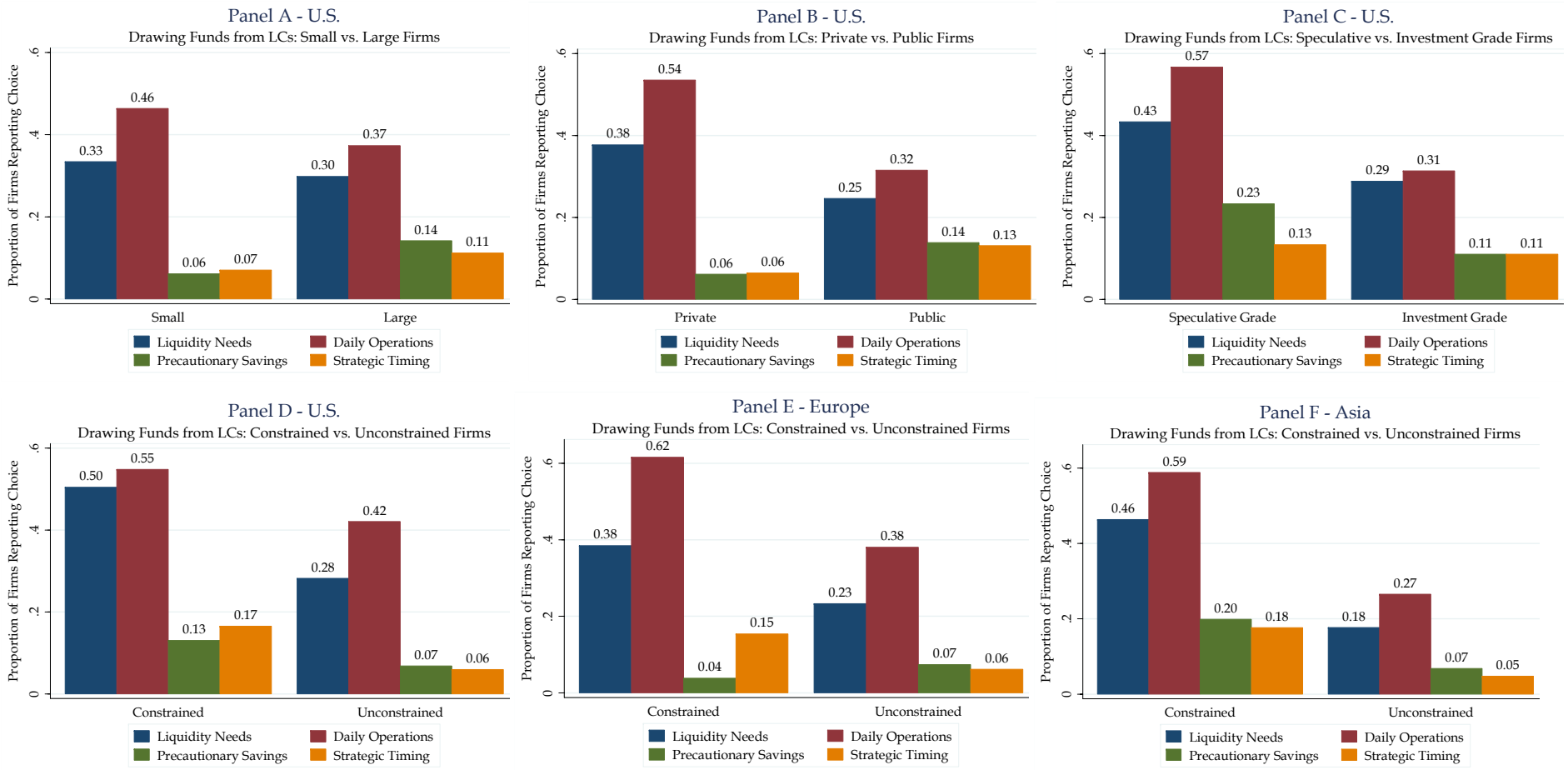

Figure 5: This figure displays firms' line of credit management (reasons for withdrawing funds from existing LCs). Responses are averaged within sample partitions based on size, ownership, credit ratings, and financial constraint. See text for additional details.

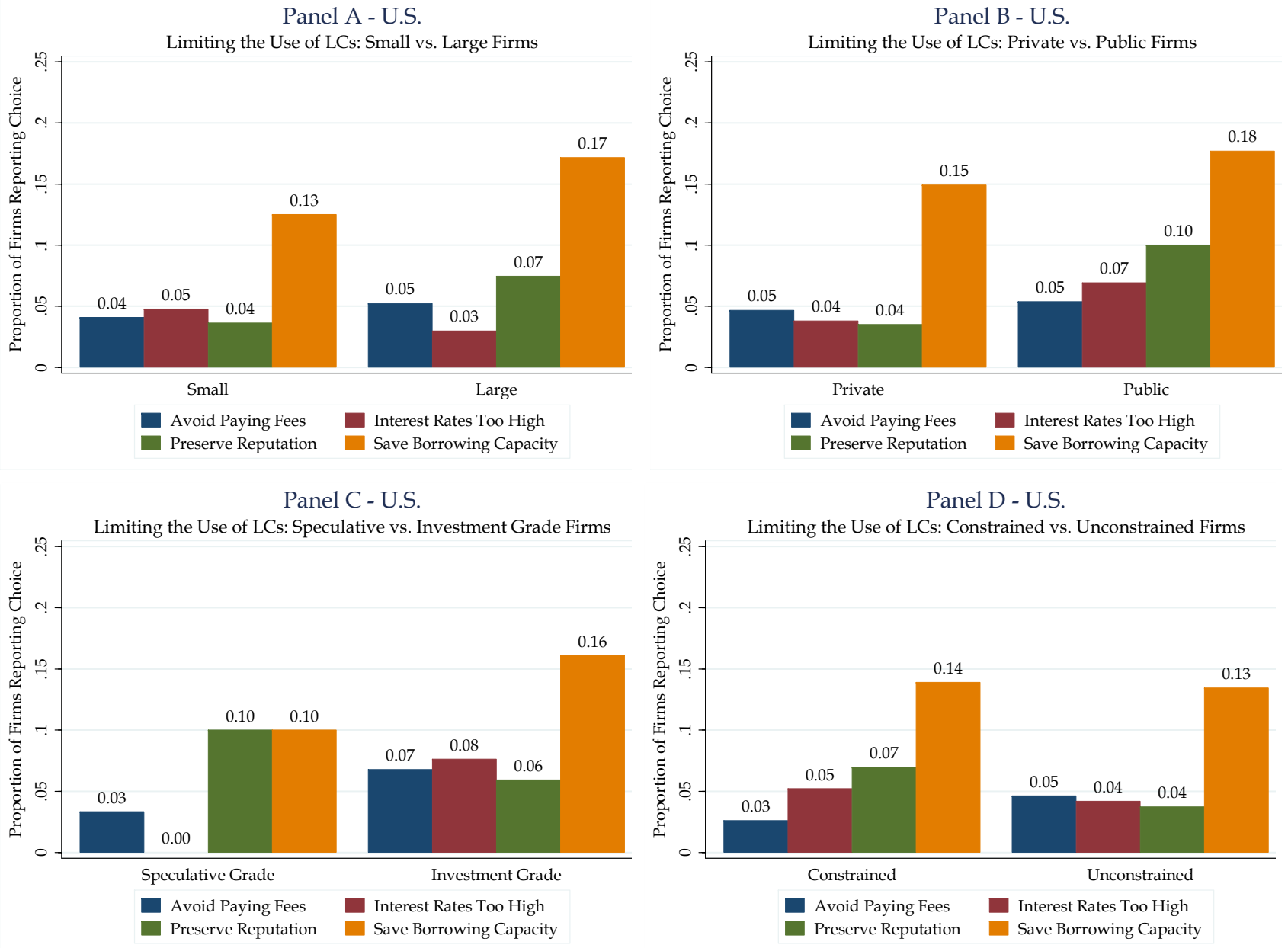

Figure 6: This figure displays firms' LC management behavior (reasons for limiting the use of existing LCs). Responses are averaged within sample partitions based on size, ownership, credit ratings, and financial constraint. Detailed information is only available from the U.S. and European surveys (only U.S. is displayed). See text for additional details.

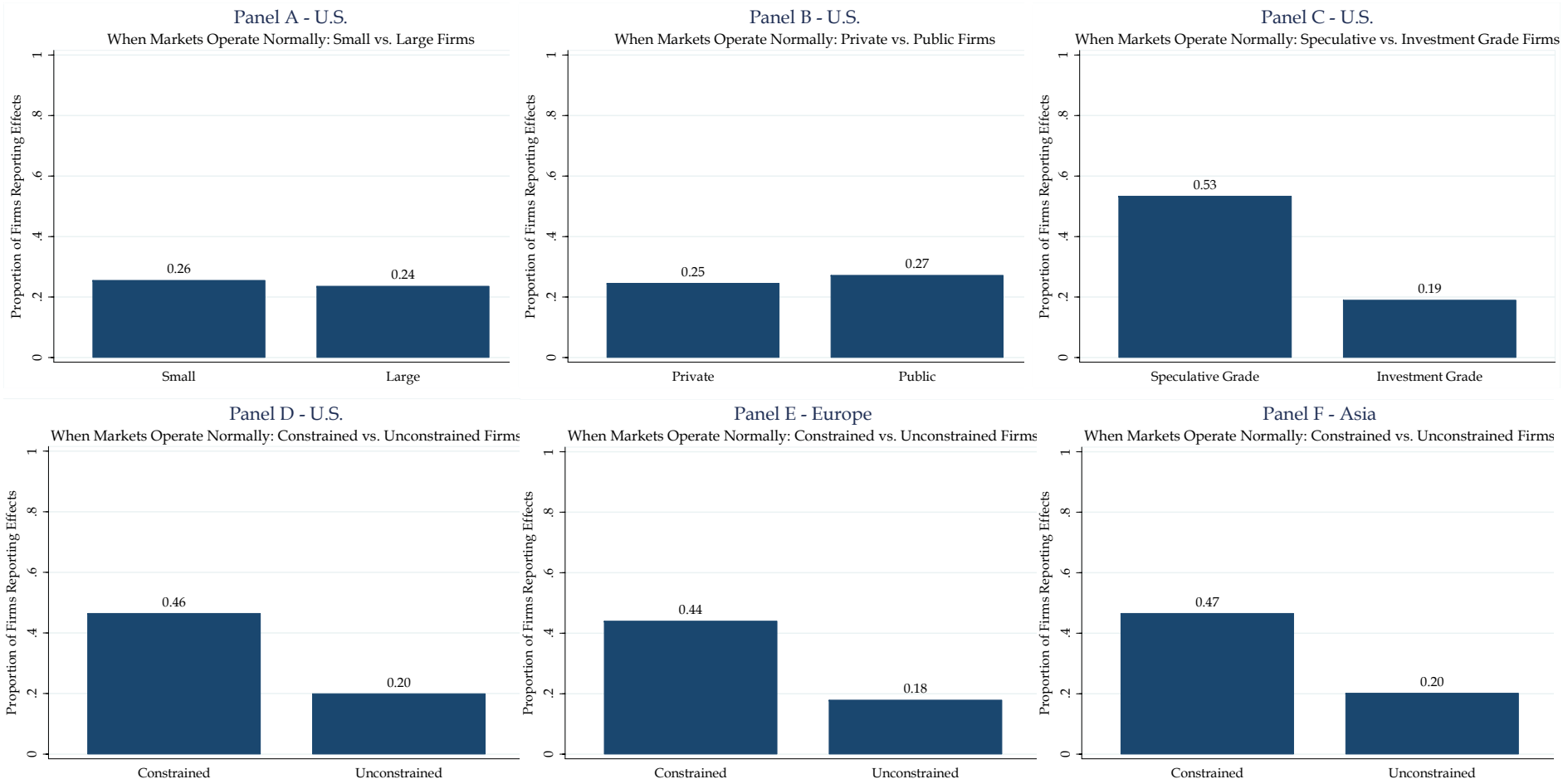

Figure 7: This figure displays the proportion of firms indicating that their ability to pursue attractive investment opportunities is linked to their ability to access external financing in "normal times." Responses are averaged within sample partitions based on size, ownership, credit ratings, and financial constraint. See text for additional details.

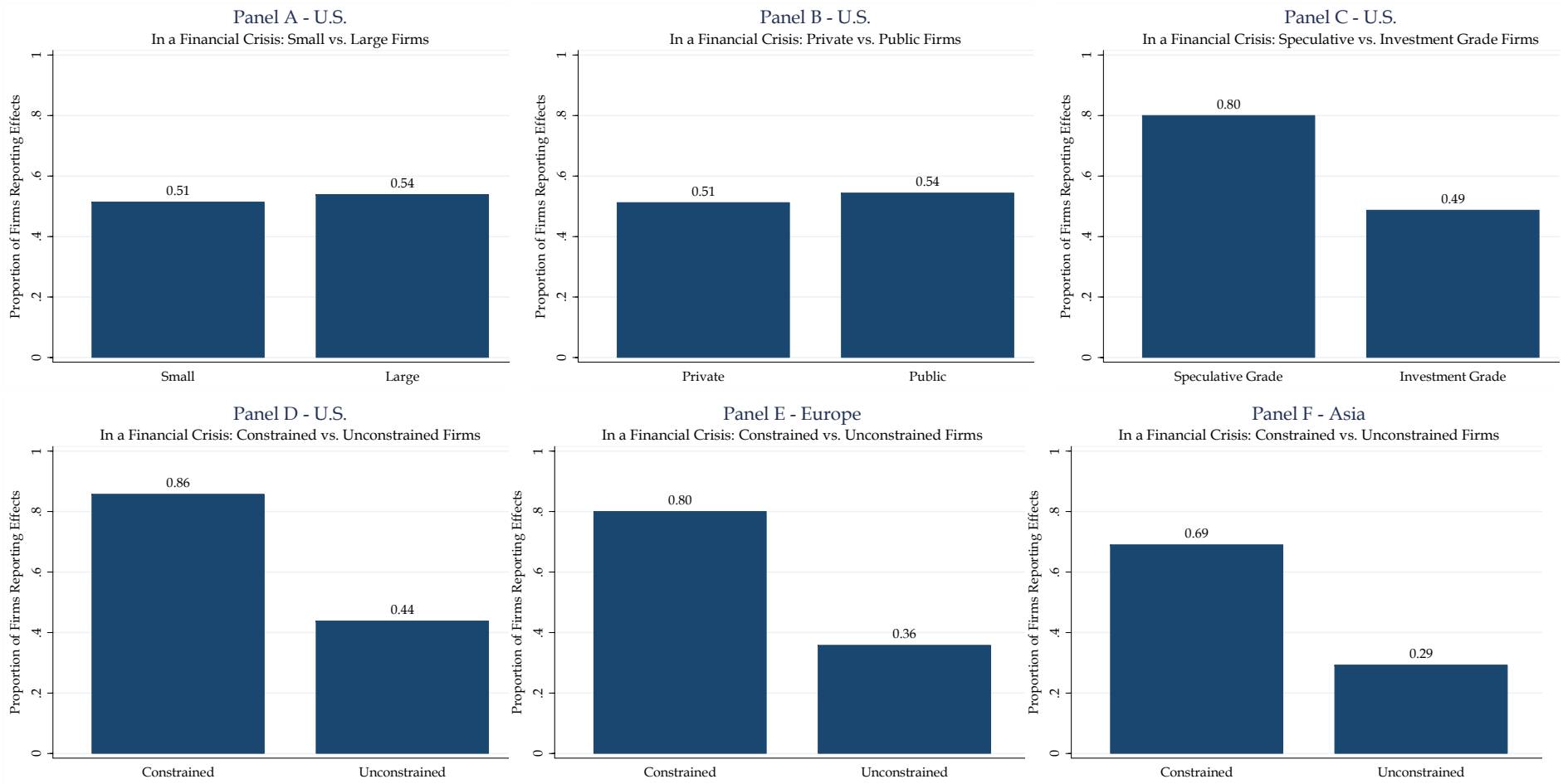

Figure 8: This figure displays the proportion of firms indicating that their ability to pursue attractive investment opportunities is linked to their ability to access external financing in the crisis period (2008Q4). Responses are averaged within sample partitions based on size, ownership, credit ratings, and financial constraint. See text for additional details.

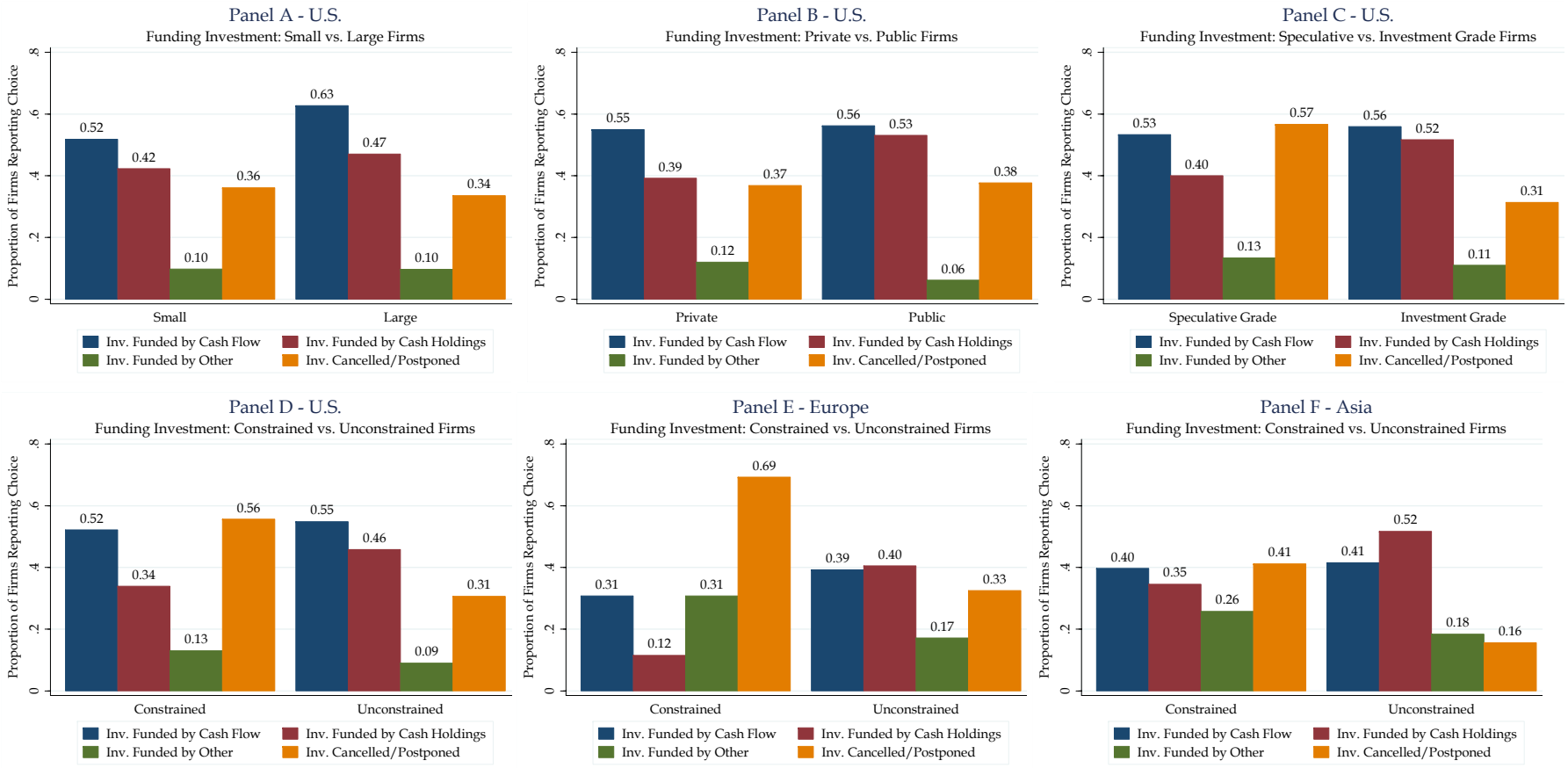

Figure 9: This figure displays the proportion of firms indicating how they fund their investment when external capital is limited. Responses are averaged within sample partitions based on size, ownership, credit ratings, and financial constraint. See text for additional details.