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Does the CEO effect differ in times of crisis? Evidence from US and China during the global financial crisis

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ABSTRACT

This study investigates short-term fluctuations in the CEO effect, measured as the proportion of variance in firm performance attributable to individual CEOs, in response to macroeconomic crises, with a specific focus on the global financial crisis. Utilizing multilevel modeling on a 15-year dataset of US firms and assessing three performance metrics, we identify a significant decline (increase) in the CEO effect on accounting-based (market-based) performance measures (measure) from the pre-crisis to the crisis period, followed by a significant rebound post-crisis. We replicate the analysis using a sample of Chinese firms and find a consistent pattern. Our research advances the CEO effect literature by emphasizing the dynamic nature of the CEO effect in an international context. Our findings highlight that the CEO effect is not static but can undergo short-term fluctuations due to significant changes in the macroeconomic environment.

1. Introduction

How much and under what conditions do chief executive officers (CEOs) matter to firm performance? Since Lieberson and O'Connor (1972), scholars in strategy, leadership, and finance have demonstrated a sustained interest in quantifying the 'CEO effect' (Bertrand & Schoar, 2003; Fitza, 2014; Mackey, 2008; Quigley & Graffin, 2017; Thomas, 1988; Weiner, 1978). Initially, studies focused on how much influence CEOs—as opposed to industry and firm—have on firm performance (Lieberson & O'Connor, 1972; Wasserman et al., 2010).[1] More recently, studies have shifted focus from '*how much*' to '*when*', scrutinizing determinants of the business environment under which the 'CEO effect' varies. Building on managerial discretion theory (Hambrick & Finkelstein, 1987), this body of research has conceptualized determinants of the business environment in terms of industry characteristics, national-level institutions, and long-term trends (Crossland & Hambrick, 2007, 2011; Quigley & Hambrick, 2015; Wasserman et al., 2010).

Despite all this research, no attention has been given to the idea that external economic shocks may significantly—yet only for a relatively short period—affect the extent to which CEOs matter for firm performance. This is an important limitation in the CEO effect literature for a few reasons. First, over the past decades, the world has experienced a series of crises with global economic ramifications. Among others, such crises include the 1997–1998 Asian economic crisis, the burst of the Dot-com bubble in the early 2000 s, the 9/11 terrorist attack with the associated economic downturn, the 2007–2009 global financial crisis, the 2015 migration crisis, and most recently, the Covid-19 global pandemic crisis (Ghobadian et al., 2022; Wenzel et al., 2020). Hence, the recurrence of crises with global economic ramifications makes them an important part of the CEO job. Second, an external economic shock is a sudden, unexpected, and disruptive change in a firm's external business environment (Chakrabarti, 2015; Li & Tallman, 2011). An economic shock may carry both threats and opportunities. On the one hand, firms may, for example, face lower access to capital, slump in demand, or shortage in production factors. On the other hand, firms may also seize new growth opportunities unavailable prior to the shock (Pangarkar & Lie, 2004; Wan & Yiu, 2009), such as the proliferation of online businesses during the Covid-19 pandemic. Either way, the crisis provides a

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[1] While firm performance is the usual outcome variable, the CEO effect can also be investigated for other firm level outcomes such as firms' strategic actions. Zacharias, Six, Schiereck & Stock (2015), for example, investigated the CEO effect for competitive initiatives, financial choices, and resource allocation decisions.

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context in which CEOs may temporarily deliver a distinctive performance by deviating—either positively or negatively—from their non-crisis performance (Quigley & Graffin, 2017). Understanding whether—and if so, how—the CEO effect differs in times of crisis contributes to our understanding of the degree to which contextual factors enable or restrict CEOs to have distinct performance effects.

The question guiding our research is thus: *Does the CEO effect differ in times of crisis?* To address this question, we follow previous research using variance partitioning techniques to isolate the proportion of variance in firm performance that is attributable to the CEO as opposed to contextual factors such as industry, firm, and year (Mackey, 2008; Quigley et al., 2021; Quigley & Hambrick, 2015; Wasserman et al., 2010).

Previous studies have reported an average CEO effect over an extended period, typically spanning between 10 to 20 years (for an overview, see Hambrick & Quigley, 2014: 477). In doing so, these studies have forgone the possibility of investigating fluctuations in the CEO effect within the period under investigation. Put differently, this approach potentially disguises short-term fluctuations in the CEO effect. A notable exception is the study of Quigley and Hambrick (2015), in which the authors employ a dataset spanning the 60 years from 1950 to 2010 to investigate whether the CEO effect has increased in recent decades. Using rolling 20-year periods, they find a long-term trend of an increasing CEO effect, from 10 percent in the early years to 20 percent in the final years of their study. To the extent that even crises with global economic ramifications typically stretch across only a relatively short time span, the 20-year periods used by Quigley and Hambrick (2015) do not allow investigating how crises impact the CEO effect. However, the authors urge future research to investigate whether recent events have affected CEOs' influence on firm performance (Quigley & Hambrick, 2015: 829).

We heed the call of Quigley and Hambrick (2015) and investigate *short-term* fluctuations of the CEO effect caused by a shock in the firm's external economic environment as reflected by the 2007–2009 global financial crisis. Specifically, in our study, we isolate the impact of one significant event on the CEO effect and show that the CEO effect is subject to short-term fluctuations. As such, our study—with its focus on the short-term fluctuations of the CEO effect—is an important complement to the long-term changes of the CEO effect identified by Quigley and Hambrick (2015).

We follow previous CEO effect research using multi-level modeling to segment variance across calendar years, industries, firms, and CEOs levels (Crossland & Hambrick, 2011; Quigley et al., 2021; Quigley & Hambrick, 2015). Specifically, we retrieve a dataset of publicly listed US firms spanning the 15-year period from 2003 to 2017 and including more than 23,000 firm-years. Reflecting the nature of our inquiry, we split our dataset into three periods—pre-crisis, crisis, and post-crisis. Using multi-level modeling, we find that the CEO effect on accounting-based performance measures significantly declines from the pre-crisis to the crisis period and subsequently significantly increases again from the crisis to the post-crisis period. In stark contrast, we find that the CEO effect on a market-based performance measure significantly increases from the pre-crisis to the crisis period and subsequently significantly decreases back to its pre-crisis level in the post-crisis period.

To test the generalizability of our results, we follow the suggestions by Bettis et al. (2016) and Dau et al. (2022) and replicate our analysis using a sample of publicly listed firms in China spanning the same period and comprising more than 25,000 firm-years. Importantly, the results we obtain for the sample of Chinese firms show a similar pattern, reinforcing the consistency of our findings in an international context. We provide support to our findings by introducing a cross-sectional analysis that splits the sample based on the availability of financial resources in the pre-crisis period. The CEO effect is expected to be higher when financial resources are more available. We find that the decline in the CEO effect on accounting-based performance measures is more severe for the subsample with low resources available before the crisis. Similarly, the increase in the CEO effect on the market-based performance measure is more pronounced for the subsample with high resources available before the crisis. This analysis suggests that the CEO effect is more sustained during tough times for firms with higher availability of financial resources *ex ante*.

Our study establishes the notion that the CEO effect may be subject to short-term fluctuations and, as such, complements Quigley and Hambrick (2015) who show a long-term increase in the CEO effect in the US. Specifically, our study contributes to the CEO effect literature by showing that a shock in the firm's external economic environment may be the mechanism leading to the short-term fluctuation in the CEO effect. Our study provides a clear answer to the question of "When does leadership matter?" (Wasserman et al., 2010), by showing that CEOs deliver more distinctive performance through deviating—either positively or negatively—when opportunities are plentiful rather than when opportunities are scarce.

The remainder of the paper is structured as follows. Section 2 reviews the literature and develops our hypothesis. Section 3 describes the methodology and sample selection. Section 4 presents the results. Section 5 discusses and concludes.

2. Background and hypothesis development

2.1. Managerial discretion

CEOs affect material firm outcomes, such as firm performance, to the extent that they possess discretion (Hambrick & Finkelstein, 1987). Hence, the CEO effect—the proportion of variance in firm performance that is attributable to the CEO—is associated with the respective CEO's level of discretion (Crossland & Hambrick, 2007, 2011). Discretion is a function of two broad factors. First, the necessary condition for CEOs to have discretion is for CEOs to be aware of, and have an array of, possible actions. Second, the sufficient condition for discretion to exist is that these possible actions lie within the 'zone of acceptance' of powerful stakeholders (Hambrick & Finkelstein, 1987). In essence, managerial discretion refers to the intersection of two independent sets of possible actions: The one is the set of possible actions CEOs have and are aware of, and the other is made up of possible actions that either meet powerful stakeholders' approval or are beyond their ability to block (Crossland & Hambrick, 2011; Finkelstein & Peteraf, 2007; Hutzschenreuter & Kleindienst, 2013).

Importantly, the level of discretion available to CEOs is not a 'happenstance occurrence' (Hambrick & Finkelstein, 1987: 378). Instead, the level of discretion originates from three distinct loci: CEO, firm, and business environment (Hambrick & Finkelstein, 1987; Wangrow et al., 2015).[2] CEOs differ in their ability to envision and create potential actions. Personal characteristics such as aspiration level, tolerance for ambiguity, cognitive complexity, or political acumen may enable some CEOs to envision and create more potential actions than others (e.g., Carpenter & Golden, 1997). Similarly, firms differ in the latitude of action they give to their CEOs. The absence of inertial forces, a weak board, or the availability of resources such as managerial talent or financial slack are firm characteristics that increase CEOs' discretion (e.g., Key, 2002). Finally, different business environments provide CEOs with different levels of discretion. For instance, business environments characterized by high market growth, demand instability, or absence of quasi-legal constraints allow CEOs to draw from a larger pool of potential actions (e.g., Hambrick & Abrahamson, 1995).

Despite Hambrick and Finkelstein (1987) calling for a dynamic perspective on managerial discretion, little attention has been given to

[2] Hambrick and Finkelstein (1987) originally refer to three distinct loci of managerial discretion. More recent work of Crossland and Hambrick (2007, 2011) points to national-level institutions as being the fourth locus.

the idea that CEO discretion may vary over time (for an exception, see Hutzschenreuter & Kleindienst, 2013). However, as Finkelstein and Peteraf (2007: 244) have reasoned, understanding the dynamics of CEO discretion is important, *"not only because the effects of discretion have found to be substantial in subsequent research, but also for the more general reason that much theory on strategic organization implicitly assumes a static model of the world, even though it is quite evident that change is endemic to strategy."* Responding to Hambrick and Finkelstein (1987) invitation, Hutzschenreuter and Kleindienst (2013) take an initial stride in developing a dynamic perspective on managerial discretion. Concentrating on CEOs, the authors posit that a CEO can intentionally shape the extent of discretion, specifically by strategically selecting the array of issues and options under consideration. However, the authors acknowledge that ultimately the extent of managerial discretion is substantially affected by personal, relational, and situational factors. Below, we draw upon the idea that the level of CEO discretion, and by that the CEO effect, may be subject to short-term fluctuations caused by a shock in the firm's external economic environment.

2.2. The global financial crisis of 2007–2009

An economic (or financial) shock is an unanticipated and disruptive change in a firm's external business environment whose impact on the firm is discontinuing and potentially harmful (Chakrabarti, 2015). It is a low probability-high consequences event that may affect specific firms or industrial segments only, but may also imply national, regional, or even global economic ramifications (Chakrabarti, 2015).

The 2007–2009 global financial crisis (GFC hereafter) provides an excellent opportunity for investigating the implications of external shocks for the level of CEO discretion and, by that, the CEO effect. The debate on the underlying causes of the financial crisis is ongoing (Cabral, 2013). However, there is broad agreement that the burst of the US housing bubble—fueled by low interest rates, loose regulations, generous lending, and toxic mortgages—had started a series of events that ultimately led to the 2007–2009 GFC (Financial Crisis Inquiry Commission, 2011; Jickling, 2009). The crisis took its departure in the US financial system. Because financial institutions from all around the world were heavily invested in securities linked to the US housing market, the crisis soon developed from a national to a global crisis, affecting developed just like emerging economies (Bamiatzi et al., 2016; Campello et al., 2010). During the financial crisis, an unprecedented number of financial institutions went bankrupt or were bailed out by their governments. The (near-) failure of many financial institutions yielded a freeze of the global credit markets and required governmental interventions worldwide (Erkens et al., 2012). Fueled by an ever-increasing uncertainty and a business environment that quickly transformed from one based on mutual trust to one of mutual distrust (Den Butter, 2012), trading stalled, stock markets plummeted, and economies worldwide plunged into a deep recession.

To avoid a catastrophic depression, governments, and central banks in both developed and emerging countries provided unprecedented fiscal stimulus packages. They injected massive amounts of credit into the financial markets to encourage lending, restore faith in the market, and offset the decline in consumption (Islam & Verick, 2011). Globally, governments' expansive fiscal policy contributed to halting the recession—though to varying degrees and at different times—and setting national economies on a path of recovery.

2.3. The Crisis, managerial discretion, and the CEO effect

Unlike downturns in specific markets or industries, economic recessions, such as the one associated with the financial crisis, affect (almost) all sectors of an economy, threatening firms' profitability and ultimately survival (Mascarenhas & Aaker, 1989). With the associated demand shock unfolding across the economy, profit margins melt away, putting a strain on firms. The sudden reduction in business environmental munificence (Park & Mezias, 2005) makes it more difficult for firms to access critical resources in their external environment. This challenge implies consequences such as decline in productivity, reduction in efficiency, and cutting of technology spending, investments, wages, and jobs (Bamiatzi et al., 2016; Bigelow & Chan, 1992; Campello et al., 2010). As a consequence of being confronted with a demand slump and a shortage of critical external resources, firms' internal resources—in particular, their financial slack—become increasingly scarce (Latham & Braun, 2008).

The most important internal set of resources is that of high-discretion resources, such as financial resources (Hutzschenreuter & Kleindienst, 2013; Latham & Braun, 2008). Financial resources offer a high level of transferability to profit-yielding activities (Amit & Schoemaker, 1993; Latham & Braun, 2008) and significantly extend CEOs' discretion as they have a vast deployment area (Cyert & March, 1963; Hambrick & Finkelstein, 1987). At the same time, financial resources reduce constraints imposed by powerful stakeholders because of conflicting demands. CEOs can use their financial resources and other easily redeployable slack resources, such as managerial talent or assets, to satisfy such competing demands (Galbraith, 1973). Similarly, financial slack may function as a shock-absorber (Bourgeois, 1981) to help firms handle adverse business environmental conditions by, for example, creating connected sub-units that reduce the pressure from environmental constraints (Wasserman et al., 2010). However, in a recessionary business environment that inhibits firms from raising external funds, firms' internal financial slack is increasingly used to compensate for the melting profit margins (Campello et al., 2010). As firms use their financial slack to secure day-to-day operations, this resource is no longer available to CEOs' array of options (Hutzschenreuter & Kleindienst, 2013).

Firms finding themselves in a recessionary business environment, while facing a potential shortage in financial resources, are likely to draw on their credit lines to ensure liquidity and secure daily operations (Campello et al., 2010; Ivashina & Scharfstein, 2010). For example, Dana Corporation, a giant manufacturer in the American automotive industry, announced on October 2nd, 2008, that it had drawn $200 million in principal amount to secure its liquidity given the uncertainty in the financial markets, despite having $1bn in cash. As James Yost, the CFO of Dana, puts it:

> *"Ensuring access to our liquidity to the fullest extent possible at a time of ambiguity in the capital markets is in the best interest of our customers, suppliers, shareholders, and employees" (*Dana, October 2nd, 2008*: 5).*

However, increased leverage comes at a cost. Higher leverage increases interest and principal payments the firm must make, reducing the funds available to CEOs' array of options in the future (Jensen, 1986). As leverage increases, so does the probability of defaulting on the debt. Creditors impose strong demands on firm management and closely monitor and control the use of the provided funds (Wasserman et al., 2010). Facing adverse external conditions, shrinking internal resources, and increasing constraints by powerful stakeholders during the crisis, CEOs have fewer strategic options and are therefore likely to have less of an effect on firm performance as compared to pre-crisis. In light of the preceding discussion, we posit the hypothesis below.

Hypothesis 1a. *Over the crisis period, there is a decrease in the proportion of variance in accounting-based performance attributable to individual CEOs as compared to the pre-crisis period.*

As the economy recovers from the recession and trust in financial markets is re-established, business environmental munificence increases again. Following a period of decline, markets start growing back, providing firms with more opportunities (Hambrick & Finkelstein, 1987). As demand increases and profit margins rise, firms can increasingly build up slack resources, in particular financial slack. In contrast to the crisis period, where internal resources were consumed to secure day-to-day operations, internal resources can now be allocated to CEOs'

array of options (Hutzschenreuter & Kleindienst, 2013), evading constraints through outside control (Jensen, 1986). Having left the bottom of the economic recession behind, firms face conditions that are expected to increasingly converge towards those in the pre-crisis period. Therefore, we hypothesize:

Hypothesis 1b. *Following the crisis period, there is an increase in the proportion of variance in accounting-based performance attributable to individual CEOs as compared to the crisis period.*

Thus far, our discussion of the CEO effect has focused on accounting-based performance measures. However, the literature also examines market performance, as evidenced by (Crossland & Hambrick, 2011) and (Quigley & Hambrick, 2015), showing that in stable times, market-based performance measures, such as the market-to-book ratio (MTB), often parallel accounting-based measures, thus reflecting similar trends in the CEO effect. Notably, MTB captures investor expectations and perceptions about a firm's future prospects rather than its historical performance, a crucial distinction since investor expectations and perceived prospects are more volatile during periods of heightened uncertainty such as economic crises.

Traditionally, research on investor behavior has drawn on the efficient market hypothesis (EMH), which assumes that investors are perfectly rational (Fama, 1970). However, behavioral finance research has shown that, due to cognitive limitations, investors do not act in perfect rationalism; instead, they are subject to cognitive biases and shortcomings that impact their evaluation of firm performance (Barberis & Thaler, 2003; Hirshleifer, 2001, 2015).

CEOs are crucial to their firms' strategic choices and subsequent financial performance (Hambrick, 2007; Hambrick & Mason, 1984), making them a significant element of investors' evaluations of firm performance (Harrison et al., 2020). During stable times, when investors can rely on traditional financial statement analysis methods when evaluating financial information, the CEO plays rather a relatively limited role in investors' assessments. This relatively limited role played by the CEO is partly due to the shortcomings of traditional evaluation methods to assess nonfinancial information such as CEO leadership ability and perceived credibility, which further amplifies uncertainty (Becker et al., 2019). However, during economic crises, when current financial information becomes less meaningful regarding a firm's future prospects, investors are likely to place more emphasis on the CEO, mainly assessing how effectively the CEO can navigate the firm through the crisis. Accordingly, we expect that in times of economic crises, where uncertainty is high, the relative importance of the CEO on MTB increases. Formally, we propose:

Hypothesis 2a. *Over the crisis period, there is an increase in the proportion of variance in market-based performance measures attributable to individual CEOs compared to the pre-crisis period.*

As market conditions stabilize post-crisis, and current financial information again becomes more meaningful for assessing a firm's future prospects, the relative importance of the CEO in investors' evaluations of a firm performance will decrease. With the reliance on traditional financial and non-financial information to assess a firm's future prospects, the CEO effect on market-based performance measures such as MTB is likely to diminish. Therefore, we hypothesize:

Hypothesis 2b. *Following the crisis period, there is a decrease in the proportion of variance in market-based performance measures (MTB) attributable to individual CEOs compared to the crisis period.*

3. Methodology

3.1. Sample and data sources

We employ a panel data design, sampling selected industries, firms within these industries, and primary decision makers within those firms over time (Crossland & Hambrick, 2011; Quigley et al., 2021; Quigley & Hambrick, 2015). To the extent that our main objective is examining short-term changes in the CEO effect around the GFC, our sampling procedure requires several considerations. First, it is essential to have a panel dataset that extends sufficiently to the years before and after the GFC. Second, per definition, we are required to analyze relatively short periods. However, this may raise concerns regarding the reliability and generalizability of our findings. To mitigate such concerns, we take two steps: (i) we perform multiple robustness tests and (ii) we employ a quasi-replication with the objective of empirical generalization following Bettis et al. (2016) and Dau et al. (2022). To do so, we leverage the 'global' in GFC and employ an additional sample from a different population to the US economy, namely China.[3] As Bettis et al. (2016: 2195) argue, such quasi-replication studies "hold especially strong promise for the field of strategic management." To the extent that the financial crisis had global implications, it should affect firms in other parts of the world similarly. Yet, given that the GFC originated in the US, we expect to observe a delay in the influence of the GFC on the CEO effect in China. Hence, getting comparable results across two different country samples—and in a synchronized timely manner—would substantially increase our confidence in empirical findings.

We draw our US sample from the S&P 1500 index from 2003 to 2017. In constructing the sample, we use two different databases. First, we download financial information from Compustat. Second, we use the unique identifiers of common firms to get information on CEOs from ExecuComp. After cleaning the data and eliminating all financial firms and government-related institutions (SIC codes 6000–6999 and 9000–9999), our final US sample includes 2,414 firms across 243 3-digit-SIC industries, and 4,573 CEOs, for 25,721 firm-year observations.

For the Chinese sample, we download data from the China Stock Market and Accounting Research (CSMAR) database, which covers all Chinese publicly listed companies in two domestic stock exchanges: Shenzhen and Shanghai. We gathered data on all firms from 2003 to 2017, excluding those in the financial industry, as financial firms have different regulations and accounting rules. We refrain from expanding the sample to years prior to 2003 because the quality of the data has proven to be problematic. However, covering 15 years in our time frame is well in line with other studies in this research stream (see Table 1 on page 477 in Hambrick & Quigley, 2014). We divide industries based on the 2012 CSRC industry code,[4] which yields 31 industries. Our final Chinese sample includes 3,352 firms across 31 industries, and 5,682 CEO, for 26,085 firm-year observations.

Recent studies show that outliers in financial data comprise about 4–5 % of the distribution (Adams et al., 2019). Hence, to mitigate the potential influence of outliers on our inferences, we follow prior studies and winsorize all variables by year at the 1 % and 99 % levels (Quigley et al., 2021).

While some prior literature has addressed the exclusion of specific firms based on CEO tenure, there is variability in the approach taken. Fitza (2014), for instance, removes firms with a consistent CEO over the entire duration in the database. In contrast Quigley and Graffin (2017) not only exclude firms with no CEO change but also those with CEOs

[3] According to the World Bank China's GDP growth (annual %) during the 2007 – 2009 period was 14.2%, 9.7%, and 9.2%, respectively. While one may interpret these numbers to show that China was not affected by the GFC, research has documented its significant impact on China (see, for example, Li, Willett, & Zhang (2012); Schmidt (2009); Strutt & Walmsley (2011)). As Li et al. (2012: 1) reason, "contrary to much popular discussion, China was hit fairly hard by the global recession generated by the financial crisis.".

[4] We create 31 industries based on two digits 2012 CSRC industry code. Manufacturing industry has 63% of observations among which 36% companies are in C3 industry sector. We break down these big industries into sub-categories and group those that are similar together. If one industry does not have a sufficient number of firms, we merge that industry with other similar industries based on the CSRC classification.

Table 1
Summary Statistics of Performance Measures in the US and China.

Panel A: Summary Statistics of Performance Measures in the US				
	Full Period	Pre-Crisis	Crisis	Post-Crisis
	2003—2017	2003—2007	2008—2011	2012—2017
Firm-year observations	25,721	8,276	7,445	10,000
Number of unique firms	2,414	2,248	2,104	1,956
Number of unique CEOs	4,573	2,932	2,627	2,842
ROA				
mean	3.10 %	3.90 %	2.35 %	3.12 %
(standard deviation)	(11.02 %)	(9.95 %)	(12.93 %)	(10.12 %)
ROS				
mean	4.84 %	5.95 %	2.09 %	5.95 %
(standard deviation)	(23.78 %)	(19.25 %)	(28.01 %)	(22.21 %)
MTB				
mean	2.90	3.04	2.34	3.21
(standard deviation)	(3.24)	(2.69)	(2.65)	(4.47)
Panel B: Summary Statistics of Performance Measures in China				
	Full Period	Pre-Crisis	Crisis	Post-Crisis
	2003—2017	2003—2008	2009—2012	2013—2017
Firm-year observations	26,085	6,043	7,551	12,491
Number of unique firms	3,352	1,473	2,262	3,152
Number of unique CEOs	5,682	2,020	2,716	4,127
ROA				
mean	5.42 %	4.81 %	6.06 %	5.32 %
(standard deviation)	(5.64 %)	(6.26 %)	(5.50 %)	(5.35 %)
ROS				
mean	8.13 %	5.75 %	9.32 %	8.57 %
(standard deviation)	(16.39 %)	(18.07 %)	(15.24 %)	(16.15 %)
MTB				
mean	1.98	1.49	1.93	2.27
(standard deviation)	(1.20)	(0.76)	(1.15)	(1.35)

Notes: Panels A and B report summary statistics of all performance measures for the full, pre-crisis, crisis, and post-crisis periods in the US and China, respectively. All variables are winsorized at 1% and 99%.

serving only one year. The rationale behind such exclusions is rooted in the concern that failing to distinguish the CEO effect from the firm effect may artificially inflate the perceived impact of the CEO.

Recent research on the CEO effect challenges this perspective, contending that single-CEO companies offer valuable insights for estimating year-to-year performance variations and the persistence of performance over time in multilevel models (Rönkkö et al., 2023, see footnote 15). Notably, Rönkkö et al. (2023) utilize the same dataset as Quigley and Graffin (2017), conducting analyses with and without the exclusion of single-CEO companies. The results are similar. Furthermore, Hu et al. (2023: 1203) argue that multilevel modeling accommodates panels with no CEO turnover and those with multiple turnovers. Their analysis, with varying criteria for CEO tenure, demonstrates qualitative stability in the magnitude of the CEO effect.

Building on this recent research, our approach does not impose exclusion criteria on CEO tenure. Beyond the theoretical justifications outlined, practical considerations also determine our decision. Given our paper's focus on investigating short-term fluctuations in the CEO effect, our observation periods are relatively brief. Consequently, imposing restrictions based on CEO tenure would significantly diminish our sample, particularly during the crisis period, jeopardizing the feasibility of estimating the CEO effect. However, to be able to reasonably control for industry conditions, we follow prior research such as Quigley and Hambrick (2015) and enforce a four-firm minimum over the entire period under investigation.

3.2. Identifying the relevant individual

For the US sample, we follow prior research and identify the CEO for each firm-year (Quigley & Hambrick, 2015). For the Chinese sample, however, our approach is different. In a recent study, Jiang and Kim (2020) point out that in Chinese firms—different from what researchers may explicitly or implicitly assume—the primary decision maker is not the CEO or general manager. Rather, the controlling shareholders are the primary decision-makers. Since the controlling shareholder is typically the chairman of the board, we use the *chairman of the board* to calculate the relative impact of the firm's primary decision-maker rather than the person entitled CEO or general manager. Because the terms are established in this literature stream, we will subsequently stick to the traditional notation and speak of CEO and CEO effect rather than Chair and Chair effect.

3.3. Computing firm performance

To ensure the robustness of our results and ensure comparability to prior studies, we use three measures of firm performance (e.g., Crossland & Hambrick, 2011; Quigley & Hambrick, 2015). Specifically, we follow Quigley and Hambrick (2015) and measure firm performance using return on assets (ROA), return on sales (ROS), and market-to-book ratio (MTB). ROA is net income divided by total assets, ROS is net income divided by total revenues, and MTB is the market value of shareholders' equity divided by the book value of equity.

3.4. Model and estimation

Over the years, research has used different estimation methods to calculate the CEO effect (for an overview, see Table 1 in Hambrick & Quigley, 2014). Early studies, including the one by Lieberson and O'Connor (1972) relied on ANOVA to discern the CEO effect. However, ANOVA has notable limitations, primarily its inability to appropriately handle the nested structure in panel data necessary to estimate the CEO effect. In these datasets, firm-years are nested within CEOs, who are in turn nested within firms and industries. This nested arrangement violates a fundamental assumption of linear models, namely that the error terms associated with each level are independent. This violation potentially leads to biased or incorrect estimates. To address these

shortcomings, multilevel modeling has emerged as a robust approach. This technique adeptly accounts for the hierarchical data structure by explicitly estimating error components at different levels. This provides more accurate and reliable estimates of the CEO effect (Crossland & Hambrick, 2011; Hough, 2006; Klein & Kozlowski, 2000).[5]

To ensure comparability with recent studies, we follow research that uses multilevel modeling to estimate the CEO effect (Crossland & Hambrick, 2011; Hambrick & Quigley, 2014; Quigley et al., 2021; Quigley & Graffin, 2017; Withers & Fitza, 2017). Notably, prior scholars have typically treated the data to be strictly nested or hierarchical. However, many multilevel data do *not* have a strict hierarchical structure. Rather, the different levels of the data are not nested within but crossed with each other (Goldstein, 1994, 2011; Hough, 2006; Withers & Fitza, 2017). Not accounting for the crossed factor may cause biased estimates (Luo & Kwok, 2009). In our data, time is the crossed factor, and we need to pay extra attention to the fact that the effect of year (for any year) is the same across the industries, firms, and CEOs. This caution arises because each industry, firm, and CEO experiences the same 'time' (year) effect at any year (Grunfeld, 1958; Rabe-Hesketh & Skrondal, 2012). We use a four-level cross-nested model. The unconditional model can, thus, be written as follows:

$$Perf_{lijk} = c + a_l + b_i + g_{ij} + d_{ijk} + e_{lijk}$$

Where *Perf* is the measure of firm performance (ROA, ROS, MTB), c is a constant (fixed effect, a grand mean), a_l is a random effect of year, which is crossed with all other factors, b_i is a random effect of industry, g_{ij} is a random effect of firm, which is nested within industry, d_{ijk} is a random effect of CEO, which is nested within firm within industry, and e_{lijk} is the error term (including interactions and 'pure' measurement error). In this model, l is the sub-index for year (l = 1, … total #years), i is the sub-index for industry (i = 1, …, total #industries), j is the sub-index for firm (j = 1, …, total #firms), and k is the sub-index for CEO (k = 1, …, total #CEOs). We lay a detailed discussion on estimating cross-classified models in Appendix A.

4. Results

4.1. Main results

Table 1 Panel A (Panel B) presents the number of firm-year observations, the number of unique firms, and the number of unique CEOs as well as means and standard deviations for each performance indicator in the US (China). The averages of the performance indicators show that Chinese firms are generally more profitable than US firms, and that US firms witness a sharper decline in performance during the crisis period.[6]

Table 2 (Table 3) reports the proportion of explained variance in firm performance (ROA, ROS, and MTB) by year, industry, firm, and CEO over four different time periods (full, pre-crisis, crisis, and post-crisis) in the US (China). To the extent that the GFC originated in the US, we expect to observe a delay in the influence of the GFC on the CEO effect in China; therefore, we lag the periods for the Chinese sample by one year.[7] Column 1 in Table 2 provides the results of the CEO effect over the entire 15-year period for the US sample. We find that the estimates for the CEO effect range from 17.75 % for ROA to 18.14 % for ROS and 21.89 % for MTB. These findings are comparable to prior research (Hambrick & Quigley, 2014; Quigley & Hambrick, 2015). Interestingly, column 1 in Table 3 shows that the CEO effect in the Chinese sample is considerably higher, ranging from 26.46 % for ROA to 29.26 % for ROS and 24.17 % for MTB. No prior CEO effect research in the Chinese context exists that would allow us to benchmark our estimates.

In this paper, we hypothesize a deterioration (an increase) in the CEO effect on accounting-based (market-based) firm performance from the pre-crisis to the crisis period. We further hypothesize a subsequent recuperation (decline) of the CEO effect on accounting-based (market-based) firm performance from the crisis to the post-crisis period.

The results in Table 2 for the US sample and in Table 3 for the China sample provide strong support for our reasoning with regard to accounting-based performance measures: we consistently observe that the CEO effect in the crisis period is lower compared to the pre- and post-crisis period for ROA and ROS. We apply Fisher's z-test to investigate whether the CEO effects were significantly different across periods (Quigley & Hambrick, 2015). The results displayed in Table 2 and Table 3 suggest that, across both samples, all differences in the CEO effect between periods are statistically significant from pre-crisis to crisis and from crisis to post-crisis. These results conform to our hypotheses 1a and 1b.

Different from its effect on accounting-based performance measures (ROA and ROS), the CEO effect on the market-based performance measure (MTB) in the crisis period is higher compared to the pre- and post-crisis periods. Applying Fisher's z-test reveals that these changes are statistically significant. These findings apply to both samples, the US and China, as reported in Tables 2 and 3, and lend support to our hypotheses 2a and 2b.

Fig. 1 depicts the changes in variance in firm performance explained by year, industry, firm, and CEO for US and China, respectively. The levels of variance in firm performance explained by year and industry are comparable for the US and China, with little change between 2003 and 2017. In both samples, we observe that the CEO effect and the firm effect seem to develop in opposing directions during the crisis. While the pattern is more pronounced in the Chinese sample, it seems that the firm effect reaches its peak during the financial crisis somewhat compensating for the CEO effect.

The key finding of our study with regards to the accounting-based performance measures ROA and ROS is that CEOs accounted for a greater proportion of overall performance variance in the pre-crisis and post-crisis periods as opposed to the crisis period in both the US and China. Accordingly, our results indicate that an external economic shock, such as the GFC, can hamper CEOs' ability to put their distinctive mark on their firms' accounting-based performance. For the market-based performance measure, we obtain the opposing pattern. Here, the CEO effect increases from the pre-crisis to the crisis period and then decreases again from the crisis to the post-crisis period. We discuss this finding below.

4.2. Cross-sectional analysis and robustness checks

Our theoretical foundation that explains the (relative) decline in the CEO effect is based on the shrinking internal resources and increasing constraints on CEOs during the crisis. To validate that reasoning, we split the US and China samples into subsamples with low and high resources availability in the pre-crisis period, and then run the analysis to compare the change in the CEO effect from pre-crisis to during crisis. We

[5] We also applied sequential ANOVA to estimate the CEO effect. The results were generally consistent with those generated by multilevel modeling. However, given ANOVA's limitations, we report only the analysis obtained using multilevel modeling.

[6] The observed substantial increase in the number of unique Chinese firms listed during the crisis period, compared to pre-crisis years, is likely to affect reported performance measures. This change is largely due to the growth and developmental stage of China's capital market in early 2000s, which is relatively new compared to the US market. China's major stock exchanges were established in the 1990s and began actively listing firms only in the early 2000s. Since our analysis starts in 2003, the influx of newly listed, typically smaller firms during this period likely skews performance metrics such as ROA, ROS, and MTB, due to smaller denominators in these ratios. It is uncertain whether this market growth began only in the early 2000s or if it is partially attributed to the CSMAR database, established in 1999, progressively including more firms in its records.

[7] We thank an anonymous reviewer for pointing this out.

Table 2
The Explained Proportion of Variance in Firm Performance using MLM in the US.

	Full Period	Period (1) Pre-Crisis	Period (2) Crisis	Period (3) Post-Crisis	Test for differences in CEO effect (Fisher's z) Period	Period
	2003—2017	2003—2007	2008—2011	2012—2017	(1) – (2)	(2) – (3)
ROA						
Year (%)	1.80 %	0.55 %	2.37 %	0.54 %		
Industry (%)	3.14 %	5.89 %	4.99 %	5.51 %		
Firm (%)	25.05 %	36.27 %	26.62 %	33.19 %		
CEO (%)	17.75 %	18.87 %	10.77 %	15.95 %	***	**
Unexplained (%)	52.26 %	38.41 %	55.25 %	44.81 %		
ROS						
Year (%)	1.88 %	0.53 %	1.96 %	0.88 %		
Industry (%)	2.48 %	5.43 %	2.40 %	6.47 %		
Firm (%)	19.41 %	34.77 %	33.01 %	21.32 %		
CEO (%)	18.14 %	25.53 %	5.61 %	13.07 %	***	***
Unexplained (%)	58.09 %	33.75 %	57.02 %	58.26 %		
MTB						
Year (%)	1.27 %	0.02 %	0.47 %	0.30 %		
Industry (%)	6.08 %	9.57 %	8.41 %	5.41 %		
Firm (%)	31.03 %	43.96 %	31.38 %	42.01 %		
CEO (%)	21.89 %	17.17 %	32.50 %	10.21 %	***	***
Unexplained (%)	39.73 %	29.28 %	27.24 %	42.06 %		

Notes: This table reports the percentage of variance in firm performance explained by year, firm, industry, and CEO for the full, pre-crisis, crisis, and post-crisis periods in the US. The significance of the difference in the CEO effect is computed based on the Fisher's z-test. The asterisks indicate a 1% (***), 5% (**), and 10% (*) level of significance. All variables are winsorized at 1% and 99%.

Table 3
The Explained Proportion of Variance in Firm Performance using MLM in China.

	Full Period	Period (1) Pre-Crisis	Period (2) Crisis	Period (3) Post-Crisis	Test for differences in CEO effect (Fisher's z) Period	Period
	2003—2017	2003—2007	2008—2011	2012—2017	(1) – (2)	(2) – (3)
ROA						
Year (%)	2.75 %	1.77 %	2.12 %	0.32 %		
Industry (%)	3.34 %	4.41 %	4.29 %	4.99 %		
Firm (%)	23.67 %	17.65 %	36.99 %	30.80 %		
CEO (%)	26.46 %	33.68 %	14.66 %	27.20 %	***	***
Unexplained (%)	43.78 %	42.49 %	41.93 %	36.69 %		
ROS						
Year (%)	0.99 %	0.90 %	0.73 %	0.31 %		
Industry (%)	4.14 %	6.99 %	6.52 %	5.90 %		
Firm (%)	26.55 %	30.13 %	46.57 %	27.74 %		
CEO (%)	29.26 %	25.83 %	15.15 %	26.03 %	***	***
Unexplained (%)	39.06 %	36.15 %	31.02 %	40.01 %		
MTB						
Year (%)	18.27 %	27.47 %	6.20 %	9.31 %		
Industry (%)	4.25 %	2.93 %	8.77 %	8.51 %		
Firm (%)	17.61 %	18.44 %	43.09 %	36.35 %		
CEO (%)	24.17 %	8.47 %	19.32 %	14.91 %	***	*
Unexplained (%)	35.70 %	42.69 %	22.63 %	30.91 %		

Notes: This table reports the percentage of variance in firm performance explained by year, firm, industry, and CEO for the full, pre-crisis, crisis, and post-crisis periods in China. The significance of the difference in the CEO effect is computed based on the Fisher's z-test. The asterisks indicate a 1% (***), 5% (**), and 10% (*) level of significance. All variables are winsorized at 1% and 99%.

followed Biddle et al. (2009) and combined two variables to proxy for the availability of resources: cash and leverage (i.e. financial obligations), reasoning that firms with more cash and less leverage have more resources to invest and operate (Biddle et al., 2009). First, we rank all firms in each country into deciles based on their cash balance and leverage, separately, in the year preceding the crisis. Then we flip the decile rank of leverage so that both variable ranks increase with the availability of resources. Next, we combine both variables into one standardized variable. Finally, we assign each firm to the low versus high resources availability based on the industry-median value in the year preceding the crisis. Table 4 shows that for both countries, the decline in the CEO effect on ROA and ROS is more severe for firms with low resources availability. Similarly, the increase in the CEO effect on MTB during the crisis is lower for firms with low resources availability. These results suggest that CEOs who manage firms with more availability of resources (and lower financial constraints) sustain more of their effect on firm performance during the crisis compared to CEOs who manage firms with constrained resources. We interpret this finding to be in support of our theoretical reasoning.

In addition, because the start and the end of the GFC are not clear cut, we repeat our analysis using alternative definitions of the pre-crisis, crisis, and post-crisis periods. To counter concerns that our results were statistical artifacts, we replicate Table 2 and Table 3 twice with different definitions of the pre-crisis, crisis, and post-crisis periods, respectively. First, we use three 4-year periods, that is 2004–2007, 2008–2011, and 2012–2015. Second, we use three 5-year periods, that is 2003–2007, 2008–2012, and 2013–2017. The results remain largely the same regarding the magnitude and change.

Moreover, we follow Quigley and Hambrick (2015) and calculated a rolling CEO effect based on ROA for 6-year rolling periods. Again, the

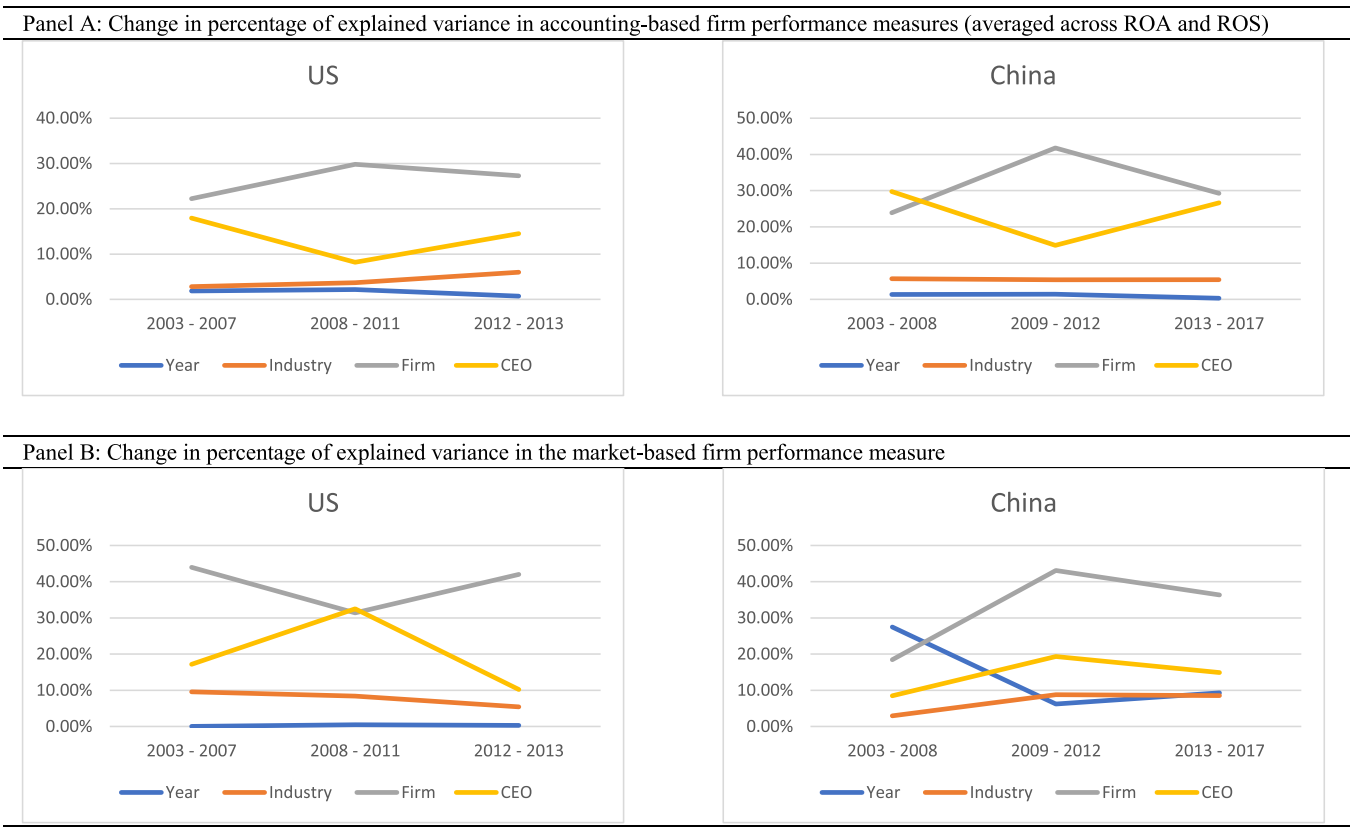

Fig. 1. Change in the Percentage of Explained Variance in Firm Performance Measures. Notes: Panels A and B of this figure depict the change in the explained variance by year, industry, firm, and the CEO of accounting-based performance and market-based performance measures, respectively, across the pre-, during, and post-crisis periods.

results are in line with our previous results showing that the GFC had a detrimental impact on the CEO effect. This analysis shows that the effects materialized earlier in the US compared to China and that the recovery was also faster in the US. This finding is in line with the GFC starting in the US and spreading to the rest of the world thereafter.

Finally, because governments in emerging countries such as China can be critical regarding firm performance (Zhou et al., 2017), we re-run a conditional version of our empirical model with 'state ownership' as a covariate. 'State ownership' refers to the percentage of ownership stake that the government holds in a firm. In our sample, 'state ownership' ranges from 0 % to 97.12 % with a mean of 11.88 % and a standard deviation of 21.02 %. The results we obtain after controlling for 'state ownership' demonstrate patterns and magnitudes that are consistent with the unconditional model.

5. Discussion

5.1. Contributions to theory

This study furthers our understanding regarding the dynamics of the CEO effect. We contribute to existing research in several ways. First, by considering short-term fluctuations of the CEO effect, we contribute to and extend our understanding of the CEO effect on firm performance at large. While prior research has portrayed the CEO effect as a static phenomenon, our study shows that considering the *dynamics* of the CEO effect holds some merits. In the only study we are aware of that explores changes in the CEO effect over time, Quigley and Hambrick (2015) explore the *long-term* changes of the CEO effect as a result of *"multiple, cumulative forces over longer periods of time, rather than because of any single abrupt trigger"* (Quigley & Hambrick, 2015: 829). Specifically, Quigley and Hambrick (2015) attribute their finding of an increasing CEO effect for the time between 1950 and 2009 to post-war stability, rise of investor capitalism, more dynamic and fast-paced competition, and internationalization. By focusing on the *short-term* changes of the CEO effect due to a single abrupt trigger, rather than the mentioned long-term developments, our study specifically shows that the CEO influence on firm performance is not only driven by long-term developments but also by significant short-term changes in the macroeconomic conditions.

Second, we develop prior research on the CEO effect by extending the consideration beyond the US context. While CEO-effect scholars have mainly focused on the US context, little emphasis has been put on other countries, especially non-western countries (for exceptions, see Crossland & Hambrick, 2007, 2011; Quigley et al., 2021; Thomas, 1988). Our study addresses this limitation by exploring the CEO effect in China. To date, research shows that—among the countries considered—the CEO effect in the US is among the highest (Crossland & Hambrick, 2007, 2011). However, our results show the CEO effect is higher in the Chinese context. Though it is beyond this study to develop a theory for why we find that the CEO effect is higher in China than in the US, it is still useful to consider a potential explanation. In Chinese firms, the chief decision maker is the chairman of the board, whereas in US firms it is the CEO. A notable difference is that, in Chinese firms, the chairman is typically the controlling shareholder. Because the chairman combines decision-making authority while being a majority shareholder, it is reasonable to assume that Chinese chairmen are expected to experience fewer constraints in their decision-making given that their interests are completely aligned with remaining shareholders'. Put differently, they have a higher level of discretion compared to US CEOs due to lower agency-related limitations, which is reflected in the higher CEO effect in our Chinese sample (Hambrick & Finkelstein, 1987).

Third, we contribute to research addressing the romanticization of

Table 4
Comparing the CEO Effect between Pre- and During-Crisis by Resources Availability.

Panel A: Comparing the change in CEO effect in USA by resources availability pre-crisis

	Low resources availability pre-crisis			High resources availability pre-crisis		
	ROA	ROS	MTB	ROA	ROS	MTB
Pre-crisis	23.69 %	24.70 %	12.33 %	24.66 %	25.37 %	13.26 %
During-crisis	8.03 %	11.31 %	16.21 %	16.56 %	19.71 %	21.55 %
Change	−15.66 %	−13.39 %	3.88 %	−8.10 %	−5.66 %	8.29 %

Panel B: Comparing the change in CEO effect in China by resources availability pre-crisis

	Low resources availability pre-crisis			High resources availability pre-crisis		
	ROA	ROS	MTB	ROA	ROS	MTB
Pre-crisis	23.06 %	26.55 %	15.58 %	23.92 %	27.05 %	15.94 %
During-crisis	9.91 %	10.26 %	18.36 %	16.83 %	19.22 %	20.09 %
Change	−13.15 %	−16.29 %	2.78 %	−7.09 %	−7.83 %	4.15 %

Notes: Panels A and B of this table report the change in the CEO effect on firm performance between pre-crisis and during-crisis periods for firms with low versus high resources availability in the US and China, respectively. Firms are assigned to the low/high resources availability subsamples based on decile ranks of cash and financial leverage. Leverage is multiplied by minus one before ranking so that both variables capture higher availability of resources. Firms are assigned to the low/high resources subsamples based on the industry-median value in the year preceding the crisis. All variables are winsorized at 1% and 99%.

leadership (Khurana, 2002; Meindl et al., 1985). Though Quigley and Hambrick (2015) posit that the increase in CEO effect is due to CEOs' increased substantive influence on firm outcomes, the authors admit that an alternative explanation holds, namely that it may simply be a case of naïve romanticization. Managerial discretion theory posits that CEOs' impact is greatest in situations that offer plentiful opportunities (Hambrick & Finkelstein, 1987; Hutzschenreuter & Kleindienst, 2013). Conversely, Wasserman et al. (2010) have argued that CEOs have the most impact when opportunities are scarce, while *"when opportunities are plentiful, they have limited impact on company performance"* (Wasserman et al., 2010: 28). Notably, to Wasserman et al. (2010) the CEO effect should reflect CEOs' ability to navigate the firm and that managerial ability should specifically play out in times of trouble (Driouchi et al., 2022). Our results provide an opposing view and somewhat reflect the alternative view of Quigley and Hambrick (2015). With the abrupt deterioration in the conditions of the external business environment, opportunities become scarce, and we expect to witness a substantial decline in the CEO effect. As the economy recovers from the crisis and opportunities become more plentiful, the CEO effect increases again. Thus, our results are instructive as they counteract the ongoing societal tendency to romanticize CEOs and view them as larger than life (Khurana, 2002). CEOs are typically extremely accomplished; however, our results show that CEOs cannot do magic. That is, when the means to make a difference are lacking, even CEOs cannot make a difference.

Fourth, our analysis delineates differing results regarding the short-term fluctuations of the CEO effect on accounting-based and market-based performance measures. Initially, the decline in the CEO effect on accounting-based measures during the crisis can be attributed to two factors. First, the decrease in resources available to the CEO reduces their capacity to influence outcomes significantly. Secondly, there is a notable reduction in the manipulation of these metrics by CEOs. Typically, executives might adjust accounting measures to align with their compensation packages or to meet or surpass analysts' forecasts, often in anticipation of future revenue streams (Dechow et al., 2010). However, the 2008 crisis curtailed these anticipated revenues, consequently diminishing the influence of CEOs on these accounting metrics.

Conversely, the narrative changes when considering market-based performance measures like the market-to-book ratio. In this context, the CEO might exert a greater impact on investors' sentiment, either positively or negatively, which manifests in an increase in the CEO effect. Specifically, investors maintaining high confidence and trust in the leadership of certain CEOs might view the decline in stock prices to be mitigated, resulting in relatively softer decreases compared to the market average (i.e., positive adjusted returns). On the other hand, CEOs perceived as lacking strategic foresight during the pre-crisis period—for instance, due to a lack of diversified investments or provisions—might face steeper declines in stock prices due to investor blame, leading to relatively sharper decreases than the market average (i.e., negative adjusted returns). Thus, the CEO effect on firm performance, when assessed through market-based metrics, might increase during crises due to a combination of strategic maneuvering and external blame. In contrast, the CEO effect on accounting-based measures may wane as the ability to manipulate earnings is minimized, especially when such practices face increased scrutiny by stakeholders. This differential impact underscores the complexity of the CEO effect, revealing its sensitivity to the type of performance measure and the prevailing economic conditions.

Furthermore, our study supplements recent research that centers on the performance effects of CEO private life events. For instance, Bennedsen et al. (2020) scrutinize the aftermath of CEO hospitalization on firm performance, while Jenter et al. (2023) delve into the performance effects stemming from CEO death. Kleindienst et al. (2022) investigate the consequences of CEO divorce on firm operating performance, and Reina et al. (2017) probe the impact of CEO family-to-work conflict (for a review of this literature, please refer to Van Doorn et al., 2023). Hospitalization, divorce, or family-to-work conflict represent a distinct form of crises or short-term shocks originating from the CEO's private life that adversely affect firm performance. Bennedsen et al. (2020), for instance, demonstrate that a 10-day CEO hospitalization leads to a 5.8 % reduction in firm operating profitability from its mean. Building on managerial discretion theory (Hambrick & Finkelstein, 1987), Kleindienst et al. (2022) argue that divorce, as an extreme life event, would diminish CEO discretion and consequently impact firm performance. Consistent with their rationale, they reveal that CEO divorce results in a 2.2 % average reduction in firm operating performance, though the effect is contingent on firm size, industry growth, and the presence of children in the CEO household. While these studies demonstrate the negative effects of crises and short-term shocks on firm performance, it is crucial to note that they investigate absolute changes in performance associated with short-term shocks. However, the present study explores the proportion of variance in firm performance explained by individual CEOs.

Finally, our study also highlights the value of 'replication' and 'quasi-replication' studies (Bettis et al., 2016; Dau et al., 2022; Ethiraj et al., 2016). A single study cannot answer a research question with certainty. Instead, to build a cumulative body of knowledge, different studies are needed to investigate the research question in a novel context or, as we do here, in a different timely setting (Ethiraj et al., 2016). If a research question can be answered with certainty, it requires multiple studies addressing it from different perspectives, in different contexts, and with different methodologies.

In our study, we contribute to the cumulative knowledge regarding the research question: (How) does the CEO effect change over time? Quigley and Hambrick (2015) are probably (among) the first to address this important question. Seizing some of their future research suggestions, our study can provide a more distinct answer to the research question. Specifically, we address the research question drawing on the insight that managerial discretion is not static but may change over time. Over three decades ago, Hambrick and Finkelstein (1987: 403) argued

that a temporal and dynamic view of managerial discretion is what we eventually need. Hutzschenreuter and Kleindienst (2013) have taken a first step toward developing such a dynamic view. Our results highlight that—as proposed by Hutzschenreuter and Kleindienst (2013)—managerial discretion is subject to changes over time, even in the short-run, which explains the short-term fluctuations in the CEO effect we find in this study. Despite the initial work on the dynamic view of managerial discretion, we reiterate the call by Hambrick and Finkelstein (1987). A temporal dynamic view of managerial discretion could help us understand the dynamics of the CEO effect and provide more insights on one of the fundamental questions in our field: How much do top executives matter for firm performance? Importantly, our study neither nullifies nor falsifies prior CEO effect research. Rather, it complements prior results and provides a first step towards a cumulative body of knowledge on an important yet neglected research question.

5.2. Policy and managerial implications

Our findings indicate a notable fluctuation in CEO influence on firm performance, emphasizing the importance of leadership in steering organizational outcomes during turbulent times. Firms can benefit from structured crisis management frameworks that involve regular risk assessments, crisis simulations, and the development of contingency plans. For example, a multinational corporation may conduct scenario planning exercises to anticipate the impact of a financial crisis in different markets and derive strategies tailored to each of the scenarios. Also, policy makers should consider frameworks that encourage firms to establish robust crisis management strategies and leadership development programs. Such regulatory frameworks should not only mandate crisis preparedness but also enforce transparency in firms' crisis response strategies, which ensures that stakeholders remain informed and engaged. In that context, Beldad and von Rosenstiel (2024) argue that effective communication, particularly from the CEO, is paramount during crises to preserve customer trust, maintain purchase intentions, and mitigate negative sentiments, thereby reinforcing the firm's reputation and stakeholder relations in challenging times. The regulatory frameworks within the banking sector may serve as guiding examples.

Our results also suggest the need for an overhaul in the approach to CEO compensation and earnings management, particularly in light of the volatile CEO influence amidst macroeconomic shifts and crises. It is imperative that compensation structures pivot from short-sighted gains to a robust, long-term performance orientation, intricately linked to the broader macroeconomic landscape, thereby ensuring a tight alignment between shareholder interests and CEO actions. The post-2008 financial crisis landscape provides a testament to this necessity. Again, the banking sector serves as a guiding example, where the CEO compensation structures post-crisis, propelled by rigorous changes in regulatory frameworks (Cerasi et al., 2020), marks a significant stride towards mitigating short-termism and excessive risk-taking. Extending these reformed governance frameworks across various sectors is direly needed. It serves as a strategic lever to attenuate the agency dilemma and equips boards with enhanced capabilities to adeptly navigate and counteract any opportunistic behavior, which are notably fluid and contingent on the prevailing economic climate.

5.3. Directions for future research

Our study also points to future research avenues. Most obvious, our study raises the question of whether the impact on the CEO effect depends on the nature of the external shock. We have focused on the GFC, which is widely considered a liquidity crisis and a subsequent trust crisis. However, other crises may unfold their effect differently, for example, in the form of a demand or supply crisis. As scholars continue their investigation of the CEO effect, they should include considerations of 'crisis characteristics' and how they affect the firm's and CEOs' significance (Ghobadian et al., 2022).

Beyond that, our finding that the CEO effect is larger in China than in the US should stimulate more research addressing the CEO effect in non-US contexts. The focus of our study was on the short-term fluctuations of the CEO effect in terms of crisis, not the absolute level of the CEO effect. We can only speculate on why we see the CEO effect is larger in China than in the US. We encourage future research to investigate the sources of the CEO effect in contexts different to the US and specifically including non-western countries.

A last point on suggestions for future research, our results also highlight that the CEO effect varies across the different nature of the performance measures used: accounting-based vs. market-based. To the best of our knowledge, research so far has not taken a deep dive to explore the differences in the CEO effect across these different performance measures. However, as we reason above, CEOs may have different latitudes to impact different performance measures. Future research is invited to uncover these relationships.

CRediT authorship contribution statement

Ingo Kleindienst: Conceptualization, Formal analysis, Investigation, Methodology, Project administration, Resources, Supervision, Writing – original draft, Writing – review & editing. **Moustafa Haj Youssef:** Conceptualization, Investigation, Methodology, Writing – original draft, Writing – review & editing. **Mostafa Harakeh:** Conceptualization, Data curation, Formal analysis, Methodology, Writing – original draft, Writing – review & editing. **Mei Yu:** Data curation, Resources, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Approach to estimating the cross-classified models

The standard multilevel model assumes that the data are strictly nested or hierarchical. Hence, in multilevel hierarchical models, units are classified by some factor (for example, *state*) into top-level clusters. The units contained in each of the top-level clusters, in turn, are (sub)classified by a further factor (for example, *county*). In a strictly nested or hierarchical structure, a lower-level cluster can only belong to one higher-level cluster (in the example: a county can only belong to one state).

The unconditional two-level model is given by

$$y_{ij} = \beta_{0j} + r_{ij} \quad (1)$$

Acknowledging that β_{0j} is a random intercept (for level-2 units) that can be re-written as

$$\beta_{0j} = \gamma_{00} + u_{0j} \tag{2}$$

where γ_{00} denotes the grand mean for the outcome Y and u_{0j} the random effect for the cluster at level 2, we obtain

$$y_{ij} = \gamma_{00} + u_{0j} + r_{ij} \tag{3}$$

with $Var(r_{ij}) = \sigma^2 (i = 1, \ldots, n_j, j = 1, \ldots, J)$ and $Var(u_{0j}) = \tau_{00} (j = 1, \ldots, J)$. τ_{00} is referred to as between variance (between-group variance; level-2 variance), whereas σ^2 is called within-variance (within-group variance; level-1 variance).

Following the above notation and approach Crossland and Hambrick (2011: 811), for example, used a four-level nested multilevel model to estimate the CEO effect. Specifically, they modeled years (level 1), nested in CEOs (level 2), nested in firms (level 3), nested in industries (level 4). Thus, ROA of a particular firm was modeled as a grand mean γ_{0000}, with random effects for industry k (α_{000k}), firm j (β_{00jk}), CEO I (δ_{0ijk}), and year t (η_{tijk}), and an overall error term (ε_{tijk}). Finally, the model was specified as follows:

$$ROA_{tijk} = \gamma_{0000} + \alpha_{000k} + \beta_{00jk} + \delta_{0ijk} + \eta_{tijk} + \varepsilon_{tijk} \tag{4}$$

However, the 'year' in this dataset is not strictly nested. Rather, the effect of year (for any given year) is the same across the industries, the firms, and the CEOs. In other words, each industry, firm, and CEO experience the same year (time) effect at any given year. As such, the set-up of the data is not strictly nested or hierarchical (see also the discussion in Hough (2006) on business segments nested within the cross-classification of corporations and industries). Rather, the data are crossed, or cross-classified and cross-classified random-effects models (CCREM) are used to investigate the relationships among variables within a given level and across different levels. Not accounting for the crossed structure of the data may affect the estimates. For example, Luo and Kwok (2009), used simulated data on corporations, business segments, and industries to analyze two models: The correctly specified CCREM and a mis-specified HLM, in which the crossed factor was ignored. Their results highlight that ignoring the crossed factor yields significantly different estimated variance components for the different level-factors, while the estimated residual variance remained unchanged (Luo & Kwok, 2009: 190).

A classic example is illustrating the crossed effect of time is provided by Grunfeld (1958). To determine the relationship between investment, market value, and capital stock, Grunfeld (1958) analyzed investment data on 10 large US corporations between 1935 and 1954 and considered the following equation:

$$I_{it} = \alpha + \beta_1 F_{it} + \beta_2 C_{it} + u_{it} \tag{5}$$

with I_{it} denoting real gross investment for firm i in year t, F_{it} representing the market value of the firm, and C_{it} the value of the capital stock. In modeling the relationship, extra attention needs to be paid to the fact that the effect of year—for any given year—is the same across each of the 10 large US corporations as each company experiences the same year (time) effect at any given year.

Baltagi (2005) suggested a model that allows the effects of both firms and years on gross investment y_{ij} to vary and specifies the following two-way error-components model:

With x_{2ij} and x_{3ij} representing the market value and the capital stock of firm I in year j, respectively. ζ_{1i} and ζ_{2j} represent the random intercepts for firm i and year j, and ε_{ij} is the residual error term. The random intercepts have zero means and are

$$y_{ij} = \beta_1 + \beta_2 x_{2ij} + \beta_3 x_{3ij} + \zeta_{1i} + \zeta_{2j} + \varepsilon_{ij} \tag{6}$$

uncorrelated with each other. Moreover, ζ_{1i} has variance ψ_1 and is uncorrelated across firms, and ζ_{2j} has variance ψ_2 and is uncorrelated across years. Both random intercepts ζ_{1i} and ζ_{2j} are uncorrelated with ε_{ij}. The residual has zero mean and variance θ and the residuals are uncorrelated across firms and years (Rabe-Hesketh & Skrondal, 2012).

The important difference to standard multilevel models is that the two random intercepts represent factors that are crossed rather than strictly nested or hierarchical. Specifically, the random intercept for firm ζ_{1i} is shared across all years for a given firm i. In turn, the random intercept ζ_{2j} for year is shared by all firms in a given year j. The residual error term ε_{ij} combines both (i) the interaction between year and firm as well as (ii) any other effect specific to the i-th firm and j-th year and not accounted for explicitly in the right-hand side of the equation (Rabe-Hesketh & Skrondal, 2012).

Following Goldstein (1987) a multilevel model with crossed effect can specified with some simple extensions of the standard model. For simplicity, we present the approach of Goldstein (1987) using the level-2 model discussed above. However, the approach can be extended to higher level models as well. Specifically, the extensions are as follows: First, consider the entire dataset as a single level-3 unit, in which both firms and years are nested. This artificial level has only one category that consists of all the observations. In the following, the single level-3 unit is referred to as 'a'. Second, treat one of the two factors—either years or firms—as level-2 units j. Specify a random intercept $u_{ja}^{(2)}$ for them, say here years. Third, for the remaining factor (here firms), specify a level-3 random intercept for each cluster $u_{pa}^{(3)}$. This can be achieved by treating $u_{pa}^{(3)}$ as the random coefficient of the dummy variable d_{pi} for firm p, where d_{pi} equals 1 if p = i and 0 otherwise. The variance of the 10 random coefficients (because we have 10 firms) are set to have equal variance ψ_1 and to be uncorrelated (Rabe-Hesketh & Skrondal, 2012). The above model can then be rewritten as

$$y_{ij} = \beta_1 + \beta_2 x_{2ij} + \beta_3 x_{3ij} + u_{ja}^{(2)} + \sum_p u_{pa}^{(3)} d_{pi} + \varepsilon_{ija} \tag{7}$$

and finally

$$y_{ij} = \beta_1 + \beta_2 x_{2ij} + \beta_3 x_{3ij} + u_{ja}^{(2)} + u_{ia}^{(3)} + \varepsilon_{ija} \tag{8}$$

with $u_{ja}^{(2)}$ representing ζ_{2j}, $u_{ia}^{(3)}$ representing ζ_{1i}, and ε_{ija} representing ε_{ij}. Because they are specified at different levels, $u_{ja}^{(2)}$ and $u_{ia}^{(3)}$ are uncorrelated (Rabe-Hesketh & Skrondal, 2012).

In Stata, the command 'mixed' can be used to fit the two-way error-components model in the following way: We create the artificial level using the command '*_all*'. The command '*R.varname*' specifies the clusters of 'varname' as a series of dummy variables. Hence, the command in Stata is as follows:

mixed I F C ||_all: R.firm || year:, mle.

with 'mle' indicating model fit via maximum likelihood.

As indicated above, in our data—which are like those of previous studies on the CEO effect—time is a crossed factor: The effect of year (for any given year) is the same across the industries, firms, and CEOs. Therefore, following the above discussion, we specified the following model in Stata:

mixed performance_variable ||_all: R.year || industry: || firm: || CEO:, mle.

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