

# The Equilibrium Assignment of Narcissistic CEOs to Firms

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## **Abstract**

Firms may rationally select CEOs whose level of narcissism is compatible with their circumstances. We model the firm-CEO matching process in which narcissistic CEOs are matched to firms characterized by their shareholders' risk aversion. This leads us to predict that (i) contemporaneous (future) CEO narcissism is increasing (decreasing) in the compensation package; (ii) CEO narcissism is decreasing in shareholder risk aversion and (iii) CEO narcissism is increasing in CEO narcissism mean reversion. We test our predictions on a 10-year sample of S&P 500 CEOs, using a time-varying measure of CEO narcissism. Our empirical results provide preliminary support for all our predictions.

## 1. Introduction

Narcissism tends to have a bad press – a typical example is a Forbes article asking “*Why Narcissistic CEOs Kill Their Companies*” (Jackson, 2012). But there are some exceptions of narcissistic CEOs praised for their visionary leadership, such as Steve Jobs. Narcissism is, in fact, a fundamental and normal part of the personality. It is a trait with both behavioral and cognitive aspects and healthy narcissism enables individuals to secure their self-esteem (Sedikides et al., 2004). In some contexts, higher levels of narcissism may be beneficial. Such is the case for CEOs (see e.g., Khurana, 2002; Kets de Vries, 2003; Maccoby, 2007; and Campbell and Campbell, 2009). It follows that it may be perfectly rational for a company to recruit a CEO with an appropriate level of narcissism. The required level of narcissism depends on firm and shareholder characteristics. In this paper, we explore the matching process between narcissistic CEOs and firms as characterized by the degree of risk aversion of their shareholders.

To study this matching process, we need to track narcissism over a relatively long period of time. This entails the construction of a time-varying measure of CEO narcissism available for a large sample of firms over a significant number of years. We do this by estimating a theoretically-grounded measure of CEO narcissism among the S&P 500 CEOs for the years 2003 to 2012. We measure narcissism by tabulating first person pronoun usage by CEOs, using transcripts of conference calls with analysts. This measure is suggested by Raskin and Shaw (1988), who show that patterns in first person pronoun usage are correlated with the narcissistic personality inventory (NPI) score. An additional benefit of using the first person pronoun measure of narcissism is that it avoids reliance on compensation package components to capture CEO personality.

We begin our analysis with an assignment model that formalizes the matching process between narcissistic CEOs and firms, depending on shareholders’ risk aversion. We derive the equilibrium assignment equation and, from it, generate three main predictions. If our assignment model is a relevant characterization of the CEO labor market, (i) CEO pay-package incentiveness and the contemporaneous level of CEO narcissism should be positively correlated while the correlation between current CEO pay-package incentiveness and future CEO narcissism should be negative, (ii) firms with more risk averse shareholders should select CEOs with lower narcissism and (iii) the faster the rate of CEO narcissism mean reversion, the higher the level of CEO narcissism selected in equilibrium.

We test our predictions on a 10-year sample of S&P 500 CEOs. Our main empirical results are the following: (i) we find that the percentage of CEO total compensation in the form of a cash bonus is positively associated with contemporaneous CEO narcissism and negatively associated with future

CEO narcissism; (ii) shareholder risk aversion, measured using firm idiosyncratic risk, is negatively correlated with CEO narcissism; (iii) we find a positive and significant relation between the rate of narcissism mean reversion and contemporaneous narcissism. In other words, the faster the CEO narcissism mean reversion, the higher the level of CEO narcissism. All these results support the predictions of our assignment model.

We supplement the existing literature on CEO selection. Gabaix and Landier (2008) hypothesize that talent has a greater effect in larger firms and that in equilibrium the most talented CEO is matched with the largest firm. They use this assignment framework to provide an explanation for the sharp increase in CEO compensation since 1980. Using the same setup, Terviö (2008) and Edmans, Gabaix and Landier (2009) also show a connection between CEO compensation and size of the firm. Edmans and Gabaix (2011) show a negative correlation between firm risk and talented CEOs. Overconfidence bias has already been studied in the CEO selection context (a.o., Goel and Thakor, 2008). However, to the best of our knowledge, our study is the first attempt to explicitly model a personality trait as a rational selection criteria for CEOs in the framework of an assignment model depicting the CEO labor market equilibrium.

We also contribute to the optimal contracting approach to the compensation package (see e.g. Hall and Liebman, 1998; and Jensen and Murphy, 1990) since our results support the idea that boards rationally select a given level of CEO narcissism and adjust the compensation package accordingly.

The remainder of the paper is organized as follows. Section 2 provides some salient facts about the concept of narcissism. Our CEO cohort is presented in Section 3. The narcissism measure is described in section 4. Some stylized facts about the narcissism dynamic are displayed in section 5. Section 6 develops our assignment model. Section 7 describes our empirical tests and provides a discussion of our findings. Section 8 concludes.

## **2. Narcissism**

Narcissism is a fundamental part of the personality. It is a trait with both behavioral and cognitive aspects. Healthy narcissism is related to high self-esteem (Sedikides et al., 2004), which itself promotes individual wellbeing and enhanced initiative (Baumeister et al., 2003). On the other hand, a very high level of narcissism is considered to be a personality disorder in the clinical and psychiatric literature (see e.g., American Psychiatric Association, 2000). However, narcissism is a continuous concept, and except in the case of a full psychiatric clinical diagnosis, there is no quantitative or qualitative threshold for the tipping point above which narcissism becomes problematic (Campbell and Foster, 2007).

Narcissism in the CEO context has been the subject of prior research. It has two salient features which interest us in the context of an assignment model. First, narcissism is beneficial at certain times or in certain contexts, so boards may rationally choose to hire CEOs with a level of narcissism appropriate to the characteristics of their firm. Second, more narcissistic individuals engage in greater risk taking.

*Contextual factors and narcissism.*

An egotistical CEO with a strong personality may be perceived as necessary in some contexts or at some times, leading the board to rationally select a CEO with a level of narcissism appropriate to the firm's characteristics. Existing research has identified some contexts where narcissism may be desirable. Khurana (2002) argues that the boards of troubled firms may seek to hire narcissistic "saviors" as CEOs. For Maccoby (2007), narcissism is a positive attribute in highly dynamic industries.

However, when narcissism becomes destructive, outcomes may be disastrous. Maccoby (2000) distinguishes productive and destructive narcissism. Productively narcissistic CEOs are able to develop successful strategies and inspire other members of their organization, while destructive narcissists lose touch with reality and engage in grandiose and damaging schemes.

Time horizon is also important. Research on narcissism in CEOs underlines that it is beneficial in the short term. Kets de Vries (2003) suggests that a minimum level of narcissism is a highly valuable characteristic for a CEO at the early stage of his tenure but it can be destructive in a second stage. In the same vein, Pittinsky and Rosenthal (2008) find that narcissism predicts leadership during initial interactions among group members but not subsequently.

In a leadership context, Campbell and Campbell (2009) define a contextual reinforcement model of narcissism with two stages, an emerging zone and an enduring zone. The emerging settings are situations involving unacquainted individuals, early-stage relationships, and short-term contexts. The enduring settings are situations involving acquainted individuals, continuing relationships, and long term consequences. The benefits of narcissism are seen primarily in emerging settings and the costs in enduring settings.

The idea of contextual reinforcement is consistent with Buss and Chiodo (1991), who describe narcissists' continual need for actions to bolster their egos. In conclusion, narcissism is more beneficial in some contexts and in the shorter term, especially in the emerging zone where CEOs narcissism is most useful. Characterizing CEO personality by narcissism therefore makes sense in an assignment framework, because the matching between CEOs and firms focuses on this early period.

### *Narcissism and risk-taking.*

It is well documented in the psychology literature that more narcissistic individuals are more likely to take risks than the less narcissistic - for a review, see the introduction to Foster et al., 2009. According to Foster and Brennan (2011), narcissists are more likely to make risky investments because they are attracted to the idea of a large payoff, not because they are unaware of the risks associated with their decisions. This echoes the more general study of Foster et al., (2009), in which the authors conclude that narcissists are positively motivated to take risks “*because of a surplus of eagerness, not a deficit of inhibition*” (p. 889). This explanation underlines an important difference between narcissism and the cognitive bias of overconfidence: narcissists are aware of what they are doing and do it for motivational reasons. In contrast, individuals displaying a cognitive bias are unaware they are taking risks. This is particularly important to support a rational assignment model, because narcissists remain rational decision makers, whose goals are a function of their specific personality trait.

### **3. CEO cohort**

To gain a better understanding of the CEO narcissism dynamic and its interaction with the firm, we need to track a large cohort of CEOs over a long period of time. We identify all CEOs of S&P 500 firms over the period 2003 to 2012. We focus on S&P500 firms because they are large firms, most likely followed by financial analysts, for which we have a greater likelihood of obtaining the necessary material to estimate the narcissism indicator (see Section 4). We start our data collection in 2003 because previous experience estimating the narcissism indicator for a different sample of CEOs shows that the availability of transcripts of CEO speech is less systematic prior to 2003 (Aktas et al., 2014). Transcript availability became much more widespread after the 2002 Sarbanes-Oxley act.

Table 1 reports summary statistics for our sample by year. We are unable to find transcripts of CEO speech for some firms in our sample. In most cases, this is because the CEO does not participate in quarterly analyst calls. We follow on average 368 firms per year, with a minimum of 256 in 2003 and a maximum of 422 in 2009. Our CEO cohort forms an unbalanced panel data set because not all firms are present every year. The mean market value of the corresponding firms is 20,290 million USD. The corresponding median market value is 9,822 million USD. Our sample is clearly tilted towards large firms but this is by construction because we restrict our attention to the S&P500 firms. We also observe a significant increase in mean market values from 2003 (13,519 million USD) to 2012 (25,077 million USD), a pattern that parallels the stock market trend during the period. Our sample covers, on average, 46.79% of the CRSP universe aggregate market value.

#### 4. Narcissism measure

The challenge of measuring CEO narcissism is threefold. First, the measure needs to be validated and theoretically grounded. Second, it has to be feasible to implement in large samples of CEOs. Third, it must provide a continuous measure to be consistent with the psychology literature (see, e.g., Campbell and Foster, 2007). To meet these requirements, we use a theoretically-grounded measure of CEO narcissism based on first person pronoun usage among the S&P 500 CEOs for the years 2003 to 2012 (denoted *FPNI* or First Person Narcissism Indicator). The period is sufficiently long to enable us to pick up year-to-year variations in CEO narcissism for around four-fifths of the S&P 500 firms. The *FPNI* measure is suggested by Raskin and Shaw (1988), who show that patterns in first person pronoun usage are correlated with the narcissistic personality inventory (NPI) score.<sup>1</sup>

The *FPNI* is based on the ratio of first person singular pronouns (I, me, my, mine, ...) to the sum of first person singular and plural pronouns (we, us, our, ours, ...) used by CEOs in their speeches, as in Aktas et al. (2014) following Chatterjee and Hambrick (2007):

$$FPNI_{i,t} = \frac{\sum \text{First Person Singular Pronouns}_{i,t}}{\sum \text{First Person Singular Pronouns}_{i,t} + \sum \text{First Person Plural Pronouns}_{i,t}} \quad (1)$$

where  $FPNI_{i,t}$  is the ratio for CEO  $i$  at period  $t$ .

An additional benefit of using the *FPNI* measure of narcissism is that it avoids reliance on compensation package components to capture CEO personality. To compute *FPNI*, we collect CEO speeches from conference calls with analysts in the Lexis Nexis Academic database as in Aktas et al. (2014). This process requires a manual search of the database on CEO name, CEO by CEO. We decide to exclude interviews about litigation, because the language used is too specific. We also exclude transcripts of annual general meetings, because there is a significant risk of them being scripted. We finally drop analyst interviews limited to a simple presentation or lacking responses to spontaneous analyst questions, for the same reason.

We collect 12,242 transcripts for 867 unique CEOs. In the vast majority of cases, these are transcripts of conference calls with analysts about either quarterly earnings or industry-specific topics. The typical conference call includes at least three firm participants, the CEO, the CFO and the Head of Investor Relations, sometimes with the additional presence of other officers. As a first step, we read each transcript to extract the part specific to CEO speech, manually deleting all the speech of other

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<sup>1</sup> The NPI is a questionnaire which is administered to individuals to measure their level of narcissism – see Emmons (1987) and Raskin and Hall (1981)

participants. Then, we use a custom made program to count singular and plural first person pronoun occurrences and to compute the narcissism variable. The number of interviews by CEO and the length of these interviews varies significantly from CEO to CEO. A legitimate concern about the possible correlation between the narcissism measure and the amount of textual material collected by CEO may be raised. Such a correlation could affect our analyses. We therefore compute a second measure of narcissism, estimated as the residuals of the regression of the *FPNI* measure on the total number of characters collected by CEO (referred hereafter as the residuals-based *FPNI*). Both measures are continuous by nature.

Table 2 displays descriptive statistics about the material collected (Panel A), and our two measures of narcissism (Panels B and C). We collect on average 111,037 characters per CEO-year before cleaning, and obtain 40,598 characters per CEO-year after manually deleting all speech which is not that of the CEO (20.30 pages per CEO-year, assuming 2,000 characters per page). This is a significant amount of textual material. Medians are close to averages, an indication of some symmetry in the distribution of the number of characters by CEO. The number of collected characters displays, however, a high degree of heterogeneity, from a yearly average minimum of 703 characters (one third of a page) to a yearly average maximum of 237,358 characters (118.67 pages). Turning to Panel B, we observe that average *FPNI* is around 20.5%, consistent with previous research (Chatterjee and Hambrick, 2007; Aktas et al., 2014). Median values are close to means. Cross-sectional heterogeneity is apparent, with a minimum *FPNI* of 0% and a maximum of 71.4%. Statistics reported in Panel C reveal a somewhat higher degree of asymmetry for the residuals-based *FPNI*. The figures themselves are no longer easily interpretable, as the residuals are mechanically centered by the regression procedure.

## 5. Stylized facts

We need to identify the most salient features of our *FPNI* narcissism measure if we are to model it with a sufficient degree of realism. To this end, we report three stylized facts in Table 3.

### *Narcissism's component parts*

Table 3, Panel A shows evidence for a time varying component of narcissism. We regress the *FPNI* narcissism measure on CEO fixed effects. We have 3,512 observations with 867 unique CEOs. The regression adjusted R-squared is 63.3%, implying that 63.3% of total CEO narcissism variance is a time-constant, CEO-specific core personality trait and the remaining 36.7% is a combination of time-variation and measurement errors.

### *Dynamics of narcissism*

In a second set of preliminary analyses, we document the time-series dynamic of CEO narcissism and estimate the following first order autoregressive model:

$$\Delta_{t+1,t}FPNI = \beta_0 + \beta_1\Delta_{t,t-1}FPNI + \varepsilon_t \quad (2)$$

where  $\Delta_{t+1,t}$  is the first difference operator ( $\Delta_{t+1,t}FPNI = FPNI_{t+1} - FPNI_t$ ). We use first differences because *FPNI* displays a significant positive time trend in our data set<sup>2</sup>. We estimate Equation (2) using both the classic ordinary least square (OLS) estimator and the fixed effect (FE) panel data estimator. Results are reported in Table 3 – Panel B. The estimated value of  $\beta_1$  is -0.35 (t-stat -11.76) using the OLS estimator and -0.43 (tstat -12.77) using the FE estimator. The *FPNI* displays a significant level of negative autocorrelation through time and the FE results confirms that this is a CEO level phenomenon (not a cross-sectional one due to change of sample composition through time, such as a shorter CEO tenure for more narcissistic CEOs).

### *Narcissism and Compensation Package Incentiveness*

We next turn to the contemporaneous relation between CEO narcissism and CEO pay package incentiviveness. We use the CEO Bonus as a percentage of the total CEO pay package, collected in the Execucomp database, as proxy for CEO pay package incentiviveness. The percentage bonus is an appropriate proxy for two main reasons. First, it is consistent with the short time-horizon of narcissists, who require continuous ego-reinforcement. Bonuses are usually decided using an annual accounting metric and are paid soon after the end of the fiscal year. Second, the use of the bonus is consistent with the need to maintain an appropriate level of narcissism for the short-term emerging zone, where it is most useful (Campbell and Campbell, 2009). Equity-based compensation, while an important component of the compensation package, is a longer-term incentive as restricted stock and stock options only vest after several years. Below we provide an excerpt from Millipore’s DEF14A filing relating to the fiscal year 2008, filed with the SEC on March 27<sup>th</sup>, 2009. It details the different components of executives’ compensation packages, identifying clearly the short-run nature of the bonus component and the long-term horizon of the equity based component.

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<sup>2</sup> Unreported results, available upon request.

Compensation Element	Description	Alignment with Compensation Committee Objectives
Base Salary	Base salary is market-competitive and determined based on each executive's experience, responsibilities and demonstrated performance.	Attract and retain highly qualified executives and provide merit adjustments to promote high business performance.
Annual Cash Awards	Annual cash payouts depend on individual performance and Company performance against annual operating targets.	Attract and retain highly qualified executives while rewarding near-term business performance.
Equity Awards	Equity grant value determined based on individual performance and retention objectives for each executive. Equity grants are comprised of stock options that vest in equal installments over four years and restricted stock units that vest 100% after three years, subject to time-based (2008 grants) or performance-based (2009 grants) requirements.	Attract and retain highly qualified executives while rewarding longer-term business performance and recognizing the value of longer-term strategic decisions.  Align executive and shareholder interests.

Source: <http://www.sec.gov/Archives/edgar/data/66479/000119312509066139/ddef14a.htm>, accessed July 17th, 2016.

To investigate the contemporaneous relation between the *FPNI* narcissism measure and CEO pay package incentiviness, we run the following regression:

$$FPNI_{i,t} = \beta_0 + \beta_1 \frac{CEO\ Bonus_{i,t}}{Total\ CEO\ Compensation\ Package_{i,t}} + \varepsilon_{i,t} \quad (3)$$

We again estimate Equation (3) using both the OLS estimator and the FE estimator. Results, reported in Table 4 – Panel C, display positive and significant estimations for  $\beta_1$  (0.055 with t-stat 4.39 using the OLS estimator, 0.021 with t-stat 2.35 using the FE estimator). The contemporaneous correlation between CEO narcissism and CEO pay package incentiviness is positive and significant.

## 6. The model

### *Model setup*

Our model economy is composed of continuums of firms and CEOs. Firms are indexed  $m$  and CEOs  $n$ <sup>3</sup>. Both  $m$  and  $n$  belong to the range  $[0, N]$ ,  $N$  being the number of firms in the economy. Firms are characterized by the degree of risk aversion of their shareholders, denoted  $\delta(m)$ , bounded between  $[0,1]$ .  $\delta(m)$  equals zero captures the case of risk neutral shareholders.  $\delta(m)$  equals one provides an upper bound on shareholders' risk aversion such that, taking into account the distributions of shareholder and CEO risk aversion, CEOs are always more risk averse than their assigned shareholders after matching. Firms are perfectly sorted according to  $\delta(m)$ <sup>4</sup>. The model therefore studies an economy in which CEOs display more risk aversion than their shareholders. This is consistent with many previous contributions that highlight the risk-aversion wedge between shareholders and their CEOs (see e.g., Hall and Murphy 2002; Becker, 2006; Gervais et al., 2011). CEOs concentrate a significant fraction of their wealth, in terms of revenues and capital, in the firm and are therefore under-diversified. Shareholders, on the other hand, benefit from diversification opportunities brought by capital markets. We assume that shareholder risk aversion is constant through time, consistent with the stability of shareholding structures reported in previous contributions (see, e.g., Holderness et al., 1999). The CEO market is competitive, implying that firms and CEOs are price takers.

CEOs are characterized by their level of narcissism, denoted  $N_t(n)$  at period  $t$ . CEO narcissism is therefore time-varying in our setup, in accordance with previous studies mentioned in Section 2. Without loss of generality, we assume that CEOs are perfectly indexed in increasing order of narcissism ( $N'_t(n) > 0$ )<sup>5</sup>.  $w_t(n)$  is the CEO pay package at period  $t$ . The CEO package depends on  $n$ , the CEO index, and therefore the level of CEO narcissism. We assume that more narcissistic CEOs require a higher pay package ( $w'_t(n) > 0$ ) due to their higher self-esteem. The CEO pay package must be understood as the incentives provided by shareholders for the CEO to maximize profits.

We finally denote by  $\beta$  the discount rate that applies to economic activities undertaken by firms (net of shareholder risk aversion).

We incorporate the empirical stylized facts presented in section 5 in our assignment model by adopting the following dynamic equation driving narcissism:

$$N_{t+1}(n) = N_t(n) + \gamma (\bar{N}(n) - (N_t(n) - \theta W_t(n))) \quad (4)$$

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<sup>3</sup> As noted in Terviö (2008), the continuity assumption is essentially a choice of convenience in assignment models.

<sup>4</sup> Perfect sorting of firms is required to support the existence of a competitive equilibrium (see Terviö, 2008).

<sup>5</sup> Perfect sorting of CEOs is required to support the existence of a competitive equilibrium (see Terviö, 2008).

where  $\bar{N}(n)$  is the long-run mean reverting level of CEO narcissism,  $\gamma$  the coefficient capturing the dynamic between the current and future level of narcissism (between 1 and 2 to obtain negative first-order autocorrelation and convergence to the long-run mean, consistent with Equation (2) estimation results) and  $\theta$  is the contemporaneous sensitivity of CEO narcissism to the CEO pay package (strictly positive, to capture Equation (3) estimation results). Equation 4 is our main departure from the Terviö (2008) and Gabaix and Landier (2008) assignment models.

#### *The CEO selection problem*

The firm's decision problem at  $t = 0$  is to hire a CEO with the appropriate level of narcissism  $N_t(n)$ , taking into account its shareholders' risk aversion  $\delta(m)$ . CEO narcissism  $N_t(n)$  increases firm expected profits, denoted  $E(\pi_{t+1})$  (and positive by the participation constraint), but more narcissistic CEOs engage firms in more risky activities by the very nature of their narcissistic personality (see Section 2). The contribution of CEO narcissism to firm expected profits  $E(\pi_{t+1})$  interacts with the firm shareholders degree of risk aversion  $\delta(m)$ :

$$E(\pi_{t+1}) = E(\pi_{t+1}^b) + \alpha E(\pi_{t+1}^b) (1 - \delta(m)) N_t(n) \quad (5)$$

where  $E(\pi_{t+1}^b)$  is the baseline firm expected profit at time  $t + 1$ . The baseline expected profit would be achieved with a population average CEO level of narcissism.  $\alpha E(\pi_{t+1}^b) (1 - \delta(m)) N_t(n)$  is the contribution of the selected CEO's level of narcissism to  $E(\pi_{t+1})$  taking into account the shareholders' risk-aversion  $\delta(m)$ ,  $\alpha$  being a parameter that quantifies the effect of CEO narcissism on the firm's expected profits<sup>6</sup>. Equation (5) is a classic multiplicative production function that supports the complementarity assumption (see Terviö, 2008). Note that if firm shareholders are risk neutral,  $\delta(m) = 0$  and  $E(\pi_{t+1}) = E(\pi_{t+1}^b) + \alpha E(\pi_{t+1}^b) N_t(n)$ : CEO narcissism fully contributes at a rate  $\alpha$  to the firm's expected profits. If the shareholders are as risk-averse as their CEO,  $\delta(m) = 1$  and  $E(\pi_{t+1}) = E(\pi_{t+1}^b)$ : CEO narcissism does not contribute to the firm expected profits, whatever the value of  $\alpha$ .

The firm maximization program at  $t = 0$  trades the contribution of the selected CEO narcissism against the cost of hiring:

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<sup>6</sup> Note that increasing or decreasing narcissism's returns to scale can easily be incorporated in the model by adopting the following specification for firm expected profits:  $E(\pi_{t+1}) = E(\pi_{t+1}^b) + \alpha E(\pi_{t+1}^b)^\varphi (1 - \delta(m)) N_t(n)$ ,  $\varphi$  being inferior (superior) to one for decreasing (increasing) returns to scale.

$$\max_n \beta E(\pi_{t+1}) - W_t(n) \quad (6)$$

Combining Equations (4), (5) and (6), we obtain:

$$\max_n \beta (E(\pi_{t+1}^b) + \alpha E(\pi_{t+1}^b) (1 - \delta(m)) [N_t(n) + \gamma (\bar{N}(n) - (N_t(n) - \theta W_t(n)))] - W_t(n) \quad (7)$$

We standardize  $\beta$  to one without loss of generality and derive the corresponding first order condition:

$$(1 - \gamma)N'_t(n) + \gamma \bar{N}'(n) = A(m) W'_t(n) \quad (8)$$

with  $A(m) = \frac{1}{\alpha E(\pi_{t+1}^b)(1-\delta(m))} + \gamma \theta$ . Equation (8) states that the firm's optimal choice of a level of CEO narcissism is such that the marginal contribution of narcissism is equal to the marginal cost of hiring the CEO.

### *Equilibrium analysis*

The assignment of CEOs to firms relies on a competitive equilibrium. A competitive equilibrium is composed of a compensation function  $W_t(n)$ , an assignment function  $\omega(n)$  that assigns CEO  $n$  to firm  $m$  in equilibrium ( $m = \omega(n)$ ) to ensure optimal selection of CEOs by firms (the first order condition of Equation (8) is respected) and CEO market clearance (each firm hires a CEO). As pointed out in Terviö (2003) and Gabaix and Landier (2008), an equilibrium exists in this type of framework. This equilibrium is efficient in the sense that it maximizes the aggregate expected profits of firms and implies positive assortative matching: if there are two firms with risk aversion  $\delta(1) < \delta(2)$  and two CEOs with narcissism  $N_t(1) > N_t(2)$ , firm 1 will match with CEO 1, and firm 2 with CEO 2 (because this is the only match which provides no incentives to deviate). A key benefit of an assignment model equilibrium analysis is that the existence of an equilibrium can be verified pair by pair and does not require a global analysis (see Terviö, 2008). The complementarity hypothesis is therefore sufficient, when coupled with continuity and perfect unidimensional sorting, to guarantee the existence of the equilibrium. The assortative matching equilibrium leads CEO  $n$  to head firm  $n$  ( $n = \omega(n)$ )<sup>7</sup> and therefore, Equation (8) becomes:

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<sup>7</sup> Note that the assignment matching does not specify whether firms choose CEOs or vice-versa. Our equilibrium predictions are therefore free of endogenous self-selection bias.

$$(1 - \gamma)N'_t(n) + \gamma \bar{N}'(n) = A(n) W'_t(n) \quad (9)$$

which is a classic assignment equation (see Sattinger, 1993; Teulings, 1995), whose form explicitly includes the modeling of the CEO narcissism dynamic (see Equation (4)). To solve the equilibrium Equation (9), we integrate the left and right sides and assume, without loss of generality, that  $N_t(0) = \bar{N}(0) = 0$  (the minimum level of narcissism is normalized to zero), to obtain:

$$(1 - \gamma)N_t(n) + \gamma \bar{N}(0) = \int_0^n \frac{1}{\alpha E(\pi_{t+1})(1-\delta(u))} W'_t(u) du + \int_0^n \gamma \theta W'_t(u) du \quad (10)$$

Solving Equation (10) requires us to specialize the distribution of shareholders' risk aversion and the form of the CEO pay package. We assume a uniform distribution for shareholders risk aversion ( $\delta(x) = \delta x$ ), which is not as restrictive as it may appear at first sight. In effect, the assortative matching equilibrium relies on the perfect sorting of firms by shareholder risk aversion, which is an ordering constraint. The specific distribution does not matter provided the ordering relation is preserved, which is by definition the case for any well-behaved cumulative distribution function. Concerning the CEO pay package, we also assume linearity ( $W_t(x) = V + W x$ ) and normalize the base level to zero ( $V = 0$ ). As there is a linear relation between the level of CEO narcissism and firm expected profits (see Equation (5)), assuming  $W_t(x) = W x$  describes a linear connection between the CEO pay package and firm performance. Such a linear compensation package is optimal in the Holmstrom and Milgrom (1987) adverse selection framework, assuming that the participation constraint is met (and normalizing the base salary to zero). The framework assumes that the agent has an exponential utility, that the cost of effort is pecuniary and that the source of noise is Gaussian. Edmans and Gabaix (2011) also show that a linear contract may be optimal in models in which the principal chooses a fixed level of action for the agent, if the cost of effort is again pecuniary or in case of agent multiplicative preferences for consumption. Using these two linear assumptions, Equation (10) can be fully solved:

$$N_t(n) = \frac{-W}{\alpha \delta (1-\gamma) E(\pi_1)} \ln(1 - \delta n) + \frac{\gamma}{1-\gamma} (\theta W n - \bar{N}(n)) + C \quad (11)$$

Equation (11) opens the door to clear predictions, which hold both in the cross-section and in the time-series, because they are based on equilibrium arguments. We summarize them in three main predictions, the proofs of which are based on straightforward static analyses of Equation (11):

**Prediction 1** – CEO narcissism and CEO pay-package incentiveness

$$\text{a. } \frac{\partial N_t(n)}{\partial W} > 0 \qquad \text{b. } \frac{\partial N_{t+1}(n)}{\partial W} < 0 \qquad (12)$$

CEO pay-package incentiveness ( $W$ ) and the level of CEO narcissism selected in equilibrium are contemporaneously positively correlated (Prediction 1.a). This prediction is hard-wired in our model because we assume that narcissistic CEO require more attractive pay packages. Due to the mean reversion of narcissism, the correlation between current CEO pay-package incentiveness and the future level of CEO narcissism is negative in equilibrium (Prediction 1.b). This negative equilibrium lagged correlation is a specific feature of our assignment model.

**Prediction 2** – CEO narcissism and shareholder risk aversion

$$\frac{\partial N_t(n)}{\partial \delta} < 0 \qquad (13)$$

In equilibrium, firms with more risk averse shareholders select CEOs with lower narcissism. This is expected in our assignment model framework because CEO narcissism is useful to combat the risk aversion wedge between shareholders and the CEO.

**Prediction 3** – CEO narcissism and the mean-reversion of narcissism

$$\frac{\partial N_t(n)}{\partial \gamma} > 0 \qquad (14)$$

We note finally that the faster the mean reversion of CEO narcissism, the higher the level of CEO narcissism selected in equilibrium. This result is again intuitive: fast mean reversion means less long-lasting effects of CEO narcissism. Consequently, a higher initial level of narcissism has to be selected to shrink the shareholders to CEO risk aversion wedge by a given level.

## 7. Tests of model predictions

### 7.1 Econometric specifications

Tests require estimates of  $N_t(n)$ , the level of CEO narcissism, which we capture by the *FPNI* measure described in section 4.

Prediction 1 states that higher levels of compensation are (1) positively associated with contemporaneous CEO narcissism and (2) negatively related with future CEO narcissism. We test part 1 of the prediction by regressing the level of CEO *FPNI* measure on the percentage of compensation in the form of a bonus for the same year. We start by estimating a pooled regression including only the bonus variable on the right hand side, and repeat the pooled regression with control variables, using ordinary least square (OLS) and robust standard errors to assess statistical significance in both cases. We then repeat the analyses using a fixed effects panel data (FE) estimator, including CEO fixed effects and clustering standard errors at the CEO level, to control fully for cross-observation correlation at the CEO level. We test part 2 of the prediction by regressing the first difference in *FPNI* on the lagged bonus variable with and without controls. We work in first differences to neutralize the time-trend which is present in our narcissism data<sup>8</sup>. We again estimate pooled regressions with OLS and robust standard errors and then, FE regressions with standard errors clustered at the CEO level, without and with control variables in both cases.

Prediction 2 forecasts that CEO narcissism is negatively associated with shareholder risk aversion. Shareholder risk aversion is not observable as such. We therefore adopt the following empirical strategy. First, we characterize the firm's risk profile using the firm's idiosyncratic risk, estimated as the standard deviation of the firm's stock returns over the previous two years. Next, assuming that more risky firms attract less risk averse shareholders, we regress the CEO *FPNI* narcissism measure on the firm's idiosyncratic risk. Under prediction 2, we expect to find a positive coefficient (less risk averse shareholders are willing to hire more narcissistic CEOs). We carry out

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<sup>8</sup> Unreported results, available on request.

pooled OLS regression using robust standard errors and FE regressions with standard errors clustered at the CEO level, with and without control variables, as for prediction 1.

Prediction three posits that CEO narcissism is increasing in mean-reversion. We test this prediction using a two stage empirical strategy. We use the following first order autoregressive model to estimate the mean-reversion coefficient for each CEO:

$$\Delta_{t+1,t}FPNI_i = \gamma_{0,i} + \gamma_{1,i} \Delta_{t,t-1}FPNI_i + \varepsilon_t \quad (15)$$

where  $i$  is the CEO index and  $\Delta_{t+1,t}$  is the first difference operator ( $\Delta_{t+1,t}FPNI = FPNI_{t+1} - FPNI_t$ ). The estimated autoregressive coefficient at the CEO level,  $\hat{\gamma}_{1,i}$ , is our empirical proxy for the  $\gamma$  coefficient in Prediction 3 (see Equation (14)). Equation (15) looks similar to Equation (2) but it is important to note that in the current case, it is estimated CEO by CEO ( $\hat{\gamma}_{1,i}$  is indexed by  $i$ ). We restrict our analysis to cases where we have at least four consecutive values of the *FPNI* indicator for a given CEO.

In the second stage, we regress CEO narcissism *FPNI* on  $\hat{\gamma}_{1,i}$ . We are constrained to use the OLS estimator because  $\hat{\gamma}_{1,i}$  is time-constant at the CEO level. Standard-errors are robust to heteroscedasticity. As for Predictions 1 and 2, we report results with and without control variables.

## 7.2 Control variables

### *CEO-level variables*

We control for two important characteristics of the CEO's pay package, total compensation in dollars and the delta and vega of the CEO's option portfolio. It is conceivable that the value of a CEO's total pay package could influence his/her narcissism. Likewise, delta and vega reflect the CEO's exposure to risk and they might also impact the degree of narcissistic behaviors.

The CEO compensation data are collected from the Execucomp database. We obtain data on the bonus and total compensation<sup>9</sup>. We use these items to estimate the bonus as a % of total compensation<sup>10</sup>.

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<sup>9</sup> We use TDC1 for total compensation. TDC1 provides total compensation with grant date valuation of restricted stock and stock options. TDC2 estimates total compensation with the value of prior grants of restricted stock vesting and stock options exercised during the year.

<sup>10</sup> We use the Execucomp valuation which is based on the Black and Scholes methods prior to 2006 and fair value from 2006.

We follow Core and Guay (2002) to obtain option portfolio sensitivity to changes in stock prices and stock return volatility for both exercisable and unexercisable options. These measures are based on the Black-Scholes (1973) option valuation model, modified by Merton (1973) to account for dividends and can be interpreted as the second order effects of the option grant on the compensation package. We deal with the changes in stock options data following new reporting requirements as in the appendix of Hayes, Lemmon and Qiu (2012).

Execucomp reports compensation information for the top five highest paid executives. Using this information, we follow Bebchuk et al. (2011) and compute the CEO pay slice (the proportion of CEO pay in the sum of top 5 executives' compensation packages). In an optimal contracting approach, CEO pay slice is the outcome of the board's optimal choice, and as such is a CEO monitoring variable (Henderson and Fredrickson (2001))<sup>11</sup>.

Table 4 Panel A provides the mean, median, standard deviation, minimum and maximum for the CEO compensation package components. Mean salary stands at 1.04 million USD (median 1 million USD), bonuses 0.8 million USD (median 0 million USD), stock grants 3.16 million USD (median 2.04 million USD) and option grants 2.98 million USD (median 1.82 million USD). The bonus represents on average 8% of total compensation. These figures are consistent with those reported in Murphy (2013). We also note the strong heterogeneity in CEO compensation packages, with minima of zero for all categories of compensation and maxima of between 8 and 40 times the mean. On average, CEOs capture 41% of the aggregate remuneration of the top five executives in the firm (Bebchuk et al. (2011) report 35.7%). Average stock option delta is 0.37 (0.33) for exercisable (unexercisable) options and vega is on average 0.01 for both types of option. The figure for option vega is the same as in Murphy (2013). Figures in Murphy (2013) for delta are not comparable to ours, as they also include stock delta.

We include the percentage of CEO ownership in our analyses to control for the CEO's exposure to firm risk (Panel C). Mean CEO ownership is 0.1% (median 0%).

### *Firm Governance*

Firm governance mechanisms are very much to the fore in controlling CEO behavior (Rijsenbilt and Commandeur, 2013). They therefore form a key set of control variables in our analyses. We use data from the Riskmetrics database to estimate the governance variables. We measure board independence by the percentage of directors appointed during the CEO's tenure, and the percentage of independent directors (Morse et al., 2011). As compensation variables form a key part of our analyses, we control for the possible lack of independence of the compensation committee, proxied

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<sup>11</sup> CEO pay slice was introduced in Bebchuk et al. (2011) as a proxy for CEO power.

by the percentage of members appointed during the CEO's tenure. We also consider the separation between the CEO and chair of the board positions (the CEO is said to be dual if he/she holds both positions concurrently). A dual CEO is likely to hold more sway over the board through his/her control of the agenda and discussions in board meetings.

Table 4 Panel B shows that on average 33.84% (median 30%) of directors were appointed during the CEO's tenure in our sample with independent directors making up 79.08% (median 81.82%) of the board (Coles et al. (2008) and Horstmeyer (2014) report around 80% of Independent directors). 34.41% (median 25%) of the compensation committee were appointed during the CEO tenure, while 79.08% (median 100%) are classified as independent (a consequence of the 2002 Sarbanes-Oxley act). The CEO is simultaneously chairman of the board in 61% (median 100%) of cases.

#### *Other Firm Characteristics*

We include a number of firm level variables. We estimate firm idiosyncratic risk as the standard deviation of the previous two years' daily returns. We use total assets to control for size, capital expenditure to characterize firm activity and leverage as an additional governance mechanism identified by Jensen and Meckling (1976). These variables are collected in the CRSP and Compustat Merged databases.

We incorporate some other corporate characteristics which could be related to CEO narcissism in our analyses. It is conceivable that narcissistic CEOs are likely to be more present in some industries or in some geographical locations. We include a dummy variable identifying financial services firms and high-tech firms. We also identify firms whose head-offices are located in New York city or in the state of California.

Table 4 Panel D summarizes relevant descriptive statistics. Our sample is focused on large firms, with mean (median) total assets of 29.17 billion USD (10.12 billion USD). The average return on assets is 15.08% (median 14.81%). The average firm leverage is 36.32% (median 36.10%). Ten percent of our sample firm-years are in the financial services industry and 27% are classified as high-tech firms according to the classification in Kile and Philips (2009). Twenty percent of firms are located in either New York City or the state of California.

### 7.3. Results

#### *CEO narcissism and bonus compensation*

Table 5 Panel A presents the results of our test of Prediction 1.a (see Section 6), which posits a positive contemporaneous relationship between CEO narcissism and bonus. Columns 1 and 3 show the coefficient on the contemporaneous bonus variable without control variables. Columns 2 and 4 show the results with controls. The first two columns provide OLS estimates with robust standard errors for statistical inference. In the remaining columns, results include CEO FE and standard errors are clustered at the CEO level. In all models, we observe a positive and significant coefficient on the percentage compensation paid as a bonus. Our findings are consistent with Prediction 1.a: more highly-narcissistic CEOs receive more of their pay package as a cash bonus.

Prediction 1.b forecasts a negative lagged relationship between compensation and CEO narcissism (see Section 6). The results in Panel B of Table 5 are consistent with this prediction. The proportion of CEO total compensation paid as a bonus is negatively associated with future CEO narcissism. Model specifications are the same as those in Panel A, except that the dependent is estimated as a first difference to neutralize the time trend that the *FPNI* measure displays in our dataset and the independent and control variables are lagged by one period.

#### *CEO narcissism and shareholder risk aversion*

Prediction 2 of the model suggests that shareholder risk aversion is negatively correlated with CEO narcissism (see Section 6). We proxy for shareholder risk aversion using firm idiosyncratic risk. Less risk averse shareholders are likely to select into more risky firms, so we expect a positive relationship between idiosyncratic risk and CEO narcissism<sup>12</sup>. Table 6 shows the results for this prediction. OLS estimates with robust standard errors are in columns 1 and 2. In columns 3 and 4, results include CEO FE and standard errors are clustered at the CEO level. Our findings are in line with our expectations, as idiosyncratic risk is positively associated with CEO narcissism, except in model 1.

#### *Mean-reversion of CEO narcissism*

Prediction 3 states that CEO narcissism is increasing in the rate of narcissism mean reversion (see Section 6). We estimate the mean reversion parameter CEO by CEO using an autoregressive

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<sup>12</sup> Note that this proxy is certainly far from perfect because we rely on a firm characteristic to proxy for shareholder features. This assumes implicitly some equilibrium assignment model between firms and shareholders, an issue that we do not investigate in this paper. Collecting data about shareholders to build direct proxies of risk aversion would be far more satisfactory but is left at this stage for future research.

model, as described in section 7.1. We use the resulting autoregressive parameter estimates in a second stage regression with the contemporaneous *FPNI* narcissism measure as the dependent variable. In table 7, column 1 reports results without control variables and column 2, with the full set of controls. We use the OLS estimator with robust standard errors for statistical inference, as the autoregressive parameter is a CEO time constant attribute. We are therefore unable to implement a FE panel data estimator. As expected, we find a positive and significant relationship between the rate of narcissism mean reversion and contemporaneous narcissism.

#### 7.4 Discussion

Our results suggest that the bonus is related to CEO narcissism – a higher proportion of bonus in the total CEO compensation package is positively related to current CEO narcissism and negatively related to future CEO narcissism. The positive contemporaneous relationship seems intuitive – firms wishing to attract more narcissistic CEOs, who display a good fit with the characteristics and context, need to flatter their egos to draw them to the firm. Seen from the other side, narcissistic CEOs, because of their high self-esteem, seek a higher compensation package. The negative relationship between bonus and future CEO narcissism is perhaps more surprising. In our model it is driven by a mean reversion process, strongly supported by our empirical analyses of narcissism. But it is also consistent with the literature in psychology. Narcissistic personalities maintain their ego through self-regulatory strategies (Campbell and Campbell, 2009). Narcissism is reinforced when the CEO does not feel sufficiently recognized (eg., by a reduced bonus), causing him/her to engage in ego-reinforcing actions. These actions manifest as more narcissistic behaviors. The short-term time horizon of the bonus is also consistent with psychology theory: narcissists need instant gratification (Morf et al., 2011). It is finally compatible with the ideas put forward by Campbell and Campbell (2009): CEO narcissism can be beneficial in the emerging zone, which is relatively short lived, while it can become harmful in the enduring zone, which occurs after the CEO has spent some time in office. The effect of the bonus on CEO narcissism indicates that a short-term component of the compensation package is able to maintain the narcissistic CEO in the emerging zone. Equity-based compensation has more limited effects because its time horizon is too long due to the vesting period.

Our results for the relationship between CEO narcissism and the bonus raise some tantalizing questions about the dynamics of CEO narcissism. Foremost among these is the idea that boards can potentially control the level of a CEO's narcissism to keep him or her in a zone which is consistent with circumstances of the firm (in our case, the risk-aversion level of shareholders). The traditional role of the board is to monitor the decisions of top management and especially of the CEO (Fama and Jensen,

1983). Our results are suggestive of the fact that, in the case of narcissism, this might be achieved through the compensation package.

In our empirical results, we find some evidence for the negative relationship between shareholder risk aversion and CEO narcissism. However, our results should be interpreted with some caution because they rely on the assumption that shareholders select into firms with a level of risk they find appropriate to their preferences, which enables us to proxy for shareholder risk attitude using firm idiosyncratic risk. A cleaner proxy for shareholder risk aversion would enable us to provide a more convincing test of Prediction 2.

Our paper documents that CEO narcissism is mean reverting. Based on this fact, our assignment model predicts a negative relation between CEO narcissism and narcissism mean reversion (Prediction 3). This prediction is very specific to our assignment model. Its empirical validation provides strong support for the idea that our model captures a relevant feature of the workings of the CEO job market. We are unable, at this stage, to provide a completely convincing explanation as to why we observe mean reversion in narcissism. It is tempting to speculate that it is because a significant part of narcissism is a fundamental, invariant personality trait. This is suggested by the stylized facts in section 5, in which core narcissism appears to represent 63.3% of total CEO narcissism. The interpretation would be consistent with the literature in psychology, according to which narcissism can be seen as composed of two parts. The stable part results from childhood experiences and from an individual's relationship with his/her parents (see e.g. Horton (2011) for a review of these studies). Narcissism can also be reinforced or attenuated according to context and life experiences (see, e.g., Finkel et al., 2009). Further research would be needed to fully address the question of the dynamics of CEO narcissism over time.

Finally, our results should not be interpreted as providing a normative tool for acting on the assignment of CEOs to firms. Even if it is intuitive to suppose that firms seek CEOs with a particular level of narcissism, our predictions rely on the equilibrium matching between CEOs and firms in an assignment model. This equilibrium is a steady state in which CEOs and firms select each other. Changing the conditions under which the matching takes place will generate a change in the equilibrium matching in directions that are hard to forecast. So, our empirical results must be understood as a validation of the fact that our assignment model captures some salient features of reality but not as a definitive causal relationship.

## 7.5 Robustness checks

One potential issue with the CEO narcissism variable lies in variations in the amount of material available to estimate the narcissism score. If the amount of material is correlated with the resulting narcissism variable, our results might be biased. To alleviate this concern, we neutralize the effect of the amount of available material by creating a new narcissism variable as the residuals of the regression of the CEO narcissism score on the number of characters in the material used to estimate the score. We then proceed as for the raw narcissism score. Untabulated results show that all coefficients are in the expected direction and significant, with the exception of model 3 in Table 5 (FE regression of narcissism on percentage compensation paid as a bonus, without control variables).

Our results for the bonus could also be affected by our choice of measure. We currently include the percentage of total compensation paid as a bonus as variable of interest in Table 5. There is a debate in the literature about whether incentive measures should be estimated in level or in percentage, depending on the form of the production function (see Edmans and Gabaix, 2015). We re-estimate the results in Table 5 using the dollar amount of the bonus. Our results (untabulated) are qualitatively unchanged, with the exception once again of model 3 (FE regression of narcissism on percentage compensation paid as a bonus, without control variables).

## 8. Conclusion

Narcissism is a personality trait which may be desirable in a CEO. Boards seek to hire a CEO whose characteristics reflect the needs of the firm at the time of hiring. Following Terviö (2008) and Gabaix and Landier (2008), we develop an assignment model where CEOs are characterized by their level of narcissism and firms by the degree of risk aversion of their shareholders. In our data, narcissism is mean reverting, which we model explicitly in our analysis of the CEO narcissism dynamic. Our main predictions are that (i) the bonus is positively related to contemporaneous narcissism and negatively related to future narcissism; (ii) there is a preferred level of CEO narcissism depending on the shareholders' risk aversion and (iii) a higher rate of narcissism mean reversion is positively associated with the level of narcissism.

We are able to provide some preliminary evidence for the predictions of our model thanks to our unique dataset. Using transcripts of CEO speech for the period 2003 – 2012, we are able to estimate a time-varying narcissism measure for the S&P 500 CEOs, covering around four fifths of the S&P 500 firms. The narcissism measure is continuous, consistent with psychology theory (Campbell and Foster, 2007) and is validated in the psychology literature (Raskin and Shaw, 1988). The measure is also exogenous to the CEO compensation package, unlike many alternatives.

Our main findings are as follows: (i) there is a positive contemporaneous relationship between CEO narcissism and bonus and a negative relationship between CEO narcissism and bonus of the preceding year; (ii) shareholders' risk aversion, approximated by the idiosyncratic risk of the firm, is positively associated with CEO narcissism; (iii) there is a positive relationship between the rate of mean reversion of narcissism and contemporaneous narcissism. All these results are in line with the assignment model predictions.

Although some CEOs with "big egos" receive a bad press, it seems reasonable to think that hiring narcissistic CEOs could be a rational strategy. Our assignment model relies on the CEO to shareholders risk aversion wedge to support such a rational matching equilibrium. Although more research is needed to establish just how good narcissists really are for firms, our assignment model opens the way to including CEO psychological characteristics in an entirely rational setup, with profit maximizing shareholders.

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## Appendix A: Variable Definitions

Variable	Definition
<b>Panel A: Narcissism variables</b>	
First Person Narcissism Indicator ( <i>FPNI</i> )	$\frac{\sum \text{First Person Singular Pronouns}_{i,t}}{\sum \text{First Person Singular Pronouns}_{i,t} + \sum \text{First Person Plural Pronouns}_{i,t}}$ First person singular and plural pronouns are extracted from transcripts of CEO speech during analyst calls (Lexis Nexis Academic database).
Residuals-based <i>FPNI</i>	The residuals of the following regression for each CEO: $\text{Narcissism score}_{i,t} = \alpha + \beta \text{ number characters}_{i,t} + \varepsilon$ The number of characters is extracted from transcripts of CEO speech during analyst calls (Lexis Nexis Academic database).
<b>Panel B: Compensation package</b>	
Salary (USD thousands)	Salary reported in the Execucomp database
Bonus (USD thousands)	Bonus reported in the Execucomp database
Bonus as a % of total compensation	Bonus reported in the Execucomp database divided by total compensation (TDC1) reported in the Execucomp database
Stock grants (USD thousands)	Stock grants reported in the Execucomp database
Option grants (USD thousands)	Stock option grants reported in the Execucomp database
Total compensation (USD thousands)	Total compensation (TDC1) reported in the Execucomp database
CEO pay slice (percent)	CEO total compensation as a percentage of the sum of the total compensation paid to the top five best-paid executives as reported in Execucomp
Exercisable (Unexercisable) option portfolio sensitivity to a 1% change in stock price	Estimated as in Core and Guay (2002), Appendix A for the exercisable (unexercisable) stock option portfolio.
Exercisable (Unexercisable) option portfolio sensitivity to a 0.01 change in stock-return volatility	Estimated as in Core and Guay (2002), Appendix A for the exercisable (unexercisable) stock option portfolio.
<b>Panel C: Firm-level governance</b>	
Percentage directors appointed during the CEO's tenure	Sum of the number of directors whose appointment dates provided by Riskmetrics occurred during the CEO's tenure as defined by Execucomp, divided by the total number of directors.
Percentage compensation committee members appointed during the CEO's tenure	Number of compensation committee members whose appointment dates provided by Riskmetrics occurred during the CEO's tenure as defined by Execucomp, divided by the total number of compensation committee members.
Percentage independent directors	Number of directors classified as independent by Execucomp divided by the total number of directors.
Dual CEO dummy	Dummy = 1 if the CEO is also chairman of the board, 0 otherwise.

<b>Variable</b>	<b>Definition</b>
<b>Panel D: CEO characteristics</b>	
% CEO ownership	Number of shares owned by the CEO as reported by Execucomp (in thousands) divided by the number of shares outstanding as reported in CRSP (in millions) / 1000
<b>Panel E: Firm-level controls</b>	
Total assets (USD Billion)	Total assets at fiscal year-end as reported by Compustat.
Return on assets (%)	EBITDA / total assets (Compustat)
Capital expenditure (USD Million)	Capital expenditures for the fiscal year as reported by Compustat.
Leverage (%)	Long term debt / Total assets (Compustat)
Financial services industry dummy	Dummy variable = 1 if the firm's 3-digit SIC code is between 600 and 699; 0 otherwise.
Firm HQ location dummy	Dummy variable = 1 if the firm's headquarters are located in New York City or the state of California; 0 otherwise.
High-tech firm dummy	Dummy = 1 if the firm is recognized as belonging to a high-tech industry according to the classification provided in Kile and Phillips (2009).
Idiosyncratic risk	The standard deviation of daily stock returns over the two previous years.

**Table 1****CEO cohort summary statistics**

Table 1 reports summary statistics by year for our CEO cohort.

Year	Number of CEOs	Mean market value of firms (USD Million)	Median market value of firms (USD Million)	% of the CRSP universe in sample (percentage of aggregate market value)
2003	256	13,519	6,594	24.71%
2004	302	18,090	8,601	34.91%
2005	356	20,240	9,414	43.89%
2006	383	21,966	11,181	45.78%
2007	313	26,028	14,688	43.28%
2008	416	16,124	6,846	58.39%
2009	422	18,946	8,519	53.97%
2010	411	21,237	10,704	51.73%
2011	414	21,671	10,386	55.18%
2012	408	25,077	11,284	56.04%
Mean	368	20,290	9,822	46.79%

**Table 2****CEO narcissism measure (First Person Narcissism Indicator - *FPNI*)**

CEO narcissism (*FPNI*) is estimated for 867 unique CEOs using 12,242 transcripts. The construction of the narcissism variables is described in section 4 of the paper. Panel A provides information on the number of characters per CEO-year in interviews used to estimate CEO narcissism. Panel B shows descriptive statistics for the raw *FPNI* narcissism measure. Panel C gives the same information for the residuals-based *FPNI* measure of CEO narcissism.

Year	Mean	Median	Minimum	Maximum	N
<b>Panel A: Number of characters in interviews</b>					
2003	37,472	33,696	2,624	109,648	256
2004	38,876	35,136	2,088	204,936	302
2005	39,974	36,960	1,424	229,508	356
2006	38,909	36,467	2,763	237,358	383
2007	40,885	40,512	4,029	94,554	313
2008	40,810	39,807	4,249	125,598	378
2009	41,496	39,654	6,272	131,716	387
2010	43,030	41,858	4,654	174,550	374
2011	42,589	41,454	1,142	150,618	381
2012	41,940	41,562	703	124,999	382
All years	40,598	38,711	703	237,358	3,512
<b>Panel B: CEO narcissism (<i>FPNI</i>)</b>					
2003	0.211	0.204	0.039	0.451	256
2004	0.216	0.212	0.010	0.625	302
2005	0.206	0.198	0.015	0.714	356
2006	0.202	0.192	0.026	0.463	383
2007	0.208	0.206	0.061	0.534	313
2008	0.196	0.189	0.046	0.521	378
2009	0.205	0.198	0.068	0.532	387
2010	0.202	0.190	0.056	0.489	374
2011	0.205	0.197	0.048	0.625	381
2012	0.197	0.190	0.000	0.571	382
All years	0.205	0.198	0.000	0.714	3,512
<b>Panel C: Residuals-based measure of CEO narcissism (<i>FPNI</i>)</b>					
2003	0.005	-0.003	-0.161	0.247	256
2004	0.009	-0.000	-0.190	0.431	302
2005	-0.001	-0.011	-0.181	0.521	356
2006	-0.005	-0.017	-0.168	0.253	383
2007	0.000	-0.005	-0.143	0.323	313
2008	-0.003	-0.012	-0.147	0.319	378
2009	0.006	-0.002	-0.129	0.339	387
2010	0.002	-0.009	-0.136	0.289	374
2011	0.005	-0.003	-0.151	0.436	381
2012	-0.003	-0.011	-0.190	0.383	382
All years	0.002	-0.007	-0.190	0.521	3,512

**Table 3****Stylized facts**

Table 3 reports stylized facts about the dynamics of the CEO narcissism *FPNI* measure over time and its relation with the CEO bonus. In Panel A, the dependent variable is the annual measure of CEO *FPNI*, regressed on CEO fixed effects, to decompose the time constant and the time varying components of *FPNI*. Panel B presents results for the regression of the first difference in *FPNI* on lagged first difference of *FPNI*. In Panel C, the dependent variable is the annual measure of CEO *FPNI*. The independent variable is the percentage of compensation paid as a bonus. Models 1 and 2 in panels B and C present ordinary least square (OLS) results with robust standard-errors and fixed effect (FE) results with CEO clustered standard-errors respectively. \*\*\* is for statistical significance at the 1% confidence level (\*\* at 5% and \* at 10%).

	Model 1	Model 2
Panel A – Dependent variable: CEO narcissism		
Constant		0.204
<i>Adjusted R</i> <sup>2</sup>		63.37%
<i>Number of observations</i>		3,512
Panel B – Dependent variable: first difference in CEO narcissism		
Constant	***0.000	***-0.000
One-year lagged narcissism	***-0.355	***-0.430
<i>F</i> -statistic	138.32	163.18
<i>Adjusted R</i> <sup>2</sup>	12.94%	0.42%
<i>Number of observations</i>	1,847	1,847
Panel C – Dependent variable: CEO narcissism		
Constant	***0.000	***0.000
Bonus as a % of total compensation	***0.055	**0.021
<i>F</i> -statistic	19.28	5.53
<i>Adjusted R</i> <sup>2</sup>	1.02%	
<i>Number of observations</i>	3,512	3,512

**Table 4****Descriptive statistics**

Table 4 presents descriptive statistics for all variables. Panel A gives details of the compensation package. Panel B provides details of firm-level governance variables. Panel C reports observable CEO characteristics. Panel D shows descriptive statistics for firm-level controls. Variable definitions are provided in appendix A. N is the number of CEO-firm-years in the sample.

Variable	Mean	Median	Standard deviation	Minimum	Maximum	N
<b>Panel A: Compensation package</b>						
Salary (USD thousands)	1,044.11	1,000	482.70	0.00	8,100	3,686
Bonus (USD thousands)	810.07	0.00	2,844.24	0.00	76,951	3,686
Bonus as a % of total compensation	8.05	0.00	14.63	0.00	100.00	3,686
Stock grant (USD thousands)	3,160.58	2,043.27	4,325.09	0.00	66,550	3,686
Option grant (USD thousands)	2,981.37	1,819.00	5,498.89	0.00	119,459	3,686
Total compensation (USD thousands)	10,083.39	7,943.71	9,188.47	0.00	134,458	3,686
CEO pay slice (percent)	40.64	41.63	10.70	0.00	88.26	3,339
Exercisable option portfolio sensitivity to a 1% change in stock price	0.37	0.33	0.37	0.00	6.66	2,860
Unexercisable option portfolio sensitivity to a 1% change in stock price	0.33	0.29	0.33	0.00	6.56	2,932
Exercisable option portfolio sensitivity to a 0.01 change in stock-return volatility	0.01	0.00	0.04	0.00	0.46	2,860
Unexercisable option portfolio sensitivity to a 0.01 change in stock-return volatility	0.01	0.00	0.05	0.00	0.72	2,932
<b>Panel B: Firm-level governance</b>						
Percentage directors appointed during the CEO's tenure	33.84	30.00	12.20	0.00	100.00	3,282
Percentage compensation committee members appointed during the CEO's tenure	34.41	25.00	11.52	0.00	100.00	2,884
Percentage independent directors	79.08	81.82	0.49	0.00	100.00	3,295
Dual CEO dummy	0.61	1.00	35.09	0.00	1.00	3,295
<b>Panel C: CEO characteristics</b>						
% CEO ownership	0.10	0.00	1.00	0.00	28.40	3,603
<b>Panel D: Firm characteristics</b>						
Total assets (USD Billion)	29.17	10.12	89.41	0.43	1,494.04	3,686
Return on assets (%)	15.08	14.18	8.58	-32.62	76.65	3,650
Capital expenditure (USD Million)	945.92	291.91	1,992.36	0.00	20,335.00	3,686
Leverage (%)	36.32	36.10	19.36	0.00	99.91	3,686
Financial services industry dummy	0.10	0.00	0.30	0.00	1.00	3,682
Firm HQ location dummy	0.20	0.00	0.40	0.00	1.00	3,686
High-tech firm dummy	0.27	0.00	0.44	0.00	1.00	3,686
Idiosyncratic risk	0.49	0.44	0.22	0.16	1.83	3,639

**Table 5****CEO narcissism and bonus compensation**

Table 5 provides results for the relation between the CEO *FPNI* narcissism measure and the bonus. In Panel A, the dependent variable is the annual measure of CEO *FPNI*. The independent variables is the Bonus as a % of total compensation. In models 2 and 4, we add a full set of control variables. Panel B presents results for the regression of the first difference in CEO *FPNI* on the one period lagged Bonus as a % of total compensation. In models 2 and 4, we add again a full set of control variables. Models 1 and 2 in panels A and B are estimated using the ordinary least square estimator (OLS) and statistical inference relies on robust standard-errors. Models 3 and 4 present fixed effects (FE) data panel estimator results, using standard-errors clustered at the CEO level for statistical inference. \*\*\* is for statistical significance at the 1% confidence level (\*\* at 5% and \* at 10%).

	Model 1	Model 2	Model 3	Model 4
Panel A – Dependent variable: Contemporaneous CEO narcissism				
Constant	***0.200	***0.155	***0.203	***0.188
Bonus as a % of total compensation	***0.055	***0.047	**0.021	*0.024
Total compensation		-0.000		0.000
Exercisable option portfolio sensitivity to a 1% change in stock price		0.005		-0.001
Unexercisable option portfolio sensitivity to a 1% change in stock price		0.010		-0.007
Exercisable option portfolio sensitivity to a 0.01 change in stock-return volatility		0.002		0.056
Unexercisable option portfolio sensitivity to a 0.01 change in stock-return volatility		0.010		0.012
Percentage independent directors		0.014		0.003
Percentage directors appointed during the CEO's tenure		-0.006		0.001
Percentage compensation committee members appointed during the CEO's tenure		0.014		0.006
Dual CEO dummy		-0.002		0.005
% CEO ownership		0.001		-0.002
CEO pay slice		***0.059		0.004
Leverage		-0.001		0.016
Total assets		0.000		0.000
Return on assets		-0.000		0.000
Capital expenditure		0.000		-0.000
High-tech firm dummy		***0.016		-0.004
Financial services industry dummy		***0.015		0.019
Firm HQ location dummy		***0.013		
<i>F</i> -statistic	35.42	3.968	4.21	0.71
Adjusted <i>R</i> <sup>2</sup>	0.01	0.03	0.63	0.63
Number of observations	3,512	1,879	3,512	1,879

	Model 1	Model 2	Model 3	Model 4
Panel B – Dependent variable: first difference in future CEO narcissism				
Constant	0.002	0.014	**0.003	-0.025
Bonus as a % of total compensation	***-0.027	***-0.028	***-0.044	** -0.043
Total compensation		-0.000		-0.000
Exercisable option portfolio sensitivity to a 1% change in stock price		0.004		0.006
Unexercisable option portfolio sensitivity to a 1% change in stock price		-0.002		0.020
Exercisable option portfolio sensitivity to a 0.01 change in stock-return volatility		**0.080		*0.095
Unexercisable option portfolio sensitivity to a 0.01 change in stock-return volatility		** -0.084		** -0.183
Percentage independent directors		*-0.025		0.017
Percentage directors appointed during the CEO's tenure		*0.183		0.018
Percentage compensation committee members appointed during the CEO's tenure		-0.010		-0.018
Dual CEO dummy		-0.003		-0.000
% CEO ownership		0.001		0.002
CEO pay slice		0.019		0.037
Leverage		-0.013		-0.014
Total assets		**0.000		0.000
Return on assets		0.000		*0.001
Capital expenditure		*0.000		0.000
High-tech firm dummy		-0.002		-0.000
Financial services industry dummy		-0.002		-0.026
Firm HQ location dummy		-0.005		
<i>F-statistic</i>	10.59	1.85	9.12	1.49
<i>Adjusted R<sup>2</sup></i>	0.00	0.01	-0.12	-0.18
<i>Number of observations</i>	2,585	1,614	2,585	1,614

**Table 6****CEO narcissism and shareholder risk aversion**

Table 6 provides results for the relationship between CEO *FPNI* narcissism measure and shareholder risk aversion, proxied by firm idiosyncratic risk. The dependent variable is the annual measure of CEO narcissism *FPNI*. The independent variable is firm idiosyncratic risk. In models 2 and 4, we add a full set of control variables. Models 1 and 2 are estimated using the ordinary least square estimator (OLS) and statistical inference relies on robust standard-errors. Models 3 and 4 present fixed effects (FE) data panel estimator results, using standard-errors clustered at the CEO level for statistical inference. \*\*\* is for statistical significance at the 1% confidence level (\*\* at 5% and \* at 10%).

Dependent variable: CEO narcissism	Model 1	Model 2	Model 3	Model 4
Constant	***0.200	***0.161	***0.197	***0.184
Firm idiosyncratic risk	0.008	***0.024	*0.014	*0.025
Total compensation		-0.000		-0.000
Exercisable option portfolio sensitivity to a 1% change in stock price		0.007		0.000
Unexercisable option portfolio sensitivity to a 1% change in stock price		0.010		-0.007
Exercisable option portfolio sensitivity to a 0.01 change in stock-return volatility		0.004		0.053
Unexercisable option portfolio sensitivity to a 0.01 change in stock-return volatility		0.013		0.012
Percentage independent directors		0.003		-0.001
Percentage directors appointed during the CEO's tenure		-0.008		-0.003
Percentage compensation committee members appointed during the CEO's tenure		0.013		0.06
Dual CEO dummy		0.000		0.005
% CEO ownership		-0.001		-0.002
CEO pay slice		***0.056		0.000
Leverage		-0.009		0.010
Total assets		**0.000		0.000
Return on assets		-0.000		0.000
Capital expenditure		0.000		-0.000
High-tech firm dummy		***0.014		-0.003
Financial services industry dummy		**0.016		0.020
Firm HQ location dummy		**0.012		
<i>F-statistic</i>	1.85	3.76	3.57	0.69
<i>Adjusted R<sup>2</sup></i>	0.00	0.02	0.63	0.63
<i>Number of observations</i>	3,470	1,879	3,470	1,879

**Table 7****Mean-reversion of CEO narcissism**

Table 7 provides results for the mean reversion of CEO narcissism. The dependent variable is the annual *FPNI* measure of CEO narcissism. The independent variable is the AR(1) coefficient from the first stage order one autoregressive model of CEO *FPNI* (see section 7.1). In model 2, we add a full set of control variables. Models 1 and 2 are estimated using the ordinary least square estimator (OLS) and statistical inference relies on robust standard-errors. \*\*\* is for statistical significance at the 1% confidence level (\*\* at 5% and \* at 10%)..

Dependent variable: CEO narcissism	Model 1	Model 2
Constant	***0.206	***0.166
AR(1) coefficient	***0.001	*0.001
Total compensation		-0.000
Exercisable option portfolio sensitivity to a 1% change in stock price		-0.000
Unexercisable option portfolio sensitivity to a 1% change in stock price		0.015
Exercisable option portfolio sensitivity to a 0.01 change in stock-return volatility		0.003
Unexercisable option portfolio sensitivity to a 0.01 change in stock-return volatility		-0.018
Percentage independent directors		0.020
Percentage directors appointed during the CEO's tenure		-0.009
Percentage compensation committee members appointed during the CEO's tenure		0.014
Dual CEO dummy		-0.000
% CEO ownership		-0.002
CEO pay slice		**0.049
Leverage		-0.005
Total assets		0.000
Return on assets		** -0.001
Capital expenditure		0.000
High-tech firm dummy		***0.016
Financial services industry dummy		0.013
Firm HQ location dummy		***0.013
<i>F</i> -statistic	13.34	3.25
Adjusted <i>R</i> <sup>2</sup>	0.00	0.02
Number of observations	2,721	1,578