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Competing with Superstars

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This paper investigates the effect of superstar chief executive officers (CEOs) on their competitors. Exploiting shocks to CEO status due to prestigious media awards, we document a significant positive stock market performance of competitors of superstar CEOs subsequent to the award. The effect is more pronounced for competitors who have not received an award themselves, who are geographically close to an award winner, and who are not entrenched. We observe an increase in risk taking, operating performance, and innovation activity of superstars' competitors as potential channels for this positive performance. Our results suggest a positive overall welfare impact of corporate superstar systems due to the incentivizing effect on superstars' competitors.

Keywords: competition; firm performance; risk taking; innovation; awards; CEO
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1. Introduction

How do chief executive officers (CEOs) react when one of their peers is elevated to superstar status? Are competitors of superstar CEOs inspired to take actions that create or destroy economic value? This paper provides an analysis of the consequences that corporate superstars have on their competitors. Given the prevalent system of managerial superstars in today's corporations, how corporate superstars influence their competitors is a timely and economically relevant question. However, the empirical consequences of competing with superstar CEOs are not a priori clear. Recent evidence from the economics literature suggests that competing with superstars in sports has a detrimental effect on performance (see, e.g., Brown 2011, using the example of golf professionals competing with Tiger Woods). On the other hand, seeing a peer being elevated to superstar status can also incentivize competing CEOs to perform better (see, e.g., Ehrenberg and Bognanno 1990, for theoretical evidence). In this paper, we study which of these two effects prevails.

Our empirical identification strategy follows Malmendier and Tate (2009). We start by constructing a sample of CEOs who experience a status shock through an award from a major newspaper or magazine, such as *Business Week*, *Forbes*, or *Time*. The competitors of these superstar CEOs are our treatment sample. We take advantage of the emergence of text-based competition measures first developed and provided by Hoberg and Phillips (2010, 2016) to define the set of competitors. We also construct a control sample to contrast the effect of competing with a superstar CEO with its counterfactual (i.e., what would have happened to the same CEO if he had not been competing with a superstar CEO). We use propensity score matching (see, e.g., Malmendier and Tate 2009) to obtain a set of pseudo or predicted superstar CEOs. These are CEOs that are very similar to actual CEO winners but do not end up winning an award. The competitors (again obtained using the Hoberg and Phillips data set) of these predicted award winners are our control sample. In our empirical analyses, we determine the treatment effect of competing with superstar CEOs by comparing the postaward behavior of our treatment and our control sample. It is important to note that our empirical strategy produces treatment and control samples that do not differ significantly from each other in nearly all observable characteristics we employ in our matching estimator.

Our results provide strong support for positive firm value effects of competing with superstar CEOs. Competitors of actual award winners have positive cumulative abnormal returns over one (4%), two (14%), and three (26%) years subsequent to an award. In contrast, competitors of predicted winners do not have significant abnormal returns. We interpret this finding as evidence that superstar CEOs have a beneficial impact on incentive levels of competing CEOs. Cross-sectional analyses show that this result is not driven by a set of known return predictors or by effects pertaining to a specific industry or year (for instance, a

peak in a certain industry). At the aggregate level, the effect does not simply reflect a reshuffling of market shares from award winners to competitors, but suggests that the positive returns associated with competing with superstar CEOs result in a positive overall effect on economic welfare. Additional analyses show that the treatment effect is heterogeneous. The effect is most pronounced for awards that have been awarded based on luck, for CEOs who have not previously received an award themselves, are geographically close to the award-winning competitor, have a comparatively short tenure and a large number of competitors, and who are not entrenched. Our documented treatment effect is also robust to a battery of robustness tests, most importantly different definitions of the control sample and different matching techniques as well as the use of subsamples to ensure that our results are not affected by the market turbulence of the recent financial crisis.

When we investigate the channels through which the documented effect takes place, our results reveal that competitors of award-winning CEOs significantly increase their risk taking, their operating performance and, their engagement in patenting activities. In the three postaward years, competitors of superstars experience a significant increase in their stock return volatility and their return on assets (among increases in other operating variables) compared to the control sample. The change in overall risk is driven by an increase in idiosyncratic risk showing that CEOs take on riskier projects (measured by filed patent applications) subsequent to a competitor being elevated to superstar status. The increase in patenting (innovation) activity is accompanied by an increase in innovation efficiency and an increase in innovation quality. The findings on innovation efficiency and quality provide substantial economic grounds for abnormal positive stock returns.

Our paper contributes to the emerging literature on CEO status. Whereas existing theoretical and empirical work usually links CEO status to CEO risk-taking incentives or behavior (see, e.g., Auriol and Renault 2008, Malmendier and Tate 2009, Roussanov 2010, Roussanov and Savor 2014, Shemesh 2010) or compensation (see, e.g., Focke et al. 2016), our paper investigates the effect of shocks to CEO status on the firm valuation of their competitors. We also add to recent work assessing the economic and financial impact of the superstar culture found among CEOs today. As such, our paper extends the work of Malmendier and Tate (2009) by looking at competitors of superstar CEOs and the work by Brown (2011), who investigates competition with superstars in sports. We document that competing with superstars can have positive effects in the corporate world in contrast to the sports world and, in addition, to the negative effects documented for the superstar CEOs' own companies. We also contribute to the recent literature investigating tournament incentives inside (Kale et al. 2009, Kini and Williams 2012) or outside (Coles et al. 2013) companies and to the growing literature making use of industry classifications that are more sophisticated than Standard Industry Classification (SIC) codes by using text-based analysis provided by Hoberg and Phillips (Hoberg and Phillips 2010, 2016; Foucault and Frésard 2014). Finally, we contribute to the recent literature examining companies' innovation activities (see, e.g., Amore et al. 2013; Bena and Li 2014; Hirshleifer et al. 2012, 2013; Lerner et al. 2011), especially in connection with CEO skills (Custódio et al. 2015).

2. Data

2.1. CEO Award Database

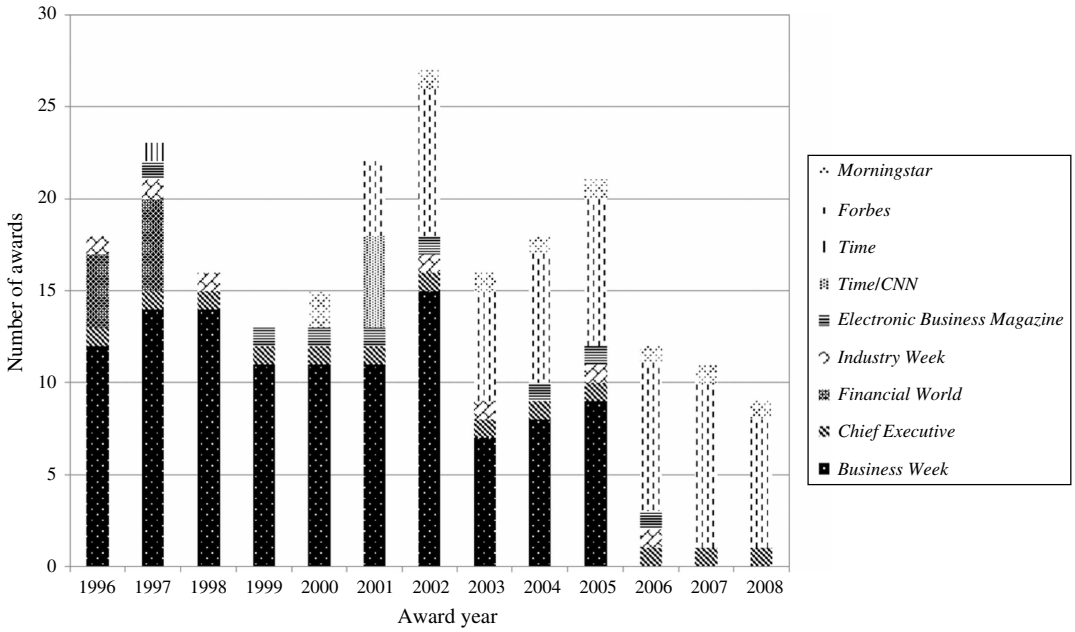
The core of our data set is a hand-collected list of CEO awards published between 1992 and 2008. Several organizations and magazines confer such awards, for instance, the "Best Manager of the Year" award by *Business Week*. Following Malmendier and Tate (2009), we only consider awards that are prominent enough to plausibly affect CEO status and that could be given to any CEO in the United States. Thus, the award has to be nationwide and not subject to any constraint in terms of industry focus, age or gender of the CEO. Based on these criteria, we consider the awards of nine media outlets: *Business Week*, *Chief Executive*, *Electronic Business Magazine*, *Financial World*, *Forbes*, *Industry Week*, *Morningstar*, *Time*, and *Time/CNN* (see the appendix for more information on the media outlets). Figure 1 presents a histogram of the CEO awards by year and magazine, indicating that *Business Week* and *Forbes* are the predominant awards. Especially due to the ceasing of *Business Week*'s Best Manager award (after 2005), the average number of awards per year decreases in later years of the sample. As the ceasing does not seem to have a systematic reason, it should not bias our results.[1] Although we consider awards that are not constrained on any industry, a concern could be that awards are only conferred to eye-catching industries. Whereas we cannot rule out that some industries are more likely to receive awards, we do not observe a clustering of awards in specific industries (Figure 2). This is consistent with the evidence in Malmendier and Tate (2009).

2.2. Definition of Competition

The definition of competition is integral to our empirical investigation. We use the Hoberg–Phillips Text-based Network Industry Classifications (TNIC-3) data

[1] Our results are similar if we only consider awards up to 2005 (2004).

Figure 1 CEO Awards by Year and Magazine



Note. This figure shows the number of awards per magazine/media outlet from 1996 to 2008, where the number of awards is on the *y* axis and the respective year is on the *x* axis.

to define companies' competitors. Hoberg and Phillips (2016) use a text-based analysis of companies' 10-K filings to determine the product similarity between companies, thereby estimating their degree of competiveness. The firm-by-firm similarity measure is based on the similarity of companies' product descriptions. Hoberg and Phillips (2016) measure the relative number of words that product descriptions of two companies have in common. This measure is bounded between zero and one. The higher the value of the measure, the more likely it is that two companies are competitors of each other. Hoberg and Phillips (2016) use a 21.3% threshold to define competitors. The 21.3% threshold is chosen to target the same average number of competitors per company as the SIC-3 measure would provide. The main advantage of the TNIC-3 data compared to traditional measures such as SIC-3 is that it is time-varying and nontransitive. A detailed explanation of the TNIC-3 data can be found in Hoberg and Phillips (2010, 2016). We use the TNIC-3 data to assign competitors to each winner and each predicted winner. Using the Hoberg–Phillips data limits our sample to the Hoberg–Phillips universe. Thus, we do not consider any awards prior to 1996 or after 2008.

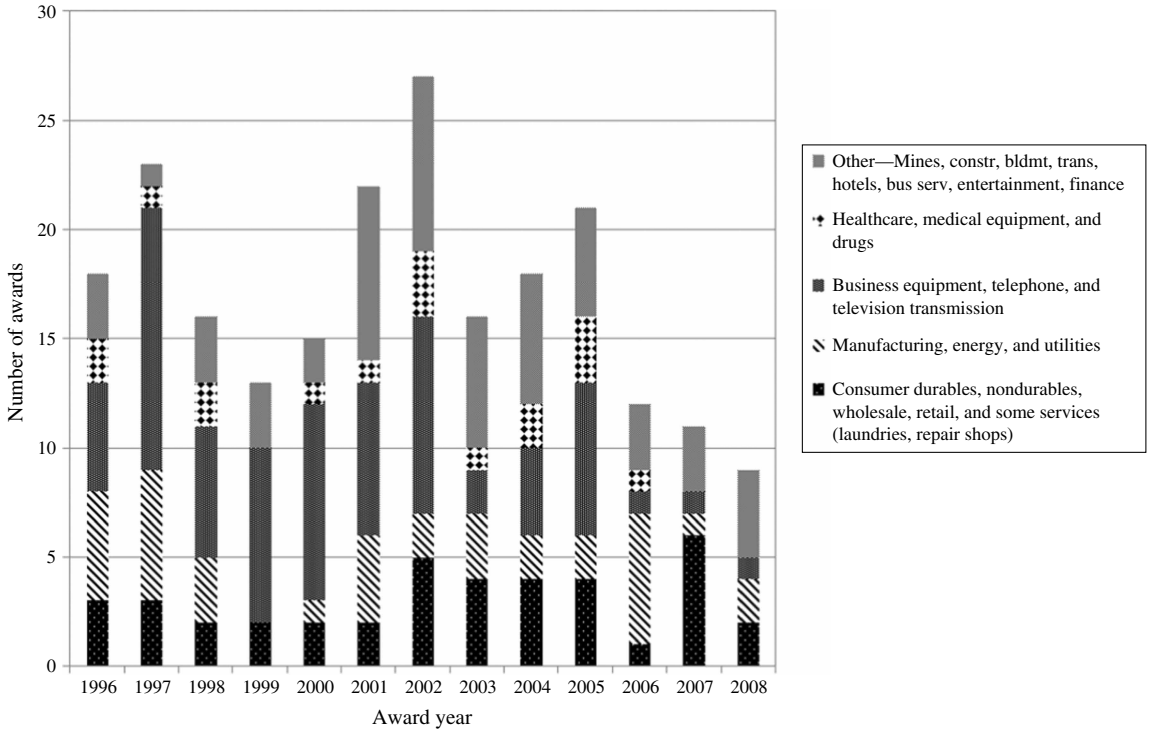
2.3. CEO Characteristics, Company Characteristics, and Firm Performance

We merge CEO award data with Compustat's Execucomp database to obtain information on CEO age, gender, overconfidence, tenure, and whether the CEO is the founder of the company. Following Malmendier and Tate (2005) and Hirshleifer et al. (2012), *CEO overconfidence* is a dummy variable that is equal to one if CEOs hold exercisable options that are at least 67% in the money. *Founder* is a dummy variable that is equal to one if a person was the CEO at the time of the initial public offering of the company. *Tenure* is the difference between the year of the observation and the year the person became CEO. If information on age or tenure is missing in Execucomp, we hand-collect it from proxy statements.

Companies' accounting data are from Compustat's annual industrial files. *Market capitalization* is the natural logarithm of the monthly stock price multiplied by common shares outstanding (CSHO). The *book-to-market ratio* is book equity[2] over market capitalization. *Return on assets* (*ROA*) is net income (NI) divided by total assets (AT). *Return on equity* (*ROE*) is net income (NI) divided by book equity. *Sales growth* is the percentage change in sales (SALE) from one year to the next. *Markup* is the difference of sales and cost of goods sold (COGS) divided by cost of goods sold. ROA_{adj}, $Sales\_growth_{adj}$, and $Markup_{adj}$ are the industry adjusted versions of *ROA*, *Sales growth*, and

[2] We use the book equity definition of Malmendier and Tate (2009). They calculate book equity as stockholders' equity (SEQ) (if available, else book value of common equity (CEQ) + par value of preferred stock (PSTK) or assets (AT) − total liabilities (LT) (in that order)) plus balance sheet deferred taxes and investment tax credit (TXDITC), if available, minus the book value of preferred stock (redemption (PSTKRV), liquidation (PSTKL), or par value (PSTK) (in that order) depending on availability).

Figure 2 CEO Awards by Year and Industry



Note. This figure shows the number of awards sorted according to the Fama–French five industries from 1996 to 2008, where the number of awards is on the *y* axis and the respective year on the *x* axis.

Markup using the mean of TNIC-3 competitors.[3] *Advertisement expenses* is advertisement expenses (XAD) divided by total assets. Using zip codes from Compustat and latitude and longitude data from the 2010 Census Gazetteer Files, we compute the geographic distance between companies' headquarters applying the Haversine method (Bouwman 2014).[4] We calculate the Governance Index (G-Index) developed by Gompers et al. (2003) and the Entrenchment Index (E-Index) developed by Bebchuk et al. (2009) using data from RiskMetrics.

Companies' stock market data are from the Center for Research in Security Prices (CRSP). We use the value-weighted return on all NYSE, AMEX, and NASDAQ stocks as the market return. We calculate the *Amihud illiquidity* measure as the average absolute daily return divided by the daily trading volume (Amihud 2002). *PIN* is the probability of informed trade measure as developed by Easley et al. (2002). Following Low (2009) we use equity risk measures to proxy for risk-taking behavior of CEOs. We consider total risk, idiosyncratic risk, and systematic risk. Total risk is the standard deviation of monthly returns per firm-year. Using the monthly value-weighted CRSP index as the benchmark, idiosyncratic risk is the standard deviation of the residuals per firm-year. The beta of this regression is the systematic risk proxy. Fama–French risk factors (Fama and French 1993), and data on the momentum factor (Carhart 1997) are from Kenneth French's database.

Patent data are from the National Bureau of Economic Research (NBER). The NBER patent database contains information on all patents approved by the United States Patent and Trademark Office (USPTO) between 1976 and 2006. The data includes information on the year of the patent application, the year of approval, and the forward and backward citations of each patent. We use the number of applied patents per firm-year as a proxy for innovation output. To mitigate potential time truncation issues arising from the time gap between patent application and approval, we follow Hall et al. (2001) and end the sample three years prior to the actual end of the database. We proxy for innovation input using firms' research and developing expenses (RDX) scaled by total assets, in log

[3] We obtain similar results using the median of TNIC-3 competitors or using the mean or the median of SIC-2 or SIC-3 industries.

[4] The location of headquarters is a proxy for CEO domiciles. This proxy might lead to measurement errors due to the backfilling of firms' location data in Compustat (Heider and Ljungqvist 2015) and CEOs living far away from their companies' headquarters (Liu and Yermack 2012). However, we think that it is still a valid method because the distortion due to the errors of the distance measure should bias against finding significant results.

Table 1 Descriptive Statistics of Winners, Nonwinners, and Predicted Winners

	CEO award winners (W)			All nonwinners (A)			Predicted winners (P)			Differences in means	
	Obs.	Mean	Std. dev.	Obs.	Mean	Std. dev.	Obs.	mean	Std. dev.	$p(W-A)$	$p(W-P)$
Market capitalization	221	10.070	1.350	82,362	7.275	1.619	221	10.021	1.222	0.000***	0.776
Book-to-market ratio	221	0.306	0.471	82,362	0.552	0.741	221	0.321	0.274	0.000***	0.702
Returns_2_3	221	0.057	0.174	82,362	0.007	0.193	221	0.074	0.167	0.003***	0.271
Returns_4_ 6	221	0.061	0.206	82,362	0.001	0.238	221	0.059	0.191	0.004***	0.934
Returns_7_12	221	0.179	0.276	82,362	0.052	0.311	221	0.144	0.269	0.000***	0.205
Returns_13_36	221	0.489	0.608	82,362	0.207	0.627	221	0.436	0.529	0.000***	0.359
CEO female (dummy)	221	0.023	0.149	82,362	0.017	0.129	221	0.009	0.095	0.685	0.318
CEO age	221	56.407	8.363	82,362	55.972	7.582	221	56.805	6.851	0.647	0.732
CEO tenure	221	10.783	7.532	82,362	8.932	7.766	221	10.303	9.155	0.015**	0.752

Notes. This table reports the descriptive statistics of all award winners, all nonwinners, and all CEOs who are defined to be predicted winners. The sample includes all months in all years from 1996 to 2008 in which a CEO award is conferred. *Market capitalization* is the stock price multiplied by common shares outstanding. It is measured two months prior to the award month and it is in log form. *Book-to-market ratio* is book value over market capitalization. *Returns_x_y* are total compound returns from the yth to the xth month prior to the award month. The column $p(W-A)$ shows the p-value of the t-test of the difference in means between winners and all nonwinners. The column $p(W-P)$ shows the p-values of the differences in means between all winners and all nonwinners. Standard errors are clustered on firm level.

** and *** represent significance at the 5% and 1% levels, respectively.

form. Missing R&D values are set to zero.[5] Following Hall et al. (2005) and Trajtenberg et al. (1997) we use citations scaled by patents (Cites per patent), in log form, to proxy for patent quality. We mitigate the time truncation issues of citations using the three-year window adjustment approach suggested by Lerner et al. (2011) and Bena and Li (2014). We count all citations a patent receives in the year of its grant and the following three years. To decrease the potential influence of outliers, we winsorize all our operating performance and innovation ratios at the 5% level.

2.4. Summary Statistics

Table 1 provides summary statistics for award winners, predicted award winners (to be defined below), and the full universe of companies with data available. It shows that winners significantly differ in almost all dimensions from nonwinners. Winners tend to be significantly larger companies than nonwinners. On average they have a market capitalization of $23.6 billion compared to the nonwinners average market capitalization of $1.4 billion. The difference in book-to-market ratios implies that winner companies tend to be growth companies. Their average book-to-market ratio of 0.306 is substantially lower than the average of nonwinners (0.552). There are significant differences in returns before the award date (over horizons of up to three years) as it seems that several awards are conferred based (at least partially) on past performance. Award-winning CEOs are also older and more likely to be female than nonwinners, although both of these differences are statistically insignificant. Winners have been in office longer than nonwinners (10.8 years versus 8.9 years). This difference is significant at the 5% level.

3. Methodology

To study the effect of award-winning CEOs on their competitors, it would be optimal to randomly assign competitors to award-winning CEOs and then compare these randomly assigned competitors to a control sample. However, such a random assignment is not feasible in the real world. Furthermore, the awards themselves are not randomly conferred but at least partially based on past performance. This leads to an endogeneity problem as discussed by Malmendier and Tate (2009). A natural solution to this problem would be to compare the competitors of winners with the competitors of nominees. This is not feasible, as nominees are not observable. Instead, we follow Malmendier and Tate (2009) and use a nearest-neighbor matching estimator to identify CEOs who are observationally equivalent to award winners and, in a next step, their competitors.

Our matching procedure consists of two steps. First, we use a logit regression to predict CEO awards based on firm and CEO characteristics. As award criteria are not observable, we follow Malmendier and Tate (2009) and assume that the awards are usually conferred based on CEO characteristics (age, gender, and tenure), firm characteristics (market capitalization and book-to-market ratio), and past performance. Thus, for a sample consisting of all award month-firm combinations, we regress an indicator variable that is

[5] Publicly traded companies are required to disclose all material R&D spending in the year the expenses are incurred (Bound et al. 1984). Consequently, Chauvin and Hirschey (1993) and Hirschey et al. (2012) show that it is appropriate to set missing R&D to zero as there are indeed no material R&D expenses reported in income statements for 99% of missing R&D observations in Compustat. To ensure that zero values are not excluded because of the log transformation we use log(1 + R&D/TA). For robustness, we rerun our analyses (1) without missing observations and (2) without the log transformation and find similar results.

equal to one if a CEO received an award in the respective month and zero otherwise on the assumed award criteria. As proxies for the award criteria we use market capitalization two months prior to the award month (in log form); book-to-market ratio based on the last fiscal year that ended at least six month prior to the award month; returns for months 2–3, 4–6, 7–12, and 13–36 before the award month; as well as CEO age, gender, and tenure as predictive variables.[6] To control for omitted variables, we include award, industry, and year fixed effects (FE). Table 2 shows evidence that awards tend to be conferred to CEOs of large companies with a comparatively low book-to-market ratio and high past performance. Regarding CEO characteristics, we observe that CEO tenure, CEO gender, and CEO age are also statistically significant award criteria. According to these findings, a female and young CEO who has served for several years as the CEO of a large and well-performing company has the highest chances of receiving an award.

In the second step of our matching procedure, we use the predicted values from the logit regression to perform propensity score matching. We use the predicted values of the logit regression without any fixed effects because the propensity score matching's analogy to fixed effects is to match within the specific categories instead of applying dummy variables (Levine and Painter 2003, List et al. 2003). In each award month we choose, without replacement, the CEO with the propensity score closest to the score of an award-winning CEO.[7] We refer to these as predicted winners. Table 1 shows summary statistics of the predicted winners alongside the statistics for award winners and nonwinners. Along all matching variables, there is no significant difference between award winners and predicted winners, an indication of the high matching quality.

We merge the competitors to the winners and predicted winners, using the TNIC-3 competition database developed by Hoberg and Phillips (2010, 2016). Equivalent to the restrictions imposed on the set of award-winning companies, we only consider competitors who are part of the Execucomp universe. The competitors of winners correspond to our treatment sample, whereas competitors of predicted winners form our control sample.[8] To ensure that we measure the effect on competitors and do not accidently capture the effect of winners or predicted winners, we exclude winners and predicted winners from our treatment and control group.[9] The assignment of

Table 2 Determinants of Award Winners

	(1)	(2)	(3)
Market capitalization	0.924***	1.024***	1.053***
	(22.41)	(22.63)	(22.06)
Book-to-market ratio	−0.260***	−0.258***	−0.253***
	(−3.00)	(−3.08)	(−2.84)
Returns_2_3	1.456***	1.565***	1.557***
	(3.26)	(3.17)	(3.18)
Returns_4_6	1.102***	2.000***	2.067***
	(3.07)	(4.81)	(4.97)
Returns_7_12	1.140***	1.780***	1.752***
	(4.63)	(6.27)	(6.16)
Returns_13_36	0.408***	0.719***	0.710***
	(3.38)	(5.55)	(5.42)
CEO female (dummy)	0.767*	0.901*	0.956**
	(1.66)	(1.92)	(2.01)
CEO age	−0.022**	−0.023**	−0.015
	(−2.13)	(−2.08)	(−1.37)
CEO tenure	0.043***	0.043***	0.039***
	(4.81)	(4.72)	(4.18)
Award FE	No	Yes	Yes
Industry FE	No	No	Yes
Year FE	No	Yes	Yes
Pseudo R^2	0.22	0.29	0.32
Observations	82,583	82,583	82,583

Notes. This table reports the results of a logit regression that is used to determine the relevant factors for winning an award. The sample includes all months in all years from 1996 to 2008 in which a CEO award is conferred. We use a binary variable equal to one if a CEO received an award in the respective month and zero otherwise as the dependent variable. *Market capitalization* is the stock price multiplied by common shares outstanding. It is measured two months prior to the award month and it is in log form. *Book-to-market ratio* is book value over market capitalization. *Returns_x_y* are total compound returns from the *y*th to the *x*th month prior to the award month. The *z*-statistics are in parentheses.

*, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.

[6] In a robustness test, we consider *advertisement expenses* and information asymmetry proxies (*PIN* and *Amihud illiquidity*) as additional matching variables. Advertisement expenses and less uncertainty about the company might increase the likelihood of receiving an award. However, the results of the logit regressions do not provide evidence for this conjecture as all three variables are insignificant in most of our logit specifications. Consequently, our main results do not change when we include advertisement and information asymmetry proxies in the propensity score matching.

[7] We do not restrict matches to be in the same industry as this is not feasible in our study. If we restricted matches to be in the same industry, the competitors of winners and the competitors of matches would (perfectly) overlap. In robustness test we restrict matches to be in the same SIC-2 (SIC-3) industry as previous award winners and obtain similar results.

[8] By first matching award winners and predicted winners and then merging their competitors, we aim to ensure that both the treatment and the control group compete with a very successful CEO. An alternative approach would be to directly match companies to competitors of superstars. Although we obtain similar results using this approach, we do not use it in the main analyses of the paper as we are not able to ensure that the directly matched companies compete with successful CEOs who do not receive an award (the counterfactual of competitors of superstar CEOs).

[9] Although we exclude predicted winners from our treatment group, we might still include observationally equivalent nonwinning CEOs (second or third nearest neighbors) in our treatment

Table 3 Descriptive Statistics of Competitors of Winners and Competitors of Predicted Winners

	Competitors of winners (*CW*)				Competitors of predicted winners (*CP*)				Differences in means
	Obs.	Mean	Median	Std. dev.	Obs.	Mean	Median	Std. dev.	$p(CW - CP)$
Market capitalization	1,875	7.513	7.399	1.615	1,999	7.707	7.528	1.647	0.029**
Book-to-market ratio	1,864	0.636	0.527	0.513	1,991	0.658	0.546	0.609	0.365
Returns_2_3	1,872	0.025	0.028	0.197	1,999	0.035	0.032	0.169	0.127
Returns_4_6	1,870	0.016	0.031	0.263	1,997	0.015	0.034	0.226	0.930
Returns_7_12	1,865	0.072	0.071	0.333	1,994	0.080	0.086	0.303	0.485
Returns_13_36	1,729	0.247	0.240	0.664	1,902	0.272	0.267	0.591	0.394
CEO female (dummy)	1,875	0.011	0.000	0.105	1,999	0.015	0.000	0.122	0.428
CEO age	1,875	55.269	56.000	7.884	1,998	55.816	56.000	7.516	0.202
CEO tenure	1,875	8.626	6.000	7.343	1,999	8.770	7.000	7.243	0.687

Notes. This table reports the descriptive statistics of all competitors of award winners and predicted winners. The sample includes the competitors of winners and predicted winners for all months in all years from 1996 to 2008 in which a CEO award is conferred. *Market capitalization* is the stock price multiplied by common shares outstanding. It is measured two months prior to the award month and it is in log form. *Book-to-market ratio* is book value over market capitalization. *Returns_x_y* are total compound returns from the *y*th to the *x*th month prior to the award month. The column $p(CW - CP)$ shows the *p*-value of the *t*-test of the difference in means between competitors of winners and competitors of nonwinners. Standard errors are clustered on firm level.

**Represents significance at the 5% level.

competitors to winners and predicted winners potentially leads to situations in which a company is a competitor of a winner and a predicted winner at the same time (award date).[10] This would make it impossible to estimate any treatment effect. Therefore, we only consider companies as competitors of either winners or predicted winners if they are not assigned to the other group 365 days prior or after the respective award date. This threshold is a trade-off between either precisely differentiating treated and control companies or keeping the characteristics of the initial sample. The differentiation precision increases with the number of days used as a threshold, whereas the sample might change because we are naturally more likely to exclude companies with a high number of competitors. If companies with many competitors are systematically different compared to companies with few competitors, a long threshold would bias the sample. Considering this trade-off, we believe that a threshold of 365 days is a reasonable setting. The *t*-tests (untabulated results) show that the characteristics of the sample do not significantly change when imposing a 365-day threshold.

Along all dimensions, except market capitalization, there are no significant differences between the competitors of winners and predicted winners, a sign of the high matching quality (Table 3). Regarding market capitalization, competitors of winners are slightly larger on average than the competitors of predicted winners (significant at the 5% significance level), however the median market capitalizations of the treatment and the control group are not significantly different. Further tests below will show that this economically small difference is not a driver of our results.

We employ an event study to analyze the stock market performance of superstars' competitors around the award announcement. For magazine awards, we use the date of the publication as the event date. For other awards, we use the date of the first public announcement as the event date. If the announcement date falls on a weekend or a holiday we use the next trading day as the event day. We calculate the abnormal returns around the event date using a market model with the CRSP value-weighted returns. α and β are the parameters of the market model that we estimate based on an estimation period of 755 weekdays, starting 778 weekdays before the event. We use the estimated parameters to predict the normal return of firms around the event date. The abnormal return of a firm is the difference between the observed return and the predicted return. We aggregate abnormal returns over various time periods to obtain cumulative abnormal returns. Following Malmendier and Tate (2009), we use four different event windows, specifically $[-5, +5]$, $[+6, +255]$, $[+6, +510]$, and $[+6, +765]$.

group and thereby accidently replicate the Malmendier and Tate (2009) study. We believe it is unlikely that we accidently replicate the Malmendier and Tate (2009) study for two reasons. First, winning CEOs are excluded from both the treatment and the control group. Second, by comparing the data on predicted winners in Table 1 and the data on competitors of winners (our treatment sample) in Table 3, we observe that the two samples are different along several dimensions.

[10] An example would be the case of Jack Blaesser, CEO of Concord Communications. On January 10, 2000, Timothy Koogle, the CEO of Yahoo!, received the Best Manager award of *Business Week*. The nearest neighbor match of Timothy Koogle and as such the predicted winner is Kevin K. Kalkhoven, the CEO of JDS Uniphase. According to the TNIC-3 database, JDS Uniphase as well as Yahoo! are competitors of Concord Communications. This means that Concord Communications would be part of the treatment as well as the control group. Because we would not be able to estimate the treatment effect in such cases, we exclude them.

The $[-5, +5]$ event window might appear to be a rather long short-term window. However, it is not always possible to clearly identify the announcement day of an award. Therefore, we follow the suggestion of Malmendier and Tate (2009) and use a longer short-term window to ensure that the announcement date lies within the event period.

In addition to the event study setting, we employ a difference-in-differences research design to study whether competitors of superstar CEOs change their risk-taking, operating performance, and innovation behavior subsequent to an award. The difference-in-differences model is specified as

$$\sigma_{i,t} = \alpha_{i,t} + \beta_1 D_{Treatment,i} + \beta_2 D_{Award,t} + \beta_3 D_{Treatment,i} D_{Award,t} + FE_{i,t} + \varepsilon_{i,t}, \quad (1)$$

where i and t are a firm and time index, respectively. The dependent variable is the equity volatility $\sigma_{i,t}$, which we use as a proxy for risk taking. In further tests, we use other risk measures, operating performance variables, and innovation variables as our dependent variable. Depending on the nature of the dependent variable, we use ordinary least squares (OLS) or Poisson regressions. $D_{Treatment,i}$ is a dummy variable that is equal to one if firm i is part of the treatment group and zero otherwise, and $D_{Award,i}$ is a dummy variable that is one in the award and all subsequent years and zero otherwise. The interaction term of these two dummy variables is our main variable of interest because it shows how CEOs are influenced if they observe one of their peers being promoted to superstar status, differencing out any time trends and omitted variables. We also include award, industry, and year fixed effects.

4. Event Study Results

4.1. Main Results

We study the stock market performance of superstars' competitors following an award by means of an event study. The outcome of the event study is a priori unclear as competitors could either be incentivized (Ehrenberg and Bognanno 1990) or discouraged by the superstar status of their peer (Brown 2011). Table 4 presents strong evidence that superstars incentivize their competitors. The treatment group (column (1)) has a positive cumulative abnormal return in every event window, ranging from 0.5% in the five-day window to 26.1% in the three-year window. The magnitude of these results increases monotonically over time and is significant at the 10% level for the shortest event window and significant at the 1% level for all longer event windows. In contrast, we do not observe any significant deviation from the control groups' predicted returns over the three years following the event

Table 4 Stock Performance of Competitors of Award Winners vs. Competitors of Predicted Winners

	(1) Treatment	(2) Control	(3) Difference
Event window $[-5, +5]$	0.005*	0.001	0.003
	(1.76)	(0.56)	(0.99)
Event window $[+6, +255]$	0.040***	−0.007	0.047**
	(2.56)	(−0.61)	(2.42)
Event window $[+6, +510]$	0.136***	−0.023	0.158***
	(4.96)	(−1.14)	(4.63)
Event window $[+6, +765]$	0.261***	−0.033	0.294***
	(6.13)	(−1.16)	(5.69)

Notes. This table reports the cumulative abnormal returns of the treatment and the control sample. The treatment sample consists of the competitors of award winners and the control sample consists of the competitors of predicted winners. Competition is defined using the Hoberg–Phillips database. The competitors are only chosen from companies listed in the Execucomp database. Companies are excluded if they classify as treatment as well as control within a 365-day period. Predicted winners are chosen using a nearest neighbor propensity score matching with controls for firm size; book-to-market ratio; returns 2–3, 4–6, 7–12, and 13–36 months prior to the award month; CEO age; CEO tenure; and CEO gender. Matching is done in every month in which an award is conferred, without replacement. Expected returns are calculated using a market model with the value-weighted CRSP index as market returns and an estimation period ranging from −775 to −23 days prior to the award date. Event windows are in trading days. The t-statistics are in parentheses. Standard errors are clustered on the firm level.

*, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.

(column (2)). Put together, these findings lead to the result that the difference between the treated and the control sample is positive and significant (column (3)).

Using cross-sectional analysis, we study whether the performance of superstars' competitors compared to competitors of predicted winners is driven by a set of known return predictors or by effects pertaining to a CEO, a certain industry, or year. For each of the four time horizons in Table 4, we regress the respective cumulative abnormal return on a treatment dummy that is equal to one if the CEO is a competitor of a winning CEO and zero otherwise. We include award, industry, and year fixed effects as well as other control variables such as firm characteristics (*market capitalization* and *book-to-market ratio*), past performance (*returns_7_12*, *ROA*, and *ROE*), proxies for information asymmetry (*PIN* and *Amihud illiquidity*), and CEO characteristics (*age*, *tenure*, *gender*, *founder*, and *overconfidence*). Table 5 presents the results of this cross-sectional analysis. Overall, the results presented in Table 4 are confirmed in this multivariate setting. The treatment dummy is positive and statistically significant for the longer time horizons. The results do not seem to be affected by the small difference in size between the treatment and control groups (see Table 3), as the inclusion of a control for firm size does not account for the significance of our treatment

Table 5 Cross-Sectional Analysis of the Cumulative Abnormal Returns

	(1) [−5, +5]	(2) [+6, +255]	(3) [+6, +510]	(4) [+6, +765]
Treatment	0.001	0.028*	0.117***	0.167***
	(0.03)	(1.67)	(4.09)	(4.08)
Market capitalization	0.001	0.011	−0.043*	−0.101***
	(0.25)	(0.78)	(−1.85)	(−2.99)
Book-to-market ratio	0.018***	0.161***	0.118*	0.142*
	(2.35)	(3.30)	(1.90)	(1.70)
Returns_7_12	−0.010***	−0.088***	−0.159***	−0.243***
	(−3.21)	(−7.34)	(−8.09)	(−9.02)
Return on assets	−0.003	0.031	−0.041	−0.100**
	(−0.58)	(1.46)	(−1.22)	(−2.11)
Return on equity	−0.004	−0.046**	−0.003	0.002
	(−0.52)	(−2.09)	(−0.08)	(0.03)
PIN	−0.003	0.083***	0.167***	0.178***
	(−1.01)	(4.98)	(5.97)	(4.36)
Amihud	−0.002	−0.014	−0.006	0.010
	(−1.06)	(−0.65)	(−0.22)	(0.21)
CEO age	0.002	0.013	0.039**	0.038
	(1.27)	(1.17)	(2.22)	(1.53)
CEO tenure	−0.002	−0.030***	−0.032*	−0.023
	(−0.85)	(−2.66)	(−1.72)	(−0.82)
CEO female (dummy)	0.013	−0.019	0.032*	−0.023
	(1.03)	(−0.22)	(−1.72)	(−0.82)
Founder (dummy)	0.001	0.008	−0.011	−0.025
	(0.20)	(0.26)	(−0.23)	(−0.37)
Overconfidence (dummy)	−0.010***	−0.024	−0.087***	−0.168
	(−2.71)	(−1.30)	(−2.72)	(−3.68)
Award FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	3,674	3,646	3,435	3,270
Adj. R^2	0.03	0.12	0.18	0.21

Notes. This table reports the results of the cross-sectional regressions of cumulative abnormal returns on known return predictors. *Treatment* is equal to one if the company is a competitor of a winning CEO and zero otherwise. *Market capitalization* is the stock price multiplied by common shares outstanding, in log form. *Book-to-market ratio* is book value over market capitalization. *Return on assets* is net income (NI) divided by total assets (AT). *Return on equity* is net income (NI) divided by book equity. *Returns_7_12* is the total compound return from the 7th to the 12th month prior to the award month. *PIN* is the probability of informed trade measure. *Amihud* is the Amihud illiquidity measure. *CEO age* and *CEO tenure* are the age and tenure of the CEO. *CEO female* is equal to one if the CEO is female and zero otherwise. *Founder* is equal to one if the CEO was the CEO at the initial public offering of the company. *Overconfidence* is equal to one if the CEO holds more than 67% of exercisable company options. Apart from the dummy variables, all independent variables are standardized. The *t*-statistics are in parentheses. Standard errors are clustered on firm level.
*, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.

dummy. Furthermore, the fact that the results survive the inclusion of industry fixed effects ensures that the documented effect is not simply attributable to industry peaks. Considering for known return predictors reduces the magnitude of the observed difference to around 16%.

In addition to the event study and the cross-sectional analysis, we use a calendar time portfolio approach comparing the performance of competitors of award winners and the performance of competitors of predicted winners. We construct a zero-cost portfolio that is rebalanced monthly. The portfolio is long in competitors of award winners and short in the competitors of predicted winners. Firms enter the portfolio in the first month after the award and exit it one, two, and three years later, or if the CEO changes. The calendar time approach has the advantage that it does not rely on any return expectations. However, in this setting, it has the disadvantage that the portfolio is not practically implementable, because it relies on future information that is used for the matching of winners and predicted winners. We run a weighted least square regression of the equally weighted portfolio returns on the three Fama and French (1993) factors and the momentum factor of Carhart (1997). Following Loughran and Ritter (2000), we use a weighted least square approach to give equal weights to each observation instead of each period. We obtain similar results if we use ordinary least squares instead or if we use returns of a value-weighted portfolio. This long-short portfolio has a significant alpha of roughly 40 basis points per month over two and three years (Table 6).[11] Economically this effect translates to about 10% and 15% over two and three years, respectively. This is very similar to the results we obtain when using event study models controlling for known return predictors, indicating that the magnitude of the effect of competing with a corporate superstar is in the range of 13% to 17%. We interpret the findings of the event study and the calendar time portfolio approach as evidence that competing with a CEO who achieves superstar status leads to an incentive impact on competing CEOs.

4.2. Welfare-Related Analysis

Malmendier and Tate (2009) document that CEO awards have a detrimental valuation effect on the winning CEO's firm due to agency problems, whereas we show a positive valuation effect on award-winning CEOs' competitors. Thus, the overall welfare effect of the award system is not clear. Moreover, competitors of winning CEOs could potentially benefit from the loss of award winners and gain part of the superstars' market shares. As such, the award system would not lead to an economic welfare gain as implied by Ehrenberg and Bognanno (1990) but solely to a redistribution of wealth among award winners and their

[11] Employing the Carhart model follows the approach used in Malmendier and Tate (2009). When we rerun our analyses using the market model or the Fama–French three-factor model, our results are unchanged.

Table 6 Calendar Time Portfolio Returns

	Year 1	Year 2	Year 3
Alpha	0.002	0.004*	0.004*
	(0.61)	(1.70)	(1.94)
Mktrf	0.207**	0.218***	0.213***
	(2.58)	(3.51)	(3.99)
SMB	0.076	0.186**	0.316***
	(0.78)	(2.42)	(4.83)
HML	0.193*	−0.027	−0.178**
	(1.76)	(−0.31)	(−2.44)
UMD	−0.120*	−0.071	−0.010
	(−1.86)	(−1.43)	(−0.24)
Observations	164	176	188
Adj. R^2	0.08	0.16	0.30

Notes. This table reports results of an equally weighted portfolio that is long in competitors of award winners and short in competitors of predicted winners. The portfolio is rebalanced monthly. Firms enter the portfolio at the first month after the award and remain in the portfolio for one, two, and three years. Firms exit the portfolio if the CEO changes. *Alpha* is the alpha from a four-factor model. *Mktrf*, *SMB*, and *HML* are the Fama–French factors. *UMD* is the momentum factor. The *t*-statistics are in parentheses. *, **, and *** represent significance at the 10%, 5%, and 1% level, respectively.

competitors, equivalent to a zero sum game. Analyzing market shares to study the empirical validity of this alternative explanation turns out to be a nontrivial exercise as observations are mechanically linked. In most studies this is not a severe problem as researchers are usually only interested in a few companies in industries comprised of many companies. In our setting, this problem is much more critical as we consider all companies of an industry. We solve this challenge (and simultaneously analyze the overall economic effect) by studying the change in aggregate market capitalization of winners (predicted winners) and their competitors. This test measures the total welfare gain of an investor who invests in both the winner and its competitors.[12] If a shifting of market shares was the unique reason for the documented effect (tantamount to a zero-sum game), market capitalization of winners and their competitors combined should also be a zero-sum game.

Table 7 shows the means of the changes in market capitalization and *t*-tests for the differences in means, once without fixed effects and once with industry and year fixed effects. We observe that in the year prior to the award, the market capitalization of winners and their competitors as well as the market capitalization of predicted winners and their competitors significantly increase but there is no significant difference between the two. Subsequent to the award, however, we observe a significant change in market capitalization for the winners and their competitors only.[13] The significant positive change indicates that the increase in market capitalization of competitors of winners is higher than the decrease in market capitalization of the award winner. In contrast, we do not observe a significant change in aggregate market capitalization for the predicted winners and their competitors. The difference between the two groups is significant, which provides support for the incentivizing theory of Ehrenberg and Bognanno (1990).[14] Moreover, showing that there is no zero-sum game provides evidence that shifting market shares is not the unique driver of the documented results. Rather, at the aggregate level, the negative agency effect on the winning firms documented by Malmendier and Tate (2009) is outweighed by the incentive effect on their competitors. We, therefore, interpret our finding in Table 7 as an indication of a positive overall welfare effect of a superstar system among corporate leaders.

4.3. Heterogeneous Treatment Effects

How competitors react to CEO awards is likely to depend on various factors, for instance, their perception of why the award was won. Specifically, if a CEO wins an award based on luck, we expect this to have a different effect on competitors than if a CEO wins an award based on merit. We hypothesize that a luck award should have a stronger incentivizing effect to work harder on competitors as they might have been close themselves to winning the award. A merit award, on the other hand, should have less of an incentivizing effect to work harder on competitors as they might either not be influenced at all (they are aware of differences in ability and feel they cannot change this) or they might consider mimicking the award winner's behavior.[15] We test for the differential effect of luck and merit awards in a heterogeneous treatment setting. We distinguish between awards based on luck and awards based on merit

[12] A similar test would be to analyze value-weighted portfolios of winners (predicted winners) and their competitors, where weights are locked in using the relative firm sizes just prior to the award being won. We obtain similar results when we use value-weighted portfolios instead of changes in market capitalization.

[13] We interpret this result as a lower bound as the actual positive economic welfare effect of superstars is likely to be larger. Note that we are likely to underestimate the effect because we only use competitors who we also use in our main event study in Table 4. This means that competitors who are dropped due to our sample restrictions are not included in the calculations. Given that robustness tests with less restricted samples lead to the same results (with sometimes even larger magnitudes) we consider the results presented in Table 7 as conservative estimates.

[14] Note that the fixed effects we use in the fourth column of Table 7 ensure that the difference between the two groups is not simply driven by different market conditions.

[15] Incidentally, both a mimicking or learning and a working harder explanation could explain our documented positive stock market performance of competitors of superstar CEOs.

Table 7 Change in Market Capitalization of Winners and Predicted Winners and Their Competitors

	Winners plus competitors	Predicted winners plus competitors	Difference	Difference
Δ *Market capitalization* [−1, 0]	0.386***	0.364***	0.022	−0.007
	(3.92)	(4.27)	(0.24)	(−0.09)
Δ *Market capitalization* [0, 1]	0.176***	0.067	0.109**	0.089**
	(2.63)	(1.52)	(2.00)	(2.09)
Δ *Market capitalization* [0, 2]	0.276***	0.094	0.182***	0.173***
	(3.05)	(1.34)	(4.85)	(4.47)
Δ *Market capitalization* [0, 3]	0.391***	0.171*	0.220***	0.187**
	(2.88)	(1.97)	(2.51)	(2.68)
Industry FE	No	No	No	Yes
Year FE	No	No	No	Yes

Notes. This table reports the percentage change in aggregate market capitalization for winners and predicted winners and their competitors before and after CEO awards. *Market capitalization* is measured 13 and 1 months prior to the award and 11, 23, and 35 months after the award. The first column shows the mean change in aggregate market capitalization for winners and their competitors. The second column shows the mean change in aggregate market capitalization for predicted winners and their competitors. The third and fourth columns show the differences in means with and without industry and time fixed effects, respectively. The *t*-statistics are in parentheses. Standard errors are clustered on firm level.

*, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.

using the matching distance between winners and predicted winners. We construct a dummy variable that is equal to one if the matching distance is larger than the median matching distance and zero otherwise. If the dummy variable is equal to one (zero), we consider the award to be based on merit (luck). The results presented in panel A of Table 8 document evidence that the effect is more pronounced for competitors of superstars who receive an award by a small margin (luck). The results indicate that competitors of superstars are incentivized to work harder instead of simply mimicking the superstar they compete with.[16]

Competitors are also more likely to react to CEO awards if they have not previously received an award themselves (panel B of Table 8). In contrast, CEOs who have already received an award are not influenced if they received their last award more than three years ago. If they have received an award within the last three years, they have a significantly negative cumulative abnormal return, supporting the findings of Malmendier and Tate (2009). Our findings indicate that CEOs who are perceived as being a superstar (as they previously received an award themselves) and who are no longer influenced by the negative effect of their own award are not affected by a competitor being promoted or reconfirmed as a superstar.[17] This could either be because they perceive themselves as superstars and therefore are not incentivized if they see a peer being promoted or because they have a higher status themselves (more awards) and therefore do not consider the winning CEO as a superstar compared to themselves.

Geographic distance is a potentially important factor when considering the peer effects of a shock to CEO status. Other CEOs might not only be influenced by observing the shock (the award) but also by observing the impacts of these shocks (increased compensation, more leisure time). Whereas some effects, for instance, the increase in compensation or the increase in publishing activity (Malmendier and Tate 2009), can be observed nationwide, others might be more geographically limited (e.g., golf handicaps). To analyze whether geographically close CEOs are more affected by CEO awards, we split the sample in two groups depending on the geographic distance between the winners (predicted winners) and their competitors. We define a CEO to be geographically close if his company's headquarter is less than 100 miles away from its peer's. Consistent with our conjecture, we find that competitors who are geographically close to a winning CEO are more strongly affected by observing their peer being promoted to superstar status (panel C). The results do not notably change if we use alternative distances such as 50 or 200 miles as thresholds. If anything, the size of the effect tends to increase as we reduce the distance but due to the decreasing sample size, the significance also decreases.

[16] We caution that this test does not allow to fully distinguish between CEOs working harder and CEOs learning from superstars. Although the results provide evidence that CEOs work harder, CEOs could also be doing both, work harder and learn from superstars, simultaneously.

[17] The effect on competitors only slightly differs depending on whether the winning CEO is promoted or reconfirmed as a superstar. The reconfirmation effect tends to be larger than the promotion effect only in the longest event window. This provides some (albeit weak) evidence that CEOs who receive more than one award have a higher status than CEOs who only won one award and thereby have a larger incentivizing effect on their competitors. This finding is supported when studying the number of awards a winning CEO previously received. Winners with four or more previous awards on average tend to have a higher effect on their competitors than first time winners.

Table 8 Heterogeneous Treatment Effects

	(1) [−5, +5]	(2) [+6, +255]	(3) [+6, +510]	(4) [+6, +765]
Panel A: Awards based on luck vs. awards based on merit				
Treated × *Merit awards*	−0.001	−0.023	0.075	0.114*
	(−0.26)	(−0.80)	(1.49)	(1.72)
Treated × *Luck awards*	0.001	0.059***	0.148***	0.157***
	(0.21)	(3.04)	(4.40)	(3.42)
Panel B: Has the competitor previously received an award, and if yes how long ago?				
Treated × *Previous award* (>3 years)	−0.031	−0.100	−0.048	0.006
	(−1.61)	(−1.31)	(−0.31)	(0.04)
Treated × *Previous award* (≤3 years)	0.005	−0.096*	−0.185**	−0.362**
	(0.50)	(−1.66)	(−2.20)	(−2.70)
Treated × *No previous award*	0.001	0.032*	0.136***	0.233***
	(0.02)	(1.67)	(4.10)	(4.90)
Panel C: Distance between winner and competitor				
Treated × *Distance* > 100	−0.001	0.018	0.093***	0.145***
	(−0.32)	(0.91)	(2.72)	(2.94)
Treated × *Distance* ≤ 100	−0.001	−0.018	0.155**	0.401***
	(−0.05)	(−0.37)	(2.05)	(3.53)
Panel D: CEO tenure				
Treated × *CEO tenure* > 7	−0.008*	0.003	0.086**	0.162***
	(−1.78)	(0.11)	(2.06)	(2.65)
Treated × *CEO tenure* ≤ 7	0.005	0.038	0.139***	0.227***
	(1.23)	(1.65)	(3.33)	(3.73)
Panel E: Number of competitors				
Treated × *Num. comp.* > 77	0.001	0.011	0.127***	0.288***
	(0.28)	(0.40)	(2.63)	(4.00)
Treated × *Num. comp.* ≤ 77	−0.002	0.036	0.108***	0.119**
	(−0.37)	(1.62)	(2.86)	(2.16)
Panel F: G-Index				
Treated × *G-Index* > 9	−0.001	0.014	0.059	0.111*
	(−0.03)	(0.53)	(1.34)	(1.68)
Treated × *G-Index* ≤ 9	−0.006	0.032	0.111***	0.138**
	(−1.16)	(1.23)	(2.69)	(2.33)
Award FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Notes. This table shows the results of various tests for heterogeneous treatment effects. *Treated* is a binary variable equal to one if the company is a competitor of an award-winning CEO and zero otherwise. The remaining variables are binary variables that are equal to one if the stated condition is fulfilled and zero otherwise. *Merit (Luck) awards* is equal to one if the matching distance between winners and predicted winners is larger (smaller) than the median matching distance. *Previous award* is equal to one if the competitor has previously won an award himself. *Distance* is the distance in miles between the headquarters of a winner or predicted winner and its competitor. *CEO tenure* is the number of years the person serves as the CEO of the company. *Num. comp.* is the number of competitors each company has according to the Hoberg–Phillips database. *G-Index* is the governance index developed by Gompers et al. (2003). The *t*-statistics are in parentheses. Standard errors are clustered on firm level.

*, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.

A further potent explanation why CEOs react differently to media awards are their individual characteristics. For example, younger and shorter tenured CEOs might have an incentive to promote themselves in the labor market (Prendergast and Stole 1996, Yim 2013). As they are at the beginning of their careers, the market opinion is still vague regarding their skills. By outperforming comparable companies, new (low tenure) CEOs have the opportunity to distinguish themselves as potential future superstars. Consistently, we find that CEOs with lower tenure (groups are split at the median) are more strongly affected by a status shock to a competing CEO. Likewise, we find a weaker effect if the CEO is the founder of the company (i.e., an entrepreneur). Founders, even young founders, have a lower incentive than professional managers to promote themselves in the job market.[18] Furthermore, long-tenured CEOs as well as founders are more entrenched, which might also reduce the incentivizing

[18] Using age as the variable of interest confirms this conjecture. For the whole sample we do not find a difference between younger and older CEOs. Considering a subsample of professional managers, however, we find a significantly stronger effect for young CEOs. This provides evidence that young professionals are influenced by superstar CEOs whereas young founders are not.

effect of observing competitors being promoted to superstar status. Differentiating the treatment effect by the median number of competitors (panel E) and the median G-Index (panel F) indicates that the magnitude of the treatment effect is influenced by the level of entrenchment of competing CEOs. Competitiveness and corporate governance are related in the sense that competitiveness can be a substitute for good corporate governance (Giroud and Mueller 2010, 2011). Thus, we interpret the more pronounced effect for companies with many competitors and for companies with good corporate governance (low G-index) as evidence that less entrenched companies are more affected by a shock to CEO status.[19]

4.4. Robustness Tests

Following Malmendier and Tate (2009) we use the market model in our event study. However, previous literature (see, e.g., Barber and Lyon 1997, Lyon et al. 1999) shows that the market model might capture too much noise over longer event periods. To control for further risk factors, we repeat the event study using a Fama–French and a Carhart model. As the market model as well as the Fama–French and the Carhart model are models that explain risk-factor loadings but not alphas, we estimate our results with and without alphas. The results of the Fama–French and the Carhart model (with and without alphas) support the previous finding of the market model. Compared to the market model, the magnitude of the results decreases to about 13% over a three-year horizon. This is very similar to the results we observe in the cross-sectional regressions and the calendar time portfolio approach. We further test the robustness of our results using various other event study settings. Following MacKinlay (1997) we use monthly returns instead of daily returns as these are less sensitive to noise in long run event studies. To check that our results are not driven by a change in parameters (due to the event) we use a postevent estimation period ranging from 788 days after the event to 1,043 days (following Agrawal et al. 1992). For all these settings we obtain similar results as in Table 4.

In additional robustness tests, we relax the sample restrictions that we impose in our main specifications, namely, that competitors have to be part of Execucomp and that there has to be a 365-day gap between being assigned to the treatment or the control group. The results do not change if we drop the Execucomp restriction. Reducing the time constraint to one and zero days also yields similar results. Increasing the time constraint to three years and infinity yields economically the same results while being only marginally significant in case of the infinity constraint because of the reduced sample size and a selection bias toward more volatile small cap companies. Second, we also check if our results are distorted by the financial crisis. We reduce the sample and only include awards (1) before 2004 and (2) before 2003. As the longest event window is three years, we thereby ensure that our sample finishes before the start of the crisis. For these reduced samples, the magnitude slightly increases indicating that the effect decreases during the financial crisis. Regarding the sample construction, we also test the robustness of our competition definition. As an alternative to the Hoberg–Phillips measure, we repeat the analysis using SIC-2, SIC-3, and SIC-4 as competition measures. All three SIC measures support the previous findings. The results' magnitudes increase from SIC-2 to SIC-4 as the competition classification becomes narrower.

The last group of robustness tests varies the matching procedure. First, we repeat the matching three times using an approach with replacement and one, two, and three neighbors, respectively. All three specifications confirm the previous findings. Second, we change the calculation of the propensity scores by (1) including award, industry, and year fixed effects (Malmendier and Tate 2009) and (2) by excluding the age variable as it is not significant for all specifications of the logit regression. The inclusion of the fixed effects leads to an increase in magnitude and significance of our results. The exclusion of the age variable does not change the results.

5. Outperformance Through Risk Taking?

Competitors of award-winning CEOs have significantly higher positive abnormal returns compared to a sample of competitors of matched nonaward winners. As the high performance is triggered by the award of the competitor, we are interested in actions managers consider when they try to catch up with a competing superstar. Previous literature shows that increased risk taking might be a viable option when trying to catch up with more successful peers. Managers could, for instance, increase the company's risk by entering new markets (Aron and Lazear 1990) or by investing in riskier projects (Roussanov and Savor 2014). When managers decide to enter new markets, we expect the company's systematic risk to change, whereas investing in riskier projects should lead to an increase of the company's idiosyncratic risk. We use a difference-in-differences research design to study the effect of CEO awards on competitors' risk taking (Equation (1)). This allows us to control for omitted variables, common trends, and shocks that affect the treatment as well as the control group. We compare the

[19] We obtain similar results when using the E-Index instead of the G-Index.

Table 9 Difference-in-Differences Test Results

	Risk taking			Operating performance			Innovation activity		
	(1) σ(*returns*)	(2) σ(*idio._CRSP*)	(3) β(*CRSP*)	(4) ROA_{adj}	(5) $Sales\_growth_{adj}$	(6) $Markup_{adj}$	(7) *Patents*	(8) *R&D/TA*	(9) *Cites/patent*
[−1, 0]	0.011	0.010	−0.054	0.002	0.009	0.048	0.044	0.001	−0.011
	(1.55)	(1.54)	(−0.94)	(0.35)	(1.02)	(1.31)	(0.92)	(0.89)	(−0.15)
[−1, 1]	0.021**	0.013*	−0.070	0.001	0.018*	0.123**	0.207***	0.002	0.108
	(2.28)	(1.81)	(−1.10)	(0.11)	(1.65)	(2.26)	(2.74)	(1.58)	(1.17)
[−1, 2]	0.039***	0.026***	0.080	0.021**	0.020*	0.083	0.272***	0.001	0.240**
	(3.90)	(3.27)	(1.19)	(2.44)	(1.71)	(1.22)	(2.58)	(0.39)	(2.35)
[−1, 3]	0.039***	0.022**	0.147**	0.026**	0.022*	0.256***	0.345**	0.000	0.528***
	(3.39)	(2.51)	(2.16)	(2.28)	(1.84)	(2.70)	(2.19)	(0.05)	(3.36)
Award FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regression	OLS	OLS	OLS	OLS	OLS	OLS	Poisson	OLS	OLS

Notes. This table reports results for difference-in-differences regressions for different time periods and dependent variables studying the risk taking, the operating performance, and the innovation activities of superstars' competitors. Year 0 is the award year. The other years are determined relative to the award year. σ(*returns*) is the volatility of monthly returns for the given firm-year. σ(*idio._CRSP*) measures the standard deviation of the residual of the regression of the monthly firm returns on the CRSP value-weighted index. β(*CRSP*) is the beta of this regression. ROA_{adj} is net income (NI) divided by total assets. $Sales\_growth_{adj}$ is the percentage change in sales (SALE) from one year to the next. $Markup_{adj}$ is the difference of sales and cost of goods sold (COGS) divided by cost of goods sold. ROA_{adj}, $Sales\_growth_{adj}$, and $Markup_{adj}$ are industry adjusted using the mean of the respective TNIC-3 competitors. *Patents* is the number of patents a company applied for in a given year. *R&D/TA* is research and development expenses scaled by total assets, in log form plus one. Missing R&D values are set to zero. *Cites/patent* is the number of all patents citing this year's patents (over a three year horizon) divided by the number of this year's patents, in log form. Ratios are winsorized at the 5% level. For count data, we use Poisson regressions. For the remaining variables, we use an ordinary least square regression. All regressions include award, industry, and year fixed effects. Standard errors are clustered on firm level. The *t*-statistics are in parentheses. Standard errors are clustered on firm level.

*, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.

data of the year prior to the award year to the award year itself and the three subsequent years.

The risk taking of award-winning competitors increases significantly in the years subsequent to an award (column (1) of Table 9). The return volatility of the treatment group increases by 0.039 over the three years after the CEO award compared to the control group. Splitting total stock price risk into the idiosyncratic (column (2)) and the systematic part (column (3)), we observe that idiosyncratic risk increases by 0.026 compared to the control group, and there is no notable increase in systematic risk.[20] Compared to the preaward mean, the results correspond to a 9.2% and a 6.3% increase in total and idiosyncratic risk, respectively. These results provide evidence that CEOs react to the superstar status of a peer by increasing their companies' own risk.[21] In particular, managers increase their companies' idiosyncratic risk, suggesting that they invest in riskier projects.

Entering new markets and engaging in riskier projects is in the interest of shareholders, as it implies that managers work harder. However, Chen and Pennacchi (2009) show that increased risk taking can also represent an agency problem. They observe that underperforming mutual fund managers increase their idiosyncratic risk (tracking error) to increase their performance related compensation. To determine whether media awards incentivize managers to work harder (resulting in increased risk taking) or whether they only increase risk for their own good (agency problem), we analyze companies' operating performance. If the increase in risk is due to an increase of managers effort (working harder, entering new markets, investing in new projects), we expect operating performance to increase. Using the difference-in differences approach, we observe a significant increase in operating performance subsequent to an award. In particular, ROA_{adj} (column (4)), $Sales\_growth_{adj}$ (column (5)), and $Markup_{adj}$ (column (6)) increase by 0.026, 0.022, and 0.256, respectively, over a three year horizon.[22] In terms of economic significance, these

[20] For consistency with our calendar time portfolio analysis, we rerun the tests using idiosyncratic and systematic risk measured as the volatility of residual and predicted returns of the Fama–French three-factor model and the Carhart model. Our results are unchanged.

[21] This is consistent with Shemesh's (2010) conjecture that CEOs take a personal interest in their firms' risk exposure. Whereas we show that competitors of superstars increase their companies' risk to catch up to their superstar peers, Shemesh (2010) finds that CEOs decrease their companies' risk once they achieve superstar status.

[22] Instead of (or in addition to) improving their operating performance, competitors of superstars might also consider raising their advertisement expenses to increase their likelihood of receiving an award in the future. Applying the difference-in-differences

increases correspond to increases of 31%, 15%, and 34% of one preaward standard deviation. The results of risk taking and operating performance, thus, provide evidence that CEOs work harder and risk more after observing a peer being promoted to superstar status.

Recent literature outlines that increased risk taking and higher stock market performance can manifest itself through an increase in innovation activity (Hirshleifer et al. 2012, Roussanov and Savor 2014). Thus, considering innovation activity of companies establishes a channel to explain how managers achieve to increase the risk and the operating performance of their company. Applying the difference-in-differences research design, we find a significant increase in the number of patents in the years after a competitor received an award (column (7) of Table 9).[23] We compare this increase in innovation output to the change in innovation input (R&D expenditures). We do not observe an increase in R&D expenditures, indicating that managers increase their innovation output at constant innovation inputs. Following Hirshleifer et al. (2013), we interpret this finding as evidence of an increase in innovation efficiency. As higher innovation efficiency leads to higher stock market performance (Hirshleifer et al. 2013), this finding provides a potent explanation for the positive stock market performance we observe in §4. We next assess whether companies also produce patents of higher quality. Column (9) shows that treated companies increase the number of citations per patent indicating an increase in patent quality. Citations per patent increase by 23% compared to the preaward mean of 1.16. Overall, the results[24] in columns (7)–(9) indicate more patenting and innovation activity as one channel through which competitors of award-winning CEOs significantly increase their risk-taking and operating performance.[25]

6. Conclusions

In this paper, we conduct an empirical investigation of the effect of superstar CEOs on their competitors. Exploiting shocks to CEO status due to awards provided by major media outlets, we provide empirical evidence that observing a peer being promoted to superstar status incentivizes CEOs, leading to significant positive abnormal returns. At the aggregate level, this incentivizing effect can compensate the negative effect on award winning firms documented in previous literature (Malmendier and Tate 2009). In addition, we document heterogeneity in the treatment effect. CEOs who perceive the award to be based on luck, who have not previously received an award themselves, who are geographically close, and who are not entrenched are on average more strongly affected if one of their peers is promoted to superstar status. Our results do not critically depend on the definition of the control sample, the matching technique employed, or the timeframe used for our analysis and are not explained by industry peaks or a redistribution of market shares from superstars to competitors. We identify an increase in operating performance and in risk taking, in particular by becoming more efficient and better innovators, as possible channels through which competitors of superstars achieve the observed performance. Studying the patenting activity of competitors of award-winning companies compared to other companies reveals that the competitors of winners significantly increase their number of patents and their innovation quality. Whereas the existing evidence documents a negative effect of CEO superstar status on the firm and a negative effect of competition with superstars in the sports world, our paper sheds light on a surprising and previously undocumented ex post benefit of a superstar CEO culture: the incentives such superstars provide for their competitors.

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test we find a positive (but not significant) change in advertisement expenses subsequent to an award. This empirical analysis is complicated by two issues. First, data on advertisement expenses is only available for around 31% of sample observations, thus reducing the power of any statistical analysis. Second, in our logit regressions we find that advertisement expenses have only a very small, if any, impact on the likelihood of receiving an award. If CEOs are aware of that, they do not have an incentive to increase their companies' advertisement expenses.

[23] The results of the Poisson regression are highly statistically significant, but it is difficult to give them economic meaning. Therefore, we repeat the analysis using an OLS regression and find that observing a competitor being promoted to superstar status leads on average to 14 patents more per year. Compared to 60 patents that companies filed on average in the year prior to the award, being a competitor of a superstar leads to a 23% increase in innovation activity.

[24] Our results are robust to using time fixed effects to mitigate the time truncation issue (Hall et al. 2001, Hirshleifer et al. 2012), accounting for firm-years with zero patents, zero citations, and self-citations (Hirshleifer et al. 2012), using logarithmic variants of patent data (Hirshleifer et al. 2012), and restricting the sample to manufacturing companies (Amore et al. 2013, Balasubramanian and Sivadasan 2011).

[25] In contrast, we do not find evidence that a decrease in innovation activities explains the negative performance of winners compared to predicted winners documented by Malmendier and Tate (2009).

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Appendix. CEO Awards

Business Week (circulation: 993,000): Since 1988, the editorial staff chooses the Best Manager of the year, and since 1991, the editorial staff additionally picks the Best Entrepreneur of the year. Between 1990 and 2001, the latter has been awarded 71 times. The number of Best Entrepreneurs per year varies, ranging from none in 2000 to 10 in 1995. Between 1988 and 2008, 317 Best Managers were chosen. There was no award in 1989 and from 2005 to 2009. On average, 18.6 Best Managers were chosen per year. The lowest number of awards is 6 in 1988 and 1990, and the highest is 29 in 2000.

Chief Executive (circulation: 42,000): *Chief Executive* has named a CEO of the year each year since 1987. The winner is chosen by a panel of CEOs.

Electronic Business Magazine (circulation: 65,000): The editorial staff has named a CEO of the year each year from 1997 to 2006.

Financial World (circulation: 430,000): From 1975 to the time the magazine ceased publication in 1997, the editorial staff of *Financial World* named a CEO of the year. There was a gold award (1 winner per year) and a silver award (about 10 winners per year, 1 winner per industry in 1995 summing up to a total of 70 winners in this year and 5 winners in 1997).

Forbes (circulation: 924,000): The editorial staff of *Forbes* started publishing a list of Best Performing CEOs in 2001. In 2001, 5 winners were chosen. From 2002 to 2008, 10 winners per year were named. After 2008, the staff ceased to further publish the list.

Industry Week: The *Industry Week* award "CEO of the Year" is based on a CEO survey. From 1993 to 2005, one winner per year was chosen.

Morningstar: Since 1999, the editorial staff of *Morningstar* names a CEO of the year. In 1999 and 2001, two persons had the honor to receive this prize. In the remaining years, only one CEO received the award.

Time: For more than 50 years, *Time* magazine has named a person of the year. The winners are chosen by the editorial staff. In 1991, 1997, 1999, and 2010, the person of the year was a CEO.

Time/CNN: In 2001, *Time*, in corporation with *CNN*, picked 25 Most Influential Global Executives.

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