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Corporate risk and the humpback of CEO narcissism

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Abstract

Purpose – The purpose of this paper is to investigate the association between CEO narcissism and corporate risk taking.

Design/methodology/design – The authors provide a novel and unobtrusive measure of CEO narcissism based on LinkedIn profiling. The authors investigate the relationship between CEO narcissism and corporate risk taking (stock return volatility) for a sample of 475 US manufacturing firms in the period 2010-2014.

Findings – The authors find an inverse U-shape relationship between CEO narcissism and stock return volatility. The inverse U-shape relationship (the "humpback") is caused by the paradoxical nature of the narcissistic personality in which the self-esteem is high but at the same time fragile with a combination of self-admiration and a constant need of having this positive self-view confirmed. The results are robust to alternative specifications of CEO narcissism and corporate risk taking. The results are economically meaningful. Thus, a moderate degree of CEO narcissism – as compared to a very low or a very high level of CEO narcissism - is associated with an increase in corporate risk taking of approximately 12%.

Originality/value - Previous literature provides multiple analyses on the association between managerial overconfidence and corporate decisions. As opposed to overconfidence, narcissism is a personality trait having both cognitive and behavioral dimensions. This paper provides a novel contribution to the growing literature on the association between managerial biases / traits and corporate decision-making.

Keywords - Behavioral corporate finance, LinkedIn profiles, CEO narcissism, Corporate risk taking

Paper type – Research paper

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1. Introduction

Conventional corporate finance is characterized by a set of broad assumptions that the preferences and beliefs of investors as well as managers are fully rational (Baker & Wurgler, 2013). Behavioral corporate finance relaxes these traditional rationality assumptions and replaces them with more evidence-driven behavioral foundations whereby elements of psychology are applied to finance by focusing on individual-level cognitive biases (Hirshleifer, 2015; Muradoglu & Harvey, 2012). Within the behavioral corporate finance literature, the more specific area of managerial biases focuses on cases of irrational managers and rational investors. The research on managerial biases has predominantly focused on the Chief Executive Officer (CEO) and the overconfidence bias (for an overview, e.g. Malmendier & Tate, 2015).[1] Focusing on these as well as other managerial biases, the literature on managerial biases shows considerable evidence of CEO psychology being associated with a variety of firm strategies and decisions (for a survey, e.g. Baker & Wurgler, 2013).

The concept of narcissism has received limited attention although anecdotal evidence on e.g. Volvo's Pehr Gyllenhammar, Scandinavian Airline System's Jan Carlson, and GE's Jack Welsh among others points to narcissistic leaders being a regular phenomenon in the corporate world (Maccoby, 2000)[2]. More generally, research suggests that narcissistic persons are likely to emerge as leaders (Brunell et al., 2008) which makes a focus on CEO narcissism highly relevant.

Broadly, the purpose of this study is to investigate the role of narcissism within the field of

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[1] Based on the psychology literature, overconfidence basically has three different manifestations (Ben-David et al., 2013): 1) the tendency to have an inflated view of one's attributes and abilities (the above-average effect), 2) the tendency to overestimate the precision of one's forecasts and underestimating the variance of risky processes (miscalibration), and 3) the tendency of individuals to overestimate the control they possess over events that they have limited influence on (the illusion of control). The first of these manifestations is also referred to as optimism. Hirshleifer et al. (2012) define optimism as the tendency to believe that one has prospects for successful life outcomes that are at odds with reality. Overconfidence is sometimes also used in a narrower frame equivalent to the second of these manifestations, i.e. miscalibration.

[2] An illustration of an extreme example of CEO narcissism is inherent in asking for the difference between God and Oracle's Larry Ellison. The answer: "God Doesn't Think He's Larry Ellison" (Wilson, 1997).

behavioral corporate finance. More specifically, the purpose is to investigate the association between CEO narcissism and corporate risk taking. The research questions raised are:

1) Is there an association between CEO narcissism and corporate risk-taking?

2) If so, how is the form of this association?

Some similarities exist between narcissism and overconfidence. However, narcissism has some essentially distinguishing features. Most notably, narcissism can be characterized as a complete personality trait [3] having both cognitive and behavioral dimensions, where overconfidence is only related to the perception of reality (Aktas et al., 2016).

In investigating the potential association between CEO narcissism and corporate risk taking, we use a new and unused source of indicator of CEO narcissism, the LinkedIn profile of the CEO. The use of the LinkedIn profile as a data source is inspired by earlier use of unobtrusive measures of CEO narcissism (Chatterjee & Hambrick, 2007 and 2011; Aktas et al., 2016), and by the data availability in social media. The approach of using data from social media in relation to personality traits is new within the context of behavioral corporate finance. We compose a LinkedIn CEO narcissism index from six different LinkedIn-based indicators and investigate the relationship between CEO narcissism and corporate risk taking on a sample of 475 US manufacturing firms in the period 2010 to 2014. We use stock return volatility as our main indicator of corporate risk-taking[4]. To the best of our knowledge, no previous study has directly tested the association between CEO narcissism and corporate risk-taking.

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[3] Freud identified three main personality types: narcissistic personality, erotic personality, and obsessive personality. (Maccoby, 2000). Freud recognized that we are all somewhat narcissistic.

[4] The use of stock return volatility as a proxy for the underlying business volatility is in line with Leahy and Whited (1996). They argue that stock price returns capture the effects of any aspect of a firm's environment that investors find important. The alternative would be to measure underlying business volatility directly. However, this approach would face problems in terms of identifying the most important sources of uncertainty and not least measuring such uncertainty. As such, using stock return volatility provides a feasible shortcut to these problems. Stock return volatility measures equity risk and not overall firm risk. However, a stock is an option on the firm's assets and as such its value is sensitive to the volatility of the underlying asset – thus justifying the use of stock return volatility as a proxy for the volatility of the value of the firm (e.g. Bulan, 2005).

Our study finds robust evidence of a non-linear relationship between CEO narcissism and corporate risk-taking. Thus, an increase in narcissism for low to moderate levels of CEO narcissism is associated with an increase in corporate risk-taking while an increase in CEO narcissism for high levels of CEO narcissism is associated with a decrease in corporate risk-taking. The inverted U-shape relationship (the "humpback") is caused by the paradoxical nature of the narcissistic personality in which the self-esteem is high but at the same time fragile with a combination of self-admiration and a constant need of having this positive self-view confirmed.

Our results are statistically significant and economically meaningful. Thus, we find that the specific form of the inverse U-shape relationship implies that 1) a very low degree of CEO narcissism and a very high degree of CEO narcissism are associated with the same level of corporate risk taking, 2) the majority of firms are situated on the left-hand side of the inverse U-shape curve so that an increase in CEO narcissism is associated with an increase in corporate risk taking, and 3) a moderate degree of CEO narcissism – as compared to a very low or a very high level of CEO narcissism - is associated with an increase in corporate risk taking of approximately 12% (as measured by the change in stock return volatility). Our results are robust to alternative measurements of corporate risk taking and CEO narcissism.

Our paper contributes to the existing literature on managerial biases and traits in behavioral corporate finance in three ways. *First*, we establish a new and unobtrusive indicator of CEO narcissism based on LinkedIn profiling. *Second*, we directly focus on the association between CEO narcissism and corporate risk taking for a large sample of CEOs in US manufacturing firms. *Third*, we document a robust and statistically significant and economically meaningful inverse U-shape relationship between CEO narcissism and corporate risk taking.

Our empirical work is most closely related to Chatterjee and Hambrick (2007 and 2011) and Aktas et al. (2016). Chatterjee and Hambrick (2007) construct an index of different indicators

of CEO narcissism and investigate 111 CEOs from the computer hardware and software industries in the period 1992-2004. They find that CEO narcissism is positively related to 1) strategic dynamism and grandiosity, 2) the number and size of acquisitions, and 3) extreme and fluctuating performance. Chatterjee and Hambrick (2011) use an almost similar indicator for CEO narcissism and 1) investigate 152 CEOs from the US computer hardware and software industries in the period 1992-2008 and 2) CEOs involved in 131 M&A activities in the period 2001-2008 to study the determinants of risk taking by CEOs. They find that highly narcissistic CEOs are much less responsive to recent objective performance than their less narcissistic peers and are especially bolstered by social praise. They argue that one "might reasonably expect that narcissists, who have elevated levels of self-admiration, would be generally inclined to take big risks". However, they find no such effect for narcissism - neither on acquisition premiums, nor on overall risky outlays – and conclude that there is little evidence that narcissists are "pervasively extreme risk takers". Aktas et al. (2016) use the CEO's first-person singular pronoun usage in interviews as an indicator of CEO narcissism and find that CEO narcissism is associated with more acquisitions initiated and faster negotiations. The findings are based on 187 US deals in the period 2002-2006. As opposed to the other studies, Aktal et al. (2016) control for overconfidence and find 1) that their results are robust to the inclusion of overconfidence, and 2) that the inclusion of overconfidence is immaterial in most of their analysis.

The remainder of the paper is structured as follows. Section 2 is a literature review that discusses why narcissism should matter for corporate risk taking and states hypotheses. Section 3 describes the sample, motivates and shows the LinkedIn based CEO narcissism indicator, and provides descriptive statistics. Section 4 presents the empirical results. Section 5 performs robustness tests. Section 6 concludes.

2. Literature review and hypotheses

The phenomenon of narcissism was first introduced to psychology and psychiatry by Ellis (1898) and is inspired by the Narcissus myth by Ovid in which a young man takes his own life because he falls in love with his own reflection and ultimately sees suicide as the only way to escape the image of himself. The concept was further developed by Freud who identified narcissism as one of three main personality types: narcissistic personality, erotic personality, and obsessive personality (Maccoby, 2000). As defined by the American Psychiatric Association (1994), narcissism was in its modern usage predominantly recognized as a personality disorder until Raskin and Hall (1979) developed their Narcissistic Personality Inventory that allowed researchers to study narcissism as a personality dimension as opposed to the more extreme case of a clinical disorder. We use narcissism as a personality dimension in accordance with prior literature within the field of behavioral corporate finance (Chatterjee and Hambrick, 2007 and 2011; Aktas et al., 2016).

The literature on managerial biases – and among these especially overconfidence - shows considerable evidence of CEO psychology being associated with a variety of firm strategies and decisions (for an excellent survey, please refer to Baker & Wurgler, 2013). Narcissism is a psychological trait that has received less attention than overconfidence in the literature on managerial biases. Similarities between narcissism and overconfidence exist but narcissism has some essential distinguishing features (Aktas et al., 2016). Chatterjee and Hambrick (2007) define the concept of narcissism as "… a coherent but multifaceted personality dimension that can be defined, again, as the degree to which an individual has an inflated sense of self and is preoccupied with having that self-view continually reinforced". This definition is inspired by the literature within psychology on the subject of narcissism as a personality dimension which is again inspired by the original definition of the clinical disorder by the American Psychiatric Association. From

this definition the most important difference between narcissism and overconfidence is evident. Thus, overconfidence is only related to the perception of reality whereas narcissism as a complete personality trait has both cognitive and behavioral dimensions (Aktas et al., 2016). Aside from believing in a superiority of one's own self, narcissistic individuals are characterized by the use of strategies to preserve and enhance this positive self-view (Campbell et al., 2004).

Narcissistic individuals do not rely solely on their own belief of their superiority as they are characterized by a constant need of admiration and attention (Bogart et al., 2004) along with a dependence on reinforcement of their positive self-view through applause and confirmation (Wallace and Baumeister, 2002). Brummelman et al. (2016) argue that narcissists crave validation because their sense of superiority is precarious. Bogart et al. (2004) find narcissism associated with increased sensitivity to social comparison information. Campbell (1999) finds narcissism associated with a desire to associate with others regarded as being of high status in order to gain self-esteem to the extent of providing a sense of popularity and importance. Chatterjee and Hambrick (2011) also point out that the narcissistic personality is paradoxical in the sense that narcissistic individuals admire themselves while they simultaneously have a constant need of having this positive self-view reinforced. Although narcissist individuals appear arrogant "on the outside", their grandiose ideas and behaviors may be a defense against deep-seated negative feelings about the self (Rosenthal and Pittinsky, 2006) thus forming a potential combination of a grandiose and a vulnerable narcissism.

For those reasons narcissistic persons are characterized by a high, but very fragile sense of self-esteem as determined by Kernis (2005). Thus, the American Psychiatric Association (1994) describes how "Individuals with this disorder generally require excessive admiration … Their self-esteem is almost invariably very fragile. They may be preoccupied with how well they are doing and how favorably they are regarded by others. This often takes the form of a constant need for

attention and admiration." This is also reflected in that - aside from being very motivated by applause and confirmation (Wallace and Baumeister, 2002) - narcissistic individuals react with great anger and denial to criticism (Kernis and Sun, 1994; Rhodewalt and Morf, 1998). Other significant characteristics of the narcissistic personality include a manipulative nature and lack of empathy (Campbell and Foster, 2007), a disposition for strategically attributing responsibility for their own successes to their abilities (Campbell et al., 2000), and finally that one's degree of narcissism is relatively fixed over time (Chatterjee and Hambrick, 2007; John and Robins, 1994). Using a computer-based question task on a group of university students, Campbell et al. (2004) find narcissism associated with both overconfidence and risk-taking.

Chatterjee and Hambrick (2007) use five different indicators of CEO narcissism: 1) the prominence of the CEO's photograph in the company's annual reports, 2) the CEO's prominence in the company's press releases, 3) the use by the CEO of first-person singular pronouns in interviews, 4) the cash compensation of the CEO scaled by that of the second-highest paid executive, and 5) the non-cash compensation of the CEO scaled by that of the second-highest paid executive. Using these unobtrusive indicators in a combined 5-item index, the authors find CEO narcissism positively related to strategic dynamism, the number and size of acquisitions, and extreme and fluctuating performance.

Chatterjee and Hambrick (2011) use the same indicators except for first-person singular pronoun usage in interviews on how CEO narcissism affects the relationship between "capability cues" (in the form of recent objective performance and social praise) and current risk-taking. Here they find that narcissism among CEOs decreases the responsiveness to recent objective performance while increasing the association between social praise (measured as media praise and media awards) and risk-taking.

Aktas et al. (2016) use the CEO's first-person singular pronoun usage in interviews as an

indicator of CEO narcissism and find that narcissism among CEOs leads to more initiated acquisitions and faster negotiations of these acquisitions. Furthermore, they find that narcissism on the part of the target CEO results in a less favorable reaction by the acquirer shareholders to a takeover announcement.

Based on the considerations, reflections, and findings in earlier studies as referenced above we find it reasonable to hypothesize that CEO narcissism could be associated with corporate risk taking. This leads to two competing hypotheses:

H1(a): CEO narcissism is associated with corporate risk taking

H1(b): CEO narcissism is not associated with corporate risk taking

If CEO narcissism is in fact associated with corporate risk taking, it is – based on the empirical findings of earlier studies – reasonable to predict that such relationship is positive. However, as described above, narcissistic persons are characterized by a high but fragile sense of self-esteem. This fragility could predict a negative relationship. Thus, narcissistic CEOs have a constant need of having their positive self-view reinforced through confirmation and applause. Such a need could lead to less risk taking because the CEO fears criticism resulting from bold and potentially unsuccessful initiatives. Finally, the two-edged sword inherent in narcissism could lead to a non-linear relationship between CEO narcissism and corporate risk taking. Thus, we state the following three competing hypotheses:

H2(a): CEO narcissism is positively related to corporate risk taking.

H2(b): CEO narcissism is negatively related to corporate risk taking.

H2(c): CEO narcissism is related in a non-linear fashion to corporate risk taking.

In the remainder of the paper we will investigate these hypotheses by examining the association (if any) between an unobtrusive indicator of CEO narcissism and a stock market based measure of corporate risk taking.

3. Sample, LinkedIn measure, and descriptive statistics

In this section we show how we reach our sample of 475 US manufacturing firms (3.1). Next, we motivate and describe our CEO narcissism proxy which is based on LinkedIn profiling (3.2). Finally, we describe other variables and show descriptive statistics for all variables (3.3).

3.1. Sample

We instigate a sample of 475 US listed manufacturing firms in the period 2010-2014. We choose US firms due to data availability. We choose manufacturing firms (NAICS 31-33) because these firms constitute 1) a large group of publicly listed firms and 2) at the same time a relatively homogenous group. We choose a period from 2010 till 2014 to 1) employ recent data and 2) ensure that the majority of CEOs have served in the CEO position in the firm in the majority of the sample period. The latter feature is relevant because we rely on LinkedIn profiles collected in 2015 to measure CEO narcissism.

We reach 475 firms in our final sample based on two further requirements and two further exclusions. Thus, we require 1) that the firms have the necessary financial and stock price information for the years 2010-2014 and 2) that the CEO of the firm has a LinkedIn profile[5]. We

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[5] We exclude firms with no CEO LinkedIn profile. This raises the question of a potential sample selection bias. Thus, we investigate the total group of 935 relevant firms in which approximately half have CEO LinkedIn profiles and the other half does not. We create a dummy variable for whether or not the CEO has a LinkedIn profile. This dummy variable is included in a regression analysis investigating the stock return volatility of the firm (our main proxy for corporate risk taking). The regression analysis includes control variables related to size, leverage, and current ratio.

exclude 1) firms with a market capitalization of less than 5 million US$ (to mitigate bias from firms in financial distress)[6] and 2) thinly traded stocks (traded on less than 40% of the days in the sample following Bartholdy et al., 2007).

3.2. LinkedIn measure

Webb et al. (1966) promote the use of unobtrusive indicators not specifically produced for the purpose of analysis. Chatterjee and Hambrick (2007 and 2011) and Aktas et al. (2016) use such unobtrusive measures in research on narcissism in a behavioral corporate finance context. Inspired by these works, we create a new unobtrusive measure of CEO narcissism based on LinkedIn profiles. The choice of this specific kind of indicator is based on the premise that LinkedIn profiles potentially could be a valuable source of indicator of managerial biases similar to how photographs of the CEO in annual reports, CEO speeches, CEO interviews, and press releases from the firms have proven to be valuable (Chatterjee and Hambrick, 2007 and 2011; Aktas et al., 2016). Providing further support for our choice, Buffardi and Campbell (2008) find that narcissism predicts higher social media activity and more self-promoting content on Facebook. To the best of our knowledge, LinkedIn as a potential source of an unobtrusive indicator has not previously been exploited in the corporate finance literature. Below we address the six indicators (three continuous and three binary) that form the basis of our LinkedIn narcissism measure. The selection of indicators in this study is based on two main criteria following Chatterjee and Hambrick (2007): 1) the indicators need to reflect the CEO's volition and 2) the indicators need to reflect one or more

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We find no indication that firms differ in their risk profile based on whether or not the CEO has a LinkedIn profile. We conclude that the exclusion of firms with no CEO LinkedIn profile does not seem to raise concerns in relation to sample selection bias.

[6] We use stock return volatility as a proxy for overall firm risk. By excluding firms with a very low market value of equity we avoid most or all stocks that are likely to behave as out-of-the money options on firm value and thus likely to have a relatively low correlation between stock value and firm value.

aspects of narcissism. The criteria lead to six indicators as described below.

First, one indicator (continuous) of this kind is the number of skills added to the "Skills and Endorsements" section of the LinkedIn profile. In this section of the profile it is possible for the user to add professional skills which he or she believes to have. When one or more skills are added in this fashion, it is then possible for people who are connected with the user on the LinkedIn network to endorse the owner of the profile on these skills. Adding skills to the section is optional and the section will only appear on the profile once one or more skills are added. With regard to the first of the two criteria, the indicator consisting of the number of skills added to skills and endorsements appears to reflect the CEO's volition successfully as the LinkedIn profile is under the complete control of the CEO. Furthermore, it is optional for the CEO to add the skills and endorsements section. Even in the case, where a secretary may be "in charge" of the LinkedIn profile of the CEO, the CEO is bound to have the final say on the contents of the profile. With regard to the second criterion, adding more than a limited amount of skills to the skills and endorsements section by a CEO would in most cases seem redundant. In order to be given the opportunity to take on the role as CEO of a firm, and furthermore to actually be capable of successfully staying in this position, a broad range of skills and capabilities is expected. The job as CEO is under most circumstances very unlikely to be the first job and will on the contrary demand experience from a variety of other positions. On this basis it is fair to assume that the vast majority of CEOs will be able to list a substantial number of professional skills on their LinkedIn profile. The most central competencies of the CEO are, however, portrayed adequately by a limited number of skills added to the LinkedIn profile while the skills added after a certain number are redundant. Excessive listing of skills can therefore be seen as a matter of drawing attention to one's skills and capabilities without any apparent purpose besides just that. Thus, narcissistic CEOs would be prone to add a lengthy list of professional skills to their profiles 1) as a result of their

need to draw attention to their superior qualities and 2) as a result of their need for acclaim and confirmation that can be fulfilled through the endorsement of their skills by their connections.

Second, another indicator (continuous) is the number of professionals that the user is connected to on the LinkedIn network. It is important for a narcissistic CEO to have a large number of connections displayed on his or her profile (following the reasoning of Buffardi and Campbell, 2008). The number of connections is a way of portraying a range of important relations as well as a general indicator of the popularity of the CEO. The CEO can invite connections and also decide whether to accept or reject requests to connect (volition). Davenport et al. (2014) find a positive relationship between narcissism and the number of friends on Facebook.

Third, a third indicator (continuous) is the number of previous positions listed. The job as CEO is under most circumstances very unlikely to be the first job and will on the contrary demand experience from a variety of other positions. On this basis it is fair to assume that the vast majority of CEOs will be able to list a substantial number of previous positions on their LinkedIn profile. Again, the listing of many previous positions is important for the narcissistic CEO in order to give a comprehensive picture of prior achievements and thus expose a superior profile.[7]

Fourth, a fourth indicator (binary) is whether or not a picture is added to the LinkedIn profile. The reasoning is fairly similar to the prominence of a photograph of the CEO in the company's annual report, which is used as an indicator of narcissism by Chatterjee and Hambrick (2007). Adding a picture to the profile is an exercise of vanity for a narcissistic CEO.

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[7] Our indicators are noisy indicators of CEO narcissism. An example is the number of previous positions listed. This variable could be increasing in the length of LinkedIn listing, independent of the degree of narcissism. For example, assume two CEOs each with 10 years' experience in the role and four different jobs during this time. One CEO has had a LinkedIn account for all 10 years and updates this when moving jobs, while the other has had an account only recently and listed all previous jobs over the last 10 years when signing up. While both CEOs will have the same value for number of positions listed, the former could be thought of as less narcissistic than the latter (updating rationally/logically each time there is a change in job). As we do not have data on the length of LinkedIn listing, we cannot mitigate this "noise". While each indicator may be noisy, we believe that by integrating six indicators for CEO narcissism the majority of the "noise" will cancel out / disappear. We thank an anonymous referee for providing us with the illustrative example above.

Fifth, a fifth indicator (binary) is the inclusion of a summary. A summary is a section that can be added to the profile to give a summary of the professional profile of the user. Here it would again be important for the narcissistic CEO to give a more detailed picture of his/her superior capabilities.

Sixth, a sixth indicator (binary) is the inclusion of interests. "Interests" is a section that can be added to the profile to give a view of the interests of the user. Here it would again be important for the narcissistic CEO to pose – often professionally irrelevant - details.

Generally, the basis for including these six indicators revolves around the need for narcissistic individuals to draw attention to themselves and their subjectively superior qualities. The indicators are based on CEO LinkedIn profiles collected in 2015. Thus, the indicators are time invariant. This is consistent with the notion that narcissism is viewed as a relatively stable personality dimension.

Table 1, Panel A, presents the descriptive statistics of these six indicators in their raw version. The median (mean) CEO has listed 7 (12.97) skills, has 288 (282.34) connections, has listed 2 (2.84) previous positions, and has included no (0.40) picture, no (0.29) summary, and no (0.09) section on interests.

*** Table 1 goes here ***

Table 1, Panel B, presents the descriptive statistics of the transformed indicators and the LinkedIn variable. The three continuous indicators are transformed. The three binary indicators are unaltered. We take the log of skills+1 and the log of previous positions+1 and transform them into a continuous variable in the range of 0 to 1. We transform number of connections to a continuous variable in the range of 0 to 1. Thus, all six indicators have a minimum of 0 and a

maximum of 1. We add the six indicators together[8]. The result is our LinkedIn narcissism measure. This LinkedIn narcissism measure has a mean of 2.11, a median of 2.03, and ranges from 0 to 6.

Table 1, Panel C, presents correlations between the six specific narcissism indicators and the general LinkedIn narcissism measure. Per construction the six specific indicators are highly correlated with the LinkedIn measure. More interestingly, the six specific indicators are also all highly and positively correlated (correlation coefficients in the range of 0.16 to 0.58). All correlations are significant at the 1% level.

3.3. Descriptive statistics

As our default, we use a stock market based proxy for corporate risk taking. We define stock return volatility as the annualized standard deviation of daily stock returns. Stock return volatility is widely used as a measure of corporate risk-taking (Bargeron, 2010; Habib and Hasan, 2015; Hirshleifer et al., 2012; Serfling, 2014). The return is calculated based on total return index data from the Datastream database. We use the log transformation[9] of stock return volatility in the regression analysis.

To mitigate omitted variable bias, we add CEO and firm control variables. Specifically, we add - besides our LinkedIn narcissism measure - two CEO control variables (age and gender) and five firm control variables (size, profitability, leverage, current ratio, and market-to-book). Furthermore, we control for subindustry sectors by adding two subindustry dummies representing two of the three subindustry classifications (2 digits) within the manufacturing sector (NAICS 31-

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[8] We do not have any prior considerations guiding us to put unequal weights on the six indicators. Thus, we follow the equality heuristic (Messick, 1993) – also known as the 1/N rule - and allocate equal weight to each indicator. This is in line with the approach of Chatterjee and Hambrick (2007) who put equal weights on their five narcissism indicators.

[9] We do not add one to the stock return volatility before we take the log because such an addition creates a distribution less similar to a normal distribution than when we refrain from such addition.

33).

We include CEO age as a continuous control variable. Serfling (2014) finds a significant and negative relationship between CEO age and risk-taking. CEO age is also included in related literature (Chatterjee and Hambrick, 2007 and 2011). CEO age is included as a time-invariant variable[10] and in the regression analysis we take the natural logarithm of CEO age. We expect a negative relation between CEO age and corporate risk taking.

We include the gender of the CEO as a binary control variable. Huang and Kisgen (2013) find that male executives are more aggressive in the context of corporate investment and financial decisions than female executives are. We expect a positive relation between gender (male=1) and corporate risk taking.

We include the size of the firm as a continuous control variable in line with previous literature (Chatterjee and Hambrick, 2007 and 2011; Faccio et al., 2011; Serfling, 2014). We define size as total assets. In the regression analysis we use the natural logarithm of total assets. Large firms tend to be less risky and more diversified than small firms. Thus, we expect a negative relation between size and corporate risk taking.

We include the profitability of the firm in line with Chatterjee and Hambrick (2007 and 2011). We calculate return on assets as net income plus interest expense net of tax effect divided by the average of last year's and current year's total assets. We expect that more profitable firms have less fluctuating earnings and cash flows than less profitable firms. Thus, we expect a negative relation between profitability and corporate risk taking as measured by stock return volatility.

We include the leverage of the firm as a continuous control variable. We define leverage as total debt to total assets. Our proxy for corporate risk taking is stock return volatility. A firm

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[10] Because time effects are fixed in our regression models, age is included as the age of the CEO in 2010 for the entire sample period in order to avoid exact collinearity between CEO age and the fixed time effects.

with a high leverage ratio implies an equity position with a highly leveraged position in the underlying (total) assets. Thus, we expect a positive relation between leverage and corporate risk-taking.

As an indicator of immediate resource availability we include the current ratio as a continuous control variable in line with Chatterjee and Hambrick (2007 and 2011). We define the current ratio as current assets divided by current liabilities in the year prior to the focal year. We use the natural logarithm of the current ratio in our regression analysis. A high current ratio cushions the firm and reduces the fluctuations in the stock price. Thus, we expect a negative relation between the current ratio and corporate risk taking.

Finally, we include the market-to-book ratio calculated as the market value of equity divided by the book value of equity. Following the reasoning above in relation to profitability, we expect a negative relation between the market-to-book ratio and stock return volatility. However, a high market-to-book ratio could also indicate a firm with multiple growth options (as opposed to assets in place) which may lead to a positive relation between stock return volatility and market-to-book ratio.

We winsorize all firm control variables and the dependent variable at the 0.5% and the 99.5% level. To control for unobservable year characteristics connected with the dependent variables, time effects are fixed in the regression models (equivalent to include time dummies for each year in the models).

*** Table 2 goes here ***

Table 2, Panel A, reports the descriptive statistics for the control variables and the dependent variable. The median and the mean CEO is a 52 years old male. The median (mean)

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firm has total assets of 0.29 (3.13) billion US$, a return on assets of 4% (-4%), a leverage ratio of 0.09 (0.13), a current ratio of 2.91 (4.08), and a market-to-book ratio of 2.08 (3.00). The median (mean) stock has a stock return volatility of 0.43 (0.49).

Table 2, Panel B, reports correlation coefficients between the variables used in subsequent regression analysis. Our LinkedIn measure is negatively related to CEO age, firm size, firm profitability, and firm leverage but positively related to stock return volatility. Our dependent variable, stock return volatility, is furthermore negatively related to firm size, firm profitability, and firm leverage but positively related to current ratio.

4. Empirical results

In this section we perform a multivariate test. Initially, we elaborate on the technicalities of the regression analysis before moving to the results.

The majority of the data chosen for the study (except age and the time-invariant indicators of narcissism) has both cross-sectional and time-series dimensions. Thus, we employ a panel data random effects regression model using the method of estimated generalized least squares (EGLS) for the empirical analysis of the potential relationships between CEO narcissism and corporate risk-taking. By choosing this model over the standard ordinary least squares (OLS), the information that lies in the data is more extensively exploited. Verbeek (2012) describes how estimators based on panel data are often more accurate than estimators based on cross-sectional or time series data alone. The choice of a panel data model is consistent with Chatterjee and Hambrick (2007 and 2011). Specifically, we use an EGLS regression analysis (cross-section random effects) and include fixed time effects. We use standard errors that are robust to arbitrary heteroskedasticity and within cross-section serial correlation (White period). In this approach, we follow Petersen (2009) and use standard errors that are robust to heteroscedasticity and cluster at the firm level

while we include fixed time effects to mitigate potential clustering in the opposite dimension.

We estimate the following model to test for the relationship between CEO narcissism and corporate risk-taking:

$Stock\ return\ volatility\ (log)_{it} = \beta_0 + \beta_1 LinkedIn_i + \beta_2 LinkedIn_i{}^2 + \beta_3 CEO\ age\ (log)_i$
$+\ \beta_4 CEO\ gender_i + \beta_5 Total\ assets\ (log)_{it} + \beta_6 ROA_{it} + \beta_7 Leverage\ ratio_{it} + \beta_8 Current\ ratio\ (log)_{it}$
$+\ \beta_9 MB\ (log)_{it} + \beta_{10} NAICS\ 32\ dummy_i + \beta_{11} NAICS\ 33\ dummy_i + \Sigma_t \alpha_t Year_t + \varepsilon i_t$ (1)

Equation (1) resembles a non-linear model. To test for the linear version of the model we exclude the squared LinkedIn term. Table 3 reports the results of our regression analysis.

*** Table 3 goes here ***

Model 1 excludes the LinkedIn variable. Model 2 includes the LinkedIn variable and tests the linear version of our model. Model 3 includes both the LinkedIn variable and the squared LinkedIn variable to test for nonlinearity. Table 3 does not support the linear version of the model but does support the non-linear version of the model. Thus, the coefficient for the LinkedIn variable and the coefficient for the squared LinkedIn variable are statistically significant at the 1% level in Model 3.

Model 3 indicates an inverse U-shape relationship between CEO narcissism and corporate risk taking. This inverse U-shape relationship tops at a LinkedIn measure of 2.44 for stock return volatility. This corresponds to 274 (58%) of the 475 firms being on the side of the inverse U-shape where an increase in CEO narcissism is associated with more corporate risk taking. The right-hand side of the inverse U-shape reaches a net effect of 0 from CEO narcissism at a LinkedIn value of

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4.89. This corresponds to 18 (4%) of the 475 firms having CEOs with such an extreme degree of narcissism that they are associated with less risk taking than firms with CEOs with an extremely low degree of narcissism (LinkedIn=0).

In terms of economic magnitude, a median firm (i.e., median in all variables but CEO narcissism) with a CEO narcissism of 0 as measured by our LinkedIn variable is associated with a stock return volatility of 0.3957. A similar firm but with a CEO narcissism of 2.44 (i.e., the CEO narcissism that maximizes corporate risk taking as measured by stock return volatility) is associated with a stock return volatility of 0.4451 – an increase of 12%.

Models 4-6 illustrate the inverse U-shape relationship in an alternative way by dividing the CEOs according to their narcissism as measured by our LinkedIn measure. Thus, Model 4 includes the 231 CEOs with a LinkedIn measure below 2.0 and shows a significant *positive* relationship between CEO narcissism and corporate risk taking (5% level). Model 5 includes the 95 CEOs with a LinkedIn measure between 2.0 and 3.0 and shows *no* significant relationship. Finally, Model 6 includes the 149 CEOs with a LinkedIn measure above 3.0 and shows a significant *negative* relationship between CEO narcissism and corporate risk taking (5% level).

For all practical reasons Table 3 suggests four main features in terms of the relationship between CEO narcissism and corporate risk taking:

1) A very low degree of CEO narcissism (LinkedIn=0) and a very high degree of CEO narcissism (LinkedIn=5) is associated with the same "low" level of corporate risk taking.

2) A moderate degree of CEO narcissism is associated with a relatively higher level of corporate risk taking.

3) An increase in CEO narcissism is related to an increase in corporate risk taking for the majority of firms that are characterized by CEOs with limited to moderate narcissistic tendencies.

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4) An increase in CEO narcissism is related to a decrease in corporate risk taking for the minority of firms characterized by CEOs with already strong narcissistic tendencies.

Table 3 consistently finds that firm size, profitability, current ratio, and market-to-book are negatively related and that leverage ratio is positively related to corporate risk taking as measured by stock price volatility. These results are in line with expectations. Table 3 does not support a significant relationship between CEO age and CEO gender on the one hand and corporate risk taking on the other hand. The NAICS dummies do not indicate a different level of corporate risk taking in the three subindustries within manufacturing. In another vein, we tried to investigate (not tabulated) if there is an association between firm performance and the level of CEO narcissism but we did not find consistent results.

Our findings in Table 3 seem to reflect a combination of the two varieties of narcissism, grandiose and vulnerable, described in the literature view. More specifically, the results in Table 3 suggest that the vulnerable part of narcissism dominates for high levels of narcissism as measured by the contents of the LinkedIn profiles. This interpretation is supported by Hart et al. (2017) who find that grandiose narcissism is associated with assertive but not defensive self-presentation tactics while vulnerable narcissism is associated with heightened use of both assertive and defensive self-presentation tactics. Thus, CEOs affected by vulnerable narcissism may dominate the right-hand end of our narcissism scale simply because they feel compelled to use their LinkedIn profile both for assertive and defensive self-presentation. The next section will investigate if our results are robust to alternative specifications.

5. Robustness tests

In this section we perform various robustness tests. First, Table 4 performs an analysis with

alternative measures of corporate risk taking (5.1). Second, Table 5 performs an analysis for single

years (5.2). Finally, Table 6 performs an analysis with an alternative measure of CEO narcissism

(5.3). Generally, the results confirm the inverse U-shape relationship between CEO narcissism and

corporate risk taking indicated by Table 3.

5.1. Alternative measures of corporate risk taking

Table 4 performs an analysis with idiosyncratic volatility (CAPM), idiosyncratic volatility (FF3),

and ROA volatility as alternative measures of corporate risk taking. Models 1, 3, and 5 shows

results for linear specifications (i.e., excluding LinkedIn squared) while Models 2, 4, and 6 show

results for non-linear specifications (i.e., including LinkedIn squared).

Models 1-2 use idiosyncratic volatility (CAPM) as a measure of corporate risk taking. We

calculate idiosyncratic volatility (CAPM) as the log of the annualized standard deviations of the

residuals from the excess daily stock returns above the risk-free rate regressed on the market risk

premium. The risk-free rate is the daily rate that compounds to the 1-month Treasury bill rate from

Ibbotson and Associates Inc. over the number of trading days in the month. The measure is

employed as a measure of idiosyncratic risk in previous research by Roussanov and Savor (2014)

and Goyal and Santa-Clara (2001) among others. Models 1 and 2 confirm our previous conclusions

and show that our results are robust to this alternative way of measuring corporate risk taking. The

correlation coefficient between the two measures based on stock return volatility and idiosyncratic

volatility respectively is 0.96 so the almost similar results are not surprising although conceptually

the two measures include different elements. Thus, conceptually one may argue that idiosyncratic

volatility is a superior measure in this context because the CEO is more likely to be able to affect

the idiosyncratic volatility than the stock return volatility because the latter comprises systematic

risk.

Models 3 and 4 use idiosyncratic volatility (FF3) based on the Fama-French 3-factor model. The results – and thus conclusions – are almost identical to the results that we obtain when we use idiosyncratic volatility (CAPM) in Models 1-2.

Models 5 and 6 use ROA volatility. The measure is used widely to indicate corporate risk-taking (Faccio et al., 2011; Habib and Hasan, 2015; Mihet, 2012). Using the same approach as Habib and Hasan (2015), the standard deviation is calculated over the prior 3 years, including the focal year. We use the natural logarithm of ROA volatility in the regression analysis. Given the fact that ROA volatility is based on only three observations, it is – at least in that aspect - a cruder and noisier measure for corporate risk taking than the measures based on stock prices (stock return volatility and idiosyncratic volatility). Thus, we expect to find less significant results. The correlation between ROA volatility (log) and stock return volatility (log) is 0.56. Models 5 and 6 provide weak support for a non-linear relationship between CEO narcissism and corporate risk taking. Model 5 shows no support for a linear relationship and Models 6 shows modest support for a non-linear relationship. Thus, the coefficient for LinkedIn is significant at the 10% level in Model 6 and the coefficient for the squared LinkedIn – although not significant at conventional levels – has the correct sign.

Overall we conclude that our results – at least in qualitative terms – are robust to alternative specifications of corporate risk taking. In terms of the actual shape of the inverse U-shape relationship, Table 4 indicates a maximum of corporate risk taking at a LinkedIn measure between 2.65 and 3.07. In terms of magnitude, this is in line with our previous maximum of 2.44 in Table 3.

*** Table 4 goes here ***

Our results are robust to alternative specifications of corporate risk taking (above) but we

fail to identify more precisely the link between narcissistic features on the part of the CEO and corporate risk taking. Thus, we perform regression analyses where R&D, M&A, and capex respectively are functions of our LinkedIn variable and relevant control variables (not tabulated). We do not find support for an inverse U-shape relationship between such specific "risky" corporate strategies and our LinkedIn measure. We attribute this failure to the general character of our risk measure that per definition encompasses all aspects of corporate risk taking and as such is not restricted to specific corporate actions.

5.2. Single years

Table 5 performs an analysis equivalent to Model 3 in Table 3 but now for the five single years in the sample period. The purpose of this analysis is twofold:

1) The results in Table 3, Model 3, could be driven by (an) extreme year(s) and thus not be representative for the whole period. By focusing on single years, we investigate this possibility.

2) The approach to panel data - and in this regard especially the approach to address potential biases in standard errors – is controversial (Petersen, 2009). By investigating single years and using simple OLS standard errors, we mitigate the controversy.

Consistently, Table 5 shows positive coefficients for the LinkedIn variable and negative coefficients for the squared LinkedIn variable. In spite of the reduced number of observations, four of the five years show statistically significant coefficients at least at the 10% level. Thus, Table 5 confirms that the previous results are driven neither by a single "outlier" year nor by our approach to standard errors in panel data analysis.

*** Table 5 goes here ***

5.3. Alternative measure of CEO narcissism

The purpose of the next analysis is to investigate whether the inverse U-shape relationship between CEO narcissism and corporate risk taking is specific to our measure of CEO narcissism (LinkedIn) or replicable with an alternative measure of CEO narcissism. Our alternative measure is the prominence of the CEO in press releases from the firm, "Press release". We measure Press release as the amount of times the CEO is mentioned by name in the firm's ten most recent press releases scaled by the total amount of words (in thousands) in these press releases. We take the log of this measure in our regression analysis. The indicator is time invariant similarly to the indicator based on the LinkedIn profile. Press release (log) has a mean of 0.62, a median of 0.57, a minimum of 0.00, and a maximum of 2.27. Chatterjee and Hambrick (2007 and 2011) use a similar measure to indicate narcissism. We choose to use the CEO's prominence in the firm's press releases because it reflects both the CEO's volition and aspects of narcissism. In terms of the CEO's volition, the content of the press releases is under the control of the CEO and the CEO personally reviews the vast majority of these announcements (Chatterjee and Hambrick, 2007). In terms of aspects of narcissism, the press releases represent a channel for the narcissistic CEO to remind everyone outside of the firm of who is in charge of the firm. The highly narcissistic CEOs will thus insist on being mentioned as often as possible as an act of vanity and demonstrating authority (Chatterjee and Hambrick, 2007).

Press release as an indicator of CEO narcissism may, however, be biased by the size of the firm. In a large firm the CEO competes for attention with a number of high-ranking – although formally subordinate - executives and a narcissistic CEO may feel compelled to emphasize who is actually "running the firm" in the press releases. This competition is less severe in a small firm

where – taking it to the extreme - the CEO more or less *is* the firm. Alternatively, one may argue that the mere existence of other senior managers makes it less likely that the CEO is mentioned in the press releases. Ultimately, it is an empirical question and we include an interaction term between our press release measure and firm size to mitigate the potential bias in our regression analysis.

Table 6 performs an analysis similar to the first models in Table 3 but now with Press release as opposed to LinkedIn as our indicator of CEO narcissism. Model 1 shows a significant, linear, and negative association between CEO narcissism and corporate risk taking. However, when we include an interaction term between Press release and Total assets in Model 2, the relationship turns positive and insignificant. Finally, Model 3 tests for a non-linear relationship between CEO narcissism and corporate risk taking while including the interaction term. In line with the results of Table 3, Model 3 in Table 6 shows a significant inverse U-shape relationship between CEO narcissism and corporate risk taking when we estimate CEO narcissism through the use of press releases. Thus, we conclude that the inverse U-shape relationship between CEO narcissism and corporate risk taking is not specific to our LinkedIn based measure of CEO narcissism.[11]

Model 4 in Table 6 combines Model 3 from Table 3 and Model 3 from Table 6 by including linear and non-linear measures of CEO narcissism as measured both from press releases and LinkedIn. Both measures – also when combined in one model – support the overall conclusion of a non-linear U-shaped relationship between CEO narcissism and corporate risk taking.

*** Table 6 goes here ***

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[11] If we include an interaction term between firm size (as measured by total assets) and CEO narcissism (as measured by LinkedIn) in Model 3 in Table 3, the coefficient for such an interaction term is not significant.

Table 6 shows that our previous conclusions are robust to an alternative measurement of CEO narcissism. It does not, however, show that our conclusions are robust to the inclusion of other CEO traits or biases. We primarily leave this for future research but we do have two considerations in this regard. *First*, two traits or biases may coexist and interact in such a way that an analysis based on solely one of the factors renders the results prone to omitted variable bias. Duxbury et al. (2015) provide such an example in the reins of the disposition effect and the house money effect. *Second*, CEO overconfidence would be an obvious candidate for inclusion into our analysis. Thus, both narcissism and overconfidence include an inflated estimate of skill and ability (Campbell et al., 2004). In support of our sole focus on CEO narcissism, we refer to 1) narcissism being a personality trait and not just a bias (and thus higher in the hierarchy than overconfidence) and 2) Aktas et al. (2016) who find that their results on the role of CEO narcissism in the M&A takeover process are robust to the inclusion of CEO overconfidence.

6. Conclusion

We investigate the association between CEO narcissism and corporate risk taking for 475 US manufacturing firms in the period 2010 to 2014. We provide a novel and unobtrusive measure of CEO narcissism based on LinkedIn profiling. We measure corporate risk taking by the firm's stock return volatility. We find an inverse U-shape relationship (a "humpback") between CEO narcissism and corporate risk taking. Our results indicate that the high sense of self-esteem related to narcissism dominates for low to moderate levels of CEO narcissism and leads to a *positive* association between narcissism and corporate risk taking while the fragile sense of self-esteem also related to narcissism dominates for high levels of CEO narcissism and leads to a *negative* association between narcissism and corporate risk taking. Our results are robust to alternative

measures of CEO narcissism and corporate risk taking and provide a novel contribution to the growing literature on the association between managerial biases / traits and corporate decision making.

Our study has two limitations – limitations that are, however, in line with the majority of related research. *First*, we do not address the question of causality. Does the firm deliberately choose a CEO with a certain profile (including the level of narcissism) or does the CEO shape the firm "by accident"? We leave the disentanglement of these effects to future research. *Second,* we investigate CEO narcissism in isolation. A more general approach to managerial traits and biases is recommendable in future research.

References

Aktas, N., De Bodt, E., Bollaert, H. & Roll, R., 2016. CEO Narcissism and the Takeover Process: From Private Initiation to Deal Completion. *Journal of Financial and Quantitative Analysis*, 51(1), 113-137.

American Psychiatric Association, 1994. Diagnostic and Statistical Manual of Mental Disorders (DSM), Washington, DC, American Psychiatric Association.

Baker, M. & Wurgler, J., 2013. Behavioral corporate finance: An updated survey. In G. M. Constantinides, M. Harris & R. M. Stulz (Eds.), *Handbook of the Economics of Finance,* 351-417. Oxford, UK: Elsevier.

Bargeron, L. L., Lehn, K. M., and Zutter, C. J., 2010. Sarbanes-Oxley and corporate risk-taking. *Journal of Accounting and Economics,* 49, 34–52.

Bartholdy, J., Olson, D. & Peare, P., 2007. Conducting event studies on a small stock exchange. *European Journal of Finance*, 13(3), 227-252.

Bogart, L.M., Benotsch, E.G. & Pavlovic, J.D.P., 2004. Feeling superior but threatened: The relation of narcissism to social comparison. *Basic and Applied Social Psychology*, 26 (1), 35-44.

Brummelman, E., Thomaes, S. & Sedikides, C., 2016. Separating Narcissism From Self-Esteem. *Current Directions in Psychological Science*, 25(1), 8-13.

Brunell, A. B., Gentry, W. A., Campbell, W. K., Hoffman, B. J., Kuhnert, K. W., & DeMarree, K. G., 2008. Leader emergence: The case of the narcissistic leader. *Personality and Social Psychology Bulletin*, 34(12), 1663–1676.

Buffardi, L.E. & Campbell, W.K., 2008. Narcissism and Social Networking Web Sites. *Personality and Social Psychology Bulletin*, 34(10), 1303-1314.

Bulan, L., 2005. Real options, irreversible investment and firm uncertainty: new evidence from U.S. firms. *Review of Financial Economics*, 14(3-4), 255–279.

Campbell, W. K., 1999. Narcissism and romantic attraction. *Journal of Personality and Social Psychology*, 77, 1254–1270.

Campbell, W. K. & Foster, J. D., 2007. The narcissistic self: Background, an extended agency model, and ongoing controversies. In C. Sedikides & S. J. Spencer, Steven (Eds.), *The self. Frontiers of social psychology,* 115-138. New York, Psychology Press.

Campbell, W. K., Goodie, A. S., & Foster, J. D., 2004. Narcissism, confidence, and risk attitude. *Journal of Behavioral Decision Making,* 17, 297-311.

Campbell, W.K., Reeder, G.D., Sedikides, C. and Elliot, A.J., 2000. Narcissism and comparative self-enhancement strategies. *Journal of Research in Personality*, 34(3), 329-347.

Chatterjee, A. & Hambrick, D. C., 2007. It's all about me: Narcissistic chief executive officers and their effects on company strategy and performance. *Administrative Science Quarterly,* 52, 351-386.

Chatterjee, A. & Hambrick, D. C., 2011. Executive personality, capability cues, and risk taking: How narcissistic CEOs react to their successes and stumbles. *Administrative Science Quarterly,* 56(2), 202-237.

Davenport, S.W., Bergman, S.M., Bergman, J.Z. & Fearrington, M.E. (2014). Twitter versus Facebook: Exploring the role of narcissism in the motives and usage of different social media platforms. *Computers in Human Behavior, 32*, 212-220.

Duxbury, D., Hudson, R., Keasey, K., Yang, Z., & Yao, S. (2015). Do the disposition and house money effects coexist? A reconciliation of two behavioral biases using individual investor-level data. *Journal of International Financial Markets, Institutions and Money*, 34, 55-68.

Ellis, H., 1898. Auto-eroticism: A psychological study. *Alienist and Neurologist*, 19, 260-299.

Emmons, R. A., 1981. Relationship between narcissism and sensation seeking. *Psychological Reports,* 48(1), 247-250.

Faccio, M., Marchica, M., & Mura, R., 2011. Large shareholder diversification and corporate risk-taking. *Review of Financial Studies,* 24(11), 3601–3641.

Goyal, A. & Santa-Clara, P., 2003. Idiosyncratic risk matters!. *The Journal of Finance*, 58(3), 975–1008.

Habib, A, & Hasan, M.M., 2015. Firm life cycle, corporate risk-taking and investor sentiment. *Accounting and Finance*, 1-33.

Hart, W., Adams, J., Burton, K.A., & Tortoriello, G.K., 2017. Narcissism and self-presentation: Profiling grandiose and vulnerable Narcissists' self-presentation tactic use. *Personality and Individual Differences*, 104, 48-57.

Hirshleifer, D., 2015. Behavioral Finance. *Annual Review of Financial Economics*, 7, 133-159.

Hirshleifer, D., Low, A., Teoh, S.H., 2012. Are Overconfident CEOs Better Innovators? *Journal of Finance*, 67(4), 1457–1498.

Huang, J. & Kisgen D. J., 2013. Gender and corporate finance: Are male executives overconfident relative to female executives? *Journal of Financial Economics,* 108(3), 822-839.

John, O.P. & Robins, R.W., 1994. Accuracy and bias in self-perception: Individual differences in self-enhancement and the role of narcissism. *Journal of personality and social psychology*, 66(1), p. 206-219.

Kernis, M. H., 2005. Measuring self-esteem in context: The importance of stability of self-esteem in psychological functioning. *Journal of personality*, 73(6), 1569-1605.

Kernis, M. H., & Sun, C. 1994. Narcissism and reactions to interpersonal feedback. *Journal of Research in Personality*, 28(1), 4-13.

Leahy, J.V., Whited, T.M., 1996. The effect of uncertainty on investment: some stylized facts. *Journal of Money, Credit and Banking*, 28(1), 64–83.

Maccoby, M, 2000. Narcissistic Leaders: The Incredible Pros, the Inevitable Cons. *Harvard Business Review*, 78(1), 69-77.

Malmendier, U. & Tate, G., 2015. Behavioral CEOs: The Role of Managerial Overconfidence. *Journal of Economic Perspectives*, 29(4), 37-60.

Mihet, R., 2012. Effects of culture on firm risk-taking: A cross-country and cross-industry analysis. *Journal of Cultural Economics,* 37(1), 109-151.

Messick, D.M., 1993. Equality as decision heuristic. In *Psychological Perspectives on Justice: Theory and Application*, ed. B.A. Mellers & J. Baron, pp. 11–31. New York: Cambridge Univ. Press.

Muradoglu, G. & Harvey N., 2012. Behavioural finance: the role of psychological factors in financial decisions. *Review of Behavioral Finance*, 4(2), 68-80.

Petersen, M. A., 2009. Estimating standard errors in finance panel data sets: Comparing approaches. *Review of Financial Studies*, 22(1), 435–480.

Raskin, R. N. & Hall C. S., 1979. A narcissistic personality inventory. *Psychological Reports,* 45(2), 590.

Rhodewalt, F. & Morf, C.C., 1998. On self-aggrandizement and anger: A temporal analysis of narcissism and affective reactions to success and failure. *Journal of personality and social psychology*, 74(3), 672-685.

Rosenthal, S.A. and Pittinsky, T.L., 2006. Narcissistic leadership. *Leadership Quarterly*, 17, 617-633.

Roussanov, N. and Savor, P., 2014. Marriage and Managers' Attitudes to Risk. *Management Science*, 60(10), 2496-2508.

Serfling, M. A., 2014. CEO age and the riskiness of corporate policies. *Journal of Corporate Finance,* 25, 251-273.

Verbeek, M., 2012. *A guide to modern econometrics*. 4th ed., John Wiley & Sons Ltd., UK.

Wallace, H. M. & Baumeister, R. F., 2002. The performance of narcissists rises and falls with perceived opportunity for glory. *Journal of Personality and Social Psychology,* 82(5), 819-834.

Webb, D. T., Schwart, R. D., & Sechrest, L., 1966. *Unobtrusive measures: Nonreactive research in the social sciences*, Chicago, Rand McNally.

Wilson, M., 1997. *The Difference between God and Larry Ellison*, William Morrow.

Table 1   LinkedIn profile

This table presents the six indicators that together constitute the elements of the combined LinkedIn based CEO narcissism indicator, "*LinkedIn*". Panel A presents descriptive statistics for the non-transformed variables. Panel B presents descriptive statistics for the transformed variables and the LinkedIn variable. *Skills* and *Previous positions* are transformed by taking the log of x+1 and converting them into a continuous variable in the range of 0 to 1. *Connections* are converted to a continuous variable in the range of 0 to 1. The binary variables are not transformed. *LinkedIn* is the sum of the six individual variables. Panel C presents correlation coefficients. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively. All correlations in Panel C are significant at the 1% level.

Panel A: Raw data

	Mean	Median	Minimum	Maximum	N
Skills	12.97	7	0	50	475
Connections	282.34	288	0	500	475
Previous positions	2.84	2	0	17	475
Picture (binary)	0.40	0	0	1	475
Summary (binary)	0.29	0	0	1	475
Interests (binary)	0.09	0	0	1	475

Panel B: Transformed data and LinkedIn variable

	Mean	Median	Minimum	Maximum	N
Skills (log, 0-1)	0.43	0.53	0	1	475
Connections (0-1)	0.56	0.58	0	1	475
Previous positions (log, 0-1)	0.35	0.38	0	1	475
Picture (binary)	0.40	0	0	1	475
Summary (binary)	0.29	0	0	1	475
Interests (binary)	0.09	0	0	1	475
LinkedIn	2.11	2.03	0	5.80	475

Panel C: Correlations

	Skills…	Connection…	Previous…	Picture…	Summary…	Interests…
Skills (log, 0-1)	1.00					

Connections (0-1)	0.53***	1.00				
Previous positions (log, 0-1)	0.43***	0.58***	1.00			
Picture (binary)	0.40***	0.54***	0.41***	1.00		
Summary (binary)	0.34***	0.35***	0.30***	0.31***	1.00	
Interests (binary)	0.23***	0.24***	0.21***	0.16***	0.30***	1.00
LinkedIn	0.72***	0.80***	0.68***	0.73***	0.66***	0.47***

Table 2 **Descriptive statistics and correlations**

This table presents descriptive statistics for non-transformed and transformed variables (Panel A) and correlation coefficients between the variables used in subsequent regression analysis (Panel B). The dependent variable and all control variables are winsorized at the 0.5% and at the 99.5% level. *LinkedIn* is described in Table 1. CEO age is the age of the CEO in 2010 (time-invariant). *CEO age (log)* is the log of CEO age. *CEO gender* is the gender of the CEO with female = 0 and male =1. Total assets (billion USD) is the total assets of the firm measured in billion USD. *Total assets (log)* is the log of Total assets (billion USD). *Return on assets (ROA)* is net income plus interest expense net of tax effect divided by the average of last year's and current year's total assets. *Leverage ratio* is total debt to total assets. Current ratio is current assets divided by current liabilities. *Current ratio (log)* is the log of current ratio. Market to book is the market value of equity divided by the book value of equity. *MB (log)* is the log of Market to book. Stock return volatility is the annualized standard deviation of daily stock returns. *Stock return volatility (log)* is the log of stock return volatility. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Descriptive statistics

	Mean	Median	Minimum	Maximum	JB	N
LinkedIn	2.11	2.03	0	5.80	25	475
CEO age	52.41	52.00	34.00	81.00	162	475
CEO age (log)	3.95	3.95	3.53	4.39	6	475
CEO gender	0.97	1	0	1	71,060	475
Total assets (billion USD)	3.13	0.29	0.00	232.00	974,527	2375
Total assets (log)	12.62	12.59	8.60	18.67	45	2375
Return on assets (ROA)	-0.04	0.04	-1.34	0.42	6,929	2375
Leverage ratio	0.13	0.09	0.00	0.61	365	2375
Current ratio	4.08	2.91	0.03	82.56	507,031	2375
Current ratio (log)	1.15	1.07	-0.46	3.42	170	2375
Market to book	3.00	2.08	0.39	25.83	47,752	2375
MB (log)	0.80	0.73	-0.94	3.25	123	2375
Stock return volatility	0.49	0.43	0.10	3.61	27,299	2375
Stock return volatility (log)	-0.84	-0.85	-1.96	0.54	12	2375

Panel B: Correlations between variables used in regression analysis

	LinkedIn	CEO age...	CEO gender...	Total assets...	ROA	Leverage…	Current…	MB(log)

	LinkedIn	CEO age (log)	CEO gender	Total assets (log)	Return on ass. (ROA)	Leverage ratio	Current ratio (log)	MB (log)	Stock return vol. (log)
LinkedIn	1.00								
CEO age (log)	-0.24***	1.00							
CEO gender	0.03	0.04**	1.00						
Total assets (log)	-0.16***	-0.01	-0.01	1.00					
Return on ass. (ROA)	-0.10***	0.08***	-0.01	0.44***	1.00				
Leverage ratio	-0.09***	0.02	0.04**	0.45***	0.16***	1.00			
Current ratio (log)	-0.03	0.06***	-0.01	-0.31***	-0.20***	-0.38***	1.00		
MB (log)	-0.03	-0.06***	-0.01	0.04*	-0.24***	0.05**	0.03	1.00	
Stock return vol. (log)	0.13***	-0.03	0.02	-0.66***	-0.51***	-0.26***	0.17***	-0.02	

Table 3   Regression analysis on LinkedIn and stock return volatility

This table reports results of EGLS regression analysis (cross-section random effects) on stock return volatility (dependent variable) and various independent variables. Variables are defined in earlier tables. Fixed time effects are included. Standard errors are robust to arbitrary heteroskedasticity and within cross-section serial correlation (White period). Numbers in parentheses are p-values. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Model 1	Model 2	Model 3	Model 4 (LinkedIn: 0.0-2.0)	Model 5 (LinkedIn: 2.0-3.0)	Model 6 (LinkedIn 3.0-6.0)
Dependent variable:	Stock vol.	Stock vol.	Stock vol.	Stock vol.	Stock vol.	Stock vol.
Independent variables:						
Constant	1.11***	1.08***	0.98***	0.51	1.05*	1.74***
	(0.0000)	(0.0013)	(0.0035)	(0.3098)	(0.0976)	(0.0080)
LinkedIn		0.0024	0.0606***	0.0625**	-0.0162	-0.0703**
		(0.7563)	(0.0069)	(0.0153)	(0.8429)	(0.0140)
LinkedIn^2			-0.0124***			
			(0.0069)			
CEO age (log)	-0.06	-0.06	-0.04	0.07	-0.08	-0.12
	(0.3557)	(0.4272)	(0.5672)	(0.5074)	(0.5952)	(0.3903)
CEO gender	0.03	0.03	0.02	0.00	-0.05	0.05
	(0.6586)	(0.6675)	(0.7191)	(0.9609)	(0.5540)	(0.6976)
Total assets (log)	-0.13***	-0.13***	-0.13***	-0.13***	-0.11***	-0.15***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Return on assets (ROA)	-0.33***	-0.33***	-0.33***	-0.35***	-0.43***	0.29***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0004)
Leverage ratio	0.17**	0.17**	0.17***	0.04	0.13	0.45***
	(0.0122)	(0.0120)	(0.0106)	(0.6664)	(0.3828)	(0.0006)
Current ratio (log)	-0.03**	-0.03**	-0.03*	-0.02	-0.02	-0.04
	(0.0323)	(0.0333)	(0.0324)	(0.3129)	(0.4114)	(0.1328)
MB (log)	-0.06***	-0.06***	-0.06***	-0.04*	-0.008***	-0.07***
	(0.0001)	(0.0001)	(0.0001)	(0.0606)	(0.0041)	(0.0040)
NAICS 32 dummy	0.05	0.06	0.06	-0.01	0.09	0.11

	(0.4762)	(0.4797)	(0.3943)	(0.9536)	(0.3975)	(0.3512)
NAICS 33 dummy	0.00	0.00	0.01	-0.07	0.01	0.10
	(0.9993)	(0.9985)	(0.8716)	(0.5574)	(0.8738)	(0.4020)
LinkedIn at max. vol.				2.44		
N	2375	2375	2375	1155	475	745
R^2	0.41	0.41	0.41	0.44	0.41	0.39
R^2 adjusted	0.40	0.40	0.41	0.43	0.39	0.38
F-statistic	124.41	115.41	109.11	62.85	22.66	33.36
Prob(F-statistic)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table 4   Regression analysis on LinkedIn and other measures of corporate risk taking

This table reports results of EGLS regression analysis (cross-section random effects). The dependent variables are idiosyncratic volatility based on CAPM (Models 1-2), idiosyncratic volatility based on the Fama-French 3-factors model (Models 3-4), and ROA volatility (Models 5-6). *IV (CAPM)* is the log of the annualized standard deviation of the residuals from the excess daily stock returns above the risk-free rate regressed on the market risk premium. *IV(FF3)* is the log of the annualized standard deviation of the residuals from the excess daily stock returns above the risk-free rate regressed on the three Fama-French factors. *ROA vol.* is the log of the standard deviation of ROAs over the prior 3 years. Other variables are defined in earlier tables. Fixed time effects are included. Standard errors are robust to arbitrary heteroskedasticity and within cross-section serial correlation (White period). Numbers in parentheses are p-values. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Model 1 IV(CAPM)	Model 2 IV(CAPM)	Model 3 IV(FF3)	Model 4 IV(FF3)	Model 5 ROA vol.	Model 6 ROA vol.
Dependent variable:						
Independent variables:						
Constant	1.63***	1.51***	1.68***	1.56***	0.46	0.27
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.6808)	(0.8150)
LinkedIn	0.0087	0.0754***	0.0102	0.0765***	0.0338	0.1469*
	(0.3083)	(0.0027)	(0.2411)	(0.0027)	(0.1987)	(0.0542)
LinkedIn^2		-0.0142***		-0.0140***		-0.0239
		(0.0050)		(0.0059)		(0.1342)
CEO age (log)	-0.08	-0.06	-0.08	-0.06	-0.36	-0.33
	(0.3822)	(0.5175)	(0.3606)	(0.4873)	(0.1678)	(0.2107)
CEO gender	0.03	0.03	0.04	0.03	0.10	0.09
	(0.6753)	(0.7271)	(0.6584)	(0.7061)	(0.5894)	(0.6200)
Total assets (log)	-0.18***	-0.18***	-0.18***	-0.18***	-0.22***	-0.22***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Return on assets (ROA)	-0.32***	-0.31***	-0.31***	-0.32***	-0.59***	-0.60***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Leverage ratio	0.22***	0.22***	0.23***	0.23***	-0.34	-0.37
	(0.0002)	(0.0012)	(0.0011)	(0.0009)	(0.1701)	(0.1781)
Current ratio (log)	-0.04*	-0.04**	-0.04**	-0.04**	-0.03	-0.03
	(0.0756)	(0.0469)	(0.0341)	(0.0334)	(0.5722)	(0.5716)
MB (log)	-0.07***	-0.08***	-0.08***	-0.08***	-0.009*	-0.09*

	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0526)	(0.0508)
NAICS 32 dummy	0.00	0.02	0.00	0.01	0.37**	0.39**
	(0.9526)	(0.8327)	(0.9993)	(0.8810)	(0.0189)	(0.0133)
NAICS 33 dummy	-0.06	-0.05	-0.07	-0.05	0.20	0.22
	(0.4305)	(0.5353)	(0.3737)	(0.4683)	(0.1526)	(0.1107)
LinkedIn at max. vol.		2.65		2.73		3.07
N	2375	2375	2375	2375	2265	2265
R^2	0.38	0.38	0.38	0.38	0.14	0.14
R^2 adjusted	0.37	0.37	0.37	0.38	0.13	0.13
F-statistic	100.50	95.64	101.24	96.24	25.84	24.36
Prob(F-statistic)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table 5   Regression analysis on LinkedIn and stock return volatility for single years

This table reports results of OLS regression analysis on stock return volatility as the dependent variable and various independent variables for single years. Variables are defined in earlier tables. Numbers in parentheses are p-values. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Model 1	Model 2	Model 3	Model 4	Model 5
Year:	2010	2011	2012	2013	2014
Dependent variable:	Stock vol.	Stock vol.	Stock vol.	Stock vol.	Stock vol.
Independent variables:					
Constant	1.02**	0.41	0.94**	0.66	0.63
	(0.0145)	(0.3177)	(0.0320)	(0.1532)	(0.1645)
LinkedIn	0.0758***	0.0491*	0.0795***	0.0524*	0.0440
	(0.0051)	(0.0660)	(0.0051)	(0.0777)	(0.1300)
LinkedIn^2	-0.0154***	-0.0122**	-0.0175***	-0.0104*	-0.0068
	(0.0045)	(0.0224)	(0.0021)	(0.0799)	(0.2404)
CEO age (log)	-0.01	-0.02	-0.03	0.03	0.02
	(0.9129)	(0.8168)	(0.7787)	(0.8133)	(0.8420)
CEO gender	-0.04	0.04	0.03	0.02	0.08
	(0.6479)	(0.5726)	(0.6913)	(0.8373)	(0.2969)
Total assets (log)	-0.14***	-0.09***	-0.13***	-0.14***	-0.14***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Return on assets (ROA)	-0.44***	-0.43***	-0.64***	-0.71***	-0.59***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Leverage ratio	0.13	0.15	0.13	0.18	0.04
	(0.2307)	(0.1810)	(0.2661)	(0.1298)	(0.6733)
Current ratio (log)	-0.05**	-0.04	-0.04*	-0.02	0.01
	(0.0176)	(0.1118)	(0.0601)	(0.4704)	(0.6670)
MB (log)	-0.08***	0.01	-0.07***	-0.06***	-0.03
	(0.0a002)	(0.4722)	(0.0007)	(0.0093)	(0.1176)
NAICS 32 dummy	0.04	0.04	-0.04	0.01	0.05
	(0.5490)	(0.5589)	(0.6043)	(0.8551)	(0.4926)
NAICS 33 dummy	0.04	0.09	-0.07	-0.07	-0.02

	(0.5294)	(0.1914)	(0.3420)	(0.3755)	(0.8029)
LinkedIn at max. vol.	2.46	2.02	2.27	2.52	3.24
N	475	475	475	475	475
R^2	0.55	0.40	0.59	0.60	0.59
R^2 adjusted	0.54	0.39	0.58	0.59	0.58
F-statistic	52.49	27.98	60.77	62.76	61.14
Prob(F-statistic)	0.0000	0.0000	0.0000	0.0000	0.0000

Table 6   **Regression analysis on press release and stock return volatility**

This table reports results of EGLS regression analysis (cross-section random effects) on stock return volatility (dependent variable) and various independent variables. Press release is the amount of times the CEO is mentioned by name in the firm's ten most recent press releases scaled by the total amount of words (in thousands) in these press releases. *Press release (log)* is the log of Press release. Other variables are defined in earlier tables. Fixed time effects are included. Standard errors are robust to arbitrary heteroskedasticity and within cross-section serial correlation (White period). Numbers in parentheses are p-values. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Model 1	Model 2	Model 3	Model 4
Dependent variable:	Stock vol.	Stock vol.	Stock vol.	Stock vol.
Independent variables:				
Constant	1.28***	0.97***	0.78**	0.65*
	(0.0000)	(0.0043)	(0.0307)	(0.0912)
Press release (log)	-0.10***	0.35	0.67**	0.67**
	(0.0092)	(0.1152)	(0.0332)	(0.0329)
Press release (log)^2			-0.11*	-0.10
			(0.0673)	(0.1021)
Press release (log)				
* Total assets (log)		-0.04*	-0.05**	-0.05**
		(0.0399)	(0.0157)	(0.0127)
LinkedIn				0.0613***
				(0.0067)
LinkedIn^2				-0.0126***
				(0.0064)
CEO age (log)	-0.07	-0.06	-0.05	-0.02
	(0.3389)	(0.4230)	(0.4997)	(0.7458)
CEO gender	0.03	0.03	0.03	0.02
	(0.6487)	(0.6836)	(0.6517)	(0.7204)
Total assets (log)	-0.14***	-0.12***	-0.11***	-0.11***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Return on assets (ROA)	-0.32***	-0.32***	-0.32***	-0.33***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)

Leverage ratio	0.18***	0.17**	0.17 **	0.17***
	(0.0079)	(0.0114)	(0.0112)	(0.0098)
Current ratio (log)	-0.03**	-0.03**	-0.03**	-0.03**
	(0.0391)	(0.0331)	(0.0342)	(0.0329)
MB (log)	-0.06***	-0.06***	-0.06***	-0.06***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
NAICS 32 dummy	0.05	0.05	0.05	0.06
	(0.4923)	(0.5149)	(0.4867)	(0.3999)
NAICS 33 dummy	0.00	-0.00	0.00	0.01
	(0.9879)	(0.9714)	(0.9761)	(0.8479)
LinkedIn at max. vol.				2.44
N	2365	2365	2365	2365
R^2	0.41	0.41	0.41	0.42
R^2 adjusted	0.41	0.41	0.41	0.41
F-statistic	116.79	109.96	103.29	93.01
Prob(F-statistic)	0.0000	0.0000	0.0000	0.0000