Comments welcome

"Do CEOs Matter?"*

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Abstract. Estimating the value of top managerial talent is a central topic of research that has attracted widespread attention from academics and practitioners. Yet, testing for the importance 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) the death of CEOs' immediate family members (spouse, parents, children, etc). Using a unique dataset from Denmark, we find that CEO (but not board members') own and family deaths 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: the death of children and spouses (mothers-in-law). We show that individual CEO, firm and industry characteristics seem to affect the impact of these shocks. In particular, CEO effects are larger (lower) for longer-tenured (older) CEOs and for those managers with large investment fixed effects. CEO shocks are relevant across the size distribution of firms but are concentrated on those firms that invested heavily in the past. Lastly, we find that CEO shocks tend to be larger in rapid growth-, high investment- and R&D-intensive industries. Overall, our findings demonstrate 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 CEOs productive abilities? What type of individual, firm or industry characteristics affect the impact of CEOs on firm outcomes? While there is a long standing debate about the contribution of senior managers to the organizations they head (see for example, Marglin, 1974 and 1975; Landes, 1986), to date, there is scant systematic evidence on the impact of *bosses* on firm performance. This debate has intensified in the corporate governance literature as a result of the rapid increase in executive pay and the series of corporate scandals in the recent years.[1]

Testing for the importance of managers on firms' outcomes has faced the challenge of finding a suitable counterfactual to convincingly isolate direct CEOs effects. Empirically, the problem arises from the fact that firms do not randomly appoint or fire CEOs. As a result, attributing differences in performance to managers, and not to concurrent industry and firm characteristics, is difficult.

Seeking to address this issue, a growing body of work in the finance and economics literature, has emphasized the importance of CEOs individual characteristics in determining firms' financial decisions and performance.[2] Using variation in individual characteristics overcomes the inference problems discussed above whenever these traits are uncorrelated with other firm and industry characteristics.

The primary objective of this paper is to investigate whether CEOs affect firm performance using variation in the firms' exposure to their CEOs resulting from managers' own deaths and from the death 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 horrid empirical strategy are two. First, these shocks presumably affect managers' ability to perform their jobs: directly through their own death or indirectly, by the associated personal grief that would tend to limit their effective ability to execute their professional roles. Second, it is reasonable to expect that beyond its effect on managers, personal shocks, particularly those associated to family members that are unaffiliated to the managers' firm, do not affect firms' investment opportunities through other channels.

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[1] Jensen, Murphy and Wruck, 2004; Bebchuk and Fried, 2004; Bebchuk and Grinstein, 2005; Gabaix and Landier, 2008, among many others.

[2] For example, Bertrand and Schoar, 2003; Malmendier and Tate, 2005; Pérez-González, 2006; Bennedsen, Nielsen, Pérez-González and Wolfenzon, 2007.

As in Johnson, Magee, Nagarajan, and Newman (1985) and in many other subsequent studies, our first set of tests evaluates whether those firms where the CEO dies perform differently relative to (a) comparable organizations that are not affected by such shocks, and (b) the companies themselves prior to the shock. This approach, in consequence, evaluates the contribution to firm performance of an incumbent CEO relative to that of an incoming executive. We extend the manager-death analysis to the performance evaluation of 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 affect the role of managers on firm performance.

Our second empirical approach is more novel and 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 managers spend with their families and, in consequence, reduce the effective time spent at the firm. This approach is attractive for at least three reasons. First, it allows us to test for the overlap between the 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.[3] Second, it provides a test on the value of CEO talent based on *existing* management, as it compares a manager-firm combination to the same match in a period where the CEO is distracted. Third, relative to CEOs' own deaths, the death of family members is more likely to be exogenous to firms' characteristics as it adds a degree of separation between the source of variation in CEO attention and the outcome variables. Our focus on the managers' immediate family deaths 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 on 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 their spouse (if any), children, parents and parents-in-law. Based on this information we construct manager-level family trees and then investigate which managers or immediate family members die during the sample period.

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[3] 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, 2006; Bennedsen et al. 2007; Bloom, and Van Reenen, 2007.

In our empirical tests, we use the first shock occurring to the CEOs –direct or indirect– of the firms in the sample, allowing only one (the first, if any) shock per firm.

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

We find that death of a CEO and her immediate family members is likely to cause a statistically significantly and economically large decline in firm profitability. Industry-adjusted operating returns on assets (OROA) falls by 0.9 percentage points using a two-year window around managerial deaths. This decline is equivalent to an 11 percent decline in OROA. When we split the direct CEO effects from the indirect events, we find CEO deaths are associated to a 1.7 decline in ORA while relatives' shocks lead to a 0.7 reduction in OROA, both significant at the one-percent level. The difference across shocks is significant at the five-percent-level. Among family deaths, the magnitude of the effect is concentrated on deaths occurring in the CEO's nuclear family, i.e. spouse and children.

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 changes prior the occurrence of these deaths. This result is important as it provides evidence against reverse causality going from firm profitability to family tragedies. It is also reassuring that most of these CEO-centered shocks do not occur in the years preceding the event date. An important limitation of our analysis is that we cannot separate expected from unexpected deaths. Failure to isolate unexpected shocks suggests our estimates are likely underestimates of CEO effects.

We further evaluate for the particular relevance of CEOs by comparing the effect on performance of CEO shocks relative to similar tragic events occurring to members of the board of directors. We do not find robust evidence that the death 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, relative to similar board related deaths, significant at the one-percent 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 the universe of limited liability firms in Denmark, one concern with the above-described results is that they might only be relevant for smaller firms, which tend to be more dependant on their CEOs and where the level of overlap between personal and business affairs is likely to be higher than in larger firms. We find,

however, that this is not the case empirically. The negative performance effect of CEO shocks is present across the size distribution of firms in the economy.

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 whenever the deceased relative was a firm employee herself. We show that it is unlikely to be the case. Specifically, the death of relatives that are not of working age (younger than 16 or older than 75) have an economically and statistically large negative effect on profitability, statistically indistinguishable from the declines in performance that result from the deaths of other family members. This finding highlights that the family-death results seem to work through the CEO's reduced attention or focus in firm related activities.

In further robustness tests, we show the CEO operating effects 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, not explained by a single event year. Omitting any of these three years at a time does not affect the results. The differences in operating performance 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 over-perform thereafter.

An additional attractive feature of the shock-performance analysis is that one could potentially identify what is a meaningful shock for a CEO's productivity. Using this logic, we find that the loss of a child followed by the death of a spouse obtains the largest estimated effects on profitability. In the other extreme, the death of a CEO's mother-in-law generates a positive but insignificant estimated 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 traits, 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 and industry characteristic of interest. Similarly, for family shocks, we need to assume that the behavioral responses resulting from family deaths are uncorrelated with the variable of interest. As a result, the cross-sectional analysis shows circumstances where CEO effects are larger but not necessarily why such differences exist.

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 are explained by those CEOs whose tenure precedes our sample period. CEO age is, in contrast, correlated with lower managerial effects: shocks to relatively older CEOs do not 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 gender performance differences as a result of CEO own deaths. Yet, family deaths affecting female CEOs have larger performance effects. Interpreting these family but not direct-CEO differentials is, however, complicated.

As in Bertrand and Schoar (2003), we estimate CEO fixed effects for those managers who prior to three years before the relevant CEO shock had served as top executives in multiple firms. We show that shocks to those CEOs with positive investment fixed effects are correlated with large declines in firm profitability, while firms with negative investment fixed-effect-CEOs do not exhibit significant changes. The correlation of active investment decisions and CEO effects is also replicated using pre-shock investment rates at the firm or industry levels. Active investment decisions seem as a result, key to understand the managerial effects that this paper is documenting.

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 arguably predict a gain in performance post shocks as firms would no longer be not subject to such inefficient investments. Yet, differences in finding a suitable CEO could potentially explain why high investing firms suffer relatively more.

We also provide suggestive evidence that the decline in performance around CEO and CEO's immediate family shocks tends to be higher in fast growing industries as well as environments with research and development activities. Looking at different organizational forms, we document similar CEO effects for "public" (A/S) and "private" (ApS) firms.[4] Smaller private 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 CEOs' own and immediate family deaths 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

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

of on-going operations. Our family-death results also demonstrate there is a significant overlap between the personal lives and the professional roles that CEOs play.

While we do not provide a direct test for whether our results reveal that CEOs add economic value in an *ex-ante* sense, we do show that the CEOs' permanent or temporary absence is material for firm *ex-post* performance.

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

I. Related Literature

This paper is directly related to several lines of research. Given that our main objective is to investigate the impact of CEOs on firm performance we build heavily on existing top management turnover studies. As mentioned in the introduction, our empirical strategy is heavily influenced by the interaction between business and personal decisions, which relates to established lines of inquiry in labor economics, as well as, to the family firms research and the growing literature showing the importance of individual managerial characteristics on firms' decision-making and performance.

I. A. Management Turnover and Firm Performance

Our paper relates to studies evaluating the impact of CEO turnover on firm performance using event-study methodologies focusing on (a) stock price responses to management turnover announcement decisions and (b) changes in firm operating results around these events.

A large number of studies have examined the announcement effects of managerial turnover decisions with mixed results. While Reinganum (1985) and Warner et al (1988) failed to find significant abnormal returns resulting from managerial turnover, Weisbach (1988) and Bonnier and Bruner (1989) documented significantly positive stock price reactions to turnover decisions. Khanna and Poulsen (1995), in contrast, find negative average effects. Denis and Denis (1995) find significantly positive but economically small effects for forced turnover and insignificant results for normal retirements.

Market-based tests on the role of management are attractive in that one could potentially estimate the value of changing executives conditional on all relevant information. Its drawbacks

are, however, several. First, the identity of a large share of succeeding managers –those that are internal–tends to be anticipated. Second, turnover decisions often coincide with other relevant news about firms. Third, the decision to replace a management team by itself can provide information about the firms' prospects. Given the strong evidence that the likelihood of management turnover is negatively related to performance (Coughlan and Schmidt (1985), Warner et al (1988), Weisbach (1988), Dahya, et al (2002), Fee and Hadlock (2004)) it seems unlikely that that management turnover decisions are the only valuable source of information provided to investors at the time of announcement.

An attractive test for the impact of managerial talent using stock prices is Johnson, et al. (1985) sudden senior management death analysis. Relative to average turnover events, Johnson, et al. (1985) analysis is attractive in that it is hard to argue sudden management deaths coincide with other events that are not directly linked to the dying individuals. Using data from 53 U.S. publicly traded firms they find (1) no average effects, (2) a negative (positive) abnormal return for non-founder (founder) CEOs, (3) larger declines for those firms whose deceased senior executives were relatively more important in their firms in terms of compensation and had shown strong pre-death firm performance (sales growth, ROE and stock price performance). These results have been interpreted as indicative that founder-CEOs destroy while professional and high performing managers enhance value. Yet as Slovin and Sushka (1993) have shown, some of these relative results might be alternatively explained not by managerial talent per se but by changes in the probability of a corporate control contest. Specifically, founder deaths might trigger firm sales that would not occur under alternative organizational structures.

An alternative route to test for the value of managers is to assess their impact of managerial turnover decisions on firms' operating profitability. Denis and Denis (1995) evaluate changes in operating return on assets around forced resignations and retirements in a sample of large U.S. publicly traded firms during the late eighties. They find significant operating performance improvements after CEO transitions, especially for forced resignations, indicating new management teams improve firms' prospects. Huson, Malatesta, and Parrino (2004) also find improvements in accounting profitability after managerial turnover events using a larger sample period. They find that the improved operating performance is not driven by mean-reversion in accounting variables, which is again consistent with added value by new management teams. More recently and in the context of relatively smaller firms, Pérez-González (2006) and Bennedsen et al (2007) find professional (non-family) CEOs are extremely important for firm performance around CEO transitions.

A limitation of these latter studies is that a significant portion of turnover events, particularly those that have been shown to improve performance, occur under challenging business environments. As a result, it is hard to establish empirically whether management teams have a direct pure effect on firm performance.

I. B. Family and Business Overlap and Family Firms

Starting with the seminal work of Becker (1965, 1981), labor economists have long recognized that individuals' market and non-market activities are closely interrelated (see for example, Gronau (1986)). Specifically, individuals allocate time and other decisions to maximize both professional and personal objectives, subject to constraints.

In the corporate finance literature, the importance of the interaction between family and professional decision-making is arguably greatest in "family" firms. Recent interest in this area of research was detonated by the finding that most firms around the world are owned, managed or controlled by families that are often related to the founder of the corporation (La Porta, et al., 1999). Even in the United States, families are influential in the management of a large fraction of publicly traded firms (Anderson and Reeb, 2003; Pérez-González, 2006; Villalonga and Amit, 2006). To this date, however, we have little systematic evidence about the specific channels through which family and business spheres interact.

CEO succession decisions are a prominent exception. Competitive contests would rarely yield a family descendant as a new CEO. Yet evidence by Pérez-González (2006) and Bennedsen et al (2007) shows family successions are common in the United States and in Denmark, respectively. Consistent with the notion that a large number of these new family CEOs are chosen based on family and not competence considerations and providing evidence that business and personal spheres overlap, they find family-CEOs significantly hurt firm performance, on average. Using detailed firm and family data from Denmark, Bennedsen et al (2007) go farther and demonstrates family characteristics affect both the decision to name a family or unrelated CEO, as well as, who within the family gets the top position. Similarly, Bertrand, et al. (2006) show founders' family characteristics affect the decision to name executives and directors in Thailand.

Overall, this line of research has shown that family considerations can affect firms' decision-making. It has also documented that professional non-family CEOs have a positive effect on firm performance. The evidence, however, is hard to generalize beyond the sub-samples of family firms.

I. C. Managerial Individual Characteristics and Firm Decision-Making

Beyond family firms, our paper also relates to recent studies linking detailed manager individual characteristics to firm decision-making. Using data from executives that switch managerial positions, Bertrand and Schoar (2003) show that managerial fixed effects do affect investment and financing decisions. Similarly, Malmendier and Tate (2005) show that measures of CEO overconfidence and other personal characteristics affect firm investment decisions.

In sum, we seek to contribute to preceding work in the literature in several ways.

First, we provide a comprehensive test on whether, beyond their effect on stock prices, senior management deaths affect firm operating profitability, investment decisions and sales growth. Given that senior management deaths do not necessarily coincide with poor firm prospects as most CEO turnover events, 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. This 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 would potentially allow us to identify those firm and individual characteristics that are likely to matter the most in evaluating the impact of managers on firm performance. In the next section we describe our data sources.

II. Data Description and Summary Statistics

II.A. Data

We construct a dataset starting from the universe of limited liability –publicly and privately held– firms in Denmark and identify 6,753 firms in which a CEO or her immediate family members died between 1994 and 2002. Our dataset contains financial information, as well as personal and family information about CEOs and board members. The dataset was constructed based on four different sources, as explained below.

1. Financial and management information are from *Købmandsstandens 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 or 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 position 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 number (CPR), 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 both 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 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 drop their maiden 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, as well as other names they had in previous marriages.

In the paper, we classify a firm as an event firm when three conditions are met. First, the records in the CRP agency indicate that the CEO or any of his immediate relatives passed away during the managers' tenure. Second, we require that matching financial information from KOB is available around event dates and that firm employment, where available, was never zero. Third, in case of multiple shocks occurring to a single firm, we only retain the first event in chronological order.

II.B. Firm Characteristics

Table I presents summary statistics of the firms in the sample both as a group (Column I) and classified by their event status. Information for event and non-event firms is listed in Columns II and III, respectively. Table I shows that event firms are larger, more profitable, older and grow faster than non CEO-shock firms, in all cases with differences that are statistically significant at the one-percent level. On average, the age of event firms is 15.5 years, while it is only 11.2 for non-event firms. The difference in age between event and non-event firms was expected. CEO shocks are more likely to occur in relatively older firms. Similarly, family size and age are expected to be larger for managers of older firms.

In Table I we scale operating and net income using the book value of assets in order to present comparable measures of firm performance. Operating return on assets (OROA) is measured as the ratio of earnings before interest and taxes (EBIT) 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 if the quality of operations changes around successions (see for example, Denis and Denis, 1995; Huson, et al, 2004). OROA compares a comprehensive proxy of firms' cash flows (EBIT) to the total asset base used to generate them. Unlike net income-based measures, such as return on assets, 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. When we scale OROA by the industry mean, we find that the magnitude of the difference in OROA across groups falls but remains large and significant at 1.45 percentage points.[5]

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 percent 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.

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[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 the NACE, European industry classification system, and move to three and two-digits if the 20-firm restriction is not satisfied with four- or three-digit groupings, respectively. The results of this paper are not affected by the way these industry adjustments are estimated.

II.C. Event characteristics

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

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-difference 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 significant differential pre-shock trends, and (2) that 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 on firm outcomes. The first test compares firm performance around the death of a CEO. The second approach examines firms' outcomes around the time of 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 these 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. Under the null hypothesis that incumbent CEOs are important for firm outcomes, we should expect that firm performance should fall as CEOs die or as the effective time they spend at the firm falls as a result of the loss of a close relative. In testing for CEO effects we implicitly rely on the assumption that CEOs are hard to substitute in the short-run as we would otherwise, obtain insignificant effects even in the scenario that 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 CEO or family deaths are anticipated or not. This implies that our "shocks" to CEO exposure are measured with error and as a result, our estimates on the value of these CEOs would tend to be biased towards zero.

To partially, assess this problem, we test of changes in firm performance prior to these shocks. If deaths are anticipated at the date of the death, it is likely that the surprise occurred in the years leading to the event date. Thus if CEOs were material we should 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 should 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 would expect firms to perform similarly as 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 on 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 CEO relative to other key individuals that are affiliated to the firms in the sample. If CEOs are particularly important we should expect CEO effects to be significantly larger than similar shocks to board members.

A caveat in interpreting the family CEO 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 likely that a deceased relative worked in the firm and that the resulting impact is the direct effect of the relative and not the described CEO effect, or a combination of these two. To test for this alternative hypothesis we evaluate CEO effects using a sub-sample of relatives that are unlikely to work for the relevant firm because of their age. If the change in performance is still significant for this group, it would show that the relatives' 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 manager's family member and establish that relatives do generate changes in firm performance through the CEO, it is difficult to attribute performance changes around these events to managerial ability. The reason is that the effect on performance we measure is driven by at least two factors: managerial ability and her response to the shock (e.g., in terms of reduced effort supplied or fewer hours worked).

To illustrate this problem, assume that performance, P, is given by the product of managerial ability, a, and effort supplied, e, as follows:

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

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

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

Or

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

where e_n is the effort supplied under normal circumstances and e_s is the effort supplied 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 a constant across managers differences in ΔP across firm will capture variation in abilities and the response to the 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 lower ability managers would be strictly positive.

Overall, this section highlights that our empirical analysis is likely to provide a test on 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 the exposure to CEOs 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, for relatives' deaths. 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 tend to only be suggestive of the relative importance of CEO on firms.

IV. Results

IV. A. Mean Differences in Profitability

We initially test for the impact of shocks to CEO on firms by computing the differences in operating returns on assets (OROA) around CEO and relatives deaths. In Table II we present the average OROA in years *t=0* and *t=1* minus the mean pre-shock OROA in the two years prior to the shock. The mean difference is -1.37 percentage points and it is significant at the one-percent level. This first result does suggest that CEOs shocks 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 one percent level. In contrast, family deaths are associated to average reductions in OROA of 1.2 percentage points. The difference own minus family shock is -0.98 percent and it is significant at conventional levels.

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

To assess whether the above described results 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 CEO shock leads to significant declines in OROA that are significant at the five-percent levels. Economically, median direct and indirect CEO effects were -0.47 and -0.15 percent, respectively. Thus Table II provides evidence that CEO shocks do generate economically large and statistically significant performance effects.

IV. 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 to the events. We compute two-year differences in performance centered at year *t=-3*. We fail to find differences in performance for CEO and family shocks. As previously argued, this result is interesting for several reasons. First, it shows the trends that affect event firms are no different from the average trends of their industry. Second, they provide evidence against a reverse causality interpretation of the results in Table II. Namely, there is no evidence firms perform poorly before the shocks or after, the CEOs or her relatives die. 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 a falsification test on the importance of CEOs on performance using similar shocks occurring to board members instead. Using our dataset we are able to identify the death of 1,066 board members and of 4,493 relatives of acting board members, for a total of 5,559 board shocks. We replicate the analysis in the second row of Table II for board member shocks. We fail to find significant effects on performance. The death of board members or their relatives leads to an estimated effect on operating performance that is indistinguishable from zero at conventional levels.

Table III, Panel C examines whether the CEO effects of Table II are explained by a subset of firms in the firm size distribution. It shows CEO shocks affect firms irrespective of which size quintile they belong to. The largest quintile of firms indicates that CEO shocks lead to an average decline in OROA of 0.77 percentage points, significant at the one-percent 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 shocks are significant at the five-percent level.

Figures 1 and 2 plot industry-adjusted operating profitability as a function of time (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) deaths of nuclear family relatives of the CEO (own death and deaths of a child or a spouse). The figure shows that profitability hovers around zero before the shock. However, after the shock, the group of firms in which the CEO dies or suffers a loss of a close relative experience a decline in performance that is driven by nuclear family or own 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 CEO shocks and comparable board shocks. 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 the decline in performance continues to be significant three and four years after the CEO shocks.

One of the novel and striking results so far is the evidence that deaths of family members significantly affect firm performance. One concern with the family-shock results in the preceding table is that they might be explained by the death of a family member that is also employed in the same firm. Given that we could not identify who works for each specific firm, we can alternatively test if those family members that die but that were unlikely to work in the firm also induce significant performance shocks. In Table IV Panel A, we investigate the impact of children deaths as a function of their age. Interestingly, industry-adjusted OROA in those firms whose CEO's children die at an age younger than 16 years (68 observations) falls by 2.4 percentage points, significant at the five-percent level. The point estimate for the decline in OROA following the deaths of older children is, if anything, lower (1.4 percentage points, significant at the ten-percent level). This difference 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 that works in the same firm.

Sorting by the number of children we find the biggest effects on firm profitability in cases where the CEO only has one child. Specifically, deaths of only children correlate with a 4.7 percentage point decline in firm profitability irrespective of the age of the child. The difference with respect to three or more children-CEO firms is -3.5, significant at the five-percent level. The lack of significant differences between one-child cases younger than 16 and those 16 or older also casts doubt on the idea that family shocks are only driven by children who participate directly in the productive activities.

In Table IV, Panel B, we provide an alternative test for the idea that family members hurt firm performance through their direct involvement in firms by investigating the differential effect of relative who die at an age of 75 years or older. 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 at age 75 or older, 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 subsequent successors. Specifically, firms might be inclined to hire the children (typically male children) of an incumbent CEO to replace him as chief executive or to help at running the firm. In Table IV we show that family CEO influence is unlikely to account for the gap in performance around CEO direct and indirect shocks. In particular, those firms whose CEO did not have male children also experience significant declines

in performance. Further, there is no statistically significant difference across groups relative to the sub-sample of firms whose CEOs did have a male child.

Overall, univariate tests 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 in which CEO suffers a shock do not appear to be subject to a different trend prior to the CEO and family deaths we identify suggesting 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 that could potentially be working for the shocked firm and for those that are unlike to be doing so. This result indicates that family deaths do not affect firm profitability due to a loss of a key employee but likely because they distract the CEO from his professional responsibilities.

IV. 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 female-CEO deaths in the sample lead to a decline in operating profitability of 1.39 percentage points. This decline is not significant at conventional levels. Male-CEO deaths (954 cases) are found to induce a decline in OROA of 1.85 percentage points, significant at the one-percent level. The difference across gender is not statistically different from zero. The fact that female CEOs are not found to induce a larger decline in firm profitability is not in line with the notion that those female CEOs that make it to the top managerial position are superior in terms of ability relative to male CEOs.

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

As discussed in Section III, the larger effect on female-CEO firms could be attributed to several firm or CEO characteristics, such as 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 differential gender response to these family shocks. Alternatively, these differences could, for example, reflect the fact that female CEO shocks differ 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 to work in the same firms as male-spouses. In this paper we cannot disentangle between these competing hypotheses.

In Panel B of Table V, we test for differences in the estimated effects as a function of the gender of the deceased. We find large and statistically significant differences for spouses. Specifically, the death of a male spouse is found to hurt firm performance by three percentage points more relative to the female-spouse effect. The death of a mother-in-law is the only family-shock that is associated to a non-negative although insignificant estimated coefficient.

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 and as a result we cannot compute their effective tenure (4,115 cases). "Medium" and "short" 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 detect a significant change in performance following a shock to CEOs with short tenures. For CEOs with moderate tenures, the drop in profitability is 0.81 percentage points, significant at the five-percent level, and rises to 1.20 percentage points (significant at the one-percent level) for CEOs with long tenures. Moreover, the difference between long- and short-tenured CEOs is statistically significant at the one-percent 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 more entrenched CEO are more likely to stay longer and to have strategically invested in making themselves indispensable.

In Table VI, Panel B we focus on CEO age as an additional proxy for CEO entrenchment. The table indicates that the effect is stronger for younger CEOs. This result casts doubt 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 with high investment-fixed-effects, in contrast, experience larger declines in profitability relative to those with low investment average. The difference is 3.7 percentage points in OROA, significant at the five percent level.

IV. D. Additional Controls

In Table VII we investigate the impact of various types of deaths on firm profitability controlling for several firm characteristics that are likely to influence firm performance. We create an indicator variable "shock" equal to one the year of the shock and in the subsequent years. Column I and II report the average CEO effect for the 6,753 shocks identified in the sample is at least -0.52 percent, with and without controls for firm size, industry profitability and firm age. As before, the larger estimated effects are found for own CEO deaths (Column IV), then for child and spouse deaths (Column V) and finally for parents and parents-in-law (Column VI). Looking at the main control variables, firm size if positively correlated with firm profitability, and not surprisingly, mean industry profits are a strong predictor of individual firm 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 nuclear family deaths. The average nuclear family shock is -1.3 percent, significant at the one-percent level. In contrast, the effect of non-nuclear family shocks is now insignificant in this specification.

As robustness, Columns IX and X provide another test for the differential effect of CEO shocks relative to similar deaths occurring to board members. As reported in Table III and in 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 to CEO shocks of 0.7 percentage points, significant at the one-percent level. In other words, CEOs do matter for firm profitability.

IV. E. Duration of CEO Shocks and Alternative Outcome Variables

In Table VIII we examine the duration of the CEO effects thus far documented. Columns I and II show that CEO shocks generate a robust decline in performance that does not depend on a particular post-shock year. That would be the case if the declines in OROA 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 *t=0* and *t=1*, and using the two subsequent years as the post-shock period, still yields a statistically and economically large decline in OROA around CEO shocks. Yet as 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 are temporary but they take at least three year 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 (own, spouse and children), which according to the preceding results are the relevant CEO shocks identified in this paper. Given the data limitations, we investigate the impact of CEO shocks on investment (asset growth) 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 one-percent level. This is result is surprising because lower OROA could have resulted from newer investments in the post-shock period. The fact that profitability falls while investment rates declines suggests the cash flow consequences of a CEO shock should be larger than the OROA results suggest. Column III in Table IX confirms this intuition by documenting a decline in sales growth of 4.3 percentage points, significant at the one-percent level, for those firms that voluntarily report their sales numbers. In sum, Table IX demonstrates CEO shocks harm performance in several ways: reducing profitability, scaling back investments growth and hurting sales expansions.

IV. 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 shown in Table VI that older CEOs are correlated with lower effects on OROA. As discussed earlier it is

difficult to disentangle whether older CEOs are less talented or that succession planning among older CEOs is more likely. In any event, CEO age effects are not statistically significant.

Column II in Table X evaluates 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 managerial effects, yet the female CEO results are only significant at the 15-percent level. When we report a specification that controls for CEO tenure, age, and gender at a time (Column IV), we now obtain statistically significant age and gender effects. Older CEOs are linked to lower effects while female CEOs tend to exhibit larger shocks. In both cases, the point estimates are significant at the 10-percent level. As previously argued, it is difficult to interpret these gender differences as pure CEO effects.

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

In Table XI we shift attention to firm characteristics. We start by revisiting the role of firm size in explaining CEO effects. Column I confirms the results of Table III that size grouping cannot explain the importance of CEO on firm profitability. Consistent with several results presented earlier, Column II shows CEO effects seems 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 increases in investment quintiles: the larger the investment the larger the CEO effects are. Column III and IV show CEO effects are concentrated on the fourth and fifth investment groupings rendering the average effect otherwise insignificant. Column Vin 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 return to having a valuable 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 proxies: (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 attractive industry environments do not exhibit statistically significant CEO effects at conventional levels.

In Table XIII we test for the correlation between governance characteristics and the estimated CEO effects. In 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, due to larger standard errors.

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" or A/S firms are required to have one. Column III shows that on average firms with no board of directors experience significant declines in OROA of 1.6 percent, significant at the one-percent level. Interestingly, Columns IV shows that firms with small board 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 percent. One interpretation of these correlations is that smaller boards are better at setting-up succession plans or at hiring competent successors.

In Table XIII, Columns VI and VII we report results 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 seats 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 tests for differences in CEO effects as a function of the firms organizational structures. This test is potentially relevant as smaller private or ApS firms rarely face a separation between ownership and control, and are as a result, less prone to

[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.

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 enhanced governance arrangements or are only driven by weaker CEOs selecting into the pool of firms with stronger governance is hard to disentangle empirically.

V. Conclusions

In this paper we have investigated the impact of individual shocks occurring to chief executive officers. Specifically, we have tested whether CEO deaths and CEOs family deaths have a bearing on firm performance. We have argued that these tragic events provide a plausible exogenous source of variation to (empirically assess the importance of managers on their firm performance, and to quantify the interaction between the personal and business roles that CEOs play.

To pursue these tests, we used a unique dataset that allowed us to match the universe of limited liability firms in Denmark to their financial statements and to 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, as well as, to identify those CEOs or immediate family members that pass away during the sample period.

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

Our ability to identify family deaths 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 children and spouses deaths, and the lower estimated impact as a result of the death of a mother-in-law. Furthermore, these family death tests allowed us to show a substantial overlap between personal and business spheres that is prevalent in both small and large firms and that works indirectly to 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 suggest 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 made chief executives indispensable ex-post, is a question for future research.

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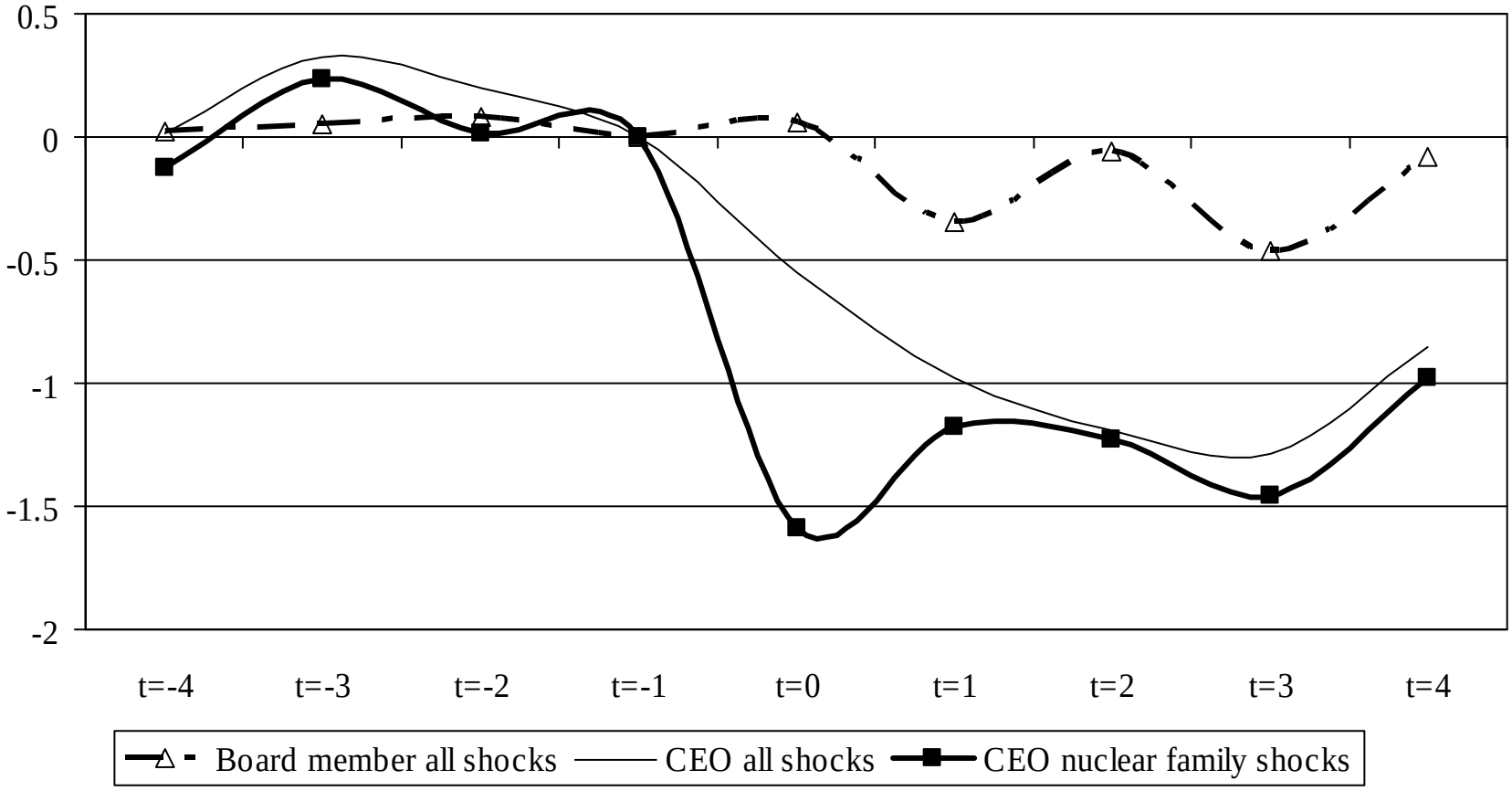
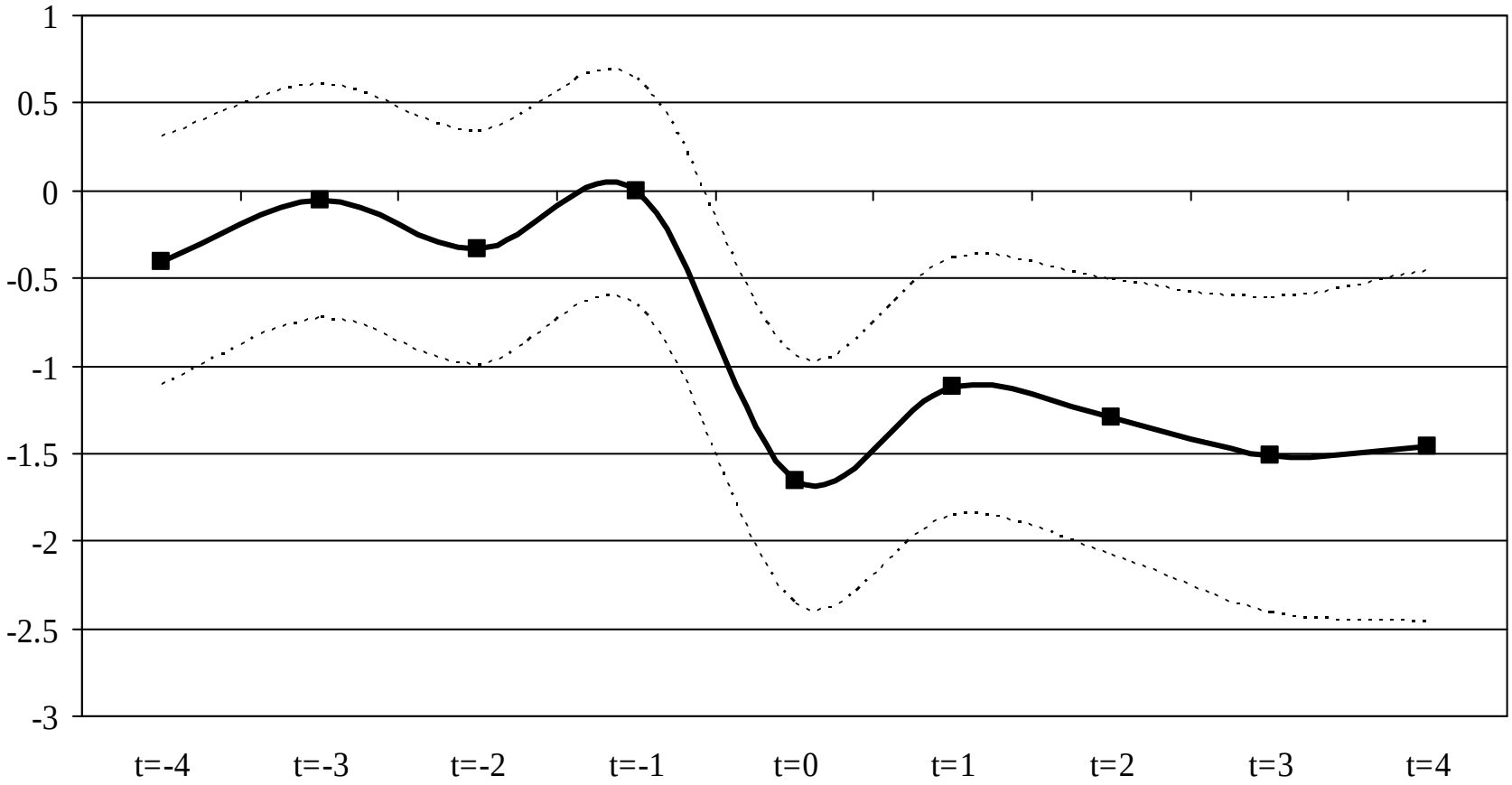
Figure 1. Industry-adjusted operating profitability: the effect of shocks to CEOs (“all” and “nuclear family” only) and to board members (“all”)



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 ***	-0.0220 ***	-0.0122 ***	-0.0098 **
	(0.0015)	*(0.0041)*	*(0.0016)*	*(0.0044)*
	[6753]	[1035]	[5718]	
Industry-adjusted OROA (mean)	-0.0090 ***	-0.0182 ***	-0.0073 ***	-0.0109 **
	(0.0015)	*(0.0041)*	*(0.0016)*	*(0.0044)*
	[6753]	[1035]	[5718]	
Industry-adjusted OROA (median)	-0.0019 **	-0.0047 **	-0.0015 **	
	(0.0007)	*(0.0023)*	*(0.0007)*	
	[6753]	[1035]	[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.