Association for Information Systems
AIS Electronic Library (AISeL)

CONF-IRM 2018 Proceedings

International Conference on Information Resources Management (CONF-IRM)

5-2018

Mining Linguistic Clues From Social Network: Impact of CEO Personality on Business Performance

Shichao Wang
Zhejiang University, wangshichao@zju.edu.cn

Xi Chen
Zhejiang University, chen_xi@zju.edu.cn

MINING LINGUISTIC CLUES FROM SOCIAL NETWORK: IMPACT OF CEO PERSONALITY ON BUSINESS PERFORMANCE

Shichao Wang
Zhejiang University
wangshichao@zju.edu.cn

Xi Chen
Zhejiang University
chen_xi@zju.edu.cn

Abstract:

Researchers in strategic management and organizational theory have demonstrated that executives explain a non-trivial proportion of organizational performance variance. Upper echelons theory further informs us what and why top managers' characteristics affect organizational performance. As the leader of executives, CEO often has a disproportionate, sometimes dominating, influence on his or her firm. However, limited research has studied the impact of CEOs' comprehensive personality on business performance. We capture linguistic clues CEOs leaving on social network to recognize their personality by a text mining approach. Meanwhile, we adopt a broader conceptualization of the construct space of business performance and measure it by both financial and operational indicators. The impact of each aspect of CEOs' personality on business performance is then estimated. Interesting results are found and conceivable explanations are proposed.

Keywords:

Upper Echelons Theory, CEO Personality, Personality Recognition, Business Performance

1. Introduction

The choice of a chief executive officer (CEO) is a crucial decision for an organization since CEO will exert great influence on organizational strategies and performance. And concluded by upper echelons theory (Hambrick and Mason, 1984), it's the psychological and observable characteristics of a CEO that significantly influence his or her decision and the organizational performance. So, as one of the major psychological characteristics, CEOs' personality has been investigated by strategic management researchers to demonstrate its impact on organizational strategies and performance (e.g. Hiller and Hambrick, 2005; Chatterjee and Hambrick, 2007).

However, few research has investigated the impact of CEOs' personality in a comprehensive view (Nadkarni and Herrmann (2010) was an exception). Extant research focuses more on special trait of personality seen in CEOs often, such as hubris (Hiller and Hambrick, 2005; Tang et al., 2015) and narcissistic (Chatterjee and Hambrick, 2007). But from a comprehensive view, personality comprises multiple dimensions and all dimensions take effect simultaneously when CEOs make decisions. So, we adopt Big Five model (Norman, 1963; Peabody and Goldberg, 1989; Goldberg, 1990), which is the most accepted framework describing personality, to capture every dimension of CEOs' personality as well as their impact on organizational performance.

One main challenge that restrains researchers from investigating the impact of CEOs' personality comprehensively is the difficulty in obtaining data about CEOs' personality. CEOs of public oganizations tend to be unwilling to respond to questionnaires about their personality, and

responses may suffer from social desirability bias (Tourangeau and Yan, 2007). One promising and practical alternative approach is to use unobtrusive indicators, e.g. Chatterjee and Hambrick (2007) leveraged the prominence of the CEO's photograph in the company's annual report, the CEO's prominence in the company's press releases, etc. to measure CEO's level of narcissism; Tang et al. (2015) adopted a media-based measure of CEO hubris with data collected from business press coverage. Nevertheless, when we aim to measure personality in a comprehensive way, the mentioned kinds of unobtrusive measure failed since the lack of and difficulty in manually defining an appropriate criterion to measure full aspects of personality uniformly. Fortunately, this digital era provides us the possibility to recognize CEOs' personality automatically through data mining or machine learning techniques based on the behavior they generated on the Internet which often leaks clues of their personality. Specifically, we crawled CEOs' social network homepages to obtain their textual posts and then adopted the SVM model trained by Mairesse et al., (2007) to automatically recognize CEOs' personality using linguistic features extracted from text. This approach allows us to measure all five dimensions of CEOs' personality based on the same feature set.

On the performance side, extant research has studied the impact of executives' characteristics on organizational strategic choices (e.g. Hayward and Hambrick, 1997), absolute level of organizational performance (e.g. Nadkarni and Herrmann, 2010) and variation of organizational performance (e.g. Chatterjee and Hambrick, 2007;). However, the performance studied mostly are financial performance. Venkatraman and Ramanujam (1986) has already advocated of adopting a broader conceptualization of the construct space of business performance in strategic management studies. They concluded that it provides a more comprehensive operationalization of business performance if it's viewed in terms of both financial and operational indicators. Therefore, in our research, we intend to investigate the overall impact of CEOs' personality on both financial and operational performance. Specifically, we choose three categories of business performance-cost efficiency, productivity and profitability (Jiang et al., 2006; Smith et al., 1998). To our knowledge, we are the first research to investigate executive characteristics' impact on operational performance.

Combining 40 CEOs' personality data with business performance indicators of corresponding firms during their tenure, we test what aspects of CEO personality affect firm business performance and in which direction. Interesting and consistent results are found, and then explanations are given.

We contribute the research stream on the methodological, theoretical and practical side: 1. We introduce a text mining approach based on public data to measure executives' personality, which may inspire researchers in related fields to make more innovative use of user digital foot print in this big data era; 2. We contribute to upper echelons perspective by demonstrating how and why CEOs' personality affects business performance in a comprehensive way; 3. Our research provides basis for board of directors to evaluate CEO candidates from a personality perspective.

2. Theoretical Background

Initiated by Lieberson and O'Connor (1972), there was a debate on whether leadership makes a difference to organizational performance among researchers in strategic management and organizational theory in 1970s~1980s. "Individualist" views of organizational leadership considered that leaders have a significant and possibly great impact on performance of the organizations they lead, but "contextualists" emphasized the constrains placed on leaders by situational factors (Pfeffer and Salancik, 1978). Relative studies in this period found that between about 5% and 20% of variance in performance is due to CEO effects (in some cases explaining as much as 50%) (Thomas, 1988). After much debate, Thomas (1988) indicated that the impact of leaders on differences between firms can be trivial because it will be determined largely by the characteristics of firms, but the impact of leaders within firms is crucial if we control the company influences. In other words, leaderships do matters at least within firms. Meanwhile, research also showed that leaders can have much different magnitude of impact on different measures of performance, which is one of the reasons we adopt a broader conceptualization of the construct space of business performance.

But the rationale underlying the effect was not systematically understood until Hambrick and Mason set up upper echelons theory in 1984 (Finkelstein and Hambrick, 1996; Hambrick and Mason, 1984). The theory suggests that psychological and observable attributes (e.g. age, education, career experience) of CEOs influence their strategic choices and organizational performance, through a three-stage process—defining a field of vision, selective perception, and interpretation (Hambrick and Mason, 1984). Upper echelons theory provides theoretical basis for our research. Extant research within the framework of upper echelons theory can be classified into four categories: (1) Impact of executives' characteristics on organizational choices, such as culture, strategy, structure (e.g. Tang et al., 2014; Chatterjee and Hambrick, 2007); (2) Impact of executives' characteristics on organizational performance mediated by organizational choice (e.g. Nadkarni and Herrmann, 2010); (3) Impact of executives' characteristics on organizational performance (e.g. Chatterjee and Hambrick, 2007; Hirshleifer, et al., 2012); (4) The moderating role played by contextual variables in the relationship of executives' characteristics and organizational performance (e.g. Nadkarni and Narayanan, 2007; Hambrick and Abrahamson, 1995). Our study contributes to the third stream.

Studies about personality and personality recognition are also related to our research. We adopt Big Five model (Norman, 1963; Peabody and Goldberg, 1989; Goldberg, 1990) as the construct to measure personality in that it presents current orthodoxy in personality assessment and provides a robust, comprehensive way of understanding personality differences. Using Big Five model also caters to the recent calls to use comprehensive and valid psychological frameworks to investigate the relationships between CEOs' personality and firm performance (Nadkarni and Herrmann, 2010).

Traditional measures of personality are questionnaire-based. Nadkarni and Herrmann (2010) adopted a 60-item revised NEO Five-Factor Inventory (Costa and McCrae, 1992) to measure personality in the framework of Big Five model. The very brief measure of the Big-Five personality proposed by Gosling et al. (2003) is also well used because of its convenience. As we

mentioned before, there are also some unobtrusive measures of personality, like leveraging the CEOs' prominence in the company's press releases to measure CEO's level of narcissism (Chatterjee and Hambrick, 2007), seeking out news articles that mention focal CEOs and then counting the total number of times they were described by terms suggesting confidence or conservatism to measure level of hubris (Malmendier and Tate, 2008; Tang et al., 2015). More intellectually, researchers in AI have been attempting to recognize personality automatically, especially through linguistic cues since it has been proved that utterances convey a great deal of information about the speaker in addition to their semantic content (Pennebaker and King, 1999; Mehl et al., 2006; Fast and Funder, 2007). A typical study for personality recognition is the one made by Mairesse et al. (2007) that trained predictive models for recognition of all Big Five personality traits, in both conversation and text, utilizing both self and observer ratings of personality. Results show that the models perform well. Inspired by these unobtrusive measures, we consider leveraging the digital footprint leaved by CEOs on the Internet to find clues about their personality. One of the fastest growing and most popular applications in this digital era is the social network where individual users maintain their social connections and sharing their experiences or opinions online. And there are already some empirical evidences demonstrating that social network use is related to users' personality (Eftekhar et al., 2014; Amichai-Hamburger and Vinitzky, 2010). Therefore it's possible both theoretically and technologically to extract CEOs' personality from the text posted on the social network by CEOs. And we think the text from social network reflects CEOs' utterance more effectively than text such as CEOs' speeches or interviews, because social network posts are more free and independent for CEOs express themselves.

3. Methodology

3.1 Data

We first acquired the list of S&P 500 companies, and then visited the official website of each company. For those publicly owned companies, information about leadership will be displayed thoroughly and updated timely for the purpose of information disclosure to stakeholders. Information about leadership displayed on an official website typically consist of (1) Full name of leaders; (2) Leaders' positions currently hold in the company; (3) Leaders' briefly education and working experiences; (4) Leaders' photographs. Thus, the CEO of a company will be easily recognized. We then search the combination of each CEO's name and the corresponding company name on Facebook and Twitter. The keywords for single CEO include: company name and CEO's full name; company name and CEO's last name; company name and CEO's first name; CEO's full name. Results are filtered by (1) comparing profile picture or photos uploaded to social network with CEO's photograph on official website; (2) comparing education and/or work experiences disclosed on social network with officially described education and/or work experiences. After this manual and time-consuming process, 71 CEOs are found on Facebook or Twitter or both.

The next step is to crawl the text that CEOs posted on Facebook and Twitter. For Facebook, we use the selenium module in Python to overcome the dynamic loading problem. For twitter, we utilized the REST APIs provided by twitter to request post data for each CEO. To make personality recognition reliability, we filtered out CEOs who posted less than 100 words on social network. Finally, we have 40 CEOs from 40 distinct companies in our sample.

Yearly business performance and other industry-level, firm-level and individual-level control variables within CEO's tenure are all collected from ExecuComp database. We filter out 8 observations whose focal year is earlier than 2000. Because the market may has changed significantly after 2000 and observations before 2000 are too sparse which may bias the estimation of time fixed effect. Combining CEOs' personality and firm business performance, we finally have 210 firm-year observations in our sample.

3.2 Measures

3.2.1 CEO Personality

We measured personality comprehensively within the framework of Big Five model (Norman, 1963; Peabody and Goldberg, 1989; Goldberg, 1990). Specifically, Big Five model assesses personality in the following five dimensions:

(1) Extraversion vs. Introversion (sociable, assertive, playful vs. aloof, reserved, shy);
(2) Emotional stability vs. Neuroticism (calm, unemotional vs. insecure, anxious);
(3) Agreeableness vs. Disagreeable (friendly, cooperative vs. antagonistic, faultfinding);
(4) Conscientiousness vs. Unconscientious (self-disciplined, organised vs. inefficient, careless);
(5) Openness to experience (intellectual, insightful vs. shallow, unimaginative).

Mairesse et al. (2007) trained predictive models for recognition of all Big Five personality traits, on both conversation and written text. They released their trained models on the Internet (http://farm2.user.srcf.net/research/personality/recognizer.html). Along with the main package, dictionaries needed for feature extraction are also provided. The two dictionaries used are: (1) Linguistic Inquiry and Word Count (LIWC) by Pennebaker and King (1999), which extracts 88 linguistic features such as "anger words", "inclusive words", "family members" etc. from text. (2) MRC Psycholinguistic database (Coltheart, 1981), which gives scores for words on 14 features such as "imagery of words", "concreteness", "frequency of use" etc. based on statistics for over 150,000 words. The program first extracts linguistic features and corresponding scores on features from text based on LIWC and MRC dictionary, then trained models are loaded to give scores between 1.0 to 7.0 (low to high) on all five traits of personality. We choose Support Vector Machine with Linear Kernel (SMOreg) model to perform personality recognition from text in that SMOreg was proved in experiments that performs best on the task of extracting self-report personality from written text.

All text posted by a CEO was aggregated to one text file for personality recognition. Thus, our measure of CEOs' personality was invariant, reflecting the view that personality is a relatively stable disposition.

3.2.2 Business Performance

Smith et al. (1998) derive a set of performance metrics to study pre-outsourcing firm characteristics. They group the firm performance metrics into six categories: cost efficiency, productivity, profitability, growth, cash management, and market ratios. Following Jiang et al., (2006), we use three out of these six performance metrics categories: cost efficiency, productivity, and profitability. Specifically, business performance is measured as following.

Cost efficiency:

(1) Selling, general and administrative expenses (SG&A) / Sales

(2) Cost of goods sold (COGS) + SG&A /Sales

Productivity:

(1) Assets turnover: Sales/Assets.

(2) PPE turnover: Sales/Property, Plant, and Equipment (fixed assets). Assets turnover and PPE turnover both measure the efficiency of a company's use of its assets in generating sales revenue to the company.

(3) Inventory turnover: Sales/Inventory. A low turnover rate may point to overstocking, obsolescence, or deficiencies in the product line or marketing effort.

(4) Employee productivity: Sales/Number of employees, which measure the efficiency of a company's use of its employees in generating sales revenue to the company.

Profitability:

(1) Return on assets: Income Before Extraordinary expenses (IBE) / Assets

(2) Net profit margin: Income Before Extraordinary expenses (IBE) / Sales

We collected each item from the second (t+1) to the last year of CEO's tenure where t is the year CEO being appointed. If CEO is still in his position when we collected data, i.e. 2015, then we set the timeframe end to the year of 2015.

3.2.3 Control Variables

Following Chatterjee and Hambrick (2007), we controlled for potentially confounding factors at three levels: the CEO, the firm, and the industry. It should be noticed that t+n ($n \geq 1$) is the focal firm year.

(1) CEO controls: Because the tendency to engage in firm affairs may vary with age or tenure, we controlled for CEO age t+n–1 and CEO tenure t+n–1.

(2) Firm controls: Because large and relatively small firms may face different bureaucratic momentum and CEOs may have different strength of power in firms with different size, we

controlled for firm size (natural logarithm of revenues in year t+n–1). For the possibility that a given firm may have strategy or performance tendencies, we included, for each dependent variable, its value for the firm in the year prior to the start of the CEO's tenure (t – 1). We also included a binary indicator of whether the firm had a COO or president other than the CEO in year t+n, to eliminate their impact on business performance.

(3) Industry controls: We controlled for the industry's central tendencies for each of our dependent variables by including the industry average (for all firms in the same industry, always excluding the focal firm) in each year (t + n), for each dependent variable.
Besides, we controlled time fixed effect using calendar year.

3.3 Model Specification and Estimation

Combining all the variables we discussed before in a linear specification, we derive the following model for estimation,

$$BP_{t+n} = \alpha + \beta_1 BP_{t-1} + \beta_2 FirmSize_{t+n-1} + \beta_3 HasCooOrPres_{t+n} + \beta_4 Personality + \beta_5 CEOAge_{t+n-1} + \beta_6 CEOTenure_{t+n-1} + \beta_7 Year + \beta_8 BPIndMean_{t+n} + \varepsilon$$

where *BP* stands for variables measuring business performance, and *BPIndMean* means industry average business performance excluding the focal firm. We also replace $BPIndMean_{t+n}$ with $BPIndMean_{t+n-1}$ (not excluding the focal firm) in the model so that it can be used for prediction, and the results are qualitatively.

As for estimation, because the firms in our sample are not from a same industry or in same size thus may exist heterogeneity among them, we first test heteroscedasticity between groups using a Wald Test proposed by Greene (2000). And we also test autocorrelation within groups using another Wald Test developed by Wooldridge (2002). The results demonstrate that there are significant heteroscedasticity and AR1 autocorrelation in our panel data. Therefore, we fit our models using Generalized Least Squares (GLS) estimation for panel-data models and account for group-wise heteroscedasticity and panel-specific AR1 autocorrelation.

3.4 Results

Table 1 and Table 2 presents the descriptive statistics for CEOs' personality scores and other main variables respectively. Table 3 shows estimation results.

From table 3, we can see that CEO's extraversion is positively related to cost efficiency. One feasible explanation is that extraverted CEOs are more sociable, which helps them build broad and diverse networks of social relationships. As a result, extraverted CEOs are accessible to more outer resources which are of benefit to reducing cost incurred to their own companies. Empirically, CEO's high level of extraversion also improves employee productivity. It can be a result of they being more talkative, warm, enthusiastic and optimistic. Talkativeness makes them more willing to communicate with employees and employees are likely to be encouraged by

CEO's warmth, enthusiasm and optimism. The two features of extraverted CEOs mentioned above are also two main reasons that they can raise firm profitability. Another reason is that extraverted CEOs are optimistic and energetic, which helps them keep calm and make right decisions when faced with high stress. However, extraverted CEOs' optimism may overestimate the market circumstance. Meanwhile extraverted CEOs are more ambitious. As a consequence, they may invest superfluously in firm assets, which leads to low assets turnover and PPE turnover. Follow the same logic, we may expect a lower inventory turnover in a firm with extraverted CEO, but the empirical results showed there is no significant relationship between them. We think it's because inventory management is a more rational procedure with advanced ERP developed nowadays. It's in conformity with the empirical results show in table 3 that none of the personality traits has significant impact on inventory turnover.

As for emotional stability, the empirical results are more consistent and demonstrate that emotional stability is definitely a positive personality trait. The reason is intuitive: neurotic CEOs (low in emotional stability) experience chronic negative affects and are prone to suffer nervous tension, depression, frustration and guilt, so that such CEOs are difficult to get along with, unable to face high stress and tend to make decisions with irrational thinking. These features do harms to almost every aspect of a company.

The empirical results for agreeableness are almost same as that of extraversion. CEOs with high agreeableness are more friendly and cooperative. As a result, they are more likely to have a broader social relationship since they are easy to get along with, and they will care more about their employees. Following the logic explaining the impact of extraversion, agreeableness's positive impacts on cost efficiency, profitability and employee productivity can be explained. But such CEOs' kindness and altruism may be "used" by others, such as suppliers, cooperative partner and other related companies. So, they are more likely to be persuaded to invest in unnecessary assets, resulting in lower PPE turnover.

The most interesting and counter-intuitive empirical results come from the impacts of CEO's conscientiousness and openness to experience. Conscientiousness is defined as self-disciplined, organized, strong-willed, dependable and achievement oriented, while openness to experience is defined as intellectual, curious, insightful, creative, unconventional and artistic. Intuitively, these two traits should be "good" characteristics. However, empirical results show that their impacts on business performance indicators are mostly negative. Conscientious CEOs lead to low cost efficiency. Following the logic proposed above, a conceivable reason is that conscientious CEOs prefer taking responsibilities on their own. Therefore, the rarely seek others for a favor. Thus, most cost will be taken by their own company. Besides, they avoid taking actions that deviate significantly from their past experience and they need concrete feedback on actions. Consequently, they are not able to response to market change immediately and cut off wrong

strategies soon after negative signs showing. These behaviors can incur low cost efficiency and profitability of a firm. But on the other hand, these helps the firm make full use of extant assets to achieve higher assets turnover.

As for openness to experience, it's the only trait that have no significant impact on cost efficiency. This result also follows the logic we proposed above, because openness to experience is less related to social relationship or responsibility taking. And the negative impact on assets turnover can be explained in the way just opposite to that we use to explain why conscientious CEOs improve assets turnover, i.e. open CEOs may change their strategy frequently, reducing the efficiency of assets usage. This is also one of the feasible reasons that CEOs' openness to experience leads to lower profitability. Another reason is that they are more likely to make decision irrationally, because their unconventional and artistic mind makes them rely less on past experience. But employees led by CEOs who are more creative and imaginative may be more open-minded and can solve problems in more efficient ways.

Generally speaking, extraversion, emotional stability and agreeableness seems to be "good" characteristics, while conscientiousness and openness to experience tend to be "bad" characteristics.

VARIABLES	N	mean	sd	min	max
extraversion	40	4.830	0.391	4.045	5.854
emotionalstability	40	3.925	0.540	3.160	5.287
agreeableness	40	4.666	0.288	3.515	5.139
conscientiousness	40	4.789	0.257	3.985	5.193
opennesstoexperience	40	4.654	0.398	4.006	5.472

Table 1: Descriptive statistics for CEOs' personality scores.

VARIABLES	N	mean	sd	min	max
SGA/Sales	210	0.305	0.228	0	0.823
Opexp/Sales	210	0.709	0.243	0	0.982
AssetsTurnover	210	0.756	0.58	0.0187	2.914
PPETurnover	210	8.197	7.983	0.798	61.38
InventoryTurnover	210	44.09	221.8	0	2,824
EmployeeProductivity	210	421	275.5	106.2	2,057
ReturnOnAssets	210	0.0614	0.061	-0.427	0.237
NetProfitMargin	210	0.12	0.156	-0.857	1.629
FirmSize	210	29,599	44,856	497.1	182,795
HasCooOrPres	210	0.333	0.473	0	1
CEOTenure	210	4.567	4.639	0	22
CEOAge	210	50.8	5.909	36	67

Table 2: Descriptive statistics for other main variables.

4. Discussion and Conclusion

This research studies the impact of CEO's personality on firm business performance in a comprehensive way. It answers two questions within the framework of upper echelons theory (Hambrick and Mason, 1984): what dimensions of CEO personality affect firm business performance and in which direction. Empirical results are consistent and interesting.

Besides, to the best of our knowledge, this research is also the first one introducing a text mining

approach to measure executives' personality in the field of upper echelons theory. It's also the first time that CEOs' social network behaviors are observed to recognize CEOs' personality. These two novel approaches may inspire researchers in related fields to make more innovative use of user digital foot print in this big data era.

	Cost Efficiency		Productivity				Profitability	
VARIABLES	SGA/Sales	Opexp/Sales	AssetsTurnover	PPETurnover	InventoryTurnover	EmployeeProductivity	ReturnOnAssets	NetProfitMargin
OP_{t-1}	0.926***	0.690***	1.023***	0.759***	0.797***	1.091***	0.283***	0.808***
	(0.0326)	(0.0424)	(0.0473)	(0.0336)	(0.278)	(0.0166)	(0.0219)	(0.0383)
$FirmSize_{t-n-1}$	0.00687**	0.000808	-0.0356***	-0.420***	-5.278	-3.430**	-0.00341**	-0.00676*
	(0.00283)	(0.00347)	(0.00771)	(0.107)	(10.26)	(1.554)	(0.00157)	(0.00349)
$HasCooOrPres_{t+n}$	-0.00485	0.0127	0.0474**	0.123	1.478	-13.70***	-0.00413	-0.000133
	(0.00361)	(0.00879)	(0.0227)	(0.208)	(8.367)	(4.259)	(0.00384)	(0.00458)
Extraversion	-0.0687***	-0.104***	-0.161**	-2.620***	-15.76	25.14**	0.0476***	0.0338*
	(0.0160)	(0.0211)	(0.0692)	(0.682)	(31.98)	(11.15)	(0.00847)	(0.0197)
EmotionalStability	-0.0260**	-0.0106	-0.00211	2.302***	12.97	64.00***	0.0156**	0.0504***
	(0.0115)	(0.0170)	(0.0298)	(0.543)	(27.84)	(4.829)	(0.00642)	(0.0141)
Agreeableness	-0.103***	-0.129***	-0.123	-1.910**	24.56	32.87*	0.0857***	0.0769*
	(0.0262)	(0.0348)	(0.0929)	(0.972)	(57.63)	(17.81)	(0.0182)	(0.0407)
Conscientiousness	0.128***	0.192***	0.327***	-0.0594	10.68	-0.475	-0.139***	-0.117***
	(0.0221)	(0.0408)	(0.0837)	(1.154)	(45.06)	(15.76)	(0.0168)	(0.0234)
OpennessToExperience	0.0106	0.0152	-0.238***	0.545	-5.786	32.23***	-0.0384***	-0.0472***
	(0.0130)	(0.0172)	(0.0718)	(0.637)	(33.62)	(9.195)	(0.00783)	(0.0176)
$CEOAge_{t-n-1}$	-0.00492***	-0.00351***	0.00484	-0.00499	-0.735	-0.705	0.00322***	0.00451***
	(0.000777)	(0.00125)	(0.00383)	(0.0423)	(2.239)	(0.690)	(0.000402)	(0.00116)
$CEOTenure_{t-n-1}$	0.00674***	0.00584***	-0.0143***	-0.231***	-3.268	8.954***	-0.00419***	0.000603
	(0.00117)	(0.00197)	(0.00340)	(0.0613)	(3.499)	(0.634)	(0.000698)	(0.00136)
Year	7.52e-05	0.00414**	0.00269	0.113**	-0.168	-0.321***	0.000303	-0.00493***
	(0.000993)	(0.00162)	(0.00422)	(0.0538)	(3.065)	(0.0774)	(0.000555)	(0.00181)
$OPIndMean_{t+n}$	0.000217	5.69e-05	0.0126	0.00115	0.0541	-0.00857*	0.000578**	-0.000243
	(0.000281)	(0.000238)	(0.0170)	(0.00602)	(0.0838)	(0.00455)	(0.000281)	(0.000148)
Constant	0.297	-7.768**	-4.399	-210.9*	320.2	0	-0.518	9.845***
	(2.028)	(3.274)	(8.437)	(110.6)	(6,188)	(0)	(1.097)	(3.717)
Observations	203	203	203	203	203	203	203	203
Number of Groups	33	33	33	33	33	33	33	33

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3: Estimation results

However, there still exist some limitations that can serve as future research directions. First, the model we used for personality recognition is initially trained on essays. People may have different written styles when posting text on social network. Therefore, it would be better to demonstrate the validity of the model in text posted online. Second, the explanation about the results is not theoretically organized. This is a difficult work in that CEOs make a plenty of decisions and all these decisions may affect business performance. But our research at least demonstrates the existence and the direction of the overall effect.

5. Acknowledgement

This work is supported by the National Natural Science Foundation of China (Nos. 91546107) and Zhejiang Natural Science Foundation (Nos. LR16G020001). The authors are grateful to the editor and reviewers for their invaluable and insightful comments that have greatly helped to improve this work.

References

Amichai-Hamburger Y, Vinitzky G. Social network use and personality[J]. Computers in human behavior, 2010, 26(6): 1289-1295.

Chatterjee A, Hambrick D C. It's all about me: Narcissistic chief executive officers and their effects on company strategy and performance[J]. Administrative Science Quarterly, 2007, 52(3): 351-386.

Costa P T, McCrae R R. Four ways five factors are basic[J]. Personality and individual differences, 1992, 13(6): 653-665.

Eftekhar A, Fullwood C, Morris N. Capturing personality from Facebook photos and photo-related activities: How much exposure do you need?[J]. Computers in Human Behavior, 2014, 37: 162-170.

Fast L A, Funder D C. Personality as manifest in word use: correlations with self-report, acquaintance report, and behavior[J]. Journal of personality and social psychology, 2008, 94(2): 334.

Finkelstein S, Hambrick D C, Cannella A. Strategic leadership[J]. St. Paul: West Educational Publishing, 1996.

Goldberg L R. An alternative" description of personality": the big-five factor structure[J]. Journal of personality and social psychology, 1990, 59(6): 1216.

Gosling S D, Rentfrow P J, Swann W B. A very brief measure of the Big-Five personality domains[J]. Journal of Research in personality, 2003, 37(6): 504-528.

Hambrick D C, Abrahamson E. Assessing managerial discretion across industries: A multimethod approach[J]. Academy of Management Journal, 1995, 38(5): 1427-1441.

Hambrick D C, Mason P A. Upper echelons: The organization as a reflection of its top managers[J]. Academy of management review, 1984, 9(2): 193-206.

Hambrick D C. Top management groups: A conceptual integration and reconsideration of the team label. In BM Staw & LL Cummings (Eds.), Research in organizational behavior, Vol. 16: 171-214. Greenwich, CT: JAI[J]. 1994.

Hayward M L A, Hambrick D C. Explaining the premiums paid for large acquisitions: Evidence of CEO hubris[J]. Administrative Science Quarterly, 1997: 103-127.

Hiller N J, Hambrick D C. Conceptualizing executive hubris: the role of (hyper-) core self-evaluations in strategic decision-making[J]. Strategic Management Journal, 2005, 26(4): 297-319.

Hirshleifer D, Low A, Teoh S H. Are overconfident CEOs better innovators?[J]. The Journal of Finance, 2012, 67(4): 1457-1498.

Iaquinto A L, Fredrickson J W. Top management team agreement about the strategic decision process: A test of some of its determinants and consequences[J]. Strategic Management Journal, 1997: 63-75.

Jensen M, Zajac E J. Corporate elites and corporate strategy: How demographic preferences and structural position shape the scope of the firm[J]. Strategic Management Journal, 2004, 25(6): 507-524.

Jiang B, Frazier G V, Prater E L. Outsourcing effects on firms' operational performance: An empirical study[J]. International Journal of Operations & Production Management, 2006, 26(12): 1280-1300.

Lieberson S, O'Connor J F. Leadership and organizational performance: A study of large corporations[J]. American sociological review, 1972: 117-130.

Mairesse F, Walker M A, Mehl M R, et al. Using linguistic cues for the automatic recognition of personality in conversation and text[J]. Journal of artificial intelligence research, 2007, 30: 457-500.

Malmendier U, Tate G. Who makes acquisitions? CEO overconfidence and the market's reaction[J]. Journal of financial Economics, 2008, 89(1): 20-43.

Mehl M R, Gosling S D, Pennebaker J W. Personality in its natural habitat: manifestations and implicit folk theories of personality in daily life[J]. Journal of personality and social psychology, 2006, 90(5): 862.

Nadkarni S, Herrmann P O L. CEO personality, strategic flexibility, and firm performance: The case of the Indian business process outsourcing industry[J]. Academy of Management Journal, 2010, 53(5): 1050-1073.

Nadkarni S, Narayanan VK. Strategic schemas, strategic flexibility, and firm performance: The moderating role of industry clockspeed. Strategic management journal. 2007 Mar 1;28(3):243-70.

Norman W T. Toward an adequate taxonomy of personality attributes: Replicated factor structure in peer nomination personality ratings[J]. The Journal of Abnormal and Social Psychology, 1963, 66(6): 574.

Peabody D, Goldberg L R. Some determinants of factor structures from personality-trait descriptors[J]. Journal of personality and social psychology, 1989, 57(3): 552.

Pennebaker J W, King L A. Linguistic styles: language use as an individual difference[J]. Journal of personality and social psychology, 1999, 77(6): 1296.

Pfeffer J, Salancik G R. The external control of organisations[J]. New York, 1978, 175.

Smith M A, Mitra S, Narasimhan S. Information systems outsourcing: a study of pre-event firm characteristics[J]. Journal of Management Information Systems, 1998, 15(2): 61-93.

Tang Y, Qian C, Chen G, et al. How CEO hubris affects corporate social (ir) responsibility[J]. Strategic Management Journal, 2015, 36(9): 1338-1357.

Thomas A B. Does leadership make a difference to organizational performance?[J]. Administrative Science Quarterly, 1988: 388-400.

Tourangeau R, Yan T. Sensitive questions in surveys[J]. Psychological bulletin, 2007, 133(5): 859.
Venkatraman N, Ramanujam V. Measurement of Business Performance in Strategy Research: A Comparison of Approaches[J]. Academy of Management Review, 1986, 11(4): 801-814.