




CEO Hubris and Firm Pollution: A Tricky Relationship

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Abstract

This article comments on the recent study “CEO hubris and firm pollution: state and market contingencies in a transitional economy” of Zhang et al. (*J Bus Ethics* 161(2):459–478, 2020) in this journal. We very much appreciate the valuable initiative of Zhang et al. to study the potential effect of CEO characteristics on corporate pollution. At the same time, we are concerned with the authors’ interpretation of the regression results and their operationalization of CEO hubris. We hope to contribute to the literature on managerial hubris in two ways. First, we repair the authors’ inferences and conclusions about the actual effect of CEO hubris on firm pollution with respect to their conflicting regression results. Second, we unpack and clarify the authors’ vulnerable operationalization of CEO hubris. We hope to stimulate more research on (1) the (tricky) relationship between CEO hubris and firm pollution, and (2) managerial hubris more generally through a more rigorous operationalization and measurement of hubris.

Keywords CEO hubris · Firm pollution · Operationalization of CEO hubris · Measurement of CEO hubris

Introduction

In their recent article “CEO Hubris and Firm Pollution: State and Market Contingencies in a Transitional Economy,” Zhang et al. (2020) in this journal study the effect of CEO hubris on firm pollution in China. They conclude that “CEO hubris significantly leads to more firm pollution” (2020, p. 474). Because firm pollution bears severe negative consequences (e.g., Heft-Neal et al. 2018; Li et al. 2019; Waller 2018), their study is highly relevant and worth noting carefully (e.g., Jia et al. 2016; Li and Zhou 2017). Drawing on the author’s regression analyses (see their Tables 4, 5, and 6), however, we question their central conclusion and the inferences made. In the remainder of this commentary, we revisit the author’s research framework, regression results,

and operationalization of hubris. We wish to inspire more research (Mishina et al. 2010) on the relationship between CEO hubris (e.g., Hiller and Hambrick 2005) and unethical or illegal behavior in organizations (e.g., Graffin et al. 2013).

Hypothesized Relationship Between CEO Hubris and Firm Pollution

Drawing on existing literature, Zhang et al. (2020) propose their first and central Hypothesis 1 on page 462: “CEO hubris is positively related to firm pollution.” Hence, their research framework (see their Fig. 1) includes one independent variable, i.e., CEO hubris, and one dependent variable, i.e., firm pollution. They develop three additional hypotheses, which are concerned with three proposed moderating variables (see their Fig. 1): state ownership (Hypothesis 2), political connection (Hypothesis 3), and industrial competition (Hypothesis 4). Because each of these three hypotheses (2, 3, and 4) refers back to the proposed “positive relationship between CEO hubris and firm pollution” (Zhang et al. 2020, pp. 463, 464), we focus on their central Hypothesis 1 in the following.

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Regression Results

Zhang et al. (2020, p. 465) employ two operationalizations of CEO hubris: a “media-based evaluation method” (see their Tables 4 and 5) and a “salary-based evaluation method” (see their Table 6). Because the authors split the media-based evaluation method into a continuous measure (see their Table 4) and an ordered categorical measure (see their Table 5), the two operationalizations of CEO hubris ultimately yield three measures of CEO hubris in their study. CEO hubris is included in the following regression models: in Models 2 to 4, in Models 6 to 8, and in Models 10 to 12.¹ The continuous media-based measure is Zhang et al.’s (2020) choice to measure CEO hubris in Models 2 to 4 (see their Table 4). The authors use the other two measures of CEO hubris in their robustness tests as an alternative to their continuous media-based measure. The ordered categorical media-based measure is Zhang et al.’s (2020) choice to measure CEO hubris in their first robustness test in Models 6 to 8 (see their Table 5). The salary-based measure is Zhang et al.’s (2020) choice to measure CEO hubris in their second robustness test in Models 10 to 12 (see their Table 6). As a consequence, Zhang et al. (2020) test their research hypotheses with multiple regression models and present three clusters of regression results in separate tables.

In total, Zhang et al. (2020) draw three inferences with regard to their Hypothesis 1 in their results section. First, the authors state the following on page 468:

“As shown in Table 4, hubris is positively and significantly associated with firm pollution ($\beta = 0.220$, $t = 2.625$) in Model 2. The results suggest that firms with hubristic CEOs are associated with more frequent pollution. In terms of economic significance, the coefficient estimate of 0.220 for CEO hubris in Model 2 of Table 4 suggests that one standard deviation (0.456, see Table 3) increase in hubris above the mean will increase firm pollution by 0.10 (0.220×0.456). Taking the mean firm pollution in our sample as the benchmark (0.644, see Table 3), the magnitude of this increase is substantial, about 15.5% ($0.01/0.644$). These data support Hypothesis 1, which predicted that CEO hubris is positively associated with firm pollution.”²

Second and in terms of their first robustness test, Zhang et al. (2020, p. 470) infer: “As shown in Models 6–8, the results are similar to our previous ones, indicating that the hypotheses are robust to alternative measurements of CEO

hubris.” Third and in terms of their second robustness test, Zhang et al. (2020, p. 471) again infer: “As shown in Table 6, the results are still similar to previous ones.”

We argue that the authors’ first inference appears to be incomplete and that the authors’ second and third inference appear to be incorrect. In contrast to Zhang et al. (2020, p. 474), we infer from their regression results that, most importantly, both robustness tests (see their Tables 5 and 6) do not provide support for their central Hypothesis 1 and that the main regression (see their Table 4) provides less support for their central Hypothesis 1 than is claimed on page 468. Hence, we question and wish to rectify their conclusion that the “results showed that CEO hubris significantly leads to more firm pollution” (Zhang et al. 2020, p. 474; see Aksinaite et al. 2019, p. 2). Next, we will address each of our three concerns and ultimately present our conclusion.

Concern 1

The regression coefficient, i.e., the effect size, and the p -value, indicating its significance, of CEO hubris in Model 3 are lower than in Model 2 (see their Table 4). The regression coefficient of CEO hubris is lower by 14.55% [$(0.188-0.220)/0.220$]. The p -value of CEO hubris is lower by 12.38% [$(2.300-2.625)/2.625$], which causes the p -value to change from $p < 0.01$ (***) to $p < 0.05$ (**). Zhang et al. (2020) on page 468 only refer to Model 2 in their evaluation of Hypothesis 1. Which of the two regression models is better suited to assess Hypothesis 1? Model 3 differs from Model 2 in that it includes the three institutional variables—i.e., state ownership, political connection, and industrial competition—as independent variables in the regression analysis. Bearing in mind that CEO hubris is the only independent variable in the authors’ research framework (see their Fig. 1), Model 3 controls for these three institutional variables. Because CEO hubris does not affect these institutional variables, Model 3 does not bear any disadvantage from controlling for the three institutional variables. In fact, Model 3 alleviates concerns about omitted variable bias (Stock and Watson 2015). Building on Zhang et al.’s (2020, pp. 462–464) development of Hypotheses 2 to 4, the institutional environment has not only the potential to moderate the effect of CEO hubris on firm pollution but also to affect firm pollution directly. Indeed, state ownership is significantly negatively ($***p < 0.01$) related to firm pollution in Model 3 ($\beta = -0.358$, $t = -2.989$), Model 7 ($\beta = -0.368$, $t = -3.068$), and Model 11 ($\beta = -0.360$, $t = -2.982$). At the same time, the institutional environment can be correlated to CEO hubris: for example, the correlation between industrial competition and CEO hubris is minus 0.102 and marginally significant ($*p < 0.1$) (see their Table 3). Because Model 2 does not control for the institutional variables, it is thus susceptible to omitted variable bias (Stock and Watson

¹ Note that Models 5 and 9 are identical with Model 1.

² There is a small typo on page 468 (Zhang et al. 2020): instead of “15.5% (0.01/0.644)” it should correctly read ‘15.5% (0.10/0.644)’.

2015). To sum up, Model 3 is better suited than Model 2 to evaluate Hypothesis 1. Correspondingly, Models 7 and 11 are better suited than Models 6 and 10, respectively, to evaluate Hypothesis 1. To follow Zhang et al.'s (2020) line of argumentation, we focus on Models 6 and 10 in the next two paragraphs (Concern 2 and 3). Our claims in these paragraphs are, however, robust in terms of switching to Models 7 and 11.

Concern 2

The first robustness test of Zhang et al. (2020) does not provide support for their central Hypothesis 1. As indicated above, the authors use the regression results of Model 2 (main regression test) to argue that CEO hubris has a significant positive effect on firm pollution. Zhang et al. (2020) are, however, silent on Model 6 from their first robustness test (see their Table 5), which differs from Model 2 only in the measurement of CEO hubris. In Model 6, CEO hubris is no longer measured continuously but measured by the media-based ordered categorical proxy. Importantly, the CEO hubris measure of Models 6 to 8 is thereby identical with the main measure of Tang et al. (2015a, b), which adds to the credibility of Models 6 to 8. In contrast to Model 2, CEO hubris in Model 6 is negatively, yet not significantly, associated with firm pollution ($\beta = -0.0601$, $t = -0.822$). In contrast to Model 2, the null hypothesis that CEO hubris has no effect on firm pollution ($\beta = 0$) cannot be rejected. In contrast to Model 2, Model 6 even hints at a negative effect of CEO hubris on firm pollution. In light of such differences, we are concerned about Zhang et al.'s (2020, p. 470) statement that “[a]s shown in Models 6–8, the results are similar to our previous ones, indicating that the hypotheses are robust to alternative measurements of CEO hubris.” To sum up, Model 6 of the first robustness test questions the reliability of the results of Model 2 for assessing Hypothesis 1. In this regard, the first robustness test fails to provide robustness.

Concern 3

The second robustness test of Zhang et al. (2020) does also not provide support for their central Hypothesis 1. Zhang et al. (2020) are silent on Model 10 (see their Table 6), which differs from Models 2 and 6 only in the measurement of CEO hubris. In Model 10, CEO hubris is no longer measured by the media-based proxy but instead by the salary-based proxy to again “ensure the reliability of the results” (Zhang et al. 2020, p. 469). In contrast to Model 2, CEO hubris in Model 10 is not significantly associated with firm pollution ($\beta = 0.338$, $t = 0.947$). Once again, the null hypothesis that CEO hubris has no effect on firm pollution ($\beta = 0$) cannot be rejected. In light of such differences, we are

concerned about Zhang et al.'s (2020, p. 471) statement that “[a]s shown in Table 6, the results are still similar to previous ones.” To sum up, Model 10 of the second robustness test also questions the reliability of the results of Model 2 for assessing Hypothesis 1. In this regard, the second robustness test fails to provide robustness, too.

After all, do the regression results support Zhang et al.'s (2020) central Hypothesis 1? In conclusion, Zhang et al. (2020, p. 462) do not provide convincing regression results on their hypothesized relationship that “CEO hubris is positively related to firm pollution” (see Akstinaite et al. 2019, p. 2). This underlines the importance of considering the main test and the two “robustness tests” (Zhang et al. 2020, p. 469) carefully, which did not provide robustness regarding the evaluation of the authors' central Hypothesis 1. As outlined by Chen, Crossland, and Luo (2015, p. 1521), it is crucial to “ensure that the findings in [a] study are not being driven by the idiosyncrasies of any specific measure.” For now, the null hypothesis that CEO hubris has no effect on firm pollution ($\beta = 0$) still seems to hold, so that more research is necessary to explore the truly intriguing relationship between CEO hubris and firm pollution including moderating and mediating variables.

Operationalization of CEO Hubris

We agree with Zhang et al. (2020, p. 465) that one of the “key issues” in their study is to operationalize CEO hubris. Roll (1986) introduced the concept of managerial hubris to explain value-destroying corporate takeovers. Hayward and Hambrick (1997, p. 106) started conceptualizing managerial hubris and used people's everyday understanding of it, i.e., “exaggerated pride or self-confidence.” On the one hand, later publications in the literature repeated Hayward and Hambrick's (1997) preliminary conceptualization and did not improve it such as Li and Tang (2010) or Tang et al. (2018). On the other hand, Hiller and Hambrick (2005) developed it further and still provide the most rigorous and in-depth conceptualization of executive hubris. They conceptualized it as “hyper-core self-evaluation” (hyper-CSE) comprising four dimensions (Hiller and Hambrick 2005, p. 297): self-esteem, self-efficacy, locus of control, and emotional stability (Judge et al. 2002). In this regard, Hiller and Hambrick (2005, pp. 297, 298) summarized the field's progress: “A chief obstacle has been the absence of any rigorous conceptual apparatus for conducting such inquiries. The few attempts to explore executive self-potency have invoked an array of disconnected concepts, including [...] colloquial concepts that, despite intuitive appeal, lack rigorous psychological and methodological grounding (hubris) (Hayward and Hambrick 1997).” In terms of the resulting measurement (see Li and Tang 2010, p. 63), the following

two exemplary studies provided promising multi-dimensional operationalizations of managerial hubris. To begin with, Park et al. (2018, pp. 925, 926) employed a three-part operationalization that comprised media praise, award records, and vocabulary in CEO letters. A “composite measure of CEO hubris [was derived] from factor analysis of the three hubris indicators” (Park et al. 2018, p. 926). Second, Arena, Michelon, and Trojanowski (2018, p. 324) employed a three-part operationalization that comprised relative compensation, photo in annual report, and a media-based indicator of confidence. Arena et al. (2018, p. 324) stated: “We improve upon previous studies and combine some of the most widespread metrics for CEO hubris. Specifically, we obtain our summary measure of CEO hubris through a principal component analysis of the three proxies.” McManus (2018, p. 177) employed two additional potentially promising proxies, i.e., length of biography and being a founding member of the firm, which could also be used to construct multi-dimensional operationalizations of managerial hubris. Zhang et al. (2020) employ two, only one-dimensional, operationalizations of CEO hubris: a media-based and a salary-based evaluation method. Due to the critical importance of how Zhang et al. (2020) measure the study’s independent variable, we revisit and clarify their two operationalizations of CEO hubris next (Suddaby 2010).

First, the authors’ media-based evaluation method uses CEO press coverage and was introduced by Malmendier and Tate (2008) to study the effect of CEO overconfidence on corporate merger decisions. In the meantime, this proxy for overconfidence has been adopted by other studies, too (e.g., Chen et al. 2015; Hirshleifer et al. 2012). Hence, it is important to clarify that Zhang et al.’s (2020) first operationalization of CEO hubris measures overconfidence, which is “the overestimation of outcomes related to own abilities (such as IQ or managerial skills)” (Malmendier and Tate 2008, p. 22).³ While (finance) scholars, such as Malmendier and Tate (2008), often used the term ‘hubris’ as a synonym for ‘overconfidence’ (Tang et al. 2018), Hiller and Hambrick’s (2005) conceptualization of executive hubris for management literature differentiates between hubris and overconfidence. Hubris is a psychological trait (orientation), whereas overconfidence is a cognitive bias (Tang et al. 2018; see Li and Tang 2010, pp. 45, 46). Overconfidence accounts for only one part of managerial hubris and corresponds with a very high level of self-efficacy, which is one of hubris’ four dimensions (Hiller and Hambrick 2005). Relatedly, Zhang et al. (2020) misstate the titles of four articles (Brown and Sarma 2007; Chen et al. 2015; Hribar and Yang 2016;

Malmendier and Tate 2008) from their methodology and results sections in their reference list. Each time the authors replace ‘overconfidence’ in the original title by ‘hubris’ in their referenced title. For example: Instead of “Who makes acquisitions? CEO overconfidence and the market’s reaction” (Malmendier and Tate 2008, p. 20), Zhang et al. (2020, p. 477) state “Who makes acquisitions? CEO hubris and the market’s reaction.” We ask for a thorough use of the related, yet distinct, terms of hubris and overconfidence.

Second, the authors’ salary-based evaluation method uses CEO relative compensation data to develop a proxy for executive hubris. Zhang et al. (2020, pp. 470, 471) state: “Following Jiang et al. (2011), we used the salary of the CEO divided by the salary of the top three executives as a proxy for CEO hubris.”⁴ Hayward and Hambrick (1997, p. 114) in their seminal paper on executive hubris and corporate acquisitions explained that “CEO relative compensation [is] a measure of CEO self-importance.” They calculated CEO relative compensation very similarly to Zhang et al. (2020) as “CEO cash compensation divided by the compensation of the second-highest-paid officer” (Hayward and Hambrick 1997, p. 114). Importantly, self-importance accounts for only one part of managerial hubris and corresponds with a very high level of self-esteem, which is one of hubris’ four dimensions (Hiller and Hambrick 2005). In addition, Zhang et al.’s (2020) salary-based proxy also forms a part of Chatterjee and Hambrick’s (2007, p. 363) five-item proxy for CEO narcissism. More specifically, Zhang et al.’s (2020) salary-based proxy corresponds conceptually with the last two items of Chatterjee and Hambrick’s (2007, p. 363) proxy for CEO narcissism: “(4) the CEO’s cash compensation divided by that of the second-highest paid executive in the firm; and (5) the CEO’s non-cash compensation divided by that of the second-highest-paid executive in the firm.” Importantly, Tang et al. (2018) in their analysis of the different effects of narcissism versus hubris in the context of corporate social responsibility (CSR) found a positive effect of CEO narcissism on CSR and a negative effect of CEO hubris on CSR. Hence, the overlap of the salary-based proxy of Zhang et al. (2020) with Chatterjee and Hambrick’s (2007) proxy for CEO narcissism (potentially) helps to explain why the regression coefficient of the central independent variable in Model 6, “CEO hubris” (Zhang et al. 2020, p. 472), is no longer statistically significant in contrast to Model 2 (see their Tables 4 and 5).

To sum up, Zhang et al.’s (2020) salary-based operationalization of CEO hubris is conceptually distinct from their

³ Optimism, by contrast, is “the overestimation of exogenous outcomes (such as the growth of the US economy)” (Malmendier and Tate 2008, p. 22).

⁴ As a side note, Jiang et al. (2011, p. 492) themselves use the term ‘overconfidence’ instead of hubris to explain their measure: “we use the CEO’s relative salary as the second measure of managerial overconfidence.”

media-based operationalization of CEO hubris: self-importance (very high levels of self-esteem) versus overconfidence (very high levels of self-efficacy). Hence, each of the two operationalizations of Zhang et al. (2020) measure only one, albeit important, dimension of the four dimensions of CEO hubris (Hiller and Hambrick 2005). Both operationalizations of CEO hubris neglect high levels of emotional stability and locus of control (Hiller and Hambrick 2005, p. 300). As a consequence, it is especially fruitful to analyze and compare the respective regression results (see our last section above).

Final Remarks

Starting with Roll (1986), several studies have raised awareness for the concept of managerial hubris (e.g., Haynes et al. 2015; Hayward et al. 2006; Tang et al. 2015a, b). In this commentary on the recent article “CEO Hubris and Firm Pollution: State and Market Contingencies in a Transitional Economy” of Zhang et al. (2020) in this journal, we hope to contribute to the literature on managerial hubris in two ways. First, we repair the authors’ inferences and conclusions about the actual effect of CEO hubris on firm pollution with respect to their conflicting regression results. Second, we unpack and clarify the authors’ vulnerable operationalization of CEO hubris. On a separate note, we wish to highlight that Zhang et al. (2020) discover—but do not mention—a significant correlation between CEO hubris and CEO duality (see Li and Tang 2010, p. 54) as well as a marginally significant correlation between CEO hubris and industrial competition (see their Table 3). These correlations provide promising, yet tentative, hunches for our emerging understanding of antecedents and effects of CEO hubris (Picone et al. 2014). We hope that our commentary will inspire more research on the (tricky) relationship between CEO hubris and firm pollution, and managerial hubris more generally. We thank Zhang and colleagues for stimulating this important conversation.

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Compliance with Ethical Standards

Conflict of interest All authors declare that they have no conflicts of interest.

Ethical Approval This article does not contain any studies with human participants or animals performed by any of the authors.

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