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Corporate culture and firm value: Evidence from crisis

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ABSTRACT

Based on the Competing Values Framework (CVF), we score 10-K text to measure company culture in four types (collaborative, controlling, competitive, and creative) and examine its role in firm stability. We find that firms with higher controlling culture fared significantly better during the 2008–09 crisis. Firms with stronger controlling culture experienced fewer layoffs, less negative asset growth, greater debt issuance, and increased access to credit-line facilities during the crisis. The positive effect of the controlling culture is stronger among the financially-constrained firms. Overall, the controlling culture improves firm stability through greater support from capital providers.

1. Introduction

Financial crises had never ceased to happen over the past decades; significant attention has been paid to the design of policy measures and governance institutions/structures that can effectively prevent such episodes and safeguard the stability of markets; however, the lesson from the 2008–09 financial crisis is that such measures/structures had seemingly failed to work. Recently, policymakers and scholars have turned their attention to social factors that may complement formal institutions, and they have increasingly discussed the importance of corporate culture in maintaining systemic and firm stability (see, e.g., Dudley, 2014; Financial Stability Board, 2014; Group of Thirty, 2015; Chaly et al., 2017).

For instance, in the banking sector, Thakor (2016) argues that bank culture complements capital regulations and promotes prudent risk-taking, adherence to ethical standards, value creation, and thus bank stability. Empirical evidence by, for example, Fahlenbrach et al. (2012), Ellul and Yerramilli (2013), and Nyugen et al. (2019) shows that bank culture shapes its risk-taking functions and lending practices, thereby having important implications for stability. Outside the banking sector, several studies argue and document that informal institutions such as a culture of trust or integrity help firms to foster an improved relationship with the labor forces and garner support from stakeholders during market downturns, thereby mitigating the negative impacts of market failures (e.g., Guiso et al., 2015; Lins et al., 2017).

In this study, we extend this line of inquiry by estimating firm-level measures of culture on a large sample of U.S. publicly-listed firms and examining whether and how culture may be related to firm performance during financial crises.

Since culture is nebulous and highly subjective, a working definition of corporate culture is required. To this end, we follow the managerial literature (e.g., O'Reilly, 1989; O'Reilly and Chatman, 1996) and define culture as "a set of values and norms" widely shared and firmly held by members of an organization. Under this definition, culture matters to firm performance due to its role as a social control mechanism over members' behaviors and choices via peer influence or social constructions.

Apart from a working definition, a cultural framework that is highly relevant to firm performance is needed. While a variety of cultural frameworks exists, we follow the managerial literature and recent studies (e.g., Fiordelisi and Ricci, 2014; Thakor, 2016;

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Nyugen et al., 2019) and utilize the "Competing Values Framework" (CVF).[1] The main advantage of the CVF is that it is objective, empirically derived using statistical techniques based on inputs from management theorists (Quinn and Rohbraugh, 1983), and sufficiently parsimonious to encompass a vast majority of *activities* organizations engage to create value (Thakor, 2016). Under the CVF, a firm's culture is classified into four distinct types: collaborative, controlling, competing, and creative, each pertaining to a series of organizational functions in value creation.

The collaborative culture is a "people" culture believing that teamwork, shared goals, and employee participation and feedback are key ingredients to firm successes. The second culture type is the controlling culture that emphasizes organizational reliability and stability; firms with strong controlling culture typically rely on standardized procedures in production, operations, and human resource management in achieving efficiency and accuracy. The third is the competitive culture that focuses on improving the firm's competitive position through transacting with external parties and maximizing market share, productivity, and profits. The fourth is the creative culture that emphasizes innovative and pioneering initiatives; creative firms actively research and develop new products and services, create visions of the future, and promote creativity, entrepreneurship, and risk-taking among employees.

To operationalize these culture types, we follow the approach of Fiordelisi and Ricci (2014) and apply textual analysis on companies' 10-Ks to score their cultural profiles. In particular, we parse each 10-K report using "bags of words" that should, in principle, capture behavioral aspects underpinning each of the four culture types. The four culture types are then measured as the frequency count of their respective synonyms divided by the total word count of the 10-Ks. Hence, for each firm-year, our textual analysis generates four culture scores that combine to form a relatively complete cultural profile. Validation tests show that the four culture variables capture various stylized firm and industry characteristics predicted by the CVF well.[2]

Using these firm-level measures, we investigate how culture affects firm stability by modeling the buy-and-hold stock returns of firms over the 2008–09 financial crisis as a function of their cultural traits, controlling for an extensive set of characteristic controls, factor risk exposure, and fixed effects. The culture variables are measured at the end of fiscal year 2006, that is, at least 15 months prior to the start of the crisis window. Our tests show that firms with strong controlling culture (*Control*) fared significantly better during the crisis, whereas the other culture types are insignificant. In quantitative terms, an interquartile increase in *Control* is associated with 2.3-percentage-point higher buy-and-hold stock returns over the crisis window, corresponding to approximately $81.8 million higher market value, given an average market capitalization of $3502 million at the beginning of the crisis window. The results are robust to using risk-adjusted returns, alternative specifications and samples, and the inclusion of additional controls for firm risk, social capital, corporate governance, and the tone and readability of the 10-K reports.

An implicit assumption of our tests is that the market is rational and stock prices in general reflect fundamentals well. However, shifts in investor sentiment, in the presence of limits-to-arbitrage and investors' behavioral bias, may cause prices to deviate from fundamental values and prevent such mispricing from being corrected (Baker and Wrugler, 2006; Stambaugh et al., 2012). Hence, our tests may suffer from the joint hypothesis problem (Fama, 1970) — abnormal returns may be caused by market inefficiencies, a bad asset pricing model (for risk-adjusting returns), or both. To circumvent this problem, we also examine a few alternative firm outcomes that do not rely on stock market information. Consistent with greater firm stability, the controlling culture is associated with a lower likelihood of receiving a credit rating downgrade, lower earnings volatilities, and higher firm profitability during the crisis.

Next, we investigate three potential channels through which the controlling culture might have mitigated value losses during the 2008–09 crisis. First, we find little evidence that it is associated with higher gross profit margin and sales growth. This suggests that support from upstream suppliers and/or downstream customers is unlikely to explain our findings. Second, although we find significantly fewer employee layoffs among the controlling firms during the crisis, their employee productivity remained largely unchanged — employee support is unlikely to drive the reduced losses we document.

The third channel is related to financing. As shown by Campello et al. (2010) and Duchin et al. (2010), capital-constrained firms planned deeper cuts in investment and employment during the crisis, and their ability to obtain external financing caused them to forgo attractive investment opportunities. Thus, if better financing helps mitigate value losses for the controlling firms, we should find that such firms have greater access to capital and make less or smaller cuts in investment during the crisis. We find empirical support for this channel. The controlling culture is associated with greater debt issuance during the crisis; the controlling firms also experienced smaller reductions in their asset bases during the crisis. A subsample analysis also shows that the positive association between the controlling culture and crisis abnormal returns is more pronounced among firms that were more financially constrained before the crisis.

Apart from this evidence, we search news articles and earnings call transcripts of companies scoring high in the precrisis controlling culture and find that some of these firms had credit line facilities, an important component in liquidity management (Jiménez et al., 2009; Sufi, 2009; Lins et al., 2010), extended and increased after the crisis unfolded. Motivated by this anecdotal evidence, we collect firm-level credit line data from Capital IQ and document large-sample evidence that the controlling firms who did not have credit line facilities prior to the crisis were more likely to receive access to credit lines and drew more credit from these lines than other firms during the crisis. Collectively, our evidence suggests that the controlling firms are more capable of absorbing negative shocks due to greater support from capital providers in the form of a more stable access to financing and credit facilities.

Next, we gage the extent to which our findings can be generalized to alternative crisis episodes. A first alternative episode we consider is the bursting of the 2000–02 technology, media, and telecommunication bubble (henceforth "the TMT bust"). Consistent with our main results, we find that the controlling culture is associated with higher buy-and-hold crisis stock returns, whereas the other three cultures are not. A second alternative episode is industry distress, defined as the years in which industry-median annual returns are negative following Acharya et al. (2007), which occurs more frequently. Again, firms with stronger controlling culture earn significantly higher returns during industry distress.

Finally, in further validation tests, we document that the controlling culture is associated with lower firm-specific and tail risk, fewer mentions of risk and uncertainties words during conference calls, smaller efficiency loss over time, and greater use of derivatives in hedging foreign exchange exposure, consistent with the CVF that controlling firms tend to have a more procedural and

[1] The CVF is named as one of the forty most important frameworks in the history of business (Ten Have et al., 2003).

[2] This text-analysis approach is consistent with the recent, growing literature that utilizes textual information to capture latent, qualitative characteristics of firms and managers (see, e.g., Hoberg and Maksimovic, 2015, 2021; for a review, see Loughran and McDonald, 2016).

standardized approach in management as well as more stringent risk management, lending further support to the validity of our culture measures.

Our paper contributes to the literature in several ways. First, we add to a growing body of finance research in corporate culture (e.g., Guiso et al., 2015; Graham et al., 2022). The most closely related paper to ours is Li et al. (2021) who adopt a semisupervised machine-learning approach, measuring corporate culture in five types, including *innovation, integrity, quality, respect*, and *teamwork*. Their approach begins with a set of seed words for each of the five culture types, trains word-embedding models on the text in earnings call transcripts to identify more words with similar contextual meanings, and measures the culture values based on the words' (weighted) occurrence in the transcripts. The authors document that a "strong" culture affects firm policies and is associated with better firm performance during bad times.

Our paper differs from theirs in several aspects. First, Li et al. (2021)'s cultural framework is based on often-mentioned values on S&P 500 companies' websites, whereas ours, the CVF, emphasizes on organizational activities that are expected to lead to value creation. Second, our culture dictionary is constructed based on synonyms from Cameron et al. (2006) and additional synonyms from the Harvard IV-4 Psychosocial Dictionary, whereas theirs is based on seed words extended by words identified via the estimated word vectors from the word-embedding models (i.e., a machine-learning approach).[3] Third, their corpus is the question-and-answers sections in earnings calls whereas ours is companies' 10-K reports. The validity of their measures depends on whether responses by company executives to questions raised by the attending analysts and buy-side investors capture the overall culture of a firm well. On the other hand, our culture measures are based on text in company 10-K reports that are expected to be consumed by a large number of investors and market participants and are likely prepared and approved by various company executives and employees of different levels. Finally, Li et al. (2021) examine the value implications of a *strong* culture instead of the 5 individual cultural values during bad times, whereas our focus is to examine how individual culture types affect firm performance during crisis times. Our results reveal that after controlling for Li et al. (2021)'s *strong* culture, the controlling culture as defined by the CVF and measured using text analysis on 10-K text remains significant in explaining crisis firm performance; the measures of Li et al. (2021) and ours appear to be capturing different value-relevant aspects of corporate culture.

Our study also adds to the recent, growing discussions among U.S. regulators and economists about the role of corporate culture in maintaining stability (Dudley, 2014; Financial Stability Board, 2014; Group of Thirty, 2015; Chaly et al., 2017). Thakor (2014), (2015), (2016), for example, argues that a strong bank culture is a form of "off-balance-sheet capital" that facilitates prudent risk-taking, adherence to ethical standards, value creation, and stability. Other studies posit that "risk culture" of banks determines their sensitivities to financial crises (Fahlenbrach et al., 2012; Ellul and Yerramilli, 2013). Relatedly, using 10-K-scored cultural values under the CVF, Nyugen et al. (2019) document that banks with more competitive culture have riskier lending practices, whereas lending by those with a more controlling culture is more conservative. Our study extends this literature by showing that the controlling culture contributes positively to firm stability using a comprehensive sample of U.S. publicly-listed firms.

A related literature examines the role of culture on organizational resilience. For instance, Lins et al. (2017) document that a culture of trust, captured by firms' socially responsible performance, helps to garner support from stakeholders and thus helps firms absorb negative losses during the 2008–09 financial crisis. Levine et al. (2018) show that firms in high-trust countries receive greater trade credits due to their trustful relationships with trading partners and thus are more resilient during banking crises. Ding et al. (2021) find that firms that are more socially responsible and those controlled by families fared significantly better during the recent COVID-19 pandemic. Our findings that the controlling culture is associated with milder drops in stock returns during the 2008–09 financial crisis are robust to controlling for corporate social performance and family control. It is important to highlight that although firms with strong controlling culture typically have more rigid and standardized systems in production, operations, and risk management (i.e., lower flexibility or agility), they do not necessarily have lower resilience during crises since the higher stringency and prudency of these systems may allow them to better anticipate and cope with the adversities brought by financial crises (Duchek, 2020).[4] Our evidence also relates to a body of interdisciplinary research examining the responses of organizations to adverse events such as disasters (for a review, see Linnenluecke (2017)).

Finally, our study also relates to four more strands of literature. The first examines the impact of culture on various firm policy choices, including managerial turnover (Fiordelisi and Ricci, 2014), investment and mergers and acquisitions decisions (Cronqvist and Fahlenbrach, 2009; Bouwman, 2013; Pan et al., 2017), the cost of debt financing (Giannetti and Yafeh, 2012; Hasan et al., 2017b), accounting conservatism and disclosure attributes (Kanagaretnam et al., 2014; Brochet et al., 2019), and tax planning (Hasan et al., 2017a; Kanagaretnam et al., 2018). The second follows a revealed preference approach, captures a firm's or its managers' cultural/personal traits by their manifested behaviors, and examines their influences on firm policies, including Fahlenbrach et al. (2012), Biggerstaff et al. (2015), Sunder et al. (2017), Bushman et al. (2018), etc. The third examines what firm, managerial, or regulatory attributes can lessen or worsen the adverse impact of financial crises and pandemic (see, e.g., Campello et al., 2010; Duchin et al., 2010; Beltratti and Stulz, 2012; Albuquerque et al., 2020; Ding et al., 2021) and the recoveries from these events (see, e.g., Reinhart and Rogoff, 2014; Ayyagari et al., 2011). Finally, we complement prior research on the CVF (see, e.g., Quinn and Rohrbaugh, 1983; Cameron and Quinn, 2006; Cameron et al., 2006; Thakor, 2016). Although there is no best framework and culture, our evidence suggests that the CVF is a value-relevant framework for diagnosing and managing company culture.

The remainder of our paper is structured as follows. Section 2 defines culture, explains the theoretical underpinnings of why culture matters for firm outcomes, and introduces the CVF. Section 3 explains our data sources, sample selection, and variable measurement. Section 4 presents our empirical results, and Section 5 concludes the paper.

[3] To gauge the extent to which the culture measures in Li et al. (2021) overlap with ours, in unreported analysis, we examine the pairwise correlations between their five culture measures with ours (all measured in fiscal year 2006). Our collaborative culture is most correlated with their *respect* culture (coefficient=0.08); our controlling culture is most correlated with their *quality* culture (coefficient=0.27); our competitive culture is most correlated with their *quality* culture (coefficient=0.29), followed by their *teamwork* culture (coefficient=0.22); our creative culture is most correlated with their *teamwork* (coefficient=0.35) culture, followed by their innovation culture (coefficient=0.18).

[4] The recent work by Duchek (2020) puts forth a new "resilience-as-a-process" framework to conceptualize organizational resiliency consisting of three stages: anticipation, coping, and adaptation.

2. Theoretical considerations

2.1. What is culture?

Culture is nebulous and can be defined in various ways. One view is that culture is the stock of knowledge shared by organization's members that provides a common language or shared knowledge of facts and behavioral rules (Crémer, 1993). Another view focuses on the role of culture in inducing cooperation and dealing with unforeseen contingencies in organizations, when contracts are incomplete or infeasible due to bargaining costs, moral hazard, and asymmetric information (Kreps, 1990). Apart from these views, a vast amount of managerial literature views culture "as a set of values and norms" that are widely shared and strongly held by an organization's members (O'Reilly and Chatman, 1996). Because most individuals care about other people around them, and if there is some mutual agreement about what constitutes appropriate behavior in the organization, they are under control when they are in the presence of other members. In this sense, culture is a social mechanism of control that regulates employee behaviors and choices through peer influences or social constructions (O'Reilly, 1989; O'Reilly and Chatman, 1996). This social-control function of culture complements formal control systems such as incentives, and it contributes to organizational effectiveness.

In this study, our definition of culture is most consistent with that by O'Reilly and Chatman (1996), asserting that culture matters for firm value through its role as a social control. This definition is consistent with prior theoretical studies based on neoclassical economic models (see e.g., Guiso et al., 2008, 2011; Tabellini, 2008), recent empirical work in finance (see, e.g., Guiso et al., 2015; Graham et al., 2022, as well as calls for more focus on risk culture in banking (see, e.g., Thakor, 2016).

2.2. Why does culture matter? culture as social control

There is a longstanding literature on how organizations use formal mechanisms such as budgetary, supervision, incentives, and others, to control collective activities. From a psychological perspective, individuals experience control when they are aware that the people who matter to them, such as their bosses or coworkers, know how and what they are doing (Dornbusch and Scott, 1975). In general, a formal control system monitors performance outcomes and behaviors, or both, and calibrates extrinsic rewards on a timely manner to direct job-related behaviors (Ouchi, 1979; O'Reilly and Chatman, 1996).

However, for several reasons, formal control systems are ineffective at times, especially when calibrating extrinsic rewards is difficult or infeasible (O'Reilly and Chatman, 1996). First, when jobs are ambiguous and the future is uncertain, desired behaviors may be difficult to identify. Second, what constitutes desired behavior could change over time due to technological developments and competitive forces. Third, because tasks differ in tangibility and difficulty of assessment, identifying and rewarding the most significant aspect of a job is often difficult and infeasible. Fourth, even if extrinsic rewards are calibrated accurately, the extent to which such extrinsic rewards motivate employees (as opposed to intrinsic rewards) is less clear from an economics perspective (Lepper et al., 1973; Bénabou and Tirole, 2003). Moreover, because direct supervision is costly and ineffective for certain jobs, employees whose marginal productivity cannot be readily observed are often not adequately rewarded by formal contracts, and thus do not fully internalize the benefits their efforts bring to the organization. Because the probability of being detected is likely low, they are tempted to reduce their efforts, which gives rise to moral-hazard problems (Eisenhardt, 1989; Guiso et al., 2015).

As a social control system, culture resolves the inadequacies of formal control systems and ameliorates moral-hazard problems. Because employees are under control when they are in the presence of other members of the organization, culture as social control could operate more extensively than formal control systems (O'Reilly and Chatman, 1996). When cultural values are established, for example, members who violate the norms, such as shirking responsibility or working suboptimally, are sanctioned and shunned by other members of the organization (O'Reilly, 1989). A strong organizational culture can also help attract or retain employees who share similar values or beliefs, thereby fostering intrinsic motivation and a sense of commitment (Guiso et al., 2015; Song and Thakor, 2019). Together, by increasing members' commitment and adherence to the organization's values and norms, culture complements traditional control systems in regulating employee behaviors and choices, and thus matters for organizational effectiveness.

Culture's role as social control may become more prominent and needed during market distress. When firms face great uncertainties and hardships, the regulating role of their formal control systems would become especially limited. For instance, due to increasingly unpredictable firm outcomes during market downturns, formal control systems may become less effective in assessing individual performance. A vast amount of literature documents an absence of relative performance evaluation in managerial compensation, and that poor performance is often attributed to managers based on factors out of their control (Jenter and Kanaan, 2015). As such, during downturns, employees who are not accurately rewarded or penalized and are fearful of job cuts or reduced benefits are less willing to work hard and make further firm-specific investments. Further, the increasing pressure on managers for performance improvement and cost reductions could generate more conflicts across organizational levels and among different stakeholders, thereby impeding coordination, productivity, and effectiveness (Pondy, 1967; Jehn, 1997).

2.3. Cultural frameworks

The extant literature on organizational culture is vast, and researchers have identified a variety of attributes and dimensions of culture. In this subsection, we outline a few widely acknowledged cultural frameworks.

Deal and Kennedy (1982) classify organizational culture into four distinct types, each of which is shaped simultaneously by two fundamental market-driven factors. The first is the degree of risk associated with the company's key activities; the second is the speed at which companies learn about whether their strategies/actions are successful. When the speed of feedback and degree-of-risk are both high, the "Tough-Guy, Macho" culture, which emphasizes individualism and risk-taking, is likely prevalent; when both are low, the "Process" culture, under which employees focus on getting the process right without measuring the actual outcome, is likely to be dominant. When the degree-of-risk is high but the speed of feedback is slow, companies may adopt a "Bet-Your-Company" culture, where employees take risk and expect the investment to be paid off only after years, as in the case of R&D-intensive firms. Finally, a "Work Hard/Play Hard" culture is likely found in businesses with low-risk activities but where success of actions can be immediately known. Employees under such culture maintain high level of energy and compete with colleagues in sales performance.

Another widely-applied framework is the Hofstede's (1980) cultural framework that identifies and rates more than 70 nations/countries in six cultural dimensions, including power distance, uncertainty avoidance, individualism, masculinity, long-term orientation, and indulgence, based on employee survey evidence (collected within IBM) between 1967 and 1973 (extended further

subsequently). A growing body of studies applies the Hofstede's national culture values to analyze the effect of culture on a number of firm policy choices and outcomes, including corporate investment (Shao et al., 2013), cash holdings (Chen et al., 2015), accounting conservatism (Kanagaretnam et al., 2014), corporate social performance (Ioannou and Serafeim, 2012), among others. Recent studies trace the ancestral countries of firms' executives and analyze whether and how their ancestral countries' cultural values may determine managerial behaviors and performance (e.g., Nguyen et al., 2018).

O'Reilly et al. (1991) develop the Organizational Culture Profile (OCP), an instrument that contains a 54 value statements for assessing the extent to which the preferences and values align between an organization and its participants. Factor analysis on the OCP responses identifies eight cultural values, including risk-taking, detail orientation, outcome orientation, aggressiveness and competitiveness, supportiveness, growth emphasis, a collaborative orientation, and decisiveness. In a follow-up work by O'Reilly et al. (2014), responses from a streamlined OCP identify six cultural values using factor analysis techniques, including adaptability, integrity, collaborative, results-oriented, customer-oriented, and detail-oriented. In a similar vein, Graham et al. (2022) interview and survey CFOs and CEOs of U.S. publicly-listed firms and have identified seven cultural values, the first six aligning with those by O'Reilly et al. (2014) and the extra dimension is "community".

Guiso et al. (2015) score the web pages of S&P 500 firms, analyze the key words related to culture used in the relevant sections on these pages, and have identified nine categories of advertised cultural values, including integrity and ethics, teamwork and collaboration, creativity and innovation, respect and diversity, quality and commitment, health and safety, community, communication, and hard work/diligence. While such advertised cultural values are shown to be uncorrelated with firm performance in their analysis, they show survey-based evidence (based on Fortune 100 firms) that a culture of integrity significantly drives firm value. Building upon Guiso et al.'s (2015) identified cultural values, Li et al. (2021) take the five most-mentioned ones and apply machine-learning and text-analysis techniques to score corporate cultures from companies' earnings calls transcripts.

Another cultural framework that has received wide attention from scholars and practitioners is the Competing Values Framework (CVF), developed by Quinn and Rohrbaugh (1983), Quinn (1988), and Cameron and Quinn (2006). The underlying objective of the CVF is to serve as a unifying cultural framework that can integrate the many cultural dimensions identified in the extant literature. The CVF was initially developed from a set of 30 organizational-effectiveness indicators generated from an extensive review of the relevant literature by Campbell et al. (1974). To explore how organizational effectiveness is perceived, Quinn and Rohrbaugh (1983) analyze these effectiveness criteria and ask over 40 organizational theorists and researchers to gage the conceptual similarity between pairs of criteria. A statistical procedure was then applied to the judgment data, identifying two dimensions (flexible vs focused; internal vs. external) that combine to form four cultural values/quadrants (*collaborate, control, compete*, and *create*). The first (second) differentiates an emphasis on flexibility and adaptability (internal orientation focusing on integration and collaboration) from that on stability, order, and control (external orientation focusing on market factors and competition).

As outlined above, a variety of cultural frameworks exists; there are similarities across frameworks but the focus of each framework may differ. While there is no perfect or "correct" cultural framework, we adopt the CVF for three reasons. First, the two cultural dimensions and the four culture types of the CVF are empirically derived using statistics techniques based on inputs from various management theorists, and they are thus sufficiently parsimonious to encompass a vast majority of *activities* organizations engage to create value (Thakor, 2016). Such organizational activities include, for example, the collaborative work/activities of participants, risk-management and internal-audit functions, market-driven activities to increase competitiveness and market share, as well as innovative, R&D, and risk-taking activities. Although the categorization of organizational activities into a two-by-two cultural framework is overly simple and likely fail to fully capture the complexities and nuances within an organization (Pollock and D'Adderio, 2012), the CVF can at least be viewed as an empirically-derived and internally-valid tool for quantifying cultural profiles of organizations.

Second, the CVF integrates and captures (in part) cultural dimensions/values of other frameworks. For instance, the CVF's *collaborate* culture overlaps with *teamwork/collaboration* of Guiso et al. (2015) and the *collaborative* culture of O'Reilly et al. (2014) and Graham et al. (2022); the CVF's *control* culture captures similar cultural values as in the "Process" culture of Deal and Kennedy (1982), *health and safety* of Guiso et al. (2015) and *detail orientation* and *risk-taking* of O'Reilly et al. (1991); the CVF's *compete* corresponds to *outcome orientation, aggressiveness and competitiveness,* and *growth emphasis* of O'Reilly et al. (1991) and resembles the "Work Hard/Play Hard" of Deal and Kennedy (1982); the CVF's *create* culture is similar to the *creativity and innovation* culture of Guiso et al. (2015), the "Bet-Your-Company" culture of Deal and Kennedy (1982), and the *risk-taking* culture of O'Reilly et al. (1991). Note, however, that the CVF does not explicitly focus on the more "sentimental" aspect of cultural values, such as integrity and respect (Guiso et al., 2015); instead it places emphasis on the cultural values embedded in organizational activities that are expected to enhance value.

The third reason is that the CVF has received increasing policy and scholarly attention over the recent years. For instance, Thakor (2016) advocates that the CVF can be applied to measure banking institutions' cultural profiles; Nguyen et al. (2019) show that US banks' cultural profiles measured by analysing 10-K reports under the CVF determine the riskiness in their lending practices; Fiordelisi and Ricci (2014) show that 10-K-scored cultural measures under the CVF explains CEO turnovers. We aim to contribute to these strands of literature by showing that cultural values under the CVF are value-relevant during market downturns, complementing other work that has adopted alternative cultural frameworks (e.g., Guiso et al., 2015; Graham et al., 2022).

2.4. Introducing the Competing Values Framework (CVF)

The CVF is best described graphically. In Fig. 1, the upper-left quadrant represents the collaborative culture, which emphasizes shared goals, cohesion, teamwork, staff involvement, and commitment to employees. Firms with strong collaborative culture typically have semiautonomous work teams, rewards based on team accomplishments, systems that encourage employee feedback, and environments that facilitate employee participation and loyalty. Such firms have relatively thin organizational hierarchies, high employee ownership, and high employee participation in decision-making.

The lower-left quadrant represents the controlling culture that emphasizes stability, predictability, and efficiency in the workplace. Firms with strong controlling culture typically have standardized procedures and multiple hierarchical levels of management. The main objectives of such firms are to maintain efficient, reliable, fast, and fault-proof production and operations. The training offered to employees and their job descriptions are also highly procedural, allowing for little discretion. An example is McDonald's, where operating efficiency and quality control are achieved by

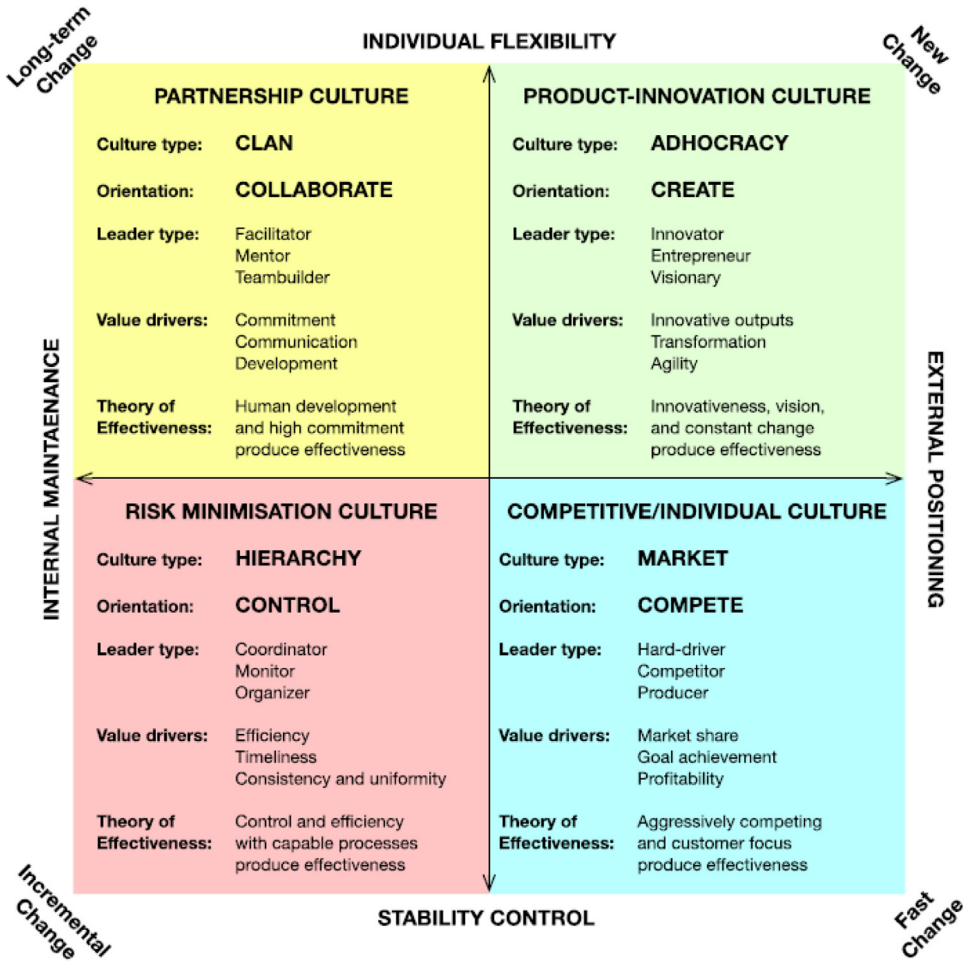

Fig. 1. The competing values framework (CVF) (Source: Cameron et al., 2006).

standardized procedures in production, logistics, and human resource management.

The lower-right quadrant represents the competitive culture, which focuses on competition and external environments. The competitive culture emphasizes that organizational control is achieved by focusing on creating competitive advantages through transacting with external parties. The main objectives are to maximize profitability, bottom-line results, market share, competitiveness, and productivity. Firms with strong competitive culture commonly assert that because external environments are hostile and customers are difficult to satisfy, they must actively improve their competitive positions by driving productivity and profits.

Finally, the upper-right quadrant represents the creative culture, which asserts that organizational success comes from innovative and pioneering initiatives. Typically, firms with creative culture actively research and develop new products and services, create visions of the future, and promote creativity and entrepreneurship among employees. Moreover, such firms do not have a hierarchical style of management and often encourage individuality, creativity, and risk-taking. These organizations often have temporary and flexible structures that can be easily altered to suit the requirements of clients or projects. The creative culture is often dominant in industries such as aerospace, filmmaking, and technology, where flexibility and responsiveness are important for competitiveness and success (Cameron and Quinn, 2006).

A limitation with the CVF as well as any other cultural frameworks is that one must pigeonhole or force a firm into a relatively small number of cultural dimensions, which may be less appropriate for those companies that do not have dominant or well-defined cultural traits. Such categorization of company culture would also miss out other cultural traits of the firm that may be important to firm performance, inducing measurement errors and validity issues. Nonetheless, we are hopeful that such issues are unlikely to be severe, since the CVF is empirically derived and encompass a vast majority of activities organizations do to create firm value. Further, such issues highlight the importance of validating our culture measures empirically (see Section 3.3).

2.5. The link between culture and firm value during financial distress

Whereas culture matters for firm value through its social control role and such role may become more important during crises, the different attributes and dimensions of culture may have different implications for firm value during market downturns. Here we discuss how each of the four culture types as theorized by the CVF may imply for firm value during market distress.

To begin with, there are competing predictions about the relation between the collaborative culture and firm value during bad economic times. On one hand, firms with stronger collaborative culture likely receive support from employees who are more committed (McGregor 1960; Flammer and Kacperczyk, 2016) and willing to accept lower compensation to help firms weather the negative shocks. On the other hand, given their emphasis on employee participation and human capital investment, such firms are likely to have more fixed costs, or operating leverage, and be less willing to downsize workforce (Banker et al., 2013; Simintzi et al., 2015),

thereby exposing them to greater risks, cash flow problems, and losses during crises.

Firms with stronger controlling culture may better survive hardships because of their more formal and detailed procedures for internal audit and compliance, self-regulation, and risk management. During market distress, such firms, benefiting from their better-organized procedures and plans, are likely more capable of solving contingencies, absorbing negative shocks, and limiting losses. In addition, given their higher organizational stability, such firms may not make large job and salary cuts, which helps maintain employee morale and productivity (Kube et al., 2013). Firms with stringent risk controls may also have greater solvency, lower cost of capital, and more stable access to external financing, as creditors who trust their risk-management quality may be more willing to lend to them even during crisis times (Levine et al., 2018; Lins et al., 2017). As such, these firms could make smaller cuts in capital spending and continue to invest in attractive projects. On the other hand, if internal plans and procedures are too detailed, complex, and bureaucratic, such firms may be slow in responding to external shocks and suffer prolonged losses because they cannot adapt quickly (Youssef and Luthans, 2007; Ortiz-De-Mandojana and Bansal, 2016).

The competitive culture asserts that the external market is hostile and success only happens by developing competitive advantages through transacting with external parties. Because dominant competitive firms tend to have a solid market shares and stable customer bases, their pricing and sales are generally less elastic to negative shocks. As such, they may incur smaller losses and be more resilient during and after a crisis than other firms. However, these firms tend to focus excessively on bottom-line results, cost savings, and extrinsic rewards to direct job-related behaviors. During crises, to keep costs down, such firms are more likely to cut jobs and salaries, and thus may have less supportive and productive workforces.

Lastly, firms with strong creative culture typically invest heavily in R&D, have a flexible organizational structures, and promote entrepreneurial thinking and risk-taking among employees. Such firms tend to have a high proportion of irreversible costs and uncertain payoffs that depend on the outcomes of their research projects (Kothari et al., 2002; Berk et al., 2004). During crises when capital becomes constrained, they are prone to cash-flow problems and may incur losses if certain projects are suspended or discontinued (Li, 2011). Alternatively, such firms could outperform others if their high flexibly and adaptability to external environments allow them to adapt quickly. Moreover, with a workforce characterized by individualistic thinking and high intrinsic motivation, they may benefit from greater employee support and productivity during a crisis (Lins et al., 2017).

To summarize, given the competing arguments, the relations between the CVF's cultural types and firm performance during bad times are ambiguous and they may depend on the extent to which the benefits of a strong cultural value are offset by its potential costs. The questions of whether the four cultural types can enhance or impede firm value during market downturns are ultimately empirical.

3. Data and variable construction

3.1. The data

Our samples are constructed using several databases. As for the culture variables, 10-K reports filed by all U.S. publicly listed firms with the SEC are retrieved from the EDGAR portal for the period from 1997 to 2013. Stock information, including monthly closing prices, holding-period returns, shares outstanding, and trading volume, are from CRSP. Income statement and balance sheet information (both annual and quarterly) are downloaded from the Compustat annual and quarterly databases. Personal characteristics of CEOs and other top executives are from ExecuComp; data on boards of directors are from RiskMetrics; institutional ownership data are from the Thomson Reuters Institutional Holdings (13F) database; family and managerial ownership information is from the Bureau van Dijk Orbis database. A firm-level antitakeover index is downloaded from Bebchuk et al. (2009) and extended using RiskMetrics data. Data on firm-level corporate social performance (CSP) are collected from the MSCI KLD database. Industries are defined using the Fama-French 49-industry classification, unless stated otherwise.

3.2. Measuring corporate culture – a textual analysis approach

We follow the procedures of Fiordelisi and Ricci (2014) and employ a text-analysis approach to measure firm-level culture. Textual analysis is a systematic and objective technique to examine writing characteristics and patterns. Due to increased computing power and online availability of company filings and news articles, this technique has been increasingly applied by accounting and finance researchers in extracting and analyzing qualitative, semantic information about companies and managers, such as investor disagreements, personal behavioral traits, and other data.[5]

We follow extant studies in applying text analysis on companies' annual 10-K reports and argue that such approach has a few advantages. First, as the most comprehensive and detailed single source of financial information available to investors, 10-K reports often contain significant information about firm performance and financial positions not provided by other communications (e.g., earnings announcements and press releases) (Griffin, 2003). Prior studies show that a wide range of investors and market participants, including, e.g., institutions, analysts, individual investors, and regulators, actively access and consume the information contained in the 10-Ks and significantly react to their announcements (see, e.g., Griffin, 2003; Asthana et al., 2004; Gibbons et al., 2021). As such, as a primary means of communication to outside investors, companies likely include, mention, and discuss in good details a significant portion of their value-relevant business and financial activities in these reports, including those relating to their business strategies, products and services, market segments, organizational structure, supply chains, and risk exposure.

Second, a growing body of research documents that the linguistic content and tone in 10-K reports captures various aspects of firms' business and financial positions well, such as the extent of capital constraints (Bodnaruk et al., 2015 Hoberg and Maksimovic, 2015), the degree of competition (Li et al., 2013), product life cycles (Hoberg and Maksimovic, 2021), etc. The evidence from these studies suggests that the textual information in 10-K reports is unlikely to be purely boilerplates or irrelevant discussions and indeed captures important value-relevant information relating to their business activities.

Finally, measuring company culture using textual analysis on 10-K reports facilitates better replicability because the reports can be readily accessed and batch-downloaded via the SEC EDGAR system, while other company text documents such as earnings call transcripts are often only available on a subscriptions basis (e.g.,

[5] For instance, Antweiler and Murray (2004) analyze text on internet stock message boards and document that their bullishness predicts market volatility; Tetlock et al. (2008) examine the linguistic content of financial media reports, documenting that negative words in firm-specific news stories convey negative information about earnings and stock returns; Hoberg and Maksimovic (2015) construct a new measure of financial constraints using text analysis on 10-K filings; for a survey of the application of textual analysis in economics, accounting, and finance research, please see Loughran and McDonald (2016).

from the Thomson Reuters Street Events via WRDS). Given the relative ease in estimating corporate culture under our approach, our findings may yield wider implications for investors or analysts who are seeking to identify value-relevant factors.

To estimate the collaborative, controlling, competitive, and creative culture, a comprehensive set of synonyms is created for each cultural type using a two-step procedure that minimizes researcher subjectivity. First, we obtain a set of synonyms from Cameron et al. (2006) for each culture. Second, other synonyms are added to the sets by searching selected words in the Harvard IV-4 Psychosocial Dictionary, which is a widely used, independent source of word classification. The two-step procedure yields a list of synonyms for each culture. For instance, words such as "people," "teamwork," or "cooperat(e)" ("perform," "pressur(e)," and "profit") suggest a collaborative (competitive) culture. Appendix A.2 provides the full list of synonyms.[6] For each firm in any given fiscal year, the culture variables, i.e., the collaborative (*Collaborate*), controlling (*Control*), competitive (*Compete*), and creative (*Create*) culture, are defined as the frequency counts of their synonyms relative to the total word count. To illustrate, a value of 0.05 for *Compete* indicates that synonyms for the competitive culture constitue 5% of the total word count on the 10-K report for a given firm-year. Hence, for each firm in a given year, the text analysis generates four culture scores that form a relatively complete cultural profile.

3.3. Summarizing and validating our corporate culture measures

Table 1 describes the four culture variables for all firms with available culture information from 1997 to 2013 (8472 firms and 55,091 observations).[7] Panel A reports summary statistics and pairwise correlations. The mean (median) *Collaborate, Control, Compete*, and *Create* are 0.63% (0.56%), 1.83% (1.83%), 1.88% (1.90%), and 1.23% (0.93%), respectively. As shown in the last four columns, the largest correlation refers to the one between *Control* and *Compete*, with a coefficient of 0.46, whereas coefficients for the other pairs range from −0.33 to 0.14. In Table OA.1 of the online appendix, the names and Fama-French 12 industries of the ten companies that score the highest in each of the four cultures (time-series averages) are reported.

A caveat in our study is that the culture variables are measured with errors. The underlying rationale for the textual approach is based on the assumption that company culture, which develops gradually, determines word choice and expressions in the 10-K reports. Such an approach has limitation because analyzing word content only captures corporate culture to the extent that cultural traits could manifest themselves in written reports. If some cultural attributes are difficult to express in writing, the proxy variables would subject to measurement errors and never fully capture culture. In addition, the culture-related synonyms on the 10-K reports may capture advertised values — cultural values that firms choose to advertise regardless of whether such culture exists (Guiso et al., 2015). Moreover, parts of the 10-K reports are often determined by the companies' in-house legal departments. If legal departments vary systematically across companies, the word choice and expressions in the 10-Ks may be influenced by such heterogeneity, thereby creating further noise to our measurement. For these reasons, the internal validity of our four culture variables must be verified empirically.

To examine the validity of our culture proxies, we analyze their correlations with various firm characteristics relating to employee relations, risk management, growth, and innovative activities.[8] Results from these validation tests are reported in panel B.

Columns (1) to (2) show that collaborative firms are positively and significantly associated with a greater employee base per million dollar asset employed (*Emp/TA*) and a greater firm spending on labor-related costs, as captured by selling, general, and administrative expenses (*ln(1+SG&A)*). On the contrary, creative firms tend to have fewer employees and thus spend less in SG&A expenses. In column (3), we find that both collaborative and creative cultures are associated with significantly better employee treatment and diversity performance, captured by the sum of the total strength scores of the employee and diversity dimensions of the MSCI KLD data. This is consistent with firms dominant in such cultures valuing labor participation, workplace diversity, creativity, and entrepreneurship among employees to a greater degree. On the other hand, controlling firms are shown to have lower employee and diversity strength scores.

Columns (4) to (5) analyze two firm risk characteristics. Our results reveal that both the collaborative and controlling culture are associated with lower cash-flow volatilities and a greater modified Z-score. This finding is consistent with the CVF that collaborative firms may benefit from a greater support from employees and thus are better able to prevent firm distress; moreover, controlling firms likely have more standardized and efficient procedures in production, operation, internal controls, and risk management. On the other hand, competitive and creative cultures, which "compete" with the collaborative and controlling culture in the CVF, respectively, are shown to associate with higher cash-flow volatilities and greater distress risk. This is consistent with the view that competitive firms emphasize on achieving sales growth via taking risk while creative firms encourage individuality and risk-taking among employees and tend to invest in R&D projects that are irreversible, opaque, and have uncertain payoffs.

Columns (6) to (8) examine how the culture variables are correlated with measures of growth and market competition (Herfindahl-Hirschman Index (*HHI*) based on 3-digit-SIC-industry sales). Consistent with an orientation towards increasing growth and market share, firms with strong competitive culture experience significantly higher annual growth in both sales revenue and fixed assets. On the contrary, the collaborative and creative cultures are shown to be negatively and significantly associated with asset growth, consistent with collaborative firms focusing mainly on the development and growth in employees and creative firms investing mainly on intangible assets. As for market competition, as column (8) shows, all cultures except the controlling culture are negatively associated with *HHI*.

Finally, in columns (9) to (11), we test whether the culture variables capture the level of firm commitment in R&D and innovative activities. Consistent with the belief that pioneering and innovative initiatives are key to organizational success, creative firms are shown to incur larger R&D expenditure, filed more patents (that are eventually granted), and are more likely to be listed as a R&D leader in their industries. Interestingly, collaborative firms are shown to invest less in R&D and file fewer patents. Such evidence suggests that such firms, while heavily invested in human capital, do not have a business model that emphasizes innovation or creativity.

[6] Note that our bags of synonyms differ from and advance those reported in Fiordelisi and Ricci (2014) that may contain synonyms that are less relevant. To ensure that our newly defined bags of words are highly relevant and valid, the initial set of synonyms are further evaluated and cross-validated by two of our researchers independently.

[7] Our sample begins in 1997 because several variables, which used data from the MSCI KLD database, in the validation test in panel B of Table 1 are only available from 1997 onward. In unreported analysis, extending our sample to as early as 1994 for the outcome variables that do not rely on MSCI KLD data does not affect our conclusion. These additional results are available upon request.

[8] In each model, each of these characteristics is regressed on the four culture variables, lagged firm controls, and industry and year fixed effects. Linear probability models are estimated when dependent variables are binary variables. Standard errors are clustered at the firm level.

Table 1
Summarizing and validating our culture variables.

Panel A. Summary statistics (full sample; $N = 55{,}091$; 8472 firms)

					Correlation			
	Obs.	Mean	Stdev	Median	*Collaborate*	*Control*	*Compete*	*Create*
Collaborate	55,091	0.627%	0.356%	0.562%	1.000			
Control	55,091	1.828%	0.561%	1.832%	0.100	1.000		
Compete	55,091	1.878%	0.689%	1.899%	0.136	0.461	1.000	
Create	55,091	1.227%	1.156%	0.913%	−0.265	−0.307	−0.328	1.000

Panel B. Validation tests

	Emp/TA	*ln(1+SG&A)*	*Employee/Diversity*	*CFVOL*	*Modified Z-score*	*ΔSale*	*ΔPPE*	*HHI*	*ln(1 + R&D)*	*ln(1+Patent)*	*R&D leader*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Collaborate	0.077***	6.131*	7.405**	−0.256***	24.160*	−1.108*	−2.288***	−4.743***	−8.022***	−1.493**	0.106
	(0.019)	(3.696)	(3.490)	(0.089)	(12.748)	(0.637)	(0.734)	(1.560)	(2.478)	(0.719)	(0.567)
Control	0.021	0.510	−15.957***	−0.394***	63.968***	−0.726	−0.531	0.747	6.532**	0.182	−0.553
	(0.013)	(3.150)	(3.556)	(0.076)	(9.670)	(0.506)	(0.603)	(1.237)	(2.602)	(0.801)	(0.562)
Compete	0.020	−0.772	2.506	0.370***	−45.814***	2.351***	1.402***	−3.759***	0.694	0.225	−0.165
	(0.013)	(2.409)	(2.577)	(0.078)	(8.715)	(0.438)	(0.509)	(1.057)	(1.950)	(0.547)	(0.329)
Create	−0.024***	−7.299***	3.474**	0.081***	−41.094***	0.021	−0.732***	−1.259***	9.374***	5.067***	1.736*
	(0.004)	(1.062)	(1.421)	(0.024)	(3.357)	(0.205)	(0.243)	(0.393)	(0.892)	(1.110)	(0.905)
Firm controls	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Industry FE	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Year FE	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Obs.	53,141	54,288	17,805	54,229	41,879	53,708	51,345	54,289	54,289	45,430	15,146
Adj. R^2	0.404	0.560	0.301	0.164	0.294	0.060	0.047	0.572	0.570	0.245	0.066

Panel C. Summary statistics

		Mean			
Year	Obs.	*Collaborate*	*Control*	*Compete*	*Create*
1997	2008	0.700%	1.643%	1.960%	0.897%
1998	2729	0.693%	1.651%	2.008%	0.910%
1999	2646	0.704%	1.701%	2.057%	0.922%
2000	2625	0.712%	1.749%	2.062%	0.953%
2001	2511	0.720%	1.703%	2.161%	0.993%
2002	2752	0.703%	1.683%	2.130%	1.003%
2003	3254	0.708%	1.759%	2.067%	1.003%
2004	4160	0.681%	1.946%	1.967%	0.975%
2005	4017	0.669%	1.994%	1.963%	0.978%
2006	3962	0.646%	2.079%	1.992%	0.988%
2007	3876	0.625%	2.103%	2.025%	1.019%
2008	3859	0.642%	2.094%	2.018%	0.998%
2009	3903	0.640%	2.074%	2.009%	0.995%
2010	3786	0.639%	1.992%	1.986%	0.995%
2011	3342	0.483%	1.708%	1.729%	1.438%
2012	2803	0.191%	0.699%	0.555%	3.963%
2013	2858	0.489%	1.855%	1.013%	2.311%
Total	55,091				

Panel D. Are there time trends in culture?

	Collaborate	*Control*	*Compete*	*Create*
	(1)	(2)	(3)	(4)
TIME	−0.023***	−0.008***	−0.068***	0.102***
	(0.000)	(0.001)	(0.001)	(0.002)
Obs.	55,091	55,091	55,091	55,091
Adj. R^2	0.088	0.004	0.189	0.127

Panel E. Sources of variation in culture

	Adj. R^2			
	Collaborate	*Control*	*Compete*	*Create*
	(1)	(2)	(3)	(4)
Year FE only	15.7%	34.0%	40.5%	36.7%
Industry FE only	2.8%	10.7%	10.9%	2.0%
Firm FE only	31.3%	26.7%	29.7%	7.6%
Firm and year FE	45.4%	63.5%	67.4%	42.7%

This table provides summary statistics and validation tests for the four culture variables (*Collaborate*, *Control*, *Compete*, and *Create*) for all firms available from 1997 to 2013. Panel A reports summary statistics and pairwise correlations for the four culture variables. Panel B reports results from validation tests that regress a firm or industry characteristic as predicted by the CVF on the four culture variables. Detailed variable definitions can be found in appendix A.1. All models include lagged natural log-transformed market capitalization, financial leverage, cash holdings to net assets, dividend yield, natural log-transformed firm age, and industry and year fixed effects. Panel C reports the mean culture variables by year. Panel D examines the linear time trends in the culture variables, with *Time* defined as the current fiscal year minus 1997, ranging from 0 to 16. Standard errors (in parentheses) in panels B and D are clustered at the firm level. Panel E analyzes the source of variation in the culture variables by regressing them on different sets of fixed effects and reports their adjusted R-squared. Symbols *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

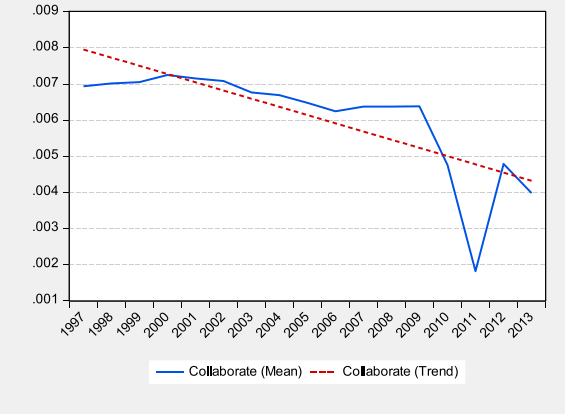

Figure 2(a). Mean *Collaborate*

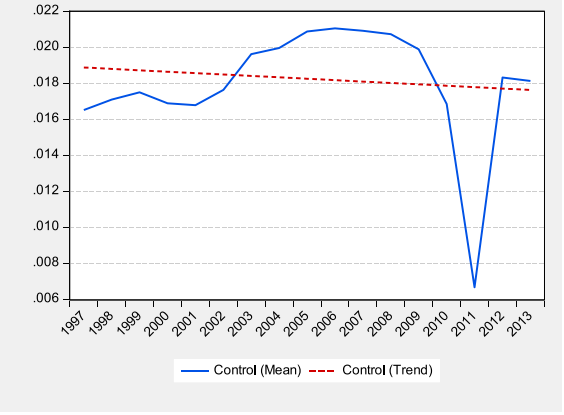

Figure 2(b). Mean *Control*

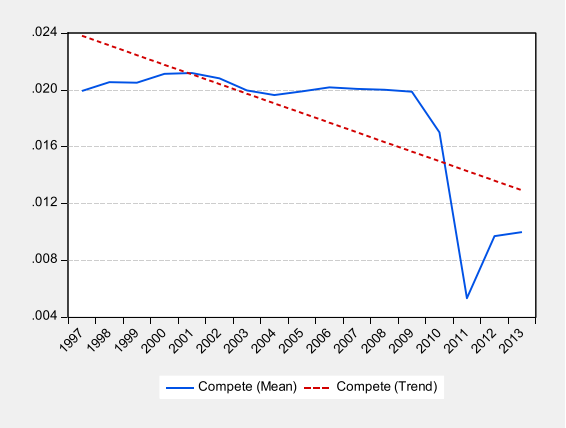

Figure 2(c). Mean *Compete*

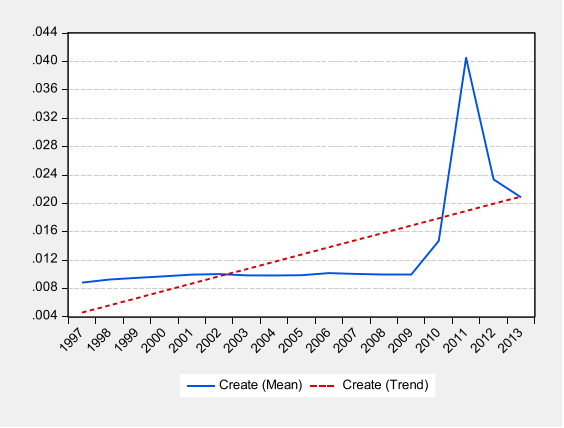

Figure 2(d). Mean *Create*

Fig. 2. Mean Cultural orientations over the sample period (1997 to 2013)
The following figures plot the annual means of the four cultural-orientation variables from 1997 to 2013. The sample consists of all firms with nonmissing values in the firm-culture variables (8472 unique firms with 55,091 observations).

In sum, while our proxies for culture are inevitably subject to measurement errors, our validation test results suggest that they are in general valid in measuring culture as theorized by the CVF. Nonetheless, note that measurement errors embedded in the culture variables would bias the coefficient estimates toward 0, thus biasing us against finding a significant effect of culture on firm value.

Panel C reports the mean values of the four culture variables by year, showing that they move slowly in general and there are some sharp changes towards the end of the sample period. To visualize these time series, Fig. 2 plots the yearly means. Apart from being persistent, we observe a downward trend in *Collaborate, Control*, and *Create*, and an upward trend in *Create*, over our sample period. Moreover, during the years surrounding the TMT bust and the 2008–09 crisis, we observe some moderate increases in *Collaborate* and *Control*. An interesting observation is that there is a sharp decline (increase) in *Collaborate, Control*, and *Compete* (*Create*) between 2009 and 2011.

Panel D reports results from regressing the four cultures on a time-trend variable. The results show a negative (positive) and significant linear trend for *Collaborate, Control,* and *Compete* (*Create*), confirming our visual evidence.

To explore the source of variation in culture, we regress each of the four cultural variables on different sets of fixed effects — (1) year; (2) industry; (3) firm; and (4) firm and year — and report their adjusted R-squared. As panel E shows, year fixed effects account for 15.7 to 40.5% of the variation in culture. Industry fixed effects explain a moderate amount of variation in culture with adjusted R-squared ranging from 2.0% for *Create* to 10.9% for *Compete*. Introducing firm fixed effects increases adjusted R-squared considerably, ranging from 7.6% for *Create* to 31.3% for *Collaborate*. Further, firm and year fixed effects together account for 42.7% to 67.4% of the variation in the culture variables, suggesting that a substantial portion of the variation in the culture variables is between-firm and across years.

3.4. Our empirical methodology

To identify the relation between culture and value during the 2008–09 financial crisis, our baseline specification models the changes in market value of firms over a prespecified period of financial distress — the 2008–09 crisis — as a function of company culture measured in the precrisis period. Our model is written as follows:

$$\text{Crisis firm performance}_i = \beta_0 + \beta \times \text{Culture}_i + \gamma X_i + \text{Industry FE} + \varepsilon_i, \quad (1)$$

where *Crisis firm performance*$_i$ is firm *i*'s performance over a crisis window, defined as the period between August 2008 and March

2009, following Lins et al. (2017);[9] $Culture_i$ is a vector of the four culture variables measured in fiscal year 2006;[10] X_i is a vector of firm and stock characteristics, and estimated loadings on the Fama-French three factors and the momentum factor; *Industry FE* denotes fixed effects constructed based on the Fama-French 49 industries; and ε_i is the regression residual. All right-hand-side variables are measured prior to the crisis. White heteroskedasticity-robust standard errors are reported, unless otherwise specified.

3.5. Measuring firms' crisis performance

Our main measure of crisis performance is a firm's buy-and-hold stock returns over a crisis window. Specifically, *Raw returns* is a firm's buy-and-hold excess returns (net of the risk-free rate). While capturing total losses in equity value, *Raw returns* is not adjusted for risk and other well-known factor risks. Hence, we compute a firm's buy-and-hold *abnormal* stock returns over the crisis period; stock returns are risk-adjusted by a Carhart (1997) four-factor model over the 60-month precrisis period ending in July 2008:

$$R_{i,t} - rf_t = \alpha_i + \beta_i^{MKT} MKT_t + \beta_i^{SMB} SMB_t + \beta_i^{HML} HML_t + \beta_i^{UMD} UMD_t + \varepsilon_{i,t}, \quad (2)$$

where $R_{i,t}$ is the monthly returns of stock i in month t; rf_t is the one-month treasury bill rate; MKT_t is the excess returns of the CRSP value-weighted market index; SMB_t is the small-minus-big (SMB) size factor; HML_t is the high-minus-low (HML) value factor; UMD_t is the up-minus-down (UMD) momentum factor; and ε is the regression residual. A firm's abnormal return in month t is its actual monthly stock return in month t minus its expected return, the latter is the sum of the estimated intercept and the product of the realization of the four factors in month t with their respective estimated loadings. *Abnormal returns* is obtained by cumulating these monthly abnormal returns over the crisis window.

Analyzing crisis stock returns implicitly assumes that the stock market is rational and abnormal stock returns during the crisis window capture the extent of *firm-specific* losses experienced by the firms well. Nonetheless, market forces and shifts in investor sentiment, in the presence of limit-to-arbitrage and investor behavioral bias, may cause prices to deviate from fundamentals for prolonged periods of time (Baker and Wrugler, 2006; Stambaugh et al., 2012). As a result, our tests may suffer from the joint hypothesis problem (Fama, 1970) — abnormal returns may be caused by market inefficiencies (i.e., the market being irrational), a bad asset pricing model (i.e., the market being rational), or both. To circumvent these issues, we construct a few additional proxies of firm performance and stability during the crisis period that do not rely on stock information.

The first is a credit-rating downgrade dummy, constructed based on a firm's S&P long-term issuer credit rating. *Credit rating downgrade dummy* is a dummy that equals 1 if a firm's rating has declined by at least one category (e.g., from BBB to BBB-) by the fiscal year end in calendar year 2009 compared to that in year 2007, and 0 otherwise. The second is the natural logarithm of a firm's earnings volatility during the crisis, estimated using quarterly earnings per share (EPS) data from Compustat Quarterly from 2008q3 to 2009q2. The final measure is a firm's earnings performance, captured by the average *ROA* during the two fiscal years ended in calendar years 2008 and 2009.

3.6. Characteristic controls

We control for various stock characteristics that are important for stock returns, including log market capitalization (*ln(ME)*) measured at the end of June 2008; log book-to-market-equity ratio (*ln(BM)*) measured at fiscal year end in calendar year 2007; log of one-plus-momentum returns over months *j-2* to *j-3* (*RET(-2,-3)*), *j-4* to *j-6* (*RET(-4,-6)*), and *j-7* to *j-12* (*RET(-7,-12)*); and log turnover ratio and stock price (*ln(Price)*) measured at the end of June 2008. To account for factor risk exposure, we include the loadings on the market, size, value, and momentum factors from estimating Eq. (3). Idiosyncratic volatilities (*ln(IVOL)*) are the logarithm of residual volatilities estimated from Eq. (3).

Several additional firm characteristics measured at the fiscal year end in calendar year 2007 are included. *ROA* is income before extraordinary income divided by total assets. Financial leverage (*Leverage*), capturing firms' distress risk, is the sum of long- and short-term debts to total assets. Since liquidity affects firms' ability in absorbing negative shocks, all models includes the ratio of cash holdings to net assets (*Cash holdings*). We also include dividend yield (*Dividend yield*) in the regressions to control for the effect of capital constraints on stock returns. Finally, we control for log firm age (in number of years) since young and mature firms differ in their ability to raise capital and access external financing. To reduce the effect of outliers, we winsorize the crisis-performance measures and control variables at the 1st and 99th percentiles. Our conclusions are unchanged without winsorization.

3.7. Descriptive statistics for the crisis sample

The sample selection for our tests surrounding the crisis begins with all publicly listed U.S. firms that (i) appear in both Compustat and CRSP, (ii) have at least one available monthly return over the entire crisis window (from August 2008 to March 2009), and (iii) have nonmissing values in our culture variables in fiscal year 2006. Our final sample consists of 3578 firms (henceforth referred to as the "crisis sample").

Panel A of Table 2 reports summary statistics for the crisis sample. The mean (median) buy-and-hold raw returns over the crisis is −41.4% (−43.2%) and that of the buy-and-hold abnormal returns is −2.6% (−11.9%); about 31.4% of the sample firms ($N = 949$) has experienced a credit rating downgrade; the mean (median) of quarterly EPS volatilities is 0.63 (0.21); the mean (median) of average ROA during the crisis years is −4.0% (0.9%). The statistics are consistent with the stylized fact that firms suffered severe losses during the crisis.

Turning to our precrisis culture variables, synonyms relating to *Control* make the largest contribution to word count in 10-K reports, with a mean value of 2.1%. The second-largest contribution comes from those related to the competitive culture (mean *Compete*=2.0%), followed by those suggestive of the creative culture (mean *Create*=1.0%) and the collaborative culture (mean *Collaborate*=0.6%).

Panel C reports summary statistics by the Fama-French 12 industries. The five industries with the largest coverage are financial (24.2%), business equipment (17.2%), others (11.4%), healthcare (11.2%), and wholesale and retail (9.1%). Based on raw returns, the oil and gas industries performed the worst during the crisis; utilities suffered the least during the crisis. Our culture variables appear to capture stylized industry characteristics well. For instance, healthcare industries score high on *Collaborate* and has the highest *Create* values among the 12 industries, consistent with the stylized view that human capital and innovation are especially vital

[9] August 2008 is one month preceding the Lehman Brothers' collapse; March 2009 was when the S&P composite index reached its lowest point. Unreported tests confirm the robustness of our results to alternative crisis windows, such as from January 2008 to December 2009, and from August 2008 to December 2009.

[10] In our empirical model, we make no assumption regarding whether a firm has a *dominant* culture type or not. All four culture measures enter jointly into the model; the effect of each culture type can be estimated, controlling for one another.

Table 2
Summary statistics and industry breakdown for the crisis sample.

Panel A. Summary statistics

	Measured as of	Obs.	Mean	Stdev	25%	Median	75%
Raw returns	2008m8–2009m3	3578	−0.414	0.296	−0.636	−0.432	−0.225
Abnormal returns	2008m8–2009m3	3578	−0.026	0.583	−0.410	−0.119	0.214
Collaborate	Fiscal year 2006	3578	0.625%	0.278%	0.461%	0.571%	0.705%
Control	Fiscal year 2006	3578	2.103%	0.471%	1.791%	2.067%	2.387%
Compete	Fiscal year 2006	3578	2.024%	0.536%	1.670%	1.994%	2.355%
Create	Fiscal year 2006	3578	1.016%	0.371%	0.769%	0.938%	1.177%
ME	2008m6	3578	3502	9876	142	516	1998
ln(ME)	2008m6	3578	6.355	1.879	4.957	6.246	7.600
ln(BM)	Fiscal year end in calendar year 2007	3578	−0.803	0.782	−1.244	−0.688	−0.267
ln(TURN)	2008m6	3578	0.127	1.323	−0.621	0.454	1.037
RET(−2,−3)	2008m5–2008m6	3578	−0.091	0.217	−0.196	−0.076	0.027
RET(−4,−6)	2008m2–2008m4	3578	−0.046	0.234	−0.154	−0.022	0.097
RET(−7,−12)	2007m7–2008m1	3578	−0.170	0.298	−0.318	−0.124	0.020
ln(Price)	2008m6	3578	2.521	1.199	1.815	2.688	3.417
ln(IVOL)	60-month window: 2003m8 - 2008m7	3578	−2.412	0.484	−2.776	−2.415	−2.068
ROA	Fiscal year end in calendar year 2007	3578	−0.002	0.173	0.001	0.029	0.071
Leverage	Fiscal year end in calendar year 2007	3578	0.202	0.196	0.025	0.158	0.319
Cash holdings	Fiscal year end in calendar year 2007	3578	0.580	1.808	0.026	0.086	0.338
Dividend yield	Fiscal year end in calendar year 2007	3578	0.015	0.027	0.000	0.000	0.022
Age	Fiscal year end in calendar year 2007	3578	2.610	0.827	2.197	2.639	3.178
ln(Age)	Fiscal year end in calendar year 2007	3578	18.289	13.528	9.000	14.000	24.000
β^{MKT}	60-month window: 2003m8 - 2008m7	3578	1.017	0.725	0.544	0.955	1.447
β^{SMB}	60-month window: 2003m8 - 2008m7	3578	0.726	1.017	0.027	0.602	1.311
β^{HML}	60-month window: 2003m8 - 2008m7	3578	0.247	1.045	−0.307	0.262	0.838
β^{UMD}	60-month window: 2003m8 - 2008m7	3578	−0.074	0.709	−0.493	−0.095	0.305
Rating downgrade dummy	Calendar year (2009 minus 2007)	949	0.314	0.464	0.000	0.000	1.000
EPS vol	From 2008q3 to 2009q2	3312	0.634	1.090	0.084	0.212	0.645
Avg. ROA	Calendar year (2008+ 2009)/2	3228	−0.040	0.200	−0.048	0.009	0.053

Panel B. Summary Statistics by Industry (Fama-French 12-Industry Classification)

	Obs.	*Raw returns*	*Abnormal returns*	*Collaborate*	*Control*	*Compete*	*Create*
Consumer nondurables	163	−0.380	−0.015	0.592%	2.062%	1.982%	0.884%
Consumer durables	79	−0.556	−0.142	0.560%	2.229%	2.010%	1.011%
Manufacturing	320	−0.509	−0.085	0.595%	2.286%	2.024%	0.923%
Oil and gas	146	−0.576	−0.162	0.611%	2.162%	1.725%	0.940%
Chemicals	76	−0.421	−0.080	0.616%	2.016%	2.052%	0.988%
Business equipment	614	−0.398	0.020	0.581%	2.395%	2.361%	1.192%
Telecom	78	−0.461	0.066	0.557%	1.972%	2.072%	0.886%
Utilities	104	−0.253	0.059	0.655%	2.152%	1.476%	0.851%
Wholesale and retail	325	−0.343	0.105	0.667%	2.145%	2.035%	0.880%
Healthcare	400	−0.370	−0.052	0.598%	2.135%	2.146%	1.415%
Finance	865	−0.404	−0.050	0.663%	1.803%	1.839%	0.901%
Others	408	−0.446	−0.041	0.662%	2.095%	2.032%	0.941%
Total	3578						

Panel A reports summary statistics of the variables used in our baseline tests for the 2008–09 financial crisis. Panel B reports the summary statistics by industry following the Fama-French 12-industry classification. The number of observations, average raw and abnormal crisis returns, and the average culture variables are reported for each industry.

for growth and competitiveness among healthcare/pharmaceutical firms. Utilities industries score relatively high in *Control* and are the lowest in terms of *Create*, consistent with utilities firms being noncyclical and less involved in innovative activities, and focusing more on enterprise risk management. Pairwise correlations can be found in Table OA.2 of the online appendix.

4. Empirical results

4.1. Does culture matter for stock performance during the 2008–09 crisis?

Table 3 examines the relation between the four culture types and firm performance during the 2008–09 crisis.

In columns (1) and (2), the dependent variables are buy-and-hold *Raw returns* and *Abnormal returns*, respectively. In both columns, the coefficients for *Control* are positive and significant at the 1% level, whereas those for the other culture variables are small and insignificant. Based on the full-model estimates, an interquartile increase in *Control* is associated with a 2.3- and 3.5-percentage-point increase in *Raw returns* and *Abnormal returns*, respectively. Based on an average precrisis market capitalization of $3502 million at the beginning of the crisis window, a 2.3-percentage-point increase in *Raw returns* corresponds to a $81.8 million smaller loss in market value, a finding that is economically significant. The economic magnitude for *Abnormal returns* is even larger.

Column (3) reports results from a linear probability model regressing the rating downgrade dummy on the culture variables, firm controls, and industry fixed effects. The results show that controlling firms are significantly (at the 10% level) less likely to receive a rating downgrade, whereas the opposite is true for the creative firms. In terms of economic magnitude, an interquartile increase in *Control* (*Create*) reduces (increases) the probability of a rating downgrade by 4.0 (4.9) percentage points. Since firms that have a strong culture may differ substantially in various observable and unobservable aspects from other firms that do not, to alleviate potential selection issues, we re-estimate the rating downgrade re-

Table 3
Corporate culture and firm performance during the 2008–09 financial crisis.

	Raw returns	*Abnormal returns*	*Rating downgrade dummy*		*ln(EPS vol)*	*Avg. ROA*
			≥*BBB-*			
	(1)	(2)	(3)	(4)	(5)	(6)
Collaborate	−1.600	−1.119	4.629	14.820**	11.807	−0.155
	(1.719)	(3.123)	(5.161)	(6.999)	(7.461)	(0.677)
Control	3.921***	5.804***	−7.128*	−17.753***	−15.976***	1.289**
	(1.150)	(2.011)	(3.656)	(4.789)	(5.437)	(0.582)
Compete	0.001	1.111	−3.257	−2.449	−0.105	−0.348
	(1.028)	(1.819)	(3.163)	(4.350)	(4.825)	(0.495)
Create	−2.122	−3.114	15.990***	26.926***	1.296	−1.956**
	(1.655)	(2.974)	(6.163)	(8.120)	(7.432)	(0.929)
ln(ME)	−0.010**	−0.013	0.017	0.029	0.013	−0.004*
	(0.005)	(0.008)	(0.015)	(0.020)	(0.021)	(0.002)
ln(BM)	−0.035***	−0.022	0.078***	0.039	0.656***	−0.026***
	(0.008)	(0.015)	(0.029)	(0.052)	(0.039)	(0.005)
ln(TURN)	−0.007	−0.009	0.062**	0.097**	0.068***	0.001
	(0.005)	(0.009)	(0.025)	(0.043)	(0.023)	(0.003)
RET(−2,−3)	0.096***	−0.006	−0.423***	−0.560***	−1.607***	0.090***
	(0.036)	(0.071)	(0.121)	(0.207)	(0.147)	(0.020)
RET(−4,−6)	0.019	−0.051	−0.302***	−0.355**	−1.228***	0.078***
	(0.027)	(0.051)	(0.084)	(0.174)	(0.110)	(0.016)
RET(−7,−12)	0.041*	−0.063	−0.256***	−0.289**	−0.878***	0.037***
	(0.023)	(0.043)	(0.073)	(0.138)	(0.092)	(0.013)
ln(Price)	0.013	−0.022	−0.024	−0.011	0.666***	0.018***
	(0.009)	(0.015)	(0.029)	(0.047)	(0.039)	(0.004)
ln(IVOL)	−0.115***	−0.253***	−0.088	−0.030	0.393***	−0.019**
	(0.017)	(0.030)	(0.062)	(0.092)	(0.078)	(0.009)
Profitability	0.124***	0.152	−0.691**	−0.789	−0.273	0.720***
	(0.045)	(0.094)	(0.290)	(0.553)	(0.179)	(0.039)
Leverage	−0.154***	−0.197***	0.056	−0.022	0.899***	0.040***
	(0.030)	(0.059)	(0.110)	(0.180)	(0.135)	(0.014)
Cash holdings	0.001	0.003	−0.061	−0.159	−0.039**	−0.017***
	(0.004)	(0.007)	(0.054)	(0.184)	(0.016)	(0.004)
Dividend yield	−0.400*	−0.774*	0.077	−0.386	0.953	0.031
	(0.217)	(0.419)	(0.641)	(1.075)	(0.993)	(0.082)
ln(Age)	−0.005	−0.017	0.005	−0.007	−0.001	0.006*
	(0.007)	(0.012)	(0.020)	(0.030)	(0.028)	(0.003)
β_{MKT}	−0.004	0.375***	0.021	0.004	0.049	−0.011*
	(0.010)	(0.018)	(0.031)	(0.063)	(0.039)	(0.006)
β_{SMB}	0.009	−0.001	0.010	−0.007	−0.010	−0.005
	(0.006)	(0.012)	(0.025)	(0.052)	(0.027)	(0.004)
β_{HML}	−0.002	0.164***	0.005	−0.017	−0.030	0.004
	(0.006)	(0.011)	(0.023)	(0.050)	(0.023)	(0.003)
β_{UMD}	−0.037***	0.044**	0.046	0.041	0.162***	−0.015**
	(0.012)	(0.022)	(0.042)	(0.078)	(0.047)	(0.007)
≥*BBB-*			−0.021			
			(0.041)			
Industry FE	Included	Included	Included	Included	Included	Included
Observations	3578	3578	949	530	3312	3228
Adjusted R^2	0.145	0.312	0.244	0.276	0.347	0.611

This table reports results on the relation between firm culture and stock performance during the 2008–09 financial crisis. *Raw returns* and *Abnormal returns* are the buy-and-hold raw and abnormal returns over the crisis window (i.e., August 2008 to March 2009). *Rating downgrade dummy* is a dummy that equals 1 if a firm's credit rating has reduced by 1 or more category (e.g., from BBB to BBB-) at the fiscal year end in calendar year 2009 compared to that in calendar year 2007, and 0 otherwise. *ln(EPS vol)* is the natural log of the standard deviation of quarterly earnings per share (EPS) over the period from 2008q3 to 2009q2. *Avg. ROA* is a firm's average *ROA* over the two fiscal year ends in calendar years 2008 and 2009. We construct the four culture variables, all measured at the end of fiscal year 2006, using text analysis of companies' 10-K filings. Control variables include: log market capitalization (*ln(ME)*), log book-to-market equity ratio (*ln(BM)*), log turnover ratio (*ln(TURN)*), a few variables for momentum returns (*RET(−2,−3), RET(−4,−6), RET(−7,−12)*), log stock price, log idiosyncratic volatilities (*ln(IVOL)*), return on assets (*ROA*), financial leverage (*Leverage*), cash holdings (*Cash holdings*), dividend yield (*Dividend yield*), log firm age (*ln(Age)*), and the four loadings on the Fama-French three factors and the momentum factor (β^{MKT}, β^{SMB}, β^{HML}, and β^{UMD}). ≥*BBB-* is a dummy if a firm has investment-grade credit rating (i.e., rating of BBB- or above) at the fiscal year end in calendar year 2007, or 0 otherwise. Detailed variable definitions can be found in appendix A.1. Industry fixed effects (based on the Fama-French 49-industry classification) are included in all models. Reported in parentheses are the White robust standard errors. Intercepts are suppressed. Symbols *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

gression on a subsample of investment-grade firms, documenting similar results (see column 4).

Column (5) report results from an OLS regression in which *ln(EPS vol)* is the dependent variable. In line with our results so far, firms with high *Control* are found to experience significantly lower earnings volatilities during the crisis, suggesting that controlling firms have more stable earnings on average. An interquartile increase in *Control* is associated with a 9.2% reduction in quarterly earnings volatilities.

Finally, in column (6) where *Avg. ROA* is the dependent variable, we find that firms with higher *Control* fared significantly better in earnings performance during the crisis, whereas those with more creative culture had significantly weaker earnings performance. An interquartile increase in *Control* (*Create*) is associated with higher (lower) average ROA by 0.78 (0.78) percentage points.

The evidence in this section suggests that firm culture, especially the controlling culture, matters significantly for firm performance and stability during bad times.

4.2. Exploring the underlying mechanisms

4.2.1. Culture and firm policies relating to trading partners, labor, and capital raising

To add credence to the stability role of culture, this section explores three potential channels through which the controlling culture may mitigate losses during the 2008–09 crisis. Specifically, we examine the linkages between culture and firm outcomes related to support from different groups of stakeholders, including trading partners, employees, and capital providers, during and after the crisis. Instead of using the annual firm-year sample, we compile a new firm-quarter panel dataset from 2007q1 to 2009q1[11] (i.e., the highest frequency in accounting data), which enables us to get the most accurate assessment of when the changes in firm outcomes occur. Our regression models can be written as follows:

$$\begin{aligned} Outcome_{i,t} = {} & \beta_0 + (\beta_1 Collaborate_{i,2006} + \beta_2 Control_{i,2006} \\ & + \beta_3 Compete_{i,2006} + \beta_4 Create_{i,2006}) \times Crisis_t + \gamma X_{i,t-1} \\ & + Firm\,FE + Industry \times Year - quarter\,FE + \varepsilon_{i,t}, \end{aligned} \quad (3)$$

where $Crisis_t$ is a crisis dummy that equals 1 for quarters between October 2008 and March 2009, and 0 otherwise; the culture variables of fiscal year 2006 are time-invariant by construction. $X_{i,t-1}$ includes firm size, measured by the natural logarithm of total assets., and it further includes leverage (*Leverage*), cash holdings (*Cash holdings*), and return on assets (*ROA*), when the outcome variables are capital-raising. Firm fixed effects are included in all models; industry-year-quarter interacted fixed effects account for industry shocks in each year-quarter pair and potential seasonality in our outcome variables. Standard errors are clustered at the firm level. Panel A of Table 4 reports the estimation for Eq. (3).[12,13]

Firms may suffer from less severe losses during the crisis due to the support provided by trading partners. When firms are under distress, downstream customers who value the existing trading relationships may be willing to purchase without requesting large price concessions or reduction in quantity, implying that declines in sales may be reduced. Likewise, considering that the supply chain is a competitive game, distressed firms may also shift some of its cost burdens onto their dependent suppliers by leveraging their relatively bargaining power, i.e., price squeezing the latter (Leung et al., 2020). Moreover, the supply chain is also a collaborative game in which competitive advantages and value are often created through effective cooperation, communication, and support between trading partners, e.g., products/services can be better tailored to the specific needs of the customers. Since dependent suppliers value a long-term trustful and collaborative relationship, they may be willing to share part of the cost burdens of their major customers if the latter suffer from financial hardship through, e.g., reducing input prices. Hence, a first potential channel is that the controlling culture is associated with greater support from trading partners during the crisis. To test this, we examine gross profit margin, computed as sales minus cost of goods sold, deflated by sales. If the stability role of controlling culture stems from support from trading partners, we expect the gross profit margin to increase with the controlling culture during the crisis (i.e., reduced cost of goods sold among the controlling firms).

In column (1), we find a negative but insignificant association between *Control* and gross profit margin during the crisis, inconsistent with this channel. Interestingly, the collaborative and competitive cultures are related to significantly higher gross profit margins (i.e., lower cost of goods sold) during the crisis. To dig deeper, we examine year-over-year sales growth. If support from downstream customers drive the positive results, sales growth should increase with the two culture variables. As shown in column (2), the collaborative culture is associated with significantly lower sales growth, whereas we find insignificant result for the competitive culture. That is, support from downstream customers does not explain the results for the two cultures, leaving support from upstream suppliers as the most consistent explanation.[14] Column (3) examines whether the culture variables are related to selling, general, and administrative expenses during the crisis. We find that the competitive culture is associated with significantly higher selling, general, and administrative spending, possibly due to heightened costs in relation to downsizing and the maintenance of firm flexibility and efficiency, which partly offset the benefits from the reduced costs of goods sold.[15]

The second potential channel is that firms may weather negative shocks better if their employees are more supportive and if work morale is higher during bad economic times. According to the CVF, since the controlling culture emphasizes job security and conformity when managing labor relations, such firms tend to cut fewer jobs during the crisis than other firms. Their employees, enjoying higher job security and stability, may expend more effort in work or may even be more tolerant to accepting salary cuts in or-

[11] Our results are similar if the firm-quarter sample begins in 2006q1.

[12] In a previous version of our draft, Eq. (3) further includes the interaction between a post-crisis dummy and the four culture variables. Our conclusions remain unchanged under this alternative model specification. Since our objective is to shed light on the underlying mechanism behind the positive link between the controlling culture and firms' crisis performance, we decided to focus on the interaction between the crisis dummy and the culture variables. The results under this alternative model specification are available upon request.

[13] For robustness, in unreported analysis, we estimate a stock-month panel regression (sample period: 2007m1 to 2009m3) that interacts the annual culture variables with a crisis dummy variable (crisis window: 2008m8 to 2009m3) in explaining monthly abnormal stock returns, controlling for the firm controls, factor loadings, and firm and industry-time interacted fixed effects. The results show that although the culture variables have an insignificant effect on abnormal stock returns during the precrisis period, the association between *Control* and abnormal stock returns becomes significantly (at the 5% level) more positive during the crisis. In terms of economic magnitude, an interquartile increase in *Control* is associated with an increase in abnormal stock returns of 26.6 basis points per month or 2.1 percentage points over the 8-month crisis window. We also find that the link between the creative culture and abnormal stock returns is significantly (at the 10% level) more negative during the crisis period. These unreported results are available upon request. We thank an anonymous reviewer for suggesting this additional robustness test.

[14] The mechanisms through which the cost of goods sold were reduced during the crisis may differ between the collaborative and competitive firms. Since collaborative firms value a long-term and trustful trading relationships to a greater extent, dependent suppliers may be willing to share some of the cost burdens of the former. By contrast, competitive firms are more interested in short-term, tangible results and may to a lesser extent value a long-term trading relationship. Instead, they may buy from a larger number of suppliers and exercise their strong relative bargaining power (due to high market share and buying power) to squeeze their suppliers for their own gain when the needs arise. To shed light on the two different mechanisms, we use customer-supplier relationship data compiled by Cen et al. (2017) using the Compustat segments customer file, construct a firm-year sample consisting only of major customers (who contribute more than 10% or more to their suppliers' total sales), and relate the four culture variables to a few supply-chain characteristics. Our results show that collaborative firms have significantly longer supply-chain relationships consistent with a long-term and collaborative orientation in trading relationships. Further, consistent with stronger relative bargaining power, we find that competitive firms have a less concentrated supplier base and they buy more from a significantly larger number of dependent suppliers. These untabulated results can be found in Table OA.3 of the Online Appendix.

[15] We do not fully understand why the improved gross profit margin does not translate into better ROA for the collaborative firms. The only other expense item that increased significantly during the crisis for the collaborative firms is income tax payable (unreported and available upon request from the authors). However, such finding is inconclusive without a comprehensive analysis on how the culture variables are related to firms' tax planning strategies, which are out of the scope of our paper. We cannot rule out the possibility that there are offsetting increases in other expenses (e.g., amortization and sales in securities) that are insignificant when analyzed individually but together may be enough to partly offset the benefits of the better gross profit margin.

Table 4
Corporate culture and firm policies during the 2008–09 financial crisis.

Panel A. Firm Outcomes/Policies Relating to Trading Partners, Labor, and Capital Raising

	Gross margin	*ΔSale*	*SG&A/TA*	*ΔEmp*	*Sale/Emp*	*DISS/TA*	*EISS/TA*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crisis × *Collaborate*$_{2006}$	12.429***	−4.533*	−0.086	−0.363	−0.132	0.543	0.881
	(3.686)	(2.460)	(0.097)	(1.368)	(0.429)	(0.458)	(0.832)
Crisis × *Control*$_{2006}$	−4.038	0.692	−0.126	2.427***	−0.007	0.571*	−1.651**
	(2.761)	(1.654)	(0.091)	(0.917)	(0.244)	(0.335)	(0.655)
Crisis × *Compete*$_{2006}$	5.450**	−1.832	0.180**	−3.012***	−0.068	0.260	0.221
	(2.379)	(1.449)	(0.076)	(0.846)	(0.226)	(0.330)	(0.628)
Crisis × *Create*$_{2006}$	−4.074	−0.764	0.118	−3.717***	0.438	0.404	3.683***
	(5.815)	(2.674)	(0.133)	(1.290)	(0.346)	(0.538)	(1.162)
ln(Total assets)	0.034	0.144***	−0.021***	−0.209***	0.018***	0.005	−0.174***
	(0.043)	(0.031)	(0.002)	(0.018)	(0.004)	(0.006)	(0.016)
Leverage						0.084***	0.115***
						(0.024)	(0.032)
Cash holdings						0.002	−0.020**
						(0.003)	(0.009)
ROA						−0.028	−0.195***
						(0.020)	(0.048)
Firm FE	Included	Included	Included	Included	Included	Included	Included
Industry × Year-quarter FE	Included	Included	Included	Included	Included	Included	Included
Obs.	28,785	28,785	28,785	10,138	27,264	28,785	28,785
Adj. R^2	0.758	0.368	0.937	0.254	0.898	0.601	0.926

Panel B. Investment Policies

	CAPX/TA	*ΔPPE*	*ln(1 + R&D)*
	(1)	(2)	(3)
Crisis × *Collaborate*$_{2006}$	−0.162*	−0.113	3.357
	(0.088)	(0.497)	(2.051)
Crisis × *Control*$_{2006}$	0.072	0.988***	−1.392
	(0.063)	(0.360)	(1.922)
Crisis × *Compete*$_{2006}$	−0.107*	−1.313***	−0.522
	(0.054)	(0.348)	(1.418)
Crisis × *Create*$_{2006}$	−0.163*	−0.902	−5.381**
	(0.088)	(0.581)	(2.206)
ln(Total assets)	−0.003***	−0.045***	0.135***
	(0.001)	(0.007)	(0.019)
Leverage	−0.011***	−0.161***	−0.251***
	(0.002)	(0.019)	(0.051)
Cash holdings	−0.001***	0.028***	−0.024*
	(0.000)	(0.004)	(0.013)
ROA	0.017***	0.113***	−0.093
	(0.003)	(0.022)	(0.065)
ln(BM)	−0.002***	−0.028***	0.000
	(0.000)	(0.003)	(0.007)
Firm FE	Included	Included	Included
Industry × Year-quarter FE	Included	Included	Included
Obs.	27,743	27,743	27,743
Adj. R^2	0.465	0.212	0.897
P			

Panel A (Panel B) of this table estimates the relations between corporate culture and firm outcomes/policies relating to customers, labor, and capital raising (investment) during the crisis and postcrisis periods. The dataset is a firm-quarter panel in all columns except column (4) where a firm-year panel is used. The sample period is from 2007q1 to 2009q1. In panel A, dependent variables include gross profit to sales ratio (*Gross margin*), year-over-year change in sales (*ΔSale*), selling, general, and administrative expenses to assets ratio (*SG&A/TA*), annual employee growth (*ΔEmp*), employee productivity (*Sale/Emp*), debt issuance to total assets (*DISS/TA*), and share issuance to total assets (*EISS/TA*). In panel B, dependent variables include capital investment (*CAPX/TA*), percentage change in quarterly property, plant, and equipment (*ΔPPE*), and log 1 plus R&D expenditure (*ln(1 + R&D)*). *Crisis* identifies the crisis period and equals 1 for quarters ending between October 2008 to March 2009, and 0 otherwise. For column (4) where annual data is used, *Crisis* equals 1 for fiscal year end in calendar year 2009 and 0 otherwise. In columns (1) to (5), control variable includes only firm size (*ln(Total assets)*). In columns (6) and (7), control variables include firm size (*ln(Total assets)*), financial leverage (*Leverage*), cash holdings to net assets (*Cash holdings*), and return on assets (*ROA*). In panel B, control variables include firm size (*ln(Total assets)*), financial leverage (*Leverage*), cash holdings (*Cash holdings*), return on assets (*ROA*), and the natural logarithm of book-to-market equity ratio (*ln(BM)*). Firm and industry-year-quarter (or industry-year in column (5)) interacted fixed effects are included. Standard errors are clustered at the firm level. Intercepts are suppressed. Symbols *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

der to help their firms to turn around, thereby contributing to firm stability.

Column (4) examines the link between *Control* and employee growth during the crisis. Since employee data is only available annually, we estimate this model on the firm-year sample covering the period of 2007–2013. The coefficient estimate on *Crisis* × *Control*$_{2006}$ is positive and significant, consistent with the view that firms with stronger controlling culture have fewer job cuts during the crisis. Considering an average employee growth rate of −3.3% during the crisis, an interquartile increase in *Control*$_{2006}$ reduces such negative employee growth rate by 1.4 percentage points during the crisis, or about 137 more employees, based on an average headcount of 9419 in fiscal year 2007.

Further, the competitive and creative cultures are associated with a significantly larger job cuts during the crisis. This is consistent with competitive firms focusing less on human capital and

more on tangible input factors, responding to negative market shocks through downsizing the workforce; likewise, creative firms whose R&D activities must be discontinued may be forced to curb fixed costs by making layoffs. Column (5) examines the association between culture and employee productivity, measured by the ratio of sales to lagged employees, finding insignificant results.[16] Employee support does not fully explain our findings.

A third potential channel is relating to financing or support from external capital providers. In general, firms with strong controlling culture emphasize efficient internal control and rely heavily on formal policies, procedures, and systems for managing enterprise risk, losses, and contingencies. Since these firms likely have greater solvency, creditors or other capital providers may place greater trust on their repayment ability and thus are willing to offer cheaper and longer term financing even during market distress, enabling such firms to better deal with negative credit supply shocks. To examine the financing channel, we study whether corporate culture explains the raising of new debt and equity capital during and after the crisis.

Columns (6) and (7) report results for debt issuance (*DISS/TA*), defined as the ratio of debt issued to total assets, and equity issuance (*EISS/TA*), defined as the ratio of shares issued to total assets, as dependent variables, respectively. In column (6), the coefficient estimate for $Crisis \times Control_{2006}$ is positive and significant (at the 10% level). In terms of economic magnitude, an interquartile increase in $Control_{2006}$ is associated with a 0.33-percentage-point ($25.3 million) increase in *DISS/TA* (newly issued debt given an average total assets of $7611 in the quarterly sample) during the crisis period, consistent with the financing channel. Yet, column (7) shows that controlling firms make significantly less equity issuance during the crisis; creative firms are shown to make significantly more equity issuance during the crisis.

To conclude, there is little evidence that the controlling culture is associated with higher gross margin and sales growth during the crisis, inconsistent with the channel relating to the support from trading partners. Although firms strong in the controlling culture have fewer job cuts during the crisis, we find insignificant evidence that their workforce was any more productive than other firms. Finally, our results are most consistent with the financing channel, since controlling firms are associated with significantly greater debt issuance during and after the crisis. Our evidence suggests that such firms are better able to absorb credit supply shocks due to a more stable access to financing.

4.2.2. Culture and investment

Campello et al. (2010) show that capital-constrained firms, due to limited internal cash flows and declines in external funding supplies, were forced to cut capital spending and forgo investment opportunities during the 2008–09 crisis. Duchin et al. (2010) find that firms with less financial resources at the onset of the subprime crisis were more constrained and cut more investment during the crisis. If controlling cultures reduce losses due to greater financing, such firms might cut less capital spending during and after the crisis.

To test this, we estimate Eq. (5) and replace the dependent variables with three measures of investment. To ensure that the culture variables are not picking up the effects of internal cash resources on investment, all models include lagged cash holdings to net assets (*Cash holdings*). Further, we include lagged log book-to-market equity ratios (*ln(BM)*) in all models to control for within-firm changes in investment opportunities. Other controls include lagged log total assets, *Leverage*, and *ROA*.

Panel B of Table 4 reports the estimation results. Column (1) shows little relation between the controlling culture and the ratio of capital investment to total assets (*CAPX/TA*) during the crisis. Column (2) examines the association between culture and quarterly growth in property, plant, and equipment (ΔPPE). We find some support for our hypothesis in that the coefficient for $Crisis \times Control_{2006}$ is positive and significant at the 1% level. Since the average growth in quarterly property, plant, and equipment is −0.86% during the crisis, an interquartile increase in $Control_{2006}$ is associated with a 0.58-percentage-point smaller decline in property, plant, and equipment during the crisis period. Besides, we find that the competitive culture is associated with significantly bigger cuts in capital investment and more negative growth in property, plant, and equipment during the crisis, consistent with competitive firms responding to the negative shocks by downsizing.

Column (3) studies the effect of culture on firms' R&D spending ($ln(1 + R\&D)$) (inputs for innovation activities) during the crisis period. We find that R&D expenses decline more for creative firms than others during the crisis, consistent with R&D activities being uncertain, irreversible, and often disrupted upon negative credit-supply shocks.

4.2.3. Subsample analysis by financial constraints

To shed more light on the financing channel, we perform two subsample tests (based on Eq. (1)). If controlling firms fared better during the crisis due to better access to financing, such benefits should be stronger among firms that are more financially constrained during the precrisis period, captured by two empirical proxies. The first is the Kaplan and Zingales's (1997) firm-level financial-constraint index (see Appendix A.1 for its definition). A firm is defined as financially constrained if its index value is in the top quartile in fiscal year 2006. The second is firm age. Young firms tend to have limited access to external financing sources and thus are capital-constrained due to unstable internal cash flows, an inability to pledge collateral, and high information asymmetry (Carpenter and Petersen, 2002). Firms are defined as financially constrained if its age is in the bottom quartile in fiscal year 2006.

Table 5 reports the results from the subsample tests where *Abnormal returns* is the dependent variable.[17] We find that the coefficients for *Control* are larger in magnitude and more significant among the more financially-constrained firms. The results are consistent across the two proxies of financial constraints; the evidence is in line with the financing channel.

4.2.4. Discussions and further evidence based on credit lines data

Our results thus far suggest that controlling firms received greater access to financing and thus had greater firm stability and performance during the crisis. While firms may have various components of debt in their liquidity management, an important source of credit is revolving credit lines (Jiménez et al., 2009; Sufi, 2009; Lins et al., 2010). Existing studies show that firms drew down on their credit lines during the global financial crisis to meet their liquidity needs, and, hence, access to credit lines mitigated the negative impact of the crisis (e.g., Ivashina and Scharfstein, 2010; Campello et al., 2010).

To shed more light on the financing channel, we analyze the access to credit lines among the controlling firms. We first searched for news articles published in 2009 that mentioned about credit facilities and credit lines for companies scoring high in *Control*. Consistent with prior studies (Campello et al., 2010), some of the searched companies had credit facilities extended and increased

[16] Since employee data are only available annually, we scale quarterly sales in year *t* by number of employees in year *t-1*. Our results are insensitive to scaling quarterly sales in year *t* by number of employees in year *t*.

[17] The results are similar if *Raw returns* is the dependent variable in the subsample tests. These results are available upon request.

Table 5
Subsample by precrisis financial constraints.

	Abnormal returns			
	KZ index		*Firm age*	
	High (1)	Low (2)	Young (3)	Mid to Mature (4)
Collaborate	1.076	−1.362	2.535	−2.017
	(7.060)	(3.750)	(6.773)	(3.360)
Control	11.915**	3.277	13.149***	3.925*
	(4.809)	(2.234)	(4.430)	(2.273)
Compete	8.054*	−3.568*	−0.048	1.240
	(4.846)	(2.083)	(3.728)	(2.117)
Create	−12.518	2.780	−12.130*	0.003
	(8.340)	(3.365)	(6.282)	(3.383)
Firm characteristics	Included	Included	Included	Included
Factor loadings	Included	Included	Included	Included
Industry FE	Included	Included	Included	Included
Observations	836	2509	1048	2530
Adj. R^2	0.302	0.335	0.322	0.303

This table presents subsample tests of our baseline crisis-return model according to several proxies of financial constraints during the precrisis period (at the fiscal year end in calendar year 2007). The dependent variable is the buy-and-hold abnormal returns over the crisis window (August 2008 to March 2009). The main variables of interest are the four culture variables, all measured at the end of fiscal year 2006, using text analysis of companies' 10-K filings. In columns (1) and (2), firms are divided into high and low constraint groups based on the 75th percentile in *KZ index*, i.e., the Kaplan and Zingales's (1997) financial constraint index. In columns (3) and (4), young firms are defined as those in the bottom quartile in firm age (*Age*) and the remaining firms are in the category of "mid to mature". Control variables and fixed effects identical to the baseline model are included in the model; detailed variable definitions can be found in Appendix A.1. Reported in parentheses are the White robust standard errors. Intercepts are suppressed. Symbols *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

during the crisis. For instance, on 7 October 2009, Stereotaxis, a manufacturer of advanced cardiology instrument control systems for hospitals (*Control* = 4.0%), announced that their facility with Silicon Valley Bank would be extended by one year and the maximum amount of credit they could draw increased by $5 million to $30 million.[18] Nanometrics, a manufacturer of process control metrology systems (used primarily in the manufacturing of semiconductor) (*Control* = 3.9%), in their 2009Q2 earnings conference call (management presentation), mentioned that they drew $3.5 million from their credit lines to maintain a cash position that was adversely affected by the extension of credit to a customer; they had then repaid all of the borrowing and had the full amount of $15 million of credit line available.

While this anecdotal evidence shows that controlling firms actively used credit lines to manage liquidity positions and sought to extend them during the crisis, we are unsure whether such evidence can be generalized. To formally study whether controlling firms receive greater support from creditors in the form of improved access to credit lines, we download data of credit lines for our sample firms from Capital IQ, including the total amount of credit lines drawn and the total amount of credit lines undrawn. We estimate a cross-sectional regression as follows:

$$\Delta\left(\frac{Credit\ lines}{TA}\right)_i = \beta_0 + \beta \times Culture_i + \gamma X_i + Industry\ FE + \varepsilon_i, \tag{4}$$

where $\Delta(\frac{Credit\ lines}{TA})_i$ is the change in the proportion of credit lines in total assets between year 2009 and 2007 (2009 minus 2007) of firm *i; Credit lines* are either the sum of drawn and undrawn credit lines (*Drawn* + *Undrawn*), drawn credit lines (*Drawn*), or undrawn credit lines (*Undrawn*). To offer a clean test, Eq. (4) is estimated on a subsample of firms with a zero value in *Drawn* + *Undrawn* in 2007, since such firms are likely most financially constrained (Sufi, 2009). In other words, our tests examine whether controlling firms with no credit lines before the crisis obtained more credit-line access after the crisis unfolded.

Panel A of Table 6 reports summary statistics for the three credit-line change variables. In panel B, column (1) shows that *Control* is positively and significantly associated with the proportion of total drawn and undrawn credit lines in total assets. Economically, a one-standard-deviation increase in *Control* is associated with 18.2% increase in the ratio of total drawn and undrawn credit lines to total assets (relative to the sample mean). Columns (2) and (3) report results separately for drawn and undrawn credit lines, finding that the significant positive effect of the controlling culture is driven by the drawn credit lines.

Overall, our findings suggest that controlling firms without credit lines were more likely to obtain such access and drew more from the credit lines than others during the crisis, thereby lending further support to the financing channel.

4.3. Alternative episodes of market distress

To generalize our findings to other times and broader contexts, this section performs additional tests on the relation between corporate culture and stock returns during alternative episodes of market distress.

4.3.1. The technology, media, and telecommunications (TMT) bust

A first alternative episode we consider is the bust of the 2000–02 TMT bubble, during which many technology companies suffered huge losses in market value. We follow Bekaert et al. (2014) and define the crisis window for the TMT bust as the period from October 2000 to December 2002, during which the cumulative loss in the CRSP value-weighted market index over TMT bust window was down at −37.6%.

Our empirical setup follows Eq. (1). Culture variables measured in fiscal year 1998 are used to explain the buy-and-hold abnormal stock returns over the window of the TMT bust.[19] A

[18] The news article can be accessed via: https://www.prnewswire.com/news-releases/stereotaxis-receives-commitment-to-increase-and-extend-credit-facility-107064563.html.

[19] In unreported analysis, our results hold when using the buy-and-hold raw stock returns as an alternative dependent variable. These results are available upon request.

Table 6
Corporate culture and credit lines during the crisis.

Panel A. Summary statistics of the credit lines variables

	Obs.	Mean	Stdev	25%	Median	75%
$\Delta(\frac{Drawn+Undrawn}{TA})$	1697	0.019	0.052	0.000	0.000	0.000
$\Delta(\frac{Drawn}{TA})$	1697	0.013	0.041	0.000	0.000	0.000
$\Delta(\frac{Undrawn}{TA})$	1697	0.005	0.026	0.000	0.000	0.000

Panel B. Corporate culture and changes in lines of credits during the crisis

	$\Delta(\frac{Drawn+Undrawn}{TA})$ (1)	$\Delta(\frac{Drawn}{TA})$ (2)	$\Delta(\frac{Undrawn}{TA})$ (3)
Collaborate	0.115	−0.108	0.190
	(0.514)	(0.394)	(0.255)
Control	0.704**	0.581**	0.057
	(0.323)	(0.257)	(0.164)
Compete	−0.266	−0.277	0.036
	(0.291)	(0.226)	(0.140)
Create	−0.163	0.048	−0.240
	(0.421)	(0.324)	(0.210)
Firm characteristics	Included	Included	Included
Factor loadings	Included	Included	Included
Industry FE	Included	Included	Included
Observations	1697	1697	1697
Adj. R^2	0.027	0.024	0.008

This table examines the relation between corporate culture and credit lines during the crisis. $\Delta(\frac{Drawn+Undrawn}{TA})$ is the change in the proportion of total credit lines drawn and undrawn (in total assets) between years 2009 and 2007. $\Delta(\frac{Drawn}{TA})$ [$\Delta(\frac{Undrawn}{TA})$] is the change in the proportion of total credit lines drawn [undrawn] (in total assets) between years 2009 and 2007. The credit-line data are collected from Capital IQ. Panel A reports the summary statistics for the three variables of the changes in firms' credit lines. Panel B reports results from crisis regression examining the relation between the precrisis corporate culture and credit line changes during the crisis. The analysis is performed on a subsample of firms that had 0 credit line in 2007. Control variables and fixed effects identical to the baseline model are included in the model; detailed variable definitions can be found in Appendix A.1. Reported in parentheses are the White robust standard errors. Intercepts are suppressed. Symbols *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Carhart (1997) four-factor model is estimated for each firm over a 60-month window from October 1995 to September 2000 to obtain the expected and abnormal returns, factors loadings, and idiosyncratic risk. All accounting variables are measured at fiscal year end in calendar year 1999; stock characteristics such as log market capitalization, log stock prices, and log turnover ratios are measured at the end of August 2000. Industry fixed effects are included and White robust standard errors are reported. The final sample for the analysis around the TMT bust consists of 2825 firms. Summary statistics and pairwise correlations can be found in Tables OA.4 and OA.5 of the Online Appendix.

Column (1) of Table 9 reports the estimation for the TMT bust. Consistent with our results for the 2008–09 crisis, we find that *Control* is positively and significantly (at the 1% level) associated with the buy-and-hold abnormal returns during the TMT bust. An interquartile increase in *Control* is associated with a 12.8-percentage-point increase in *Abnormal returns*.

4.3.2. Industry distress

Although culture matters for firm stability during the TMT bust and the 2008–09 crisis, and since these crisis events are rare, not all market users may benefit from such implications. In light of this, this section explores the culture-return relation during episodes of industry distress, which occur more frequently (than crisis events). To test this, we gather a stock-month sample covering the period from July 1998 to December 2013 and estimate a regression model with firm and industry-time fixed effects as follows:

$$\begin{aligned} Abnormal\ returns_{i,t} = {} & \beta_0 + (\beta_1\, Collaborate_{i,t-1} + \beta_2\, Control_{i,t-1} \\ & + \beta_3\, Compete_{i,t-1} + \beta_4 Create_{i,t-1}) \\ & \times Industry\ distress_{i,t} + \gamma X_{i,t-1} \\ & + Firm\ FE + Industry \\ & \times Year - month\ FE + \varepsilon_i. \end{aligned} \quad (5)$$

where *Abnormal returns*$_{i,t}$ is the buy-and-hold abnormal returns of stock *i* in month *t*; culture variables measured at fiscal year-ends in calendar year *t-1* explain stock returns between July of year *t* and June of year *t + 1; Industry distress*$_{i,t}$ is an indicator that equals 1 for firms operating in distressed industries, and 0 otherwise. Following Acharya et al. (2007), an industry is in distress when the industry-median annual stock returns (compounded using monthly returns in each calendar year) are below 0 (*Industry distress*). $X_{i,t-1}$ contains lagged firm and stock characteristics and estimated factor loadings.[20] Firm fixed effects absorb all time-invariant unobserved heterogeneity across firms; industry-year-month interacted fixed effects account for all industry-specific time trends. Standard errors are clustered at the firm level.

Column (2) of Table 7 reports the estimation of Eq. (5). Consistent with our expectation, the association between *Control* and stock returns is significantly more positive during industry distress events. In terms of economic magnitude, during an industry distress event, an interquartile increase in *Control* is associated with a 10.3-basis-point higher abnormal returns monthly.

4.4. Further validation tests for the controlling culture

Our results are consistent with controlling firms having more standardized procedures and stringent risk management functions, thereby resulting in greater stability during the crisis. Although our validation analysis in Section 3.3 has shown that *Control* is associated with lower credit risk, such evidence is nonetheless indirect and inadequate, because credit risk can be correlated with other factors unrelated to the cultural attributes we are seeking to capture within the organizational contexts. In this section, we present

[20] Updated annually, accounting variables of fiscal year end in calendar year *t-1* are used to explain stock returns from July of year *t* to June of year *t + 1*; all stock variables are updated monthly. To estimate the factor loadings, idiosyncratic volatilities, and abnormal returns in month *t*, Eq. (3) is estimated with a rolling 60-month window up to month *t-1* (requiring at least 24 monthly observations).

Table 7
Alternative crisis episodes: the TMT bust and industry distress events.

	Abnormal returns	
Sample	The TMT crisis (1)	Stock-month panel (1998m7–2013m12) (2)
Collaborate	−5.390	−0.073
	(5.083)	(0.090)
Control	24.233***	−0.086
	(6.614)	(0.084)
Compete	−6.869	−0.017
	(4.259)	(0.070)
Create	8.875	0.029
	(7.913)	(0.026)
Collaborate × *Industry distress*	0.062	
		(0.142)
Control × *Industry distress*		0.247**
		(0.118)
Compete × *Industry distress*	0.007	
		(0.100)
Create × *Industry distress*		−0.057
		(0.109)
Firm characteristics	Included	Included
Factor loadings	Included	Included
Firm FE		Included
Industry FE	Included	
Industry × Year-month FE		Included
Observations	2825	425,857
Adj. R^2	0.211	0.068

This table examines the relation between corporate culture and stock performance during the technology, media, and telecom (TMT) bust (column 1) and industry distress events (column 2). In column (1), the dependent variables are the buy-and-hold abnormal returns over the TMT bust (October 2000 to December 2002). The four culture variables are measured at the end of fiscal year 1998. Control variables are identical to those used in Table 3 (see appendix A.1 for more details). The factor loadings for each firm are estimated using their stock returns over a 60-month window from October 1995 to September 2000 based on the expanded market model of Eq. (3). All accounting variables are measured at the end of fiscal years ended in 1999. Industry fixed effects (based on the Fama-French 49-industry classification) are controlled for in column (1). Reported in parentheses are the White robust standard errors. In column (2), the sample used is a stock-month panel from July 1998 to December 2013. The dependent variables are the monthly abnormal returns. To calculate abnormal returns, we estimate Eq. (3) with a rolling 60-month window up to month *t-1* (requiring a minimum of 24 monthly observations for the estimation), and we compute expected returns as the product of the estimated factor loadings and the realization of factors in month *t*. *Industry distress* is a dummy that equals 1 when the industry median annual stock return is negative, and 0 otherwise. The four culture variables (*Collaborate, Control, Compete,* and *Create*) and accounting variables of fiscal years ended in year *t-1* explain stock returns from July of year *t* to June of year $t + 1$ and thus are updated annually. The stock-level control variables are updated monthly. The factor loadings and idiosyncratic volatilities in month *t* are from the same regression for abnormal return estimation. Firm fixed effects and industry-time interacted fixed effects (based on the Fama-French 49-industry classification) are included in column (2). Standard errors are clustered at the firm level. Intercepts are suppressed in both columns. Symbols *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

additional validation tests that relate the culture variables to proxies of risk management, firm efficiency, and hedging activities (using the same firm-year panel as in Section 3.3) and report the results in Table 8.

Our first two proxies are ex post measures of risk management: (1) the natural logarithm of idiosyncratic risk (*ln(IVOL)*), estimated from the Carhart's (1997) 4-factor model using daily returns over a year, and (2) tail risk exposure (*Tail risk*), defined as the mean returns of a firm's stock during the worst 5% return days over a year (Ellul and Yerramilli, 2013). As columns (1) and (2) show, controlling firms have significantly lower idiosyncratic risk and less severe tail risk returns. Collaborative culture is associated with lower firm-specific risk and tail risk exposure, whereas the opposite is true for the competitive and creative cultures. This finding is unsurprising because the latter two cultures emphasize market expansion and risk taking. The third proxy is the proportion of risk and uncertainties words mentioned during earnings calls (at the fiscal year end) (*Risk exposure*), obtained from Hassan et al. (2019). Firms with a greater exposure to risk and adversities are likely to discuss more about such exposure and thus would mention synonyms of risk and uncertainties more frequently during conference calls. As column (3) shows, the controlling culture is correlated with fewer mentions of the risk and uncertainty synonyms, suggestive of a lower risk exposure.

Our next set of tests relates the culture variables to a firm-level measure of relative efficiency (*Efficiency*) (in converting input factors into revenue), estimated by Demerjian et al. (2012) using data envelopment analysis (DEA) and a few input factors, including cost of inventory, general and administrative expenses, fixed assets, operating leases, research and development (R&D) expenditures, and intangible assets. In column (4), the controlling culture is negatively but insignificantly associated with firm efficiency. The collaborative and creative cultures, emphasizing human capital and employee participation, are associated with significantly lower efficiency. This is not surprising because investments in intangible capital in general take longer to convert into revenue and also because increased interactions and divergence in viewpoints among employees may impede and/or slow down the decision making processes. By contrast, firms with strong competitive culture are significantly more efficient, consistent with such firms seeking to increase market share by investing in flexibility and efficiency in production and distribution.

Further, we examine annual changes in *Efficiency* and separate them into positive and negative changes ($+\Delta$*Efficiency* and $-\Delta$*Efficiency*) to capture efficiency gain and loss. Since firms with strong controlling culture have a hierarchical and rigid firm structure due to their standardized and procedural approach in management, loss of efficiency over time, if any, would be small among such firms, whereas it is less clear as to how efficiency gain is related to the controlling culture. Consistent with this view, columns (5) and (6) show that *Control* is associated with significantly smaller efficiency loss but does not correlate with efficiency gain. Besides, firms with strong collaborative or creative cultures have significantly smaller efficiency gain, and those with strong

Table 8
Further validation tests for the controlling culture.

	ln(IVOL) (1)	*Tail risk* (2)	*Risk exposure* (3)	*Efficiency* (4)	$-\Delta$*Efficiency* (5)	$+\Delta$*Efficiency* (6)	*ln(1+FX hedge)* (7)
Collaborate	−4.324***	0.301***	−2.954	−1.333***	−0.024	−0.364***	1.225
	(0.871)	(0.055)	(2.442)	(0.296)	(0.090)	(0.103)	(1.414)
Control	−1.491**	0.280***	−4.021**	−0.199	0.185***	0.029	−10.968***
	(0.739)	(0.047)	(1.974)	(0.246)	(0.071)	(0.082)	(1.504)
Compete	4.292***	−0.303***	1.448	0.455**	−0.083	0.055	3.601***
	(0.591)	(0.039)	(1.554)	(0.190)	(0.057)	(0.064)	(1.229)
Create	1.378***	−0.088***	−0.510	−0.333***	−0.145***	−0.217***	−3.406***
	(0.238)	(0.013)	(0.591)	(0.098)	(0.034)	(0.065)	(0.513)
Offshore							0.412***
							(0.046)
Collaborate × *Offshore*							−2.779
							(2.333)
Control × *Offshore*							3.870**
							(1.835)
Compete × *Offshore*							−5.526***
							(1.510)
Create × *Offshore*							2.812***
							(0.699)
Firm characteristics	Included	Included	Included	Included	Included	Included	Included
Industry FE	Included	Included	Included	Included	Included	Included	Included
Year FE	Included	Included	Included	Included	Included	Included	Included
Observations	53,083	54,007	25,883	38,388	36,567	36,567	54,091
Adj. R^2	0.594	0.466	0.137	0.333	0.170	0.117	0.312

This table presents further validation tests for the controlling culture variable by relating it to measures of firm risk, level of and changes in relative efficiency, cost stickiness, and foreign exchange hedging activities. *ln(IVOL)* is the natural logarithm of residual volatilities from the Carhart 4-factor model estimated using daily returns over a year. *Tail risk* is a measure of tail risk, computed as the mean returns during the worst 5% returns days over a year. *Risk exposure* is the proportion risk or uncertainty words mentioned in the (fiscal year end) earnings calls, deflated by the total number of bigrams. *Efficiency* is a firm-level measure of relative efficiency (in converting firm resources into sales), estimated using data envelopment analysis (DEA) and the following resource-generating input factors: cost of inventory, general and administrative expenses, fixed assets, operating leases, past research and development (R&D) expenditures, and intangible assets. $-\Delta$*Efficiency* ($+\Delta$*Efficiency*) is the negative yearly changes in *Efficiency* that take on the values of the yearly changes in *Efficiency* if the yearly changes in Δ*Efficiency* are negative (positive), and a value of 0 otherwise. *ln(1+FX hedge)* is the natural logarithm of one plus the number of times a firm has mentioned the use of foreign currency derivatives in their 10-K reports. *Offshore* is a dummy variable that equal 1 if a firm has mentioned sales to or imports from foreign countries in their 10-K reports, and zero otherwise. All models include lagged natural log-transformed market capitalization, financial leverage, cash holdings to net assets, dividend yield, natural log-transformed firm age, and industry and year fixed effects. Standard errors are clustered at the firm level. Intercepts are suppressed in both columns. Symbols *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

creative culture also have bigger efficiency loss. As such, both cultures are correlated with lower firm efficiency, consistent with the results in column (4).

Finally, we expect controlling firms who have sold or bought from foreign countries to make greater use of foreign currency derivatives to manage their risk exposure. Using data of firms' offshoring activities and the number of times foreign currency derivatives are mentioned in their 10-K reports (*FX hedge*) from Hoberg and Moon (2017), (2019), we regress the natural logarithm of one plus the number of mentions on the interaction between a dummy variable of offshore activities and the four culture variables, firm controls, and industry and year fixed effects. As column (7) shows, the interaction between the controlling culture and the offshore dummy is positive and significant at the 5% level. This suggests that controlling firms make greater use of foreign currency derivatives to hedge their offshore exposure. Creative (competitive) firms also make greater (less) use of derivatives to hedge their offshore exposure.

Overall, our additional validation tests show that our text-based measure of the controlling culture is associated with lower risk exposure, smaller efficiency loss, and greater use of foreign currency hedges, consistent of controlling firms having a more procedural and standardized approach in firm management and more stringent risk management.

4.5. Further discussions

A recent paper by Li et al. (2021) applies machine-learning techniques on earnings call transcripts to measure corporate culture in five values: *innovation, integrity, quality, respect*, and *teamwork*; they document that a strong culture associates with better stock performance during the 2008–09 financial crisis. To get a sense of the extent to which our culture measures, especially *Control*, may overlap with theirs, we compare our culture synonyms with those in their dictionaries. Not surprisingly, we find a moderate level of overlaps in synonyms between their dictionary and ours. In particular, 29.0%, 25.8%, 19.4%, 6.5%, and 16.1% of the synonyms of *Control* also appear in Li et al. (2021)'s dictionaries of innovation, integrity, quality, respect, and teamwork, respectively.

Such a comparison may not be informative given that our corpus is different from theirs, and, hence, the matched synonyms and their occurrences would differ considerably. As such, we examine the pairwise correlations between their culture measures and ours, all measured in fiscal year 2006. The unreported correlation analysis shows that *Control* is most correlated with the quality culture (coefficient=0.27), followed by the innovation (coefficient=0.12), respect (coefficient=0.048), teamwork (coefficient=0.042), and integrity (coefficient=−0.033) cultures. The evidence is consistent with the view that controlling firms tend to value systems that are foul-proof and have a focus on quality, further supporting its internal validity.

To test whether our culture variables have incremental explanatory power over those by Li et al. (2021), we download their five culture variables and follow them in constructing a strong-culture dummy equal to 1 if the sum of their five culture measures is in the top 20% and 0 otherwise. Untabulated tests show that a strong culture is associated with significantly higher buy-and-hold abnormal returns; however, the estimate on *Control* remains positive and significant after controlling for a strong culture. The details can be found in Table OA.8 of the Online Appendix.

Finally, while it may not be immediately apparent as to which culture types may indeed explain crisis firm performance *ex ante* given the competing arguments discussed in Section 2.5, our findings that only the controlling culture is relevant to firm value and stability during bad times are perhaps surprising but not entirely unreasonable for at least two reasons. First, the economic benefits of a strong internal risk management are likely to be evident especially during market downturns when risks and losses begin to substantiate. Second, when evaluating the creditworthiness of companies, the extent of risk exposure and the quality of internal risk management (attributes captured by the controlling culture) are likely to be important factors that capital providers incorporate into their lending decisions (Campello et al., 2011; Chen and King, 2014). When credit supply withers during a financial crisis, capital providers are more willing to extend credits to the controlling firms because of the latter's stronger risk control than to other firms. Since the ability to access external financing and mitigate capital constraints during market downturns is particularly important for firm stability and competitiveness, the positive relation of controlling culture with crisis firm performance is likely more evident during the crisis, whereas the effect of the other cultures may be less obvious.

4.6. Other robustness tests

In this final section, a number of additional robustness tests are summarized. The abridged version of these results can be found in Appendix A.3.

First, as previously discussed, in the presence of limits to arbitrage, stock prices may deviate from fundamentals, especially during market downturns when investor sentiment is likely irrational. To account for the effect of investor sentiment, we estimate a stock's factor exposure to the Baker and Wrugler (2006) investor-sentiment index (in an augmented Carhart (1997) 4-factor model) over the 60-month window from August 2003 to July 2008. Shown in row (1), our results are robust after controlling for firms' exposure to market sentiment.

Second, Lins et al. (2017) argue that high-social-capital firms are perceived as more trustworthy and receive more stakeholder support during market downturns. To control for social capital, a firm-level CSP index (*CSR*) (measured in fiscal year 2006) is constructed using data from the MSCI KLD database. As row (2) shows, the estimate for *Control* remains similar in magnitude, albeit being less significant (at the 10% level).

Third, Graham et al. (2016) argue that a firm's formal institutions, such as governance structures, may influence how it establishes and enforces cultural values and may also determine firm performance during financial crises (Johnson et al., 2000; Mitton, 2002). Row (3) controls for the antitakeover index (*E index*) from Bebchuk et al. (2009), board size, fraction of independent directors, and CEO chairman indicator (all measured in fiscal year end in calendar year 2007). Row (4) controls for the percentage of shares held by institutional investors. Results continue to hold.

Fourth, a recent paper by Ding et al. (2021) documents that family firms fared significantly better during the recent COVID-19 pandemic. To account for the effect of family ownership on firm performance during bad times, we use the percentage voting rights by ultimate controlling family owners for our sample firms (down to 368 firms) during the precrisis period from the Bureau van Dijk Orbis database. The pairwise correlations (unreported) between the precrisis culture variables and family ownership is small in general, ranging from −0.05 to 0.07. Row (5) shows that our results hold after controlling for family ownership.

Fifth, 10-K reports may vary across firms in ways unrelated to culture that may be correlated with future performance. For instance, a more negative tone in 10-K predicts lower stock returns (Loughran and McDonald, 2011); lower readability of 10-K reports is associated with higher future return volatilities and earnings forecast errors (Loughran and McDonald, 2014). Since our culture variables are measured with error and may capture these text-related attributes, in row (6), we control for the proportion of negative words (*FIN-NEG*), from Loughran and McDonald (2011), and the natural logarithm of 10-K report file size (in megabytes) (*ln(File size)*), from Loughran and McDonald (2014); our results hold.

Fifth, if controlling companies are more risk-averse, the reduced value losses documented may be attributed to differences in the precrisis level of risk-taking. Although our tests have already included three risk measures (i.e., leverage, market beta, and idiosyncratic volatilities), we further introduce the modified Z-score, capturing default risk (Leary and Roberts, 2005), and cash-flow volatilities (estimated using *ROA* over 2002–2006) (rows 7 and 8, respectively) as additional controls. Our results hold. In row (9), we apply propensity-score-matching techniques to construct a control group of firms comparable in the firm controls (including the five risk measures) to firms in the top quartile of *Control*. Estimating our tests on the matched sample, the estimates for *Control* remain similar (more details of these results can be found in Table OA.6 of the Online Appendix).[21]

Sixth, in rows (10) and (11), we estimate our baseline tests on alternative samples that excluded firms with closing stock prices smaller than $1 or larger than $1000 (at the end of June 2008) and firms operating in the financial and utilities sectors, which are heavily regulated. Our results are intact.

Further, to address the omitted-variables concern, we follow the recommendation by Larcker and Rusticus (2010) and apply Frank's (2000) approach to evaluate how closely an unobservable confounding variable would have to be correlated with the controlling culture and *Abnormal returns* to turn the significant coefficient for *Control* in the baseline tests to borderline insignificant. Untabulated results (see Table OA.7 of the Online Appendix) show that the "impact threshold for a confounding variable" (ITCV) is 0.0161 for *Abnormal returns*, implying that the minimum required correlation between *Control* and the unobserved confounding variable and between *Abnormal returns* and the confounding variable must be more than 0.127.

5. Conclusion

We apply an easy-to-implement text-based methodology to measure firm-level culture. Organizing culture using the CVF, we perform text analysis on firms' 10-K reports and capture their cultural profiles in four dimensions (collaborate, control, compete, and create). The culture variables are shown to be valid in capturing stylized firm and industry characteristics theorized by the CVF.

Using these empirical measures of culture, we investigate the role of culture in firm performance during the 2008–09 financial crisis. Firms with stronger controlling culture are shown to have significantly higher stock returns, higher earnings performance, and greater firm stability during the crisis. Exploring the mechanisms, such firms also have fewer employee layoffs, less negative asset growth, greater debt issuance, and improved access to credit line facilities during the crisis, consistent with greater support from capital providers. Our conclusions hold under alternative crisis episodes, including the 2000–02 TMT bust and, more generally, industry distress.

[21] According to Hong and Kacperczyk (2009), "sin" stocks yield higher expected returns since they are subject to higher litigation risk and greater limit to arbitrage. If risk minimization is the underlying mechanism behind our results, we may find that the culture effect vary between the sin and non-sin stocks. In our crisis sample, there are only 30 sin stocks. Our results are insensitive to controlling for a sin-stock indicator and its interaction with the culture variables, which is inconsistent with this alternative explanation.

Findings from our study contribute to existing studies in finance measuring corporate culture using text-analysis techniques (e.g., Li et al., 2021) and to the recent, growing discussions among U.S. regulators about the importance of culture for enhancing value and stability (Dudley, 2014; Financial Stability Board, 2014; Group of Thirty, 2015; Chaly et al., 2017). Complementing the growing literature on culture (see, e.g., Quinn and Rohrbaugh, 1983; Cameron and Quinn, 2006; Thakor, 2016), our evidence supports the view that the CVF is a practical, valid, effective, and value-relevant tool for understanding, diagnosing, and managing corporate culture. Finally, acknowledging that there is no best framework or right way to diagnose and organize culture, we agree with Cameron and Quinn (2006) that the CVF is a "critically important strategy in an organization's repertoire for changing culture and improving performance."

CRediT authorship contribution statement

Yiwei Fang: Project administration. **Franco Fiordelisi:** Software, Data curation. **Iftekhar Hasan:** Supervision, Resources. **Woon Sau Leung:** Conceptualization, Methodology, Formal analysis, Writing – original draft, Writing – review & editing. **Gabriel Wong:** Software.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jbankfin.2022.106710.

Appendix A.1. Variable definitions

Variable	Definition	Source
Baseline tests for the 2008–09 crisis (Table 3)		
Raw returns	Buy-and-hold stock returns from August 2008 to March 2009.	CRSP
Abnormal returns	Buy-and-hold risk-adjusted returns from August 2008 to March 2009. To risk-adjust a stock's monthly returns, we estimate a Carhart (1997) four-factor model over the 60-month precrisis period ending in July 2008 to first obtain its estimated alpha and factor loadings. A stock's abnormal returns are defined as its actual returns minus its expected returns, which are the sum of its estimated intercept and the product of the realization of the four factors with its factor loadings estimated over the precrisis period.	CRSP
Collaborate	Collaborative culture, measured at the end of fiscal year 2006. It is measured as the number of synonyms for collaborative culture divided by the total number of words in a given 10-K document. The list of synonyms is in appendix A.2.	10-K
Control	Controlling culture, measured at the end of fiscal year 2006. It is the number of synonyms for controlling culture divided by the total number of words in a given 10-K document. The list of synonyms is in appendix A.2.	10-K
Compete	Competitive culture, measured at the end of fiscal year 2006. It is the number of synonyms for competitive culture divided by the total number of words in a given 10-K document. The list of synonyms is in appendix A.2.	10-K
Create	Creative culture, measured at the end of fiscal year 2006. It is the number of synonyms for creative culture divided by the total number of words in a given 10-K document. The list of synonyms is in Appendix A.2.	10-K
ln(ME)	Natural logarithm of market capitalization in June 2008. Market capitalization is the product of stock prices and number of shares outstanding.	CRSP
ln(BM)	Book-to-market-equity ratio.	CRSP, Compustat Annual
ln(TURN)	Natural logarithm of turnover ratio in June 2008. Turnover ratio is monthly turnover divided by the number of shares outstanding.	CRSP
RET(−2,−3)	Past cumulative returns over months *j-2* to *j-3* (May 2008 to June 2008).	CRSP
RET(−4,−6)	Past cumulative returns over months *j-4* to *j-6* (February 2008 to April 2008).	CRSP
RET(−7,−12)	Past cumulative returns over months *j-7* to *j-12* (August 2007 to January 2008).	CRSP
ln(Price)	Natural logarithm of stock price in June 2008.	CRSP
ln(IVOL)	Natural logarithm of idiosyncratic volatilities, defined as the volatilities of the residuals from the Carhart (1997) four-factor model regressions, estimated using the 60-month precrisis window ending in July 2008.	CRSP
ROA	Return on assets, measured at the fiscal year end in calendar year 2007. It is the ratio of income before extraordinary income to total assets.	Compustat Annual
Leverage	Financial leverage, measured at the fiscal year end in calendar year 2007. It is the sum of long- and short-term debt divided by total assets.	Compustat Annual
Cash holdings	Cash holdings, measured at the fiscal year end in calendar year 2007. It is the ratio of cash and short-term investments to total net assets. Net assets is total assets minus cash and short-term investments.	Compustat Annual
Dividend yield	Dividend yield, measured at the fiscal year end in calendar year 2007. It is the ratio of dividends per share to stock price.	Compustat Annual
Age	Firm age in years.	Compustat Annual
β^{MKT}	Estimated market beta from the Carhart (1997) four-factor model during the precrisis window.	CRSP
β^{SMB}	Estimated factor loadings on the size (SMB) factor from the Carhart (1997) four-factor model during the precrisis window.	CRSP
β^{HML}	Estimated factor loadings on the value (HML) factor from the Carhart (1997) four-factor model during the precrisis window.	CRSP
β^{UMD}	Estimated factor loadings on the momentum (UMD) factor from the Carhart (1997) four-factor model during the precrisis window.	CRSP
β^{SENT}	Estimated factor loadings on the Baker and Wrugler (2006) investor sentiment index (orthogonalized with respective to macroeconomic variables) from an augmented Carhart (1997) four-factor model during the precrisis window.	CRSP; Baker and Wrugler (2006)

(*continued on next page*)

(*continued*)

Variable	Definition	Source
Rating downgrade dummy	A dummy that equals 1 if a firm's had a downgrade in the S&P long-term credit rating at the end of fiscal year end in calendar year 2009 compared to that in calendar year 2007, and 0 otherwise.	Compustat
ln(EPS vol)	The natural log of the standard deviation of quarterly earnings per share (EPS) estimated over the period from 2008q3 to 2009q2.	Compustat Quarterly
Avg. ROA	A firm's average *ROA* over the two fiscal years ending in calendar years 2008 and 2009.	Compustat
KZ index	Kaplan and Zingales's (1997) firm-level index of financial constraints. Following Lamont et al. (2001), the KZ index is defined as −1.002 × [Income Before Extraordinary Items + Depreciation (item DP)]/Lagged Property, Plant, and Equipment + 0.283 × [Total Assets + Market Value - Common Equity - Deferred Taxes]/[Total Assets (item AT)] + 3.139 × [Long-Term Debt + Short-Term Debt]/[Long-Term Debt + Short-Term Debt + Shareholder Equity] - 39.368 × [Common Dividends + Preferred Dividends]/[Lagged Property, Plant, and Equipment] - 1.315 × [Cash]/[Lagged Property, Plant, and Equipment].	Compustat
$\Delta(\frac{Credit\ lines}{TA})$	Change in the proportion of credit lines in total assets between year 2009 and 2007 (2009 minus 2007). *Credit lines* are either the sum of drawn and undrawn credit lines (*Drawn* + *Undrawn*), drawn credit lines (*Drawn*), or undrawn credit lines (*Undrawn*). Drawn credit lines are total revolving credit (code: IQ_RC) in Capital IQ; Undrawn credit lines are undrawn revolving credit (code: IQ_UNDRAWN_RC) in Capital IQ.	Capital IQ
Stock-month panel (Table 7)		
Industry distress	A dummy that equals 1 when the industry-median annual stock returns are negative, and 0 otherwise.	CRSP
Firm-quarter (or firm-year panel) (Table 4)		
Gross margin	Gross profit margin, calculated as sales minus cost of goods sold, deflated by total sales.	Compustat Quarterly
ΔSale	Year-over-year growth in total sales, calculated as total sales in quarter *t* minus total sales in quarter *t*-4, deflated by total sales in quarter *t*-4.	Compustat Quarterly
SG&A/TA	The ratio of selling, general, and administrative expenses to total assets.	
Sale/Emp	Employee productivity, measured as quarterly sales divided by the number of employees in the previous year.	Compustat Quarterly, Compustat Annual (for employee number)
ΔEmp	Percentage change in the number of employees from the previous year.	Compustat Annual
DISS/TA	Debt issuance divided by total assets.	Compustat Quarterly
EISS/TA	Equity issuance divided by total assets.	Compustat Quarterly
CAPX/TA	Capital investment divided by total assets.	Compustat Quarterly
ΔPPE	Percentage change in property, plant, and equipment from the previous quarter (or year).	Compustat Quarterly
ln(1 + R&D)	Natural logarithm of 1 plus quarterly (or annual) R&D expenses. Missing R&D expenses are treated as 0.	Compustat Quarterly
ln(TA)	Natural logarithm of total assets.	Compustat Quarterly
ln(BM)	Natural logarithm of book-to-market equity ratio.	Compustat Quarterly
Emp/TA	The number of employees (in thousands) divided by total assets.	Compustat Annual
ln(1+SG&A)	Natural logarithm of 1 plus the selling, general, and administrative (SG&A) expenses. Missing SG&A expenses are treated as 0.	Compustat Annual
Employee/Diversity	Sum of total strength scores for the employee relations and diversity dimensions.	MSCI KLD database
CFVOL	Standard deviation of quarterly industry-median-adjusted return on assets over the past two years.	Compustat Quarterly
HHI	Herfindahl-Hirschman Index of industry concentration, computed based on 2-digit-SIC industry sales.	Compustat Annual
ln(1+Patent)	Natural logarithm of one plus the total number of patents filed (and eventually granted).	NBER Patent Database
R&D leader	A dummy that equals 1 when a firm is rated as a leader in its industry in R&D (PRO-str-B) in the MSCI KLD database, and 0 otherwise.	MSCI KLD database
Tail risk	A firm-level measure of tail risk, computed as the mean returns during the worst 5% returns days over the year.	CRSP
Risk exposure	The number of risk or uncertainty words mentioned in the earnings call transcript divided by the total number of bigrams in the transcript.	Hassan et al. (2019)
Efficiency	A firm-level measure of relative efficiency (in converting firm resources into sales), estimated using data envelopment analysis (DEA) and the following resource-generating input factors: cost of inventory, general and administrative expenses, fixed assets, operating leases, past research and development (R&D) expenditures, and intangible assets.	Demerjian et al. (2012)
−ΔEfficiency	Negative yearly changes in *ΔEfficiency* that take on the values of *ΔEfficiency* if *ΔEfficiency* is negative and a value of 0 otherwise. *ΔEfficiency* is the yearly changes in *Efficiency*.	Demerjian et al. (2012)
+ΔEfficiency	Positive yearly changes in *ΔEfficiency* that take on the values of *ΔEfficiency* if *ΔEfficiency* is positive and a value of 0 otherwise. *ΔEfficiency* is the yearly changes in *Efficiency*.	Demerjian et al. (2012)
Offshore	A dummy variable that equal 1 if a firm has mentioned sales to or imports from foreign countries in their 10-K reports, and zero otherwise.	Hoberg and Moon (2017, 2019)
ln(1+FX hedge)	Natural logarithm of 1 plus the number of times a firm has mentioned the use of foreign currency derivatives in their 10-K reports.	Hoberg and Moon (2017)

Appendix A.2. Bags of synonyms

Culture	Synonyms
Collaborate	capab*, cohes*, collab*, collectiv*, commit*, commun*, competen*, consens*, contribut*, cooperat*, coordin*, decentr*, dialog*, employ*, empower*, engag*, facilitator*, help*, hir*, human*, interper*, involv*, life*, longlast*, longterm*, loyal*, mentor*, mutual*, parent*, partic*, partner*, people*, responsib*, retain*, reten*, skill*, social*, team*, teamwork*, train*, willingness*, workgroup*
Control	administrat*, analys*, boss*, bureaucr*, cautio*, certain*, chief*, conservat*, control*, cost*, detail*, discipline*, document*, efficien*, enhance*, fail*, inform*, logic*, measur*, method*, outcom*, predictab*, procedur*, process*, productiv*, regular*, rule*, solv*, standard*, system*, uniform*
Compete	achiev*, acquir*, acquis*, aggress*, analyst*, attack*, challeng*, client*, compet*, customer*, expand*, fast*, goal*, growth*, hard*, market*, outsourc*, perform*, position*, pressur*, profit*, rapid*, reputat*, result*, revenue*, satisf*, share*, signal*, speed*, strong*, superior*, target*, value*, win*
Create	adapt*, begin*, chang*, creat*, develop*, discontin*, dream*, elabor*, entrepre*, envis*, experim*, fantas*, freedom*, future*, idea*, imagin*, init*, innovat*, intellect*, inventive*, learn*, new*, origin*, pioneer*, rd*, radic*, research*, start*, thought*, trend*, unafra*, ventur*, vision*

Appendix A.3. Other robustness tests

		Raw returns				*Abnormal returns*			
Row	Description	*Collaborate*	*Control*	*Compete*	*Create*	*Collaborate*	*Control*	*Compete*	*Create*
(1)	Controlling for investor sentiment (β_{SENT})	−1.613	3.919***	0.001	−2.114	−1.386	5.750***	1.113	−2.927
		(1.718)	(1.150)	(1.028)	(1.658)	(3.117)	(2.011)	(1.817)	(2.973)
(2)	Controlling for CSR ($N = 1749$)	−3.592	4.607***	0.242	−3.032	−3.322	6.477**	0.441	−2.963
		(2.693)	(1.653)	(1.373)	(2.427)	(5.069)	(2.877)	(2.469)	(4.273)
(3)	Controlling for governance variables ($N = 973$)	−6.685**	4.631**	−1.580	−4.203	−9.850**	7.411**	−2.713	−3.447
		(3.138)	(1.922)	(1.684)	(3.287)	(4.903)	(3.282)	(2.868)	(5.543)
(4)	Controlling for total institutional ownership ($N = 2961$)	−0.451	3.362***	0.383	−1.727	−8.885**	4.452*	1.699	−5.386
		(1.831)	(1.254)	(1.112)	(1.859)	(4.302)	(2.456)	(2.273)	(5.563)
(5)	Controlling for family & managerial ownership ($N = 368$)	−0.006	4.159**	1.351	−1.949	−11.658*	6.561*	1.581	−6.333
		(3.337)	(2.118)	(1.953)	(3.310)	(6.848)	(3.735)	(3.667)	(8.649)
(6)	Controlling for 10-K tone and readability	−1.587	3.619***	−0.075	−1.757	−0.940	5.607***	0.988	−2.360
		(1.728)	(1.159)	(1.034)	(1.655)	(3.135)	(2.010)	(1.832)	(2.968)
(7)	Controlling for *Modified Z-score*	−0.940	3.710***	−0.358	−0.147	2.267	5.551**	−0.171	0.645
		(2.286)	(1.268)	(1.178)	(1.938)	(4.377)	(2.237)	(2.091)	(3.481)
(8)	Controlling for *precrisis ROA vol* over 2002–06	−2.377	3.146***	0.630	−2.011	−2.420	4.857**	1.366	−1.828
		(1.783)	(1.193)	(1.071)	(1.668)	(3.307)	(2.111)	(1.898)	(3.000)
(9)	Matched sample for high-*Control* firms (top 25%)	0.244	3.325**	−1.563	1.962	2.774	5.665**	−3.218	5.184
		(2.958)	(1.518)	(1.525)	(2.448)	(4.883)	(2.692)	(2.581)	(4.391)
(10)	Alternative sample: \$1≤ Price <\$1000	−1.277	3.850***	0.560	−2.669	−0.319	5.905***	1.396	−4.517
		(1.725)	(1.147)	(1.020)	(1.671)	(3.087)	(2.009)	(1.805)	(2.998)
(11)	Excluding financial and utilities firms	1.416	3.517***	−0.712	−1.000	4.953	4.765**	−0.496	−0.548
		(2.096)	(1.304)	(1.206)	(1.932)	(3.911)	(2.311)	(2.142)	(3.537)

This table reports results from other robustness tests (following the baseline crisis regression model specification, if not stated otherwise). Only the estimates for the four culture variables are reported for brevity. Columns (1) to (4) ((5) to (8)) report results for *Raw returns* (*Abnormal returns*). In a given row, the results reported in the four columns (e.g., columns 1 to 4) are extracted from a single regression. Row (1) accounts for the influence of investor sentiment on crisis stock returns. β_{SENT} is the estimated loadings of the Baker and Wrugler (2006) investor sentiment index from a time-series factor regression based on the Carhart (1997) four-factor model augmented with the sentiment index, using monthly excess stock returns over the 60-month window prior to the crisis (i.e., from 2003m8 to 2008m7). Row (2) controls for firm-level corporate-social-responsibility score constructed following Lins et al. (2017). *CSR* is the sum of the net index (relative strength index minus relative concern index) across the five dimensions (diversity, employee, social, environment, and human rights) for a given firm from the MSCI KLD database. Row (3) controls for several firm-level governance characteristics, including an antitakeover index, board size, board independence, and CEO duality. Row (4) controls for the total percentage ownership by institutional ownership from the Thomson Reuters Institutional Holdings (13F) database. Row (5) controls for the total percentage voting rights by ultimate controlling family owners, from the Bureau van Dijk Orbis database. Row (6) control for the proportion of negative words on a firm's 10-K report, collected from Loughran and McDonald (2011), and the natural log of 10-K report file size (in megabyte), collected from Loughran and McDonald (2014). Row (7) controls for bankruptcy risk measured by the modified Z-score, computed as the sum of 3.3 times earnings before interest and taxes, plus sales, 1.4 times retained earnings, plus 1.2 times working capital, all divided by total assets. Row (8) controls for the time-series standard deviation of annual *ROA* (*precrisis ROA vol*) estimated over the period from 2002 to 2006. In row (9), we apply propensity-score-matching techniques to construct a control group of firms comparable in all observable characteristics (including *Collaborate, Compete*, and *Create, Modified Z-score* and *precrisis ROA vol*) to firms in the top quartile of *Control* and then estimate the baseline crisis regressions on the matched sample. Row (10) exclude stocks with prices below or equal to \$1 and those with prices above \$1000. Row (11) excludes stocks operating in the financial and utilities industries.

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