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The impact of managerial ability on crisis-period corporate investment

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ABSTRACT

In this study, we document a strong positive relation between pre-crisis managerial ability and corporate investment during the crisis period, which remains robust in the presence of a large array of control variables capturing corporate governance attributes, executive compensation incentives and CEO characteristics. This relationship was prevalent only among firms with CEOs that had general managerial skills, rather than firm-specific skills. Our results also show that the positive relationship between managerial ability and corporate investment was supported by the capacity of such firms to secure greater financing and be less vulnerable to financial constraints during the crisis. Finally, we find that, on average, the stock market evaluates crisis-period investments positively, yet this effect is evident solely among firms characterized by high pre-crisis managerial ability. Overall, the results are consistent with the view that high managerial ability helps to mitigate underinvestment problems during a crisis which in turn increases firm value.

1. Introduction

The impact of managerial ability on firm policies has long been ignored under the assumption that managers are largely homogeneous entities, which implies a limited role for manager-specific influence on economic outcomes. Only recently have a handful of studies challenged this view by recognizing that managers play an economically significant role on their firms' choices and performance (Andreou, Philip, & Robejsek, 2016; Bamber, Jiang, & Wang, 2010; Chemmanur, Paeglis, & Simonyan, 2010; Choi, Han, Jung, & Kang, 2015; Demerjian, Lev, & McVay, 2013; Francis, Ren, Sun, & Qiang, 2016). We extend this literature by using the 2008 global financial crisis as a natural experiment setting to investigate the impact of managerial ability on corporate investment. In addition, we scrutinize the nature of managerial ability to acquire insights about the type of ability that has the greatest effect on investments. Finally, we explore the relationship of managerial ability with corporate financing and firm value respectively.

Although it could be argued that the relationship between firm managerial ability and corporate policy is straightforward, prior findings have often proved contradictory. For instance, a stream of literature suggests that more able managers with reputations at stake are expected to reject opportunistic rent-seeking actions that harm firm value, since such behavior could tarnish their ability and standing as perceived by shareholders and investors (e.g., Falato, Li, & Milbourn, 2015; Fama, 1980; Graham, Harvey, & Puri, 2013; Kreps, Milgrom, Roberts, & Wilson, 1982). A different stream of literature, however, argues that more able managers may decide to pursue such as ill-advised investment- or earning- management to preserve their human capital and reputation, despite the fact that these actions usually reduce firm value (Malmendier & Tate, 2007; Francis 2008; Petrou & Procopiou, 2016). Such mixed evidence indicates that the relationship of managerial ability with firm policy and outcomes has not yet reached a consensus. Perhaps, this controversy is due to the confounding effects arising from endogeneity problems, whereby contemporaneous realizations of both the dependent variable and the explanatory variables in question affect each other (Abdallah, Goergen, & O'Sullivan, 2015).

In this paper, we circumvent such endogeneity concerns by focusing on the relationship between managerial ability and corporate policy during the financial crisis. This period is an ideal setting for such an investigation, not only for its recentness and severity, but primarily due to its broadly adverse impact on the availability of corporate finance, as well as consumers in general (Duchin, Ozbas, & Sensoy, 2010). Specifically, the extreme market conditions characterized by liquidity shortfalls (Ivashina & Scharfstein, 2010), along with the uncertainty and conservative approach of financial institutions dictating for more internal control, made it very difficult for corporations to obtain credit lines and access external capital. At the same time, firms faced various

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exogenously-driven bottlenecks, such as low demand for their products, resulting in losses that harmed their capacity to internally generate enough resources to finance attractive investments. Such weakened funding capacity created the conditions for firms to suffer from underinvestment problems (Balakrishnan, Watts, & Zuo, 2016; Campello, Graham, & Harvey, 2010; Duchin et al., 2010), which could be detrimental to firm value. Overall, the recent financial crisis abruptly changed firms' environment by causing an exogenous shock on their policies. The crisis therefore provides a natural experiment setting, suitable to alleviate endogeneity caveats that usually handicap empirical analyses in corporate finance research.

In this study, we hypothesize that the impact of managerial ability on firms' corporate investment were not only more easily identified during the crisis period, but were also more profound in the presence of an exogenous negative shock to the availability of financing resources that potentially undermines investments. Accordingly, we expect firms with higher pre-crisis managerial ability to have invested more during the crisis period because their managers' ability facilitated greater access to financing resources. In addition, such investments should also have been more highly valued by the market because they mitigated severe underinvestment problems that emerged during that period.

To investigate these hypotheses, we use a measure of managerial ability proposed by Demerjian, Lev, and McVay (2012). The measure is based on a comparison of managerial efficiency in transforming corporate resources to revenue, relative to their industry peers. Managerial ability is considered high when managers generate more significant revenue using a given level of resources or, conversely, when they minimize the resources used for a given level of revenue. Using this measure, we provide empirical evidence of a strong positive relation between pre-crisis managerial ability and crisis-period capital expenditure. The results remain robust even at the inclusion of additional control variables relating to corporate governance attributes, executive compensation incentives and CEO characteristics.

Despite the financial crisis being exogenous, capable of mitigating endogeneity, for robustness purposes, we also use a propensity score matching (PSM) approach to ensure that our results are not driven by different characteristics between firms with high or low managerial ability. This treatment controls for the possibility that certain firm attributes simultaneously affect managerial ability and crisis-period investments. The results of PSM lend further credence to our main finding regarding the positive relationship between pre-crisis managerial ability and crisis-period corporate investment.

Further, we examine the types of managerial ability that seem to withstand distressed times, shedding light on the growing importance of general versus firm-specific managerial skills (Brockman, Lee, & Salas, 2016; Custódio, Ferreira, & Matos, 2013). We find that the positive relationship between pre-crisis managerial ability and crisis-period investments is prevalent only among firms with CEOs who have general managerial skills (i.e. generalists) rather than firm-specific skills (i.e. specialists). Additionally, we find a positive relationship between pre-crisis managerial ability and crisis-period financing resources. Thus, an important channel through which managerial ability affects investments is by facilitating financing. Finally, we document that the stock market highly valued the crisis-period investments only when these were made by firms with high pre-crisis managerial ability.

This study contributes to the literature as follows. First, our results show positive valuation of capital expenditure during the crisis period for firms with high pre-crisis managerial ability, whereby firms with low pre-crisis managerial ability experienced negative valuation of investments. This finding contributes to the extant literature (e.g., Falato et al., 2015; Francis, Huang, Rajgopal, & Zang, 2008; Graham et al., 2013; Malmendier & Tate, 2007) by shedding light on the differential way that managerial ability impacts firm value and helps to settle the conflicting conjectures as debated in prior studies. Second, we contribute to recent studies that investigate how firms managed liquidity shortfalls in their effort to mitigate underinvestment problems following the onset of the crisis (e.g., Campello, Giambona, Graham, & Harvey, 2011; Campello et al., 2010; Duchin et al., 2010). Our findings suggest that higher managerial ability contributed to the capacity of firms to secure more financing during the crisis, which in turn enabled them to pursue more investment opportunities. In this respect, high managerial ability appears to offset crisis-period underinvestment problems that in turn enhanced firm value. Finally, we contribute to the burgeoning literature that highlights the importance of general versus firm-specific skills with respect to CEO pay (e.g., Brockman et al., 2016; Custódio et al., 2013; Murphy & Zabojnik, 2004). Our results reveal that generalist, not specialist, CEOs mitigate underinvestment at times of constrained economic conditions. In this vein, our findings provide an economic explanation of why generalist CEOs earn significantly higher salaries compared to their specialist peers.

The remainder of this paper is organized as follows: Section 2 describes the literature review and the arguments of the study. Section 3 includes the sample and data measurement, Section 4, the statistical methodology and empirical results. Section 5 provides a conclusion.

2. Background on managerial ability, corporate policies and outcomes

Recent literature has investigated whether managerial characteristics and competencies such as ability, talent, quality or reputation influence corporate decision-making. Starting with Bertrand and Schoar (2003), a significant extent of the heterogeneity in investment, financial, and organizational practices of firms is shown to be explained by managers' fixed effects. Chang, Dasgupta, and Hilary (2010) link variations in management actions and styles to variations in firm performance, consistent with the view that differences in firm performance may also stem from managers' traits or experiences. This view is also supported by Chemmanur and Paeglis (2005), Chemmanur, Paeglis, and Simonyan (2009) and Switzer and Bourdon (2011) who document positive relations between firm management quality and IPO/SEO performance. In addition, Chemmanur et al. (2010) find value-enhancing anti-takeover provisions in the presence of higher quality firm management. In the banking industry, Andreou et al. (2016) demonstrate that more able bank managers have the capacity to handle higher risks and to facilitate greater intermediation. Finally, Francis et al. (2016) show that firms with higher ability managers obtain more favorable loan contract terms, such as lower loan spreads, less stringent covenants, and longer term maturity. Overall, the literature demonstrates the importance of managerial ability on firm policies and outcomes.

More able managers tend to be, inter alia, more knowledgeable about their business, leading to better judgments and estimates about product demand, a better understanding of technology and industry trends and a more efficient management of their employees (Demerjian et al., 2012, 2013). Therefore, firms with higher managerial ability are expected to align resources well with the environment in which they operate, resulting in greater internal profitability. This is particularly important in the presence of growth opportunities, since it can facilitate a continuum of investments, especially if these firms face difficulties in raising external finance.[1]

Perhaps the most prominent channel through which managerial ability affects firm policy is through the reputational capital that managers accumulate over the course of their career. When financing

[1] Campello et al. (2010) report that during the financial crisis, 86% of US firms facing financial constraints bypassed attractive investments due to difficulties in raising external finance, compared to 44% of financially unconstrained firms that did the same. Also, they report that more than half of US firms rely on internally-generated cash flows to fund investment under financially constrained circumstances, and 56% of constrained firms are found to cancel investment projects when they are unable to obtain external funds, compared to 31% of unconstrained firms that may cancel investment.

investment opportunities through internal profitability is not adequate, the reputational capital of more able managers is relied upon to access external financing for the firm; for instance, through sustained negotiations and dealings with market participants (Chemmanur & Paeglis, 2005; Chemmanur et al., 2009). Higher managerial ability can therefore act as a guarantee, as it vouches for a firm's quality to outside markets, thus achieving a lesser cost of capital due to a reduction in information asymmetry between firm insiders and outside markets regarding firm value (Chemmanur & Paeglis, 2005). A reduction in information asymmetry allows creditors to anticipate future performance and more accurately evaluate the probability of default states, which translates into a lower price of debt and more flexible contract terms such as maturity, limitations on covenants, or collateral requirements (Aivazian, Qiu, & Rahaman, 2010; Francis et al., 2016). Together with their perceived ability to better resolve agency issues (Chemmanur et al., 2009), more able managers inspire credibility in the eyes of creditors and other stakeholders in general. Credibility is important, especially during financial crises, as such periods intensify friction in external capital markets. Such friction hinders a firm's capacity to acquire capital to pursue investment projects (Bernanke & Gertler, 1989; Bernanke & Gertler, 1999), resulting in underinvestment; not so, however, for firms with more able managers, which manage to overcome such friction. Therefore, firms with higher managerial ability should have better chances to access external financing such as loans and achieve lower loan rates or less stringent non-price contract terms, lowering in this way the financing cost of their investments.

Overall, we hypothesize that firms with higher managerial ability were likely to have a larger scale of corporate investment during the crisis period, due to greater access to financing resources, mitigating in this respect underinvestment problems which, in turn, enhances firm value.

3. Data and variables

3.1. Data

To construct our dependent variables, we obtain data from the COMPUSTAT/CRSP merged database for the fiscal year 2008. According to Duchin et al. (2010), and Balakrishnan et al. (2016), the crisis period lasted from August 1, 2007 to August 31, 2009. During that period, there was an abnormally high LIBOR-OIS spread, which caused loan spreads to skyrocket, consistent with the view that the financial crisis exogenously tightened firms' access to finance. Therefore, the fiscal year 2008, residing somewhere in the middle of the above-mentioned dates, serves to represent the period of *crisis*. We then link our crisis-period-dependent variables with two measures of managerial ability estimated before the onset of the crisis (i.e., up to the end of the fiscal year 2006); estimating ability during the *pre-crisis* period ensures that our measure is not affected by consequences arising from the crisis. The sample on which we can secure an estimate of managerial ability measures features 2748 firms, however, depending on the regression model, we ultimately use less data, due to missing observations around the control variables, specifically around firm characteristics, corporate governance attributes and CEO characteristics/executive compensation incentives. Corporate governance attributes and CEO education information are collected from BoardEx, while executive compensation and other CEO characteristics data are collected from Execucomp. To lessen the influence of outliers, we winsorize the continuous variables at the 1st and 99th percentiles.

3.2. Variable definitions and measurement

In this section, we describe the measurement of the three sets of variables used to empirically test our baseline models, specifically: (i) dependent variables, i.e., investments, financing and firm value, (ii) independent variables, i.e., managerial ability, and (iii) main control variables relating to firm-level characteristics. Detailed variable definitions can be found in the Appendix.

3.2.1. Dependent variables

We use different dependent variables that cover the three main areas examined in the study: investments, financing and firm value. We measure crisis-period corporate investment (*CRISIS_INVESTMENT*) with capital expenditures divided by beginning of the year net assets, while crisis-period firm value is measured using Tobin's Q (*CRISIS_Q*), defined as market value of equity, plus total debt, plus preferred stock liquidating value, minus deferred taxes and investment tax credits, all deflated by the book-value of assets. For financing resources we employ three measures. First, crisis-period cash flow (*CRISIS_CF*) is defined as operating income before depreciation, deflated by beginning of the year stockholder equity. Second, crisis-period total resources (*CRISIS_RESOURCES*) are defined as the difference between the issuance of long-term debt and long-term debt reduction, plus operating activities, all deflated by beginning of the year net assets. Third, a crisis-period financial constraints index (*CRISIS_FINCON*) is defined as in the Whited and Wu (2006) study, which is based on firm characteristics associated with external finance constraints and, as such, reflects the severity of liquidity constraints faced by each firm in our sample during the crisis period.

3.2.2. Independent variable: Managerial ability

The managerial ability measures are derived from the method proposed by Demerjian et al. (2012).[2] This measurement of managerial ability captures the ability of firm managers to produce more revenue while using either the same or even fewer resources than their peers in the same industry. Demerjian et al. (2012) use data envelopment analysis (DEA) to model firm efficiency, following a two-step procedure to quantify managerial ability. The first step requires the estimation of firm efficiency scores defined as the ratio of outputs over inputs using the following DEA optimization problem:

$$DEA - Eff: \quad max_v \theta = \frac{\sum_{i=1}^{s} u_i y_{ik}}{\sum_{j=1}^{m} v_j x_{jk}}, \; k = 1, \ldots n \tag{1}$$

In Eq. (1), s are the outputs, m are the inputs, n is the number of firms, while u and v represent the respective weight for the outputs and inputs, which is necessary to calculate the firm efficiency score. Following the rationale of Demerjian et al. (2012), the output variable used in Eq. (1) is sales, whereas the input variables are: net property, plant and equipment, net operating leases, net research and development, purchased goodwill, other intangible assets, cost of inventory, as well as, general, selling and administrative expenses. These inputs all contribute to the generation of revenue and are affected by managerial ability, as each input is subject to managerial discretion. The solution to the above optimization problem results in an efficient frontier that measures the amount and mix of resources used to generate revenue by firms within each industry. Firms operating on the frontier are assigned a score of one and the least efficient firms are assigned a score of zero; the lower the firm's score, the further away it is from the frontier.

As theorized by Demerjian et al. (2012), firm efficiency scores are affected by both firm-specific factors and management ability. Therefore, the second step purges the effect of key firm-specific characteristics, which may aid or hinder manager ability, by regressing the DEA efficiency scores ($DEA - Eff$) on firm size, market share, positive free cash flows, firm age, number of segments and a foreign currency indicator. Demerjian et al. (2012) estimate the following Tobit regression model per industry:

[2] Our implementation follows the estimations in Demerjian et al. (2012) exactly. Therefore, in this section we provide a brief discussion of how we measure managerial ability. Further details on the implementation of this method can be found in the original article.

Table 1
Summary statistics.

	Mean	Median	Standard deviation
Dependent variables			
CRISIS_INVESTMENT	0.140	0.063	0.258
CRISIS_CF	0.209	0.206	0.562
CRISIS_RESOURCES	0.196	0.158	0.510
CRISIS_FINCON	-0.171	− 0.197	0.187
CRISIS_Q	2.617	2.355	6.872
Main independent variables			
RES_EFF_2006	− 0.005	− 0.042	0.257
RES_EFF_AV	− 0.017	− 0.065	0.263
Main control variables			
SIZE	6.435	6.351	2.025
MTB	3.289	2.429	4.003
LEV	0.259	0.189	0.285
GROWTH	0.190	0.092	0.413
RET	0.228	0.092	0.784
ROE	0.128	0.165	0.508
CF	0.215	0.252	0.598

This table reports descriptive statistics for the dependent variables, managerial ability and main control variables using a sample of 2583 observations with available information for all tabulated variables. All variables are defined in the Appendix A.

$$DEA - Eff = a_0 + a_1 FirmSize + a_2 MarketShare + a_3 FreeCashFlow + a_4\ FirmAge + a_5 Number of Segments + a_6 ForeignCurrencyIndicator + a_7 YearFixedEffects + RES.EFF. \quad (2)$$

In regression Eq. (2), the residual term (*RES_EFF*) captures the effect of firm efficiency attributed to managerial ability. Hence, our first measure of managerial ability, denoted as *RES_EFF_2006*, is the residual term of Eq. (2) using data exclusively from the fiscal year 2006. We also estimate an alternative managerial ability measure, denoted as *RES_EFF_AV*, by using the per-firm average value of *RES_EFF* with data from the fiscal years 2002 to 2006. As shown in Table 1, which describes the summary statistics of our main variables, the mean (median) values of *RES_EFF_2006* and *RES_EFF_AV* are − 0.005 (− 0.042) and − 0.017 (− 0.065) respectively, all close to the value of − 0.004 (− 0.013) reported by Demerjian et al. (2012). The standard deviations of *RES_EFF_2006* and *RES_EFF_AV* are respectively 0.257 and 0.263, which are higher than the value of 0.149 reported by Demerjian et al. (2012). We attribute this discrepancy to the difference in the sample size between the two studies. Specifically, Demerjian et al. (2012) employ 177,134 observations sampled from 1980 to 2009, which is a significantly bigger data set compared to ours. Due to statistical reasons, it is natural to observe a much lower standard deviation in their case.

We deem this managerial ability measurement approach suitable for our investigation, as it reflects the ability of managers to generate revenue through efficient exploration of resources through decisions and choices encompassing capital, labor, investment, and other revenue-generating practices. In this respect, higher-ability firms are those with more able managers who are knowledgeable of their business in terms of cost and revenue drivers, and have better skill attributes and superior judgment in anticipating future changes compared to their less able peers. Therefore, the choice of the managerial ability measure for this study is directly linked to the main research questions under investigation that reflect access to, and use of, resources in the form of investments to enhance firm value. Further, this approach lends credence to our analysis as it enables us to compute managerial ability measures for a broader set of firms, including small ones, offering more generalized inferences compared to studies that have focused exclusively on certain types of firms and specific events (e.g., Chemmanur & Paeglis, 2005; Chemmanur et al., 2009).

Due to the fact that *RES_EFF* in Eq. (2) is calculated on a two-step estimation approach, it is likely to suffer from random measurement errors that could harm the precision of the ability measure and consequently distort statistical inferences. Therefore, to mitigate a potential bias in the managerial ability measures, as in the case of Demerjian et al. (2013), we independently recode *RES_EFF_2006* and *RES_EFF_AV* into deciles by assigning the value of 0 to the decile with the 10% lowest values, the value of 9 to the decile with the 10% highest values, while in-between deciles are accordingly assigned values from 1 to 8. The categorical definitions of managerial ability are correspondingly denoted as *MA* and *MA_AV*.[3]

Finally, it is important to note that both managerial ability measures utilize information from fiscal year 2006 or prior, that is to say at least two years away from the time-point we measure our dependent variables. This is a crucial treatment, ensuring that the measurement of managerial ability is less likely to be spuriously related to unobserved within-firm changes in financing and investment policies following the onset of the crisis. The latter advantage should be stronger for *MA_AV* that aggregates (per-firm) information from 2002 to 2006, and therefore it is even less likely to be confounded from effects related to a potential anticipation of the crisis.

3.2.3. Main control variables

Following prior studies (see Balakrishnan et al., 2016; Chemmanur et al., 2009; Duchin et al., 2010; Francis et al., 2016) within the context of our own investigation, we control for size, leverage, profitability, cash flow, and growth opportunities to account for firm-related heterogeneity that can influence corporate investment and financing opportunities, all of them measured in the pre-crisis period (i.e., the fiscal year 2006). Specifically, size (*SIZE*) is defined as the natural logarithm of the firm's market value of equity. Size signals firm quality and power, whereby larger firms may enjoy easier access and more favorable financing terms, hence they might have the capacity to carry out more investments. Leverage (*LEV*) is the book value of debt divided by the book value of total assets and could account for potential investment distortions and impediments to financing in case of over-indebtedness; conversely, leverage may also signal a firm's stronger corporate governance quality, as higher levels of leverage discipline and incentivize managers in delivering strong operating performance and high growth in the net assets of the firm. Cash flow (CF) is calculated as operating income, before depreciation, deflated by beginning-of-the-year stockholder equity and used to account for financial slack that could allow for more investments that remedy underinvestment problems. Return on equity (*ROE*) is calculated as earnings, before interest and taxes, deflated by beginning-of-the-year net assets and used to account for profitability, which enhance the firm's internal sources of financing allowing for more investments. Further, we proxy for growth opportunities using the firm's market-to-book ratio (*MTB*) and stock return performance (*RET*). *MTB* is calculated as the market value, divided by the book value of equity. Firms with higher *MTB* values feature richer growth opportunity sets, implying higher market expectations for future profitability. Hence, such firms may have easier access to external financing in order to make investments. To capture growth opportunities and market expectations not reflected in MTB, we also consider the firm's stock return performance (*RET*), calculated as the 12-month compounded stock return (excluding dividends) spanning the fiscal year 2006. Additionally, we account for the firm's asset growth rate (*GROWTH*), calculated as the difference between the beginning- and

[3] The recoding of managerial ability from a continuous variable to a categorical one, leads to slightly stronger relations with the dependent variables. For example, the correlation coefficient between *RES_EFF_AV* and *CRISIS_INVESTMENT* is 0.069 (p-value < 1%), whereas the correlation coefficient between *MA_AV* and *CRISIS_INVESTMENT* is 0.071 (p-value < 1%). In general, we get slightly higher power in our test statistics when using the categorical definition of managerial ability, despite the fact that all our statistical inferences and conclusions remain unaltered if we instead use *RES_EFF_2006* and *RES_EFF_AV*.

end-of-year total assets deflated by beginning-of-year total assets. A firm featuring greater past asset expansion might have exhausted its financial slackness and hence has less capacity to access additional financing to offset underinvestment.

4. Empirical results

4.1. Descriptive statistics

Table 1 provides summary statistics of the main variables employed in the empirical analysis. These statistics are computed using a sample of 2583 observations with all available information across the variables contained in this table.[4] In terms of crisis-period investments, *CRISIS_INVESTMENT* has a mean of 0.140 and a standard deviation of 0.258. In terms of the various financing resources, *CRISIS_CF* has a mean (standard deviation) of 0.209 (0.562), while the corresponding figures for *CRISIS_RESOURCES* and *CRISIS_FINCON* are 0.196 (0.510) and −0.171 (0.187), respectively. In terms of firm value, *CRISIS_Q* has a mean of 2.617 and a standard deviation of 6.872. Finally, in terms of control variables, the mean values (standard deviations) for *SIZE*, *MTB*, and *LEV* are 6.435 (2.025), 3.289 (4.003) and 0.259 (0.285), respectively. Other mean values (standard deviations) are 0.190 (0.413) for *GROWTH*, 0.228 (0.784) for *RET*, 0.128 (0.508) for *ROE* and 0.215 (0.598) for CF.

4.2. Multivariate analysis

In this section, we describe the methodology of our multivariate regression tests and discuss the results obtained from investigating the relation between pre-crisis managerial ability and crisis-period investments, financing and firm value.[5] According to our main hypothesis, we expect to observe a positive relation between pre-crisis managerial ability and crisis-period corporate investment. This should consequently be echoed on the crisis-period firm value.

4.2.1. Pre-crisis managerial ability and crisis corporate investment

Table 2 reports the results of the relation between pre-crisis managerial ability (*MA*, *MA_AV*) and capital expenditures during the crisis (*CRISIS_INVESTMENT*). The regression models include Fama-French 48 industry-fixed effects under the assumption that such treatment broadly captures product market competition, which highly correlates with corporate governance mechanisms (Giroud & Mueller, 2011). Thus, the inclusion of industry dummies can potentially control for disciplining effects on managerial opportunism, which correlates with severe agency problems that constitute significant caveats for firms in non-competitive industries. The regression models also include the above-mentioned set of control variables. Accordingly, characteristics featuring larger firms, and firms with greater growth opportunity sets and higher liquidity supply/slackness should have a positive impact on the scale of corporate investment.

The results in Table 2 show positive and significant relations between the pre-crisis managerial ability measures, namely *MA* (p-value < 10%) and *MA_AV* (p-value < 5%), and crisis-period investments (*CRISIS_INVESTMENT*). These findings lend support to the notion that more ably-managed firms made more investments during the crisis and this could act as a remedy to underinvestment problems. With regards to the control variables, the coefficients of firm size (*SIZE*), market-to-book (*MTB*) and leverage (*LEV*) are positive and statistically significant (p-values < 5%). Past asset growth rate (*GROWTH*), stock return performance (*RET*) and cash flows (CF) carry the expected coefficients signs but are not statistically significant, mainly because their influence on *CRISIS_INVESTMENT* is subsumed by the other variables.

Table 2
Managerial ability and investments.

	CRISIS_INVESTMENT	
	(1)	(2)
MA	0.010*	
	(0.006)	
MA_AV		0.012**
		(0.006)
SIZE	0.041**	0.042**
	(0.018)	(0.018)
MTB	0.115***	0.116***
	(0.017)	(0.017)
LEV	0.176***	0.176***
	(0.018)	(0.018)
GROWTH	0.004	0.004
	(0.017)	(0.017)
RET	0.021	0.022
	(0.017)	(0.017)
CF	0.011	0.011
	(0.018)	(0.018)
No. of Firms	2748	2748
R^2	0.262	0.262

This table reports regression coefficient estimates of pre-crisis managerial ability on investments during the crisis period (*CRISIS_INVESTMENT*). Model (1) includes the managerial ability measure, *MA*, whereas model (2) includes the managerial ability measure *MA_AV*. *CRISIS_INVESTMENT* is measured during the fiscal year 2008 while the managerial ability measures and the control variables are measured during the fiscal year 2006. All regressions include a constant and industry fixed effects. Statistical significance is designated by '***' at 1%, '**' at 5% and '*' at 10%.

4.2.2. Propensity score analysis

If the baseline characteristics of firms managed by more able managers are fundamentally different than those of firms managed by less able managers, then the managerial ability impact on corporate investment might be a statistical artefact stemming from model misspecification. To mitigate any potential non-randomized confounding biases relating to either measured or unmeasured baseline characteristics, we follow Andreou, Louca, and Petrou (2017) and create two data samples using a one-to-one PSM estimation. Based on this method, the resulting firm-year observations in each sample are comparable across the control variables, with the exception of managerial ability. Specifically, the method consists of a probit regression to estimate propensity scores based on the probability of receiving a binary treatment conditional on all the control variables. Thus, to operationalize the probit regression, we consider firms with more able managers as the treatment. We define more able managers using a binary variable based on the median value of pre-crisis managerial ability measures (e.g. *MA*, *MA_AV*). Then, for each managerial ability measure, we separately estimate the probability of firms with more able managers using as independent variables the controls included in our baseline models as per Table 2. Finally, for each case where a firm has more able managers, we use the propensity scores to find comparable firm observations where a firm has less able managers. To do so, we use the nearest-neighbor method along with the requirement that the absolute difference of the propensity score among pairs does not exceed 0.01. Where there is a concentration of firms with a less able manager that meet this criterion, we keep only the firm with the smallest difference in the propensity scores. This method yields, respectively, 1244 and 1364 unique pairs of matched firms when using *MA* and *MA_AV*. Panel A (Panel C) of Table 3 reports difference-in-means of the control variables for firms with more and less able managers for both the unmatched and matched samples

[4] In the regression analysis that follows, we only require simultaneous availability for *MA* and *MA_AV*, therefore certain regression models are estimated using a larger number of observations.

[5] For the regression analysis, all continuous variables have been standardized to have a mean of 0 and standard deviation of 1. Such standardization is useful to avoid potential influences attributed to scaling differences. Nevertheless, all results are robust when instead using unstandardized variables.

Table 3
Propensity score matching.

Panel A: Difference-in-means of control variables between high managerial ability and low managerial ability (based on the median value of *MA*)

	Unmatched sample		Matched sample	
	Difference-in-means	*t*-stat	Difference-in-means	*t*-stat
SIZE	0.078**	2.04	− 0.052	− 1.35
MTB	0.008	0.22	− 0.016	− 0.53
LEV	0.017	0.44	0.054	1.50
GROWTH	− 0.030	− 0.80	0.016	0.43
RET	− 0.033	− 0.86	0.016	0.47
CF	− 0.188***	− 4.94	− 0.031	− 1.38
Observations				
Total sample	2748		2488	
High MA	1374		1244	
Low MA	1374		1244	

Panel B: Managerial Ability (*MA*) and investments: Matched sample

MA	0.010*
	(0.006)
SIZE	3.578**
	(1.471)
MTB	0.575***
	(0.188)
LEV	0.718***
	(0.219)
GROWTH	− 0.660**
	(0.277)
RET	− 0.859**
	(0.367)
CF	− 6.170**
	(2.565)
No of firms	2488
R^2	0.665

Panel C: Difference-in-means of control variables between high managerial ability and low managerial ability (based on the median of *MA_AV*)

SIZE	0.058	1.53	− 0.042	–1.12
MTB	0.038	1.00	0.011	0.31
LEV	0.020	0.52	0.004	0.11
GROWTH	–0.018	− 0.47	0.018	0.46
RET	0.012	0.31	0.036	0.97
CF	–0.160***	− 4.21	− 0.016	− 0.44
Observations				
Total sample	2748		2728	
High MA_AV	1374		1364	
Low MA_AV	1374		1364	

Panel D: Managerial ability (*MA_AV*) and investments: Matched sample

MA_AV	0.018***
	(0.006)
SIZE	0.137***
	(0.032)
MTB	0.095***
	(0.027)
LEV	0.146***
	(0.026)
GROWTH	0.031
	(0.025)
RET	0.041*
	(0.025)
CF	–0.047
	(0.036)
No of firms	2728
R^2	0.625

This table reports regression coefficient estimates of pre-crisis managerial ability on investments during the crisis period (*CRISIS_INVESTMENT*) using propensity score matched samples. Panels A and C display for each control variable in Table 2 the difference-in-means between the high and low pre-crisis managerial ability subsamples (*MA* and *MA_AV*, respectively) together with the corresponding *t*-statistics. The unmatched sample corresponds to the original sample. The matched samples are the samples based on pre-crisis managerial ability propensity score matching. Panels B and D present coefficient estimates of specifications (1) and (2) of Table 2 (for *MA* and *MA_AV*, respectively) using the matched samples. *CRISIS_INVESTMENT* is measured during the fiscal year 2008 while the managerial ability measures and the control variables are measured during the fiscal year 2006. All regressions include a constant and industry fixed effects. Statistical significance is designated by '***' at 1%, '**' at 5% and '*' at 10%.

when the treatment effect is based on *MA* (*MA_AV*). As expected, the corresponding difference-in-means show that some control variables differ statistically for the unmatched sample. Nevertheless, the difference-in-means become statistically insignificant for the matched sample, consistent with the view that the propensity score matching approach succeeds in making the sample of firms with more able managers comparable to the sample of firms with less able managers. Based on these matched samples, we re-run the regression models of Table 2 using *MA* and *MA_AV*, respectively, as main variables of interest. The results in Panels B and D of Table 3 show positive and significant relations between *MA* (*p*-value < 10%), *MA_AV* (*p*-value < 1%) and crisis-period investments (*CRISIS_INVESTMENT*).

Overall, the PSM results continue to demonstrate that pre-crisis managerial ability has a strong positive relation with crisis-period corporate investments, lending further credence to the results obtained in Table 2.

4.2.3. Additional controls

The analysis in this subsection investigates the robustness of the main finding at the inclusion of a large array of corporate governance and CEO-related controls. Such an investigation is motivated by previous literature that documents links between firm policies with corporate governance (e.g., Harford, Mansi, & Maxwell, 2012) and CEO characteristics (e.g., Bertrand & Schoar, 2003; Chemmanur & Paeglis, 2005). If the positive effect of pre-crisis managerial ability on the scale of corporate investment is due to stronger governance structures or managerial traits, then we would expect this effect to diminish considerably (or even vanish) when such controls are included in the regression analysis.

We scrutinize the importance of corporate governance by augmenting our main regression models with corporate governance variables and retaining all other explanatory variables. Particularly, we incorporate the Gompers, Ishii, and Metrick (2003) index (*GIM*), which proxies for the balance of power between shareholders and managers, board size (*BOARD_SIZE*) to control for the effects of larger boards on investment levels, board independence (*BOARD_INDEP*) as an indication of superior governance, as well as stock (*INC_STOCKS*) and option (*INC_OPTIONS*) compensation incentives to account for the degree of alignment of executive incentives with shareholder interests as a direct way to mitigate agency problems.[6] We expect firms with lower GIM indices, smaller board sizes, higher proportions of independent directors, as well as more incentivized CEOs in terms of compensation, to maintain superior governance structures (Hoechle, Markus, Walter, & Yermack, 2012).

[6] These variables are all defined in the Appendix of this paper.

Table 4
Managerial ability and investments: Additional control variables.

	CRISIS_INVESTMENT		
Panel A	(1)	(2)	(3)
MA	0.027***	0.014*	0.028***
	(0.010)	(0.009)	(0.010)
SIZE	–0.035	0.008	− 0.028
	(0.056)	(0.035)	(0.057)
MTB	0.061*	0.051	0.051
	(0.036)	(0.031)	(0.036)
LEV	0.255***	0.219***	0.256***
	(0.035)	(0.028)	(0.035)
GROWTH	–0.031	0.009	− 0.036
	(0.040)	(0.033)	(0.040)
RET	0.181***	0.098***	0.184***
	(0.051)	(0.036)	(0.051)
CF	0.030	0.121***	0.034
	(0.041)	(0.034)	(0.040)
GIM	–0.014		− 0.011
	(0.012)		(0.012)
BOARD_SIZE	0.0289		0.045
	(0.036)		(0.036)
BOARD_INDEP	0.007		0.006
	(0.030)		(0.030)
INC_STOCKS	0.075**		0.079**
	(0.030)		(0.033)
INC_OPTIONS	0.019		0.016
	(0.034)		(0.035)
CEO_AGE		–0.091***	− 0.108***
		(0.028)	(0.033)
CEO_TENURE		0.051*	0.047
		(0.028)	(0.036)
CEO_DUALITY		0.0192	− 0.060
		(0.052)	(0.062)
No of Firms	844	1090	844
R^2	0.317	0.292	0.329
Panel B	(1)	(2)	(3)
MA_AV	0.026***	0.014*	0.027***
	(0.010)	(0.008)	(0.010)
SIZE	–0.036	0.007	− 0.029
	(0.056)	(0.035)	(0.057)
MTB	0.062*	0.051*	0.052
	(0.036)	(0.031)	(0.036)
LEV	0.255	0.219***	0.256***
	(0.035)	(0.028)	(0.035)
GROWTH	–0.029	0.009	− 0.034
	(0.040)	(0.033)	(0.040)
RET	0.184***	0.100***	0.187***
	(0.051)	(0.036)	(0.051)
CF	0.028	0.014	0.027***
	(0.041)	(0.008)	(0.010)
GIM	0.013		0.031
	(0.012)		(0.040)
BOARD_SIZE	0.030		− 0.011
	(0.036)		(0.012)
BOARD_INDEP	0.007		0.045
	(0.030)		(0.036)
INC_STOCKS	0.076**		0.005
	(0.030)		(0.030)
INC_OPTIONS	0.019		0.080**
	(0.034)		(0.033)
CEO_AGE		–0.091***	0.017
		(0.028)	(0.035)
CEO_TENURE		0.051*	− 0.109***
		(0.028)	(0.033)
CEO_DUALITY		0.021	0.047
		(0.052)	(0.036)
No of firms	844	1090	844
R^2	0.317	0.292	0.328

This table reports regression coefficient estimates of pre-crisis managerial ability on investments during the crisis period (*CRISIS_INVESTMENT*). *CRISIS_INVESTMENT* is measured during the fiscal year 2008 while the managerial ability measures and the control variables are measured during the fiscal year 2006. Panel A display results using the managerial ability measure *MA*. Model (1) includes corporate governance variables as additional controls. Model (2) includes CEO-level controls. Model (3) includes both corporate governance and CEO-level controls. Panel B displays similar estimations using the managerial ability measure *MA_AV*. All regressions include a constant and industry fixed effects. Statistical significance is designated by '***' at 1%, '**' at 5% and '*' at 10%.

Along with the corporate governance controls, our analysis also considers the effects of certain managerial characteristics. We include a proxy where a CEO's formal power is defined as a dummy that equals one when the CEO also serves as chairman of the board (*CEO_DUALITY*). We also include the natural logarithm of the CEO's age (*CEO_AGE*) and the natural logarithm of the CEO's tenure (*CEO_TENURE*) to proxy for the CEO's risk-taking and investment behavior. Much like the inclusion of corporate governance variables, we would expect pre-crisis managerial ability to have less impact on crisis-period investments in the presence of: (i) powerful CEOs, since they have discretionary authority to opportunistically engage in additional investments for servicing their risk-preferences (e.g., Aktas, Andreou, Karasamani, & Philip, 2016; Kim, Al-Shammari, Kim, & Lee, 2009), (ii) older CEOs consistent with the view that risk-taking behavior pertaining to certain corporate policies decreases as CEOs become older (Andreou et al., 2017; Serfling, 2014), and (iii) shorter tenures, as CEOs become more conservative as their tenure lengthens, an important factor, which may influence CEOs to adapt less to their external environment and limit their appetite to take more investments (e.g., McClelland, Barker, & Oh, 2012; Miller, 1991).

Model (1) of Panels A and B in Table 4 shows the regression results after the inclusion of additional corporate governance variables. Results maintain positive and significant coefficients (p-value $<$ 1%) for both measures of managerial ability (*MA*, *MA_AV*). A similar positive relation is shown in model (2), where the regression model controls for CEO characteristics. When all corporate governance and CEO characteristics controls are added in model (3), we still observe a strong positive and significant (p-value $<$ 1%) relation between both measures of pre-crisis managerial ability and crisis-period corporate investment.

Overall, we can conclude that the impact of managerial ability on investments is distinct and remains robust at the inclusion of other variables that feature corporate governance and CEO characteristics.

4.2.4. Types of managerial ability and crisis investments

Since the measure of managerial ability is generic, capturing a broader notion of manager impact on firm operational effectiveness, it would be beneficial to delve into the varying types of managerial ability that appear to be more influential within the setting of our analysis. Custódio et al. (2013) argue that general managerial skills have recently become more important than firm-specific skills. Firms and their respective boards show an inclination to outside hires, reflecting a shift in the relative importance of general versus specific human capital chosen for executive positions. These facts are substantiated by the premium that tends to be paid to generalist CEOs who have accumulated general managerial capital that is transferrable across firms and industries, rather than specialist CEOs, whose human capital is firm-specific (Brockman et al., 2016; Custódio et al., 2013).

We investigate whether our main inferences from Table 2 hold true across the array of skill type. We therefore utilize the general ability index as in Custódio et al. (2013) that classifies CEOs as either generalists or specialists, to investigate the types of managerial skills that matter most in corporate investment during the financial crisis. It is important to note that, while in Demerjian et al. (2012) the ability score is attributed to the management team, the general ability measure by Custódio et al. (2013) is attributed only to the CEO; the reasoning here

is that the CEO is considered the most influential personality in corporate decision-making and the one who, on average, most likely impacts corporate investment (Demerjian et al., 2012; Fee & Hadlock, 2003).[7]

The general ability index is based on the lifetime work experience of CEOs in publicly traded firms prior to their present CEO position, focusing, as mentioned, upon transferrable, rather than firm-specific, skills. Custódio et al. (2013) consider five aspects of general managerial ability: (i) number of previous positions in the CEO's career, to examine the exposure of the CEO to different organizational fields such as production, finance, sales, etc.; (ii) number of firms at which the CEO has been previously employed; (iii) number of previous industries, to identify the degree of the CEO's exposure to different business environments; (iv) previous positions of the CEO at various firms which could be viewed as an indicator of skills allowing the CEO to internally manage these firms and externally maintain the appropriate strategies for all stakeholders involved; and (v) past work experience in a conglomerate firm, which serves as a generic skill enhancer of management in complex and multi-industry settings. The index of general managerial ability is derived as the first factor of principal components analysis of these five dimensions, deriving a one-dimensional index of general managerial ability, with more weight attributed to those components that more precisely represent the general skills of a CEO; specifically, equal weight is assigned to the number of previous positions, firms, and industries, and a lower weight is assigned to the previous positions as CEO and conglomerate experience. The index is estimated by applying the scores of each proxy to the standardized general ability components, and is normalized to have a mean equal to zero and a standard deviation equal to one. This construction of a composite measure from the five variables helps to avoid problems arising from multicollinearity and measurement errors. The five variables are positively correlated with the index, indicating that higher values of the index reflect greater general human capital.

In Table 5, model (1) re-examines the relation between the two measures of managerial ability (Panel A for *MA* and Panel B for *MA_AV*) and crisis investments (*CRISIS_INVESTMENT*) for the sample in which the general ability index is available. In support of Table's 2 findings, these results also show that pre-crisis managerial ability is, in both measures, significant (p-values $<$ 5%) and positively related to crisis-period investments. We then investigate the effect of the types of managerial ability on this relation, whereby the relation is re-examined based on whether the CEO is classified as a specialist (observations with values below the median general ability scores) in model (2) or as a generalist (observations with values above the median general ability scores) in model (3).[8] Overall, the results show that the positive relation between pre-crisis managerial ability and crisis investments is statistically significant only in model (3) of Panels A and B, which refers to firms run by generalist CEOs (p-value $<$ 1% for *MA* and p-value $<$ 5% for *MA_AV*). It appears that generalist CEOs may be the best match in distressed times, as general knowledge and skills are an important dimension of CEO ability during such times. This finding adds to the work by Custódio et al. (2013) by providing further evidence of the growing importance of general versus firm-specific skills in the CEO market, particularly in periods when firms face several challenges, such as liquidity shortfalls and underinvestment problems.

[7] Demerjian,et al. (2012) find that 60.5% of their CEO fixed-effects within the period 1992–2009 are important indicators of managerial ability after controlling for firm fixed effects. They argue that these results indicate that the managerial ability measure reflects, to a large extent, the CEO's impact on firm organizational output. In our sample, we revisit their approach to observe a CEO-fixed-effects explanatory power of about 67%. This evidence suggests that the managerial ability measures we use are highly attributed to the decision-making of the CEO.

[8] This classification follows Custodio et al. (2013).

Table 5
Managerial ability and investments: Specialists versus generalists.

	CRISIS_INVESTMENT		
	All	Specialists	Generalists
Panel A			
MA	0.020**	0.001	0.035***
	(0.009)	(0.012)	(0.013)
SIZE	-0.006	− 0.052	0.033
	(0.035)	(0.052)	(0.048)
MTB	0.091***	0.358***	− 0.040
	(0.033)	(0.056)	(0.041)
LEV	0.228***	0.278***	0.169***
	(0.029)	(0.045)	(0.039)
GROWTH	-0.018	0.031	− 0.051
	(0.036)	(0.053)	(0.048)
RET	0.107***	0.050	0.173***
	(0.037)	(0.054)	(0.050)
CF	0.129***	− 0.071	0.152***
	(0.036)	(0.063)	(0.046)
No of firms	1029	511	518
R^2	0.279	0.433	0.254
Panel B			
MA_AV	0.019**	− 0.004	0.033**
	(0.009)	(0.012)	(0.013)
SIZE	-0.007	− 0.054	0.031
	(0.035)	(0.052)	(0.048)
MTB	0.091***	0.360***	− 0.040
	(0.033)	(0.056)	(0.041)
LEV	0.228***	0.276***	0.168***
	(0.029)	(0.045)	(0.039)
GROWTH	-0.017	0.032	− 0.049
	(0.036)	(0.053)	(0.048)
RET	0.109***	0.049	0.179***
	(0.037)	(0.054)	(0.050)
CF	0.128***	− 0.073	0.153***
	(0.036)	(0.063)	(0.046)
No of firms	1029	511	518
R^2	0.278	0.433	0.253

This table reports regression coefficient estimates of pre-crisis managerial ability on investments during the crisis period (*CRISIS_INVESTMENT*). *CRISIS_INVESTMENT* is measured during the fiscal year 2008 while the managerial ability measures and the control variables are measured during the fiscal year 2006. The sample consists of firms with available information for the general ability index developed by Custódio et al. (2013). Panels A and B display results using the managerial ability measures *MA* and *MA_AV*, respectively. All regressions include a constant and industry fixed effects. Statistical significance is designated by '***' at 1%, '**' at 5% and '*' at 10%.

4.2.5. Additional analysis on the types of managerial ability

Following a similar line of reasoning as for the analysis in Table 4, we investigate whether the above positive relation between managerial ability and investment that is prevalent only for generalist CEOs remains robust at the inclusion of additional controls. In Table 6, models (1) to (3) report the results for the sample of specialist CEOs, while models (4) to (6) report the results for the sample of generalist CEOs. Models (1) and (4) include corporate governance control variables, namely *GIM* index, board size (*BOARD_SIZE*), board independence (*BOARD_INDEP*), as well as executive stock (*INC_STOCKS*) and option (*INC_OPTIONS*) compensation incentives. For both managerial ability measures (Panels A and B), the results of model (1) show that the relation between pre-crisis managerial ability and crisis-period investments is insignificant for the sample of specialist CEOs. Conversely, the results in model (4) show that both measures are significant (p-value $<$ 1%) and positively related to the scale of corporate investment for the sample of generalist CEOs. Hence, generalist CEOs help to increase investments during distressed times even after taking into account corporate governance attributes. The same pattern appears in models (2) and (5) when CEO-level characteristics, namely age (*CEO_AGE*), tenure (*CEO_TENURE*), duality (*CEO_DUALITY*) and

Table 6
Specialists versus generalists and investments: Additional controls.

	CRISIS_INVESTMENT					
	Specialists			Generalists		
Panel A	(1)	(2)	(3)	(4)	(5)	(6)
MA	0.011	− 0.001	0.016	0.047***	0.046***	0.049***
	(0.014)	(0.014)	(0.016)	(0.014)	(0.015)	(0.015)
SIZE	–0.012	0.017	0.028	− 0.035	0.010	− 0.047
	(0.082)	(0.061)	(0.093)	(0.076)	(0.052)	(0.082)
MTB	0.350***	0.283***	0.367***	− 0.061	− 0.089*	− 0.071
	(0.067)	(0.062)	(0.071)	(0.045)	(0.046)	(0.047)
LEV	0.377***	0.318***	0.395***	0.168***	0.212	0.171***
	(0.055)	(0.051)	(0.060)	(0.048)	(0.044)	(0.051)
GROWTH	0.077	0.052	0.105	− 0.084*	− 0.066	− 0.090*
	(0.073)	(0.061)	(0.087)	(0.049)	(0.050)	(0.051)
RET	–0.009	− 0.002	0.008	0.354***	0.166***	0.361***
	(0.069)	(0.059)	(0.075)	(0.076)	(0.053)	(0.078)
CF	–0.289***	− 0.130*	− 0.331***	0.062	0.175***	0.067
	(0.078)	(0.070)	(0.082)	(0.050)	(0.049)	(0.052)
GIM	–0.025		− 0.021	− 0.000		0.001
	(0.017)		(0.018)	(0.017)		(0.018)
BOARD_SIZE	0.006		0.040	0.030		0.039
	(0.051)		(0.059)	(0.050)		(0.053)
BOARD_INDEP	0.010		0.026	0.030		0.028
	(0.041)		(0.047)	(0.044)		(0.051)
INC_STOCKS	0.149		0.092	0.374		0.466*
	(0.186)		(0.229)	(0.232)		(0.256)
INC_OPTIONS	–0.043		− 0.012	0.278		0.321
	(0.259)		(0.292)	(0.261)		(0.278)
CEO_AGE		–0.114**	− 0.180***		− 0.063	− 0.051
		(0.045)	(0.052)		(0.050)	(0.054)
CEO_TENURE		0.097**	0.159***		0.044	− 0.012
		(0.044)	(0.058)		(0.050)	(0.060)
CEO_DUALITY		–0.084	− 0.102		0.033	− 0.056
		(0.089)	(0.103)		(0.085)	(0.091)
CEO_EDU		–0.106**	− 0.186***		0.061	0.071
		(0.051)	(0.059)		(0.051)	(0.054)
No of firms	392	416	342	425	461	400
R^2	0.447	0.446	0.487	0.326	0.278	0.331
Panel B						
MA_AV	0.005	− 0.003	0.010	0.048***	0.044***	0.052***
	(0.014)	(0.014)	(0.016)	(0.014)	(0.014)	(0.015)
SIZE	–0.011	0.016	0.030	− 0.039	0.007	− 0.052
	(0.083)	(0.062)	(0.093)	(0.076)	(0.052)	(0.082)
MTB	0.353***	0.284***	0.369***	− 0.057	− 0.086*	− 0.067
	(0.067)	(0.062)	(0.071)	(0.045)	(0.046)	(0.047)
LEV	0.376***	0.317***	0.395***	0.166***	0.210***	0.167***
	(0.055)	(0.051)	(0.060)	(0.048)	(0.044)	(0.051)
GROWTH	0.079	0.052	0.108	− 0.083*	− 0.064	− 0.089*
	(0.073)	(0.061)	(0.087)	(0.049)	(0.050)	(0.0505)
RET	–0.011	− 0.003	0.005	0.362***	0.174***	0.369***
	(0.070)	(0.059)	(0.076)	(0.076)	(0.053)	(0.078)
CF	–0.292***	− 0.130*	− 0.335	0.060	0.175***	0.063
	(0.078)	(0.070)	(0.082)	(0.050)	(0.049)	(0.052)
GIM	–0.024		− 0.020	0.001		0.003
	(0.017)		(0.018)	(0.017)		(0.018)
BOARD_SIZE	0.004		0.039	0.036		0.045
	(0.051)		(0.059)	(0.050)		(0.053)
BOARD_INDEP	0.009		0.025	0.029		0.026
	(0.041)		(0.048)	(0.044)		(0.051)
INC_STOCKS	0.155		0.096	0.374		0.472*
	(0.186)		(0.229)	(0.231)		(0.255)
INC_OPTIONS	–0.055		− 0.029	0.300		0.350
	(0.259)		(0.291)	(0.261)		(0.277)
CEO_AGE		–0.115**	− 0.180***		− 0.060	− 0.050
		(0.045)	(0.053)		(0.050)	(0.054)
CEO_TENURE		0.097**	0.160***		0.042	− 0.014
		(0.044)	(0.058)		(0.050)	(0.060)
CEO_DUALITY		–0.084	− 0.100		0.040	− 0.053
		(0.089)	(0.103)		(0.085)	(0.090)

(continued on next page)

Table 6 *(continued)*

	CRISIS_INVESTMENT					
	Specialists			Generalists		
Panel A	(1)	(2)	(3)	(4)	(5)	(6)
CEO_EDU		–0.106**	− 0.185***		0.066	0.075
		(0.051)	(0.059)		(0.052)	(0.054)
No of firms	392	416	342	425	461	400
R^2	0.447	0.446	0.485	0.329	0.278	0.335

This table reports regression coefficient estimates of pre-crisis managerial ability on investments during the crisis period (*CRISIS_INVESTMENT*). *CRISIS_INVESTMENT* is measured during the fiscal year 2008 while the managerial ability measures and the control variables are measured during the fiscal year 2006. Models (1)–(3) use firm-years where the CEO is classified as specialist while models (4)–(6) use firm-years where the CEO is classified as generalist. Model (1) includes corporate governance variables. Model (2) includes CEO-level controls. Model (3) includes both corporate governance and CEO-level controls. Panels A and B display results using the managerial ability measures *MA* and *MA_AV*, respectively. All regressions include a constant and industry fixed effects. Statistical significance is designated by '***' at 1%, '**' at 5% and '*' at 10%.

education (*CEO_EDU*) are included as control variables in the models.[9] The ability of CEOs with more general managerial skills to increase investments during crisis periods is again robust at the inclusion of CEO-level characteristics. The same conclusions can be reached even when all corporate governance and CEO characteristics are combined together, as they are in models (3) and (6).

Overall, after the inclusion of a large array of corporate governance and CEO-related characteristics, the results in Table 6 continue to show a strong positive relationship between pre-crisis managerial ability and crisis-period investments that is prevalent only among firms with CEOs that have general (rather than firm-specific) managerial skills.

We also perform additional robustness checks on the above-mentioned relations. In Table 7, we use alternative measures to categorize between generalist vs. specialist CEOs. Using detailed data on the educational background of CEOs, we classify CEOs based on their highest educational degree. First, we conduct a test by dividing the data into the sample of CEOs who hold a PhD (i.e., specialists) and those that do not (i.e., generalists). Second, we conduct an additional test on whether the CEO holds any general postgraduate education degrees; thus, we divide the data into the sample of CEOs who have been awarded an MBA and/or a CPA degree (i.e., generalists) and all others who have specific postgraduate degrees (i.e., specialists).[10] Our reasoning in utilizing the educational background to characterize a CEO as a specialist or generalist concerns the fact that education is considered to affect managerial decision-making (e.g., Bertrand & Schoar, 2003). In this vein, for example, CEOs with PhDs can be regarded as individuals with skills which can be characterized as more firm-specific, as they can process specific information and make better decisions for specialized business/scientific-related issues. On the contrary, CEOs with MBA and/or CPA degrees can be regarded as individuals with more likely generic skills, who can more easily process information pertaining to factors such as investing, financing, forecasting, etc., allowing them to make better and sharper decisions in the context of evolving and highly turbulent market conditions.

In Table 7, models (1) to (6) report estimates for regression models of *CRISIS_INVESTMENT* when the CEO is classified as a specialist or a generalist based on whether they hold a PhD. To maintain consistency with previous analyses, we also incorporate controls of corporate governance and CEO-level characteristics. Similarly to our findings in Table 6, regression coefficients for both managerial ability measures emerge as insignificant in models (1) to (3) for the sample in which the CEO is classified as a specialist (under the heading "CEO holds a PhD"). Conversely, for the sample in which the CEO is classified as a generalist (under the heading "CEO does not hold a PhD"), regression models (4) to (6) evince a positive and significant relation between the two measures and investments. The same patterns continue to hold true for the specific vs. general education subsample analysis in models (7) to (12), which ascertain the robustness of our findings. Overall, the results confirm that a generalist CEO is the type of manager whose ability was most influential for the scale of corporate investment during the financial crisis.

4.2.6. Pre-crisis managerial ability and crisis period financing

Duchin et al. (2010) argue that corporate investment declined significantly following the onset of the crisis, and this decline appears to be greatest for firms with low cash reserves or high-net short-term debt, with high financing frictions, or in industries which are heavily dependent on external finance. If higher ability managers were more capable in mitigating underinvestment during the crisis, then one important conjecture to be made is that more ably-managed firms should also be able to mitigate the impact of negative shocks on the supply of internal and external finance, thus preserving the firm's capacity to carry out corporate investment. Further, more ably-managed firms convey trust and credibility to external markets and thus deal with fewer financial constraints and a greater supply of external funds; however, more ably-managed firms might have less need to raise funds externally if they generate internally-sufficient cash flows to undertake attractive investments during the crisis.

To examine these arguments, we investigate the relation between pre-crisis managerial ability and crisis-period financing resources as captured by cash flows (*CRISIS_CF*), total financing resources (*CRISIS_RESOURCES*) and financial constraints (*CRISIS_FINCON*). Table 8 presents regression results of the relation between the pre-crisis managerial ability (*MA*, *MA_AV*) and the aforementioned financing measures. As before, the regression models include our main control variables measured at the end of the fiscal year 2006, as well as industry fixed effects. Moreover, it is reasonable to posit that more able managers are better at anticipating future changes in their firm's underlying economic conditions (Trueman, 1986). This means that more able managers may foresee an upcoming financial crisis and build precautionary cash reserves or secure additional credit lines which can be used to fund investments during a crisis. To control for this possibility in our tests, which could otherwise create a mechanical relation between pre-crisis managerial ability and crisis-period financing, we include the pre-crisis period value (measured in fiscal year 2006) of each dependent variable under investigation, namely CF, *RESOURCES* and *FINCON*, respectively. Further, since information asymmetry between the firm and external capital markets may affect the relation

[9] We include CEO education as an extra managerial characteristic for this analysis that relies on a sample with available observations for the generalist-specialist skills. We deem this additional control variable necessary as variations in CEO educational background might be driving the strong positive relationship that is observed for the sample of generalists. *CEO_EDU* takes the value of 0 when the CEO has no university education, the value of 1 when the CEO has a bachelor's, the value of 2 when the CEO also holds a master's and a value of 3 when the CEO holds a PhD.

[10] CEOs that hold a PhD are always classified as specialists despite any other postgraduate degree(s) they may hold.

Table 7
Specialist versus generalists and investments: Alternative measures

	CRISIS_INVESTMENT											
	SPECIALISTS (CEO holds a PhD)			GENERALISTS (CEO does not hold a PhD)			SPECIALISTS (CEO with specific education)			GENERALISTS (CEO with MBA and/or CPA)		
Panel A	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
MA	0.017	0.012	0.021	0.032***	0.024**	0.031***	0.012	0.009	0.012	0.044**	0.038**	0.042**
	(0.036)	(0.026)	(0.037)	(0.011)	(0.010)	(0.011)	(0.012)	(0.012)	(0.012)	(0.019)	(0.016)	(0.019)
SIZE	–0.450***	− 0.080	− 0.480***	0.017	0.018	0.031	0.031	0.018	0.021	− 0.102	− 0.000	− 0.070
	(0.168)	(0.096)	(0.176)	(0.065)	(0.042)	(0.066)	(0.063)	(0.044)	(0.067)	(0.107)	(0.064)	(0.111)
MTB	–0.020	− 0.034	− 0.035	0.064	0.045	0.053	− 0.087**	− 0.060	− 0.080**	0.172***	0.141**	0.165**
	(0.146)	(0.104)	(0.152)	(0.040)	(0.036)	(0.040)	(0.043)	(0.040)	(0.043)	(0.064)	(0.056)	(0.064)
LEV	0.312***	0.333***	0.319**	0.274***	0.254***	0.275	0.212	0.181	0.218***	0.362	0.388	0.357
	(0.117)	(0.090)	(0.122)	(0.040)	(0.034)	(0.040)	(0.043)	(0.036)	(0.043)	(0.066)	(0.054)	(0.067)
GROWTH	0.029	0.009	0.024	− 0.033	− 0.036	− 0.039	− 0.032	− 0.032	− 0.040	− 0.038	− 0.014	− 0.036
	(0.089)	(0.077)	(0.091)	(0.049)	(0.040)	(0.049)	(0.047)	(0.039)	(0.047)	(0.078)	(0.067)	(0.079)
RET	–0.072	− 0.076	− 0.108	0.169***	0.096**	0.180***	0.118	0.038	0.113	0.147*	0.126**	0.157*
	(0.214)	(0.174)	(0.225)	(0.057)	(0.040)	(0.057)	(0.079)	(0.047)	(0.079)	(0.080)	(0.062)	(0.081)
CF	0.192	0.129	0.246	0.012	0.119***	0.014	0.107*	0.278***	0.118**	− 0.060	− 0.052	− 0.060
	(0.224)	(0.115)	(0.239)	(0.044)	(0.040)	(0.044)	(0.058)	(0.049)	(0.058)	(0.065)	(0.058)	(0.065)
GIM	0.055		0.062*	− 0.013		− 0.010	− 0.022		− 0.020	− 0.014		− 0.007
	(0.034)		(0.035)	(0.014)		(0.014)	(0.014)		(0.014)	(0.023)		(0.023)
BOARD_SIZE	0.286***		0.296***	− 0.026		− 0.009	0.004		0.018	0.066		0.075
	(0.090)		(0.100)	(0.043)		(0.043)	(0.044)		(0.045)	(0.066)		(0.066)
BOARD_INDEP	–0.036		− 0.017	0.021		0.027	0.041		0.048	− 0.029		− 0.021
	(0.083)		(0.088)	(0.036)		(0.037)	(0.036)		(0.037)	(0.060)		(0.062)
INC_STOCKS	0.393		0.469	0.357**		0.355**	0.259*		0.348**	0.382		0.309
	(0.367)		(0.437)	(0.167)		(0.180)	(0.150)		(0.168)	(0.309)		(0.329)
INC_OPTIONS	1.294***		1.341***	0.034		0.026	0.249		0.280	0.018		− 0.096
	(0.475)		(0.488)	(0.213)		(0.215)	(0.198)		(0.199)	(0.366)		(0.373)
CEO_AGE		–0.043	0.008		− 0.098***	− 0.103***		− 0.069*	− 0.069*		− 0.073	− 0.100
		(0.084)	(0.106)		(0.035)	(0.039)		(0.037)	(0.040)		(0.053)	(0.064)
CEO_TENURE		0.024	− 0.006		0.073**	0.063		0.026	0.000		0.125**	0.117
		(0.066)	(0.096)		(0.034)	(0.043)		(0.034)	(0.040)		(0.055)	(0.074)
CEO_DUALITY		0.122	− 0.167		− 0.024	− 0.092		0.008	− 0.094		− 0.039	− 0.047
		(0.151)	(0.189)		(0.062)	(0.071)		(0.067)	(0.070)		(0.096)	(0.122)
No of firms	97	125	97	672	826	672	398	505	398	371	446	371
R^2 0.627		0.500	0.632	0.311	0.285	0.322	0.410	0.346	0.422	0.333	0.340	0.341
Panel B												
MA_AV	0.016	0.007	0.017	0.030***	0.025**	0.030***	0.014	0.012	0.014	0.037**	0.030**	0.035*
	(0.035)	(0.026)	(0.036)	(0.011)	(0.010)	(0.011)	(0.012)	(0.011)	(0.012)	(0.019)	(0.015)	(0.019)
SIZE	–0.447**	− 0.085	− 0.480***	0.015	0.018	0.030	0.032	0.020	0.022	− 0.102	− 0.003	− 0.071
	(0.171)	(0.096)	(0.179)	(0.065)	(0.042)	(0.066)	(0.062)	(0.044)	(0.064)	(0.108)	(0.064)	(0.111)
MTB	–0.012	− 0.027	− 0.020	0.065	0.045	0.054	− 0.086**	− 0.061	− 0.093**	0.176***	0.145***	0.168***
	(0.140)	(0.103)	(0.144)	(0.040)	(0.036)	(0.040)	(0.043)	(0.040)	(0.043)	(0.064)	(0.056)	(0.064)
LEV	0.315***	0.332***	0.324***	0.273***	0.256***	0.274***	0.212***	0.182***	0.218	0.361***	0.387***	0.356***
	(0.117)	(0.090)	(0.121)	(0.040)	(0.034)	(0.040)	(0.043)	(0.036)	(0.043)	(0.067)	(0.054)	(0.067)
GROWTH	0.031	0.012	0.027	− 0.032	− 0.036	− 0.038	− 0.032	− 0.033	− 0.041	− 0.033	− 0.010	− 0.030
	(0.088)	(0.077)	(0.091)	(0.049)	(0.040)	(0.049)	(0.047)	(0.039)	(0.047)	(0.079)	(0.067)	(0.079)
RET	-0.077	− 0.080	− 0.115	0.172***	0.099**	0.183***	0.118	0.040	0.113	0.153*	0.130**	0.162**
	(0.212)	(0.174)	(0.224)	(0.057)	(0.040)	(0.057)	(0.079)	(0.047)	(0.079)	(0.081)	(0.062)	(0.081)
CF	0.178	0.127	0.222	0.009	0.118***	0.011	0.105*	0.277***	0.116**	− 0.066	− 0.058	− 0.065
	(0.219)	(0.115)	(0.231)	(0.044)	(0.040)	(0.044)	(0.058)	(0.049)	(0.058)	(0.065)	(0.058)	(0.065)
GIM	0.056*		0.062*	− 0.013		− 0.010	− 0.021		− 0.020	− 0.013		− 0.005
	(0.034)		(0.035)	(0.014)		(0.014)	(0.014)		(0.014)	(0.023)		(0.023)
BOARD_SIZE	0.285***		0.293***	− 0.024		− 0.007	0.005		0.019	0.071		0.080
	(0.091)		(0.098)	(0.043)		(0.043)	(0.044)		(0.045)	(0.066)		(0.066)
BOARD_INDEP	–0.037		− 0.017	0.022		0.027	0.041		0.048	− 0.026		− 0.020
	(0.084)		(0.089)	(0.036)		(0.037)	(0.035)		(0.037)	(0.060)		(0.062)
INC_STOCKS	0.398		0.479	0.361**		0.358**	0.257*		0.344**	0.419		0.350
	(0.366)		(0.436)	(0.167)		(0.180)	(0.150)		(0.168)	(0.308)		(0.328)
INC_OPTIONS	1.301***		1.354***	0.035		0.027	0.253		0.283	− 0.008		− 0.119
	(0.473)		(0.487)	(0.213)		(0.215)	(0.198)		(0.199)	(0.366)		(0.373)
CEO_AGE		–0.042	0.016		− 0.098***	− 0.105***		− 0.067*	− 0.068*		− 0.076	− 0.106*
		(0.084)	(0.106)		(0.035)	(0.039)		(0.037)	(0.040)		(0.053)	(0.064)
CEO_TENURE		0.024	− 0.010		0.073**	0.064		0.025	0.001		0.123**	0.115
		(0.066)	(0.096)		(0.034)	(0.043)		(0.034)	(0.040)		(0.055)	(0.074)
CEO_DUALITY		0.124	− 0.160		− 0.022	− 0.090		0.008	− 0.094		− 0.030	− 0.040
		(0.151)	(0.188)		(0.062)	(0.071)		(0.067)	(0.070)		(0.096)	(0.122)
No of firms	97	125	97	672	826	672	398	505	398	371	446	371
R^2 0.627		0.500	0.632	0.311	0.286	0.322	0.411	0.347	0.422	0.331	0.337	0.339

This table reports regression coefficient estimates of pre-crisis managerial ability on investments during the crisis period (*CRISIS_INVESTMENT*). *CRISIS_INVESTMENT* is measured during the fiscal year 2008 while the managerial ability measures and the control variables are measured during the fiscal year 2006. Panel A display results using the managerial ability measure *MA*. Models (1)–(3) and (7)–(8) use firms where the CEO is classified as specialist (CEO holds a PhD and CEO with specific education, respectively) while models (4)–(6) and (10)–(12) use

firms where the CEO is classified as generalist (CEO does not hold a PhD and CEO with MBA and/or CPA, respectively). In addition, models (1), (4), (7) and (10) include corporate governance variables as additional controls. Models (2), (5), (8) and (11) include CEO-level controls. Models (3), (6), (9) and (12) include corporate governance and CEO-level controls. Panel B displays similar estimations using the managerial ability measure *MA_AV*. All regressions include a constant and industry fixed effects. Statistical significance is designated by '***' at 1%, '**' at 5% and '*' at 10%.

Table 8
Managerial ability and financing.

	CRISIS_CF		CRISIS_RESOURCES		CRISIS_FINCON	
Panel A	(1)	(2)	(3)	(4)	(5)	(6)
MA	0.018***	0.018***	0.018***	0.018***	− 0.005***	− 0.005***
	(0.006)	(0.006)	(0.007)	(0.007)	(0.002)	(0.002)
SIZE	0.204***	0.184***	0.206***	0.182***	− 0.049***	− 0.049***
	(0.020)	(0.026)	(0.021)	(0.027)	(0.008)	(0.009)
MTB	0.097***	0.100***	0.064***	0.065***	− 0.012**	− 0.010*
	(0.019)	(0.019)	(0.019)	(0.020)	(0.005)	(0.005)
LEV	0.129***	0.150***	0.083***	0.092***	− 0.014***	− 0.012**
	(0.019)	(0.020)	(0.020)	(0.021)	(0.005)	(0.005)
GROWTH	-0.033*	− 0.033*	− 0.043**	− 0.037*	0.032***	0.032***
	(0.018)	(0.019)	(0.020)	(0.021)	(0.005)	(0.005)
RET	0.009	0.020	− 0.016	0.002	− 0.010**	− 0.012**
	(0.018)	(0.020)	(0.019)	(0.021)	(0.005)	(0.005)
ROE	0.063	0.060	0.028	0.021	0.001	− 0.007
	(0.053)	(0.053)	(0.025)	(0.025)	(0.006)	(0.006)
CF	0.111**	0.108**				
	(0.052)	(0.053)				
RESOURCES			0.148***	0.152***		
			(0.042)	(0.042)		
FINCON					0.915***	0.923***
					(0.009)	(0.009)
NUM_ANAL		0.008		− 0.003		0.002
		(0.023)		(0.024)		(0.006)
RET_STD		–0.015		− 0.052**		− 0.004
		(0.020)		(0.022)		(0.006)
No of firms	2748	2689	2529	2471	2695	2642
R^2	0.168	0.171	0.147	0.149	0.937	0.939
Panel B						
MA_AV	0.018***	0.018***	0.017***	0.017**	− 0.004**	− 0.004**
	(0.006)	(0.006)	(0.007)	(0.007)	(0.002)	(0.002)
SIZE	0.203***	0.183***	0.205***	0.180***	0.048***	− 0.048***
	(0.019)	(0.026)	(0.020)	(0.027)	(0.008)	(0.009)
MTB	0.098***	0.101***	0.065***	0.067***	− 0.012**	− 0.011**
	(0.019)	(0.019)	(0.019)	(0.020)	(0.005)	(0.005)
LEV	0.129***	0.150***	0.083***	0.092***	− 0.014***	− 0.012**
	(0.019)	(0.020)	(0.020)	(0.021)	(0.005)	(0.005)
GROWTH	-0.033*	− 0.033*	− 0.042**	− 0.037*	0.032***	0.032***
	(0.018)	(0.019)	(0.020)	(0.021)	(0.005)	(0.005)
RET	0.011	0.020	− 0.014	0.002	− 0.011**	− 0.012**
	(0.018)	(0.020)	(0.019)	(0.021)	(0.005)	(0.005)
ROE	0.063	0.060	0.030	0.024	0.000	− 0.008
	(0.053)	(0.053)	(0.025)	(0.025)	(0.006)	(0.006)
CF	0.112**	0.110**				
	(0.052)	(0.053)				
RESOURCES			0.146***	0.151***		
			(0.042)	(0.042)		
FINCON					0.915***	0.922***
					(0.009)	(0.009)
NUM_ANAL		0.008		− 0.002		0.002
		(0.023)		(0.024)		(0.006)
RET_STD		-0.015		− 0.051**		− 0.004
		(0.020)		(0.022)		(0.006)
No of firms	2748	2689	2529	2471	2695	2642
R^2	0.169	0.171	0.147	0.149	0.937	0.939

This table reports regression coefficient estimates of pre-crisis managerial ability on financing during the crisis period. The financing variable in models (1) and (2) is the crisis period cash flow (*CRISIS_CF*), in models (3) and (4) is the crisis period total financing resources (*CRISIS_RESOURCES*) and in models (5) and (6) is the Whited and Wu (2006) financial constraints index (*CRISIS_ FINCON)*. The financing variables are measured during the fiscal year 2008 while the managerial ability measures and the control variables are measured during the fiscal year 2006. Panels A and B display results using the managerial ability measures *MA* and *MA_AV*, respectively. All regressions include a constant and industry fixed effects. Statistical significance is designated by '***' at 1%, '**' at 5% and '*' at 10%.

between managerial ability and financing, we report regression results that control for the number of analysts following the firm (*NUM_ANAL*), calculated as the natural logarithm of one, plus the number of analysts following the firm in the fiscal year 2006, as well as the standard deviation of daily returns during the fiscal year 2006 (*RET_STD*). High information asymmetry may impede the capacity of the firm to attract

external financing, thus an inverse relation is expected between *NUM_ANAL* and *RET_STD* and total financing resources (*CRISIS_RESOURCES)*, while a positive relation is anticipated between these variables and financial constraints (*CRISIS_FINCON)*.

Models (1) and (2) in Table 8 present the relation between managerial ability and *CRISIS_CF*. Findings for model (1) evince that both measures of pre-crisis managerial ability are positively related to crisis cash flows (p-values < 1%), and the results maintain their statistical significance when controlling for information asymmetry in model (2). It seems that, in the presence of high pre-crisis managerial ability, firms managed to internally generate more cash flow during the crisis. With regards to the coefficient of the crisis period cash flow variable, *CF*, it emerges as positive and significant (p-value < 5%) supporting that firms with strong internal financial positions prior the crisis continued generating higher crisis-period internal resources. The two measures of pre-crisis information asymmetry appear weakly related to crisis cash flows, a behavior that is expected since information asymmetry is a problem primarily affecting the credibility the firm signals to its external markets.

In model (3), pre-crisis managerial ability is again positive and significant (p-values < 1%) in relation to total financing resources (*CRISIS_RESOURCES*), and remains significant after the inclusion of information asymmetry controls as shown in model (4). These results provide strong empirical evidence that firms with higher pre-crisis managerial ability have higher levels of financing resources during the crisis. Overall, these findings complement Chemmanur et al. (2009) who support that superior managerial quality results in the accurate disclosure to the markets regarding true future cash flow and firm performance, thus attaining easier access to financing resources. Higher managerial ability conveys the intrinsic value of the firm more credibly to outsiders and reduces information frictions, thus achieving higher levels of external fund raising even in times where this is hard to attain. The positive and significant coefficient of the pre-crisis total resources variable (*RESOURCES*) confirms that crisis total resources are significantly larger for firms with higher total resources before the onset of the crisis. Further, in model (4) and according to our expectations, *RET_STD* is negative and significant to crisis-period total resources.

We also examine the relation between pre-crisis managerial ability and the severity of liquidity constraints during the financial crisis as proxied by the Whited and Wu (2006) financial constraints index (*CRISIS_FINCON*). Results in model (5) reveal a strong negative relation between managerial ability and financial constraints, which is also robust to additional information asymmetry controls as in model (6). The more able a firm's managers, the less the firm suffers from financial constraints, substantiating the results of previous models. The positive and significant relation between pre-crisis financial constraints (*FINCON*) to crisis-period financial constraints (*CRISIS_FINCON*) verify that already-constrained firms were most likely further constrained during the crisis.

Overall, the results in Table 8 suggest that higher managerial ability immunized firms against adverse negative liquidity shocks caused by the financial crisis. Our findings confirm that more able managers had greater availability of financing necessary to enable them to support the increased investments they undertook during the crisis period.

Table 9
Investments and firm value.

	CRISIS_Q			
	(1)	(2)	LOW-MA (3)	HIGH-MA (4)
CRISIS_INVESTMENT	4.729***	3.672***	− 5.149***	7.230***
	(0.569)	(1.238)	(1.805)	(1.410)
SIZE	0.226***	0.354	0.875***	− 0.545*
	(0.076)	(0.231)	(0.288)	(0.297)
MTB	0.079**	0.103	− 0.207**	0.565
	(0.033)	(0.072)	(0.095)	(0.092)
LEV	–2.119***	− 0.930	− 0.649	2.370
	(0.530)	(1.177)	(1.458)	(1.549)
GROWTH	–0.104	− 0.773	0.306	− 2.482**
	(0.233)	(0.853)	(1.075)	(1.240)
RD	1.078**	2.325	− 4.481*	6.747***
	(0.483)	(1.868)	(2.690)	(2.030)
INVESTMENT	–0.026	0.603	2.862***	− 0.974
	(0.059)	(0.742)	(1.055)	(0.915)
GIM		0.026	− 0.437	− 0.128
		(0.111)	(1.776)	(1.675)
INC_STOCKS		-1.249	1.181	− 0.541
		(1.304)	(2.231)	(2.253)
INC_OPTIONS		0.502	− 0.066	0.097
		(1.724)	(0.139)	(0.149)
No of firms	2866	914	503	411
R^2	0.052	0.071	0.061	0.199

This table reports regression coefficient estimates of investment (*CRISIS_INVESTMENT*) on firm value (*CRISIS_Q*) during the crisis period. *CRISIS_INVESTMENT* and *CRISIS_Q* are measured during the fiscal year 2008. The remaining variables are controls and are measured during the fiscal year 2006. All regressions include constants and industry fixed effects. Statistical significance is designated by '***' at 1%, '**' at 5% and '*' at 10%.

4.2.7. Managerial ability and firm value

As previously discussed, more ably managed firms undertook more investments as they appeared to have greater access to financing resources during the crisis period. Yet, the act of increasing investments does not necessarily imply conducting more value-enhancing investments. Therefore, to gain more insight, we examine the valuation effects of the increased investment activity carried out by high-ability managers.

The regression models in Table 9 are intended to capture the effects of crisis-period investments (*CRISIS_INVESTMENT*) on firm value as measured by crisis-period Tobin's Q (*CRISIS_Q*). The following variables are additionally included in the models along with the main controls as used in previous regression models: (i) R & D (*RD*) defined as the research and development expense in the fiscal year 2006 divided by beginning of the year net assets to proxy for discretionary investments in the realm of CEO power which might have value-relevance (Lev & Sougiannis, 1996), and (ii) capital expenditure investments made in the fiscal year 2006 (*INVEST*) to capture potential crisis-period valuation effects emanating from past investments. Under an agency view, more able managers who have their reputation at stake are expected to avoid opportunistic rent-seeking actions that harm firm value; in that respect, discretionary investments conducted by low ability managers would diminish firm value, whereas such investments undertaken by high ability managers would enhance value. In few of the models we further include controls for corporate governance (*GIM*) and equity- (*INC_STOCKS*) and option- (*INC_OPTIONS*) related incentives. Stronger corporate governance and better compensation alignment to shareholder interest should be positively related to crisis-period firm value.

In model (1) of Table 9, we find that crisis investments (*CRISIS_INVESTMENT)* have a significantly positive effect (p-value < 1%) on crisis firm value (*CRISIS_Q*). There is evidence that, on average, the market valued investments made during the financial crisis highly. In model (2), we control for corporate governance and executive compensation incentives and find that results still show a strong positive relation (p-value < 1%) between crisis-period investments and firm value.

In models (3) and (4), we use *MA* to divide the available sample between *low* versus *high* pre-crisis managerial ability firms. We do this to examine the effect of crisis investments on firm value based on whether these investments are a result of inferior or superior managerial ability.[11] Firms with pre-crisis managerial ability values below the

[11] Alternatively, using *MA_AV* to separate firms into low and high managerial ability also gives identical results.

median are classified as low-ability (LOW-MA) firms, whereas firms with pre-crisis managerial ability values above the median are classified as high-ability (HIGH-MA) firms. The results show that for the sample of LOW-MA firms there is a strong negative relation (p-value < 1%) between crisis investments (*CRISIS_INVESTMENT*) and firm value (*CRISIS_Q*); it seems that the market did not value investments made by low-ability firms during the crisis. This is perhaps the outcome of bad and/or unprofitable investments made by low-ability managers, which are not of value to the market. This finding is not surprising and squares with managers' career and reputation concerns in the labor market as outlined in Scharfstein and Stein (1990), who posit that, under distressed financial conditions where they cannot utilize their private information, managers display a type of herding behavior, choosing to mimic the investment decisions of other (more able) managers. Another explanation for this negative value effect is managers' failure to optimally downsize, especially when the market expects low-ability managers to have shrunk their existing operations by reducing crisis-period investments. Such explanation gains merit given that low managerial ability implies low managerial capacity to accurately foresee and estimate economic conditions and market expectations (e.g., Baik, Farber, & Lee, 2011; Demerjian et al., 2013; Trueman, 1986).

Conversely, for the sample of HIGH-MA firms, *CRISIS_INVESTMENT* is positively and significantly related (p-value < 1%) to *CRISIS_Q*. This finding reflects that more able managers do not bow to opportunistic rent-seeking actions and are prudent in picking high-quality investments that eventually enhance firm value (e.g., Falato et al., 2015; Fama, 1980; Graham et al., 2013; Kreps et al., 1982). Such investment decision-making also reflects the intentions and capacity of high-ability managers to further strengthen their perceived reputation and human capital during highly distressed times.

Overall, these findings provide a scope on the role of managerial ability during the financial crisis, which complements the work of Campello et al. (2010) and Duchin et al. (2010), among others, who find that managers let slip profitable investment opportunities during the crisis as a result of external financing constraints. Managerial ability is however an important driver of corporate investment activity and a channel through which more able managers enhance firm value.

5. Conclusions and implications

This study investigates the effect of pre-crisis managerial ability on corporate policies and value during the recent financial crisis. We primarily document a positive and robust relation between pre-crisis managerial ability and crisis-period corporate investment. In an attempt to gain more insight into the types of managerial ability most effective during the crisis, we provide evidence that managers with general skills (versus managers with firm-specific skills) were driving their firms' scale of corporate investment. Additionally, we provide evidence of a positive relation between pre-crisis managerial ability and crisis-period financing. Finally, the increased crisis-period investment activity is mediated on market valuation, evincing strong positive relations between the levels of investment undertaken by high managerial ability individuals and firm value.

Overall, the findings of our study suggest that managerial ability is a crucial dimension of firm quality and performance during the crisis period. We propose that a firm's managerial ability is useful to curtail underinvestment problems through gaining access to more resources that enhance firm value. Consequently, in light of our results, assuming that there is homogeneity in the managerial factor, as in the case of several past studies, should be considered problematic; instead, understanding the impact of managerial ability on firm policies and economic outcomes is fundamental, especially at times when the firm is financially distressed, that is suffering from liquidity shortages and harsh finance provisions. It is important to note that firms should acknowledge that there are aspects of managerial ability that seem to be more effective in hard economic times and, as such, general managerial skills should be taken into consideration heavily when hiring CEOs.

In this study, we are mostly interested in investigating the role of managerial ability in mitigating or exacerbating the impact of the crisis on the scale of corporate investment. Our setting recognizes that inferences may be confounded as variation in managerial ability and corporate decision-making are endogenous to unobserved variation in investment opportunities. To address this issue, our analysis employs data from the fiscal year 2008 to take advantage of the natural experiment conditions enabled by the negative liquidity shock and the deteriorating product demand observed during the financial crisis. However, our empirical findings and implications remain agnostic as to whether the positive effect of managerial ability on corporate investment, financial policies and firm value is also present during normal times or when such negative shocks are temporary. Despite this limitation, we remark that our results are fully consistent with market-based theories which predict that differences in managerial ability should relate to corporate decision-making and lead to potentially large differences in firm valuation (e.g., Custódio et al., 2013; Falato et al., 2015; Graham et al., 2013; Murphy & Zabojnik, 2004).

Finally, this study is the first one that empirically examines the relationship between managerial ability and corporate policies during the financial crisis period. Thus, future studies can examine other attributes based on demographics, human or social capital of the managers or even the board, which may also be informative regarding how and why certain types of firms attempt to alleviate underinvestment problems during periods of financing shortage. For instance, managerial prestige may interact with the ability to facilitate access to financing; likewise, politically-connected managers or boards with directors linked to financial institutions may have a more favorable treatment by lenders.

Dedication

This work is in memory of Professor Simon Benninga, a beloved colleague and respected researcher who passed away on August 29, 2015.

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Appendix A. Definitions of the variables

Variables	Definitions
Dependent variables	
CRISIS_INVESTMENT	Capital expenditures (Compustat item: CAPX) in fiscal year 2008 divided by beginning of the year net assets (Compustat item: SEQ).
CRISIS_CF	Operating income before depreciation (Compustat item: OIBDP) in fiscal year 2008 divided by beginning of the year

	net assets (Compustat item: SEQ).
CRISIS_RESOURCES	Issuance of long term debt (Compustat item: DLTIS) minus reduction of long term debt (Compustat item: DLTR) plus operating activities (Compustat item: OANCF) in fiscal year 2008 divided by beginning of the year net assets (Compustat item: SEQ).
CRISIS_FINCON	A financial constraints measure estimated as in Whited and Wu (2006) for fiscal year 2008.
CRISIS_Q	Market equity (Compustat items: CSHO ∗ PRCC_F) plus total debt (Compustat items: DLC + DLTT) plus preferred stock liquidating value (Compustat item: PSTKL) minus deferred taxes and investment tax credits (Compustat item: TXDITC) all divided by book assets (Compustat item: AT).
Managerial variables	
RES_EFF_2006	Residual efficiency resulting from a Tobit regression in the spirit of Demerjian et al. (2012) that regresses firm efficiency score on a set of industry and firm-specific variables (see, *RES_EFF* term in Eq. (2)). This measure is estimated using data from fiscal year 2006.
RES_EFF_AV	Residual efficiency resulting from a Tobit regression in the spirit of Demerjian et al. (2012) that regresses firm efficiency score on a set of industry and firm-specific variables (see, *RES_EFF* term in Eq. (2)). This measure is estimated using the average residual efficiency, per firm, across the fiscal years 2002–2006.
MA	Assigned a value between 0 and 9 according to the decile ranking of *RES_EFF_2006*.
MA_AV	Assigned a value between 0 and 9 according to the decile ranking of *RES_EFF_AV*.
GA	General ability index in the spirit of Custódio et al. (2013). It summarizes information on CEOs skills and allows the classification among *generalists* and *specialists*.
Control variables	
SIZE	Natural logarithm of the firm's market value of equity (Compustat items: CSHO ∗ PRCC_F) in the end of fiscal year 2006.
MTB	The firm's market value (Compustat items: CSHO ∗ PRCC_F) divided by book value of equity (Compustat item: CEQ) in the end of fiscal year 2006.
LEV	Book value of debt (Compustat items: DLC + DLTT) divided by book value of total assets (Compustat items: DLC + DLTT + CEQ) in the end of fiscal year 2006.
GROWTH	The difference from 2005 to 2006 in total assets (Compustat item: AT) divided by the year 2005 total assets.
RET	The 12-month compounded stock return (excluding dividends) spanning the fiscal year 2006 (database: CRSP).
ROE	Earnings before interest and taxes (Compustat item: EBIT) in the end of fiscal year 2006 deflated by beginning of the year net assets (Compustat item: SEQ).
CF	Operating income before depreciation (Compustat item: OIBDP) at the end of fiscal year 2006 divided by beginning of the year net assets (Compustat item: SEQ).
FINCON	A financial constraints measure estimated as in Whited and Wu (2006) for fiscal year 2006.
RESOURCES	Issuance of long term debt (Compustat item: DLTIS) minus reduction of long term debt (Compustat item: DLTR) plus operating activities (Compustat item: OANCF) in fiscal year 2006 deflated by beginning of the year net assets (Compustat item: SEQ).
INVESTMENT	Capital expenditures (Compustat item: CAPX) in the fiscal year 2006 divided by beginning of the year net assets (Compustat item: SEQ).
NUM_ANAL	The natural logarithm of 1 plus the number of analysts covering the firm in the end of fiscal year 2006.
RET_STD	Standard deviation of daily returns spanning the fiscal year 2006 (database: CRSP).
GIM	The index constructed by Gompers et al. (2003) for year 2006 (Andrew Metric's website).
BOARD_SIZE	The number of members in a firm's board of directors (database: Boardex).
BOARD_INDEPENDENCE	The percentage of outside directors in a firm's board of directors (database: BoardEx).
INC_STOCKS	The CEO stock holdings incentives ratio estimated as in Bergstresser and Philippon (2006) (database: Execucomp).
INC_OPTIONS	The CEO option holdings incentives ratio estimated as in Bergstresser and Philippon (2006) (database: Execucomp).
CEO_AGE	The natural logarithm of the CEO age (database: Execucomp).
CEO_TENURE	The natural logarithm of the number of years in the CEO position (database: Execucomp).
CEO_DUALITY	A binary variable that equals 1 when the positions of the CEO and the chairman of the board are held by the same person, and 0 otherwise (database: Execucomp).
CEO_EDU	A categorical variable that takes the value of 0 when the CEO has no university education, the value of 1 when the CEO has a bachelor degree, the value of 2 when the CEO also holds a master degree and a value of 3 when the CEO holds a PhD degree (database: BoardEx).
RD	Research and development expense (Compustat item: XRD) in the fiscal year 2006 divided by beginning of the year net assets (Compustat item: SEQ).

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