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Does CEO fitness matter?

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does CEO fitness matter?

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centre for financial research
Look deeper

Does CEO Fitness Matter?[◇]

Peter Limbach[†] and Florian Sonnenburg^{††}

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ABSTRACT

This study provides evidence suggesting that CEOs' physical fitness has a positive impact on firm value, consistent with the beneficial effects of fitness on, e.g., cognitive functions, stress coping and job performance. For each of the years 2001 to 2011, we define S&P 1500 CEOs as fit if they finish a marathon. CEO fitness is also associated with higher firm profitability and higher M&A announcement returns. Our identification strategy includes CEO-firm fixed effects, instrumental variables, permutation tests, random effects, and time-varying CEO, firm and industry effects. An additional analysis of sudden CEO deaths, based on a fitness measure not limited to running, confirms our results.

JEL classification: G32, G34, J24

Keywords: CEO heterogeneity, firm value, mergers and acquisitions, physical fitness

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“While marathon training and predawn workouts aren’t explicitly part of a senior manager’s job description, leadership experts and executive recruiters say that staying trim is now virtually required for anyone on the track for the corner office. Because the demands of leadership can be quite strenuous, the physical aspects are just as important as everything else [...]” (*The Wall Street Journal* „Want to Be CEO? What’s Your BMI?”, January 16, 2013)

Physical fitness likely plays an important role for CEOs as they face increasingly high levels of demands and responsibilities (Hambrick, Finkelstein, and Mooney (2005), Lovelace, Manz, and Alves (2007), and Neck, et al. (2000)). Their job is characterized by high work stress, far-reaching decisions, frequent media and shareholder scrutiny, changing schedules, and frequent global travel. However, despite many documented benefits of fitness, the CEO literature, based on Bertrand and Schoar (2003), has not addressed the question whether CEO fitness matters. This study attempts to provide a first answer to this question.

Physical fitness is likely to benefit CEOs as it moderates stress (e.g., Gal and Lazarus (1975), Brown (1991)) and promotes cognitive functions and executive-control processes (e.g., Colcombe and Kramer (2003), and Kramer, et al. (1999)), self-esteem (e.g., Fox (2000)), work behavior (e.g., Folkins and Sime (1981)), and performance (e.g., Coe, et al. (2006), and Rhea, Alvar, and Gray (2004)). Accordingly, fit CEOs can be expected to better stand their high work stress, to be less exhausted, more efficient and better performing, and to ultimately be associated with a higher firm value.

Consistent with the benefits of fitness, there has been a significant trend among CEOs to participate in endurance sports.¹ Examples of CEOs who run marathons include Jack Brennan (formerly Vanguard), Robert Iger (Walt Disney), Neal Keating (Kaman), Klaus Kleinfeld (Alcoa), John Legere (T-Mobile), or Steven Reinemund (formerly PepsiCo).

¹ See, for example, „Executive endurance” in *The Wall Street Journal MarketWatch* (October 4, 2007). The article reports about the increasing number of CEOs and high-ranked managers who run marathons. It states that “[...] for many CEOs, a motivation to keep running is that it leads to business success by reducing stress, creating a balance in their lives and fostering a mental toughness that can bring rewards in the boardroom.”

The trend among CEOs to participate in endurance activities, particularly running, can be explained by the nature of this sport: it can be done at virtually any place and any time, and without any teammates. Thus, running is a primary sport for CEOs, who likely have a high need for both flexibility and fitness.² In this regard, improving fitness is the most common reason to start running (Summers, et al. (1982)). Therefore, in this study we use hand-collected data on large U.S. marathons to measure CEO fitness. We document that an increasing number of CEOs run.

Using a panel of more than 9,500 firm-year observations between 2001 and 2011, we find that S&P 1500 CEOs who finish a marathon in a given year – denoted as *Fit CEOs* – are associated with a significantly higher firm value (measured by Tobin’s Q). This result is found on both univariate and multivariate level. Our analyses account for CEO and governance characteristics, firm characteristics, past performance, and year fixed effects. The positive relation between fit CEOs and firm value is found when we use (time-varying) industry fixed effects, firm fixed effects, random effects, or CEO-firm fixed effects. The latter is of particular importance in the context of our study as physical fitness might correlate with unobserved CEO characteristics such as innate talent, a military background (likely coupled with a high level of discipline), or other life or work experience gathered before the CEO took office. Although CEO-firm fixed effects cannot account for all unobserved CEO heterogeneity that might possibly affect firm value, they do at least considerably mitigate such concerns. Moreover, they also address concerns of endogenous CEO-firm matching.

² One may argue that CEOs do not have the time to do sports frequently and that shareholders want to see CEOs in the corner office, not in the gym. This point of view is in contrast to the anecdotal evidence which suggests that CEOs practice regularly. For example, the article “The fittest CEOs in America?” (*Fortune Magazine*, May 5, 2015) reports about CEOs who do sports several days a week. It cites Richard Branson, CEO of Virgin Group and a marathon finisher, who says that work out gives him four extra hours of productivity a day. In “Marathon running – A hobby of global CEOs” (in *Global CEO*), Rao (2006) lists CEOs of large, global firms who run several days a week. He states that “[...] running CEOs manage the challenge of time management.” For example: “Nike’s Bill Perez [...] is up at 4:00 a.m. He heads out, at 5:00, for a four-mile run [...]” and “Greg Brenneman of Burger King trains most mornings by 4:30 a.m. with an eight-mile run.”

Apart from unobserved heterogeneity, the major concern with our study is reverse causality. Specifically, one might argue that our results are driven by CEOs who can afford the time for physical activity when their firm has performed well, while their fitness actually does not matter for firm value. Although this concern is not backed by anecdotal evidence (see footnote 2), we address it in several ways. First, we do not find any significant relation between past performance (Tobin's Q and operating cash flow of the previous fiscal year) and our CEO fitness measure. This intuitive test thus provides no indication that CEOs start to practice when firm performance shows a positive trend. Second, as a more sophisticated test we use an instrumental variables (IV) approach. As our instrument for CEO fitness, we use the fraction of obese people, based on the body mass index (BMI), per U.S. state and year. As expected, BMI has a negative effect on the variable *Fit CEO*, consistent with CEOs being less physically active or less pressured to stay fit if their environment, on average, is more obese. We use the binary endogenous variable IV methodology (see Adams, Almeida, and Ferreira (2009), Angrist and Pischke (2009)), which takes the binary nature of our fitness measure into account. The results of this test suggest that CEO fitness has a positive effect on firm value.

As another test whether CEO fitness affects firm value, we implement an additional identification strategy based on sudden CEO deaths. Because sudden deaths occur randomly and are likely to be exogenous to current firm and market conditions, this approach further mitigates endogeneity concerns such as reverse causality. We follow the methodology in Nguyen and Nielsen (2014) to identify sudden deaths. CEOs are defined as being fit when they are characterized as fit (in the related news and obituaries) around the time of their death. In this analysis we do not rely on our running-based fitness measure as i) there are not enough cases of suddenly deceased runners and because ii) we are able to hand collect data on CEO activities for the relatively small sample of sudden deaths. Among others, cases of fit CEOs include active mountaineers, skiers as well as hockey and tennis players. This makes concerns

of reverse causality even less plausible as it seems unlikely that CEOs start skiing or playing hockey or tennis when their firm performs well. The broader definition of fitness allows for a more general test of the validity of our results. We find a significantly negative effect of CEO fitness on the average abnormal stock return to announcements of sudden deaths, consistent with our panel regression results for Tobin's Q. This additional evidence supports our previous findings as it suggests (using a broader definition of fitness) that a CEO's contribution to firm value is significantly higher if he or she is physically fit.

As a last attempt to address the concern that we do not measure CEO fitness and its consequences, we return to our panel data set for further tests. We control for additional time-varying CEO and firm characteristics, including measures for CEO busyness and firm competition, which are likely to correlate with CEO fitness. Our results remain qualitatively similar. This is also the case when we exclude (very fit) CEOs with marathon finish times below 4 hours who might drive our results. We further perform permutation tests where each CEO is assigned a random (pseudo) fitness status. Since an insignificant number of permutations yield similar or larger coefficients for our fitness measure, the positive relation between CEO fitness and firm value is supported by this test.

Finally, to understand how CEO fitness translates into firm value, we consider firm profitability and mergers and acquisitions (M&As) as important channels of firm valuation. First, we find that fit CEOs are associated with significantly higher return on assets and more free cash flow. This result is confirmed by our instrumental variables approach described above. Second, we examine the stock market reaction around M&A announcements. M&As constitute an optimal laboratory to study CEO fitness as they tend to be particularly work-intensive and stressful for the CEO due to intense (re)negotiations (Officer (2004)), considerable media and shareholder scrutiny (Lehn and Zhao (2006), (Liu and McConnell (2013))), and hence pressure to perform. Consequently, the positive effects of fitness on stress

coping, self-esteem and performance should be very relevant when CEOs make M&As. This should particularly be the case if bids are made for relatively large targets which put the CEO in particular spotlight and likely involve more intense negotiations and a lengthier post-merger integration. Consistently, we find that abnormal stock returns to M&A announcements are significantly higher, and are less likely to be negative, when the bidding firm's CEO is fit. We further find that the positive effect of CEO fitness increases in relative deal size. Because the M&A event study measures the stock market's reaction and considers the firm and its CEO at a given point in time, it is less affected by endogeneity concerns and thus provides another test on the robustness of our results.

Our study contributes to the vast literature on CEOs as it suggests that fitness is an important explanator for CEO heterogeneity. In general, existing studies have revealed the importance of CEOs' (early-life) experience and personality traits (e.g., Benmelech and Frydman (2015), Bernile, Bhagwat, and Rau (2015), Graham, Harvey, and Puri (2013), Malmendier, Tate, and Yan (2011)) as well as execution skills and general, cognitive and non-cognitive abilities (e.g., Adams, Keloharju, and Knüpfer (2015), Kaplan, Klebanov, and Sorensen (2012)). In particular, three recent studies are related to our work in the sense that they also consider aspects of CEOs' physiology. All of them use data about facial traits to examine effects of CEO outward appearance. In experimental work, Graham, Harvey, and Puri (2015) find that CEOs' "look of competence" positively affect their selection and compensation, while it does not affect firm performance. Regarding firm value, Halford and Hsu (2014) find that S&P 500 CEOs who score high in a facial attractiveness index are associated with higher stock returns around their first day on the job and around announcements of M&As. Consistently, Cook and Mobbs (2015) find that the stock market reacts more positively to announcements of CEO appointments if the appointed executive has a higher facial attractiveness score.

In contrast to most of the aforementioned studies, we identify a (physical) CEO attribute - relevant for firm value - that can be influenced actively by most CEOs and other executives, basically over their entire career. While attaining or improving on the attributes mentioned above is either impossible or associated with very high costs, it appears feasible that a majority of CEOs can improve their fitness. Our results suggest that they should do so. Our results do not say anything about how much time CEOs should spend on physical activity (and this is beyond the scope of our study). However, CEOs likely should not spend too much time outside the corner office. In this regard, Biggerstaff, Cicero, and Puckett (2014) find that among the group of golf-playing CEOs those in the top quartile of golf rounds per year are associated with relatively poor firm performance.

The results of our study are important for both shareholders and participants in the managerial labor market including CEOs, senior executives, board members, and executive recruiting firms. We provide a rationale for why recruiting firms define physical fitness as a requirement for potential CEO candidates (see the first paragraph of this paper) and help explain the growing trend among executives to stay fit. We believe that our results can be applied to other corporate executives and people whose jobs resemble that of the CEO.

The remainder of this paper is organized as follows. In Section 1, we describe our data and sample as well as the determinants of CEO fitness. Section 2 presents our empirical results for firm value. The section also includes our identification strategy. Section 3 considers firm profitability and M&As as important channels of firm value. Conclusions follow.

1 Data and Sample

1.1 Data on CEO fitness and sample selection

To construct our sample, we use two main data sources. Our panel of S&P 1500 firms is from The Corporate Library's *Board Analyst* database and covers the sample period 2001 to 2011.³ The database provides detailed information about CEOs' names, gender and age. This information is necessary to accurately match our firm-CEO panel with CEO-specific data. This CEO-specific information constitutes our second main source of data, information about CEOs who finish at least one marathon in a given year. We classify these CEOs as fit CEOs, i.e., our main variable of interest, *Fit CEO*, is defined on an annual basis.⁴

We hand-collect the fitness (marathon finisher) data from public data sources on the internet. Particularly, in order to keep the costs of hand-collection of data manageable, we collect data about all people who finished one of the fifteen largest U.S. marathons (in terms of the number of finishers) for each year over the sample period 2001 to 2011. Appendix A provides an overview of the marathons we consider. For the vast majority of these marathons, information about finishers is available on the respective marathons' websites. For each person who finished one of the marathons in the sample period, we gather the following data: first name, last name, age, gender, country. In case data are not available on the official marathon websites, we gather the data from www.marathonguide.com, a public website providing detailed information about U.S. marathons from 2000 onwards.

³ *Board Analyst* is a machine-readable database which provides proxy-statement data including detailed information about CEOs and about firms' governance structures. The database includes information about founder CEOs, exact descriptions of chairmen resulting in comprehensible flags for CEO duality, and data about firms' age since foundation, a primary indicator for the stage of a firm's life cycle. Data is available for the year 2001 onwards. The database is used in recent studies on corporate boards, such as Alam, et al. (2014).

⁴ The use of an annual measure of fitness is preferable econometrically as it allows to exploit CEO-specific variation over the fitness measure. More important, the annual measure appears necessary to accurately capture (differences in) fitness according to the medicine and sports literature. Specifically, several studies document that fitness levels vary considerably between periods of training and detraining, i.e., fitness levels increase/revert when practice is started/stopped (see, e.g., Coyle, et al. (1984), Mujika and Padilla (2000), Ready and Quinney (1982)).

Our data gathering process generates a sample of almost 2.4 million non-distinct and more than 1.5 million distinct marathon finishers. This sample accounts for about 50% of all non-distinct U.S. marathon finishers over the sample period and, given that some people run several marathons, for an even larger fraction of distinct marathoners.⁵ The fact that we do not cover all U.S. marathons may lead us to exclude some CEOs who are actually fit (i.e., unidentified marathoners) from the group of fit CEOs. Yet, in this case, our reference group also contains some fit CEOs and we thus tend to underestimate the true effects of CEO fitness. A similar reasoning applies to CEOs who remain undetected as they do other sports.

From a geographical viewpoint, our focus on the fifteen largest U.S. marathons does not appear to be a serious limitation for our empirical analysis. In fact, the locations of the marathons we use fit the geographical distribution of the S&P 1500 firms very well as illustrated in Figure 1. In the figure we use zip codes to plot the locations of S&P 1500 companies' headquarters. The runner symbol indicates the locations of the marathons we use. Figure 1 indicates that we cover the vast majority of all major U.S. business centers.

We match our data on marathon finishers described above with the initial sample of CEOs from the *Board Analyst* database using the information about each CEO's first name, last name, and age. Particularly, if the first name, the last name, and the age of the marathon finisher exactly match the CEO's first name, last name and age, we define this as a positive (non-final) match. In case the names perfectly match, but the age matching results in an age difference between the CEO and the marathon finisher of one year, we consider this a potential positive (non-final) match. The reason is that it is possible that the CEO's birthday is before or after the marathon event and thus our matching procedure creates an age difference greater than zero, although the match may be correct. Matches are then manually checked (if

⁵ The estimated total number of U.S. marathon finishers (provided by www.runningusa.org) in the year 2011 was 518,000. The number of finishers of the fifteen largest marathons in 2011 was 244,000 (see Appendix A). In the earlier years of our sample period, these marathons accounted for a higher fraction of all marathoners.

possible) by screening the internet using LexisNexis, LinkedIn, and Google. Additionally, we gather data on name distributions from the U.S. census to calculate - for each positive match we identify - the probability of a false positive match for a given CEO's first name, last name and age.⁶ Whenever the probability is greater than ten percent, we define an initially positive match as a false match.

Using the described procedure, we find that about six percent of all CEOs can be classified as fit, i.e., they finish at least one marathon over the sample period. The fraction of CEOs who finished a marathon has almost doubled between 2001 and 2011, as can be seen from Figure 2 which shows the annual percentage of CEOs identified as marathon finishers over the entire sample period. The figure shows that the fraction of CEOs with at least one finished marathon has increased over the sample period. On average, these CEOs finish two marathons. The 25th percentile is one, the 75th percentile is three, and the maximum is nine.

Our final sample consists of 9,549 firm-year observations (by 2,694 CEOs) with all available data, including CEO, firm and governance characteristics. CEO-specific data include the CEO's age and tenure and whether the CEO is also the firm's chairman (duality) or its founder. Firm characteristics include book leverage, business segments, capital expenditures (CapEx), firm age and firm size, operating cash flow (OperCF), and R&D. All accounting data is from Compustat. Governance characteristics include the fraction (%) of independent directors, board size, the E-index (Bebchuk, Cohen, and Ferrell (2009)), and whether the majority of a firm's outstanding shares are held by institutions (i.e., institutional

⁶ We assume that the 1.5 million distinct marathon finishers in our marathon dataset are representative for the U.S. population and consequently handle them as random draws from the population. We use the age distribution from this population together with the name distribution from the U.S. census to estimate the probability of a randomly achieved false positive match for a given CEO.

majority). Our measure for firm value is Tobin's Q. Firm profitability is measured by return on assets (ROA) and free cash flow to total assets.⁷ All variables are defined in Appendix B.

1.2 Summary statistics

The summary statistics for our sample are presented in Table 1. In terms of CEO characteristics, we report that the typical CEO in our sample is 55 years old and has been on the company's board for 11 years. 63% of the CEOs in our sample are also the chairman of their board and 8% of the CEOs are the founders of the company they lead. The typical firm in our sample has a book leverage of 21%, three business segments, CapEx of 7%, and is 50 years old (in terms of firm age since foundation). On average, firm size is \$2.54 billion (i.e., $\ln(\text{total assets lagged})$ is 7.84), operating cash flow is 11%, and R&D is 5%. In terms of firm performance, average Tobin's Q amounts to 1.81, while ROA and free cash flow are 13% and 8%, respectively. Regarding governance characteristics, our sample firms have an average fraction of independent directors of 70%, a board size of 9, and an E-index of 2.67. For 81% of our sample firms the majority of their outstanding shares are held by institutions. Overall, our sample compares well to the related literature (e.g., Adams, Almeida, and Ferreira (2005), Alam, et al. (2014), Custódio and Metzger (2014), Fahlenbrach (2009)).⁸

Table 1 also presents summary statistics for the subsamples of firms with and without fit CEOs (i.e., the variable *Fit CEO* is used to split the sample). Tests for mean and median differences suggest that the two subsamples show a few significant disparities: fit CEOs are younger (53 vs. 55 years), manage smaller companies (with smaller boards), and are

⁷ The number of observations is lower for measures of firm profitability because EBITDA and data on working capital (used to calculate free cash flow) are not provided for all firms in the Compustat universe.

⁸ For example, Adams, Almeida, and Ferreira (2005) and Fahlenbrach (2009) report fractions of founder CEOs of 9% and 10.6%, respectively, only slightly larger than the 8% we report. These studies also report comparable values with regard to business segments, CapEx, firm age, and leverage. In terms of governance characteristics, Cremers and Romano (2011), for example, report comparable values for institutional ownership (72%), while Bebchuk, Cohen, and Ferrell (2009) report comparable E-index values. A very important statistic for our study is the CEO's age as we use it for our marathon runner-CEO match. Custódio and Metzger (2014), among other studies, report the same mean and median CEO age as we do.

associated with slightly higher CapEx. Most important, ROA and, in particular, Tobin's Q are significantly higher for firms managed by fit CEOs.

We illustrate the annual differences in firm value between firms with and without fit CEOs for our sample period in Figure 3. As can be seen, except for the very beginning of our sample period, Tobin's Q is always higher for the sample of fit CEOs. Hence, a positive relation between CEO fitness and firm value is apparent in the data. In this regard, we note that firms with and without fit CEOs do not belong to significantly different industries based on SIC codes (not reported for brevity).

1.3 Determinants of CEO fitness

Table 2 presents an analysis of the determinants (i.e., multivariate correlations) of CEO fitness. In particular, we regress the variable *Fit CEO* on the aforementioned CEO, firm and governance characteristics to provide a better understanding of our variable of main interest. Regression specification (1) shows the results of a linear probability model, while specification (2) shows the results of a probit model. Both regressions control for year and industry fixed effects. The probit model in specification (2) reports fewer observations due to exclusion of explanatory variables (industry dummies in this case) in instances in which these variables cause separation (see Zorn (2005)).

Table 2 shows that only few variables correlate significantly with *Fit CEO*, i.e., there are only few determinants of CEO fitness. We find that the regression coefficient of *CEO age* is significantly negative, consistent with older people being less physically active. Further, the coefficients of *Founder CEO* and *Firm size* are also negative. This suggests that CEOs who bear more responsibility and who are involved in more managerial tasks are less likely to be physically active. All other variables are not consistently significant. Importantly, the variables *OperCF* and *Tobin's Q lagged* do not correlate with *Fit CEO*. This suggests that the

likelihood that CEOs are physically active does not seem to depend on firm performance, i.e., we find no indication that CEOs practice when firm performance shows a positive trend.

2 CEO Fitness and Firm Value

In the following, we examine the relation between CEO fitness and firm value to provide an answer to the question whether CEO fitness matters. Given the positive effects of fitness on, for example, cognitive functions and executive control processes, stress coping as well as work behavior and job performance, we expect a positive impact of our CEO fitness measure, *Fit CEO*, on firm value (Tobin's Q). Section 2.1 presents our baseline regression results. The analyses take unobserved firm, industry and CEO heterogeneity as well as random effects and outliers into account. Section 2.2 presents our identification strategy. It is particularly concerned with the issue of reverse causality, but also further addresses other concerns such as time-varying CEO and firm characteristics.

2.1 Firm value analysis

We test the relation between CEO fitness and firm value using our sample of 9,549 firm-year observations. Table 3 shows results from regressions of the natural logarithm of Tobin's Q on *Fit CEO* (which equals one if a CEO finishes a marathon in a given year) and the CEO, firm and governance characteristics described in Section 1. Controlling for firm age since foundation and firm size, our results account for the stage of a firm's life cycle. Book leverage, business segments, and R&D control for firm complexity and risk, while CapEx and operating cash flow control for firm investments and accounting performance. Controls for corporate governance (board size and independence, the E-index, and whether institutions hold a majority of the firm's stock) and CEO age and tenure as well as dummies whether the CEO is also the chairman or the founder of the firm allow us to account for the career concerns, experience and power of CEOs. All regressions also include year fixed effects.

We show five different regression specifications. In specification (1), we account for unobserved (time-invariant) firm heterogeneity using firm fixed effects in addition to the controls mentioned above. In specification (2), we further add two-digit SIC industry interacted with year dummies to also control for year-specific industry effects. The reason is that some CEOs might be physically active (and finish a marathon) because their firms belong to industries which show a good performance in specific years. This might drive our results. A related reasoning can be made for past performance, which might have a positive effect on current performance (i.e., a positive performance trend for some firms) and on the likelihood that a CEO is fit. To account for this concern, in specification (3), we rerun the regression from specification (2) and further add the lag of Tobin's Q to our set of controls. Another important concern in the context of our study is unobserved CEO heterogeneity, which might cause us to find a positive effect of CEO physical fitness. Specifically, our variable *Fit CEO* might correlate with unobserved CEO characteristics such as innate talent, an athletic or a military background (likely coupled with a higher level of discipline), or any other life or work experience gathered before the CEO took office. To take CEO heterogeneity into account, we rerun specifications (2) and (3) and use CEO-firm fixed effects instead of firm fixed effects in specifications (4) and (5). Although CEO-firm fixed effects cannot account for all unobserved CEO characteristics that might affect both *Fit CEO* and *Tobin' Q*, they do at least considerably mitigate such concerns. In addition, they also address the issue of endogenous CEO-firm matching.

Consistent with our results from Section 1.2, the results shown in Table 3 provide empirical support for our expectation that CEO fitness has a positive impact on firm value. In particular, the regression coefficient of *Fit CEO* is positive and statistically significant at the

5% (10%) level in regression specification (1) to (4) (in specification (5)).⁹ The effect of *Fit CEO* is also economically significant: Tobin's Q is at least 3% higher for fit CEOs.

With regard to the control variables, we find that firm size, leverage and the E-index have negative effects on Tobin's Q, while operating cash flow, R&D and institutional ownership have positive effects. These results are in line with the literature (e.g., Bebchuk, Cohen, and Ferrell (2009), Custódio and Metzger (2014), Li, Lu, and Phillips (2014)).¹⁰

In Appendix C, we rerun our baseline regression from specification (1) of Table 3 using random effects with two-digit SIC industry controls instead of firm fixed effects. This analysis intends to address the potential concern of low time-series variation (needed for parameter identification) given that only a small fraction of CEOs is identified as fit. In support of the above results, the regression coefficient of *Fit CEO* remains significant at the 5% level.

In Appendix D, we address the concern that outliers drive our findings. In particular, we collect all marathon finish times for the fit CEOs in our sample and rerun our baseline regression excluding the arguably fittest CEOs who finish a marathon in less than 4 hours. These CEOs likely spend a considerable amount of time to prepare for the marathons (as fast times necessitate much practice). Thus, for these CEOs the concern that they are fit because they can (for whatever reason) afford the time for practice is most apparent. Fortunately, the coefficient of *Fit CEO* remains significant at the 5% level (for both firm fixed effects and CEO-firm fixed effects).¹¹

⁹ In unreported regressions, we additionally include the squared values of CEO age and firm size to take important non-linear effects on firm value into account. The results remain qualitatively similar.

¹⁰ With regard to the CEO characteristics age, duality, founder and tenure, the literature finds either insignificant or opposing effects. For example, while Fahlenbrach (2009) finds a positive effect of founder CEOs on firm value, Li, Lu, and Phillips (2014) find a negative effect. Similar examples can be made for all other CEO characteristics we use.

¹¹ According to www.marathonguide.com, the average U.S. marathon finish time in 2011 was 4.26h (for males with an average age of 40 years). The average finish time for fit CEOs is 4.39h. Our results also remain qualitatively unchanged when we exclude the slowest CEOs, for example, those who finish in more than 6h.

2.2 Identification and robustness tests

This section presents our identification strategy used to further mitigate endogeneity problems. Apart from unobserved CEO and firm heterogeneity, we particularly address the concern of reverse causality. In this regard, one might argue that our results are driven by CEOs who can afford the time for physical activity when their firm has performed well, while their fitness actually does not matter for firm value. Put differently, it is possible that it is not CEO fitness which affects firm value, but firm value which affects CEO fitness. Our analyses in Sections 1.3 and 2.1 already provide first, but of course insufficient, attempts to address this concern. In the following, we provide results from an instrumental variables approach (Section 2.2.1) as well as from an analysis of sudden CEO deaths (Section 2.2.2) to further address reverse causality. We also show results from multivariate regressions with additional CEO and firm characteristics (Section 2.2.3) and from permutation tests where we randomly assign pseudo fitness dummies to CEOs (Section 2.2.4).

2.2.1 An instrumental variables approach

Because *Fit CEO* is a binary variable, we follow Adams, Almeida, and Ferreira (2009) and use a three-stage instrumental variables (IV) approach (see also Angrist and Pischke (2009)). Following this approach, we first estimate our binary response model, a probit regression that analyzes the determinants of the variable *Fit CEO*. The probit regression model is similar to that used in Section 1.3 (see Table 2). The only difference is that we add an instrumental variable (see below) to the list of explanatory variables. The second and third stage consist of running the standard 2SLS approach where the nonlinear fitted values of *Fit CEO* resulting from the first stage are used as instruments.

This methodology has several advantages (see Adams, Almeida, and Ferreira (2009)). First, it takes the binary nature of the endogenous variable (to be instrumented) into account. Second, it does not require the binary response (first-stage regression) model to be correctly

specified, which is advantageous given that we are, to the best of our knowledge, the first to predict a CEO's physical activity. Third, the standard errors of the standard IV approach remain asymptotically valid. For robustness purposes, we also estimate a two-stage IV approach.

As our instrument for *Fit CEO* we use the variable *BMI (state)*. It is based on the average body mass index (BMI) per U.S. state and year. Specifically, we use data provided by the Centers for Disease Control and Prevention (CDC), a federal agency under the Department of Health and Human Services.¹² For each year of our sample period, the CDC provides state-level data on the percentage of adults who have a BMI greater than or equal to 30 (i.e., the fraction of people who are obese). Higher values of *BMI (state)* hence indicate that a larger fraction of people in a state are obese. We expect *BMI (state)* to have a negative effect on the variable *Fit CEO* as CEOs are less likely to be physically active if their environment, on average, more obese. The idea behind this is that people are less likely to feel pressured to be or stay fit if the people around them are (and look) less fit.

To be a valid instrument, *BMI (state)* must be as good as randomly assigned and it must meet the exclusion restriction (see Angrist and Pischke (2009)). In this regard, it seems very unlikely that the average BMI on state-year level can be influenced by the value of a specific firm headquartered in a specific state (we can thus likely rule out reverse causation and simultaneity). Furthermore, *BMI (state)* must predict the dependent variable Tobin's Q only through the instrumented variable *Fit CEO*. In this regard, it appears very unlikely that the average BMI on state-year level has a direct effect on the value of a specific firm within a specific state. We therefore consider our instrument to be valid.

¹² The data is available via http://www.cdc.gov/obesity/downloads/obesity_trends_2010.pdf. CDC defines six categories of obesity based on the fraction of obese people in a state and year. *BMI (state)* hence can take on values from 1 to 6, where 6 stands for the largest fraction of obese people. As the data ends in 2010, we use the 2010 data also for 2011. Results remain significant when we exclude the year 2011 (not reported).

Table 4 shows the results of our instrumental variables approach. In specification (1), the first-stage probit regression results are shown. As expected, our instrumental variable *BMI (state)* has a negative effect on *Fit CEO* (significant at the 10% level). The F-statistic of the first-stage regression in the 2SLS approach is 30.84 (significant at the 1% level). Specification (2) shows the result of the 2SLS (third-stage) regression where *Fit CEO (IV)* denotes the instrumented *Fit CEO* variable. The regression coefficient of the instrumented CEO fitness measure has a positive effect on Tobin's Q (significant at the 10% level). Specification (3) shows the (second-stage) results of a two-stage IV approach. The coefficient of *Fit CEO (IV)* is positive and significant at the 5% level. In sum, the results suggest that CEO fitness indeed has a positive effect on firm value.

2.2.2 Sudden deaths

As another test, we use an identification strategy based on sudden deaths of CEOs and presidents. Because sudden deaths occur randomly and are likely to be exogenous to current firm and market conditions, and because we compare each firm to itself when we consider the stock market reaction to announcements of sudden deaths, this approach further mitigates endogeneity concerns such as reverse causality.

To identify sudden deaths, we follow Nguyen and Nielsen (2014) and search the internet for keywords - such as 'CEO' and 'president' as well as 'death', 'deceased', 'died' and 'passed away' - using Edgar Online, Lexis-Nexis and Google searches. We restrict our sample to sudden deaths of CEOs and presidents (who are typically the CEO's successor). We use the period 1990 to 2012 to be able to identify enough cases. Deaths have to be described as 'sudden' or 'unexpected' (or a comparable term). If we find evidence that a death was not sudden, we exclude it (e.g., if a CEO was known to suffer from cancer or a heart disease). We also exclude suicides as they may be related to firm performance. The event date is defined as

the trading day of the first public announcement of the sudden death or the first trading day following the death announcement if it occurred on a non-trading day.

As we only handle a small sample in this analysis, we are now able to hand-collect all information about CEOs' activities that we need to classify the deceased as fit or not fit. We do not limit our definition of fitness to marathon finishers but also allow for other physical activities (in order to end up with enough cases of deceased CEOs to be defined as fit). The broader definition of CEO fitness allows us to provide more general empirical evidence on the effects of fitness. We use a conservative approach in defining the deceased as fit. Specifically, consistent with how we have identified fitness in this study, a deceased is defined as fit if she can be identified as fit *around* the time of her death, i.e., the CEO or president has to be an active sportsman around the time of her death. For example, if a deceased was a sportsman at college (i.e., athletic background), but cannot be identified as active around the time of her death, she is considered not to be fit. We use information from news around deaths, including obituaries and press releases, and additionally search the internet for information about the activities of the deceased.

Of course, the depth of information we require limits the number of sudden deaths we can use in our analysis. From the 91 cases of sudden deaths we identify and for which an abnormal stock return can be calculated, we find information that allows us to classify the deceased as fit or not for 51 cases. For 50 cases we are able to collect control variables. The deceased CEOs (or presidents) classified as fit are active tennis and ice hockey players, mountaineers and hunters, skiers, and aerialists. In contrast to running, this makes concerns of reverse causality even less plausible as it seems unlikely that CEOs start sports such as hockey, skiing or tennis (which need technical practice) when their firm performs well.

We regress the abnormal return in the three days around the announcement of a sudden death, denoted $CAR [-1,1]$, on our fitness measure ($Fit\ CEO$). The regression results

are shown in Table 5. Specification (1) does not include any controls. Specification (2) includes important controls for CEO and firm characteristics used in the extant literature (see Nguyen and Nielsen, 2014). In specification (3) we additionally control for time fixed effects using decade dummies (for the 1990s, 2000s, and 2010s). The regression coefficient of *Fit CEO* is negative and statistically significant in all three regressions. Firms lose significantly more shareholder value around the announcement of a sudden death when the deceased CEO (or president) was physically fit. Put differently, the results indicate that the contribution to firm value is significantly higher when CEOs are fit, consistent with our panel regression results. This finding suggests that CEO fitness indeed has a positive effect on firm value.

2.2.3 Unobserved time-varying CEO and firm heterogeneity

Although we control for various important CEO, firm and governance characteristics as well as for time-varying industry effects and for either firm or CEO-firm fixed effects, some uncertainty might remain that other time-varying CEO or firm characteristics cause us to find an effect of CEO fitness on firm value. Put differently, as in many other studies, it is impossible for us to rule out entirely that some unobserved time-varying variable correlates with our variable of main interest, *Fit CEO*, and is the true force behind all of our results. However, to further mitigate this concern, we run regressions where we control for additional time-varying CEO and firm variables. The results of these regressions, shown in Table 6, are based on fewer observations as we are unable to get data for all variables for all firm-years.

The additional CEO controls are a dummy variable *CEO female*, set to one if the CEO is a woman, *CEO outside directorships*, i.e., the number of board seats a CEO holds outside the firm he or she manages, and *CEO stock ownership*, which is the percentage of shares held by the CEO. The additional firm controls are *Board meetings*, i.e., the number of a firm's board meetings over the current fiscal year, *Competition*, defined as the Herfindahl index of sales (on annual basis) for all firms in the Compustat universe that belong to the same (two-

digit SIC code) industry, and *Sales growth*, which measures the increase in sales from the previous to the current fiscal year.

Female CEO intends to capture potential gender differences with respect to both physical activity and managing styles. Regarding the latter, Faccio, Marchica, and Mura (2015) provide evidence that female CEOs are associated with less corporate risk taking. *CEO outside directorships* and *Board meetings* intend to capture the CEO's business. Busy CEOs might have less time for physical activity, i.e., the variable *Fit CEO* is less likely to take on a value of one, while at the same time they might be associated with a lower firm value. *CEO stock ownership* is an additional measure of the CEO's power and incentives. At certain levels of stock ownership, CEOs might be able to spend more time for physical fitness and might be more incentivized to increase firm value. Regarding the concern of reverse causality addressed earlier, *Competition* and *Sales growth* (again) account for CEOs who may afford the time to be fit when their firm performs well, i.e., when competition is relatively low (and likely product margins and firm value are high) and when sales show a positive trend.

As can be seen from Table 6, the positive effect of CEO fitness on firm value cannot (entirely) be attributed to the above alternative explanations. The coefficient of *Fit CEO* remains statistically significant even when we add the six new controls and use industry interacted with year dummies in addition to either firm fixed effects (in specification (1)) or CEO-firm fixed effects (in specification (2)).

Further, one might raise the point that character traits, such as ambition and discipline, vary with time (and are hence not captured by CEO-firm fixed effects) and that CEOs who increase their physical fitness also become more ambitious or more disciplined. This may or may not have a positive effect on firm value. While we are not aware of any studies that support this reasoning or that determine optimal levels of ambition or discipline, we argue that positive changes in character traits (like increased discipline), which might arise from

physical activity, can be summarized under the many positive aspects of CEO fitness. Put differently, the changes would very likely not occur if the CEO was not physically fit. Unfortunately we are unable to test time-varying aspects like this.

2.2.4 Permutation tests: random assignment of pseudo fitness

As a last step to provide evidence that we measure CEO fitness and its consequences, we perform a permutation test and assign each CEO a random (pseudo) fitness status. We use 10,000 random draws, i.e., we repeat the random procedure of assigning a pseudo fitness status to CEOs 10,000 times and rerun our baseline regression from specification (1) of Table 3 for each random draw. The results are shown in Table 7. We apply the described procedure using firm fixed effects in regression specification (1) and CEO-firm fixed effects in specification (2).

In Table 7, we only show the coefficient of our main variable of interest, *Fit CEO*, and the p-value resulting from the permutation test. The p-value is calculated as the fraction of randomly permuted datasets that yield a regression coefficient larger than or equal to the reported coefficient for *Fit CEO* relative to the total number of 10,000 permutations. The results confirm our earlier findings for both firm fixed effects and CEO-firm fixed effects. The null hypothesis that there is no effect of the variable *Fit CEO* can be rejected given that the p-values for the coefficient of *Fit CEO* resulting from the two regressions are 0.0237 and 0.0332. This means that only 237 and 332 of 10,000 permutations yield a similar or larger coefficient for our fitness measure. The result suggests that our main findings are statistically reliable. We thus conclude that the positive coefficient of *Fit CEO* is not a statistical artifact.

In sum, from the results in Section 2.2 we conclude that firms managed by fit CEOs indeed have higher firm values, consistent with the postulated positive effects of CEO fitness.

3 Channels of Firm Value

To gain a better understanding how CEO fitness translates into firm value, we examine profitability (in Section 3.1) and mergers and acquisitions (in Section 3.2) as important channels that have an immediate impact on firm value.

3.1 CEO fitness and firm profitability

We use two measures of firm profitability, return on assets (*ROA*) and free cash flow to assets (*FCF*). Free cash flow is defined as a firm's EBITDA minus its capital expenditures and changes in working capital. Thus, *FCF* takes corporate investments into account. We run regressions of these two measures on our variable *Fit CEO* and the control variables used in Section 2.1 (except for *OperCF* which is omitted). Results are shown in Table 8. Regression specifications (1) and (2) use *ROA* as the dependent variable. In specification (1) we run a within regression based on firm fixed effects, while in specification (2) we use the three-stage IV approach described in Section 2.2.1 to address causality. The first-stage regression is the same as in Table 4. We repeat these analyses using *FCF* instead of *ROA* as the dependent variable in specifications (3) and (4). Given the aforementioned positive effects of fitness, we expect our variable *Fit CEO* to have a statistically significant, positive regression coefficient when used to explain the two aforementioned measures of firm accounting performance.

The regression results shown in Table 8 support our expectation. The coefficient of *Fit CEO* is indeed positive and significant (at least at the 5% level) throughout all regression specifications. As can be seen from Appendix C, when we use random effects with industry dummies (based on two-digit SIC codes) instead of firm fixed effects our results from both *ROA* and *FCF* are confirmed. We thus conclude that fit CEOs are associated with a higher firm profitability. This suggests that CEO fitness, which can be expected to foster CEO job performance, seems to translate into better firm accounting performance and, therefore, into a

higher firm value. This result provides an important explanation for the positive relation between CEO fitness and firm value found in Section 2.

3.2 CEO fitness and M&A performance

Apart from putting the firm's assets to work in a profitable way, making new investments with positive net present values is another important channel of value creation. Thus, we now turn to M&As which constitute the largest investments that firms undertake. As such they have an immediate impact on firm value (see, e.g., Betton, Eckbo, and Thorburn (2008)). Furthermore, they are under the control of the CEO and thus allow drawing inferences about him or her. To measure (the market's evaluation of) the impact on firm value, we examine bidder abnormal stock returns in the three trading days around M&A announcements, denoted $CAR [-1,1]$.

M&As are an optimal laboratory for our study because fitness - which enables CEOs to better cope with stress and enhances their self-esteem and performance - should be highly relevant in this context. M&As do not only constitute far-reaching decisions often times including plant closures and layoffs, but they also tend to be particularly stressful and work-intensive for the CEO due to considerable media scrutiny (Liu and McConnell (2013)), lengthy and uncertain (re)negotiations (Officer (2004)), and pressure to perform. Regarding the latter, Lehn and Zhao (2006) find that CEOs who are associated with poor takeover performance are significantly more likely to get fired. The aforementioned reasoning should particularly apply to takeover bids for relatively large targets as deal complexity and post merger integration effort tend to increase in transaction size. Furthermore, larger transactions draw more attention by the media and by firms' shareholders, thus putting CEOs in direct spotlight, and are likely to be associated with tougher negotiations. As a consequence, the positive effects of improved stress coping, better job performance and more self-esteem can be expected to increase in relative deal size.

To examine the effect of CEO fitness on bidders' abnormal stock returns, we use a sample of 2,203 M&A transactions (with all available data) announced by our sample firms during the 2001-2011 period. The M&A data is retrieved from the Standard and Poor's Capital IQ database. The sample includes all announced takeovers with a total transaction value of at least five million US dollars. Only bids for a majority stake (i.e., for at least 50%) of the target firm are included. For these deals, we are able to use the same control variables as in the previous analyses. We further include additional M&A-specific controls which follow the extant literature (e.g., Custódio and Metzger (2013), Fuller, Netter, and Stegemoller (2002), and Moeller, Schlingemann, and Stulz (2005)). The additional controls are the absolute and the relative size of the transaction, whether the target is a publicly listed firm, dummy variables for cross-border, focusing, and hostile transactions as well as the means of payment. All additional controls are defined in the caption of Table 9.

Table 9 shows the results of regressions of $CAR [-1,1]$ on the variable *Fit CEO* and all controls (including year and industry fixed effects). In regression specifications (2) to (4), we use the full set of control variables, while we use a limited set of controls in specification (1) to make our results more comparable to the extant M&A literature. In specification (3), we use $CAR [-1,1] < 0$ (instead of $CAR [-1,1]$) as the dependent variable, which is a dummy variable set to one if the cumulative abnormal return is negative (< 0). Specifications (1) to (3) are based on all M&As with a relative deal size (i.e., total transaction value divided by acquirer market capitalization 20 trading days prior to M&A announcement) of at least 1%, as frequently done in the literature (e.g., Lehn and Zhao (2006), Moeller, Schlingemann, and Stulz (2005)). In specification (4), we interact the variable *Fit CEO* with the variable *Relative size* to test whether the positive effect of CEO fitness increases in deal size as motivated above. This regression is not restricted to deals with any particular relative size.

In terms of the effect of CEO fitness on abnormal stock returns, we find that the regression coefficient of *Fit CEO* is statistically significant (at least at the 5% level) and has the expected sign in specifications (1) to (3). The former two specifications suggest that abnormal stock returns are between 1.2 and 1.3 percentage points higher if a fit CEO is at the helm of the bidding firm. In addition, specification (3) indicates that stock returns have a significantly lower likelihood of being negative if a bid is announced by a fit CEO. Finally, in line with our expectation, in specification (4) we find that the interaction term *Fit CEO * Relative size* is positive and significant suggesting that the benefits of CEO fitness are increasing in relative M&A deal size.

In terms of the control variables, our findings are consistent with the literature. Similar to Fuller, Netter, and Stegemoller (2002) and Moeller, Schlingemann, and Stulz (2005), we find that relative deal size has a significantly positive effect on bidder stock returns, while target size is insignificant. Further, in line with Custódio and Metzger (2013), we find no effect of CEO age or tenure on abnormal returns, while acquirer size is found to negatively affect stock returns. Finally, public targets are associated with lower bidder stock returns.

To conclude, the M&A event study results provide a strong explanation for our main effect, the positive relation between CEO fitness and firm value. The findings, particularly those for relative deal size, support the idea that CEO fitness matters as it facilitates CEO performance and stress coping. Furthermore, the use of the event study methodology constitutes another attempt to mitigate endogeneity, as we consider the market's evaluation of a firm and its CEO at a given point in time.

4 Conclusion

Despite the large and growing interest of economists in attributes that help explain CEO heterogeneity, the literature has remained relatively silent about physical aspects of CEOs.

One reason is might be that data about CEOs' physical attributes is generally not available. However, with the increasing demand and responsibilities CEOs have to face, physical aspects likely become more and more important. In this study we provide a first attempt to answer the question whether the physical fitness of CEOs matters. Therefore, we use hand-collected data on U.S. marathons to measure CEO fitness. Fitness should play an important role for CEOs due to its many positive effects, such as improved stress coping, improved cognitive functions and executive control processes, and better job performance.

Using a panel of S&P 1500 companies over the period from 2001 to 2011 we provide evidence suggesting that fitness is indeed an important CEO attribute. We find that CEO fitness has a positive impact on firm value. This conclusion is backed by many tests, including the use of CEO-firm fixed effects, an instrumental variables approach, CEO sudden deaths, and time-varying CEO, firm and industry controls. In addition, we identify significantly higher firm profitability and higher M&A announcement returns as important channels explaining how CEO fitness translates into firm value.

The results of this study help explain the trend for fitness among executives. They further provide a rationale for why executive recruiting firms look for physically fit candidates. In the light of our results, one might argue that investments which help CEOs cope with the high demands and stress of their job, some of them might be (falsely) labeled as perquisites, can be valuable and thus in the interest of shareholders. We believe that our findings have general implications for executives (beyond the CEO) as fitness is likely to be highly relevant in jobs resembling that of the CEO.

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Figure 1 – Company clusters and marathon locations

This figure plots the geographical distribution of the S&P 1500 companies (based on zip codes) and the 15 largest U.S. marathons. Each red star marks a company's headquarter location. The runner symbol indicates the marathon's location. For an overview of the 15 largest U.S. marathons, see Appendix A.



Figure 2 – Fraction of CEOs identified as marathon runners over the sample period

This figure shows the annual fraction of S&P 1500 CEOs identified as marathon finishers over the sample period 2001 to 2011.

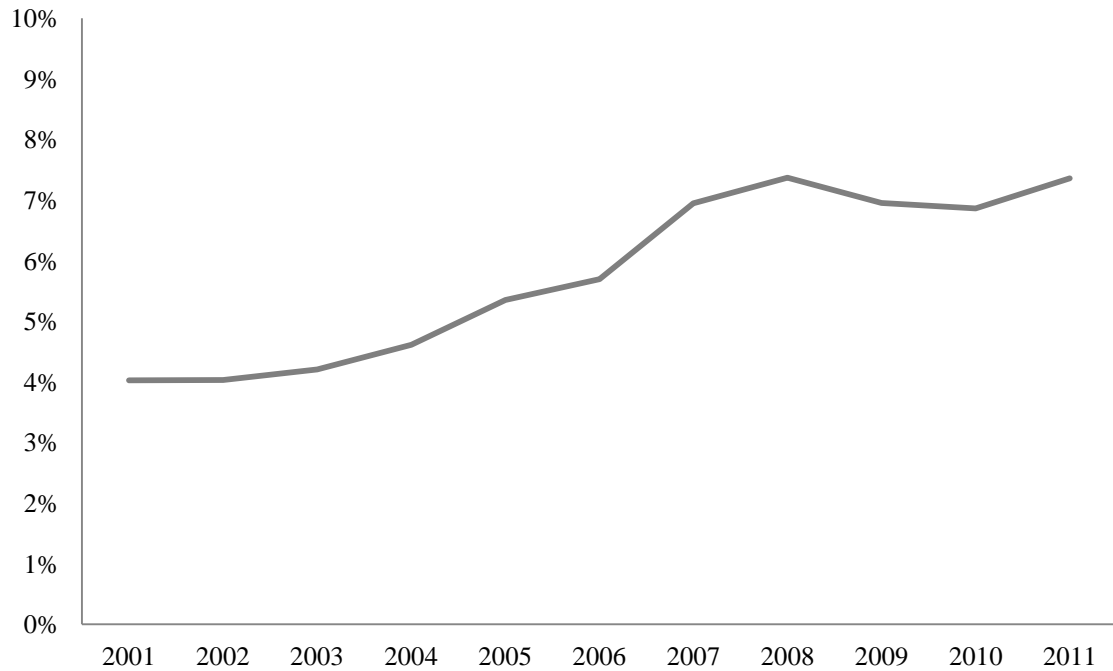


Figure 3 – CEO fitness and firm value

This figure shows the annual mean *Tobin's Q* for firms with and without a *Fit CEO* for each year in the sample period 2001 to 2011. Variables are defined in Appendix B.

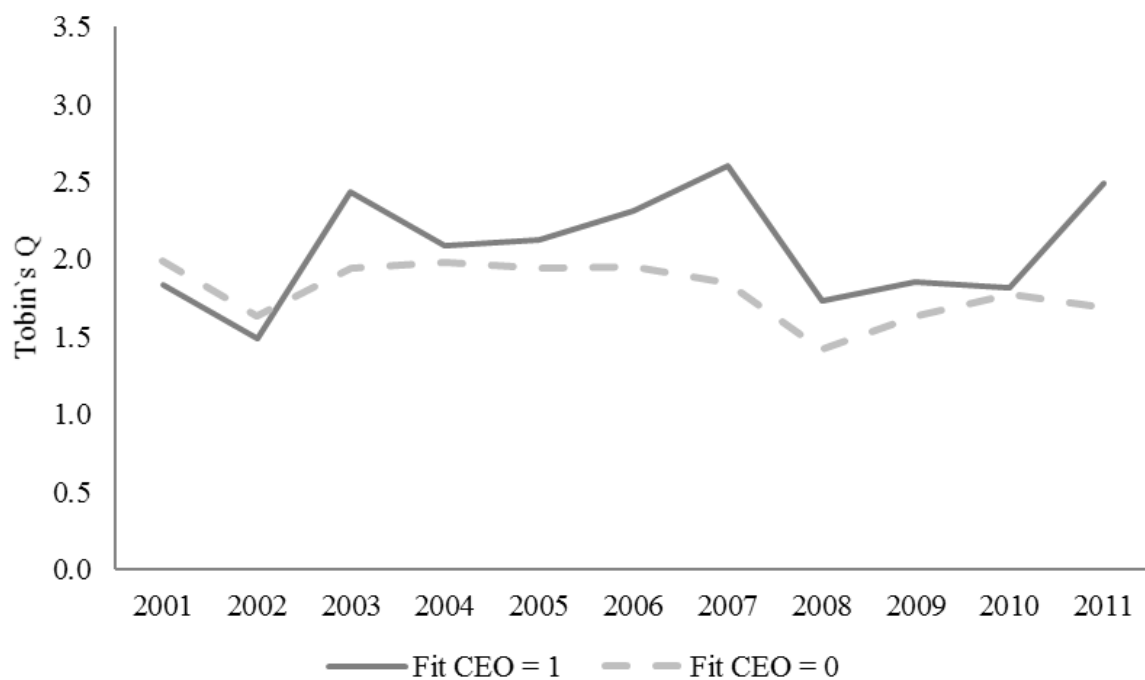


Table 1 – Summary statistics

This table reports summary statistics (on firm-year level) for our full sample of S&P 1500 companies for the sample period 2001 to 2011 as well as for the subsamples as defined by CEO fitness. Mean and median differences for the subsamples of firms with and without a *Fit CEO* are reported. All variables are defined in Appendix B. ***, **, and * denote statistical significance at the 1%-, 5%-, and 10%-level, respectively, for the difference in means and medians between both subsamples (based on t-tests and Mann-Whitney-Wilcoxon rank-sum tests).

| | Mean | p25 | p50 | p75 | Std Dev | N | Mean | | | Median | | |
|------------------------------------|-------|-------|-------|-------|---------|-------|-----------|-----------|------------|-----------|-----------|------------|
| | | | | | | | Fit CEO=1 | Fit CEO=0 | Difference | Fit CEO=1 | Fit CEO=0 | Difference |
| <i>CEO characteristics:</i> | | | | | | | | | | | | |
| CEO age | 55.53 | 51.00 | 55.00 | 60.00 | 7.22 | 9,549 | 53.12 | 55.56 | -2.44 *** | 53.00 | 55.00 | -2.00 *** |
| CEO duality | 0.63 | | | | 0.48 | 9,549 | 0.64 | 0.63 | 0.01 | | | |
| CEO tenure | 11.30 | 5.00 | 9.00 | 16.00 | 9.05 | 9,549 | 11.32 | 9.98 | 1.34 | 8.00 | 9.00 | -1.00 |
| Founder CEO | 0.08 | | | | 0.27 | 9,549 | 0.04 | 0.08 | -0.04 | | | |
| <i>Firm characteristics:</i> | | | | | | | | | | | | |
| Book leverage | 0.21 | 0.06 | 0.20 | 0.33 | 0.18 | 9,549 | 0.21 | 0.21 | -0.01 | 0.19 | 0.20 | -0.01 |
| Business segments | 2.90 | 1.00 | 3.00 | 4.00 | 2.14 | 9,549 | 2.82 | 2.91 | -0.08 | 3.00 | 3.00 | 0.00 |
| CapEx | 0.07 | 0.02 | 0.03 | 0.07 | 0.14 | 9,549 | 0.10 | 0.07 | 0.03 ** | 0.03 | 0.03 | 0.00 |
| Firm age | 50.1 | 19.0 | 36.0 | 76.0 | 40.8 | 9,549 | 45.7 | 50.1 | -4.48 | 34.0 | 36.0 | -2.00 |
| Firm size | 7.84 | 6.63 | 7.69 | 8.91 | 1.66 | 9,549 | 7.34 | 7.85 | -0.51 *** | 7.18 | 7.70 | -0.51 *** |
| FCF | 0.08 | 0.02 | 0.07 | 0.13 | 0.12 | 8,250 | 0.08 | 0.08 | 0.00 | 0.07 | 0.07 | 0.00 |
| OperCF | 0.11 | 0.06 | 0.10 | 0.16 | 0.10 | 9,549 | 0.13 | 0.11 | 0.01 | 0.10 | 0.10 | 0.00 |
| R&D | 0.05 | 0.00 | 0.00 | 0.03 | 0.30 | 9,549 | 0.03 | 0.05 | -0.02 | 0.00 | 0.00 | 0.00 |
| ROA | 0.13 | 0.08 | 0.12 | 0.18 | 0.10 | 9,331 | 0.16 | 0.13 | 0.03 *** | 0.14 | 0.12 | 0.02 ** |
| Tobin's Q | 1.81 | 1.13 | 1.46 | 2.07 | 1.09 | 9,549 | 2.14 | 1.80 | 0.33 *** | 1.53 | 1.46 | 0.07 * |
| <i>Governance characteristics:</i> | | | | | | | | | | | | |
| % indep. directors | 0.70 | 0.60 | 0.71 | 0.82 | 0.15 | 9,549 | 0.69 | 0.70 | -0.01 | 0.70 | 0.71 | -0.01 |
| Board size | 9.45 | 8.00 | 9.00 | 11.00 | 2.47 | 9,549 | 8.66 | 9.46 | -0.80 *** | 9.00 | 9.00 | 0.00 *** |
| E-Index | 2.67 | 2.00 | 3.00 | 3.00 | 1.32 | 9,549 | 2.53 | 2.68 | -0.15 | 2.00 | 3.00 | -1.00 |
| Institutional majority | 0.81 | 1.00 | 1.00 | 1.00 | 0.39 | 9,549 | 0.77 | 0.81 | -0.03 | 1.00 | 1.00 | 0.00 |

Table 2 – Determinants of CEO fitness

This table reports coefficients from OLS (Column 1) and Probit (Column 2) regressions of the *Fit CEO* dummy on CEO, firm and corporate governance variables as well as year and industry fixed effects (based on two-digit SIC codes). Both regressions include a constant (not reported). All variables are defined in Appendix B. Robust t-statistics (z-statistics) of the regression coefficients are reported in parentheses. ***, **, and * denote statistical significance at the 1%-, 5%-, and 10%-level, respectively.

| Dep. variable: | Fit CEO | |
|---|------------------------|------------------------|
| | LPM (1) | Probit (2) |
| <i>CEO characteristics:</i> | | |
| CEO age | -0.0005*** (-2.769) | -0.0165*** (-3.007) |
| CEO tenure | -0.0012 (-0.704) | -0.0474 (-0.897) |
| CEO duality | 0.0044 (1.488) | 0.1260 (1.435) |
| Founder CEO | -0.0096*** (-2.852) | -0.4754*** (-3.010) |
| <i>Firm characteristics:</i> | | |
| Firm age | 0.0001 (0.088) | 0.0076 (0.157) |
| Firm size | -0.0019* (-1.917) | -0.0658** (-2.018) |
| Book leverage | -0.0105 (-1.376) | -0.1591 (-0.720) |
| R&D | -0.0056* (-1.913) | -1.3556 (-1.519) |
| CapEx | 0.0411 (1.400) | 1.0536*** (4.737) |
| OperCF | 0.0023 (0.155) | -0.2061 (-0.428) |
| Business segments | -0.0012 (-0.759) | -0.0310 (-0.617) |
| Tobin's Q lagged | 0.0017 (0.506) | 0.0827 (0.908) |
| <i>Governance characteristics:</i> | | |
| Board size | -0.0070 (-1.265) | -0.2882* (-1.793) |
| % indep. directors | -0.0032 (-0.429) | -0.1249 (-0.547) |
| E-index | -0.0008 (-0.854) | -0.0225 (-0.763) |
| Institutional majority | -0.0025 (-0.790) | -0.1058 (-1.116) |
| Year fixed effects | Yes | Yes |
| Industry fixed effects | Yes | Yes |
| NObs | 9,537 | 7,571 |
| Adjusted R-squared | 0.288 | |
| Pseudo R-squared | | 0.086 |

Table 3 – CEO fitness and firm value

This table reports coefficients from firm fixed effects (Columns 1-3) and CEO-firm fixed effects (Columns 4-5) regressions of the natural logarithm of Tobin's Q on the *Fit CEO* dummy and control variables. All regressions include a constant (not reported). Industry*year fixed effects are based on industries clustered on two-digit SIC codes. All variables are defined in Appendix B. Robust t-statistics of the regression coefficients are reported in parentheses. ***, **, and * denote statistical significance at the 1%-, 5%-, and 10%-level, respectively.

| Dep. variable: | Ln(Tobin's Q) | | | | |
|---|----------------------------|----------------------------|----------------------------|----------------------------|---------------------------|
| | (1) | (2) | (3) | (4) | (5) |
| Fit CEO | 0.0461** (2.067) | 0.0445** (2.247) | 0.0341** (2.072) | 0.0391** (2.006) | 0.0313* (1.794) |
| <i>CEO characteristics:</i> | | | | | |
| CEO age | 0.0009 (0.822) | 0.0009 (0.902) | 0.0007 (0.955) | 0.0274 (0.001) | -0.0279*** (-7.654) |
| CEO tenure | -0.0029 (-0.405) | -0.0004 (-0.062) | -0.0061 (-1.079) | 0.0238 (1.559) | 0.0161 (1.214) |
| CEO duality | 0.0092 (0.761) | 0.0089 (0.759) | 0.0142 (1.453) | 0.0016 (0.118) | 0.0061 (0.514) |
| Founder CEO | -0.0323 (-1.220) | -0.0352 (-1.476) | -0.0295 (-1.540) | | |
| <i>Firm characteristics:</i> | | | | | |
| Firm age | 0.0275 (0.888) | 0.0285 (0.978) | 0.0256 (1.145) | 0.0174 (0.558) | 0.0178 (0.659) |
| Firm size | -0.1707*** (-12.100) | -0.1755*** (-11.942) | -0.1585*** (-13.607) | -0.1782*** (-11.412) | -0.1684*** (-12.684) |
| Book leverage | -0.1052** (-2.158) | -0.0722 (-1.496) | 0.0646 (1.570) | -0.0814 (-1.529) | 0.0346 (0.722) |
| R&D | 0.1148*** (19.333) | 0.1168*** (16.496) | 0.0772*** (11.565) | 0.0541 (0.960) | 0.0591 (0.912) |
| CapEx | -0.0882 (-1.590) | -0.1331** (-2.443) | -0.1079** (-2.411) | -0.1531*** (-2.723) | -0.1328*** (-2.816) |
| OperCF | 0.4821*** (7.495) | 0.4307*** (7.195) | 0.1272*** (2.631) | 0.2592*** (4.414) | 0.0662 (1.324) |
| Business segments | -0.0011 (-0.153) | -0.0024 (-0.350) | -0.0024 (-0.435) | -0.0020 (-0.299) | -0.0032 (-0.544) |
| Tobin's Q lagged | | | 0.3239*** (19.378) | | 0.2376*** (13.418) |
| <i>Governance characteristics:</i> | | | | | |
| Board size | -0.0214 (-0.783) | 0.0041 (0.151) | 0.0130 (0.565) | 0.0239 (0.899) | 0.0268 (1.093) |
| % indep. directors | -0.0033 (-0.132) | 0.0118 (0.481) | 0.0061 (0.312) | 0.0034 (0.145) | 0.0036 (0.172) |
| E-index | -0.0151*** (-3.233) | -0.0128*** (-2.829) | -0.0078** (-2.162) | -0.0111** (-2.331) | -0.0092** (-2.232) |
| Institutional majority | 0.0322*** (3.442) | 0.0137 (1.449) | 0.0064 (0.807) | 0.0088 (0.948) | 0.0038 (0.450) |
| Year fixed effects | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effects | Yes | Yes | Yes | No | No |
| Industry * year fixed effects | No | Yes | Yes | Yes | Yes |
| CEO-firm fixed effects | No | No | No | Yes | Yes |
| NObs | 9,549 | 9,549 | 9,537 | 9,549 | 9,537 |
| Within R-Squared | 0.290 | 0.420 | 0.498 | 0.412 | 0.455 |

Table 4 – Instrumental variable (IV) regressions

This table reports coefficients from binary endogenous instrumental variable (IV) regressions. Specification (1) shows the results from the first-stage probit regression. Specification (2) shows the (third-stage) results from a three-stage IV approach. Specification (3) shows the (second-stage) results of a two-stage IV approach. All regressions include a constant (not reported). *BMI (state)* measures the fraction of obese people (i.e., Body Mass Index > 30) per U.S. state and year. All other variables are defined in Appendix B. Robust t-statistics of the regression coefficients are reported in parentheses. ***, **, and * denote statistical significance at the 1%-, 5%-, and 10%-level, respectively.

| Dep. variable: | First stage Fit CEO (1) | Three-stage IV Ln(Tobin's Q) (2) | Two-stage IV (3) |
|------------------------------------|-------------------------------|--|----------------------------|
| Fit CEO (IV) | | 0.9835* (1.666) | 1.2183** (2.313) |
| <i>Instruments:</i> | | | |
| BMI (state) | -0.0910* (-1.831) | | |
| <i>CEO characteristics:</i> | | | |
| CEO age | -0.0163*** (-2.959) | -0.0018** (-2.248) | 0.0011 (0.872) |
| CEO tenure | -0.0447 (-0.841) | 0.0111* (1.758) | 0.0047 (0.566) |
| CEO duality | 0.1270 (1.444) | 0.0036 (0.327) | 0.0069 (0.481) |
| Founder CEO | -0.4941*** (-3.154) | 0.0587*** (2.991) | -0.0175 (-0.577) |
| <i>Firm characteristics:</i> | | | |
| Firm age | 0.0069 (0.140) | 0.0176*** (3.539) | 0.0327 (0.950) |
| Firm size | -0.0638* (-1.959) | -0.0084* (-1.859) | -0.1661*** (-10.136) |
| Book leverage | -0.1678 (-0.752) | -0.2147*** (-5.534) | -0.0967* (-1.771) |
| R&D/sales | -1.3451 (-1.512) | 0.2646*** (4.182) | 0.1141*** (19.925) |
| CapEx/sales | 1.0476*** (4.690) | -0.0584 (-0.917) | -0.1107* (-1.838) |
| Operating Cash flow | -0.2227 (-0.462) | 1.9085*** (17.282) | 0.3942*** (5.714) |
| Business segments | -0.0328 (-0.655) | 0.0042 (0.709) | -0.0021 (-0.259) |
| Tobin's Q lagged | 0.0817 (0.893) | | |
| <i>Governance characteristics:</i> | | | |
| Board size | -0.2831* (-1.750) | 0.0058 (0.254) | -0.0056 (-0.178) |
| % indep. directors | -0.1325 (-0.583) | 0.0168 (0.608) | 0.0129 (0.443) |
| E-index | -0.0216 (-0.729) | -0.0260*** (-6.571) | -0.0164*** (-3.057) |
| Institutional majority | -0.1030 (-1.087) | 0.0143 (1.238) | 0.0217** (2.012) |
| Year fixed effects | Yes | Yes | Yes |
| Industry fixed effect | Yes | Yes | No |
| Firm fixed effects | No | No | Yes |
| NObs | 7,555 | | |
| Pseudo R-squared | 0.088 | | |

Table 5 – Sudden deaths and the value of fitness

This table reports coefficients from regressions of cumulative abnormal stock returns in reaction to sudden deaths of CEOs and presidents on the variable *Fit CEO (or president)* (defined below) and other control variables. *CAR [-1,1]* is the cumulative abnormal return (CAR) around the first announcement of a sudden death over the three-day event window, where day 0 is the event date (the first public announcement of the sudden death). CARs are estimated using the market model with the CRSP index as the market index. Deceased CEOs and presidents are defined as being fit if they can be identified as active sportsmen around the time of the sudden death. The number of CEOs (and presidents) identified as fit is seven. The variable *Age* measures the age of the deceased, the variable *CEO* equals one if the deceased was the CEO of the company (zero if she was the president), the variable *Duality* equals one if the deceased was also the chairman of the company (zero otherwise), the variable *Founder* equals one if the deceased was the founder of the company (zero otherwise), and the variable *Tenure* measures the tenure of the deceased CEO or president. *CAR [-1,1]*, *MTB*, and *ROA* are winsorized (at the 5th and 95th percentiles). Specification (3) includes a dummy for each decade of the sample period (i.e., 1990s, 2000s and 2010s), denoted as decade dummies. Robust t-statistics of the regression coefficients are reported in parentheses. ***, **, and * denote statistical significance at the 1%-, 5%-, and 10%-level, respectively.

| Dep. Var.: | CAR [-1,1] | | |
|------------------------------|------------------------------|-------------------------------|-----------------------------|
| | (1) | (2) | (3) |
| Fit CEO | -0.0483** (-2.370) | -0.0395*** (-2.893) | -0.0315* (-1.862) |
| <i>CEO characteristics:</i> | | | |
| CEO | | -0.0339 (-1.557) | -0.0507* (-1.896) |
| CEO age | | 0.0023** (2.435) | 0.0019* (1.740) |
| CEO tenure | | | 0.0007 (0.888) |
| CEO duality | | | 0.0197 (0.852) |
| Founder CEO | | | -0.0106 (-0.517) |
| <i>Firm characteristics:</i> | | | |
| Firm size | | 0.0122*** (2.727) | 0.0110** (2.163) |
| MTB | | 0.0005 (0.175) | 0.0005 (0.167) |
| ROA | | 0.0003 (0.006) | -0.0099 (-0.167) |
| Constant | -0.0034 (-0.330) | -0.1931*** (-2.798) | -0.1970** (-2.303) |
| Decade dummies | No | No | Yes |
| NObs | 51 | 50 | 50 |
| R-Squared | 0.062 | 0.448 | 0.478 |

Table 6 – Time-varying CEO and firm heterogeneity as alternative explanations

This table reports coefficients from firm fixed effects (Column 1) and CEO-firm fixed effects (Column 2) regressions of the natural logarithm of Tobin's Q on the *Fit CEO* dummy, control variables and additional control variables explained below. All regressions include a constant (not reported). For sake of brevity, we only report the coefficients for the *Fit CEO* dummy and the additional control variables. *CEO Female* is a dummy variable set to one for female CEOs, zero otherwise. *CEO outside directorships* is the number of a CEO's board seats outside the company she leads as the CEO. *CEO stock ownership* is the percentage of shares held by the CEO. *Board meetings* is the number of board meetings held by the company (in the current fiscal year). *Sales growth* is the annual change in net sales divided by prior year's net sales ($\text{Sales}_t / \text{Sales}_{t-1} - 1$). *Competition* is the Herfindahl index of sales (on annual basis) for all firms in the Compustat universe that belong to the same two-digit SIC industry. All other variables are defined in Appendix B. Industry*year fixed effects are based on industries clustered on two-digit SIC codes. Robust t-statistics of the regression coefficients are reported in parentheses. ***, **, and * denote statistical significance at the 1%-, 5%-, and 10%-level, respectively.

| Dep. variable: | Ln(Tobin's Q) | |
|-------------------------------|----------------------------------|-----------------------------------|
| | (1) | (2) |
| Fit CEO | 0.0278* (1.706) | 0.0399** (2.259) |
| <i>Additional controls:</i> | | |
| CEO Female | -0.0161 (-0.466) | |
| CEO outside directorships | -0.0017 (-0.558) | -0.0012 (-0.332) |
| CEO stock ownership | -0.0830 (-1.196) | -0.2540*** (-2.667) |
| Board meetings | -0.0057*** (-6.399) | -0.0063*** (-6.795) |
| Sales growth | 0.0259*** (3.211) | 0.0296*** (3.219) |
| Competition | 0.1282 (1.468) | 0.1869* (1.876) |
| CEO characteristics | Yes | Yes |
| Firm characteristics | Yes | Yes |
| Governance characteristics | Yes | Yes |
| Year fixed effects | Yes | Yes |
| Firm fixed effects | Yes | No |
| CEO-firm fixed effects | No | Yes |
| Industry * year fixed effects | Yes | Yes |
| NObs | 9,037 | 9,037 |
| Within R-squared | 0.509 | 0.475 |

Table 7 – Permutation tests: random assignment of pseudo fitness

This table reports p-values from Monte Carlo permutation tests with 10,000 random draws. The reported p-value is the fraction of randomly permuted datasets that yield a regression coefficient larger than or equal to the reported coefficient for the variable *Fit CEO* from our regressions of the natural logarithm of Tobin's Q on the *Fit CEO* dummy and control variables using either firm fixed effects (Column 1) or CEO-firm fixed effects (Column 2). All regressions also include a constant (not reported). For sake of brevity, we only report the coefficients and the p-values resulting from the permutations for the *Fit CEO* dummy. All variables are defined in Appendix B.

| Dep. Var.: | Ln(Tobin's Q) | |
|----------------------------|-----------------|-----------------|
| | (1) | (2) |
| Fit CEO | 0.0461 | 0.0421 |
| <i>p-value</i> | <i>[0.0237]</i> | <i>[0.0332]</i> |
| CEO characteristics | Yes | Yes |
| Firm characteristics | Yes | Yes |
| Governance characteristics | Yes | Yes |
| Year fixed effects | Yes | Yes |
| Firm fixed effects | Yes | No |
| CEO-firm fixed effects | No | Yes |
| NObs | 9,549 | 9,549 |
| Permutations | 10,000 | 10,000 |

Table 8 – CEO fitness and firm profitability

This table reports coefficients from regressions of ROA (in Columns 1 and 2) and FCF (in Columns 3 and 4) on the *Fit CEO* dummy (or the instrumented *Fit CEO* dummy) and control variables. Specifications (1) and (3) use firm fixed effects. Specifications (2) and (4) are IV regressions with the instrumented *Fit CEO* dummy. The corresponding first-stage regression results are reported in specification (1) of Table 4. The instrumental variable (IV) regressions use the three-stage IV methodology described in Adams, Almeida, and Ferreira (2009). Industry fixed effects are based on two-digit SIC codes. All regressions include a constant (not reported). All variables are defined in Appendix B. Robust t-statistics of the regression coefficients are reported in parentheses. ***, **, and * denote statistical significance at the 1%-, 5%-, and 10%-level, respectively.

| Dep. variable: | ROA | | FCF | |
|---|----------------------------|-----------------------------|----------------------------|-----------------------------|
| | Firm fixed (1) | IV (2) | Firm fixed (3) | IV (4) |
| Fit CEO | 0.0086** (2.087) | 0.6894*** (2.585) | 0.0218** (2.492) | 0.7556*** (4.353) |
| <i>CEO characteristics:</i> | | | | |
| CEO age | -0.0002 (-0.572) | 0.0004 (1.577) | -0.0001 (-0.333) | 0.0003 (1.038) |
| CEO tenure | -0.0015 (-0.849) | 0.0042* (1.912) | -0.0010 (-0.291) | 0.0013 (0.451) |
| CEO duality | 0.0075** (2.226) | 0.0003 (0.085) | 0.0031 (0.510) | -0.0005 (-0.105) |
| Founder CEO | -0.0189** (-2.478) | -0.0069 (-1.129) | -0.0136 (-1.275) | -0.0027 (-0.347) |
| <i>Firm characteristics:</i> | | | | |
| Firm age | 0.0057 (0.766) | 0.0079*** (4.512) | 0.0160 (1.611) | 0.0098*** (4.132) |
| Firm size | -0.0148*** (-3.836) | -0.0002 (-0.154) | 0.0285*** (3.529) | 0.0084*** (4.221) |
| Book leverage | -0.0106 (-0.771) | -0.0314** (-2.238) | 0.0282 (1.084) | 0.0178 (1.141) |
| R&D/sales | -0.0405*** (-12.215) | -0.0805*** (-3.988) | -0.0251*** (-3.749) | -0.0603*** (-3.674) |
| CapEx/sales | -0.0116 (-0.511) | -0.0416* (-1.877) | -0.1023*** (-3.147) | -0.2317*** (-8.469) |
| Business segments | -0.0032* (-1.767) | 0.0052** (2.537) | 0.0005 (0.209) | 0.0074*** (2.725) |
| <i>Governance characteristics:</i> | | | | |
| Board size | 0.0183*** (2.708) | 0.0240*** (2.949) | 0.0060 (0.449) | 0.0063 (0.601) |
| % indep. directors | 0.0058 (1.037) | -0.0104 (-1.173) | -0.0097 (-0.868) | -0.0249** (-2.004) |
| E-index | 0.0006 (0.435) | -0.0011 (-0.844) | 0.0034 (1.553) | -0.0001 (-0.084) |
| Institutional majority | 0.0062** (2.311) | 0.0117*** (2.841) | 0.0012 (0.260) | 0.0097* (1.678) |
| Year fixed effects | Yes | Yes | Yes | Yes |
| Industry fixed effects | No | Yes | No | Yes |
| Firm fixed effects | Yes | No | Yes | No |
| NObs | 9,331 | 7,396 | 8,250 | 6,728 |
| Within R-Squared | 0.080 | | 0.031 | |

Table 9 – CEO fitness and M&A performance

This table reports coefficients from OLS regressions of cumulative abnormal returns around the announcement of mergers and acquisitions (M&As) on the *Fit CEO* dummy, other control variables and interaction terms between the *Fit CEO* dummy and various deal characteristics. *CAR[-1,1]* is the cumulative abnormal return around the merger announcement over the three-day event window. CARs are estimated using the market model with the S&P 500 as the market index. In specification (3) the dependent variable is an indicator variable set to one if *CAR[-1,1]* is below zero (denoted *CAR[-1,1] < 0*). *Cross-border* is a dummy variable that is set to one if the deal is a cross-border deal, zero for domestic deals. *Hostile* is a dummy variable that is set to one for deals defined as hostile deals, zero otherwise. *MTB* is the acquiring firm's market-to-book ratio defined as the acquirer's market capitalization 20 trading days prior to deal announcement divided by the acquirer's common equity as of the end of the fiscal year prior the announcement of the M&A deal. *Payment includes stock* is a dummy variable (regarding the acquirer's chosen method of payment) that equals one for deals in which the consideration includes some stock, zero otherwise. *Public target* is a dummy variable that equals one if the target firm is a listed company, zero otherwise. *Relative size* is the deal's total transaction value divided by the acquirer's market capitalization 20 days prior to the announcement of the deal. *Same industry* is a dummy variable that equals one if the acquirer and the target belong to the same two-digit SIC industry, zero otherwise. *Transaction value* is the natural logarithm of the total transaction value. All other control variables are defined in Appendix B. All regressions also include a constant (not reported) as well as year fixed effects and industry fixed effects based on first-digit SIC codes as in Moeller, Schlingemann, and Stulz (2005); the respective regression coefficients are not reported for brevity. Robust t-statistics (based on standard errors clustered by acquirer) of the regression coefficients are reported in parentheses. ***, **, and * denote statistical significance at the 1%-, 5%-, and 10%-level, respectively.

| Sample: | Relative size >= 1% | | | Full sample |
|-------------------------------------|-----------------------------|----------------------------|------------------------------|-----------------------------|
| Dep. variable: | CAR [-1,1] (1) | CAR [-1,1] (2) | CAR [-1,1] < 0 (3) | CAR [-1,1] (4) |
| Fit CEO | 0.0117*** (2.618) | 0.0132** (2.448) | -0.2528** (-2.119) | -0.0133 (-1.333) |
| Fit CEO * Relative size | | | | 0.7169*** (2.609) |
| <i>Deal characteristics:</i> | | | | |
| Public target | -0.0104*** (-2.928) | -0.0122*** (-2.967) | 0.1010*** (2.584) | -0.0105*** (-3.312) |
| Relative size | 0.0213*** (2.985) | 0.0196* (1.811) | -0.0470 (-0.764) | 0.0205** (2.092) |
| Ln(Transaction value) | | 0.0015 (0.347) | -0.0444 (-1.227) | -0.0005 (-0.246) |
| Payment includes stock | -0.0050 (-1.062) | -0.0045 (-0.822) | 0.0564 (1.260) | -0.0030 (-0.662) |
| Cross-border | | -0.0007 (-0.189) | -0.0355 (-1.034) | -0.0017 (-0.707) |
| Same industry | | 0.0017 (0.516) | -0.0817*** (-2.625) | 0.0023 (0.875) |
| Hostile | | -0.0021 (-0.083) | 0.0600 (0.266) | -0.0039 (-0.163) |
| <i>Firm characteristics:</i> | | | | |
| Firm age | | 0.0017 (0.887) | -0.0125 (-0.742) | 0.0011 (0.761) |
| Firm size | -0.0022** (-2.392) | -0.0030 (-1.573) | 0.0337* (1.956) | -0.0018* (-1.880) |
| Book leverage | | 0.0032 (0.286) | -0.0853 (-0.920) | -0.0023 (-0.286) |
| R&D | | 0.0229 (1.123) | 0.3660*** (3.041) | 0.0295** (1.989) |

(Table 9 continued)

| | | | | |
|------------------------------------|--------------------|------------------------|-----------------------|------------------------|
| CapEx | | 0.0041 (0.285) | -0.0374 (-0.349) | 0.0084 (0.760) |
| OperCF | | -0.0393*** (-2.636) | -0.2665 (-1.620) | -0.0289*** (-2.588) |
| MTB | 0.0008* (1.882) | 0.0007 (1.115) | -0.0042 (-0.800) | 0.0004 (1.527) |
| Business segments | | 0.0006 (0.973) | -0.0044 (-0.805) | 0.0006 (1.419) |
| CEO characteristics: | | | | |
| CEO age | | -0.0000 (-0.115) | 0.0001 (0.044) | 0.0001 (0.281) |
| CEO tenure | | -0.0036 (-1.443) | 0.0391 (1.642) | -0.0017 (-0.945) |
| CEO duality | | 0.0039 (1.232) | -0.0540* (-1.747) | 0.0027 (1.161) |
| Founder CEO | | 0.0073 (1.114) | -0.0627 (-1.128) | 0.0045 (0.941) |
| Governance characteristics: | | | | |
| Board size | | 0.0020 (1.552) | 0.0587 (0.801) | 0.0009 (0.941) |
| % indep. directors | | 0.0039 (0.480) | 0.1444 (1.409) | 0.0035 (0.576) |
| E-index | | 0.0071* (1.704) | -0.0295** (-2.523) | 0.0029 (0.921) |
| Institutional majority | | -0.0201* (-1.662) | -0.0624* (-1.820) | -0.0111 (-1.173) |
| Year fixed effects | Yes | Yes | Yes | Yes |
| Industry fixed effects | Yes | Yes | Yes | Yes |
| NObs | 1,702 | 1,425 | 1,425 | 2,203 |
| R-Squared | 0.025 | 0.052 | 0.017 | 0.036 |

APPENDICES

Appendix A – Largest 15 U.S. marathons by number of finishers

This table presents the fifteen largest marathons in the United States ranked by the number of finishers in the year 2011. Data about the number of marathon finishers in the U.S. is provided by www.runningusa.org.

| | Name of marathon | Location | # finishers 2011 | Avrg. # finishers 2001-2011 |
|----------|-------------------------|-------------------|------------------|-----------------------------|
| 1 | ING New York City | New York, NY | 47,133 | 37,665 |
| 2 | Bank of America Chicago | Chicago, IL | 35,755 | 32,196 |
| 3 | Boston | Boston, MA | 23,913 | 19,193 |
| 4 | Marine Corps | Washington, DC | 21,042 | 18,604 |
| 5 | Honda LA | Los Angeles, CA | 19,902 | 21,121 |
| 6 | Honolulu | Honolulu, HI | 19,102 | 21,742 |
| 7 | Walt Disney World | Orlando, FL | 13,551 | 11,072 |
| 8 | Philadelphia | Philadelphia, PA | 10,267 | 6,927 |
| 9 | Medtronic Twin Cities | St. Paul, MN | 8,534 | 7,593 |
| 10 | Portland | Portland, OR | 8,461 | 7,424 |
| 11 | Rock'n'Roll San Diego | San Diego, CA | 8,290 | 14,467 |
| 12 | Chevron Houston | Houston, TX | 6,919 | 5,368 |
| 13 | Grandma's | Duluth, MN | 6,337 | 6,594 |
| 14 | Nike Women's | San Francisco, CA | 6,108 | 4,193 |
| 15 | San Francisco | San Francisco, CA | 5,989 | 3,948 |
| Σ | | | 243,859 | 218,107 |

Appendix B – Variable definitions

The table shows the definitions of the variables used in this study. Accounting data is from Compustat. CEO and governance data is from the Corporate Library's Board Analyst database.

| Variable | Definition |
|------------------------|--|
| % indep. directors | Percentage of directors on the board classified as independent directors. |
| Board size | Natural logarithm of the number of directors on the firm's board of directors. |
| Book leverage | $(\text{Long-term debt} + \text{current liabilities})_{t-1} / \text{Total assets}_{t-1}$. |
| Business segments | Natural logarithm of the number of business segments. |
| CapEx | $\text{Capital expenditures}_{t-1} / \text{Sales}_{t-1}$. |
| CEO age | Age of the firm's CEO in years. |
| CEO duality | Indicator variable equals one if the CEO is also the chairman of the board, zero otherwise. |
| CEO tenure | Natural logarithm of the number of years of service of the firm's CEO (measured as the CEO's time on the firm's board). |
| E-Index | The Bebchuk, Cohen, Ferrell (2009) entrenchment index of six IRRC provisions. |
| Firm age | Natural logarithm of the number of years the company has been in business, i.e., the firm's age since foundation. |
| Firm size | Natural logarithm of total assets _{t-1} . |
| Fit CEO | Indicator variable equals one if a CEO finishes a marathon in a given year, zero otherwise. Data sources: official marathon websites and www.marathonguide.com |
| Founder CEO | Indicator variable equals one if the CEO is the founder of the company, zero otherwise. |
| Free cash flow (FCF) | $\text{FCF} = (\text{EBITDA} - \text{CapEx} - (\text{Working capital}_t - \text{Working capital}_{t-1})) / \text{Total assets}$. Information about Working capital not available for all Compustat firms. |
| Institutional majority | Indicator variable equals one if the majority of a firm's outstanding shares is held by institutions, zero otherwise. In The Corporate Library database the variable is available for the years 2003 and later; the dummy for the years 2001 and 2002 is created using the variable 'InstitutionPctg' reported in The Corporate Library. |
| OperCF | $\text{Annual cash flow from operations}_{t-1} / \text{Total assets}_{t-1}$. |
| R&D | $\text{R\&D expense}_{t-1} / \text{Sales}_{t-1}$. |
| Return on Assets (ROA) | $\text{ROA} = \text{EBITDA} / \text{Total assets}$. |
| Tobin's Q | $\text{Tobin's Q} = (\text{Total assets} - \text{Book equity} + \text{Market value of equity}) / \text{Total assets}$. |

Appendix C – Random effects

This table reports coefficients from random effects regressions of the natural logarithm of Tobin's Q (Column 1) or ROA (Column 2) or FCF (Column 3) on the *Fit CEO* dummy and control variables. Industry fixed effects are based on two-digit SIC codes. All regressions include a constant (not reported). For sake of brevity, we only report the coefficients for the *Fit CEO* dummy. All variables are defined in Appendix B. Robust z-statistics of the regression coefficients are reported in parentheses. ***, **, and * denote statistical significance at the 1%-, 5%-, and 10%-level, respectively.

| Dep. variable: | Ln(Tobin's Q) | ROA | FCF |
|---|----------------------------|-----------------------------|-----------------------------|
| | (1) | (2) | (3) |
| Fit CEO | 0.0526** (2.132) | 0.0111*** (2.715) | 0.0239*** (2.710) |
| <i>CEO characteristics:</i> | | | |
| CEO age | 0.0002 (0.178) | -0.0000 (-0.122) | 0.0001 (0.160) |
| CEO tenure | -0.0043 (-0.661) | -0.0015 (-0.934) | -0.0018 (-0.566) |
| CEO duality | 0.0120 (1.079) | 0.0060** (1.981) | 0.0011 (0.226) |
| Founder CEO | -0.0104 (-0.473) | -0.0133** (-2.081) | -0.0030 (-0.350) |
| <i>Firm characteristics:</i> | | | |
| Firm age | 0.0146* (1.723) | 0.0069*** (2.968) | 0.0064** (2.378) |
| Firm size | -0.0608*** (-9.267) | -0.0054*** (-2.623) | 0.0104*** (3.491) |
| Book leverage | -0.1745*** (-4.325) | -0.0317** (-2.288) | 0.0110 (0.535) |
| R&D/sales | 0.1412*** (12.910) | -0.0513*** (-5.344) | -0.0397*** (-5.546) |
| CapEx/sales | -0.0554 (-1.383) | -0.0235* (-1.670) | -0.1377*** (-4.199) |
| Operating Cash flow | 0.7336*** (10.216) | | |
| Business segments | 0.0023 (0.369) | -0.0019 (-1.128) | 0.0029 (1.293) |
| <i>Governance characteristics:</i> | | | |
| Board size | -0.0003 (-0.014) | 0.0170*** (2.704) | -0.0014 (-0.126) |
| % indep. directors | -0.0003 (-0.013) | 0.0046 (0.859) | -0.0109 (-1.068) |
| E-index | -0.0191*** (-4.698) | 0.0004 (0.358) | 0.0024 (1.409) |
| Institutional majority | 0.0374*** (4.086) | 0.0079*** (2.993) | 0.0013 (0.293) |
| Year fixed effects | Yes | Yes | Yes |
| Industry fixed effects | Yes | Yes | Yes |
| NObs | 9,549 | 9,331 | 8,250 |
| Within R-squared | 0.269 | 0.075 | 0.026 |

Appendix D – Excluding the fittest CEOs

This table reports coefficients from firm fixed effects and CEO-firm fixed effects regressions of the natural logarithm of Tobin's Q on the *Fit CEO* dummy and control variables. All regressions include a constant (not reported). For sake of brevity, we only report the coefficients for the *Fit CEO* dummy. All variables are defined in Appendix B. Robust t-statistics of the regression coefficients are reported in parentheses. ***, **, and * denote statistical significance at the 1%-, 5%-, and 10%-level, respectively. "Marathon finish time > 4.00h" means that fit CEOs who finished a marathon in less than 4 hours (in a given year) are excluded from the sample.

| Dep. variable: | Marathon finish time > 4h | |
|----------------------------|-----------------------------------|-----------------------------------|
| | Ln(Tobin's Q) | |
| | (1) | (2) |
| Fit CEO | 0.0482** (1.971) | 0.0449** (2.026) |
| CEO characteristics | Yes | Yes |
| Firm characteristics | Yes | Yes |
| Governance characteristics | Yes | Yes |
| Year fixed effects | Yes | Yes |
| Firm fixed effects | Yes | No |
| CEO-firm fixed effects | No | Yes |
| NObs | 9,516 | 9,516 |
| Within R-Squared | 0.291 | 0.269 |

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