

“Evaluating the Impact of The Boss: Evidence from CEO Hospitalization Events”*

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Abstract. This paper shows that Chief Executive Officers (CEOs) meaningfully affect firm performance. Using variation in CEO exposure resulting from the number of days a CEO is hospitalized, we investigate the effect of CEOs on firm policies, holding firm and CEO matches constant. We have four main findings. First, CEOs have an economically and statistically significant effect on profitability, revenue, and investment outcomes. Firms whose CEOs are hospitalized underperform when their chief executives are sick but otherwise exhibit similar performance relative to other firms. Second, we find robust CEO effects for relatively young and highly educated CEOs, and for CEOs in rapidly growing environments, settings where the value of CEOs actions are arguably highest. Third, we show that CEOs are unique: the hospitalization of other senior executives does not have similar effects on performance. Fourth, consistent with the idea that hospitalizations meaningfully affect CEO potential at the firm level, we find that hospitalizations lead to significant increases in turnover probabilities. Overall, our findings demonstrate that CEOs are a key determinant of firm performance, and that the value of CEO succession and contingency plans is likely to be substantial.

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This paper uses variation in firms' chief executive officer (CEO) exposure resulting from the number of days he or she is hospitalized to examine the effect of CEOs on firm performance. The basic premise of this empirical test is that hospitalizations affect managers' ability to perform their jobs as they are physically away from the office or convalescent from a medical condition. Econometrically, this test is attractive because it allows us to assess how firm outcomes change as firms' exposure to its CEO varies, holding a firm and CEO match constant.

To investigate this issue empirically we use firm, CEO, and hospitalization data from 8,798 Danish firms from 1995 to 2007. Denmark provides a near-ideal setting to study these issues for four reasons. First, reliable financial information is available for the universe of limited liability firms. Second, firms are required to report the name of their CEOs to government agencies. Third and crucial for this study, detailed information about individual hospitalizations is available from the National Patient Registry, and such data can be matched with CEO and firm records. Lastly, given that 95% of hospital spending in the country is financed through general government expenditures, this setting mitigates concerns that CEO hospitalizations may affect performance directly as a result of increased medical bills.¹

Using these data our main findings are four:

First, CEOs have an economically and statistically large effect on firm performance. Firms underperform when their chief executives are hospitalized but otherwise exhibit similar performance relative to other firms. Our results indicate that 10 day hospital stay reduces firm operating profitability by 4%. We show that the results are unlikely to be driven by selection: using the fraction of lengthy hospital stays per medical condition for the entire country as an instrumental variable we show that extended CEO hospitalizations lead to lower operating results. Beyond profitability, we also report economically and statistically significant CEO effects on firms' sales, assets and investment, bolstering the case that CEOs provide meaningful services to their organizations.

Second, CEOs are unique. By replicating the same tests for non-CEO senior managers, we are able to provide a useful counterfactual of the effect of CEOs on firm performance. Interestingly, we are unable to detect significant effects of non-CEO hospitalizations on any of the variables of

¹ Source: stats.oecd.org based on data from 2005 to 2009.

interest. These results highlight the importance of CEOs relative to other senior employees, and provide an empirical justification for the attention that chief executive officers receive both in the media and in the academic literature.²

Third, we show that CEO effects are robustly significant in settings where the value of managerial discretion is arguably highest. In particular, rapidly growing environments –at the firm or industry level– exhibit significant CEO effects on firm profitability, firm sales and investment. Interestingly, we show that in settings with relatively unattractive investment opportunities, CEO hospitalizations significantly hurt profitability but do not systematically affect revenue or investment policy. These latter results suggest that CEO actions in low growth industries are potentially more influential in reducing costs than in expanding operations. We also report consistent effects for firms that are led by relatively young, college educated, and intermediate-tenure CEOs.

Fourth, hospitalized CEOs are more likely to be replaced than their peers. A 10 day hospital stay increases the probability that a CEO is subsequently replaced by 15%. CEO turnover events are a *revealed preference* test of the basic tenet of this paper. Namely, if CEO hospitalizations undermine the productive potential of managers, then the Board of Directors should act on this information and replace them, which is consistent with the results.

Despite the sharp effect of hospitalizations on managerial turnover, we show that the hospitalization results presented in this paper are not driven by those firms that replace their CEOs: we replicate the effects of CEO hospitalizations in the subsample of firms that does not experience managerial turnover.

Taken together, our results demonstrate that CEOs are valuable for the organizations they lead. As such, the evidence is consistent with a growing line of research in economics and finance that stresses the unique contribution of managers, and of management practices to firm outcomes (Bertrand and Schoar (2003), Pérez-González (2006), Bennedsen, Nielsen, Pérez-González, and Wolfenzon (2007), Bennedsen, Pérez-González, and Wolfenzon (2010), Bloom and Van Reenen (2007), and Bloom et al. (2011), among others).

² For a recent survey, see Bertand (2009).

Our results extend this literature in several important dimensions:

First, we provide an estimate of the value of CEOs using firm and CEO fixed effects. These empirical specifications allow us to isolate the empirical consequences of shifting CEO's *effort* or effective supply, holding constant the firms' demand for his or her services. As a result, we are able to overcome an important inference concern that affects existing studies using managerial fixed effects as proxies for CEO traits. Namely, that managerial fixed effects are the result of endogenous decisions that capture both demand and supply forces (Fee, Hadlock, and Pierce (2010)).³ Our results, however, provide empirical support to the view that managerial fixed effects are not entirely driven by demand forces. This result is important as a growing literature in finance uses managerial fixed effects as key determinants for a long array of corporate policies (Bertrand and Schoar (2003), Frank and Goyal (2007), Graham, Li, and Qiu (2011), among others).

Second, we provide an estimate of the value of CEOs using a relatively continuous, and representative variable capturing CEO shocks. Previous studies in this literature have often emphasized dichotomous variables such as CEO deaths (Johnson et al (1985), Bennedsen et al. (2010), Fee, Hadlock, and Pierce (2010), among others)), which tend to occur rarely, and disproportionately in older firms, with older CEOs. In our sample, CEO deaths occur in only 0.2% of the firm-year observations while CEO hospitalizations occur in 6.5% of them. In consequence, our results are more likely to be representative of the relevant CEO effects on the average firm in the economy. Furthermore, our empirical strategy allows us to assess the magnitude of the shock needed to affect performance. Empirically, we show significant effects for firms whose CEOs are hospitalized for five or more days, and insignificant effects for shorter hospitalizations.

Third, our results provide novel insights on the value of CEO succession and contingency plans. Our analysis documents both the settings in which CEO hospitalizations robustly affect firm performance, as well as, the specific policies that those contingency plans may target. For example, the evidence shows that CEOs systematically influence firm outcomes when they are young or when the firm is in high growth environments, suggesting that succession plans may be particularly

³ For example, a CEO with a history of intensively using leverage (large leverage fixed effect) may be hired by another firm precisely because he or she had experience with managing debt. As a result, it is difficult to separate whether CEO fixed effects reflect the style of the CEO (a supply trait), the desired policies that the Board of Directors wanted to implement (demand), or both.

valuable in those settings. Similarly, the results show that introducing policies to shield cost cutting initiatives may be crucial for firms operating in low growth environments. Lastly, by failing to report significant results for non-CEO senior executives, this paper stresses the importance of contingency plans for chief executive officers.

Finally, we contribute to the CEO turnover literature by providing systematic and country-wide evidence that CEOs hospitalization, even relatively short hospital stays, lead to drastic increases in the probability of observing a CEO turnover event. We show these effects after controlling for a set of variables that capture both firm and industry conditions.⁴

The rest of the paper is organized as follows. Section I describes the data. Section II examines the impact of CEO hospitalizations on performance. Section III tests for the uniqueness of the value of CEOs. Section IV, assesses the cross-sectional determinants of CEO effects, and the impact of CEO hospitalizations on turnover events. Section V concludes.

I. Data and Summary Statistics

A. Data Sources

To analyze the impact of CEO hospitalization on firm performance, we use the following firm and individual data sources:

1. **Firm financial information.** Financial data are from *Købmandsstandens Oplysningsbureau* (KOB) and the *Statistical Business Register* (SBR) at Statistics Denmark.

KOB is a dataset assembled by a private data provider that collects financial statement and management information from financial reports that all limited liability firms in Denmark are required to file to the Ministry of Economics and Business Affairs. Firms are required to disclose the value of total assets, as well as the value of their operating and net income. While most of the firms in KOB are privately held, firm financials are audited by external accountants, in compliance with Danish corporate law. Critically for our purposes, KOB includes the unique firm-level identifier, the CVR number, issued by the Danish Commerce and Companies Agency, which serves as firm

⁴ For related turnover studies, see Weisbach (1988), Parrino, (1997), Huson et al. (2001), and Jenter and Kanaan (2010), among others.

identifier in all interaction with the Danish authorities. The CVR numbers allow us to match KOB data with other data sources.

We supplement KOB's financial information with revenue and employment information from the SBR, which is assembled by Statistics Denmark, a Danish government entity under the Ministry of Economic and Business Affairs that is responsible for data collection and record keeping for a large number of economic variables. Furthermore, merging KOB and SBR data allows us to focus on those limited liability firms with actual employment and sales records, and exclude from the tests shell companies that are otherwise difficult to identify using KOB financials alone.

2. **Management data.** To identify the firms' CEOs we rely on three data sources: (a) KOB, (b) Erhvervs- og Selskabsstyrelsen (ES), a dataset assembled by the Danish Commerce and Companies Agency, and (c) employment information from the Integreret Database of Arbejdsmarkedsforskning (IDA) at Statistics Denmark.

KOB reports the names of firms' top executives but does not contain individual identifiers. To be able to merge the names reported in KOB with other data sources, we use ES, which contains the Danish Personal Identification number (CPR) for all managers of limited liability firms. The CPR number is the Danish equivalent of the U.S. Social Security number. Under Danish corporate law, firms are required to file with ES any change in CEO positions within two weeks of its occurrence.

Lastly, we use IDA to verify that CEOs are indeed registered as employees in the reporting firms, as well as to obtain personal information about the firms' CEOs, such as their age and education levels. IDA reports the primary place of employment for each employee during the month of November of each calendar year.

3. **Hospitalization data.** Data on hospitalizations are from the National Patient Registry (NPR), at Statistics Denmark. NPR registers all public hospital interactions in the country and contains individual CPR identifiers, the duration of each hospital stay, and the primary medical condition of patients based on the classification of diseases of the World Health Organization.⁵

⁵ <http://www.who.int/classifications/icd/>

B. Sample Selection

KOB data are available for two types of limited liability firms: aktieselskab (A/S) and anpartsselskab (ApS). ApS corporations are smaller and likely to be informal in their organizational structure as they are not legally required to have a formal Board of Directors.⁶ Because of our interest in the role of CEOs in large organizations, we focus on A/S firms. Given our reliance on multiple data sources, our analysis is constrained to the 1995 to 2007 period. As is standard in the literature, we focus on non-financial, non-utility, and non-government-owned entities. Lastly, to focus on the largest firms in Denmark, we require a minimum of (a) 20 or more employees, (b) USD \$5 million or more in assets, and (c) USD \$10 million or more in sales. We retain any firm that met all three requirements for at least one year during the 1995 to 2005 period.⁷ We arrive at a final panel of 8,798 firms and 76,354 firm year observations.

C. Summary Statistics

Table I shows summary statistics for the sample firms as a group (Column I), “event” firms (Column II), and “non-event” firms (Column III). Event firms are those whose CEO was hospitalized for at least one day during the sample period. Of the 8,798 firms in the sample, we classify 3,167 as event and 5,631 as non-event firms. Table I also reports the difference of means across groups (Column IV).

To assess firm performance in the absence of stock price information, we follow the CEO turnover literature in using operating return on assets (OROA) as a measure of performance.⁸ OROA is a natural proxy for performance, as it compares the cash flows from operations to the value of assets, and is not distorted by capital structure decisions. The average OROA for event and non-event firms, respectively, is 9.5 and 9.3 percentage points. The difference across groups is not statistically significant at conventional levels.

⁶ A/S firms must have a minimum of DKK 500,000 in capitalization. The minimum for ApS firms is DKK 80,000. Neither of these organizational forms includes partnerships. For detailed information on the regulations governing limited liability firms in Denmark, the current Danish Company Act is available online at <http://www.dcca.dk/>.

⁷ Eliminating these size cutoffs does not affect the results of the paper.

⁸ Denis and Denis (1995); Huson, Malatesta, and Parrino (2004); Pérez-González (2006), Bennedsen et al (2007), and many others. Operating return on assets (OROA) is measured as the ratio of earnings before interest and taxes (EBIT) to the book value of total assets.

We also report net income to assets, which is 5.7 percentage points for event firms and 5.5 for non-event firms; again, the difference across groups is insignificant. To explore whether event firms differ in terms of their industry patterns, we also show industry-adjusted OROA values, using their four-digit codes from the Classification of Economic Activities in the European Community (NACE). Industry-adjusted OROAs is indistinguishable from zero for both event and non-event firms, and for the resulting difference across groups.

The mean value of sales is 126 million Danish Kroner (2008 DKK values) for all sample firms, and we report comparable averages for both event and non-event firms.⁹ Other measures of firm size, such as total assets or employment, also indicate that firms are comparable across groups. In addition, the average sales values (USD \$25 million) indicate that sample firms are medium-sized organizations, relative to the large publicly traded firms in COMPUSTAT.

Firm age reveals that event firms are significantly older than their non-event peers. Event firms have been in business for nearly 28 years on average while non-event firms have been active for close to 26 years. While this difference is relatively small (1.9 years), it is significant at the 1% level. We also report that an examination of CEO age unsurprisingly shows that event firms are managed by older CEOs (older CEOs are both more likely to be hospitalized and more likely to manage older firms). The average CEO age for firms in the sample is 50.9 years; however, it is 52.2 and 50.1 years for event and non-event firms respectively. The difference of 2.2 years is significant at the 1% level.

Table I also presents evidence that investment is higher for non-event firms. Average investment rate for event firms is 5%, compared to 5.5% for their non-event peers. The difference is statistically significant at the 1% level. Note that since Table I shows mean values for all the firm years of those event firms, this difference can potentially be the result of CEO hospitalization events, an issue we investigate later in the paper.

Lastly, in terms of the representativeness of the firms under examination, the share of the sample firms' employment relative to the aggregate employment of all A/S firms in 2000 in their respective industries was 70.4%. In other words, firms are likely to be representative of limited liability firms in Denmark.

⁹ The average DKK-USD exchange rate in 2008 was 0.1961. Source: www.statbank.dk.

These summary statistics highlight three issues. First, event and non-event firms are comparable in terms of profitability and size. Second, event firms are slightly older and are managed by CEOs who are also older than their peers. Third, sample firms are likely to be representative of medium-sized firms in the economy.

In Table II, we present hospitalization data for the CEOs in the sample, broken by the main medical condition reported in the Danish National Patient Registry, and the length of the CEO hospital stay. From the 76,354 total firm-year observations, we identify 4,943 firm-years in which a CEO was hospitalized for at least one day and 1,581 cases in which the CEO experienced hospital stays of 5 or more days. These numbers represent 6.5% and 2.1% of the total number of firm-years, respectively. For the econometrician investigating whether CEOs affect firm performance, these hospitalization events, while unfortunate, are useful, because they are significantly more frequent than other CEO shocks previously explored in the literature. One such event is CEO deaths (Johnson et al (1985), Bennedsen et al. (2010), Fee, Hadlock, and Pierce (2010), among others)). Yet, CEO deaths occur rarely: in only 0.2% of the firm-years.

Table II shows significant variation in the duration of hospital stays as a function of the primary medical condition of the patient. For example, the fraction of neoplasm-related hospitalizations leading to 10 day or longer stays is 32.9%, while the same fraction for illnesses related to the genitourinary system is 7.8%. In the subsequent sections, we exploit this heterogeneity in our empirical tests.

In sum, Table II shows that hospitalization events are frequent and hence provide a significant amount of variation in CEO exposure that we can exploit empirically in the subsequent sections.

II. CEO Hospitalization Events and Firm Performance

A. Univariate Tests

As an initial test for the impact of CEOs on firm performance, in Table III, we examine mean operating profitability ratios as a function of the number of days of hospitalization for the firm's chief executive. As measures of operating profitability, we report OROA (Column I), industry-adjusted OROA (Column II), and net income ratios (Column III).

Mean profitability ratios show that firms with no CEO hospitalizations and those whose CEOs experienced short hospital stays perform similarly. More specifically, the mean OROA, as shown in the first row of Panel A in Table III, is 0.094 for firms with no hospitalization events and 0.096 for firms with CEOs who experienced a one day hospital stay. The difference of 0.002, reported in Panel B, is indistinguishable from zero at conventional levels. Columns II and III show that similarly comparable performance obtains if we instead rely on industry-adjusted profit measures. Similarly, firms whose CEO was hospitalized for 2-4 days exhibit profitability ratios that are comparable to both no hospitalization and one-day hospitalization events firms.

In contrast, firms whose CEOs experienced hospital stays of at least five days consistently underperform their peers. Mean OROA is 0.083, 0.077, and 0.079 for firms with CEOs hospitalized for 5-9, 10-19, and 20 or more days, respectively. More informatively, the mean industry-adjusted OROA is -0.98, -1.43, and -1.67 percentage points relative to the industry norm. As a group, firms with CEOs who were hospitalized for at least five days underperform their industry benchmarks by 1.2 percentage points. The second row of Table III, Panel B shows that when compared to firms with CEOs who had fewer than 4 hospitalization days, the underperformance is significant at the 1% level.

Interestingly, the third row of Panel B shows that the underperformance of firms with CEOs who experience hospital stays of at least 5 days is not explained by non-hospitalization firm comparisons. In other words, comparing the within-firm changes in operating profitability of event firms (i.e., those with at least one hospital event), we obtain in Columns I, II, and III a performance difference of 1.5, 1.4, and 1.3 percentage points for OROA, industry-adjusted OROA, and industry-adjusted net income to assets, respectively, relative to the same firms in settings where the CEO is healthy. Economically, these performance differences imply reductions in operating profitability of 13-15%, significant at the 1% level.

In Table III, Panel C, we report results from univariate quantile (median) regression analysis performed to test if the differences in operating performance are explained by outliers. Using median analysis, we confirm the three main patterns highlighted above. First, firms with CEOs who had brief hospital stays are indistinguishable from non-event firms in terms of operating performance. Second, firms whose CEOs experience hospitalizations of at least five days significantly underperform. Third, such underperformance is not explained by industry effects and holds even when we solely focus on within-firm comparisons.

B. Hospitalization Events and Firm Profitability: Regression Analysis

In Table IV, we turn to multivariate analysis to investigate the impact of hospitalization events on firm profitability using both firm fixed and firm-CEO fixed effects specifications.

Firm fixed effects

As a benchmark for analysis, in Column I, we report the impact of the number of days that a CEO spends in the hospital on profitability (OROA) without firm or year controls, but using a firm fixed effect specification. The estimated coefficient is -0.0004, significant at the 1% level. Such estimate implies that a 10 day hospitalization would lead to a decline in OROA of 0.4 percentage points or 4% relative to mean profitability levels. Column II shows that the estimated coefficient on the number of days a CEO spends in the hospital is unaffected by the introduction of firm controls.

In terms of the impact of firm-level variables, firm size (log of lagged assets) and CEO age are correlated with lower OROA levels. Industry profitability (4-digit level) is strongly and positively correlated with firm OROA. In contrast, employment and firm age are insignificant at conventional levels.

Firm-CEO fixed effects

The evidence presented in Columns I and II shows that when firm time-invariant characteristics and other time-varying controls are held constant, CEO hospitalizations affect firm profitability. Firm fixed effects specifications, however, do not allow us to separate whether the results reported are driven by CEO turnover events, which compare outgoing and incoming CEOs, or by the within-CEO variation in CEO exposure that results from hospitalization. A large literature has emphasized the importance of CEO turnover events and of CEO fixed effects in explaining changing firm outcomes.¹⁰ However, in this paper, we seek to estimate the effect of changing CEO productivity and capacity on performance, holding firm and CEO matches constant, which is

¹⁰ For changes in performance around turnover events see, for example, Johnson et al. (1985), Denis and Denis (1995), Huson, Malatesta, and Parrino (2004), Pérez-González (2006), and Bennedsen et al (2007), among others. For the importance of CEO fixed effects on firm outcomes see Chevalier and Ellison (1999), Bertrand and Schoar (2003), Frank and Goyal (2007), and Graham, Li, and Qiu (2011), among others.

economically relevant and previously unexplored in the literature. To this end, we rely on firm and CEO fixed effects specifications.

In Table IV, Column III, we show that after controlling for firm and CEO fixed effects, CEO hospitalizations negatively affect profitability. The effect is statistically significant at the 1% level and in terms of magnitude is virtually unchanged relative to the firm fixed effects specifications. However, the economic interpretation of the result is unique. Relative to a given CEO and firm match, firm performance declines whenever a CEO is hospitalized. This result provides striking evidence of the direct impact of CEOs on the organizations they lead.

Furthermore, this finding overcomes concerns that the correlation between managerial effects and firm performance, as previously reported in the literature, is driven solely by demand and not supply effects (Fee, Hadlock, and Pierce (2010).) The concern is that CEO fixed effects are observed by the board of directors and other market participants. As such, CEOs would tend to be hired precisely because of their known traits, making it empirically challenging to separate the effect of CEOs on firm performance that results from demand (firm) or supply (CEO) forces. The evidence demonstrates that changing managerial supply of *effort*, resulting from hospitalizations, significantly influences firm outcomes.

When considering other variables, such as size, industry profitability, and CEO age, their effect on performance is unchanged. Moreover, firm age drops from the analysis, because within firm-CEO groupings, firm age increases one to one with CEO age.

In Table IV, Columns IV and V, we test whether CEO hospitalization effects last beyond the year in which these shocks occur. The results show that lagged hospitalization events continue to affect firm operating performance one year after they occur. The estimated coefficient reported in Column IV is, however, smaller than the one estimated for concurrent hospitalizations. Nevertheless, the effect is negative and statistically significant. In contrast, results in Column V show that two year lags in hospitalization events do not have a significant effect on firm performance.

In Table IV, Columns VI and VII, we examine the effect of hospital stays of different lengths using indicator variables. Specifically, we use dummy variables that indicate whether the CEO had a hospital stay of at least 1, 5, 10, or 30 days, respectively. The results confirm that short hospitalization events (hospital stays of 1 to 4 days) do not have a meaningful impact on firm performance. In contrast, longer hospitalizations are correlated with economically and statistically

significant effects on profitability. In Column VI, we show that hospital stays of at least 5 days lead to a decline in OROA of 0.72 percentage points or 7.6%. Hospital stays of 30 or more days suggest even larger effects on firms, but the standard errors on those coefficients are large, preventing us from establishing significant incremental effects relative to firms with 5 to 29 day hospitalizations. In Column VII, we show that 10 day and longer hospital stays are correlated with a decrease in OROA of 1.12 percentage points, a 12% decline in profitability relative to non-event years. As before, the dummy for hospitalizations of 30 or more days is negative but insignificant. The latter result may be indicative that long hospital shocks may allow some firms to react and minimize further deterioration of the bottom line.

C. Alternative Specifications

One concern with the evidence thus far presented is that we are only able to verify that CEOs are employed in the firm in November of each year, and as result, our findings may be subject to a sample selection problem. Specifically, it is plausible that even when hospitalization events are exogenous to firms' investment opportunities, those firms that allow their sick CEOs to remain as top executives until the end of the year are predominantly firms with declining firm prospects. Firms with attractive investment opportunities would arguably replace their CEOs, making the correlation spurious.

To evaluate this concern, we replicate the analysis using hospitalizations of the individual who was reported as CEO of the firm as of November of the prior year. If only relatively weak firms retain their hospitalized CEOs, we would expect insignificant effects on performance using this alternative test. In contrast to this anticipated outcome, the results shown in Table V demonstrate that the impact of CEO hospitalization on profitability is unchanged both for the univariate (Column I) and multivariate (Column II) specifications.¹¹

An alternative approach to overcome inference concerns related to the number of days a CEO is in the hospital, is to find a plausibly exogenous variable that captures the severity of the CEO

¹¹ The number of observations in Table V, Columns I and II, drops from 76,354 to 65,038 as we impose the additional requirement of identifying a CEO with data from a year prior.

hospitalization shocks but does not condition on the potentially endogenous length of a hospital stay. We argue that the fraction of lengthy hospital stays per medical condition for the entire Danish population is a reasonably proxy for the expected intensity of a medical shock. To test this idea empirically, we compute the fraction of patients that spend at least 10 days in the hospital between 1995 and 2007 for each medical condition.¹² We use this variable to predict: (a) the length in days of hospital stays, and (b) whether the CEO experiences a 10 day or longer hospitalization. We subsequently, use a two-stage least-squares instrumental variable (2SLS-IV) specification to test for the impact of hospitalizations on performance.

As predicted, country-wide variables are strong predictors of CEOs' time spent hospitalized. The value of the univariate first-stage F-test is over 70 (results not shown). Using this first-stage variation, we confirm that CEO hospitalization events have a negative effect on operating profitability. The IV estimates shown in Table V, Columns III and IV indicate that the effect of the number of days a CEO spends in the hospital is in the 0.1 percentage point range or 2.5 times the estimates reported in other specifications, significant at the 10% level. An analysis based on the 10 day hospital stay indicator variable shown in Column V arrives at similar conclusions. As is common with IV-2SLS specifications, standard errors are substantially larger than those obtained using fixed effects models because IV estimates rely on a fraction of the data to generate the estimates of interest. As a result, we cannot reject the hypothesis that the OLS fixed effect estimates are different than those reported in this alternative specification.

An alternative potential concern with the analysis is that hospital stays may be anticipated and, as a result, we may not be capturing the direct effect of CEO hospitalizations. To address this issue, and to capture the effect of the first hospitalization event occurring to a CEO during the sample period, we set to zero those hospitalization events that occurred to CEOs who had had a previous hospital stay since 1995. Table V, Column VI shows that the effect of the duration of CEO hospitalization on performance is indeed larger in absolute value in the specification without firm controls, but it is unchanged relative to other estimates once we control for firm characteristics (Column VII).

¹² 99 diagnosis based on the International Classification of Diseases of the World Health Organization.

Overall, the results show that CEO hospitalizations lead to large and significant declines in profitability. These findings provide novel evidence that varying CEO exposure affects performance when controlling for firm-CEO fixed effects, which is a new result in the literature. Moreover, we demonstrate that the results are robust to the inclusion of a battery of controls and specifications. However, while the evidence presented weakens the case that our results are driven by selection in the number of days a CEO is in the hospital, our tests are thus far silent about the potentially mechanical connection between CEO hospitalizations and profitability. Namely, if hospitalizations lead to higher medical bills, the correlation between hospitalization and profits may hold even in a setting where CEOs are irrelevant for performance.

As we previously argued, an attractive feature of our empirical setting is the dominant presence of the public sector in the provision of health services. Data from the OECD shows that for each year between 2005 and 2009, the share of hospital expenditures that was financed by general government expenditures was 95%.¹³ Still, to address these concerns more directly we now examine alternative outcome variables that are not directly affected by medical expenses.

D. Alternative Outcome Variables

In Table VI, we investigate the impact of CEO hospital shocks on net income, sales, total assets, and investment rates, both in the concurrent and immediately prior years. For each variable we rely on firm-CEO fixed effect specifications, with and without time-varying firm controls. Moreover, we report clustered (firm) standard errors to relax the assumption that multiple observations from the same firm are uncorrelated.

As with OROA, net income also declines as a function of the number of days the CEO is hospitalized. The negative effect of hospitalizations on earnings reported in Table VI, Columns I and II, is both economically and statistically significant. A 10 day hospitalization leads to a decline in net income of 5%. Net income, however, may also reflect incremental medical expenses.

The results presented in Table VI, Columns II and IV show that CEO hospitalizations also have a negative effect on firm sales. Both concurrent and lagged hospital stays significantly affect

¹³ Source: stats.oecd.org.

revenues. These findings suggest that the results reported capture the effect of convalescent CEOs whose productive capacity is at least temporarily affected. An increase in medical expenses resulting from hospitalization events cannot, by itself, explain why revenue declines when CEOs are hospitalized.

Columns V to VIII of Table VI show the effect of CEO hospitalization on the level of assets and the rate of investment growth. Both concurrent and lagged hospital stays negatively affect the level of assets. In particular, a 10 day hospitalization event leads to a reduction in assets of at least 1.2%, significant at the 1% level. Lagged hospital shocks also affect assets, with estimates that are at least half of those for concurrent values of that variable. Finally, the number of days that a CEO is hospitalized also has a negative effect on investment rates. Given the discretionary nature of investment, it is not surprising that such estimates are economically larger relative to other variables: a 10 day hospital stay leads to a decline in investment rates of 0.8-0.9 percentage points or at least 16%.

III. Are CEOs Unique? A Placebo Test Using Senior Managers' Hospitalization Events

The evidence presented in Tables III to VI shows a striking connection between the personal health of a firm's chief executive and its performance. In this section, we test whether CEOs are unique, or if the effects reported for CEOs also apply to other senior executives. To assess this issue empirically, we test whether the hospitalization events of senior managers have significant consequences for profitability, revenue, and investment policies.

To identify senior executives, we use employment records that contain broad job classifications and we sort employees into three groups according to the seniority of their positions. The first group includes the most senior employees (classified as "top managers" or "high level managers"), the second group includes mid-level employees ("intermediate" positions) and, finally, the third group includes the rest (employees classified as performing "basic" or "other" jobs). Using these data, and for each firm-year, we randomly select an employee from the most senior category. With the identity of the senior employee in hand, we obtain matching hospitalization records using the same procedure we followed for the CEOs.

Table VII reports the impact of senior employees' hospitalization events on firm performance. In Columns I to III, we assess the impact of the number of days in the hospital on operating profitability, the benchmark performance measure used in the preceding section. Interestingly, the effect of a hospital stay by non-CEO executives reported in Column I, while negative, is indistinguishable from zero at conventional levels. We test for the effect of lagged (one and two year) hospitalization events (Column II), and for the effect of 1 and 10 day and longer hospitalization events (Column III). The results are also insignificant.

In Table VII, Columns IV and V, we report similar results for net income and revenue. In both cases, the estimated coefficients are negative but indistinguishable from zero at conventional levels. Lastly, we show that investment levels also exhibit insignificant effects.

Taken together, this evidence provides a compelling case for the importance of CEOs for firm performance. Furthermore, the placebo tests shown stress the uniqueness of the CEOs' contributions. These combined results make a strong empirical case for the importance of a comprehensive CEO succession and contingency plan. As we document, the organizational disruption costs that are triggered by even partial CEO illness or disability can be substantial.

IV. CEO Hospitalization Events and Firm Performance

Having established the importance of CEOs for firm prospects, we examine the environments in which CEOs affect performance the most. To this end, we divide event firms into groups based on CEO, firm, and industry traits. As before, we explore the consequences of CEO hospitalizations on OROA, net income, revenue, sales, and investment rates.

In the interest of conserving space, in Table VIII and IX we only report the estimated coefficient of the key variable of interest, i.e., the number of days of hospitalization. Also, to allow for lagged effects, in this section we redefine this variable to include the number of days in the hospital in the concurrent plus immediately prior years. In consequence, each estimated coefficient in these tables corresponds to a separate fixed firm-CEO specification. Results are unchanged when we separately include these variables. As before, we rely on firm-CEO fixed effects to stress deviations in performance that compare each CEO-firm match to the same CEO-firm combination in periods

without a hospitalization. All specifications include controls for year effects, firm size, and mean industry profitability.

A. CEO Characteristics

Table VIII, Panel A examines the impact of the number of days a CEO is hospitalized on subsamples grouped by the tenure of the CEO at the time of the initial hospital event. The first row in Table VIII reports the impact of CEO hospitalization events on firms with relatively new CEOs. For all performance measures other than investment rate, we show that CEO hospitalizations have an insignificant effect on outcomes for these firms. In contrast, the second row in Panel A shows that for firms with CEOs who had been at the helm for 3 to 7 years prior to their hospitalization, performance—including profitability, revenue, and investment—consistently declines when their CEOs are hospitalized. These drops in performance are significant at the 1% level. The third row in Panel A reports insignificant effects on profitability (OROA and net income) for long-tenured CEOs. However, the estimated coefficients are larger in absolute value, suggesting that there is larger heterogeneity in this subsample. Such evidence is consistent with the idea that a fraction of long-tenured CEOs are entrenched and difficult to fire, while others are highly valuable. Sales and asset tests also yield mixed results. While revenue increases around long-tenured CEO hospitalizations, suggesting that some firms may benefit from these events; assets exhibit significant declines, suggesting the opposite.

To further explore the effect of CEO tenure, in Table VIII, Panel B, we split firms based on whether their CEOs have served past a normal retirement age. However, we find that fewer than 10% of the event firms faced initial hospitalization events after their CEO was 64 years of age or older. The results in the first row in Table B, shows insignificant effects on those firms.

We also explore whether the results that CEO hospitalizations affect performance can be explained by CEO deaths, which would mean that our findings are not strictly new. To assess this issue, we focus on those firms where a CEO died during the sample period. We identify 176 CEO deaths, and we then separately analyze the hospitalization effects for those firms with at least one CEO death (1,711 firm-years). The results, shown in Table VIII, Panel C, indicate that the effect of CEO hospitalization on outcomes is not obtained in that subsample. These results reinforce the idea

that the hospitalization-performance tests presented in this paper are uncovering a thus far unexplored link between CEOs and firm performance.

Table VIII, Panel D presents the results obtained by splitting the sample firms based on the education of their CEOs. We find that firms with college-educated CEOs suffer significant declines in all performance measures when their CEOs are hospitalized. Assuming education proxies for managerial talent, such evidence is consistent with the idea that highly talented CEOs are particularly valuable. In contrast, we find significant effects only on assets and investments in the subsample of non-college-educated CEOs.

As a whole, the results of the analysis of CEO characteristics stress that robust managerial effects are found in settings where CEOs are relatively young, college educated, and with intermediate CEO tenures. Additionally, and importantly, we are able to rule out the hypothesis that the results shown are a consequence of CEO deaths, which have been explored in the literature at least since Johnson et al (1985). We examine industry and firm traits next.

B. Industry and Firm Characteristics

In Table IX, Panel A, we test whether the industry environment in which the firm operates has a bearing on the results by investigating the cost of having a hospitalized CEO in settings where the industry is rapidly expanding. To this end, we split firms into two groups based on the aggregate asset growth of its industry (4-digit NACE code) during the sample period. The results, reported in the first row of Panel A, indicate that firms that operate in the top half of industry growth exhibit significant performance declines whenever their CEOs are hospitalized; OROA, net income, revenue, assets, and investment rates are all negatively and significantly affected. In contrast, firms in moderate growth industries exhibit less robust effects. While these firms' profitability is significantly depressed by CEO hospital stays, revenue and investment are not robustly affected. These latter results may indicate that CEO actions in low growth industries are potentially more influential in reducing costs rather than in expanding operations. Thus, having a sick CEO hurts profits but leaves unaffected the scale of operations.

In Table IX, Panel B, we split event firms into two groups based on their firm-level investment rate (up to five year averages, where the data is available) prior to the first hospitalization event. Following the logic in Panel A, we explore whether firms that are engaged in significant

expansion campaigns are more likely to suffer significant effects on performance when their CEOs are in the hospital. The results, shown in Panel B, confirm that the performance of high growth firms deteriorates when their CEOs are hospitalized. In contrast, firms in the bottom half of the growth distribution show mixed results. OROA significantly declines, consistent with the idea that CEOs may be crucial for cost cutting in those environments. However, revenue is unaffected, while assets decline with CEO hospital stays.

The results presented in Tables IX and X provide suggestive evidence of the settings in which CEO succession and contingency plans may have the most meaningful effect on performance. For example, the evidence shows that CEOs systematically influence firm outcomes when they are relatively young or when the firm is in a high growth environment. The evidence shows that succession plans are extremely valuable in those settings. Furthermore, the results also stress specific variables that may be targeted in designing contingency plans. For example, shielding cost cutting initiatives relative to other policies may be crucial for firms operating in low growth environments.

C. CEO Turnover

The basic tenet of this paper is that hospitalizations affect the productive capacity of CEOs. The evidence thus far presented is consistent with this premise, as it demonstrates that firms whose CEOs experience hospital stays underperform relative to both their peers and their own performance in years without hospital shocks. A further test of this idea is to investigate whether CEO hospitalizations affect turnover decisions. If, as predicted, the effectiveness of CEOs is at least partially reduced by hospitalizations, we would expect that those executives who experience a hospital stay are more likely to exit the labor force than other executives.

In Table X, we examine the impact of the number of days of hospitalization on CEO turnover outcomes in the subsequent year using both probit (Columns I to IV, which report marginal effects) and fixed-effects specifications (Columns V to VIII). The results show that CEO hospitalizations have a significant effect on CEO turnover that is both economically large and statistically significant. Univariate results, shown in Column I, indicate that 10 day hospital stays lead to a 1.1 percentage point increase in the probability that a CEO is replaced, significant at the 1% level. Economically, this estimate implies an increase in the probability of a CEO turnover of over 25% (turnover occurs in 4% of the firm-year observations).

In Table X, Column II, we show that including controls for firm size and profitability, CEO tenure and age, and industry performance reduces the marginal effects of hospitalizations by almost half: from 0.11 to 0.06 percentage points per day, but it remains significant at the 1% level. Economically, the estimates imply that a 10-day hospital stay would increase the probability of a CEO turnover by 15%.

Beyond hospitalization effects, the impact of additional variables on turnover is as expected: when controlling for industry profitability, more profitable and larger firms are less likely to replace their CEOs, while older executives with longer tenure are more likely to be removed. Lastly, fixed effects estimates, reported in Columns V to VII, show that probit estimates are not driven by time-invariant firm characteristics.

In Table X, Columns III and IV, we examine the duration of hospitalization's effect on turnover events, and explore the robustness of the results to changes in the definition of a health shock. Column III shows that hospital stays do not systematically affect CEO turnover two years after the event. Column IV shows that 10 to 29 day hospitalizations increase the probability of CEO turnover by 2.4 percentage points, significant at the 1% level. The effect of longer than 30 day hospital stays, however, is not significant at the margin. This result suggests that firms react and replace their CEOs when they have been away from the office for spells of up to a month.

The evidence indicates that even moderate-length hospitalizations trigger economically large and statistically significant increases in the probability of CEO turnover, confirming the notion that a CEO's effectiveness is diminished by these shocks. This is the first systematic evidence that a continuous variable reflecting the productive ability of CEOs, such as the number of days hospitalized, affects CEO turnover decisions.

Given the results shown in Table X, it is relevant to explore whether the performance results reported in this paper hold for those firms without CEO turnover events. Such tests are important, as an established line of research has shown the relevance of CEO turnover events for performance (Weisbach (1988), Parrino, (1997), Huson et al. (2001), and Jenter, and Kanaan (2010), among others). In contrast, relatively little is known about whether variation in CEO exposure within firm-CEOs pairs matters in the absence of CEO turnover. This latter setting is particularly interesting as turnover events coincide with periods of high business uncertainty, complicating inference about the direct effect of CEOs on performance.

To evaluate this empirically, in Table XI we reexamine the analyses shown in Tables IV to VI focusing solely on non-turnover firms. In these tests, we omit firms that experienced both a hospitalization and a turnover event. The results, reported in Table XI, show an across-the-board negative effect of hospitalizations on profits, size, and investments of non-turnover firms. Furthermore, the estimated coefficients are virtually identical to those reported in previous analyses. In other words, changes in CEO exposure resulting from hospital stays significantly affect firm performance even in the absence of CEO turnover events.

Overall, these results highlight two important contributions to the extant literature. First, holding firm and CEO matches constant, CEO exposure has an economically and statistically important effect on performance. Second, CEO hospitalizations, even relatively short hospital stays, lead to drastic increases in the probability of observing a CEO turnover event. This latter result is important because CEO turnover events are a revealed preference test on the idea that hospitalizations undermine the productive ability of CEOs.

V. *Conclusions*

Chief executive officers play a central role in theoretical and empirical work in financial economics. At the core of the optimal contracting literature lies the notion that CEOs' actions have a meaningful effect on firm performance, holding constant firm and CEO characteristics. Yet, establishing these effects has proved empirically challenging.

Using a novel dataset containing individual hospitalization records from Denmark, this paper exploits variation in firms' CEO exposure, resulting from the number of days he or she is hospitalized, to estimate the effect of CEOs on firm performance. We posit that hospitalization events tend to negatively affect managers' ability to perform their role as CEOs, and we therefore use hospitalizations as a proxy for lower CEOs effectiveness, at the margin. To our knowledge, this is the first empirical study that tests for the effect of CEOs using firm and CEO fixed effects. As a result, we are able to provide an empirical estimate of the value of CEOs that closely resembles the theoretical benchmark of interest.

Our results demonstrate that CEOs play a central role in organizations. The evidence shows that hospitalizations lead to significant declines in a broad set of performance measures. We also show that CEOs are unique: identical shocks to other senior manager do not affect firm outcomes. Furthermore, the costs of having a hospitalized CEO are particularly robust in settings where the value of managerial discretion is high, as expected. Finally, our results emphasize the importance of comprehensive CEO succession and contingency plans.

Whether our evidence generalizes to settings where CEOs' actions are changed in response to contractual incentives, or other countries, are fascinating issues for further research.

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TABLE I. SUMMARY STATISTICS

This table presents firm characteristics for non-financial, non-utility public limited liability firms in Denmark (A/S) between 1995 and 2007. Firms are classified as: (a) *event* firms (Column II) in cases where their chief executive officer (CEO) was hospitalized at least one day during the sample period according to data from Statistics Denmark, (b) *non-event* (Column III), otherwise. *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. Revenue (omsætning) is the value of sales in Danish Kroner (DKK) in millions (constant 2008 DKK). *Ln assets* is the natural logarithm of the total book value of assets in millions (2008 DKK). *Ln employment* is the natural logarithm of the total number of employees. *Investment rate* is the rate of growth of total assets. *Firm age* is calculated using the earliest of the year of establishment, registration, or the firms' bylaws. *CEO age* is determined based on information from the Danish Civil Registration System. Standard errors are shown in parentheses.

Variable	All	Event Firms	Non-Event Firms	Difference (II)-(III)
	(I)	(II)	(III)	(IV)
<i>Operating return on assets (OROA)</i>	0.0939 (0.0010)	0.0951 (0.0015)	0.0931 (0.0013)	0.0020 (0.0020)
<i>Net income to assets</i>	0.0555 (0.0008)	0.0566 (0.0012)	0.0548 (0.0010)	0.0018 (0.0016)
<i>Industry-adjusted OROA</i>	-0.0001 (0.0010)	0.0014 (0.0015)	-0.0012 (0.0013)	0.0026 (0.0019)
<i>Revenue</i>	125.6788 (5.4494)	125.7473 (10.2066)	125.6339 (6.0553)	0.1133 (11.8667)
<i>Ln assets</i>	3.2121 (0.0135)	3.1997 (0.0221)	3.2202 (0.0171)	-0.0205 (0.0279)
<i>Ln employment</i>	3.5059 (0.0104)	3.4916 (0.0167)	3.5153 (0.0133)	-0.0237 (0.0214)
<i>Investment rate</i>	0.0529 (0.0009)	0.0493 (0.0014)	0.0553 (0.0012)	-0.0060 *** (0.0019)
<i>Firm age</i>	26.4925 (0.2326)	27.7356 (0.3846)	25.6785 (0.2907)	2.0571 *** (0.4821)
<i>CEO age</i>	50.9382 (0.0866)	52.2394 (0.1401)	50.0863 (0.1085)	2.1531 *** (0.1772)
Number of observations	76,354	30,211	46,143	
Number of firms	8,798	3,125	5,673	

***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

TABLE II. NUMBER OF DAYS OF HOSPITAL STAY AND MEDICAL CONDITIONS

This table presents hospitalization data for Chief Executive Officers (CEOs) of non-financial, non-utility public limited liability firms in Denmark (A/S) between 1995 and 2007. Data are classified by medical condition (main sickness) based on the *International Classification of Diseases* of the World Health Organization. Hospital data are constructed based on records from Statistics Denmark, which reports the number of days that an individual was hospitalized and reported as sick in a year.

Main Medical Condition	Number of Days of Hospital Stay					
	All	1	2-4	5-9	10-19	over 20
	(I)	(II)	(III)	(IV)	(V)	(VI)
All firm-years	76,354					
No hospital stay	71,411					
Hospital stay	4,943	1,921	1,441	846	478	257
Infectious and parasitic diseases	120	27	43	28	15	7
Neoplasms	374	90	88	73	56	67
Endocrine, nutritional and metabolic diseases, and immunity disorders	64	15	19	24	4	2
Diseases of the blood / blood-forming organs	16	6	3	2	3	2
Mental disorders	26	10	8	5	2	1
Diseases of the nervous system / sense organs	234	89	76	42	18	9
Diseases of the circulatory system	1026	270	284	229	168	75
Diseases of the respiratory system	242	86	87	35	23	11
Diseases of the digestive system	610	237	190	106	58	19
Diseases of the genitourinary system	319	112	113	69	18	7
Pregnancy, childbirth, post-natal complications	5	5	0	0	0	0
Diseases of the skin and subcutaneous tissue	81	31	26	12	6	6
Diseases of the musculoskeletal system and connective tissue	416	172	100	79	45	20
Congenital anomalies	18	9	4	2	3	0
Symptoms, signs, and ill-defined conditions	836	486	242	73	23	12
Injury and poisoning	556	276	158	67	36	19

TABLE III. NUMBER OF DAYS OF HOSPITAL STAY AND FIRM PERFORMANCE: TABLE OF MEANS

This table presents: (1) average performance measures as a function of the number of days that a firm's CEO stayed in the hospital in a given year (Panel A), (2) differences of means analysis (Panel B), and (3) results from quantile (median) regressions (Panel C). Performance measures include: (a) OROA: operating return on assets (Column I), the ratio of operating income to total assets, (b) Industry-adjusted OROA (Column II): the difference between a firm's OROA and the average of its four-digit NACE (European industry classification system) industry benchmark, and (c) Industry-adjusted net income (Column III): the difference between a firm's net income to assets ratio and the average of its four-digit NACE benchmark. Industry averages are calculated using firm-year observations where CEOs were not hospitalized. Hospital day data are constructed based on hospitalization records from Statistics Denmark, which reports the number of days that an individual was hospitalized and reported as sick in a year. Standard errors are shown in parentheses.

	Firm-Years	Dependent variables		
		OROA	Ind Adj. OROA	Ind. Adj. NI/Assets
		(I)	(II)	(III)
All firm-years	76,354	0.0939 (0.0010)	-0.0001 (0.0010)	-0.0002 (0.0007)
<i>Panel A. By number of days of hospital stay</i>				
A. 0 days	71,411	0.0941 (0.0010)	0.000002 (0.0010)	-0.0001 (0.0008)
B. 1 day	1,921	0.0964 (0.0033)	0.0023 (0.0033)	0.0038 (0.0027)
C. 2-4 days	1,441	0.0974 (0.0036)	0.0027 (0.0036)	0.0020 (0.0031)
D. 5-9 days	846	0.0830 (0.0044)	-0.0098 (0.0044)	-0.0100 (0.0037)
E. 10-19 days	478	0.0770 (0.0055)	-0.0143 (0.0055)	-0.0098 (0.0049)
F. At least 20 days	257	0.0785 (0.0089)	-0.0167 (0.0089)	-0.0149 (0.0076)
G. 0-4 days, all firms (A+B+C)	74,773	0.09419 (0.00098)	0.00011 (0.00096)	0.00003 (0.00075)
H. 0-4 days, event firms	28,630	0.0959 (0.0015)	0.0022 (0.0015)	0.0021 (0.0012)
I. At least 5 days (D+E+F)	1,581	0.0805 (0.0034)	-0.0123 (0.0034)	-0.0107 (0.0029)
<i>Panel B. Differences of Means</i>				
J. 1 vs. 0 days (B) minus (A)		0.0023 (0.0032)	0.0023 (0.0032)	0.0039 (0.0027)
K. At least 5 days minus 0-4 days (I) minus (G)		-0.0137 *** (0.0034)	-0.0124 *** (0.0034)	-0.0108 *** (0.0029)
L. At least 5 days minus 0-4 days, event firms only, (I) minus (H)		-0.0154 *** (0.0033)	-0.0144 *** (0.0033)	-0.0128 *** (0.0029)
<i>Panel C. Median Analysis</i>				
M. 1 vs. 0 days		0.0040 (0.0025)	0.0020 (0.0022)	0.0027 (0.0019)
N. At least 5 days minus 0-4 days		-0.0076 *** (0.0027)	-0.0079 *** (0.0025)	-0.0062 *** (0.0021)
O. At least 5 days minus 0-4 days, event firms only		-0.0083 *** (0.0026)	-0.0088 *** (0.0024)	-0.0074 *** (0.0022)

***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

TABLE IV. THE IMPACT OF CEO HOSPITALIZATION EVENTS ON FIRM PERFORMANCE

This table examines the impact of CEO hospitalization events on firm operating performance. The dependent variable is *operating return on assets* (OROA), defined as the ratio of operating income to total assets. Hospital day data are constructed based on records from Statistics Denmark, which reports the number of days that an individual was hospitalized and reported as sick in a given year. *N days of hospital stay, t*, is the number of days of hospital stay for a CEO in a given year. *N days of hospital stay, t-1 and t-2*, are the number of days of hospital stay for a CEO in the year (two years) prior, respectively. *At least 1, 5, 10 and 30 days hospitalized*, are indicator variables equal to one if a given CEO experienced a hospital stay of 1, 5, 10, or 30 days, respectively, in a given year, zero otherwise. Other controls where shown include: (i) *Ln assets*: the natural logarithm of the lagged value of total assets (in DKK millions), (ii) *Ln employment*: the natural logarithm of the lagged value of number of employees, (iii) *Industry OROA*: the average operating return on assets of the firm's four-digit NACE industry benchmark, (iv) *CEO age*: the age of the incumbent CEO, and (v) *Firm age*: calculated using the earliest of the year of establishment, registration, or the firms' bylaws. Each column shows the results of a separate fixed effect regression using, respectively: (a) firm fixed effects (Columns I and II), and (b) firm-CEO fixed effects (Columns III to VII). Clustered (firm) standard errors are shown in parentheses.

Dependent variable: Operating Return on Assets (OROA)							
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)
<i>N days of hospital stay, t</i>	-0.0004 *** (0.0001)	-0.0004 *** (0.0001)	-0.0004 *** (0.0001)	-0.0004 ** (0.0001)	-0.0004 *** (0.0001)		
<i>N days of hospital stay, t-1</i>				-0.0002 ** (0.0001)	-0.0003 *** (0.0001)		
<i>N days of hospital stay, t-2</i>					-0.0001 (0.0001)		
<i>At least 1 day hospitalized, t</i>						0.0030 (0.0019)	0.0023 (0.0018)
<i>At least 5 days hospitalized, t</i>						-0.0072 ** (0.0032)	
<i>At least 10 days hospitalized, t</i>							-0.0112 *** (0.0039)
<i>At least 30 days hospitalized, t</i>						-0.0110 (0.0116)	-0.0066 (0.0117)
<i>Ln assets</i>		-0.0222 *** (0.0024)	-0.0241 *** (0.0026)	-0.0241 *** (0.0026)	-0.0241 *** (0.0026)	-0.0240 *** (0.0026)	-0.0240 *** (0.0026)
<i>Ln employment</i>		0.0017 (0.0021)	0.0019 (0.0022)	0.0019 (0.0022)	0.0018 (0.0022)	0.0018 (0.0022)	0.0018 (0.0022)
<i>Industry OROA</i>		0.8914 *** (0.0370)	0.8895 *** (0.0386)	0.8896 *** (0.0386)	0.8897 *** (0.0386)	0.8895 *** (0.0386)	0.8891 *** (0.0386)
<i>CEO age</i>		-0.0006 *** (0.0001)	-0.0008 *** (0.0003)	-0.0008 *** (0.0003)	-0.0007 *** (0.0003)	-0.0008 *** (0.0003)	-0.0008 *** (0.0003)
<i>Firm age</i>		-0.0001 (0.0002)					
Year controls	No	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effect	Firm	Firm	Firm-CEO	Firm-CEO	Firm-CEO	Firm-CEO	Firm-CEO
Number of firm-years	76,354	76,354	76,354	76,354	76,354	76,354	76,354
R-squared	0.4791	0.5031	0.5440	0.5440	0.5441	0.5440	0.5440

***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

TABLE V. CEO HOSPITALIZATION EVENTS AND FIRM PERFORMANCE: ALTERNATIVE SPECIFICATIONS

This table examines the impact of CEO hospitalization events on operating return on assets (OROA). OROA is defined as the ratio of operating income to total assets. *N days of hospital stay*: is the number of days of hospital stay for a CEO in a given year. *At least 10 days hospitalized*: is an indicator variable equal to one if a given CEO experienced a hospital stay of 10 days in a given year, zero otherwise. Columns I and II show results for CEO hospitalization events occurring to the individual that was reported as CEO of the firm as of November of the prior year. Columns III to V show results of IV-2SLS specifications in which the number of days of hospital stay occurring to the individual that was reported as CEO of the firm in a given year is instrumented by the fraction of patients that spend at least 10 days at the hospital for a given medical condition (99 diagnosis) between 1995 and 2007 for the entire Danish population. Columns VI and VII show results for CEO hospitalization events occurring to the individual that was reported as CEO of the firm in a given year, except for hospitalization events that occur to CEOs who had a previous hospital stay since 1995, which are set to zero. Columns VI and VII seek to capture the effect of the first hospitalization event occurring to a CEO during the sample period. Additional controls in Columns II, IV, V, and VII include (estimated coefficients are not shown): (i) *Ln assets*: the natural logarithm of the lagged value of total assets (in DKK millions), (ii) *Ln employment*: the natural logarithm of the lagged value of number of employees, (iii) *Mean industry OROA*: the average operating return on assets of the firm's four-digit NACE industry benchmark, and (iv) year indicator variables. Each column shows results for a separate fixed effect (firm-CEO) specification. The number of observations in Columns I and II reflects the additional requirement of identifying a CEO using data from a year prior. In Columns III to V, nine observations for which no within firm variation exists drop from the analysis. Clustered (firm) standard errors are shown in parentheses.

Dependent variable: Operating Return on Assets (OROA)							
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)
<i>N days of hospital stay</i>	-0.0004 *** (0.0001)	-0.0004 ** (0.0002)	-0.0011 * (0.0006)	-0.0010 * (0.0006)		-0.0005 *** (0.0002)	-0.0004 ** (0.0002)
<i>At least 10 days hospitalized</i>					-0.0337 * (0.0204)		
Year controls	No	Yes	No	Yes	Yes	No	Yes
Firm controls	No	Yes	No	Yes	Yes	No	Yes
Firm-CEO fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IV-2SLS	No	No	Yes	Yes	Yes	No	No
Number of firm-years	65,038	65,038	76,345	76,345	76,345	76,354	76,354

***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

TABLE VI. THE IMPACT OF CEO HOSPITALIZATION EVENTS ON FIRM PERFORMANCE: ALTERNATIVE OUTCOME VARIABLES

This table examines the impact of CEO hospitalization events on: (a) *Net income/assets* (Columns I and II): the ratio of net income to total assets, (b) *Ln revenue* (Columns III and IV): the natural logarithm of sales in DKK millions, (c) *Ln assets* (Columns V and VI): the natural logarithm of total book value of assets in DKK millions, and (d) *Investment rate* (Columns VII and VIII): the rate of growth of total assets. *N days of hospital stay, t*, is the number of days of hospital stay for a CEO in a given year. *N days of hospital stay, t-1* is the number of days of hospital stay for a CEO in the prior year. All specifications include year indicator variables as controls (results not shown). Additional controls in Columns II, IV, VI and VII include: (i) *Ln employment*: the natural logarithm of the lagged value of number of employees, and (ii) *Mean industry net income to assets ratio*: the mean ratio of net income to total assets of the firm's four-digit NACE industry benchmark (estimated coefficients are not shown). Columns II, IV, and VIII also include *Ln assets*: the natural logarithm of the lagged value of total assets (in DKK millions) as an additional control variable. Each column shows results for a separate fixed effect (firm-CEO) specification. Clustered (firm) standard errors are shown in parentheses.

	Dependent variables							
	Net income / Assets		Ln Revenue		Ln Assets		Investment Rate	
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
<i>N days of hospital stay, t</i>	-0.0003 ** (0.0001)	-0.0003 *** (0.0001)	-0.0006 * (0.0004)	-0.0006 * (0.0003)	-0.0012 *** (0.0004)	-0.0013 *** (0.0003)	-0.0008 *** (0.0003)	-0.0009 *** (0.0002)
<i>N days of hospital stay, t-1</i>	-0.0001 (0.0001)	-0.0001 (0.0001)	-0.0007 ** (0.0003)	-0.0005 ** (0.0002)	-0.0008 *** (0.0003)	-0.0007 *** (0.0002)	-0.0002 (0.0003)	-0.0004 (0.0003)
Year controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	Yes	No	Yes	No	Yes	No	Yes
Firm-CEO fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of firm-years	76,354	76,354	76,354	76,354	76,354	76,354	76,354	76,354
R-squared	0.4917	0.5050	0.9260	0.9533	0.9490	0.9588	0.2025	0.3060

***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

TABLE VII. ARE CEOs UNIQUE? OTHER MANAGERS' HOSPITALIZATION EVENTS AND FIRM PERFORMANCE

This table examines the impact of senior manager's (non-CEO) hospitalization events on: (a) *Operating return on assets* (OROA) (Columns I to III): the ratio of operating income to total assets, (b) *Net income to assets* (Column IV): the ratio of net income to total assets, (c) *Ln revenue* (Column V): the natural logarithm of sales in DKK millions, (d) *Ln assets* (Column VI): the natural logarithm of total book value of assets in DKK millions, and (e) *Investment rate* (Column VII): the rate of growth of total assets. Hospital day data are constructed based on records from Statistics Denmark, which reports the number of days that an individual was hospitalized and reported as sick in a given year. For each firm-year observation, we: (1) use employment data and randomly select a non-CEO senior manager, and (2) obtain matching hospitalization data from Statistics Denmark. *N days of hospital stay, t*, is the number of days of hospital stay for the randomly selected senior manager in a given year. *N days of hospital stay, t-1 and t-2*, are the number of days of hospital stay for the randomly selected senior manager in the year (two years) prior, respectively. *At least 1 and 10 days hospitalized*: are indicator variables equal to one if the randomly selected senior manager experienced a hospital stay of 1 or 10 days, respectively, in a given year, and zero otherwise. All specifications include the following variables as controls (estimated coefficients not shown): (i) *Ln assets*: the natural logarithm of the lagged value of total assets in DKK millions (except for Column VI, where it is omitted), (ii) *Ln employment*: the natural logarithm of the lagged value of number of employees, (iii) *Mean industry OROA*: the average operating return on assets of the firm's four-digit NACE industry benchmark, and (iv) year controls. Each column shows results for a separate fixed effect (firm) specification. Clustered (firm) standard errors are shown in parentheses.

	Dependent variables						
	OROA			NI/Assets	Ln Rev.	Ln Assets	Inv. Rate
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)
<i>N days of hospital stay, t</i>	-0.00020 (0.00017)	-0.00020 (0.00017)		-0.00007 (0.00016)	-0.00029 (0.00050)	-0.00069 (0.00044)	-0.00041 (0.00032)
<i>N days of hospital stay, t-1</i>		0.00023 (0.00023)					
<i>N days of hospital stay, t-2</i>		-0.00021 (0.00033)					
<i>At least 1 day hospitalized, t</i>			0.00375 (0.00288)				
<i>At least 10 days hospitalized, t</i>			-0.00972 (0.00741)				
Year controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of firm-years	76,354	76,354	76,354	76,354	76,354	76,354	76,354
R-squared	0.50266	0.50267	0.50267	0.45760	0.94732	0.95075	0.26392

***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

TABLE VIII. CEO HOSPITALIZATION EVENTS ON FIRM PERFORMANCE: CEO CHARACTERISTICS

This table examines the impact of CEO hospitalization events on firm performance when event firms are classified into subsamples based on a number of CEO's individual characteristics at the time of the initial hospitalization event (non-event firms are omitted from the analysis). The dependent variables are: (a) *Operating return on assets* (OROA) (Column I): the ratio of operating income to total assets, (b) *Net income to assets* (Column II): the ratio of net income to total assets, (c) *Ln revenue* (Column III): the natural logarithm of sales in DKK millions, (d) *Ln assets* (Column IV): the natural logarithm of total book value of assets in DKK millions, and (e) *Investment rate* (Column V): the rate of growth of total assets. Each estimated coefficient in the table reports the effect of *N days of hospital stay*, the number of days of hospital stay for a CEO in the current and immediately prior years on each of the outcome variables. Each estimated coefficient corresponds to a separate regression that results from a fixed effects (firm-CEO) specification. Individual characteristics include: (1) *CEO tenure* (Panel A): is the number of years since the individual first appears as CEO of the firm, (b) *CEO age* (Panel B): the age of the CEO at the time of the initial hospitalization event, (c) *CEO status* (Panel C): whether the CEO was alive or passed away during the hospitalization year based on data from the Danish Civil Registration System, and (d) *CEO education* (Panel D): whether or not the CEO obtained a college education based on data from Statistics Denmark. All specifications include the following variables as controls (estimated coefficients not shown): (i) *Ln assets*: the natural logarithm of the lagged value of total assets in DKK millions (except for Column IV, where it is omitted), (ii) *Ln employment*: the natural logarithm of the lagged value of number of employees, (iii) *Mean industry OROA*: the average operating return on assets of the firm's four-digit NACE industry benchmark, and (iv) year controls. Clustered (firm) standard errors are shown in parentheses.

	Firm-Years	Dependent variables				
		OROA (I)	NI/Assets (II)	Ln Revenue (III)	Ln Assets (IV)	Inv. Rate (V)
<u>Panel A. By CEO Tenure Characteristics</u>						
Tenure ≤ 2	8,406	-0.0002 (0.0003)	-0.00003 (0.0003)	-0.0003 (0.0006)	-0.0004 (0.0006)	-0.0008 ** (0.0004)
2 < Tenure ≤ 7	15,013	-0.0003 *** (0.0001)	-0.0003 *** (0.0001)	-0.0008 *** (0.0003)	-0.0009 *** (0.0002)	-0.0006 ** (0.0002)
Tenure > 8	6,792	-0.0005 (0.0004)	-0.0004 (0.0003)	0.0012 * (0.0007)	-0.0027 *** (0.0009)	-0.0005 (0.0006)
<u>Panel B. By CEO Age</u>						
Age ≥ 64	2,847	-0.0004 (0.0004)	-0.0004 (0.0003)	0.0004 (0.0008)	-0.0008 (0.0007)	-0.0003 (0.0004)
Age < 64	27,364	-0.0003 *** (0.0001)	-0.0002 ** (0.0001)	-0.0006 ** (0.0002)	-0.0010 *** (0.0002)	-0.0007 *** (0.0002)
<u>Panel C. By CEO Status</u>						
CEO passed away	1,142	-0.0001 (0.0004)	0.00001 (0.0003)	-0.0004 (0.0008)	-0.0001 (0.0009)	0.0001 (0.0005)
CEO is alive	29,069	-0.0003 *** (0.0001)	-0.0003 *** (0.0001)	-0.0005 ** (0.0002)	-0.0011 *** (0.0002)	-0.0007 *** (0.0002)
<u>Panel D. By CEO Education</u>						
College	9,492	-0.0004 *** (0.0001)	-0.0003 *** (0.0001)	-0.0005 ** (0.0002)	-0.0011 *** (0.0003)	-0.0005 ** (0.0002)
Non-College	20,719	-0.0002 (0.0002)	-0.0002 (0.0001)	-0.0005 (0.0004)	-0.0009 ** (0.0004)	-0.0007 *** (0.0003)

***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

TABLE IX. WHAT ACTIONS DO CEOs PERFORM?

This table examines the impact of CEO hospitalization events on firm performance when event firms are classified into subsamples based on their industry (Panel A) and firm (Panel B) relative growth prospects (non-event firms are omitted from the analysis). The dependent variables are: (a) *Operating return on assets* (OROA) (Column I): the ratio of operating income to total assets, (b) *Net income to assets* (Column II): the ratio of net income to total assets, (c) *Ln revenue* (Column III): the natural logarithm of sales in DKK millions, (d) *Ln assets* (Column IV): the natural logarithm of total book value of assets in DKK millions, and (e) *Investment rate* (Column V): the rate of growth of total assets. Each estimated coefficient in the table reports the effect of *N days of hospital stay*, the number of days of hospital stay for a CEO in the current and immediately prior years on each of the outcome variables. Each estimated coefficient corresponds to a separate regression that results from a fixed effects (firm-CEO) specification. In Panel A, event firms are classified into the “high” (low) industry growth grouping whenever the aggregate rate of growth in the industry (four-digit NACE classification) value of total assets was above (below) the median of the sample for the 1995-2007 period. In Panel B, event firms are classified into the “high” (low) firm growth category whenever the firm five-year average investment rate prior to the hospitalization event was above (below) the median. All specifications include the following variables as controls (estimated coefficients not shown): (i) *Ln assets*: the natural logarithm of the lagged value of total assets in DKK millions (except for Column IV, where it is omitted), (ii) *Ln employment*: the natural logarithm of the lagged value of number of employees, (iii) *Mean industry OROA*: the average operating return on assets of the firm’s four-digit NACE industry benchmark, and (iv) year controls. Clustered (firm) standard errors are shown in parentheses.

		Dependent variables				
		OROA	NI/Assets	Ln Revenue	Ln Assets	Inv. Rate
Firm-Years		(I)	(II)	(III)	(IV)	(V)
<i>Panel A. By Industry Growth</i>						
<i>High industry growth</i>	14,977	-0.0003 *** (0.0001)	-0.0002 ** (0.0001)	-0.0006 ** (0.0002)	-0.0012 *** (0.0003)	-0.0007 ** (0.0003)
<i>Low industry growth</i>	15,234	-0.0003 * (0.0002)	-0.0003 * (0.0002)	-0.0002 (0.0005)	-0.0003 (0.0005)	-0.0004 (0.0002)
<i>Panel B. By Firm Growth</i>						
<i>High firm growth</i>	15,102	-0.0003 ** (0.0001)	-0.0002 ** (0.0001)	-0.0008 *** (0.0003)	-0.0006 *** (0.0002)	-0.0007 *** (0.0003)
<i>Low firm growth</i>	15,109	-0.0005 ** (0.0002)	-0.0003 (0.0002)	0.0003 (0.0005)	-0.0016 *** (0.0006)	-0.0003 (0.0003)

***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

TABLE X. CEO HOSPITALIZATION AND CEO TURNOVER DECISIONS

This table examines the impact of CEO hospitalization events on CEO turnover. The dependent variable is *CEO Turnover*: an indicator variable equal to one whenever the CEO is replaced. *N days of hospital stay*: is the number of days of hospital stay for a CEO in a given year. *At least 10 and 30 days hospitalized*: are indicator variables equal to one if a given CEO experienced a hospital stay of 10, or 30 days, respectively, zero otherwise. t_{-1} and t_{-2} subscripts indicate hospitalization values corresponding to the year and two years prior, respectively, to the relevant firm-year observation. Other controls include: (i) $\ln assets_{t-1}$: the lagged value of the natural logarithm of total assets (in DKK millions), (ii) $OROA_{t-1}$ and $OROA_{t-2}$, the lagged and two-year lagged values of the ratio of operating income to total assets, (iii) *Industry OROA* t_{-1} : the lagged value of the average operating return on assets of the firm's four-digit NACE industry benchmark, (iv) *CEO tenure*: the number of years since the CEO first appears as such in the sample, and (v) *CEO age*: the age of the CEO. All specifications except for Columns I and V include year controls. Columns I to IV report changes in probabilities estimated using a maximum-likelihood probit model. Columns V to VIII report fixed effects (firm) estimates. Clustered (firm) standard errors are shown in parentheses.

	Dependent variable: CEO Turnover							
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
<i>N days of hospital stay</i> , t_{-1}	0.0011 *** (0.0003)	0.0006 *** (0.0002)	0.0006 *** (0.0002)		0.0028 *** (0.0009)	0.0020 *** (0.0007)	0.0020 *** (0.0007)	
<i>N days of hospital stay</i> , t_{-2}			0.0001 (0.0001)				0.0002 (0.0003)	
<i>At least 10 days hospitalized</i> , t_{-1}				0.0245 *** (0.0088)				0.0463 *** (0.0157)
<i>At least 30 days hospitalized</i> , t_{-1}				0.0195 (0.0125)				0.0375 (0.0311)
<i>Ln assets</i> , t_{-1}		0.0042 *** (0.0005)	0.0042 *** (0.0005)	0.0042 *** (0.0005)		-0.0091 *** (0.0030)	-0.0091 *** (0.0030)	-0.0092 *** (0.0030)
<i>OROA</i> , t_{-1}		-0.0283 *** (0.0058)	-0.0283 *** (0.0058)	-0.0280 *** (0.0058)		-0.0411 *** (0.0099)	-0.0411 *** (0.0099)	-0.0414 *** (0.0099)
<i>OROA</i> , t_{-2}		0.0016 (0.0060)	0.0016 (0.0060)	0.0015 (0.0059)		-0.0021 (0.0094)	-0.0021 (0.0094)	-0.0024 (0.0094)
<i>Industry OROA</i> , t_{-1}		0.0730 *** (0.0263)	0.0730 *** (0.0263)	0.0720 *** (0.0262)		0.1261 * (0.0661)	0.1258 * (0.0661)	0.1260 * (0.0661)
<i>Tenure</i>		0.0011 *** (0.0002)	0.0011 *** (0.0002)	0.0011 *** (0.0002)		0.0258 *** (0.0008)	0.0258 *** (0.0008)	0.0258 *** (0.0008)
<i>CEO age</i>		0.0015 *** (0.0001)	0.0015 *** (0.0001)	0.0015 *** (0.0001)		0.0032 *** (0.0003)	0.0032 *** (0.0003)	0.0032 *** (0.0003)
Year controls	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Specification	Probit	Probit	Probit	Probit	FE	FE	FE	FE
Number of firm-years	67,556	67,556	67,556	67,556	67,556	67,556	67,556	67,556

***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

TABLE XI. CEO HOSPITALIZATION EVENTS AND FIRM PERFORMANCE: EVIDENCE FROM NON-TURNOVER FIRMS

This table examines the impact of CEO hospitalization events on firm performance for the subsample that excludes observations in which the CEO is replaced after being hospitalized. The dependent variables are: (a) *Operating return on assets* (OROA) (Column I): the ratio of operating income to total assets, (b) *Net income to assets* (Column II): the ratio of net income to total assets, (c) *Ln revenue* (Column III): the natural logarithm of sales in DKK millions, (d) *Ln assets* (Column IV): the natural logarithm of total book value of assets in DKK millions, and (e) *Investment rate* (Column V): the rate of growth of total assets. *N days of hospital stay, t*, is the number of days of hospital stay for a CEO in a given year. *N days of hospital stay, t-1* is the number of days of hospital stay for a CEO in the prior year. All specifications include the following variables as controls (estimated coefficients not shown): (i) *Ln assets*: the natural logarithm of the lagged value of total assets in DKK millions (except for Column IV, where it is omitted), (ii) *Ln employment*: the natural logarithm of the lagged value of number of employees, (iii) *Mean industry OROA*: the average operating return on assets of the firm's four-digit NACE industry benchmark, and (iv) year controls. Each column shows results for a separate fixed effect (firm-CEO) specification. Clustered (firm) standard errors are shown in parentheses.

	Dependent variables				
	<i>OROA</i>	<i>NI/Assets</i>	<i>Ln Rev.</i>	<i>Ln Assets</i>	<i>Inv. Rate</i>
	(I)	(II)	(III)	(IV)	(V)
<i>N days of hospital stay, t</i>	-0.0004 ** (0.0002)	-0.0003 ** (0.0001)	-0.0006 * (0.0004)	-0.0010 *** (0.0003)	-0.0011 *** (0.0003)
<i>N days of hospital stay, t-1</i>	-0.0003 *** (0.0001)	-0.0002 * (0.0001)	-0.0005 *** (0.0002)	-0.0005 (0.0003)	-0.0004 (0.0003)
Year controls	Yes	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes	Yes
Firm-CEO fixed effects	Yes	Yes	Yes	Yes	Yes
Number of firm-years	73,388	73,388	73,388	73,388	73,388
R-squared	0.5432	0.5018	0.9521	0.9771	0.3041

***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.