Illusory correlation in the remuneration of chief executive officers: It pays to play golf, and *well*

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July 31, 2010

Abstract

We examine the relations between golf handicaps of CEOs, corporate performance, and CEO compensation. We find that golfers earn more than non-golfers and pay increases with golfing ability. Furthermore golfers perform worse than non-golfers, performance decreases with golfing ability, and when low-ability golfers are appointed as CEOs, there are positive stock price reactions. To overcome *illusory correlation*, i.e., the use of information in CEO compensation decisions that is irrelevant or, worse, inversely related to shareholders' value maximization, we recommend using explicit, mechanical decision rules to ensure a transparent process.

JEL classification: D03, G30, J31

Key words: executive compensation, illusory correlation, golf handicaps, decision rules

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"Many chief executives are obsessed with golf. Warren Buffet and Bill Gates are both keen players. Jack Welch, a former boss of General Electric, considered handicaps a good measure of business acumen."

The *Economist*, April 10, 2008. Addressing the ball.

1. Introduction

Decisions concerning the remuneration of the chief executive officers (CEOs) of large corporations are important. Curiously, however, few studies have focused on the underlying judgmental processes that lead to these decisions. Instead, there seems to be an underlying belief that market forces will act to ensure that appropriate decisions are taken.[1]

Whereas it would be foolish to ignore the corrective power of market forces, it would be equally foolish to ignore the fact that judgments involving the remuneration of CEOs are fraught with difficulties. Not least of these is that such judgments – like many other complex, decision tasks – depend on information that is only probabilistically related to the criterion of interest (Brunswik, 1952; Kahneman, Slovic, and Tversky, 1982). For example, imagine estimating the future performance of a potential CEO. Clearly, some information – or cues – will be more important than others, the track-record of the candidate, say, or the type of problems facing the corporation. However, no one cue will be a perfect predictor and humans typically consider and aggregate several (Karelaia and Hogarth, 2008).

The quality – or accuracy – of human judgment depends on factors that characterize the environment in which judgments are made and people's actions (Simon, 1956; Hammond, 1996). First, the predictive ability of available cues sets an upper limit on how well anyone can predict the criterion. Second, how people use these cues in their judgments, as well as their consistency in doing so, affects relative success. Ideal tasks for accurate judgment involve just a few highly predictive cues, repeated occasions on which judgments are made, and good feedback on outcomes (Karelaia and Hogarth, 2008).

[1] CEO's remuneration is just the price tag attached to the value of services that the CEO provides to the firm. According to the efficient market hypothesis (Samuelson, 1965; Fama, 1970) prices fully reflect all the available (relevant) information.

Judgmental tasks concerning the remuneration of CEOs are not "ideal." There are few good, predictive cues, the task is not repeated frequently (compare judging distances when driving), and feedback is unclear (e.g., delayed and/or distorted by extraneous factors). In these circumstances, the psychological literature suggests that people will be susceptible to different types of bias in the selection and weighting of different sources of information (Einhorn and Hogarth, 1978; Gilovich, Griffin, and Kahneman, 2002).

One such phenomenon has been termed "illusory correlation" (Chapman and Chapman, 1967), and relates to using information systematically that is unrelated to the criterion of interest. This phenomenon was originally identified (and named) in the area of clinical psychology but it is not hard to see how it pervades many aspects of life. There have, for example, been many demonstrations of how physical height is used as a discriminating cue in situations such as job selection and political elections even when there is no basis to assume a veridical correlation between height and, say, competence (for a comprehensive review, see Judge and Cable, 2004). Parenthetically, we add that people may or may not be aware that they are using illusory correlations. In some cases, these could arise from conscious beliefs that are just misconceived. In other cases, people might lack awareness about which cues affect their judgments.

This paper documents the role of illusory correlation in decisions about CEO remuneration. In short, in common with economic theory we assume that CEO remuneration should be related to the performance of the companies they manage. Second, we document a cue (or information about CEOs) that predicts inferior corporate performance. Third, we maintain that this cue is available to those making decisions about CEO remuneration, and that (a) those CEOs who exhibit the cue earn more than those that don't, and (b) remuneration is larger for CEOs who display more desirable values of the cue. The cue in question is the CEO's golf handicap, a measure of how well a person plays the sport of golf. In short, possession of a handicap indicates whether or not a person plays golf on a regular basis and the actual handicap indicates ability.[2] Our argument that

[2]Handicaps are administered by golf clubs or national associations such as the United States Golf Association. A handicap reflects how many more shots an amateur is expected to take to complete a round of golf than a hypothetical excellent player (or "par") – thus, the lower the handicap, the better the player.

this cue is available to those making remuneration decisions is based on the fact that, in addition to providing recreational facilities, golf clubs in the USA serve as important venues where wealthy investors, top business executives, board members and other relevant luminaries can meet and discuss. A CEO, therefore, can choose to be visible in such circles of influence.

This paper is organized as follows. Before describing the data used to test for illusory correlation, we give simple examples how illusory correlation might arise from non-representative sampling from the population of interest and discuss some related literature. Our actual tests follow two steps. The first is to document that CEOs with handicaps earn more than those that don't as well as the relation between handicap and remuneration. The second is to show that CEOs with handicaps deliver inferior corporate performance, and further, the better the handicap the worse the performance. We also document stock price reactions to the hiring of CEOs who play golf. These are most negative for good golfers and most positive for bad golfers. We conclude by discussing implications.

2. The emergence of illusory correlation

Many psychological studies have shown that people have a remarkable ability to encode accurately – and without apparent effort – the frequencies of events they encounter in the environment (Zacks and Hasher, 2002). Indeed, the ability to learn relations in data through observation and experience is an important cognitive skill that is highly adaptive (Hogarth, 2001, Ch. 3). Learning is automatically tailored to what is observed. The cost, however, of this ability is that when samples observed are not representative of the population of instances for which inferences are being made, judgment can be biased (Fiedler, 2000; Denrell, 2005; Fielder and Juslin, 2006). Indeed, Fiedler (2006) makes the point that judgmental biases can arise because humans lack the "meta-cognitive" ability to correct inferences for the fact that samples might be biased. This is particularly likely when there is ambiguity in the data observed, feedback is missing and/or misleading, and so on. Moreover, if people act on the basis of biased inferences they may end up seeing what they believe through a self-fulfilling process (Einhorn and Hogarth, 1978).

Our explanation for the emergence of illusory correlation follows these arguments. They key lies in the sampling mechanisms used to learn features and relations in the population as a whole. Crucial is the distinction between sample correlation, which might be correctly perceived, and population correlation, which might not be perceived correctly if the mechanism generating the samples is non representative. Clearly, for out of sample prediction, only population correlations matter.

2.1. The possible case of Jack Welch

An article in the *Economist* (April 10, 2008) entitled “Addressing the ball” states: “Many chief executives are obsessed with golf. Warren Buffet and Bill Gates are both keen players. Jack Welch, a former boss of General Electric, considered handicaps a good measure of business acumen.”

Imagine that managerial and golfing ability are independently distributed in the population of managers. Assume further that both types of abilities are uniformly distributed between 0 and 1. Imagine that Jack Welch, a very busy CEO and a keen golfer does only two things in life – he either runs General Electric or plays golf with other managers and learns about their managerial ability through discussions on the golf course. In other words, on the job Jack Welch observes managerial skills but does not observe golfing abilities. Hence, what he learns on the job is not informative about the relation between golfing and managerial ability. On the other hand, since he can recognize the traits of successful managers, his observations on the golf course allow him to assess both managerial ability and golfing skills in the groups of individuals that he meets there. Thus, it is from the sample of managers who play golf that Jack learns the relation between golfing and managerial ability.

If Jack Welch were able to observe the whole population of managers, or a representative sample of managers from the population, he would be confronted with Figure 1.

The two types of abilities are clearly unrelated. The problem is that Jack Welch does not see the whole population and therefore might fail to infer the nonexistent relation between golfing and managerial ability.

Almost by definition, "good golfers" visit the golf course regularly and are therefore observed and studied carefully by the eagle eye of Jack Welch. "Bad golfers" with normalized golfing ability below 0.5 are more complicated.

Assume that bad golfers who are good managers never go to the golf course. This could reflect a preference for running their companies well as opposed to exposing their incompetence on the golf course, i.e., golfing and management are substitutes in the managers' utility function. On the other hand, bad managers who are bad golfers do go to the golf course. They do not particularly like to demonstrate their lack of golfing ability but the recreation allows them to forget the frustrations and failures that they experience with their managerial activities.

Thus, given that whether bad golfers go to the golf course depends on their being good or bad managers, the sample which Jack Welch will actually observe and study is

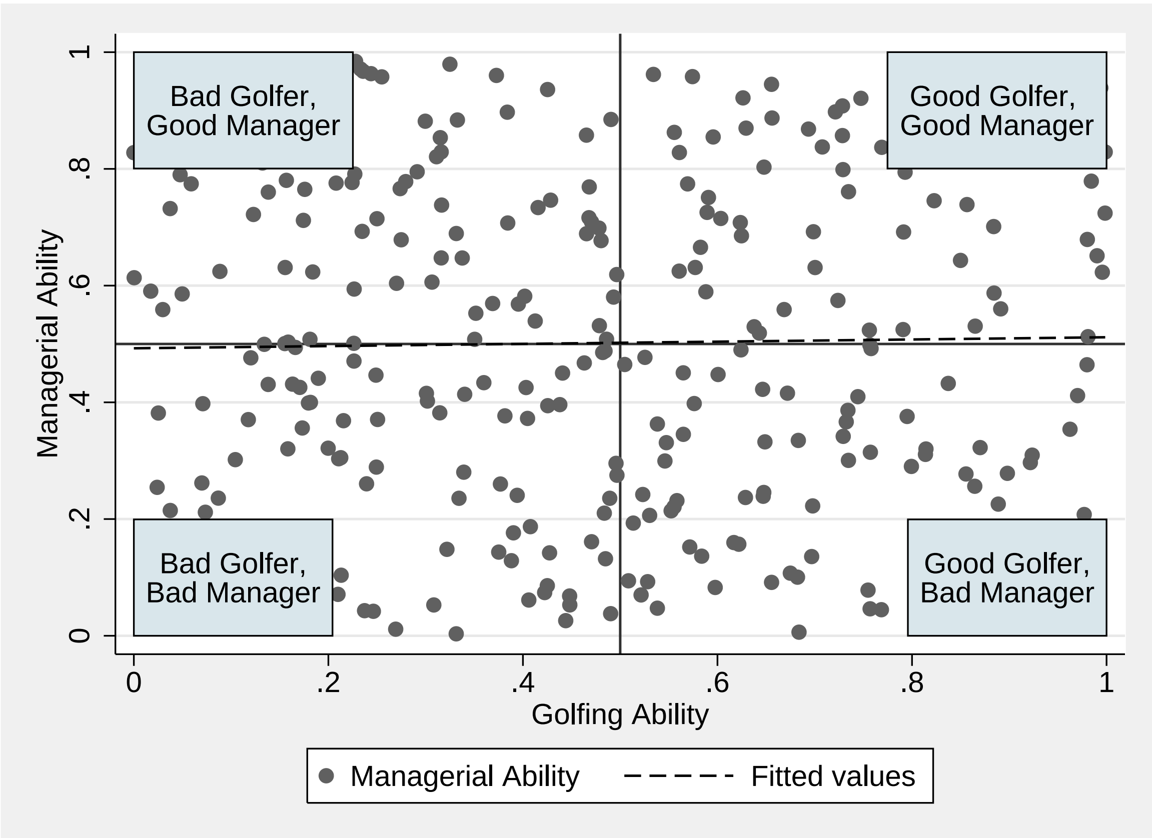

Figure 1: Scatter plot and linear regression fitted values of managerial ability versus golfing ability in a random sample from a population where the two abilities are unrelated and distributed as Uniform[0,1].

illustrated in Figure 2.

Figure 2: Scatter plot and linear regression fitted values of managerial ability versus golfing ability in a non-random sample from a population where the two abilities are unrelated and distributed as Uniform[0,1]. Bad golfers who are good managers never go to the golf course in this example.

Because observations in the upper left quadrant, good managers and bad golfers, are absent from his sample, Jack Welch perceives an illusory positive correlation between golfing and managerial ability (in this particular example, $r = 0.43$, p-value $< .01$). In other words, Jack Welch correctly perceives and processes the data available to him such that his inference is completely *internally valid*. However as his sample is not representative of the population as a whole, the correlation he observes is spurious, i.e., nonexistent in the population. His inference is *externally invalid*.

2.2. A simple example with explicit optimizing behavior by managers

The example above is unrealistic in that some managers never go to the golf course. We also do not quite explain why managers do what they do. Here we allow managers to visit the golf course probabilistically, i.e., they can be observed golfing with a specific probability. We then derive the optimal probability of playing golf – which can be thought of as the fraction of time a particular manager is observed golfing – from explicit utility optimizing behavior. To emphasize that no errors in estimation of managerial ability are needed to generate population illusory correlation, we retain the unrealistic assumption that, like Jack Welch, expert observers are able to judge managerial ability accurately.

Our experts collect their samples on the golf course from which they judge the relation between

- a : managerial ability distributed as Uniform[0,1]
- g : golfing ability distributed as Uniform[0,1] and independent of a in the population.

Managers, characterized by their golfing and managerial ability, optimally choose the rate at which they visit the golf course p (i.e., p is the probability that a manager is observed golfing).

The manager's problem is to choose between only two activities, the fraction of time golfing p, and the fraction of time spent working and maximizing shareholder value $(1-p)$, to maximize his log-linear utility function

$$\max_{\{p\}} U(p, 1-p; a, g) = g\log(p) + a\log(1-p) \text{ s.t. } p \text{ is in } [0,1]. \quad (1)$$

Each manager in the population is characterized by levels of managerial ability a and golfing ability g. These are two state variables with which managers are exogenously endowed. They do, however, have a choice of how much golf to play, represented here by the probability that they visit the golf course p. The utility of managers is increasing in how much golf they play, because they enjoy golfing. The utility is also increasing in the time spent working $(1-p)$ – probably because managers like doing a good job, or more likely because they derive utility from the money they earn and this increases as they work more $(1-p)$.

The first order condition for this problem yields

$$dU/dp = g(1/p) - a[1/(1-p)] = 0. \quad (2)$$

Solving the first order condition for p we find the optimal fraction of time playing golf as a function of the state variables

$$p* = g/(a+g). \tag{3}$$

If expert observers had access to a random sample from the population, i.e., if each type of manager was forced to play golf with equal probability, they would see Figure 1 and would compute correlation of roughly 0 between a and g.

However, the managers choose optimally how much golf to play. The probability of observing a manager on the golf course is thus given by $p*$ in eq. (3). The expert observers will in fact see a manager playing golf with different probability depending on managerial characteristics – golfing ability and shareholder maximization ability. So observers will see Figure 3.

The sizes of the circles in Figure 3 indicate the frequency with which particular types of managers are observed in available samples. For this particular example, the observer will compute a positive correlation of 0.16 (p-value $< .01$) which is spurious, i.e., not present in the population. The maximization of the log-linear utility function results in good managers who are bad golfer being observed less frequently than the others, i.e., the probabilistic version of the situation considered in the previous subsection.

To summarize, even if expert observers form their beliefs and judgments completely rationally based on the samples they have at hand, these will only be externally valid to the extent that the samples they see are representative of the population as a whole. Almost by definition expertise is somewhat idiosyncratic, i.e., specific to experts and their particular environments. Therefore the condition for external validity – that the expert studies representative random samples from the population – is often likely to fail. In the example above, the combination of two facts – (1) that Jack Welch is a keen golfer and gathers a lot of professional information about others on the golf course, and (2) that managers non-randomly, but optimally choose how much golf to play – implies that Jack Welch studies non-representative samples of the managerial population and thus possibly forms illusory correlations based on his expertise.[3]

3. Related literature

This paper is most closely related to the small literature on pay for luck in CEO compensation in that it shows that this largely depends on a factor that has no place in standard principal-agent models. Indeed, one has to think hard and have a rich imagination to come up with a rational explanation for the empirical facts we report. Bertrand and Mullainathan (2001) show that CEO pay responds as much to a lucky dollar as to a general dollar, contrary to what the basic principal-agent model predicts. As measures of

[3] For a further explanation as to how illusory correlations can arise despite rational information processing and decision making, see Le Mens and Denrell (2010).

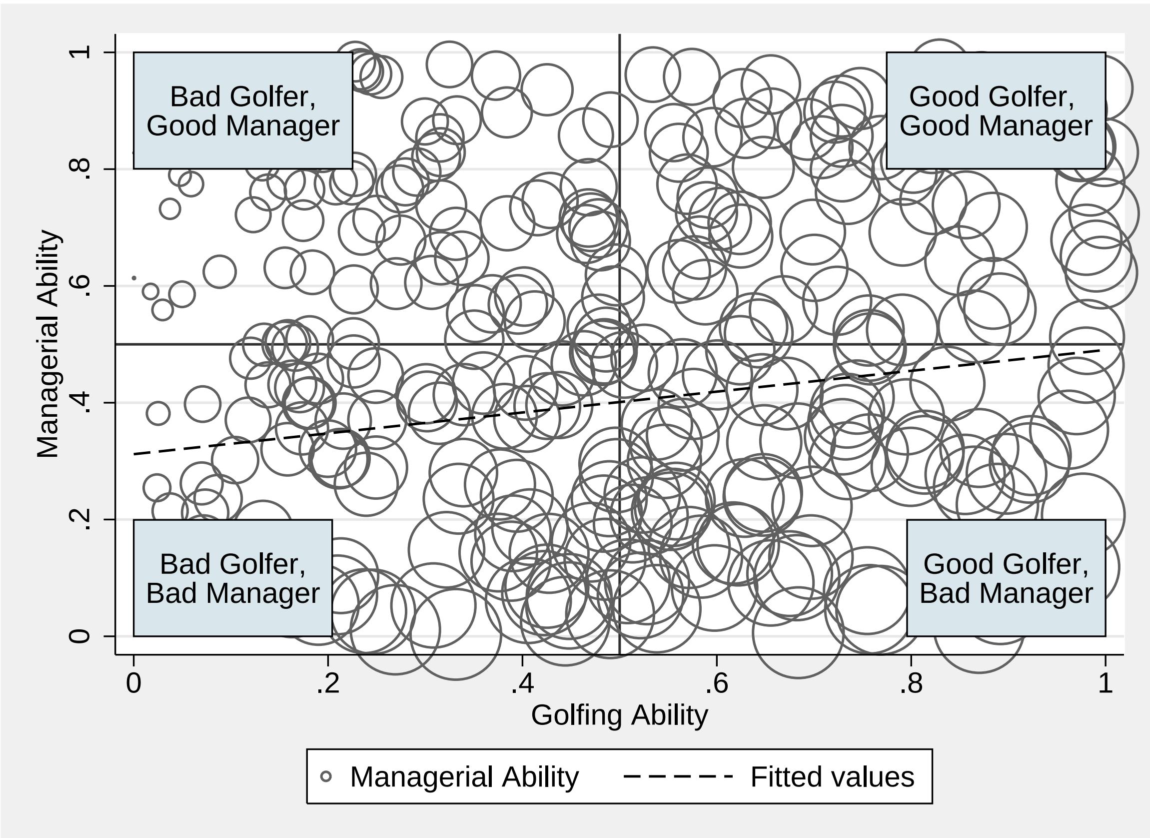

Figure 3: Scatter plot and linear regression fitted values of managerial ability versus golfing ability in a non-random sample from a population where the two abilities are unrelated and distributed as Uniform[0,1]. Managers maximize log-linear utility function and choose optimally how much golf to play. In the Figure the size of each circle is given by the probability that a particular type of manager is observed golfing given by his optimal fraction of time devoted to golfing $p*$.

luck in their analysis they use oil prices (for firms in the oil industry), average industry performance and exchange rate movements (for firms in the traded goods sector). Further they find that firms with stronger governance (e.g., firms where a large shareholder is present on the board of directors) pay less for luck.

Garvey and Milbourn (2006) demonstrate asymmetries in pay for luck – CEOs are rewarded for good luck, but are not punished for bad luck. The measure of luck they use is average industry performance.

Kolev (2008) shows that CEO pay is affected by the conditions in the public equity market, reflected in the number of IPOs and first day IPO returns. He argues that this is a manifestation of another judgmental bias, the "fundamental attribution error"[4] – shareholders confuse good public equity market conditions for CEO leadership and skill.

There are extensions to the basic principal-agent model, which can make pay for luck potentially optimal – see, e.g., Oyer (2004), Himmelberg and Hubbard (2000), and Celentani and Loveira (2006). The key feature of these models is that CEO marginal productivity or the value of a CEO's outside options fluctuates. As these fluctuations can be potentially correlated with the state of the economy, pay for luck is not necessarily suboptimal – the state variables that we label "luck" are plausibly beyond the CEO's control, yet they might reflect the CEO's marginal productivity or values of outside options.

Blanchard, Lopez-de-Silanes, and Shleifer (1994) provide the most convincing evidence that CEO compensation in the USA has nothing to do with efficient compensation models and is a result of badly functioning corporate governance. They study the effect of cash windfalls, in the form of won or settled lawsuits, on CEO compensation. They start with a sample of 110 firms with settled lawsuits, and exclude all firms for which awards can be potentially connected to the firms' marginal Tobin's Q, thereby reaching a final sample of 11 firms. This method rules out the possibility that the effect of the cash windfall on CEO compensation is due to a change in the marginal productivity of the

[4]Classic studies demonstrating the fundamental attribution error, i.e., people's tendency to attribute observed outcomes to internal dispositions and characteristics of agents (ability, skill, effort) as opposed to situational factors (exogenous shocks, luck) are Jones and Harris (1967) and Ross, Amabile and Steinmetz (1977). More recent and more relevant for the CEO compensation literature are Weber, Camerer, Rottenstreich, and Knez (2001) and Durell (2001).

CEO. Further, their luck variable – cash windfall – is firm specific, hence the possibility that the effect of luck on pay is due to changing values of outside options is also discarded. Blanchard et al. (1994) show that a median of 16% of the net award is given to the top three executives in the form of extra cash over the three years following the award. This increases cash compensation over the three years following the award by 84% compared to the three preceding years. Median management ownership rises from 14.5% before the award, to 16.5% after the award. The empirical results in Blanchard et al. (1994) cast serious doubts on the empirical relevance of the models in Oyer (2004), Himmelberg and Hubbard (2000), and Celentani and Loveira (2006). Incidentally, none of the latter three papers quotes the former.

4. Data

The magazine *Golf Digest* compiles data on CEOs' golf handicaps biennially. For 1998, the *Golf Digest* ranking covers CEOs from the top 300 firms in the Fortune 500 list, and only data on those having US Golf Association handicap indices are included. For 2000, the ranking covers the 230 CEOs with the lowest handicaps (i.e., the 230 best players). For 2002, the *Golf Digest* CEO handicap ranking lists the top 270 golfers among Fortune 500 and S&P 500 companies. For 2004, the ranking contains the top 234 golfers, again among Fortune 500 and S&P 500 companies. For 2006, the *Golf Digest* CEO handicap ranking lists the top 200 golfers among Fortune 1000 companies.

We merged the data for the years 1998, 2000, 2002, 2004 and 2006 from issues of *Golf Digest* with *Execucomp* data on CEO compensation, stock returns and other control variables. To study how playing golf affects CEOs' remuneration and shareholders' returns we define three regressors.

Handicap is the exact golf handicap of the CEO in the given fiscal year as reported in the corresponding year report of *Golf Digest*. *No handicap* is a dummy variable equal to 1 if the CEO does not appear in any *Golf Digest* ranking, and equal to 0 otherwise. Summary statistics for the main variables of interest are contained in Table 1.

Table 1: Summary statistics for the main variables of interest

Variable	Mean	Std. Dev.	Min.	Max.	N
Total expected CEO compensation♣ in thousands USD	5361.557	13747.155	0	655447.998	8680
Log(total comp. expected)	7.871	1.247	-6.908	13.393	8665
Total current CEO compensation♢ in thousands USD	1367.206	1660.385	0	32208.334	8770
Log(total current comp.)	6.853	1.039	-6.908	10.38	8710
NO handicap♡	0.836	0.37	0	1	8770
Handicap♠	14.12	5.588	0.3	35.1	839

♣ comprised of Salary, Bonus, Other Annual, Total Value of Restricted Stock Granted, Total Value of Stock Options Granted (using Black-Scholes), Long-Term Incentive Payouts, and All Other Total (tdc1 item in *Execucomp*).
♢ comprised of salary and bonus (total_curr item in *Execucomp*).
♡ a dummy variable equal to 1 if the CEO is not present in any of the *Golf Digest* rankings.
♠ the golf handicap for the given year as reported in the relevant *Golf Digest* ranking.

We also compute the mean golf handicap for each CEO over the years in which he[5] appears in rankings (e.g., if the CEO appears only in year 2000 ranking, then his mean golf handicap is the handicap for year 2000; if he appears in both the 2000 and 2002 rankings, his mean handicap is the average value of the handicap for year 2000 and the handicap for year 2002). We classify CEOs according to their mean golf handicap and define two dummy variables taking the value of 1 if the given CEO falls in the middle or the top tercile, respectively, of the mean golf handicap distribution. In the instrumental variable regressions the dummies denoting in which tercile of the mean handicap distribution the CEO falls are used as instruments for the exact golf handicap, i.e., we use them to compute the Wald (1940) type of instrumental variable estimator.

[5]The vast majority of CEOs were male.

5. Results

5.1. CEO handicaps and compensation

We start our analysis by establishing the relation between golf handicap and CEO compensation. CEOs whose handicaps are good enough to warrant presence in the *Golf Digest* ranking are better paid and the effect is significant in all specifications at better than 1% significance level. Among the set of executives present in the ranking, the ones who have higher handicaps (i.e., are worse golfers) are paid less.

Tables 2 and 3 establish these facts for the log of total direct compensation [log(tdc1) item in *Execucomp*], and Tables 4 and 5 do the same with respect to the log of total current compensation [log(total_curr) item in *Execucomp*].

5.1.1. CEO handicaps and compensation, conditional on other covariates

Tables 2-5 show the results of regressing CEO compensation on golf handicap and other controls. Moving from column 1 to column 4 in each table, more regressors are included. Column 1 contains the bare minimum of controls relevant in this context – the size of the firm measured by the log of the market value. Column 2 adds a full set of year dummies. Column 3 adds other controls which might be relevant for explaining compensation – a dummy variable equal to 1 if the firm belongs to the S&P 500 index, log of book to market ratio to proxy for firms' growth opportunities, 1 and 3 year stock returns (including dividend distributions), return on assets, number of employees, 3 year sales growth, price to earnings ratio, and dividend yield. Column 4, which is our preferred specification, additionally includes a full set of industry fixed effects at the 2 digit SIC level, and quadratics in the CEO's age and tenure.[6]

Table 2 explains the log of total CEO compensation [Salary, Bonus, Other Annual, Total Value of Restricted Stock Granted, Total Value of Stock Options Granted (using Black-Scholes), Long-Term Incentive Payouts, and All Other Total, i.e., tdc1 item in

[6]The regressors age and tenure are sample demeaned for ease of interpretation. Therefore the estimated coefficients on, e.g., age (disregarding age^2) is interpreted as the percentage increase in pay resulting from a year increase in the regressor, evaluated at the sample mean of age.

Table 2: Regression of log of total compensation on playing golf. The dependent variable is the log of total compensation, comprised of Salary, Bonus, Other Annual, Total Value of Restricted Stock Granted, Total Value of Stock Options Granted (using Black-Scholes), Long-Term Incentive Payouts, and All Other Total (tdc1 item in *Execucomp*). The main regressor of interest *NO handicap* is a dummy variable equal to 1 if the CEO does *not* appear in any of the *Golf Digest* golf handicap rankings.

	(1)	(2)	(3)	(4)
NO handicap	-0.2170***	-0.2179***	-0.1461***	-0.1440***
	[0.0459]	[0.0460]	[0.0473]	[0.0472]
Log(mktvalue)	0.3925***	0.3913***	0.4149***	0.4318***
	[0.0119]	[0.0120]	[0.0213]	[0.0205]
Log(book/mkt value)			0.0826***	0.1109***
			[0.0218]	[0.0222]
S&P 500 dummy			0.0653	0.0506
			[0.0631]	[0.0619]
Return 1 yr			0.0000***	0.0000**
			[0.0000]	[0.0000]
Return 3 yrs			0.0013***	0.0016***
			[0.0004]	[0.0005]
Return on Assets			-0.0047***	-0.0051***
			[0.0011]	[0.0011]
Sales growth 3yrs			0.0004	0.0002
			[0.0003]	[0.0003]
Employees			0.0005	0.0006*
			[0.0003]	[0.0003]
Dividend yield			-0.0084	-0.0002
			[0.0066]	[0.0023]
Price/earnings			-0.0001	-0.0001
			[0.0000]	[0.0000]
age				0.0008
				[0.0025]
age^2				0.0001
				[0.0002]
tenure				0.0008
				[0.0030]
tenure^2				-0.0005***
				[0.0002]
Time dummies	No	Yes	Yes	Yes
2 digit SIC dummies	No	No	No	Yes
Observations	8450	8450	7731	7384
R^2	0.319	0.325	0.347	0.388
number of CEOs	3786	3786	3521	3335

Standard errors [in brackets] consistent in the presence of arbitrary within CEO autocorrelation and heteroskedasticity (see Wooldridge 2002, eq. 7.26). Significance: * $p < .10$, ** $p < .05$, *** $p < .01$.

Execucomp] with a regressor which is a dummy variable taking the value 1 if the CEO does not have a golf handicap, or the handicap was not good enough to merit inclusion in any of the *Golf Digest* rankings. CEOs who are not regular golf players receive about 14% less[7] in total ex-ante compensation and the effect is significant at the 1% significance level (Table 2, column 4).

Table 3 is limited to the set of executives appearing in the *Golf Digest* rankings and presents regressions of the log of total CEO compensation on the CEO's golf handicap. Better golfers are paid more: an increase of one point in handicap (i.e., being a marginally worse player) results in 1.91% decrease in total ex-ante pay (Table 3, column 4). The effect is statistically significant at the 1% significance level and economically large.

Table 4 presents regressions of the log of total current compensation comprised of salary and bonus (total_curr item in *Execucomp*) on a dummy variable equal to 1 if the CEO does not have a handicap or if the handicap is not good enough to merit inclusion in the rankings, and other controls. Not playing golf regularly costs about 15.3% in total current compensation (Table 4, column 4), and the effect is significant at the 1% significance level. The sizes of the estimated effects of not playing golf for total current compensation are fairly similar to the estimated effects for total direct compensation.

The evidence supports our claim that CEOs who are regular golfers earn more than those who are not. At the same time, we stress that the effect is economically large – 15% less in pay just because the CEO does not play golf or does not play golf regularly enough to have a decent handicap. Table 5 presents regressions of the log of total current compensation on golf handicap and other covariates. Among the CEOs who have good golf handicaps – and hence appear in the *Golf Digest* rankings – an increase of one handicap point (i.e., being a marginally worse player) results in a decrease in salary and bonus of about 0.86% (Table 5, column 4). The effect is only statistically significant at the 10% significance level but economically quite large.[8]

[7] More precisely, the marginal effect on CEO compensation from switching the No golf handicap dummy from 0 to 1 is $100*[\exp(-0.144) - 1] = -13.41\%$

[8] A good but not outstanding golfer might have a handicap of, say, 15. An outstanding golf player might have a handicap of 2 (i.e., plays nearly at par). Thus, a decrease in handicap from 15 to 2 , which is a move from being a good to an excellent golf player, results in about a 0.86*13 = 11.18% increase in total current compensation. This is a large effect.

Table 3: Regression of log of total compensation on golf handicap. The dependent variable is the log of total compensation, comprised of Salary, Bonus, Other Annual, Total Value of Restricted Stock Granted, Total Value of Stock Options Granted (using Black-Scholes), Long-Term Incentive Payouts, and All Other Total (tdc1 item in *Execucomp*). The main regressor of interest is *Handicap*, the golf handicap for the given year as reported in the relevant *Golf Digest* ranking.

	(1)	(2)	(3)	(4)
Handicap	-0.0138**	-0.0128*	-0.0119*	-0.0191***
	[0.0067]	[0.0070]	[0.0072]	[0.0063]
Log(mktvalue)	0.3329***	0.3296***	0.3569***	0.3470***
	[0.0440]	[0.0440]	[0.0743]	[0.0662]
Log(book/mkt value)			0.0973	0.0763
			[0.1020]	[0.0922]
Return 1 yr			0.0036*	0.0038**
			[0.0019]	[0.0016]
Return 3 yrs			0.0029*	0.0027**
			[0.0017]	[0.0013]
Return on Assets			-0.0029	-0.0025
			[0.0109]	[0.0113]
Sales growth 3yrs			-0.0038	-0.0027
			[0.0036]	[0.0031]
Employees			0.0001	0.0009
			[0.0004]	[0.0007]
Dividend yield			0.0021	0.0247
			[0.0253]	[0.0237]
Price/earnings			0.0003	0.0004
			[0.0002]	[0.0002]
S&P 500 dummy			0.0145	-0.0024
			[0.1394]	[0.1087]
age				0.0166**
				[0.0076]
age^2				-0.0005
				[0.0008]
tenure				-0.0011
				[0.0092]
tenure^2				-0.0016
				[0.0010]
Time dummies	No	Yes	Yes	Yes
2 digit SIC dummies	No	No	No	Yes
Observations	811	811	777	764
R^2	0.173	0.181	0.211	0.344
number of CEOs	447	447	430	423

Standard errors [in brackets] consistent in the presence of arbitrary within CEO autocorrelation and heteroskedasticity (see Wooldridge 2002, eq. 7.26). Significance: * $p < .10$, ** $p < .05$, *** $p < .01$.

Table 4: Regression of log of total current compensation on playing golf. The dependent variable is total current compensation comprised of salary and bonus (total_curr item in *Execucomp*). The main regressor of interest is *NO handicap*, a dummy variable equal to 1 if the CEO is not present in any of the *Golf Digest* rankings.

	(1)	(2)	(3)	(4)
NO handicap	-0.2637***	-0.2451***	-0.1679***	-0.1530***
	[0.0444]	[0.0445]	[0.0478]	[0.0465]
Log(mktvalue)	0.2304***	0.2346***	0.2671***	0.2532***
	[0.0127]	[0.0129]	[0.0206]	[0.0213]
Log(book/mkt value)			0.1345***	0.0960***
			[0.0185]	[0.0200]
S&P 500 dummy			-0.0173	0.0024
			[0.0602]	[0.0598]
Return 1 yr			0.0000	0.0000
			[0.0000]	[0.0000]
Return 3 yrs			0.0013***	0.0009**
			[0.0004]	[0.0004]
Return on Assets			0.0017**	0.0005
			[0.0008]	[0.0007]
Sales growth 3yrs			-0.0007	-0.0008
			[0.0007]	[0.0006]
Employees			0.0007	0.0009*
			[0.0004]	[0.0005]
Dividend yield			-0.0005	0.0015
			[0.0017]	[0.0021]
Price/earnings			-0.0001*	-0.0001
			[0.0000]	[0.0000]
age				0.0090***
				[0.0025]
age^2				-0.0002
				[0.0002]
tenure				0.0051**
				[0.0024]
tenure^2				-0.0003**
				[0.0001]
Time dummies	No	Yes	Yes	Yes
2 digit SIC dummies	No	No	No	Yes
Observations	8492	8492	7762	7419
R^2	0.185	0.204	0.227	0.279
number of CEOs	3806	3806	3534	3348

Standard errors [in brackets] consistent in the presence of arbitrary within firm autocorrelation and heteroskedasticity (see Wooldridge 2002, eq. 7.26). Significance: * $p < .10$, ** $p < .05$, *** $p < .01$.

Table 5: Regression of log of total current compensation on golf handicap. The dependent variable is total current compensation comprised of salary and bonus (total_curr item in *Execucomp*). The main regressor of interest is *Handicap*, the golf handicap for the given year as reported in the relevant *Golf Digest* ranking.

	(1)	(2)	(3)	(4)
Handicap	-0.0045	-0.0045	-0.0056	-0.0086*
	[0.0061]	[0.0061]	[0.0066]	[0.0051]
Log(mktvalue)	0.2102***	0.2102***	0.2095***	0.1641***
	[0.0346]	[0.0346]	[0.0630]	[0.0399]
Log(book/mkt value)			0.1560*	0.1006
			[0.0819]	[0.0636]
Return 1 yr			0.0052***	0.0050***
			[0.0016]	[0.0013]
Return 3 yrs			0.0026	0.0024
			[0.0021]	[0.0015]
Return on Assets			0.0100*	0.0137***
			[0.0056]	[0.0049]
Sales growth 3yrs			-0.0010	0.0002
			[0.0031]	[0.0027]
Employees			0.0005	0.0012*
			[0.0004]	[0.0007]
Dividend yield			0.0039	0.0140
			[0.0162]	[0.0144]
Price/earnings			0.0001	0.0002
			[0.0002]	[0.0002]
S&P 500 dummy			0.0564	0.1260
			[0.1224]	[0.0881]
age				0.0122**
				[0.0061]
age^2				-0.0011
				[0.0007]
tenure				0.0015
				[0.0071]
tenure^2				-0.0017*
				[0.0009]
Time dummies	No	Yes	Yes	Yes
2 digit SIC dummies	No	No	No	Yes
Observations	809	809	775	762
R^2	0.161	0.161	0.219	0.363
number of CEOs	446	446	429	422

Standard errors [in brackets] consistent in the presence of arbitrary within CEO autocorrelation and heteroskedasticity (see Wooldridge 2002, eq. 7.26). Significance: * $p < .10$, ** $p < .05$, *** $p < .01$.

Finally, the mean CEO golf handicap in our sample is 14.12 with a standard deviation of 5.58. Hence an increase in golf handicap of one standard deviation (i.e., becoming a worse golfer) leads to about 10.66% decrease in total ex-ante compensation and about an 4.8% decrease in salary plus bonus. This is strong evidence in support of our claim concerning the relative effects of golf handicap on remuneration.

5.1.2. CEO handicaps and compensation, instrumental variable regressions

We argue that good golf playing abilities confer a "halo" effect on the CEO. The presence of the illusory belief that golf playing abilities correlate with shareholder value maximisation abilities prompts the relevant decision makers (board of directors, compensation committee members) to confer higher pay on CEOs who are good golfers. Hence the thought experiment we have in mind is to elicit and somehow aggregate the opinions of all relevant decision makers regarding how good a golfer their CEO is, and to correlate this (infeasible) measurement of CEO golf playing abilities with CEO compensation.

As this experiment is infeasible in practice, the best measurement of how good a golfer a CEO is in the eyes of the relevant decision makers, is the golf handicap in the fiscal year in question. The theoretical variable we wish we could have regarding golf playing abilities is a weighted average of the opinions of the people deciding how much the CEO should be paid, where the weights reflect how important each person is in the decision making process. Therefore the golf handicap is an imperfect measurement of the theoretical variable we are interested in, even if the true golf handicap is measured without error in our data for the year in question.

If the decision makers' estimates of the CEOs' golf playing abilities diverge from the golf handicap in a random manner, as in the classical errors in variables model (i.e., the noise is uncorrelated with the golf handicap and with the error term in the estimating equation), our regressions of CEO remuneration on golf handicap would suffer from attenuation bias and we would underestimate the true effect of golf playing abilities on CEO pay. To investigate this issue, and correct for potential attenuation, we estimate instrumental variable regressions following a suggestion by Wald (1940). We use the ter-

Table 6: Instrumental variable regression of log of total compensation♣ on golf handicap.

	(1)	(2)	(3)	(4)
Handicap	-0.0175**	-0.0180**	-0.0170*	-0.0249***
	[0.0084]	[0.0088]	[0.0093]	[0.0080]
Log(mktvalue)	0.3331***	0.3298***	0.3575***	0.3486***
	[0.0440]	[0.0439]	[0.0738]	[0.0682]
Log(book/mkt value)			0.0946	0.0730
			[0.1021]	[0.0950]
Return 1 yr			0.0036*	0.0038**
			[0.0018]	[0.0016]
Return 3 yrs			0.0029*	0.0028**
			[0.0017]	[0.0013]
Return on Assets			-0.0025	-0.0020
			[0.0109]	[0.0117]
Sales growth 3yrs			-0.0038	-0.0029
			[0.0036]	[0.0032]
Employees			0.0001	0.0009
			[0.0004]	[0.0007]
Dividend yield			0.0026	0.0251
			[0.0252]	[0.0243]
Price/earnings			0.0003	0.0003
			[0.0002]	[0.0002]
S&P 500 dummy			0.0124	-0.0106
			[0.1383]	[0.1111]
age				0.0173**
				[0.0080]
age^2				-0.0004
				[0.0008]
tenure				-0.0017
				[0.0096]
tenure^2				-0.0015
				[0.0010]
Time dummies	No	Yes	Yes	Yes
2 digit SIC dummies	No	No	No	Yes
Observations	811	811	777	764
R^2	0.172	0.180	0.211	0.343
number of CEOs	447	447	430	423

♣ comprised of Salary, Bonus, Other Annual, Total Value of Restricted Stock Granted, Total Value of Stock Options Granted (using Black-Scholes), Long-Term Incentive Payouts, and All Other Total (tdc1 item in *Execucomp*). The main regressor of interest is *Handicap*, the golf handicap for the given year as reported in the relevant *Golf Digest* ranking. We compute the mean golf handicap for each CEO across the years in which he appears in the sample. The *Handicap* variable is instrumented with two dummy variables which take the value of 1 if the CEO falls in the top or middle terciles respectively of the distribution of the mean golf handicaps.
Standard errors [in brackets] consistent in the presence of arbitrary within CEO autocorrelation and heteroskedasticity (see Wooldridge 2002, eq. 8.33). Significance: * $p < .10$, ** $p < .05$, *** $p < .01$.

Table 7: Instrumental variable regression of log of total current compensation♣ on playing golf.

	(1)	(2)	(3)	(4)
Handicap	-0.0000	-0.0088	-0.0099	-0.0140**
	[0.0070]	[0.0071]	[0.0079]	[0.0063]
Log(mktvalue)	0.2224***	0.2104***	0.2100***	0.1656***
	[0.0352]	[0.0344]	[0.0625]	[0.0411]
Log(book/mkt value)			0.1536*	0.0973
			[0.0822]	[0.0662]
Return 1 yr			0.0052***	0.0050***
			[0.0016]	[0.0013]
Return 3 yrs			0.0026	0.0024
			[0.0021]	[0.0016]
Return on Assets			0.0103*	0.0141***
			[0.0056]	[0.0051]
Sales growth 3yrs			-0.0011	0.0000
			[0.0031]	[0.0028]
Employees			0.0005	0.0012
			[0.0004]	[0.0008]
Dividend yield			0.0044	0.0144
			[0.0163]	[0.0148]
Price/earnings			0.0001	0.0002
			[0.0002]	[0.0002]
S&P 500 dummy			0.0546	0.1182
			[0.1213]	[0.0895]
age				0.0129**
				[0.0064]
age^2				-0.0011
				[0.0007]
tenure				0.0009
				[0.0076]
$tenure^2$				-0.0017*
				[0.0010]
Time dummies	No	Yes	Yes	Yes
2 digit SIC dummies	No	No	No	Yes
Observations	809	809	775	762
R^2	0.108	0.160	0.218	0.362
number of CEOs	446	446	429	422

♣ comprised of salary and bonus (tcc item in *Execucomp*). The main regressor of interest is *Handicap*, the golf handicap for the given year as reported in the relevant *Golf Digest* ranking. We compute the mean golf handicap for each CEO across the years in which he appears in the sample. The *Handicap* variable is instrumented with two dummy variables which take the value of 1 if the CEO falls in the top or middle terciles respectively of the distribution of the mean golf handicaps.
Standard errors [in brackets] consistent in the presence of arbitrary within CEO autocorrelation and heteroskedasticity (see Wooldridge 2002, eq. 8.33). Significance: * $p < .10$, ** $p < .05$, *** $p < .01$.

cile to which a CEO belongs in the handicap distribution (of CEO average handicaps) as an instrument for the golf handicap in the given year in question.[9]

We find some evidence that our OLS handicap regressions are subject to attenuation. In the instrumental variable regressions the marginal effects of the golf handicap on CEO compensation become larger and statistically significant both for total direct compensation and total current compensation. For total direct compensation the instrumental variable estimate of the marginal effect of a unit increase in golf handicap is -2.49% (Table 6, column 4) versus the OLS estimate of -1.91% (Table 3, column 4). For total current compensation the instrumental variable estimate of the marginal effect of a unit increase in golf handicap is -1.4% (Table 7, column 4) versus the OLS estimate of -0.86% (Table 5, column 4). In the instrumental variable regression, the golf handicap appears as a significant predictor for total current compensation, whereas this effect was only marginally significant in the OLS regression.

5.2. CEO handicaps and shareholder returns

The second step in our analysis is to establish that CEO golf handicap is not a relevant cue regarding a CEO's ability to generate shareholder returns.

We start with running cross sectional regressions of the next fiscal year shareholder returns and return on assets, on this fiscal year firm characteristics and golf handicaps. The firm characteristics are the same as the firm level controls used in the CEO pay regressions from the previous sections. Therefore the cross sectional return regressions allow one to easily contrast the effect of playing golf on pay vs. the effect of playing golf on corporate performance in the same framework.

The cross sectional regressions of future returns on current characteristics have also some shortcomings: the power of the tests might be low, as we use just 5 yearly cross sections of returns – one could gain power by moving to monthly returns. We do this

[9] We firstly compute the average golf handicap by CEO, e.g., if the CEO is present in the handicap rankings for years 2000, 2002 and 2004 we take the average of the three; if he is present only for year 2000 we take the handicap for this year. Then we create dummy variables equal to 1 if the CEO belongs to the first, second or third tercile in this average handicap distribution, and use these dummy variables as instruments for the exact golf handicap in a given year. The idea is that this procedure provides another measurement of how good a golfer the CEO is in the eyes of the relevant decision makers.

in the time series tests asset pricing framework initially proposed in Black, Jensen, and Scholes (1972) and further popularised in Fama and French (1993).

We compute mean excess risk-adjusted returns, i.e., Jensen's alphas, from Jensen-Fama-French-Carhart 4-factor models (Jensen, 1968; Fama and French, 1993; Jegadeesh and Titman, 1993; Carhart, 1997). We construct portfolios which are long in the stocks of CEOs not appearing in *Golf Digest* rankings, and short in the stock of the CEOs appearing in the rankings. We also construct portfolios which are long in the stocks of CEOs who fall in the top and the middle tercile of the mean handicap distribution (not exceptionally good golf players), and short in the stock of the CEOs appearing in the bottom tercile of the mean handicap distribution (good golf players). Then we run time series regressions of these portfolio returns on the commonly used factors (the market factor, high minus low, small minus big, and momentum) and study the Jensen's alphas, as, e.g., in Carhart (1997).

Finally we present results of an event study (Fama, Fisher, Jensen and Roll, 1969) of stock price reaction to appointments of CEOs. We relate the daily abnormal returns around the succession date to the *No handicap* dummy, and to the golfing ability of the CEOs who appear in the *Golf Digest* rankings summarised by the tercile in the handicap distribution in which the golfing CEO falls.

5.2.1. CEO handicaps and the cross section of shareholder returns

Having established that golfers are better paid than non-golfers and that pay increases with golfing ability, we now examine the relation between playing golf and corporate performance. If golf is a relevant cue for predicting CEO performance, we should find that CEO golfers deliver better performance compared to non-golfers, and that CEOs who are better golfers deliver better performance than the ones who do not play golf that well. This prediction is valid for accounting measures of corporate performance without further qualifications.

When corporate performance is measured by shareholder returns some further qualifications are in order. If infinitely many firms are competing for scarce CEO talent, the

CEO might be able to extract all the rents that he produces from the firm. In such a market, even if golfers are better shareholder value maximisers, shareholders would not receive any extra return net of the CEO pay from having a better CEO.

Another possibility that results in no cross sectional relation between golfing ability and shareholders returns is a market in which CEO golfers are in fact better, however the shareholders are aware of this fact and correctly value the added benefit from having a CEO golfer. In such a market we should observe positive stock price reaction when the CEO golfer is hired, and no cross sectional relation between golf and performance thereafter.

With these qualifications in mind, we now look at the cross sectional relation between future corporate performance, and firm characteristics and golf handicaps presented in Table 8. In columns 1 and 3 we regress next year shareholder returns on the *No handicap* dummy and on the exact handicap in the given year. In columns 2 and 4 we do the same for return on assets (ROA), defined as net income before extraordinary items and discontinued operations divided by total assets and expressed in percent. In all regressions we include the full set of firm characteristics that were present in the CEO pay regressions – most notably we control for size, book to market and past year returns. Following Fama and French (2008), we do not include risk exposures as controls, the rationale being that "current size and B/M are more timely proxies for the loadings than three-factor regression slopes estimated as constants," furthermore, "the betas of the three-factor model tend to be much less disperse (closer to 1.0) than the betas of the CAPM" (Fama and French, 2008, p. 1667).

The marginal effects of playing golf on future shareholder returns are negligible in size and insignificant. The marginal effect of *No handicap* dummy on future ROA is marginally significant and economically large – an additional half a percent of not playing golf over playing, compared to the sample mean of future ROA of 3.15%. The marginal effect of a unit increase in the exact golf handicap, i.e., worse golfing ability, is significant and economically large. For example moving from excellent golfer (say handicap of 3) to good golfer (say handicap of 13) predicts a gain in future ROA of roughly half a percent,

Table 8: Regressions of future total shareholders returns and future returns on assets (ROA) on playing golf and other current firm characteristics.

	(1) Future 1yr ret	(2) Future ROA	(3) Future 1yr ret	(4) Future ROA
NO handicap	1.5948	0.4984*		
	[1.6611]	[0.2880]		
Handicap			0.0094	0.0683**
			[0.2517]	[0.0347]
Log(mktvalue)	-5.6181***	1.0847***	-3.3773***	-0.1875
	[0.9751]	[0.3259]	[1.1871]	[0.1671]
Log(book/mkt value)	3.7330*	-2.1568***	5.4156*	-2.0648***
	[2.0513]	[0.6389]	[3.1207]	[0.5431]
S&P 500 dummy	17.5508***	-0.2820	7.2443**	0.9897***
	[2.3886]	[0.4414]	[3.0649]	[0.3661]
Return 1 yr	0.0008	0.0001	-0.1086**	0.0038
	[0.0017]	[0.0002]	[0.0531]	[0.0087]
Return 3 yrs	-0.0607*	-0.0020	-0.0096	-0.0003
	[0.0360]	[0.0152]	[0.0283]	[0.0038]
Return on Assets	-0.2593*	0.4319***	0.0690	0.4933***
	[0.1465]	[0.0590]	[0.5066]	[0.1031]
Sales growth 3yrs	0.0438	-0.0087	0.1736	0.0283*
	[0.0294]	[0.0073]	[0.1507]	[0.0152]
Employees	0.0016	-0.0058***	0.0019	-0.0003
	[0.0083]	[0.0021]	[0.0117]	[0.0015]
Dividend yield	-0.1803	0.0510***	-1.7717**	-0.0481
	[0.1923]	[0.0182]	[0.8467]	[0.0966]
Price/earnings	0.0089	0.0007	-0.0029	0.0013
	[0.0077]	[0.0005]	[0.0119]	[0.0009]
Year=2000	-6.2988**	-3.6082***	-6.2723	-2.0797***
	[2.8174]	[0.7023]	[7.2994]	[0.5678]
Year=2002	25.3354***	0.9226**	19.9738***	0.6036
	[2.7757]	[0.4571]	[7.1292]	[0.5465]
Year=2004	-4.1149	0.2967	-1.0054	0.5435
	[2.5407]	[0.3930]	[7.2038]	[0.5764]
Year=2006	-14.6231***	-0.5921	-12.5001	0.0359
	[2.6111]	[0.4333]	[7.9687]	[0.6145]
Observations	6453	6453	649	648
R^2	0.131	0.276	0.186	0.474
number of CEOs	2995	2995	362	362

Note: We regress shareholders' returns in percentage form (*Execucomp* data item trs1yr) for the next fiscal year (columns 1 and 3) and return on assets (*Execucomp* data item ROA) for the next fiscal year (columns 2 and 4) on an indicator for whether the CEO does not appear in any *Golf Digest* golf handicap ranking (column 1 and 2), the golf handicap for the current year, and other firm characteristics measured in the current fiscal year.
Standard errors [in brackets] consistent in the presence of arbitrary heteroskedasticity.
Significance: * $p < .10$, ** $p < .05$, *** $p < .01$.

compared to the mean future ROA for the subsample of regular golfers of 4.56%. Unconditionally golfers earn higher future ROA. However after one includes size and book to market characteristics as conditioning variables, the effect totally reverses and non-golfers outperform golfers.

To summarise, we find in the cross section that playing golf and high golfing abilities have *negative* impact on corporate performance as measured by future ROA. From the cross sectional regressions we cannot find significant effects on shareholder returns. This might be a problem of power, as we use only the 5 yearly cross sections. We also do not control for risk exposures in these cross sectional regressions, e.g., we do not include the market beta of each firm in the regressions. To address these issues in the next sections we estimate time series performance attribution regressions.

5.2.2. Long term performance attribution regressions

We carry out calendar time performance attribution regressions (Jensen, 1968; Black, Jensen, and Scholes, 1972; Fama and French, 1993; Carhart, 1997) to study the long term impact of golf playing on shareholder returns. For each month from January 1997 to December 2007, for a total of 132 months, we compute the equally (in the following tables columns 1, 2 and 3) and value weighted (columns 4, 5 and 6) returns of portfolios which are

a) long in firms with CEOs who do not appear in any *Golf Digest* ranking and short in firms with CEOs who appear in at least one ranking (Table 9). We calculate

$$\sum_{i \text{ s.t. No handicap}=1} w_{it-1} r_{it} - \sum_{i \text{ s.t. No handicap}=0} w_{it-1} r_{it} \equiv R_t^1, \tag{4}$$

where r_{it} is the monthly return for firm i in month t. For equally weighted returns, w_{it-1} is one over the total number of firms in the portfolio. For value weighted returns w_{it-1} is the market capitalisation of the firm (number of shares outstanding multiplied by the price per share) and divided by the total capitalisation of all firms in the portfolio, where capitalisations are computed in the previous month.

b) long in firms with CEOs who are in the second tercile of the mean golf handicap distribution (good but not exceptional golf players) and short in firms with CEOs who are in the first tercile of the mean golf handicap distribution (exceptionally good golf players) (Table 10). We calculate

$$\sum_{i \text{ s.t. CEO in 2nd tercile}} w_{it-1} r_{it} - \sum_{i \text{ s.t. CEO in 1st tercile}} w_{it-1} r_{it} \equiv R_t^2, \qquad (5)$$

where r_{it} and w_{it-1} are as previously defined.

c) long in firms with CEOs who are in the third tercile of the mean golf handicap distribution (relatively bad golf players) and short in firms with CEOs who are in the first tercile of the mean golf handicap distribution (exceptionally good golf players) (Table 11). We calculate

$$\sum_{i \text{ s.t. CEO in 3rd tercile}} w_{it-1} r_{it} - \sum_{i \text{ s.t. CEO in 1st tercile}} w_{it-1} r_{it} \equiv R_t^3, \qquad (6)$$

where r_{it} and w_{it-1} are as previously defined.

The mean golf handicap distribution is the distribution of the average golf handicap of each CEO (the average taken across all the years in which the CEO appears in the rankings). The terciles are computed from this mean golf handicap distribution, and each CEO is classified as either belonging to the first, second or third tercile of the mean golf handicap distribution. The whole sample of firms on which the computations are based are the successful matches resulting from merging *Execucomp* to *CRSP* data. Merging was done on *gvkey*, through the *CRSP/Compustat Merged* monthly database.

For each portfolio in a), b) and c) this procedure results in time series of monthly returns, which are regressed on the monthly time series of returns of a set of "risk" factors. In the one factor model the only risk factor is the return on the value weighted market portfolio minus the risk free rate. In the three factor model (Fama and French, 1993) the risk factors are the returns on the value weighted market portfolio minus the risk free rate, the high book to market minus low book to market firms portfolio and the small firms minus big firms portfolio. In the four factor model the momentum factor (Jegadeesh and

Titman, 1993; Carhart, 1997) is added to the previously mentioned three factors.[10] For example, for the four factor model, for $j = 1, 2, 3$ we run the following time series regressions

$$R_t^j = \alpha^j + \beta_1^j MktRf_t + \beta_2^j SMB_t + \beta_3^j HML_t + \beta_4^j MOM_t + \varepsilon_t^j. \tag{7}$$

The returns on the portfolios are regressed on the risk factors and the constant term in this regression, known as Jensen's alpha, represents the average risk adjusted abnormal return the portfolio generates after controlling for the known risk factors. For example, if the portfolio strategy long in bad golf players (top tercile, the same as 3rd tercile) and short in good golf players (bottom tercile, the same as 1st tercile) generates positive statistically significant and economically large Jensen's alpha, we can conclude that bad golf players outperform good golf players in the long run and generate abnormal returns even after appropriately controlling for risk.

Table 9: The dependent variable in columns 1, 2 , and 3 is the equally weighted Monthly Return in % form difference between the portfolio of CEOs who do not appear in any *Golf Digest* ranking (long position) and the portfolio of CEOs who do appear in at least one ranking (short position). The dependent variable in columns 4, 5 , and 6 is the value weighted Monthly Return in % form difference between the portfolio of CEOs who do not appear in any *Golf Digest* ranking (long position) and the portfolio of CEOs who do appear in at least one ranking (short position).

	(1)	(2)	(3)	(4)	(5)	(6)
Mkt-rf	0.2401***	0.0858***	0.0668**	0.2157***	0.1092***	0.1329***
	[0.0390]	[0.0257]	[0.0286]	[0.0442]	[0.0376]	[0.0395]
High-Low		-0.1405***	-0.1506***		-0.0844	-0.0719
		[0.0311]	[0.0317]		[0.0591]	[0.0590]
Small-Big		0.4339***	0.4452***		0.3255***	0.3116***
		[0.0345]	[0.0352]		[0.0562]	[0.0506]
Momentum			-0.0455**			0.0565
			[0.0227]			[0.0353]
Constant	0.2395	0.2774***	0.3277***	-0.0952	-0.0802	-0.1426
	[0.1903]	[0.0823]	[0.0876]	[0.1813]	[0.1338]	[0.1318]
Observations	132	132	132	132	132	132
R^2	0.190	0.849	0.858	0.173	0.569	0.585

Standard errors in brackets

* $p < .10$, ** $p < .05$, *** $p < .01$

Standard errors robust to heteroskedasticity

[10]Time series of the factor returns are downloaded from Kenneth R. French's website (http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html).

In column 3 of Table 9 we see that CEOs who are not regular golf players *outperform* the regular golfers with a highly significant risk adjusted yearly excess return of roughly 3.9324% (= 0.3277% * 12), when equally weighted returns are used. The result from column 2 is similar so the three and the four factor models are in agreement here and the addition of momentum does not make a difference.

Table 10: The dependent variable in columns 1, 2 , and 3 is the equally weighted Monthly Return in % form difference between the portfolio of CEOs who fall in the second tercile of the mean handicap distribution (average ability regular golf players, long position), and the portfolio of CEOs who fall in the first tercile of the mean handicap distribution (excellent regular golf players, short position). The dependent variable in columns 4, 5, and 6 is the value weighted Monthly Return in % form difference between the portfolio of CEOs who fall in the second tercile of the mean handicap distribution (average ability regular golf players, long position) and the portfolio of CEOs who fall in the first tercile of the mean handicap distribution (excellent regular golf players, short position).

	(1)	(2)	(3)	(4)	(5)	(6)
Mkt-rf	0.1134***	0.0634	0.0467	-0.0745	-0.0755	-0.1012
	[0.0322]	[0.0406]	[0.0428]	[0.0580]	[0.0681]	[0.0709]
High-Low		-0.0853**	-0.0941**		0.0170	0.0034
		[0.0410]	[0.0417]		[0.0931]	[0.0881]
Small-Big		0.0570	0.0669		0.0404	0.0556
		[0.0435]	[0.0441]		[0.0832]	[0.0769]
Momentum			-0.0400			-0.0614
			[0.0250]			[0.0520]
Constant	0.1737	0.2214*	0.2655**	-0.0077	-0.0234	0.0444
	[0.1253]	[0.1268]	[0.1286]	[0.2112]	[0.2385]	[0.2277]
Observations	132	132	132	132	132	132
R^2	0.110	0.188	0.207	0.019	0.023	0.040

Standard errors in brackets

* $p < .10$, ** $p < .05$, *** $p < .01$

Standard errors robust to heteroskedasticity

Similarly in Table 10 we see that CEOs who fall in the second tercile of the mean golf handicap distribution (regular golfers of average golfing ability) *outperform* CEOs who fall in the first tercile of the mean golf handicap distribution (regular golfers of high golfing ability) with a significant risk adjusted yearly excess return of roughly 3.1860% (= 0.2655% * 12), when equally weighted returns are used.

In Table 11 we see that the worst regular golfers outperform the best golfers, but the Jensen's alphas are insignificant.

Table 11: The dependent variable in columns 1, 2 , and 3 is the equally weighted Monthly Return in % form difference between the portfolio of CEOs who fall in the third tercile of the mean handicap distribution (relatively low ability, regular golf players, long position) and the portfolio of CEOs who fall in the first tercile of the mean handicap distribution (excellent regular golf players, short position). The dependent variable in columns 4, 5, and 6 is the value weighted Monthly Return in % form difference between the portfolio of CEOs who fall in the third tercile of the mean handicap distribution (relatively low ability regular golf players, long position) and the portfolio of CEOs who fall in the first tercile of the mean handicap distribution (excellent regular golf players, short position).

	(1)	(2)	(3)	(4)	(5)	(6)
Mkt-rf	0.0114	0.0227	0.0115	-0.0852	-0.0188	-0.0134
	[0.0264]	[0.0312]	[0.0318]	[0.0566]	[0.0572]	[0.0603]
High-Low		0.0111	0.0052		0.1661*	0.1690*
		[0.0420]	[0.0416]		[0.0907]	[0.0922]
Small-Big		-0.0299	-0.0233		0.0345	0.0313
		[0.0306]	[0.0316]		[0.0665]	[0.0691]
Momentum			-0.0267			0.0129
			[0.0214]			[0.0548]
Constant	0.0682	0.0646	0.0940	0.3289	0.2186	0.2043
	[0.1097]	[0.1110]	[0.1124]	[0.2060]	[0.2013]	[0.2152]
Observations	132	132	132	132	132	132
R^2	0.002	0.014	0.026	0.028	0.073	0.074

Standard errors in brackets
* $p < .10$, ** $p < .05$, *** $p < .01$
Standard errors robust to heteroskedasticity

The three tables show that Jensen's alphas are never significant at conventional levels when value weighted returns are used as the regressand. This fact is not important for our purposes for two reasons. First, the companies covered by *Execucomp* on which our sample is based, are all relatively large. Therefore the concern from the asset pricing literature, that lots of penny stock companies with negligible market capitalisation would drive the results if equally weighted returns are used, is not present. Second, we are more interested in the question: If you bet that a good golfer is a good CEO, how many times you will get it right? (Contrast this with the question: If you bet money on a good golfer how much money you will make?) The reason for this focus is that from the point of view of the members of the board of directors the size of the company which they oversee is a predetermined variable, so in a way the money they can bet on the CEO, i.e., the market capitalisation of their firm, is given to them and hence not a matter of choice.

To summarise the results

- CEOs who do not appear in any *Golf Digest* ranking outperform the rest. The effect is significant when equally weighted returns are used.
- Average golfers (second tercile) outperform excellent golfers (first tercile). Again the effect is significant when equally weighted returns are used.
- Bad regular golfers (third tercile) outperform excellent golfers (first tercile). The effect is not significant, but is of the same sign both for equally and value weighted returns.

Overall we conclude that regularly playing golf and good golf playing skills of CEOs are related to inferior long term stock performance. It is worth pointing out that the regressions in this subsection are not a genuine out of sample test, and they do not imply a profitable real time trading strategy. The regressions measure only the long term abnormal stock performance as a function of CEOs' playing golf and their abilities in doing so.

5.3. An Event study of stock price reaction around CEO successions

If shareholders can anticipate the value consequences of having a CEO golfer, some or whole of the price adjustment might take place on the day the CEO is hired. To study this issue, we employ the event study methodology, proposed in Fama, Fisher, Jensen and Roll (1969) and summarised in MacKinlay (1997). We study how stock price reaction around CEO successions relates to whether the incoming CEO appears in any *Golf Digest* ranking, and to the golf handicap of the incoming CEO if he appears in some *Golf Digest* rankings. We start by extracting the dates when the CEOs entered office from *Execucomp*, as given in the *becameceo* item for the years between 1997 and 2007. We compute abnormal returns using daily data and the market model

$$AR_{it} = R_{it} - (\widehat{\alpha}_i + \widehat{\beta}_i R_{mt}) \tag{8}$$

where AR_{it} is the abnormal return for firm i at day t in the event window, R_{it} is the raw return for firm i at day t in the event window, $\widehat{\alpha}_i$ and $\widehat{\beta}_i$ are the parameters of the market model estimated over the estimation window for each firm, and R_{mt} is the market return on date t. The market return is the equally weighted return on the universe of *CRSP* stocks, an index readily provided by *CRSP*.

We take the event window to be from 2 days before the day the new CEO takes over office to 2 days after the event.[11] Date 0 is the date given in the *becameceo* variable in *Execucomp*. We use as nonoverlapping estimation window stock returns from 150 days before the CEO entered office to 30 days before the CEO entered office. Therefore we use at maximum 120 days' returns to estimate the parameters of the market model. If the returns are not available for at least 30 days in the estimation window, we drop the firm.[12]

Once we have calculated the abnormal returns in the event window AR_{it}, we regress them on explanatory variables reflecting the newly hired CEOs characteristics:

- *No handicap* dummy is equal to 1 if the CEO does not appear in any *Golf Digest* ranking and 0 otherwise.
- *tercile2* dummy is equal to 1 if the CEO appears in at least one *Golf Digest* ranking and falls in the second tercile of the mean golf handicap distribution, the latter being just the distribution of the average golf handicap for each CEO, the average taken over all years he appears in the rankings. So the *tercile2* dummy is equal to 1 if the CEO is a regular golf player but of average golfing ability and 0 otherwise.
- *tercile3* dummy is equal to 1 if the CEO appears in at least one *Golf Digest* ranking and falls in the third tercile of the mean golf handicap distribution. So the *tercile3* dummy is equal to 1 if the CEO is a regular golf player but of low golfing ability and 0 otherwise.
- *female* dummy is equal to 1 if the CEO is female and 0 otherwise.
- *outsider* dummy is equal to 1 if the CEO has not worked for the firm before becoming the CEO, and 0 otherwise.

In Table 12 we are mostly interested in the coefficients on the *No handicap* dummy, and the coefficients on the *tercile2* and *tercile3* dummies. As these are binary variables their coefficients are interpreted most easily in columns 2 and 3 where they are the only regressors.

[11] As robustness checks we tried event windows -30 to +30, -20 to +20, -10 to +10, -5 to +5 and -1 to +1 days relative to the event date. Results were qualitatively similar to the results for the event window -2 to +2 days relative to the event date reported here (see Kolev, 2009).

[12] As robustness checks we tried also estimation window from -360 to -45, and different benchmarks – Fama-French three factor model, Fama-French-Carhart four factor model, and value weighted stock market returns. The results were quite similar and are not reported here.

Table 12: The dependent variable is the Daily Abnormal Return in % form, the Event Window is -2 to +2 days relative to the event date

	(1)	(2)	(3)	(4)	(5)
NO handicap		0.0176		-0.0140	
		[0.1160]		[0.1161]	
2nd tercile			0.2035		0.2205
			[0.1913]		[0.1963]
3rd tercile			0.6469**		0.5321**
			[0.2602]		[0.2379]
female				-0.2371	0.1032
				[0.2025]	[0.1632]
outsider				0.4269***	0.4172
				[0.1598]	[0.4286]
age				0.0090	0.0399**
				[0.0069]	[0.0155]
age^2				-0.0007	0.0003
				[0.0007]	[0.0017]
Constant	0.0666	0.0511	-0.2342*	0.0068	-0.3022**
	[0.0497]	[0.1022]	[0.1209]	[0.1029]	[0.1447]
Observations	8436	8436	1027	8173	1023
R^2	0.000	0.000	0.009	0.002	0.019
number of CEOs	2361	2361	275	2288	274

Standard errors in brackets
* $p < .10$, ** $p < .05$, *** $p < .01$
Standard errors robust to heteroskedasticity and arbitrary within CEO correlation
No handicap is binary = 1 if the newly hired CEO does not appear in any *Golf Digest* ranking
tercile2 is binary = 1 if the CEO falls in the 2nd tercile of the mean handicap distribution
tercile3 is binary = 1 if the CEO falls in the 3rd tercile of the mean handicap distribution
female is binary = 1 if the newly hired CEO is female
outsider is binary = 1 if the CEO has not worked for the firm before becoming the CEO

In column 2, the Constant is the average daily abnormal return in the event window for CEOs who appear in at least one ranking (i.e., *No handicap* = 0) and the coefficient estimated on the *No handicap* regressor is simply the *difference* in the average daily abnormal return in the event window for the CEOs who do not appear in any ranking (i.e., *No handicap* = 1), relative to the ones who appear in at least one ranking. The effect of *No handicap* is insignificant both in columns 2 and 4.

In column 3 the Constant is the average daily abnormal return in the event window for CEOs in the first tercile of the mean handicap distribution (i.e., the best golfers) which is -0.2342% and marginally significant, i.e., different from 0. The coefficients on the *tercile2* and *tercile3* dummies are the difference for each of these two groups of CEOs relative to the first tercile CEOs. The coefficient on *tercile2* is insignificant but indicates more positive stock price reaction relative to the first tercile. The coefficient on *tercile3* is 0.6469% and significant, i.e., different from 0. CEOs who are regular but relatively bad golfers generate average daily abnormal return in the event window of 0.6469% higher relative to the best golfers (first tercile).

The coefficients on the dummies are still interpreted as differences in the presence of other covariates, but the interpretation of the Constant is more complicated. For example the Constant in column 5 is the average daily abnormal return for a hypothetical CEO who is in the first tercile, i.e., good golfer, male, insider and with the sample average age (the age regressor is sample demeaned). The results in column 5 are very similar to the results in column 3 – the best CEO golfers generate significant negative stock price reaction, and the worse of a golfer the CEO is, the more positive is the stock price reaction. For the third tercile, i.e., worst golfers, the stock price reaction is significantly different from 0 and 0.5321% higher than the price reaction for the best golfers.

If CEOs who play golf regularly are better shareholder value maximisers than those who do not play (net of the pay they receive), and the shareholders are aware of this fact, we expect a more positive price reaction when the former enter office. We do not find statistically significant evidence of this. Furthermore, if CEOs of higher golfing ability are better shareholder value maximisers we expect more positive price reaction for CEOs who are in the first tercile of the mean handicap distribution, i.e., they are the best golfers among all the CEOs playing regularly golf. In fact we find just the opposite – the best golfers generate negative stock price reactions, and the worse the golfer is, the more positive the stock price reaction. The worst regular golfers are associated with the most positive and statistically significant stock price reactions.

6. Plausibility of alternative (rational) explanations of our results

We consider three alternative explanations of our results.

6.1. Reverse causality – better paid CEOs are able to afford to play more golf

In our sample, a CEO at the 10th percentile of the distribution of total compensation receives about $650 thousands. A CEO at the median receives more than $2.5 million. Such levels of annual income are clearly not all spent on consumption.[13] Hence even the poorest CEOs in our sample are rich enough to afford playing as much golf as they want – let alone notice the accompanying expense.

Prima facie evidence that CEOs are not really optimising golf-playing related expenses is the fact that most belong to more than one golf club.[14] Lastly, there is casual evidence that golf club memberships are considered a legitimate business expense and are often paid by the corporation (for examples, see the article quoted in the last footnote; for systematic evidence on this issue we will have to wait for improved *SEC* requirements for disclosure of executive perquisites).

A more sophisticated explanation along the same lines could be that better paid CEOs are more relaxed and play more golf. We should remark that given the results showing that playing golf more results in worse corporate performance, the well paid CEOs under this hypothesis might be getting *too* relaxed. This mechanism is difficult to test though, as it is hard to identify proxies for the state of a CEO's mind.

6.2. Golf playing abilities correlated with unobserved productivity

We admit that this is always a possibility and challenge readers to generate a plausible explanation. What we have shown is that playing golf regularly and good golf playing abilities are related to inferior corporate performance.

We find more positive stock price reactions to appointments of bad golfers, and more negative stock price reactions to appointments of good golfers.

[13]Notice that buying a multi-million dollar mansion at the waterfront is not consumption, but investment as it will appreciate in value with the passage of time.

[14]An article in USA Today (July 11, 2006) entitled "CEOs belong to fore – or 5 or even 6 golf clubs" states: "a USA TODAY analysis of 115 CEOs and chairmen of Fortune 1,000 companies who also score good to excellent at golf found 51 who belong to at least two clubs, and 25 who belong to three or more." This could be an underestimate, as the *Golf Digest* survey for 2006 reports that 65% of CEO golfers who run Fortune 1,000 companies belong to at least two private country clubs and 45% belong to four or more.

Therefore the unobserved productivity mechanism seems unlikely.

6.3. Corporate cronyism, bad corporate governance and non-productive networking

A viable alternative to the illusory correlation hypothesis is that by playing golf a CEO becomes a member of a "goodfellas" network. Therefore board members do not really think that golfers are better CEOs – they simply reward members of the network with higher pay.

If this were the case, one would indeed expect regular golfers to be better paid. However, there is no reason to expect that pay will increase further with golfing ability. Once the CEO plays golf regularly enough to have a handicap, he is already a member of the network. Therefore we do not think that simple investigation of how golf playing interrelates with corporate governance will lead to interesting insights.

On the other hand, more sophisticated analysis of how well the CEO is connected, i.e., how high he is in the hierarchy of the network, as a function of his golf playing abilities might lead to interesting insights and could possibly reject the illusory correlation hypothesis.

7. Conclusions and implications

Our results show clearly that information – or a cue – that is negatively related to corporate performance is positively related to the remuneration of CEOs. The presumption therefore is that this cue is used in remuneration decisions whether or not those making the decisions are conscious of its influence. We emphasize that given the inherent difficulty of assessing CEO compensation, it should come as no surprise that the underlying process of judgment is subject to bias. This is simply the nature of human information processing and leads to two questions. The first is why this particular cue – ability to play golf – plays an inappropriate role in these decisions. The second is what might be done to alleviate this, and possibly other biases, in the decision making process.

Given the social context in which CEO remuneration decisions are made, the underlying judgments undoubtedly involve a host of tangible and intangible measures ranging from concrete indicators of past performance to the observation of "soft" social skills and even physical appearance. Moreover, in the USA golf clubs provide locations in which the relevant actors socialize and can judge each other on a variety of dimensions. In this milieu, then, we suspect that being a good golfer is a positive attribute, generating its own "halo" effect (for an example, see the opening vignette).

Since golf handicap does not predict superior corporate performance, what might be done about this – and possibly other – illusory correlates? Our suggestion goes back to clinical psychology (where illusory correlation was identified) and the classic work of Meehl (1954) who showed that, even for complex diagnostic tasks, predictive ability is improved if human judgment is replaced by simple, explicit statistical rules. Moreover, as demonstrated by a meta-analysis involving some 140 studies (Grove et al., 2000), these findings have only been reinforced with time. As stated by the authors:

> This study confirms and greatly extends previous reports that mechanical prediction is typically as accurate or more accurate than clinical prediction...
>
> Even though outlier studies can be found, we identified no systematic exceptions to the general superiority (or at least material equivalence) of mechanical prediction. It holds in general medicine, in mental health, in personality, and in education and training settings. It holds for medically trained judges and for psychologists. It holds for inexperienced and seasoned judges (Grove et al., 2000, p. 25).

This does not, of course, mean that no human judgment is involved in mechanical prediction. People still need to identify the variables that are used in formulas. Thus, if decision makers believe that golf handicap is a relevant variable for CEO compensation, it should be explicitly included in the equation. Given the inherent uncertainty in corporate performance, no decision rule – clinical or mechanical – can be a perfect predictor. However, to maximize expected shareholder value, one should clearly use the "best" rule available.

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