

Predicting counterproductive work behavior with narrow personality traits: A nuanced examination using quantile regression

Abstract

Conditional means models such as linear regression is a conventional method that researchers regularly employ to examine relationships between personality traits and counterproductive work behavior. However, this method has several shortcomings limiting its utility. Quantile regression analysis better accounts for many of these limitations. This study investigates narrow personality traits as predictors of counterproductive workplace behavior using quantile methods with 952 working adults. Results show that quantile regression analysis provides a more nuanced representation of the relationship that personality traits have with counterproductive workplace behavior. We demonstrate that the conditional mean (i.e., regression coefficient) observed with standard ordinary least squares regression overestimates regression parameters at low levels of counterproductive work behavior, and underestimates it at high levels. The findings from this study suggest that reliance on conditional means models for the prediction of CWB may have resulted in an incomplete understanding and under appreciation of personality's actual value for the prediction of workplace deviance.

Keywords: conditional means modeling, quantile regression, linear regression, counterproductive work behaviour, workplace deviance, personality, trait

1. Introduction

Applied researchers regularly investigate relationships between psychological variables and real world outcomes using linear regression, however this method may yield results that are not optimally informative. For instance, organizational scholars typically investigate relationships between individual difference variables of personality and job performance, job satisfaction, organizational citizenship, and counterproductive work behavior (CWB), using linear regression and other forms of conditional means modeling. These methods all yield a single statistic that serves to describe the complete relationship between variables. While these methods have been useful to expand research in many disciplines, it has a number of limitations that prevents a comprehensive understanding of the relationship between predictor and outcome variables (Hao & Naiman, 2007; Petcher, Logan, & Zhou, 2013).

Quantile regression analysis is a method that overcomes many of these limitations and allows for more nuanced examinations between predictor and response variables. The purpose of this study is to examine the relationship between several narrow personality traits and CWB using quantile regression analysis, and to contribute new insights to this field of applied research. The aim is not to fully explicate quantile analysis, but to demonstrate its utility in applied research of this type.

In what follows we will briefly describe the limitations of traditional linear regression and then proceed to analyze the relationship between several narrow personality traits and CWB. In the process, we will show how our capacity to understand and advance theory, along with our ability to develop predictive models is being constrained by our reliance on conditional means modeling, and how it could be enriched using quantile methods.

1.1. Conditional means modeling and quantile analysis

Both the utility and drawback of traditional linear regression is that it seeks to model and fit a conditional mean function, which, in essence, examines the average degree to which variable

X relates to variable Y (Petscher et al., 2013). This is valuable seeing as many of the analytic techniques that scholars employ with great success including ANOVA, hierarchical regression analysis, multilevel analysis and structural equation modeling, are all forms of conditional means modeling (Petscher et al., 2013).

Conditional means modeling nevertheless has several important weaknesses limiting its utility. Most important is that it cannot be used at non-central locations where the interests of social scientists often lie (Hao & Naiman 2007; Li, 2015). According to Li (2015, p. 77) linear regression models can

only produce interesting summary statistics of a covariate, and cannot depict its full distributional impact unless the variable has the same effect on both the central and tail. Because it uses only the grand mean for interpretation, the model can only give an incomplete regression picture

This stands in contrast with the natural inclinations of applied researchers to understand how changing values of the predictors might impact on the underlying distributional shape of the response variable (Hao & Naiman, 2007). For instance, when researchers are interested in the predictive relationship between personality and CWB, we are presumably trying to understand what is going on at the high end rather than the low end of the counterproductive distribution.

However, conditional means models do not allow for such nuanced examinations, since an assumption of these models is that the relationship between the predictor and outcome variable is equally strong across the entire distribution. Thus, we tend to assume that there are no slope differences in the regression line. For instance, when aggression is thought to be predictive of CWB, it is likely that this relationship will be at its most meaningful at high levels of aggression, and conversely, that low levels of aggression might have little predictive value. Unfortunately, conditional means modeling does not accommodate such

differential relations. This means that we cannot investigate relationships among variables where we expect them to be most interesting. Neither can we compare those areas on the distribution where we expect relationships to be weak and strong with one another. Although such theoretical conjectures might exist in the minds of researchers, they are not modelled explicitly using conditional means models. This is a substantial constraint on our ability to develop and test comprehensive theories (Petscher et al., 2013).

While it is of course, possible to divide an outcome variable into smaller chunks and to investigate them separately, the tacit assumption by researchers using conditional means models is, arguably, that this is unnecessary because there is a known linear relationship. While this might be true in many instances, the relationship might not be equally linear across the entire distribution and in this sense, obscure important variations given that results from conditional means do not generalize well to non-central locations (Li, 2015).

Another important shortcoming of conditional means modeling is that real world data on outcome variables often violate required assumptions such as normally distributed residuals and homoscedasticity (Cohen, Cohen, West & Aitken, 2003). Thus, methods based on conditional means modeling do not deal well with non-normal distributions. This is particularly relevant to research on CWB, which typically suffers from excessive positive skew in our experience.

Quantile regression is particularly well-suited to investigate relationships between heavy-tailed outcome variables and their predictors (Li, 2015). Most important however, is that quantile analysis facilitates nuanced examination of associations among variables, and as such, better accounts for the shortcomings of conditional means modeling (Koenker & Bassett, 1978; Li, 2015; Petcher & Logan, 2014). According to Hao and Naiman (2007), this method has gained popularity among researchers in several fields of study, most notably in economics, but also in other fields including sociology, ecological sciences and medicine.

While quantile regression is not a new idea (Koenker & Basset, 1978), it has yet to be incorporated in mainstream psychological research, barring few exceptions such as developmental psychology (Petcher & Logan, 2014).

1.2. Personality and counterproductive work behavior

A vast literature has empirically linked CWB to broad and narrow traits of personality. The degree to which the dimensions of the Five Factor Model (FFM; John, Naumann, & Soto, 2008; McCrae & Costa, 1990) is directly related to CWB is especially well researched. Meta-analytic and other large sample studies have found consistent, meaningful associations for Conscientiousness, Agreeableness and Neuroticism with overall, interpersonal and organizational forms of CWB (Salgado, 2002; Dalal, 2005; Sackett, Berry, Wiemann & Laczko, 2006; Chang & Smithkrai, 2010; Berry, Ones & Sackett, 2007), as well as more specific CWBs such as absenteeism (Salgado, 2002), turnover (Salgado, 2002; Zimmerman, 2008) and accident involvement (Clarke & Robinson, 2005; Salgado, 2002). Weak to negligible correlations have largely been observed for Extraversion and Openness to Experience across a range of CWBs (Salgado, Moscoso & Anderson, 2013).

Several narrow personality traits have also been found to be related to a range of CWBs. These traits include Locus of Control (Fox & Spector, 1999), Trait Anger (Fox & Spector, 1999; O'Brien & Allen, 2008), Negative and Positive Affect (Crede, Chernryshenko, Stara, Dlala, Bashshur, 2007; Kaplan, Bradley, Luchman, & Hayes, 2010), Self-Esteem (Chang & Smithkrai, 2010), Manipulation, Risk-Taking, and Egotism (O'Neill & Hastings, 2011).

Thus, there is ample evidence that broad and narrow personality traits are meaningfully associated with CWB. However, in most previous research the relationship between personality and CWB was investigated with correlations (including the meta-

analyses) and various forms of conditional means modeling (i.e., O'Neill & Hastings, 2011). However, such single statistics may not adequately represent more complex relationships.

1.3. Present study

In this study, we focus on the relationship between several narrow personality traits and CWB. In contrast to previous research of this type, we make use of quantile regression analysis, which allows for examinations beyond the conditional mean to include non-central locations, with particular interest in the upper tail.

2. Method

2.1 Participants

Participants were 952 working adults ranging between 18 and 78 years of age (mean = 35, SD = 12). The sample comprised of 384 (40.3%) men and 491 (51.65) women, with 77 participants not indicating their gender. The ethnic distribution was 405 (42.5%) Black/African; 259 (27.2%) White; 99 (10.4%) mixed origin; 94 (9.8%) Indian and 11 (1.2%) Asian, with 84 (8.8%) participants opting not to answer the question.

2.2 Instruments

Personality variables were measured with the Work-related Risk and Integrity Scale (WRISc; van Zyl & de Bruin, 2017), a personality based integrity measure that contains 81 statements to which participants respond on a 5-point Likert scale: Strongly Disagree = 1, Disagree = 2; Somewhat agree/Somewhat disagree = 3; Agree = 4; Strongly Agree = 5. The WRISc measures 12 universal narrow personality traits namely: Aggression, Low Effortful Control, Negative Affect, Callous Affect, Impulsivity, Locus of Control (external), Manipulation, Egotism, Pessimism, Risk-Taking, Rule-Defiance and Cynicism. In previous research, these traits were identified as salient narrow attributes related to CWB. The constructs were subsequently operationalized and empirically evaluated, culminating in the WRISc (for more on the theoretical background and psychometric properties, see van Zyl, 2016; and van Zyl &

de Bruin, 2017). Important to note, is that all scales are scored in the direction such that high scores are associated with higher CWB. Hence, the following scales were reverse scored: Effortful Control (to low Effortful Control), Optimism (to Pessimism), Impulse Control (to Impulsivity), and Locus of Control (to external Locus of Control). Example items include 'Dangerous activities excite me' (Risk-Taking); 'To achieve success, you have to know influential people' (Locus of Control); I often feel sad for no apparent reason (Negative Affect). Scale scores were obtained by summing item scores.

CWB was measured using the counterproductive work behaviour checklist (CWB-C; Spector, Fox, Penney, Bruusema, Goh, & Kessler 2004). This questionnaire contains 45 items. It asks of participants to indicate the frequency with which they engage in different types of CWB, by selecting one of the following five response categories: Never =1; Once or twice =2; Once or twice per month = 3; Once or twice per week = 4; or Everyday = 5. Total CWB scores are obtained by summing the item responses.

3. Results

Zero-order correlation coefficients between the all the personality variables of the study are displayed in Table 1. Cronbach's alpha reliability coefficients are displayed on the diagonal. Correlations ranged from small to large, with most falling somewhere in between.

Table 1
Zero-order correlations and Cronbach's alpha reliabilities

	Aggression	Low Effortful Control	Negative Affect	External locus of Control	Cynicism	Impulsivity	Manipulation	Pessimism (low Optimism)	Risk-Taking	Rule-Defiance	Egotism	Callous Affect	CWB
Aggression	0.87												
Low Effortful Control	.245**	0.86											
Negative Affect	.271**	0.06	0.85										
Locus of Control (ext)	.227**	0.06	.617**	0.80									
Cynicism	.181**	-0.05	.438**	.338**	0.74								
Impulsivity	.253**	.080*	.566**	.550**	.383**	0.85							
Manipulation	.444**	.230**	.174**	.228**	.266**	.253**	0.81						
Pessimism	.297**	.489**	.183**	.147**	0.00	.115**	.234**	0.85					
Risk-Taking	.224**	-0.02	0.02	0.06	.089**	.149**	.256**	-.112**	0.88				
Rule-Defiance	.386**	.114**	.150**	.188**	.199**	.272**	.435**	0.03	.449**	0.79			
Egotism	-0.03	-.442**	-.070*	0.02	.121**	0.04	.095**	-.483**	.266**	.229**	0.85		
Callous Affect	.198**	.304**	-0.01	0.04	-0.01	0.03	.277**	.354**	0.03	.097**	-.239**	0.78	
CWB	.397**	.279**	.096**	.087*	.137**	.137**	.464**	.245**	.199**	.324**	0.00	.228**	0.88

Note. CWB=Counterproductive work behavior; Cronbach's alpha reliability coefficients are displayed on the diagonal

** Correlation significant at the 0.01 level

* Correlation significant at the 0.05 level

3.1. OLS regression analysis

Results of simple linear regressions for each personality trait predicting CWB is presented in Table 2. Unstandardized ordinary least squares coefficients are displayed in the table, along with adjusted R-square goodness of fit measures for each model. With the exception of Egotism, each trait was found to be a statistically significant predictor of CWB.

Table 2

Simple OLS regression parameters for the prediction of CWB

Scale	F-statistic	df	B	Adjusted R ²
Manipulation	239.44	875	1.36***	.212
Aggression	163.7	873	1.05***	.157
Effortful Control (low)	73.88	875	0.89***	.077
Negative Affect	8.11	866	0.22**	.008
Callous Affect	48.50	887	0.84***	.051
Impulsivity	16.64	874	0.35***	.017
Locus of Control (external)	6.66	867	0.24*	.006
Egotism	0.00	874	-0.00	-.001
Pessimism	56.14	881	0.81***	.059
Risk-Taking	36.53	883	0.54***	.039
Rule -Defiance	100.30	856	1.05***	.104
Cynicism	16.62	872	0.54***	.018

Note. df=degrees of freedom; B = unstandardized regression coefficient

*** p < .001

** p < .01

* p < 0.5

3.2. Quantile regression analysis (including OLS regression)

Figure 1 graphically presents the results of both simple linear and quantile regression analysis for the prediction of CWB for all the personality traits. We will first consider the degree to which the trait of Manipulation is predictive of CWB (top left plot of Figure 1). This will

serve as an example of how the other plots should be interpreted. The solid red horizontal line, and corresponding dotted lines shows the OLS regression coefficient for Manipulation (as reported in Table 2), along with its 95% confidence interval (indicated on the y-axis). The x-axis shows the different quantiles of the dependent variable (CWB). Quantiles as indicated at 0.2, 0.4, 0.6, and 0.8 is conceptually similar to the 20th, 40th, 60th and 80th percentile scores.

The black broken line represents the estimated regression coefficients at the conditional quantiles, with the grey background representing the 95% confidence interval for the quantile coefficients. In each case, estimates were computed across the distribution at every 5th quantile, starting at quantile 5, and continuing up to the 95th quantile. Quantile regression coefficients are interpreted in the same way as OLS coefficients, the only difference is that it relates to a conditional quantile whereas for OLS it relates to the conditional mean.

We can now simultaneously compare the OLS and quantile regression parameters across the entire counterproductive distribution, as both are indicated on the plot. The first thing to note is that the OLS regression estimate is not at all representative of the relationship between Manipulation and CWB across the entire distribution of the dependent variable (CWB). Most interesting, is that the OLS regression estimate underestimates the strength of the relationship at higher levels of CWB. This is evident from the way the broken line deviates outside of the OLS confidence band around the 80th to 85th quantiles. This is particularly interesting given that the objective of the study is to predict the likelihood of CWB from personality traits, and this shows that Manipulation becomes substantially more predictive of CWB for people who score around the 80th quantile and higher on CWB, compared to individuals who score lower. In fact, while the OLS regression coefficient is about 1.4, the quantile estimates at higher levels of the distribution shows a continued and

marked increase progressing to approximately 3.0 at the 95th quantile. This indicates a substantial increase in predictive power at higher levels of CWB.

Interestingly, a similar effect was observed for all the predictor variables of the study, to differing degrees, with the exception of Egotism. Nonetheless, the quantile patterns were alike in the sense that marked deviations occurred at higher levels of the dependent variable (CWB) for eleven of the twelve personality predictors. Indeed, all predictors with the exception of Egotism were statistically significant at the .01 level, or smaller, at the 85th, 90th and 95th quantiles. Risk-Taking and Cynicism was significant the .05 level for the same high level quantiles.

It is also important to note the inverse pattern, where the OLS conditional mean overestimates the predictive power of the personality variables for low scores on the counterproductive criterion. Although this is consistent with theoretical expectations, OLS regression cannot provide such nuanced information.

These plots clearly demonstrate the degree to which traditional regression methods underestimates the actual relationship between CWB and personality at high levels of CWB, and overestimates it at low levels of CWB. This underscores the inadequacy of conditional means modeling to provide a nuanced perspective when investigating relationships of this type.

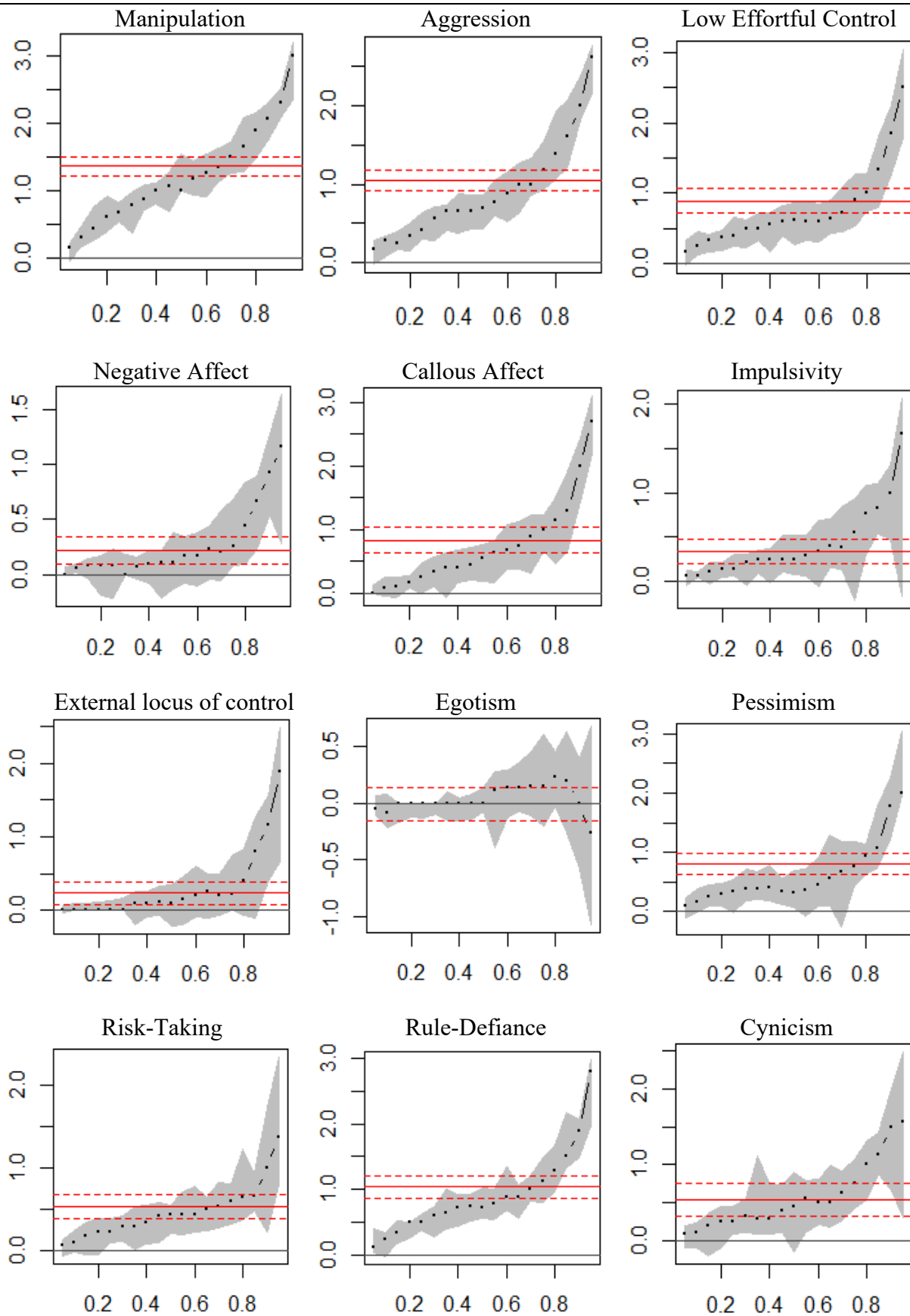


Figure 1. Simple linear and quantile regression plots for the prediction of CWB with narrow personality traits. Unstandardized beta estimates are indicated on the y-axis and conditional quantiles on the x-axis.

4. Discussion

The purpose of this study was to investigate the predictive relationship between narrow personality traits and CWB. In contrast to typical research in the field, we made use of quantile regression analysis. This method allows for nuanced examinations between predictor and outcome variables across the entire distribution of outcome variables. As such, it paints a more comprehensive picture regarding the actual relationships than what can be gleaned from conventional correlations and conditional means modeling.

Overall, the results of this study are largely consistent with previous research. Our findings also found good support for the view that CWB is related to narrow personality traits such as Manipulation and Risk-Taking (O'Neill & Hastings, 2011), Locus of Control (Fox & Spector, 1999; Leroy, 2005; Storms & Spector, 1987) and Negative Affect (Crede et al., 2007; Kaplan et al., 2010; Dalal, 2005). The positive association that Effortful Control and Aggression has with CWB is consistent with findings using conceptually overlapping broad traits such as Conscientiousness and Agreeableness (Chang & Smithikrai, 2010; O'Neill & Hastings, 2011; Sackett et al., 2006; Salgado, 2002).

Moreover, the relationship between Aggression and CWB is consistent with the positive association found between Trait Anger and CWB (Fox & Spector, 1999; Fox et al., 2001; O'Brien & Allen, 2008). So too is the association between Effortful Control (low) and CWB in line with findings of overlapping narrow sub-facets of Conscientiousness such as Dependability, Order, Cautiousness and Achievement (Dudley, Orvis, Lebiecki & Cortina, 2006). Similar to O'Neill and Hastings (2011), we also found no relationship between Egotism and CWB.

The quantile regression plots illustrating the relationships between personality variables and CWB are important. They clearly demonstrate how traditional OLS regression paints an incomplete picture of much more nuanced relationships that exists between the

personality variables of this study and CWB. The only exception was Egotism for which none of the quantile estimates deviated beyond the OLS confidence band.

When predicting CWB, the interest of researchers would presumably lie at the high end of the distribution (Hao & Naiman, 2007) as this would constitute the greatest risk to organizations. The plots show that it is in exactly these instances that OLS regression falters, and quantile regression becomes instructive. Again with the exception of Egotism, a pattern emerged for all the personality variables showing that the relationship strength is overestimated at low levels of CWB, but as expected theoretically, steadily rises as scores on the CWB measure increases.

Most interesting is that at higher levels of CWB, a marked deviation occurs, with the quantile estimates increasing substantially, indicating that the predictive relationship increases considerably at high levels of CWB. Thus, at these elevated levels of CWB, conventional regression underestimates the actual predictive power of the personality variables. This is something researchers remain unaware of when using OLS regression or other forms of conditional means modeling. As such, we appear to be underestimating the actual value of personality traits as predictors of CWB. However, this effect was not equally robust for all traits. For example, the 95% confidence intervals of the quantile and OLS estimates at high levels of CWB overlapped for Negative Affect, Impulsivity, Locus of Control (external), Risk-Taking and Cynicism. Since frequentist (traditional) confidence intervals does not allow for strong inferences in general (Morey, Hoekstra, Rouder, Lee, & Wagenmakers, 2016), future research using Bayesian methods will be useful to determine the robustness of parameter differences between OLS and quantile estimates.

A further methodological implication of this study is that, the way individual difference variables such as personality (but not limited to it) have been investigated as predictors of behavior, might require reconsideration. The quantile regression results

demonstrated that with regard to CWB, we were working with partial information. Specifically, it shows where on the trait distribution, and the degree to which, conventional regression based statistics overestimate and underestimate the true nature of the relationship between predictor and outcome variables. Moreover, it showed that the conditional mean is uninformative at the high end of the CWB distribution, where researchers' focal interest actually lie in counterproductive workplace research. In this study the quantile results show that the relationship between personality and counterproductive behavior may be more complex than previously realized. Although, as far as we are aware, this study is the first to utilize quantile regression to investigate personality–CWB relationships, future replications will be required to determine the robustness of our findings.

Nonetheless, the results from this study importantly suggest that dependence on conditional means models may be obscuring critical nuances present in many other personality–behavior relationships. Only by empirically exploring these relations using quantile methods will we discover if we have inadvertently been lulled into accepting incomplete accounts of the actual value of personality for the prediction of real world outcomes.

A potential limitation of this study is the possibility of biased results due to common method variance (CMV), seeing as several predictors were measured with a single tool, as one reviewer correctly pointed out. To test whether this was the case, we evaluated the potential for common method bias with Harmon's single factor test, which revealed no reason for concern at 13.3% (Fuller, Simmering, Atinc, Atinc, & Babin, 2015). In addition, recent empirical research have found increasing evidence that the concern regarding common method variance in general appears to be overstated (Conway & Lance, 2010; Fuller et al., 2016; Lance Dawson, Birkelbach, & Hoffman, 2010).

5. Conclusions

Taken together, our findings suggest that conditional means modeling as typically employed in studies investigating predictive relationships between personality and CWB, might not be optimal. Quantile regression analysis show there could be more to the story than we previously realized. The ability to examine personality-CWB relationships across the entire CWB distribution, revealed important nuances at the tails, away from the conditional mean upon which we are reliant when using traditional linear regression. While our findings cannot be taken to mean that such surprises will lurk in other sub-fields of individual differences research, these results, at minimum imply that important nuances might be prevalent in many other research domains. To find out, we will have to start exploring further afield from the conditional mean.

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