"Do CEOs Matter?"*

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Abstract. Estimating the value of top managerial talent is a topic of research that has attracted widespread attention from academics and practitioners, but testing the effect of chief executive officers (CEOs) on firm outcomes is challenging. In this paper, we test for the impact of CEOs on performance by assessing the effect of (1) CEO deaths and (2) deaths of CEOs' immediate family members (spouses, parents, children, etc.). Using a unique dataset from Denmark, we find that CEOs' (but not board members') deaths and deaths in CEOs' families are strongly correlated with declines in firm operating profitability, investment, and sales growth. Our CEO shock-outcome analysis allows us to identify the personal shocks that are the most (least) meaningful for CEOs. We show that CEO, firm, and industry characteristics affect the impact of these shocks. Overall, our findings demonstrate that managers are a key determinant of firm performance.

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What do chief executive officers (CEOs) *do*? Do they meaningfully affect firm performance? What types of shocks affect CEO productivity? While there is a long-standing debate about the contributions of senior managers to the organizations they lead, to date, there is scant systematic evidence on the causal impact of CEOs on firm performance. The debate has intensified in the corporate governance literature because of the rapid increase in executive pay, a series of corporate scandals, and the recent financial crisis.

Testing for the importance of managers on firms' outcomes is challenging because of the difficulty of finding a suitable counterfactual to convincingly isolate direct CEO effects. Firms do not randomly appoint or fire CEOs. As a result, attributing differences in performance to managers themselves, and not to industry and firm characteristics, is empirically difficult.

The objective of this paper is to investigate whether CEOs affect firm performance using variation in the firms' exposure to their CEOs resulting from the managers' own deaths and from the deaths of their immediate family members. Specifically, we study the effects of the deaths of spouses, children, parents, and parents-in-law. The main advantages of this rather painful empirical strategy are two. First, these shocks presumably affect managers' ability to perform their jobs, either directly, through their own death, or indirectly, by grief or the additional time they spend with their families, which would limit their ability to execute their professional roles. Second, it is reasonable to expect that, personal shocks to managers, particularly those arising from the deaths of family members unaffiliated with the firm, do not affect firms' investment opportunities, except through the decrease in the CEO's effectiveness that results from personal grief or additional time spent with the family.

As in Johnson, Magee, Nagarajan, and Newman (1985) and many other subsequent studies, our first set of tests evaluates whether firms who lose their CEO to death perform differently than (a) comparable organizations that are not affected by such shocks and (b) the companies themselves prior to the shock. This approach evaluates the contribution to firm performance of the incumbent CEO relative to that of the incoming executive. We extend this analysis to a larger number and wider range of firms. To our knowledge, we are the first to examine the importance of CEOs on a sample of firms that is representative of an entire economy. Further, we are also able to assess the impact of a richer array of executive and firm characteristics that could influence the effect of managers on firm performance.

Our second empirical approach is more novel. It is inspired by the insights of Becker's (1965) seminal work on the allocation of time between productive and household activities. We hypothesize that family deaths increase the time CEOs spend with their families and, in consequence, reduce the effective time spent at the firm. This approach is attractive for three reasons. First, it allows us to test for the overlap between business and personal spheres under the influence of a CEO. Understanding such interactions is central to the growing literature that examines the prevalence and performance of firms controlled by founders and their families.[1] Second, it provides a test of the value of CEO talent based on *existing* management, as it compares a manager-firm combination with and without distraction. Third, relative to CEOs' own deaths, the deaths of family members are more likely to be exogenous to firms' characteristics, as they add a degree of separation between the source of variation in CEO attention and the outcome variables. Our focus on deaths in a manager's immediate family is, to the best of our knowledge, new in the corporate performance literature.

To pursue these questions empirically, we use a detailed dataset that includes financial and senior management information for the universe of limited liability firms in Denmark between 1992 and 2003. These data are unique in that we are able to match each chief executive officer (CEO) to Civil Registry data containing information on his or her spouse (if any), children, parents, and parents-in-law. Based on these data we construct manager-level family trees and then investigate which managers or immediate family members die during the sample period. In our empirical tests, we use the first shock occurring to the CEOs–direct or indirect–of the firms in the sample, allowing a maximum of one shock per firm.

We are able to identify 6,753 deaths of CEOs and their immediate family members. Of these tragic events, 1,015 deaths are of CEOs, 733 of spouses, 282 of children, 3,061 of parents and 1,364 of parents-in-law.

We find that the death of a CEO or her immediate family members is likely to cause a statistically significant and economically large decline in firm profitability. Industry-adjusted operating return on assets (OROA) falls by 0.9 percentage points using a two-year window around managerial deaths. This decline is equivalent to an 11% decrease in OROA. When we

[1] See, for example, La Porta, López-de-Silanes, and Shleifer (1999); Morck, Stangeland, and Yeung (2000); Burkart, Panunzi, and Shleifer (2003); Anderson and Reeb (2003); Pérez-González (2006); Villalonga and Amit (2006); Bertrand, Johnson, Samphantharak, and Schoar (2008); Bennedsen et al. (2007); Bloom and Van Reenen (2007), among others.

split the direct CEO effects from the indirect events, we find that CEO deaths are associated with a 1.7 decline in OROA, while relatives' deaths lead to a 0.7 reduction in OROA, both significant at the 1% level. The difference across shocks is significant. Among family deaths, the magnitude of the effect is concentrated on nuclear family, i.e., spouse and children deaths.

To bolster the case for a causal interpretation of the link between CEO shocks and firm performance, we show that event firms do not exhibit differential performance prior to the occurrence of these deaths. This result is important as it provides evidence against reverse causality going from firm profitability to family tragedies. An important limitation of our analysis is that we cannot separate expected from unexpected deaths. Inability to isolate unexpected shocks suggests we are likely to be underestimating CEO effects.

We further evaluate for the particular relevance of CEOs by comparing the effect on performance of CEO shocks to similar tragic events occurring to members of the board of directors. We do not find robust evidence that the deaths of individual board members or their immediate family members significantly affect firm profitability. Using board member shocks as a control group for the above-described CEO effect, we find a differential drop in operating profitability for CEO nuclear family shocks of 1.5 percentage points of OROA, significant at the 1% level. Finally, using alternative outcome variables, we find that CEO shocks also harm firm investment decisions and sales growth.

Given that our dataset is representative of limited liability firms in Denmark, one concern about the above-described results is that they might only be relevant for smaller firms, which may be more dependant on their CEOs. In addition, the level of overlap between personal and business affairs is likely to be higher for smaller organizations. We find, however, that this is not the case empirically. We report negative performance effects across the size distribution of firms.

We also test whether family deaths are likely to reflect "direct" or "indirect" shocks. A concern with this family-shock-based approach is that the death of relatives may affect firm performance directly if the deceased relative was a firm employee herself. We show that it is unlikely to be the case. Specifically, the deaths of relatives who are not of working age (younger than 16 or older than 75) have an economically and statistically substantial negative effect on profitability, statistically indistinguishable from the declines in performance that result from the deaths of other family members. This finding suggests that the family death results seem to work through the CEO's reduced attention to firm-related activities.

In further robustness tests, we show that CEO effects on operating performance tend to disappear over time: they are economically large and significant when we use data for the year of the shock and the two subsequent years. The results are, however, are not explained by a single event year. Omitting any one of these three years does not affect the results. The differences in profitability disappear when we evaluate the gaps in performance based on years $t=+3$ onwards. While the effects on measures of operating performance are temporary, the negative impact on the value of the firm is permanent, as we do not find that shocked firms overperform thereafter.

An additional attractive feature of the shock-performance analysis is that one could potentially identify what shocks are meaningful for a CEO's productivity. Using this logic, we find that the loss of a child obtains the largest estimated effects on profitability, followed by the death of a spouse. At the other extreme, the death of a CEO's mother-in-law generates a positive but insignificant effect on performance.

Having established that CEOs have a determinant effect on firm profitability, we then evaluate whether the estimated CEO effects are explained by the need to have *anyone* to rubber stamp firm decisions, or if, in contrast, particular CEO, firm, or industry characteristics affect the estimated managerial effects described above. Taking this further step, however, complicates inference, as comparing CEO shocks across individuals requires us to make further identifying assumptions. In particular, for CEO deaths we need to assume that the frictions that allow us to estimate these CEO effects–for example, the cost of finding a new CEO or the quality of succession planning–are uncorrelated with the individual, firm, or industry characteristic of interest. Similarly, for family shocks, we need to assume that behavioral responses to family deaths are uncorrelated with the variable of interest. As a result, the cross-sectional results are relatively more difficult to interpret.

We examine the role of CEO tenure and find that significant declines in performance are concentrated in those firms where CEOs have had the position for at least two years and that the largest performance effects occur with CEOs whose tenure precedes our sample period. CEO age is, in contrast, correlated with lower managerial effects: shocks to relatively older CEOs do not significantly harm performance.

We also test for differences in CEO effects as a function of the gender of the CEO. In our data, there are 618 female CEO events. We fail to find systematic gender performance

differences as a result of CEOs' own deaths. However, family deaths affecting female CEOs have larger performance effects. Interpreting these differentials is, however, challenging.

As in Bertrand and Schoar (2003), we estimate CEO fixed effects for those managers who had served as top executives in multiple firms. We show that shocks to CEOs with positive investment fixed effects are correlated with large declines in firm profitability, while the effects for firms with CEOs with negative investment fixed effect are insignificant. The correlation of active investment decisions and CEO effects is also replicated using pre-shock investment rates at the firm and industry levels. Active investment decisions seem, as a result, key to understanding the CEO effects we document. Moreover, the results are consistent with the notion that the CEO effects in Bertrand and Schoar (2003) are important to understand firm outcomes.

A potential interpretation of the strong investment results is that pre-shock investments were indeed profitable and that firms suffer when competent CEOs are affected by managerial shocks. Value-destroying overinvestment would predict a gain in performance post shocks, as firms would no longer be subject to such inefficient investments. Alternatively, differences in finding a suitable CEO could potentially explain why high investing firms suffer more.

We also provide suggestive evidence that the decline in performance around CEO shocks and shocks to the CEO's immediate family tends to be higher in fast growing industries and in environments with research and development activities. Looking at different organizational forms, we document similar CEO effects for "public" (A/S) and "private" (ApS) firms.[2] Smaller ApS firms are of interest, as CEO entrenchment would tend to be less severe in a setting where ownership and control are rarely separated.

Overall, this paper provides striking evidence that the deaths of CEOs themselves and CEOs' family members are important for firm profitability, investment decisions, and sales growth. Direct and indirect shocks show that CEOs but not board members are extremely important for the success of on-going operations. Our family death results also demonstrate that there is a significant overlap between the personal and professional roles that CEOs play.

The rest of the paper is organized as follows. Section I reviews previous work closely related to our analysis. Section II describes the data. Section III outlines our empirical strategy. Section IV presents the results of the paper and Section V concludes.

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[2] ApS firms cannot become publicly traded and their shares are non-negotiable instruments.

I. Related Literature

We build on studies that have previously examined the impact of CEO turnover on firm performance using event study methodologies.[3] Like those tests, we analyze firm performance around the date of a key managerial event and seek to establish an empirical link between the relevant managerial events and firm-level performance measures.

Our focus on CEO and family deaths builds on the work of Johnson et al. (1985), and subsequent studies, who have examined the effect of sudden senior management deaths on stock prices. Using data from 53 U.S. firms Johnson et al. (1985) find (1) no average effects, (2) a negative (positive) abnormal return for non-founder (founder) CEOs, (3) larger declines for firms with strong pre-death performance and whose executives were highly compensated. These results have been interpreted as indicating that founder CEOs destroy while professional and high performing managers enhance value. Yet as Slovin and Sushka (1993) have shown, these results may be alternatively explained by changes in the probability of a corporate control contests. Specifically, the death of founders might trigger firm sales that would not occur under alternative organizational structures, making inference difficult.

To address these inference concerns, we investigate the impact of CEO and family deaths using firms' operating profitability as a benchmark measure of firm performance. Previous studies have documented significant changes in operating profitability that are attributable to CEO turnover events (Denis and Denis (1995), Huson, et al. (2004), Pérez-González (2006) and Bennedsen et al. (2007), among others).

Our focus on family members exploits the interaction between personal and business spheres. Starting with the seminal work of Becker (1965, 1981), the interactions between individuals' market and non-market activities are widely understood conceptually but rarely applied to corporate settings. In the corporate finance literature, the importance of the interaction between family and professional decision-making is arguably greatest in the "family" firm literature.[4] In this line of research, recent work by Bennedsen et al. (2007) and Bertrand et al. (2008), demonstrate that family characteristics have a determining role in shaping important firm

[3] See for example, Reinganum (1985), Warner et al. (1988), Weisbach (1988), Bonnier and Bruner (1989), Khanna and Poulsen (1995), among others.

[4] See for example, Burkart et al (2003), Anderson and Reeb (2003); Pérez-González (2006); Villalonga and Amit (2006), Bennedsen et al. (2007), Bertrand et al. (2008), among others.

decisions, such as CEO succession or investment outcomes, respectively. We build on this literature by testing whether family deaths have an influential effect on firm performance.

Lastly, our paper also relates to recent studies linking detailed managerial individual characteristics to firm decision making. Using data from executives who switch managerial positions, Bertrand and Schoar (2003) show that managerial fixed effects affect investment and financing decisions. Malmendier and Tate (2005) show that measures of CEO overconfidence and other personal characteristics affect firm investment decisions. Pérez-González (2006) shows that the college attended by family CEOs affects firm performance around CEO turnover events. Similarly, Jenter and Lewellen (2011) show that the age of a CEO has a significant effect on the probability that a firm is taken-over.

We seek to contribute to preceding work in the literature in several ways. First, we provide a comprehensive test of whether, beyond their effect on stock prices, senior management deaths affect firm operating profitability, investment decisions, and sales growth. Given that, unlike most CEO turnover events, senior management deaths do not necessarily coincide with poor firm prospects, our evidence could potentially shed light on the value of managers on average, and not only on their value for troubled firms. Second, by focusing on the deaths of immediate family members, we provide a new and arguably more general test on the interaction between personal and business decision making. The family shock approach provides a cleaner test for the effect of managers, as it is less likely that the deaths of CEO's immediate family members are affected by firm performance. Third, our larger sample size potentially allows us to identify those firm and individual characteristics that are likely to matter the most in evaluating the impact of managers on firm performance.

II. Data Description and Summary Statistics

A. Data

We start with the universe of publicly and privately held limited liability firms in Denmark and identify 6,753 firms that experienced the death of a CEO or one of her immediate family members between 1994 and 2002. Our dataset contains financial information, as well as personal and family information about the CEOs and board members. The dataset was constructed based on three different sources, as explained below.

1. Financial and management information are from *Købmandstandens Oplysningsbureau* (KOB). KOB is a dataset assembled by a private firm using the annual reports that all limited liability firms are required to file at the Danish Ministry of Economic and Business Affairs. The dataset contains selected accounting and management information. Local regulations mandate disclosure of firm assets and measures of profitability, such as operating results and net income. The disclosure of alternative firm-level attributes, such as sales or employment, is not required, although some firms do selectively report them. Management data, reported by all firms, includes the names and positions of executives and board members.

We obtained access to management information from 1994 to 2002, and financial data from 1992 to 2003. Even though a large fraction of KOB firms are privately held, KOB data are likely to be reliable. Danish corporate law requires annual reports to be approved by external accountants. Given our focus on changes in firm performance around CEO shocks, for our analysis, we only require that reporting biases are consistent at the firm level.

2. Individual and family data about CEOs and board members are from the official Danish Civil Registration System. These administrative records include the personal identification (CPR) number, name, gender, and dates of birth and death of all Danish citizens. In addition, these records contain the names and CPR numbers of parents, siblings, and children, as well as the individual's marital history (marriage, divorce, etc.). We use these data to construct CEOs and board members' family trees and to identify deaths in their families.

3. To match the names of top management reported in KOB with their CPR numbers, which are needed to access their individual and family information in the Danish Civil Registration System, we use a database from the Danish Commerce and Companies Agency (*Erhvervs- og Selskabsstyrelsen*, or ES) at the Ministry of Economic and Business Affairs. The ES dataset reports the names and CPR numbers of management and board members of all limited liability corporations. Under Danish corporate law, firms are required to file with ES any change in CEO or board positions within two weeks of the actual date of occurrence.

Firm by firm, we match the name of the chief executive officer with the management names reported in the ES dataset. For all these matches, we use the CPR number from ES to obtain family information from the official Danish Civil Registration System. Despite the fact that women often change their family names after marriage, we are able to match men and

women equally well. We do it by using women's family trees to reconstruct their maiden names and names they had in previous marriages.

In the paper, we classify a firm as an event firm when two conditions are met. First, the records in the CRP agency indicate that the CEO or any of his immediate relatives passed away during the manager's tenure. Second, matching financial information from KOB is available around event dates and that firm employment, where available, was never zero.

Lastly, in case of multiple shocks occurring to a single firm, we only retain the first event in chronological order.

B. Firm Characteristics

Table I presents summary statistics of the firms in the sample both as a group (Column I) and when classified by their event status; Column II has event firms and Column III has non-event firms. Table I shows that event firms are larger, more profitable, older, and growing faster than non-event firms, in all cases with differences that are statistically significant at the 1% level. On average, the age of event firms is 15.5 years, while it is only 11.2 for non-event firms. This difference in age was expected. CEO shocks are more likely to occur in relatively older firms. Similarly, family size and age are expected to be greater for managers of older firms.

In Table I we scale operating and net income using total assets. Operating return on assets (OROA) is measured as the ratio of earnings before interest and taxes to the book value of assets. OROA is a natural measure of performance that has been previously used in the CEO turnover literature to assess the quality of operations changes around successions (e.g., Denis and Denis (1995); Huson et al. (2004)). OROA compares a comprehensive proxy of firms' cash flows to the total asset base used to generate them. Unlike net-income-based measures it is unaffected by differences in the firms' capital structure decisions. In contrast to return on equity, for example, it compares firm performance relative to total assets, rather than to a fraction of them.

We find that OROA is 7.75 and 5.42 percentage points for event and non-event firms, respectively. Using industry-adjusted OROA, we find that the magnitude of the difference across groups falls but remains large and significant at 1.45 percentage points.[5]

[5] To estimate industry controls, we require that at least 20 non-event firms exist in a given industry and year. We favor four-digit industry controls using NACE, the European industry classification system, and move to three and two digits if the 20-firm restriction is not satisfied. The results are unaffected these industry adjustments.

In Table I we also present the ratio of net income to assets, calculated using after-tax profits relative to the book value of assets. The average net income to assets is 4.2% for event firms and 3.1% for those firms that are not subject to a CEO shock. Finally, Table I shows that event firms have higher asset and sales growth.

C. Event Characteristics

We classify shocks by the relationship of the individual who passes away to the CEO. In our sample we find 6,753 deaths occurring to CEOs and their immediate family members. Of these events, 1,015 occur to CEOs, 733 to spouses, 282 to children, 3,061 to parents, and 1,364 to parents-in-law.

Overall, the main message from Table 1 is that firms that are subject to a CEO shock are different relative to other firms in the economy. Thus empirical strategies that assess differential performance across groups would tend to be problematic. As a result, in this paper we use a difference-in-differences methodology that emphasizes within-firm variation for event firms, using non-event firms as an additional control. In implementing this approach, we follow Bertrand et al. (2004) and show that (1) event and non-event firms do not exhibit significantly different pre-shock trends and (2) collapsing the data into a "pre" and "post" period does not affect the main results of the paper.

III. Empirical Strategy and Predictions

As previously discussed, we provide two alternative approaches to evaluate the importance of CEOs for firm outcomes. The first test compares firm performance around the death of a CEO. The second approach examines firms' outcomes around the time the CEO is undergoing family distress. Both tests are intuitive and are clear about the source of variation in firms' exposure to their CEO. Based on the available information, we measure firm performance using operating profitability, investment rates, and sales growth.

The simplest way to test for effects is to estimate the difference in firm performance (for example, profitability) around these CEO shocks and assess the way in which firm outcomes change as a result of its exposure to the CEO. Using differences in performance is attractive as it allows us to estimate CEO effects that are not affected by firms' time-invariant characteristics. If

incumbent CEOs are important for firm outcomes, we expect that firm performance should fall as CEOs or CEOs' relatives die. In testing for CEO effects we implicitly rely on the assumption that it is hard to substitute for CEOs in the short run, as we would otherwise obtain insignificant effects even if CEOs were valuable for their firms.

Given the nature of our data, we face an additional challenge in testing for CEO effects. Namely, we are not able to distinguish whether event deaths are anticipated or not. This implies that our shocks to CEO exposure are measured with error and, as a result, our estimates of the value of these CEOs would tend to be biased towards zero.

To partially assess this problem, we test changes in firm performance prior to the death-related shocks. If deaths are anticipated at the date of the death, it is likely that the surprise occurred in the years leading up to the event date. Thus, if CEOs are material we expect to observe declines in performance before these deaths. Testing for pre-shock trends is also attractive because it allows us to examine if event firms perform differently relative to their peers, which would complicate inference. Finally, it provides a natural test for reverse causality. That is, if CEO or family deaths are caused by firm performance, we would expect event firms to underperform relative to their competitors in the years prior to the detected deaths. If, in contrast, CEO shocks are unanticipated and CEOs are indeed important for firm performance, we expect firms to perform similarly to other firms in their industry until the year of the shock, and then to underperform as exposure to the CEO changes.

To further test for the relevance of CEOs to performance, we assess the differential impact of changing CEO exposure relative to similar shocks that occur to members of the board of directors. Using this additional difference-in-differences analysis is attractive because it highlights the contribution of the CEO relative to other key individuals that are affiliated with the firms in the sample. If CEOs are particularly important, we expect CEO shock effects to be significantly larger than the effect of similar shocks to board members.

An alternative hypothesis when interpreting the CEO family shocks is that significant changes in performance, if found, do not necessarily reflect the value of individual CEOs. Given that the firms in our sample are relatively small, it is possible that the deceased relative worked in the firm and that the resulting impact is the direct effect of the relative and not the CEO, or is a combination of these two. To test for this, we evaluate CEO effects using a subsample of relatives who are unlikely to work because of their age. If the change in performance is still

significant for this group, it would show that a relative's death affects performance indirectly through its impact on the CEO.

Even if we are able to rule out the direct effect of the death of a CEO's family member and establish that the death of relatives does generate changes in firm performance through the effect on the CEO, it is difficult to attribute performance changes around these events to managerial ability. The effect on performance is driven by at least two factors: the CEO's ability and her response to the shock (i.e., in terms of reduced effort made or fewer hours worked). To illustrate this problem, assume that performance, *P*, is given by the product of managerial ability, *a*, and effort made, *e*, as follows:

$$P = a * e. \qquad (1)$$

The change in performance around a family member's death is given by:

$$\Delta P = a * e_s - a * e_n \qquad (2)$$

or

$$\Delta P = a\, \Delta e, \qquad (3)$$

where e_n is the effort under normal circumstances and e_s is the effort following the shock. Under the assumption that the behavioral response to the shock is constant for everyone (constant Δe), we could use the measured ΔP to rank managerial ability: the higher the magnitude of the performance change, the higher the managerial ability.

However, if the behavioral response is not constant across managers, differences in ΔP across firms will capture variation both in ability and in response to shock. Moreover, the interpretation of ΔP becomes problematic, as ability and the behavioral response to the shock are correlated. For example, consider the extreme case in which high-ability individuals (high *a*) are also the ones who are not distracted from their professional activities even under extreme personal circumstances ($\Delta e=0$). In this case, the magnitude of ΔP for high-ability managers would be zero and that for managers of lower ability would be strictly positive.

Overall, this section highlights that our empirical analysis is likely to provide a test of the importance of CEOs to firms. If CEO and family shocks are orthogonal to firm outcomes, which

is likely, we would be able to assess if exposure to the CEO has a causal impact on firm performance. Yet, comparing CEO effects or providing a CEO talent rank as a function of the estimated changes in performance requires further identifying assumptions. Specifically, for CEOs' deaths, we need to assume that frictions in the managerial labor market or in firms' succession planning are uncorrelated with the variables of interest. Similarly, we need to assume comparable changes in CEO focus when relatives die. Thus assuming similar effort and succession planning conditions across managers, we can gain further understanding of the impact of CEOs on firms by studying the cross-sectional distribution of the effect using individual, firm, and industry characteristics. Given that these additional requirements are strong, cross-sectional results would only be suggestive of the relative importance of CEOs to firms.

IV. Results

A. Mean Differences in Profitability

We initially test for the impact of shocks to CEOs on their firms by computing the differences in operating return on assets (OROA) around the deaths of CEOs and their relatives. In Table II, we present the average OROA in years *t=0* and *t=1* minus the mean OROA in the two years prior to the shock. The mean difference is -1.37 percentage points and it is significant at the 1% level. This first result does suggest that shocks to CEOs seem to significantly affect performance. When we split the CEO shocks by whether they affect the CEO directly or not, we find that CEO deaths result in declines in OROA of 2.2 percentage points, significant at the 1% level. In contrast, family deaths are associated with average reductions in OROA of 1.2 percentage points. The difference of self shock minus family shock is -0.98% and it is significant at conventional levels.

Differences in OROA could be explained by industry trends differentially affecting event firms. In the second row of Table II, we present differences in operating performance once we adjust profitability by the annual industry mean. We find that netting out the industry effect reduces the estimated declines in profitability for all shocks, but does not affect the estimated difference between direct and indirect shocks. Specifically, CEO and family deaths lead to reductions in industry-adjusted OROA of 1.8 and 0.7%, respectively. The difference of 1.1 percentage points is significant at the 5% level.

To assess whether the results described above are driven by a few outliers, we provide the median drop in industry-adjusted OROA in the third row of Table II. For both CEO and family deaths we find that the median shock leads to significant declines in OROA that are significant at the 5% level. Economically, median CEO and CEO's family death-related effects were -0.47 and -0.15%, respectively. Thus Table II provides evidence that CEO shocks do generate economically large and statistically significant performance effects.

B. Causal Interpretation of CEO Effects

In Table III, we assess whether the results of Table II are likely to be causal or could be alternatively explained by pre-shock trends or other omitted variables. In Panel A of Table III, we show differences in performance for those firms with available data for the years leading up to the events. We compute two-year differences in performance centered at year $t=-3$. We fail to find differences in performance for firms with CEO death versus family death shocks. This result is interesting for several reasons. First, it shows that the trends that affect event firms are not different from the average trends of their industry. Second, it provides evidence against a reverse causality interpretation of the results shown in Table II; there is no evidence that event firms perform poorly before the death-related shocks. Third, it also indicates the events under analysis were unlikely to be expected, as the CEO effects are not present before the year of the deaths.

In Table III, Panel B we provide data from a falsification test for the importance of CEOs to performance using similar death-related shocks occurring to board members. Using our dataset, we are able to identify the deaths of 1,066 board members and 4,493 relatives of acting board members, for a total of 5,559 board shocks. We replicate our analysis for board member shocks, but fail to find significant effects. The death of board members or their relatives leads to estimated effect on performance that is indistinguishable from zero at conventional levels.

The data in Table III, Panel C explores whether the CEO effects shown in Table II are explained by a subset of firms in the firm size distribution. We find that CEO shocks affect firms irrespective of size quintile. The top quintile indicates that CEO shocks lead to an average decline in OROA of 0.77 percentage points, significant at the 1% level. The estimated effect of CEO shocks are -0.94, -1.13, -0.73 and -0.91 for quintiles one through four; all of these are significant at the 5% level.

Figures 1 and 2 plot industry-adjusted operating profitability as a function of time in years, relative to the date of the shock. In Figure 1, shocks are classified into 1) all shocks to board members, 2) all shocks to CEOs, and 3) only shocks from the deaths of nuclear family relatives of the CEO (the CEO's own death or the death of a child or spouse). The figure shows that industry-adjusted profitability hovers around zero before the shock. However, after the shock, the group of firms in which the CEO dies or suffers the loss of a close relative experience a decline in performance that is driven by these deaths. The group of firms with shocks to board members shows no significant changes in profitability. Figure 2 plots the mean difference in industry-adjusted profitability between own and nuclear family CEO shocks and comparable board shocks. It shows that shocks to CEOs are associated with a drastic drop in performance. Figure 2 also plots confidence bounds around the time of the event. These figures suggest that the decline in performance continues to be significant three and four years after the shock event.

One of the novel and striking results so far is the evidence that death in the CEO's family significantly affects firm performance. As previously discussed, it is possible that these results could simply indicate that the deceased family member is also employed by the firm. To address this, we can test if the deaths of family members who were unlikely to work also cause significant performance effects. In Table IV Panel A, we investigate the impact of the deaths of CEOs' children as a function of their age. Interestingly, industry-adjusted OROA in those firms headed by a CEO whose child dies at an age younger than 16 years (68 observations) falls by 2.4 percentage points, significant at the 5% level. The point estimate for the decline in OROA following the deaths of older children is actually lower: 1.4 percentage points, significant at the 10% level. This is not statistically different from zero, suggesting that it is unlikely that family shocks affect firm profitability because they hurt the value of the labor output of a family member who works in the same firm.

Sorting by the number of children, we find that their deaths have the biggest effects on firm profitability in cases where CEOs only had one child: the deaths of only children correlate with a 4.7 percentage point decline in firm profitability, irrespective of the age of the child. The difference for firms whose CEOs have three or more children is -3.5, significant at the 5% level. The lack of significant differences between only child cases where the individual is younger than 16 and those where the child is 16 or older also casts doubt on the idea that family shocks are only driven by children who participate directly in the productive activities of the firm.

In Table IV, Panel B, we show the results of an alternative test of the idea that the deaths of CEOs' family members hurt firm performance because of their direct involvement in the firm by investigating the differential effect of relatives who die at the age of 75 years or more. Older relatives are presumably less likely to be directly involved in productive activities, and if they are, it could be argued that their productive output is potentially less valuable than that of younger relatives. We find a significant decline in firm profitability of 0.60 in those firms whose CEO's relatives die when they are at least 75, statistically indistinguishable from the 0.73 found for younger relatives. The evidence does not support the idea that family shocks are larger for those relatives of active working age.

In the last Panel of Table IV we assess an alternative channel that has been explored in the literature with respect to potential CEO successors. Firms might be inclined to hire the children (typically male children) of an incumbent CEO to replace him as chief executive or to help the CEO's successor run the firm. In Table IV, we show that this is unlikely to account for the gap in performance around CEO direct and indirect shocks. In particular, firms with CEOs who did not have male children also experience significant declines in performance. Further, there is no statistically significant difference across groups relative to the subsample of firms whose CEOs did have a male child.

Overall, Tables III and IV, and Figures 1 and 2 highlight four main results. First, CEO and family member deaths affect firm profitability. The latter type of shock is, to the best of our knowledge, new in the literature and underscores the strong connection between the personal and professional lives of CEOs. Second, firms with CEOs who suffer these shocks do not appear to be subject to a different trend prior to the deaths, suggesting that these shocks are unlikely to be expected and that reverse causality is not a serious concern. Third, the decline in performance is present in firms of all sizes. Fourth, the decline in performance following a shock is comparable for relatives who could potentially be working for the shocked firm and those who are unlikely to be doing so. This result indicates that family deaths do not affect firm profitability due to the loss of a key employee; more probably, the effect on profitability arises from the CEO's distraction from his professional responsibilities.

C. CEO Shocks by the Gender of the CEO and the Gender of the Deceased

We now proceed to test whether individual CEO characteristics affect firm responses to shocks. Table V explores whether the decline in profitability differs systematically as a function of the gender of the manager (Panel A) or the gender of the deceased relative (Panel B). Columns II and III report results for females and males, respectively. The first row in Table IV shows results for CEO deaths only. We find that, on average, the 81 deaths of female CEOs in the sample lead to a decline in operating profitability of 1.39 percentage points. This decline is not significant at conventional levels. Deaths of male CEOs (954 cases) are found to cause a decline in OROA of 1.85 percentage points, significant at the 1% level. The difference across gender is not significant. The fact that the deaths of female CEOs are not found to induce a larger decline in firm profitability is not in line with the notion that those female CEOs who make it to the top managerial position are superior in terms of ability compared to male CEOs.

The second row in Table V shows the average family death shock effects for female and male CEOs. Firms whose female CEO suffers a death in the family undergo a decline in industry-adjusted OROA of 1.67 percentage points. In contrast, firms whose male CEO suffers a family-death-related shock exhibit a decline in profitability of 0.63 percentage points. The difference for female and male CEOs' family shocks is about 1%, significant at the 10% level.

As discussed in Section III, the larger effect on firms with female CEOs could be attributed to several firm or CEO characteristics, such as the higher ability of female CEOs, differential emergency planning, or higher female commitment to family-related activities, among others. If, however, those firms that suffer direct and indirect shocks have comparable investment opportunities, organizational designs, family participation, and CEO talent, the significant gap between female and male CEOs could potentially be attributed to a gender-based variation in response to family deaths. Alternatively, these differences could, for example, reflect the fact that the effect of female CEO shocks differs because a spouse shock also implies the loss of a key employee (the spouse). This “double” shock would be arguably less likely to occur in a male-CEO firm if female spouses are less likely than male spouses to work in the same firms. In this paper, we cannot distinguish between these competing hypotheses.

In Panel B of Table V, we test for differences in the estimated effects of a family member's death as a function of the gender of the deceased. We find large and statistically significant differences for the gender of spouses. Specifically, the death of a male spouse is

found to hurt firm performance by three percentage points more than the death of a female. The death of a mother-in-law is the only family-death-related shock that is associated with a non-negative estimated coefficient, yet statistically indistinguishable from zero at conventional levels.

In Table VI, we examine the importance of other CEO characteristics. In Panel A, we compute the drop in profitability as a function of CEO tenure. We classify firms into three groups based on CEO tenure. "Long" tenure corresponds to those CEOs who started as top executives before our sample period, meaning that we cannot compute their effective tenure (4,115 cases). "Medium" and "short" groups are constructed using the median tenure (2.5 years) for those CEOs with appointment and departure information, 1318 and 1320 observations, respectively.

We fail to find a significant change in firm performance following a shock to short-tenured CEOs. For CEOs who have moderate tenures, the drop in profitability is 0.81 percentage points, significant at the 5% level; this rises to 1.20 percentage points (significant at the 1% level) for CEOs with long tenures. Moreover, the difference between long- and short-tenured CEOs is statistically significant at the 1% level. One explanation of this result is that more experienced CEOs are more valuable. However, it could also be that tenure length is an indication of CEO entrenchment, as entrenched CEOs are more likely to stay longer and to have worked strategically to make themselves indispensable.

In Table VI, Panel B we focus on CEO age as an additional proxy for CEO entrenchment. The table indicates that the death-related shock effect is stronger for younger CEOs. This result casts doubt on the hypothesis that the effects we document are driven by older CEOs who are more likely to suffer a shock and may experience a downward trend in their performance even without a shock due to the firm lifecycle.

In Table VI, Panel C, we compute performance and investment managerial fixed effects for the subset of managers who switched firms prior to suffering the shock (Bertrand and Schoar, 2003). These measures capture the average impact of a particular manager on firm performance and investment rate, respectively. The table indicates that there is no statistical difference in a firm's response when the shock is suffered by a manager of either low or high performance fixed effect. Managers who have high investment-fixed effects, in contrast, experience larger declines in profitability relative to those with a low investment average. The difference is 3.7 percentage points in OROA, significant at the 5% level.

D. Additional Controls

In Table VII, we investigate the impact of various types of deaths on firm profitability, controlling for firm characteristics that are likely to influence performance. We create a shock indicator variable that is equal to one the year of the shock and in subsequent years. Columns I and II report that the average CEO effect for the 6,753 shocks in the sample is at least -0.52%, with and without controls for firm size, industry profitability, and firm age. As before, the larger estimated effects are found for CEOs' own deaths (Column IV), then for child and spouse deaths (Column V), and finally for the deaths of parents and parents-in-law (Column VI). Looking at the main control variables, firm size is positively correlated with firm profitability, and, not surprisingly, mean industry profits are a strong predictor of an individual firm's OROA. In contrast, firm age is negatively correlated with firm profits.

Column VII in Table VII shows the fixed effects estimate for nuclear (own, spouse, and children) and non-nuclear (parents and in-laws) family shocks, which we previously explored in Figures 1 and 2. A similar pattern emerges: the robustly significant and economically large shocks result from deaths within the nuclear family. The average effect of a nuclear family shock is -1.3%, significant at the 1% level. In contrast, the effect of a non-nuclear family shock is insignificant in this specification.

As a robustness test, Columns IX and X assess the differential effect of CEO shocks relative to similar deaths occurring to board members. As reported in Table III and Figures 1 and 2, individual board members' shocks do not significantly impact profitability. More interestingly, CEO shocks generate a significantly large loss in profitability that is statistically different from the board member effects. Table VII documents an incremental loss associated with CEO shocks of 0.7 percentage points, significant at the 1% level. In other words, CEOs do matter for firm profitability.

E. Duration of the Effect of CEO Shocks and Alternative Outcome Variables

Table VIII shows the results of our examination of the duration of the CEO effects we have documented. Columns I and II indicate that CEO shocks generate a robust decline in performance that does not depend on a particular post-shock year, as would be the case if the declines were the result of a one-time correction in the firms' financials due to, for example, a "big bath." Specifically, omitting year $t=0$ or years $t=0$ and $t=1$ and instead using the two

subsequent years as the post-shock period still yields a statistically and economically large decline in OROA around CEO shocks. However, when we open the window of analysis beyond year *t=2*, the CEO effect loses statistical significance at conventional levels. In other words, CEO shocks on operating profitability take at least three years to disappear. Their impact on firm value is permanent, however, as the performance of shocked firms does not overshoot after the initial decline in performance.

Table IX examines the robustness of the CEO shock results thus far presented using alternative outcome variables as measures of firm performance. Starting from this table, we focus on evaluating the role of nuclear family shocks, which according to the preceding results are the major CEO shocks identified in this paper. Given the data limitations, we investigate the impact of CEO shocks on investments and sales growth. In Column I, we also report OROA results as a benchmark for comparison. Column II shows that following a shock, investment rates fall by 2.4 percentage points, significant at the 1% level. This result is interesting because a lower OROA could have resulted from newer investments in the post-shock period. The fact that profitability falls while investment rate declines suggests the cash flow consequences of a CEO shock should be larger than the OROA results indicate. Column III in Table IX confirms this intuition by documenting a decline in sales growth of 4.3 percentage points, significant at the 1% level, for those firms that voluntarily report their sales numbers. In sum, Table IX demonstrates that CEO shocks harm performance in several ways: reducing profitability, scaling back investment growth, and hurting sales expansions.

F. Individual, Firm, and Industry Characteristics

Table X tests for the impact of CEO age, gender, tenure, and family size on the magnitude of the CEO shocks. The results shown in Column I confirm the direction of the evidence from Table VI, revealing that older CEOs are correlated with lower effects on OROA. As discussed earlier, it is difficult to determine whether this means that older CEOs are less talented or rather, for example, that their succession planning is more robust to these shocks. In any event, CEO age effects are not statistically significant.

In Column II in Table X, we evaluate whether the differences in CEO shocks as a function of gender prevail after we control for firm observables. As suggested in Table V, female

CEOs are correlated with larger overall effects, yet the direct female CEO results are only significant at the 15% level. When we use a specification that controls for CEO tenure, age, and gender (Column IV), we obtain statistically significant age and gender effects. Older CEOs are linked to lower effects while female CEOs are linked to larger shocks. In both cases, the point estimates are significant at the 10% level. As previously argued, it is difficult to interpret these gender differences as arising purely from CEO effects.

Additionally, we report that CEO tenure strongly correlates with CEO effects. That is, shocks to senior CEOs are correlated with larger declines in firm operating profitability. Column V in Table X evaluates whether family size, measured as the sum of nuclear and non-nuclear family members, affects these CEO shocks. We do not find robust family size effects on OROA.

In Table XI, we shift our attention to firm characteristics. We start by revisiting the role of firm size in explaining the observed CEO effects. Column I confirms the results of Table III, which indicated that size grouping cannot explain the importance of the CEO for firm profitability. Consistent with several results presented earlier, Column II shows CEO effects seem to be larger in firms that invested heavily in the years prior to the CEO shocks. The magnitude and statistical significance of the CEO effects increase in investment quintiles: the larger the investment, the larger the CEO effects are. Columns III and IV show that CEO effects are concentrated in the fourth and fifth investment quintiles, rendering the average effect otherwise insignificant. Column V in Table XI shows the regression model with a dummy for high investment managerial fixed effect. Confirming the result previously shown in Table VI, higher investment fixed effect CEOs are associated with a larger drop in profitability.

In Table XII, we investigate whether different industry environments affect the estimated effect of CEOs on profitability. In principle, the value of having a CEO coordinating firms' decisions would tend to vary as a function of the value of managerial discretion. We proxy for the value of managerial discretion using the following measures: (a) industry profitability (Columns I and II), (b) industry employment growth (Columns III and IV), (c) industry levels of research development (Columns V and VI), and (d) industry-level investment rates (Columns VII and VIII). In each case, we separately analyze the impact of CEO shocks on firms that are

below or above the median of each relevant variable.[6] Each column represents a separate regression. Columns II, IV, VI, and VIII in Table XII show a consistent pattern: the importance of CEOs is economically large and statistically significant for firms with attractive investment opportunities. In contrast, firms in less investment-rich industry environments do not exhibit statistically significant CEO effects at conventional levels.

In Table XIII, we test for the correlation between specific governance characteristics and estimated CEO effects. When assessing these effects we implicitly assume that corporate governance mechanisms are uncorrelated with CEO ability. In Columns I and II, we test for CEO effects as a function of the number of reported CEOs. In our sample, 440 firms have a dual CEO structure. Perhaps unsurprisingly, we find robust CEO effects in firms with a single CEO. We also find an economically large but statistically insignificant effect on dual CEO firms.

In Table XIII, Columns III to V, we examine the correlation between board of director characteristics and CEO effects. In Denmark, private (ApS) limited liability firms are not required to have a board of directors, while public (A/S) firms are required to have one. Column III shows that on average firms with no board of directors experience declines in OROA of 1.6%, significant at the 1% level. Interestingly, Column IV shows that firms with small boards of directors do not exhibit significant declines in operating profitability around these shocks, while those with large boards do show a significant decline in OROA of 2.3%. One interpretation of these correlations is that smaller boards are arguably better at setting up succession plans or at hiring competent successors.

In Table XIII, Columns VI and VII, we report results from splitting firms by whether or not the incumbent CEO was a member of the board of directors. Column VI shows no effects when CEOs are not in the board, while the key result of this paper (Column VII) is driven by firms where the incumbent CEO sits in the board of directors. While these differential results are interesting, it is hard to interpret them as direct evidence that a separation between operating and supervisory roles reduces firms' exposure to risk. Alternatively, relatively unimportant CEOs would, by construction, be kept out of the board of directors.

In Table XIII, Columns VIII and IX, we test for differences in CEO effects as a function of the firms' organizational structures. This test is potentially relevant as smaller, private or ApS

[6] The only exception is R&D groupings, which are classified as "high" or "low" based on whether the industry was reported to engage in any research and development activity.

firms rarely face a separation between ownership and control, and are, as a result, less prone to entrenchment. Sorting by organizational structure, we find that both private and public limited liability firms undergo significantly lower operating profits as a result of CEO shocks. The mean difference in OROA is -1.4 and -1.2 for private and public limited liability firms, respectively.

The above-described results show that some governance characteristics, such as having a small board of directors or separating the board and management roles, seem correlated with lower CEO effects. Whether these effects are the result of superior governance arrangements or are only driven by weaker CEOs selecting into the pool of firms with stronger governance is hard to determine empirically.

V. Conclusions

In this paper, we investigate the impact of personal shocks occurring to chief executive officers. Specifically, we test whether CEO deaths and deaths in CEOs' families have a bearing on firm performance. We argue that these tragic events provide a plausible exogenous source of variation in CEO exposure that allow us to empirically assess the importance of managers to their firm's performance, and to quantify the interaction between the personal and business roles that CEOs play.

To pursue these tests, we use a unique dataset that allows us to match the universe of limited liability firms in Denmark to their financial statements and to personal information on their CEOs. Based on these data, we are able to obtain official Civil Registry information on top executives, which allows us to construct CEO family trees and to identify which CEOs died or lost immediate family members during the sample period.

We first show that CEOs' own deaths and deaths in their families lead to economically and statistically large declines in firm performance as measured by firm profitability, investment, and sales growth. We find significant CEO effects across the size distribution of firms. In our robustness analysis, we do not find evidence for reverse causality. Interestingly, similar deaths experienced by individual members of the board of directors do not significantly affect firms' outcomes. Our results provide strong empirical support for the idea that CEOs are extremely important to firm performance.

Our ability to identify deaths in the CEO's family and to match them to an outcome variable allows us to measure, perhaps controversially, the shocks that are truly meaningful for CEOs. In particular, we find the strongest effects for the deaths of children and spouses, and the lowest estimated impact as a result of the death of mothers-in-law. Furthermore, these family death tests allow us to show a substantial overlap between the personal and business spheres that is prevalent in both small and large firms and that works indirectly to affect firms through its impact on CEO focus.

We provide suggestive evidence that the large CEO effects we document are consistent with CEO talent and with specific valuable actions. We show larger CEO effects in environments where the value of making decisions is higher. Further, we find comparable CEO effects in private and public limited liability firms, which suggests that the separation of ownership and control that is more likely to prevail in the latter group might not drive our findings.

Whether the large CEO effects we document are only the result of the efficiency value of CEOs, or are, alternatively, the result of pre-shock strategic behavior that makes chief executives indispensable ex-post, is a question for future research.

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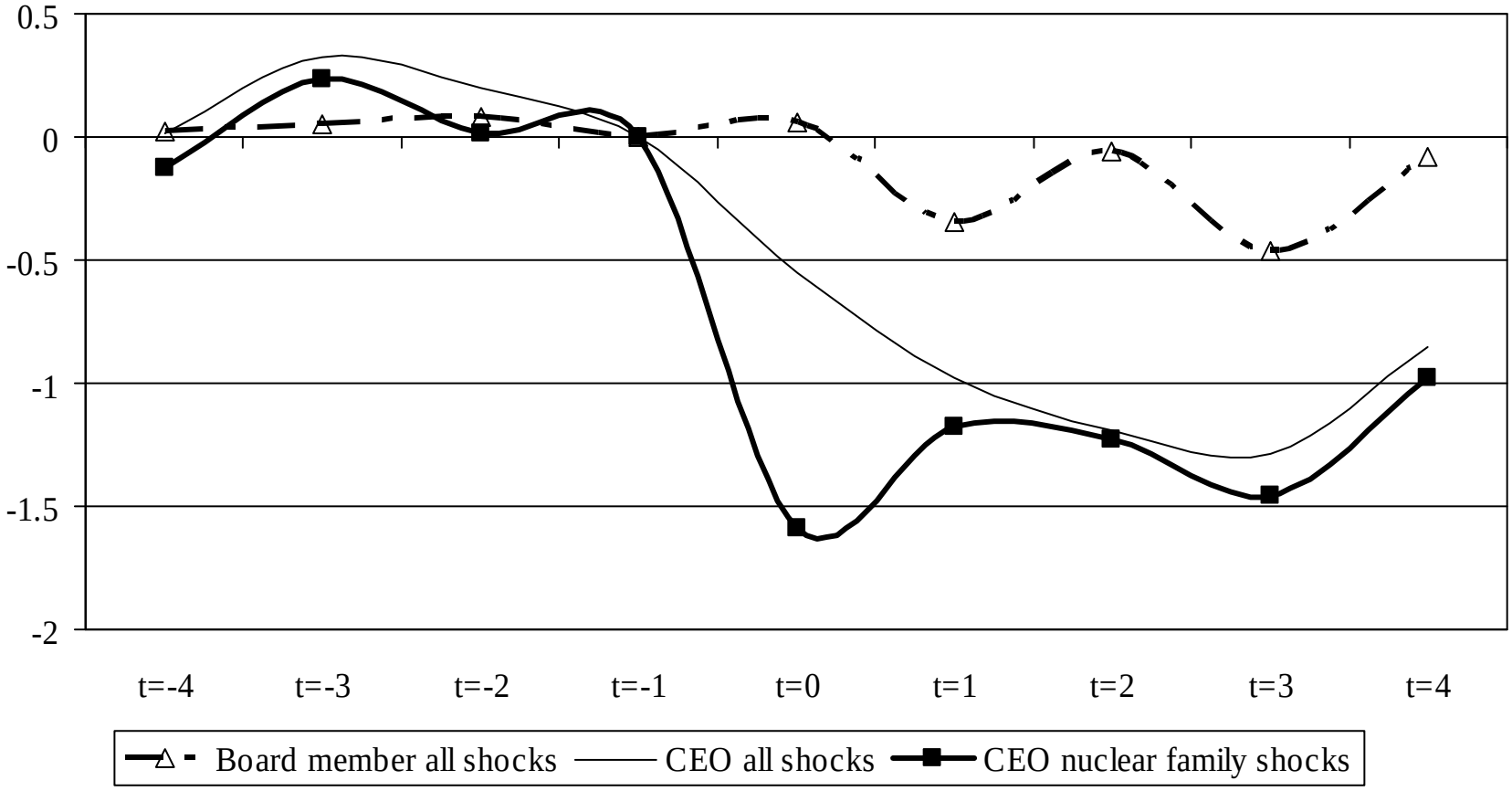
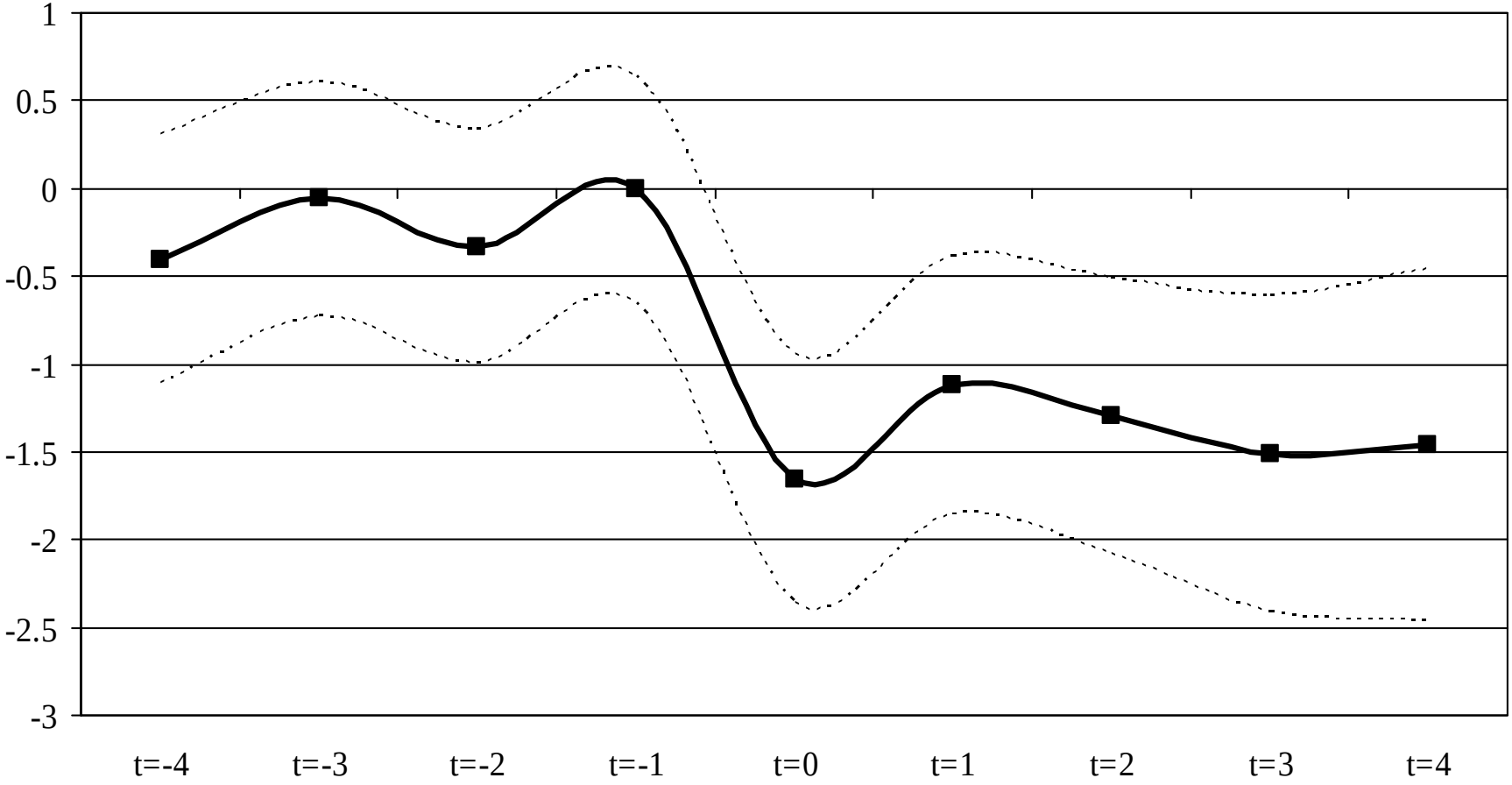
Figure 1. Industry-adjusted operating profitability: the effect of shocks to CEOs (“all” and “nuclear family” only) and to board members (“all”)



Notes:

a. This figure shows mean industry adjusted operating profitability (OROA) for firms experiencing (1) a board member shock, (2) a CEO shocks and (3) a CEO nuclear family shocks. Industry-adjusted OROA *t=-1* is set to zero for all firms.
b. Board member “all shocks” are defined as the death of a board member or the death of a board member spouse, children, parent or parent in law.
c. CEO “all shocks” are defined as the death of a CEO or the death of a CEO’s spouse, children, parent or parent-in-law.
d. CEO “nuclear” family shock are the death of a CEO, her spouse or her children.
e. Source: authors’ calculations.

Figure 2. Industry-adjusted operating profitability: CEO's nuclear family shocks *minus* board members' shocks



Notes:

a. This figure shows the mean difference in industry adjusted operating profitability between (1) the average board member "all" shocks group and (2) the average CEO "nuclear family" shocks grouping.
b. The bold line indicates the mean difference between the two groupings and the dotted lines show the 95 percent confidence interval.
c. Board member "all shocks" are defined as the death of a board member or the death of a board member's spouse, children, parent or parent in law.
d. CEO "nuclear" family shock are the death of a CEO, her spouse or her children.
e. Source: authors' calculations.

TABLE I. SUMMARY STATISTICS

This table presents firm characteristics for all limited liability firms in Denmark during 1994 and 2002. Each observation represents the sample average of the relevant firm (one observation per firm). Firms are classified as "event" firms (Column II) when either: (1) the incumbent chief executive officer (CEO) died in office, or alternatively (2) a member of the CEO's immediate family died while she was in office; "non-event", otherwise. Ln assets (sales) is the natural logarithm of the total book value of assets (sales) in Danish Kroner, where available. OROA is the operating income (Primært resultat) to book value of assets. Net income to assets is the ratio of net income (Årets resultat) to book value of assets. Industry-adjusted OROA is the difference between OROA and the average of its four-digit NACE (European industry classification system) benchmark. Firm age is calculated using the oldest of: the year of establishment, the year of registration, or the year of firms' bylaws. Firm and management characteristics are from the Købmandsstandens Oplysningsbureau's (KOB) dataset, which is based on firms' annual reports to the Danish Ministry of Economic and Business Affairs. Death information is from the Danish Civil Registration System.

Variable	All	Event Firms	Non-Event Firms	Difference
	(I)	(II)	(III)	(V)
Ln assets	8.1567	8.2619	8.1464	0.1155 ***
	(0.0051)	*(0.0173)*	*(0.0053)*	*(0.0181)*
	[75647]	[6753]	[68894]	
Operating return on assets (OROA)	0.0563	0.0775	0.0542	0.0233 ***
	(0.0004)	*(0.0011)*	*(0.0005)*	*(0.0012)*
	[75647]	[6753]	[68894]	
Net income to assets	0.0316	0.0421	0.0305	0.0115 ***
	(0.0005)	*(0.001)*	*(0.0005)*	*(0.0011)*
	[75543]	[6752]	[68791]	
Industry-adjusted OROA	-0.0046	0.0086	-0.0059	0.0145 ***
	(0.0004)	*(0.001)*	*(0.0005)*	*(0.0011)*
	[75647]	[6753]	[68894]	
Ln sales	8.0798	8.2434	8.0610	0.1824 ***
	(0.0112)	*(0.034)*	*(0.0118)*	*(0.036)*
	[34937]	[3605]	[31332]	
Firm age	11.5810	15.4657	11.2003	4.2654 ***
	(0.1341)	*(0.3723)*	*(0.1426)*	*(0.3987)*
	[75647]	[6753]	[68894]	
Asset growth	0.0352	0.0431	0.0343	0.0088 ***
	(0.0007)	*(0.0016)*	*(0.0008)*	*(0.0018)*
	[63459]	[6739]	[56720]	
Sales growth	0.0145	0.0269	0.0128	0.0141 ***
	(0.0014)	*(0.0034)*	*(0.0015)*	*(0.0038)*
	[25515]	[3043]	[22472]	

Standard errors are in parentheses.
The number of firms are in squared brackets.
***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

TABLE II. CHIEF EXECUTIVE OFFICER SHOCKS AND FIRM PROFITABILITY

This table presents changes in operating profitability for limited liability firms that are classified as having a "CEO Shock". CEO shocks are cases where either (1) a Chief Executive Officer died in office (Column II) or when a member of the CEO's immediate family member (spouse, children, parents, parents-in-law) died while she was in office (Column III). Changes in profitability are computed as the difference between the (two-year post shock) minus (two - year pre-shock): mean operating return on assets (OROA), mean industry-adjusted OROA and median industry-adjusted OROA, respectively. Industry-adjusted OROA is the difference between OROA and the average of its four-digit NACE (European industry classification system) benchmark.

Post *minus* pre death differences in variable	**All**	**Type of Death**		**Difference**
		Chief Executive	**Family Member**	
	(I)	(II)	(III)	(IV)
Operating return on assets (mean)	-0.0137 *** *(0.0015)* [6753]	-0.0220 *** *(0.0041)* [1035]	-0.0122 *** *(0.0016)* [5718]	-0.0098 ** *(0.0044)*
Industry-adjusted OROA (mean)	-0.0090 *** *(0.0015)* [6753]	-0.0182 *** *(0.0041)* [1035]	-0.0073 *** *(0.0016)* [5718]	-0.0109 ** *(0.0044)*
Industry-adjusted OROA (median)	-0.0019 ** *(0.0007)* [6753]	-0.0047 ** *(0.0023)* [1035]	-0.0015 ** *(0.0007)* [5718]	

Standard errors are in parentheses.
The number of firms are in squared brackets.
***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

TABLE III. CEO EFFECTS BY PRE-SHOCK PERFORMANCE, SHOCKS TO BOARD MEMBERS ANS SIZE QUINTILES

This table presents changes in operating profitability computed in Panel A as the difference between the (average two-year pre shock, years t=-2,t=-1) minus the (average two -year prior, years t=-4,t=-3) industry-adjusted operating return on assets (OROA). In Panels B and C, changes in operating profitability are defined as the difference between the (average two-year post shock) minus (average two -year pre-shock) in industry adjusted OROA. Industry-adjusted OROA is the difference between OROA and the average of its four-digit NACE (European industry classification system) benchmark. Firms are classified into two groups. Own death, for firms where a Chief Executive Officer (Panel A and C) or board member (Panel B) died in office (Column II). Family member, when a member of the CEO's (Panel A and C) or board member (Panel B) immediate family member (spouse, children, parents, parents-in-law) died while the CEO (board member) was in office (Column III). In Panel C, firms are sorted into five equally sized (assets) groupings.

		Type of Death		
	All	Own	Family Member	Difference
	(I)	(II)	(III)	(IV)
Panel A. Pre-CEO shocks differences in performance				
Industry adjusted OROA	-0.0007	0.0000	-0.0008	0.0008
	(0.0018)	*(0.0035)*	*(0.002)*	*(0.004)*
	[3398]	[621]	[2777]	
Panel B. Shocks to board members				
Industry adjusted OROA	-0.0025	-0.001	-0.0029	0.0019
	(0.0016)	*(0.0032)*	*(0.0019)*	*(0.0037)*
	[5559]	[1066]	[4493]	
Panel C. CEO shocks by size quintiles				
Smallest quintile	-0.0094 **	-0.0371 ***	-0.0040	-0.0330 **
	(0.0045)	*(0.0122)*	*(0.0047)*	*(0.0131)*
	[1351]	[219]	[1132]	
Quintile 2	-0.0113 ***	-0.0113	-0.0113 ***	0.0000
	(0.0036)	*(0.0105)*	*(0.0039)*	*(0.0111)*
	[1353]	[173]	[1180]	
Quintile 3	-0.0073 **	-0.0184 *	-0.0054	-0.013
	(0.0032)	*(0.0095)*	*(0.0034)*	*(0.0101)*
	[1348]	[202]	[1146]	
Quintile 4	-0.0091 ***	-0.0108 *	-0.0088 ***	-0.002
	(0.0028)	*(0.0065)*	*(0.0031)*	*(0.0072)*
	[1351]	[211]	[1140]	
Largest quintile	-0.0077 ***	-0.0120 **	-0.0068 **	-0.0052
	(0.0025)	*(0.0055)*	*(0.0028)*	*(0.0061)*
	[1350]	[230]	[1120]	

Standard errors are in parentheses.
The number of firms are in squared brackets.
***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

TABLE IV. CEO EFFECTS: (A) BY AGE AND NUMBER OF CHILDREN, (B) AGE OF RELATIVES AND (C) PRESENCE OF SONS

This table presents changes in operating profitability computed as the difference between the (average two-year post shock) minus (average two-year pre-shock) in industry adjusted operating return on assets. In Panel A firms are classified based on the age and the number of children of the incumbent CEO. In Panel B firms are groups based on the age of non-children relatives. In Panel C firms are classified as having a son if the CEO running the firm had at least one male child, no sons, otherwise.

Panel A. Deaths of children only		**Age of child**		
	All	**< 16 years**	**16 or older**	**Difference**
	(I)	(II)	(III)	(IV)
All	-0.0166 **	-0.0244 **	-0.0141 *	-0.0103
	(0.0064)	*(0.011)*	*(0.0077)*	*(0.0134)*
	[284]	[68]	[216]	
Number of children				
One	-0.0467 ***	-0.0461 **	-0.0471 **	0.001
	(0.0131)	*(0.0195)*	*(0.0179)*	*(0.0264)*
	[36]	[14]	[22]	
Two	-0.0127	-0.0288	-0.0077	-0.0211
	(0.01)	*(0.0188)*	*(0.0117)*	*(0.0221)*
	[115]	[27]	[88]	
Three of more	-0.0118	-0.0088	-0.0125	0.0037
	(0.01)	*(0.0176)*	*(0.0117)*	*(0.021)*
	[133]	[27]	[106]	
Difference (three or more) vs (one child)	0.0349 **	0.0373	0.0346	0.0027
	(0.0164)	*(0.0261)*	*(0.0212)*	*(0.0334)*

Panel B. All relatives excluding children		**Age of relative**		
	All	**< 75 years**	**75 or older**	**Difference**
All non-child relatives	-0.0068 ***	-0.0073 ***	-0.0060 **	-0.0012
	(0.0017)	*(0.0022)*	*(0.0026)*	*(0.0034)*
	[5434]	[3318]	[2116]	

Panel C. All relatives by presence of sons	**No sons**	**At least one son**	**Difference**
All shocks	-0.0059 **	-0.0104 ***	-0.0045
	(0.0027)	*(0.0018)*	*(0.0033)*
	[2235]	[4518]	

Standard errors are in parentheses.
The number of firms are in squared brackets.
***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

TABLE V. CEO SHOCKS AND FIRM PROFITABILITY: BY GENDER

This table presents changes in operating profitability computed as the difference between the (average two-year post shock) minus (average two-year pre-shock) in industry adjusted operating return on assets. In Panel A (B) firms are classified based on the gender of the CEO (relative) and the type of death: CEO or family death.

	All	Female	Male	Difference
	(I)	(II)	(III)	(IV)
Panel A. Gender of CEO				
Chief executive death	-0.0182 ***	-0.0139	-0.0185 ***	0.0046
	(0.0041)	*(0.0121)*	*(0.0043)*	*(0.0128)*
	[1035]	[81]	[954]	
Family member death (All)	-0.0073 ***	-0.0167 ***	-0.0063 ***	-0.0104 *
	(0.0016)	*(0.0059)*	*(0.0017)*	*(0.0062)*
	[5718]	[530]	[5188]	
Spouse death	-0.0114 **	-0.0390 ***	-0.0061	-0.0329 **
	(0.0047)	*(0.0123)*	*(0.0051)*	*(0.0133)*
	[722]	[116]	[606]	
Child	-0.0166 **	-0.0381 **	-0.0151 **	-0.0229
	(0.0064)	*(0.0158)*	*(0.0068)*	*(0.0169)*
	[284]	[18]	[266]	
Parent	-0.0060 ***	-0.0122	-0.0054 **	-0.0068
	(0.0021)	*(0.0085)*	*(0.0022)*	*(0.0087)*
	[3348]	[285]	[3063]	
Parent in law	-0.0065 *	-0.0015	-0.0069 *	0.0054
	(0.0035)	*(0.0126)*	*(0.0037)*	*(0.0131)*
	[1364]	[111]	[1253]	
Panel B. Gender of Relative				
Spouse		-0.0061	-0.0390 ***	0.0329 **
		(0.0051)	*(0.0123)*	*(0.0133)*
		[606]	[116]	
Child		-0.0161	-0.0168 **	0.0007
		(0.011)	*(0.0079)*	*(0.0135)*
		[97]	[187]	
Parent		-0.0055 *	-0.0062 **	0.0007
		(0.003)	*(0.0029)*	*(0.0042)*
		[1335]	[2013]	
Parent in law		0.0004	-0.0110 **	0.0114
		(0.006)	*(0.0043)*	*(0.0073)*
		[542]	[822]	

Standard errors are in parentheses.
The number of firms are in squared brackets.
***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

TABLE VI. CEO AGE, TENURE AND CEO FIXED EFFECTS

This table presents changes in operating profitability computed as the difference between the (average two-year post shock) minus (average two-year pre-shock) in industry adjusted operating return on assets. In Panel A firms are classified into three groups based on the length of the CEO tenure: short (medium) if the tenure is below (above) the median of the firms with tenure information, and long tenure if the CEO's tenure precedes the sample period. In Panel B, firms in the long and medium tenure groupings are classified into two groups based on the age of the incumbent CEO. In Panel C, firms are classified as having a "low" or "high" profitability (investment)-fixed-effect CEO if the incumbent CEO has a larger than average profitability (investment) residual. CEO-fixed-effects can only be estimated for those CEOs that switch firms at least once during the sample period.

Panel A. Shocks by CEO tenure		**Tenure**			
	All	**Short**	**Medium**	**Long**	**Difference**
	(I)	(II)	(III)	(IV)	(IV) minus ((II)
All shocks	-0.0090 ***	-0.0001	-0.0081 **	-0.0120 ***	-0.0119 ***
	(0.0015)	*(0.0038)*	*(0.0035)*	*(0.0019)*	*(0.0042)*
	[6753]	[1320]	[1318]	[4115]	

Panel B. Shocks by CEO age	**CEO Age**			
	All	**CEO age ≤ 75**	**CEO age > 75**	**Difference**
Shocks to CEOs with medium and long tenures	-0.0111 ***	-0.0113 ***	-0.0049	0.0065
	(0.0016)	*(0.0017)*	*(0.0061)*	*(0.0063)*
	[5433]	[5224]	[209]	

Panel C. Shocks by CEO fixed effects	**CEO fixed effects for switching CEOs**		
	Low	***High***	**Difference**
Profitability fixed effects	-0.0051	-0.0197 *	-0.0146
	(0.0076)	*(0.0114)*	*(0.0137)*
	[120]	[120]	
Investment fixed effects	-0.0022	-0.0389 ***	-0.0367 **
	(0.0084)	*(0.0147)*	*(0.017)*
	[88]	[87]	

Standard errors are in parentheses.
The number of firms are in squared brackets.
***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

TABLE VII. CEO SHOCKS AND FIRM PROFITABILITY: TYPE OF SHOCKS

The dependent variable is industry adjusted operating return on assets. The table shows the estimated effect of having a CEO or a board shock on firm performance for different sub-samples (Columns I to X): all CEO shocks, nuclear family (own, spouse and children), CEO own shock, non-nuclear family (parents and parents-in-law), shock to board members, and shocks to both CEO and board members. Shock is an indicator variable equal to one in the after shock period, zero otherwise. Shock*CEO shows the interaction between the shock dummy and the CEO shock dummy in the specification that also includes board members. Ln assets is the natural logarithm of the total book value of assets. Mean industry OROA is the mean operating income to assets of the industry. Ln firm age is one plus firm age.

	Dependent variable: Operating return on assets									
	Type of death									
Variables	All CEO	All CEO	Nuclear family CEO	CEO (own)	CEO Child or spouse	CEO Non-Nuclear family	CEO Nuclear family	CEO Non-Nuclear family	All shocks to board members	All shocks to CEO and board members
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX)	(X)
Shocks	-0.0057 ***	-0.0052 ***	-0.0129 ***	-0.0157 ***	-0.0105 **	-0.0019	-0.0134 ***	0.0038	0.0006	0.0033
	(0.0018)	*(0.0018)*	*(0.0031)*	*(0.0045)*	*(0.0043)*	*(0.0022)*	*(0.0049)*	*(0.0033)*	*(0.0027)*	*(0.0023)*
CEO shocks										-0.0074 ***
										(0.0024)
Ln assets		0.0045 ***	0.0088 ***	0.0084 ***	0.0092 ***	0.0023 **	0.0435 ***	0.0282 ***	0.0307 ***	0.0319 ***
		(0.0008)	*(0.0014)*	*(0.0018)*	*(0.0023)*	*(0.001)*	*(0.0075)*	*(0.0046)*	*(0.0045)*	*(0.0029)*
Mean industry OROA		0.8976 ***	0.7435 ***	0.8256 ***	0.6618 ***	0.9196 ***	0.4254 ***	0.5847 ***	0.4255 ***	0.4837 ***
		(0.0323)	*(0.0559)*	*(0.0802)*	*(0.0798)*	*(0.0393)*	*(0.135)*	*(0.0972)*	*(0.0809)*	*(0.0567)*
Ln firm age		-0.0129 ***	-0.0134 ***	-0.0176 ***	-0.0084 **	-0.0099 ***	-0.0254 **	0.0037	-0.0104	-0.0067 *
		(0.0013)	*(0.0024)*	*(0.0032)*	*(0.0035)*	*(0.0016)*	*(0.0121)*	*(0.0059)*	*(0.0064)*	*(0.004)*
Year controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed-effects	No	No	No	No	No	No	Yes	Yes	Yes	Yes
Number of shocks	6,753	6,753	2,041	1,035	1,006	4,712	2,041	4,712	5,559	12,312
Number of firms	6,753	6,753	2,041	1,035	1,006	4,712	2,041	4,712	5,559	12,312
Number of observations	29,925	29,644	8,998	4,437	4,561	20,646	8,998	20,646	24,625	54,269
R^2	0.007	0.062	0.054	0.059	0.051	0.062	0.541	0.554	0.582	0.566

Clustered (firm) standard errors are reported in parentheses.
***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

TABLE VIII. DURATION OF CEO EFFECTS

Dependent variable: Operating return on assets			
	Years omitted		
	t = 0	***t = 0,1***	***t = 0,1,2***
	(I)	(II)	(III)
Shock	-0.0041 **	-0.0047 **	-0.0023
	(0.002)	*(0.0022)*	*(0.0025)*
Year controls	Yes	Yes	Yes
Firm fixed-effects	Yes	Yes	Yes
Number of shocks	6737	6704	6680
Number of firms	6737	6704	6680
Number of observations	36426	34253	32519
R^2	0.44	0.447	0.458

Notes:

a. Shock is an indicator variable equal to one for year of the shock and subsequent years.
b. All specifications include data for the two years preceding the shock.
c. Column (I) reports post event data for the years *t=1* and *t=2*, Column (II) for years *t=2* and *t=3*, and Column (III) for years *t=3* and *t=4*.
d. All regressions include as additional controls: Ln assets, Ln firm age, and mean industry OROA
e. Clustered (firm) standard errors are reported in parentheses.
f. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

TABLE IX. ALTERNATIVE OUTCOME VARIABLES

	Dependent variable		
	OROA	**Asset growth**	**Sales growth**
	(I)	(II)	(III)
Shock	-0.0127 ***	-0.0244 ***	-0.0430 ***
	(0.0039)	*(0.0075)*	*(0.0163)*
Year controls	Yes	Yes	Yes
Firm fixed-effects	Yes	Yes	Yes
Number of shocks	2041	2040	887
Number of firms	2041	2040	887
Number of observations	14321	13157	4322
R^2	0.446	0.328	0.328

Notes:

a. Shock is an indicator variable equal to one for year of the shock and subsequent years.
b. CEO shocks reported correspond to nuclear family shocks: CEO, spouse and children shocks
c. All regressions include as additional controls: Ln assets and Ln firm age, as well as the industry mean of the dependent variable.
d. Clustered (firm) standard errors are reported in parentheses.
e. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

TABLE X. CEO CHARACTERISTICS

	Dependent variable: Operating return on assets				
	(I)	(II)	(III)	(IV)	(V)
Shock	-0.0954 *	-0.0119 **	-0.0928 *	-0.0964 *	-0.0140 ***
	(0.0554)	*(0.005)*	*(0.0555)*	*(0.0553)*	*(0.0049)*
Shock * Ln CEO age	0.0201		0.0198	0.0241 *	
	(0.0135)		*(0.0135)*	*(0.0136)*	
Shock * Female CEO		-0.014	-0.0139	-0.0153 *	
		(0.0091)	*(0.0091)*	*(0.0091)*	
Shock * Long CEO tenure				-0.0174 **	
				(0.0086)	
Shock * CEO Family size					0.0146
					(0.0127)
Year controls	Yes	Yes	Yes	Yes	Yes
Firm fixed-effects	Yes	Yes	Yes	Yes	Yes
Number of shocks	2041	2041	2041	2041	2041
Number of firms	2041	2041	2041	2041	2041
Number of observations	8998	8998	8998	8998	8998
R^2	0.541	0.541	0.541	0.542	0.541

Notes:

a. All regressions include as additional controls: Ln assets, Ln firm age, and median industry OROA.
b. Clustered (firm) standard errors are reported in parentheses.
c. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

TABLE XI. FIRM CHARACTERISTICS

	All firms				Switcher CEOs
	(I)	(II)	(III)	(IV)	(V)
Shock	-0.0172 *	0.0102	0.0000	-0.0478	-0.0313
	(0.0098)	*(0.0079)*	*(0.0055)*	*(0.0569)*	*(0.0196)*
Shock * 2nd size quintile	0.004			0.0019	
	(0.0115)			*(0.0115)*	
Shock * 3rd size quintile	0.0111			0.0083	
	(0.011)			*(0.011)*	
Shock * 4th size quintile	0.000			-0.0016	
	(0.0108)			*(0.0107)*	
Shock * 5th size quintile	0.0035			0.0037	
	(0.01)			*(0.0101)*	
Shock * 2nd investment quintile		-0.0169 *			
		(0.0088)			
Shock * 3rd investment quintile		-0.0226 **			
		(0.0088)			
Shock * 4th investment quintile		-0.0410 ***			
		(0.0093)			
Shock * 5th investment quintile		-0.0597 ***			
		(0.0107)			
Shock * 4th and 5th investment quintile			-0.0318 ***	-0.0323 ***	
			(0.0061)	*(0.0062)*	
Shock * Female CEO				-0.0147	
				(0.0092)	
Shock * Ln CEO age				0.0155	
				(0.0138)	
Shock * Long CEO tenure				-0.0213 **	
				(0.0085)	
Shock * CEO Family size				0.0120	
				(0.0127)	
Shock * High CEO investment fixed effect					-0.0365 *
					(0.0209)
Year controls	Yes	Yes	Yes	Yes	Yes
Firm fixed-effects	Yes	Yes	Yes	Yes	Yes
Number of shocks	2041	2041	2041	2041	108
Number of firms	2041	2041	2041	2041	108
Number of observations	8998	8998	8998	8998	474
R^2	0.541	0.546	0.544	0.545	0.609

Notes:

a. All regressions include as additional controls: Ln assets, Ln firm age, and median industry OROA
b. The dependent variable is operating return on assets.
c. Clustered (firm) standard errors are reported in parentheses.
d. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

TABLE XII. INDUSTRY CHARACTERISTICS

	Profitability		Employment growth		R&D		Investment	
	Low	High	Low	High	Low	High	Low	High
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
Shock	-0.0071	-0.0172 **	-0.0077	-0.0196 ***	-0.0078	-0.0253 ***	-0.0087	-0.0173 **
	(0.0065)	*(0.0071)*	*(0.0065)*	*(0.0072)*	*(0.0056)*	*(0.0096)*	*(0.0064)*	*(0.0073)*
Year controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed-effects	No	No	No	No	No	No	No	No
Number of shocks	1023	1018	1033	1008	1424	617	1047	994
Number of firms	1023	1018	1033	1008	1424	617	1047	994
Number of observations	4316	4682	4527	4471	6243	2755	4542	4456
R^2	0.54	0.529	0.537	0.544	0.545	0.54	0.574	0.515

Notes:

a. Industry characteristics are defined relative to other industries in the country. All but research and development (R&D) groupings are based on the median of the sample. R&D groupings are "high" if the industry was reported to engage in any research and development activity.
b. The dependent variable is operating return on assets.
c. All regressions include as additional controls: Ln assets, Ln firm age, and mean industry OROA.
d. Clustered (firm) standard errors are reported in parentheses.
e. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

TABLE XIII. GOVERNANCE CHARACTERISTICS

	CEOs in charge		Board existance and size			CEO in the board		"Private" vs "Public" Status	
	One	Dual	No board	Small	Large	No	Yes	Private	Public
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX)
Shock	-0.0133 **	-0.0129	-0.0161 **	-0.0025	-0.0234 **	0.0094	-0.0143 **	-0.0143 **	-0.0119 *
	(0.0055)	*(0.0101)*	*(0.0078)*	*(0.0079)*	*(0.0093)*	*(0.0145)*	*(0.0069)*	*(0.0069)*	*(0.0065)*
Year controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of shocks	1601	440	960	631	450	205	1185	1185	856
Number of firms	1601	440	960	631	450	205	1185	1185	856
Number of observations	7004	1994	4139	2823	2036	926	5125	5125	3873
R^2	0.534	0.565	0.501	0.566	0.613	0.567	0.518	0.518	0.584

Notes:

a. CEOs in charge denotes the number of CEOs at the helm, dual is when there is more than one CEO.
b. Private limited liability firms are not required to have a board of directors. “Public” firms are required to have a board of directors of at least three members. *Small* board is equal to three members. *Large* board if the board has more than three members.
c. Public status refers to whether limited liability firms can issue shares that are negotiable instruments.
d. All regressions include as additional controls: Ln assets, Ln firm age, and mean industry OROA.
e. The dependent variable is operating return on assets.
f. Clustered (firm) standard errors are reported in parentheses.
g. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.