Auditing Judgment and Dispositional Need for Closure: Effects on Hypothesis Generation and Confidence

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Abstract

The extent to which auditors seek and process information before forming a judgment can have important consequences. In this regard, psychology researchers have identified a personality characteristic, called Cognitive Need for Closure (Kruglanski 1989a; Webster and Kruglanski 1994), concerning one's drive to terminate deliberations and reach conclusions. This construct, and Kruglanski's Need for Closure Scale (NFCS) that measures dispositional need for closure (DNFC), are well established in the psychology literature but not in the accounting or business literature. Further, similarities exist between the characteristics of persons low in DNFC and the characteristics of experts. We began our study of this construct by administering the NFCS to a sample of Big-Four auditors, finding that CPAs at higher ranks tend to be lower in DNFC. After finding significant differences across ranks, we conducted an experiment in which professional auditors offered hypotheses regarding the cause of shifts in financial ratios between two reported years. Participants continued to generate hypotheses until satisfied that they had considered the cause of the shifts. Results indicate that auditors lower in DNFC generate more hypotheses, and higher quality hypotheses, than auditors higher in DNFC. Further, although their hypotheses are lower in both number and quality, auditors higher in DNFC express greater confidence that they have included the true cause among their hypotheses. Finally, questions arise concerning the selection/socialization of auditing professionals, because persons most

attracted to the profession may be less suited to it and less comfortable with the decision-making environment than they expected.

Keywords: auditing judgment; need for closure; motivated cognition; judgment and decision making

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I. Introduction

Much prior research in accounting and auditing has focused on the heuristics used in the decision-making process and the subsequent biases.[1] The research reported here focuses on the "need for closure" (hereafter, NFC; Kruglanski 1989a; Webster and Kruglanski 1994), which is a motivation for judgment and decision-making (JDM). An auditor's motivation for JDM determines the extent to which he or she uses heuristics in the JDM process and, therefore, the extent that judgments are affected by the associated biases (Tversky and Kahneman 1974; Hogarth 1981; Kruglanski and Ajzen 1983; Kruglanski and Freund 1983; Kruglanski 1989a; Chaiken et al. 1989; Hogarth 1991; Kahneman et al. 1982; Smith and Kida 1991).

Research on the characteristics of experts and novices (Choo 1989) reveals similarities between experts and persons lower in NFC. Further, prior research indicates that individuals relatively *higher* in NFC tend to be attracted to the accounting major (Webster and Kruglanski 1994), and they are presumably representative of entry-level auditors. Although well established in the psychology literature, the NFC has not been examined in the accounting or business literature and, thus, there is no evidence that professional accountants, in general, are higher in need for closure. Of particular interest are professional accountants who reasonably could be considered experts (e.g., CPA firm partners, corporate officers, etc.). Therefore, we undertake to determine if there is a difference in the dispositional need for closure (DNFC) of auditors according

to rank. As anticipated, we find that auditors at the higher ranks of CPA firms tend to be lower in DNFC than those in the lower ranks.

After finding significant difference across ranks, we examine experimentally whether the differences in DNFC affect the decision-making process of auditors. Early research on the NFC (e.g., Freund et al. 1985; Kruglanski and Freund 1983) indicates that individuals higher in DNFC develop fewer hypotheses in the decision-making process and exhibit greater confidence in their decisions. Hence, we set out to determine first if there is a difference in the number of hypotheses generated by high versus low DNFC auditors (controlled for possible confounding with rank), then whether there is a difference in the time spent on the generation of hypotheses and the quality of the hypotheses, and finally, the auditors' confidence in their resulting judgment.

Consistent with expectations, we find that auditors lower in DNFC generate more hypotheses and higher quality hypotheses than auditors higher in DNFC. We also determine that auditors lower in DNFC spend relatively more time on the deliberative, judgmental task of hypothesis generation, than on simple non-deliberative tasks. Further, although their hypotheses are lower in both number and quality, auditors higher in DNFC express greater confidence that they have included the true cause among their hypotheses. Our findings prompt questions concerning the selection/socialization of auditing professionals, in that those persons most attracted to the profession (high DNFC individuals) may be less suited to it and less comfortable with the decision-making environment than they expect. In addition, the results of our research indicate that this topic has implications and applications well beyond the setting tested here.

The remainder of the paper is organized as follows. Section II provides a review of the literature and motivation for our study. Section III presents our research question and hypotheses and the results of the two phases of the study (Phase I tests auditors' DNFC across professional ranks and Phase II examines the effects of DNFC on judgment and decision making). Finally, Section IV presents the summary and conclusions as well as limitations and suggestions for future research.

II. THEORY OF LAY EPISTEMICS

The theory of lay epistemics addresses the way in which individuals acquire knowledge. The search for knowledge is a sequential process starting with the formulation of a problem and progressing to its ultimate resolution. According to Arie W. Kruglanski, the problem formulation process is a *motivated* behavior "prompted by an interest that the knower may have in a given bit of knowledge" (Kruglanski 1980, 71). In fact, it is the motivational element that initiates the search for knowledge and then terminates the process when the decision maker feels he or she has obtained sufficient knowledge.

Lay Hypothesis Generation and Validation

Kruglanski (1980) laid the foundation for the development of a theory of the process of knowledge acquisition, and Kruglanski and his collaborators have continued to develop this theory (Kruglanski and Ajzen 1983; Kruglanski and Freund 1983; Kruglanski and Mayseless 1987; Kruglanski 1989a). The theory of lay epistemics outlines the process by which individuals acquire knowledge in two steps—hypothesis-

generation and hypothesis-validation (Kruglanski 1989a; Kruglanski et al. 1991). It is NFC that motivates an individual to begin, and ultimately end, the hypothesis-generation process. Hypothesis validation occurs through deductive logic—a person has confidence in the hypothesis if it is logically consistent with (or deducible from) known facts and evidence (Kruglanski and Ajzen 1983). However, the "acceptance of any hypothesis is potentially revocable" (Kruglanski and Freund 1983, 449) and evidence inconsistent with the hypothesis can (if the individual attends to it) result in the revision, modification, or abandonment of the hypothesis.

The theory of lay epistemics has a clear motivational content, in contrast to the "cold" cognitive theory that has been prominent in human-information-processing research in accounting and auditing, epitomized by Nisbett and Ross (1980). However, Kruglanski (2001) argues that motivation, itself, can be viewed as a special class of cognition.

Effects of Motivations

The motivational element associated with the acquisition of knowledge sets the knowledge acquisition process in motion and then terminates the process upon validating or invalidating the hypotheses (Kruglanski 1980). A key construct of the theory of lay epistemics—the NFC—is "the desire to possess some knowledge on a given topic, any definite knowledge as opposed to confusion and ambiguity" (Mayseless and Kruglanski 1987, 164). Further, a heightened NFC would inhibit a subsequent hypothesis-generation process because conflicting hypotheses would threaten the existing conclusion (Kruglanski 1989b). Conversely, an individual with a reduced NFC

would generate more hypotheses in the decision-making process and would be particularly sensitive to information that might invalidate current beliefs (Mayseless and Kruglanski 1987).

Early research uncovered numerous situations that can increase the NFC, including pressure to form a clear opinion, reach a definite conclusion or take action (Kruglanski and Freund 1983; Webster and Kruglanski 1994). Research has also shown that this heightened NFC will trigger the hypothesis-generation process when no knowledge is available on a particular subject and will subsequently bring that activity to a halt once a plausible hypothesis has been generated and supported by evidence (Kruglanski 1989b). A related phenomenon is conclusional bias, or “wishful thinking” (Kruglanski and Freund 1983). If the working hypothesis is consistent with the individual’s needs or wishes (i.e., desirable), they will be more likely to accept the hypothesis and halt the generation of further alternative hypotheses. Conversely, when the hypothesis is undesirable, the individual will be more likely to continue seeking a more attractive hypothesis.

Situational factors that can *reduce* the NFC include instructions stressing the importance of accuracy, evaluation of judgments by significant others, and other means of assigning a cost to incorrect judgments (Mayseless and Kruglanski 1987; Kruglanski and Freund 1983). Enhanced task attractiveness may also reduce the NFC. Individuals perceiving a task as more attractive than the completion of the task were found more likely to correct their initial hypotheses after evaluating relevant situational information (Webster 1993).

Moreover, and of particular relevance to the current study, research indicates that NFC is a dispositional construct, i.e., a personality trait that influences the knowledge acquisition process in rather stable ways across various situations (Kruglanski and Ajzen 1983; Kruglanski 1989a). Although early research concentrated on the situational manipulation of the NFC and identification of consequences of high/low NFC, more recent research, discussed in the next section, has focused on the development of the NFC scale to measure dispositional NFC and further discovery of decision-making anomalies associated with high/low need for closure.

The Need for Closure Scale

Webster and Kruglanski (1994) developed an individual-difference measure of the need for cognitive closure. According to Webster and Kruglanski (1994, 1050), individuals higher in need for closure:

1) desire "definite order and structure in their lives and abhor unconstrained chaos and disorder" *(Preference for Order);*
2) desire a knowledge that can be "relied on across circumstances and is unchallenged by exceptions or disagreements" *(Preference for Predictability);*
3) "experience an urgent desire to reach closure, reflected in a decisiveness of their judgments and choices" *(Decisiveness);*
4) "would experience as aversive, situations devoid of closure" *(Discomfort with Ambiguity);*
5) do not desire that their "knowledge [be] confronted by alternative opinions or inconsistent evidence" *(Closed Mindedness)*.

Their Need for Closure Scale (NFCS) uses a 47-item questionnaire to measure these five facets of the dispositional construct.[2] Table 1 shows examples of items from the NFCS, and the entire instrument appears in the "Experimental Materials.pdf" file provided separately at www.profbailey.com/nfc/ .

Insert Table 1 about here.

Although seemingly related to previously studied constructs,

> the need for closure scale taps a unique variable distinct from alternative relevant constructs….The need for closure did exhibit the predicted pattern of relations with a number of other relevant measures. Specifically, it manifested low to moderate association with authoritarianism, intolerance of ambiguity, dogmatism, need for cognition, cognitive complexity, impulsivity, need for structure, and fear of invalidity, while retaining considerable distinctiveness from those various constructs. Finally, as expected, it did not appear to be related to respondents' intelligence or their concerns regarding social desirability. These findings attest to the construct validity of our scale (Webster and Kruglanski 1994, 1056).[3]

Webster and Kruglanski (1994) determined "the high test-retest reliability observed over a 12–13-week period indicates that the personality construct tapped by the scale is relatively stable" (1052). Roets et al. (2006) also found acceptable test-retest reliability over a one month period. Although these comparisons are short-term, recent studies hint that DNFC may increase with age. Hess (2001) argues that, with old age, reduced cognitive resources may increase the need for personal structure, leading to an increased NFC. Recently, Cornelis et al. (2007) have demonstrated, in a broad cross-sectional study with several Belgian and Polish samples, that age and NFC are positively related. As reported below, age-related trends are not apparent in our sample; but the indications of increased DNFC with advancing age are directly opposite from the kind of trend that would pose an internal validity threat in this study.

With the increasing use and validation of the NFCS across various countries and languages,[4] more information is available to test the validity of the scale itself. Consequently, structural analysis of the scale consistently shows the decisiveness facet to have a lower Cronbach's alpha than the other four facets (Chirumbolo et al. 2004;

DeBacker and Crowson 2006; Mannetti et al. 2002; Neuberg et al. 1997). These studies conclude that it is best to treat Decisiveness separately, resulting in a better measure for DNFC. Recently, however, Roets and Van Hiel (2007) have argued that the problem with Decisiveness is due to its operationalization, not its theoretical status, and they offer a revised set of questions for the Decisiveness segment of the NFCS. In view of this ongoing debate, we will follow Chirumbolo et al. (2004) and the others just cited above by omitting Decisiveness except when making some limited comparisons with past research. The metric that excludes Decisiveness will be referred to as *DNFC2*.

Given the novelty of this topic in the auditing and accounting literature, we will summarize the abbreviations introduced above, for use throughout the remainder of the paper:

- NFC: need for closure (the general term that we will use when referring to the measured personality trait and the situationally induced state);[5]
- DNFC: dispositional need for closure, a measured personality trait;
- NFCS: the Need for Closure Scale developed by Webster and Kruglanski (1994) to measure DNFC; and
- DNFC2: the sum of the four subscales of the NFCS excluding Decisiveness, i.e., Preference for Order, Preference for Predictability, Discomfort with Ambiguity, and Closed Mindedness

Implications for Auditing Research

Individual differences in information seeking and knowledge acquisition processes can affect the way in which information is retrieved, interpreted, and ultimately the decision reached. Research has shown that NFC will affect the decision-making process in predictable ways. In this section, we summarize the main findings relevant to the current study.

Expertise and Dispositional Need for Closure

Accounting research aimed at identifying the effects of experience on judgment and decision making has uncovered attributes of experienced individuals that are similar to the characteristics of low-NFC individuals. Bouwman (1982) compares judgments made by three professional accountants and fifteen accounting students and determines that, while the students use an unsophisticated, sequential search process, the more experienced accountants use a much more organized search process—relying on a directed evidence search (based on the overall picture of the firm), examining trends, and attending to contradictory evidence. Kaplan and Reckers (1989) examine the auditors' initial planning process and find that inexperienced auditors will follow a hypothesis confirming strategy, while experienced auditors will follow a more balanced information search strategy. Libby and Frederick (1990) conduct a study of performance differences between auditors with differences in experience levels, using a less structured task, so that knowledge differences will not be as significant. The more experienced auditors are able to generate a larger set of possible explanations for the errors, which increases the likelihood that they will find the actual cause of the error.

Furthermore, evidence exists that accounting students tend to exhibit high DNFC. Based on a theory of careers proposed by Holland (1985), that certain personalities tend to gravitate towards certain careers, and as part of their validation of the NFCS instrument, Webster and Kruglanski (1994) identified accounting majors as likely to be the "Conventional" type preferring explicit, ordered, and structured tasks, with an aversion to ambiguous, unstructured tasks. As the authors anticipated, accounting majors in their sample exhibited relatively high scores, indicating that persons who enter the accounting profession tend to be higher in DNFC.

Accordingly, if novice auditors tend to be higher in DNFC than those at higher ranks, then the implications of this difference point toward research questions about the origins of the difference across ranks and the implications about the JDM ability of auditors. Consideration of DNFC may contribute to the understanding of expertise, since it may provide some explanation of the observed differences between expert and non-expert JDM processes.

Hypothesis Generation and Confidence in Decisions

A prominent stream of research on NFC concerns hypothesis generation and subjective confidence in the related judgments. Individuals higher in NFC generate fewer hypotheses and demonstrate a higher level of confidence in the decision reached. Accordingly, the tendency to quickly terminate the hypothesis-generation phase of the decision-making process is called cognitive "seizing," and the ultimate confidence in this early decision (and subsequently ceasing the search for relevant evidence) is called "freezing" (Freund et al. 1985; Kruglanski and Freund 1983; Mayseless and Kruglanski 1987; Chirumbolo et al. 2005).[6]

Hypothesis generation has long been recognized as important to auditing judgment (e.g., Libby 1985; Asare and Wright 2003, 2008). Recently, the issuance of SAS 99 (AICPA 2002), with its requirement for "brainstorming," has reemphasized the importance of explicit hypothesis generation by auditors. Carpenter (2007) addresses the importance of identifying hypotheses about potential fraud, and the possibility of losing important hypotheses during group deliberations. Brazel et al. (2007) conduct a field investigation into the conduct of brainstorming sessions and recognize that little is known about the group dynamics involved. The theory and research on NFC offer clear predictions concerning hypothesis generation, testing, and validation.

III. EMPIRICAL INVESTIGATION

This empirical study progressed through two phases. Given that the characteristics of lower DNFC are similar to the traits of experts, and that accounting students tend to be relatively high in DNFC, we first assessed whether DNFC, as measured by the NFCS, differs systematically across auditors at different ranks. If so, then it may be related to expertise in professional auditing judgment and decision making. Secondly, after finding significant differences across ranks, we designed an experiment to investigate whether DNFC can affect audit judgment and decision making. Both studies were internet-based.

Phase I: Tests of Auditors' DNFC

The following research question is implied by the discussion above:

RQ: Do auditors at higher firm ranks differ from those at lower ranks as to their DNFC?

Method

Participants for this study were members of the American Institute of Certified Public Accountants (AICPA) who had specified a professional interest in auditing and who worked for a Big-Four accounting firm.[7] As of July 31, 2002, membership was approximately 350,000 (AICPA website). The list of individuals fitting these criteria included 4,386 names. E-mail addresses were associated with members' names using the protocols for assigning addresses within the firms. Those that were returned as invalid were excluded, resulting in 2,635 successful e-mail messages. The message included a link to an interactive website designed to collect the necessary data for this study, stating that the website would be available for approximately two weeks. Participants were assured of their anonymity and reminded that participation was strictly voluntary.

Approximately 520 individuals visited the website and completed at least one section of the experiment. Individuals providing an incomplete response and those indicating an area of professional interest other than auditing were eliminated, resulting in 292 appropriate, complete responses. The first part of the task required completion of demographic information and the second part required completion of the "personality questionnaire" (the NFCS). See the "Experimental Materials.pdf" file provided separately at www.profbailey.com/nfc/ for the website details.

Demographic Information

Table 2, Panel A, lists the number of requests sent to members of each of the Big-Four firms as well as the response rate of each firm. The highest response rate of 15.23% is from KPMG, while the lowest response rate is 10.09% from Deloitte &

Touche. Seventy-eight percent of the participants are male, twenty-two percent female. The youngest is 21 years of age, the oldest 81, and 46 percent are forty or older. Fifty-three percent have fifteen or fewer years of experience, while 47 percent have more than fifteen years. Approximately 72 percent indicate a bachelor's degree as their highest level of education, and 28 percent indicate a master's degree.

Insert Table 2 about here.

Results

Table 2, Panel B, shows the participants' ranks within the firm. Almost half (45.9%) are partners, with less than twenty percent being staff, senior or supervisor. The smallest groups of respondents are supervisor (four) and staff (six). We do not know the base rate in the AICPA sampling frame, and will not theorize why fewer respondents were at these lower levels, but given that these are levels with less accountability, we have combined them for the purposes of this study, as "lower ranks."

The study represents a national sample, including thirty-eight of the fifty states and the District of Columbia. California has the most participants (42, or 14.4% of the total), and Texas has the second most (27, or 9.2%), while New York is represented by twenty-four participants.

An analysis of participants shows that their NFCS scores have an overall mean of 155.8, a standard deviation of 17.12, and range from 114 to 209. The mean for our sample is thus lower than the mean for accounting majors in Webster and Kruglanski's (1994) sample, mentioned above, in which accounting majors at the University of

Maryland scored a mean of 173.3 (n = 63) while studio art majors scored 139.2 (n = 51). In the same study, another group of participants, not affiliated with the university and ranging in age from 24 to 56 years, scored between these two averages (n = 172, mean = 154.89). Thus, our sample is in the moderate range.

Insert Table 3 about here.

One-way ANOVAs were used to assess differences between the three ranks in the firms, with DNFC and DNFC2 as dependent variables. Differences were significant at $p < 0.0001$ for both DNFC (shown only as a point of reference to other studies) and DNFC2. The means appear in Table 3. Tukey's HSD for post-hoc pairwise comparisons (a conservative test), show that, for DNFC2, all differences between ranks are significant, controlling α at 0.05.

Internal validity considerations

Two possible alternative explanations for the differences across rank would be maturation and differences in gender composition. First, if DNFC tends to decrease with age, this could explain the decreased DNFC with increasing rank. In our setting, this internal validity threat is especially salient, but we find no research to indicate such a phenomenon.[8] As a check, however, we regressed DNFC2 against age within each rank, to control for the rank effect. Within each rank, there was no evidence of a trend (r^2 being approximately zero for each group), and within each group the range of DNFC and DNFC2 scores was wide. In Figure 1, the wide variance in DNFC2 and the absence of an age-related trend are clear. Under another analytical approach, age is not

significant when included with the rank factor in an analysis of covariance ($F = 0.25$, $p = 0.62$).

Insert Figure 1 about here.

Regarding gender, research does not indicate differences in DNFC (Cheng 2003; Shah et al. 1998; Richter and Kruglanski 1999; Webster and Kruglanski 1994; Kossowska 2007; Fu et al. 2007; Chiu et al. 2000; Klein and Webster 2000; Pierro et al. 2003). Within ranks, our male and female participants do not differ significantly on DNFC2 at $\alpha = 0.10$. In another analytical approach, inclusion of gender as a covariate does not change the results. Thus, we conclude that the differences are associated with rank and not with gender or age.

Analysis of Subscales

Table 4 shows the means and standard deviations by rank for each of the subscales. In every instance except Decisiveness (which is not used in this study) the means decrease monotonically with an increase in rank. Except for Decisiveness, the means also differ significantly at $\alpha = 0.05$ in one-way ANOVAs; and in each of those analyses partners differ from one or both of the lower-ranked groups in Tukey's HSD comparisons ($\alpha = 0.05$), details of which are omitted here.

Insert Table 4 about here.

Phase II: Effects on Judgment and Decision Making

Given that auditors across professional ranks differ as to DNFC, we undertook an experiment to test a key implication of DNFC for auditing judgment and decision making. One particularly relevant area is hypothesis generation, an activity well

established in the auditing literature as being key to effective decision making (Libby 1985; Yip-Ow and Tan 2000; Agoglia et al. 2003; Nelson and Tan 2005; Asare and Wright 2003, 2008). In particular, the literature of judgment and decision making has shown that, if the hypothesis-generation process is truncated prematurely, then the true cause of an error is unlikely to be found. The study by Asare and Wright (2003) emphasizes the importance of starting an investigation with a set of hypotheses that includes the correct hypothesis. They found that, contrary to prior research, "providing balanced evidence did not fully attenuate an incorrect hypothesis set because of a failure to generate new hypotheses when testing commenced" (248).

Given their propensity to consider multiple hypotheses and collect additional data, as opposed to "seizing and freezing" on an early hypothesis, auditors with lower DNFC are expected to expend more effort, which will be manifested in the additional time on the task (e.g., see Freund et al. 1985; Kruglanski and Freund 1983; Mayseless and Kruglanski 1987; Chirumbolo et al. 2005). In a series of web-based experiments, using senior- and graduate-level accounting student participants, Bailey et al. (2006) calculated the amounts of time taken by each participant to complete the main components of the study. One clear finding was that participants who were lower in DNFC tended to spend more time on the tasks that required deliberation than did participants who were higher on DNFC. These "deliberative" questions concerned the resolution of ethical dilemmas and the analysis of corporate financial condition. There was no DNFC-based difference, however, for straightforward response items such as the NFCS questionnaire and responses about impressions participants had formed concerning the trustworthiness of characters in a vignette.

When working on a decision task in which one has expertise, spending more time may be fruitful. Thus a question arises as to the time allocation, leading to the first hypothesis:

H1: Auditors who are lower in DNFC will spend relatively more time on the deliberative, judgmental task of hypothesis generation, than on simple non-deliberative tasks.

As discussed above, higher DNFC individuals tend to generate fewer hypotheses and at the same time have a higher level of confidence in the decision reached, a phenomenon called “seizing and freezing” (Freund et al. 1985; Kruglanski and Freund 1983; Mayseless and Kruglanski 1987). However, because of their willingness to consider additional, conflicting information, lower-DNFC individuals should generate both a greater number of causal hypotheses and hypotheses of higher quality as well. This leads to our remaining three hypotheses:

H2: Auditors who are lower in DNFC will generate a greater number of causal hypotheses.

H3: Auditors who are lower in DNFC will generate higher-quality causal hypotheses.

H4: Auditors high in DNFC will display greater confidence in their judgment given their level of achievement in terms of hypothesis quantity or quality.

Design of Experiment

Our experiment employed a modified version of the hypothesis generation task from Libby (1985). The online experiment (see “Experimental Materials.pdf” file provided

separately at www.profbailey.com/nfc/) required participants to complete the NFCS, read the case, and enter hypotheses until they felt reasonably confident that they had identified the true cause of the variations in financial ratios between two reported years. When finished, they completed a short questionnaire with demographic and debriefing questions.

Participants

We desired a total sample size of about fifty[9] auditor-participants for the experiment and decided to solicit them from Big-Four and other large firms, to achieve a degree of homogeneity and minimize extraneous differences. Towards that end, we purchased a mailing list of AICPA members, specifying that they be in *public accounting*, with *firm size of 1001 members* or more, and express an *interest in auditing*.[10] We then mailed personalized invitations (randomly selected) until we had obtained 53 volunteer participants.

Variables

No variables were manipulated in the experiment. We measured DNFC using the NFCS, and captured the time spent on each task via the computer clock time. In addition, the participants were asked, "How confident are you that your hypotheses include the correct reason for the discrepancy? Enter a number between 0 = 'not at all' and 100 = 'completely.'" Finally, to allow for unexpected interruptions that might affect time recording, participants were asked two questions: (1) whether an interruption had occurred, and, if so, at what point in the process and how long; and (2) in the event they printed out the case and worked on it (e.g., overnight) and then returned and entered

their hypotheses, how much time they spent. These responses proved invaluable in refining the time measurements.[11]

Quality Ratings. Two of the authors, who were blind as to the demographics and NFCS scores of the participants, independently rated the 158 hypotheses as to quality, using a five-point scale (see Appendix). The two raters, who seldom disagreed initially by more than one rating point, discussed their individual judgments and reached consensus. The number of hypotheses also was subject to some interpretation, so that computing a coefficient for initial agreement was not straightforward. Therefore, an unrelated, experienced auditor rated the hypotheses blindly after the other raters had agreed on the identification of discrete hypotheses. He agreed exactly on 56 percent of the items, disagreed by one point on 41 percent and by two points on only three percent (five) of the items. Spearman's r correlation between his ratings and their joint ratings is 0.69.

Results

The mean DNFC of these participants is 123.4 for DNFC2 (and 154.4 for DNFC), which is consistent with our earlier sample mean for upper-level personnel. Forty-six of the participants (87 percent) are male, which does not differ significantly from the 78 percent male composition of our solicitation list purchased from the AICPA (chi-square = 2.3, p = 0.13). Only eight of the participants are from firms in the 1001–5000 employee range, the other 45 being from firms with over 5000. By rank within their firm, 31 are partners, 16 managers, 3 directors, and 3 “others.”

All of the hypotheses are directional, so the tests are one-tailed unless otherwise specified. Hypothesis 1 states that *auditors who are lower in DNFC will spend relatively*

more time on the deliberative, judgmental task of hypothesis generation, than on simple non-deliberative tasks. This hypothesis is supported, based on the relationships shown in Figure 2. The negative slope of the *pcthypo* (percentage of time spent on

Insert Figure 2 about here.

hypotheses) is significant at p = 0.008. (Given that the regression assumptions may be violated, we also computed the Spearman correlation, which is -0.31, p = 0.013.) Since the percentages sum to 100, the other two lines (pctques and pctdebr, the percentages spent on the NFCS questions and debriefing questions respectively) would necessarily have a net positive slope, but *both have positive* slopes that are about equal; i.e., persons lower in DNFC are shifting their time away from the other tasks and towards the important deliberative task. They appear to be budgeting their time where it can be productive.

Hypothesis 2 states that *auditors who are lower in DNFC will generate a greater number of causal hypotheses.* Both the Spearman and the Pearson correlations between DNFC and number of hypotheses are the same value, -0.21, marginally significant at p = 0.07, showing some support for the hypothesized relationship.

Hypothesis 3 states that *auditors who are lower in DNFC will generate higher-quality causal hypotheses.* Quality can be measured in at least three ways:

Average quality indicates the general level of thinking, and contributes to the total quality of the hypothesis pool.

Maximum quality is an indication of the likelihood that the correct hypothesis will be in the pool (cf. Bhattacharjee et al. 1999, 84).

Total quality indicates the size of the “net” that is cast to find the actual cause.

All three of these quality metrics are significantly related to DNFC: average quality at Spearman (Pearson) = -0.26 (-0.27), both p = 0.03; maximum quality at -0.31 (-0.32), both p = 0.01; and total quality at Spearman (Pearson) = -0.32 (-0.34), both p = 0.01.

Hypothesis 4 states that *auditors high in DNFC will display greater confidence in their judgment given their level of achievement in terms of hypothesis generation or quality.*

Although, as shown above, auditors with higher DNFC do *not* generate more hypotheses or higher-quality hypotheses, they do display greater confidence that they have found the correct hypothesis (Spearman [Pearson] = 0.28 [0.24], p = 0.02 [0.04]).

Additionally, confidence is unrelated to the quality of the respondent's own hypotheses, in terms of average, maximum or total quality (all correlations n.s., p > 0.25).

Supplemental Analyses

To gain insight into the phenomena reported here, we investigated which of the four DNFC subscales may drive the effects. Table 5 shows correlations between the subscales and

Insert Table 5 about here.

the dependent variables related to the four hypotheses. With respect to the percentage of time spent on hypothesis generation, the significant relationships ($\alpha = 0.05$, one-tailed using either correlation statistic) are with Closed Mindedness and Preference for Order, while Preference for Predictability is significant at $\alpha = 0.10$.

In considering the hypotheses that are generated, we examined both the

number and quality of hypotheses. For the number of hypotheses generated, all coefficients are consistently negative, but, in keeping with the marginal significance of the overall effect, only one (Discomfort with Ambiguity) is significant at $\alpha = 0.10$. In looking at the quality metric, we report total quality, which gives results similar to average or maximum quality. Three of the four subscales are significant at $\alpha = 0.05$, with the fourth (Preference for Order) significant at $\alpha = 0.10$.

Regarding participants' confidence in their hypotheses, Preference for Predictability and Preference for Order are significant at $\alpha = 0.05$, while Closed Mindedness and Discomfort with Ambiguity are not significant, even at $\alpha = 0.10$. Further, since the origin of this misplaced confidence by higher DNFC individuals is of particular interest, we used a stepwise regression to identify variables predictive of confidence level. The candidate independent variables were the number of hypotheses generated, total quality of hypotheses, maximum quality of hypotheses, Preference for Order, Preference for Predictability, Discomfort with Ambiguity, and Closed Mindedness. The only variable to enter at $\alpha = 0.10$ was Preference for Order, with $R^2 = 0.15$.

Taken together, these analyses of subscale effects demonstrate that the results of our main hypothesis tests are not driven by just one or two of the subscales. The pattern of significance varies across the four dependent variables related to the four hypotheses, as seen in Table 5. This is consistent with the status of DNFC as a coherent, rich construct and not simply a reflection of, say, intolerance of ambiguity.

The last supplemental analysis addresses the potential confounding of DNFC with rank (presumably associated with expertise). Given that persons of different

professional rank (albeit at least manager) were combined in this experiment, the effect of experience is a potential internal validity threat. To address this issue, we performed two analyses. First, we compared the means of key variables, between partners (n = 31) and managers/directors/lower ranks (n = 22), using one-tailed t-tests consistent with the main analysis. The partners are, as expected, lower on DNFC2 ($p < 0.001$), but they do not differ on the percentage of time spent on hypothesis generation ($p = 0.21$), maximum quality ($p = 0.20$), average quality ($p = 0.20$), or confidence ($p = 0.16$). Partners did, however, generate more hypotheses (means = 3.29 vs. 2.55, $p = 0.07$ for the t-test and similarly for a nonparametric Mann-Whitney U-test) and subsequently a higher total quality ($p = 0.04$). As an additional test, we compared the overall results reported above to results from separately analyzing the 31 partners and the 22 other participants. In the subsample analyses, all of the patterns reported above are still evident except the relationship between DNFC2 and total hypotheses, which was marginally significant in the main analysis but is seen only in the non-partner subsample.

Thus, although individuals at the higher levels of the CPA firms have lower DNFC2 scores than those at lower levels of the firms, there is still a sufficient range of scores of partners so that we are able to show differences in generated hypotheses based on the DNFC2 scores of these individuals whose rank is identical and experience level is reasonably homogeneous. Similarly, the separate analysis of the 22 other participants offers the same conclusion. Thus, the two analyses provide evidence that the differences in auditors' hypothesis-generation, attributed to DNFC2, do not appear to be driven by an individual's rank in the firm.

IV. SUMMARY AND CONCLUSIONS

Much research has been devoted to the judgment and decision-making of auditors. The current study introduces evidence about DNFC, a personality characteristic which affects the judgment and decision-making process. First, we investigate whether auditors at various ranks differ in their DNFC, by testing CPAs who identify their area of professional interest as auditing and work for Big-Four accounting firms.

We find significant differences across ranks (partners, managers, and lower level auditors) in the firms, with DNFC increasing significantly and monotonically from partners to managers to lower level personnel. The characteristics of lower-DNFC individuals indicate that partners and managers are therefore less likely to “freeze” on information early, will take time to consider all sides and possibilities, and are better able to see the bigger picture when making decisions. Webster and Kruglanski (1994) showed that accounting students were high in DNFC, but we find accountants at the upper ranks tend not to be so high on this measure.

Possibly students high in DNFC are attracted to the accounting major because of its structure, but once experienced in a business environment, they find that the profession is not as structured as they had anticipated, and ultimately may leave the firm voluntarily or involuntarily. If so, the lower-DNFC individuals may remain as auditors for an extended period and be promoted to the level of partner. Given the evidence that DNFC is a stable personality trait for working-age adults, experience in auditing is unlikely to modify one’s DNFC; and age-related trends are not evident in our sample.

This study further examined the five facets of the dispositional construct. The difference on four of the five facets (Preference for Order, Preference for Predictability, Discomfort with Ambiguity and Closed Mindedness) was significant between partners and the lower ranking individuals, with partners' scores for each facet of the scale significantly lower than the scores for the lower ranking participants. The difference between ranks was not significant for the "Decisiveness" facet (not used in this study), indicating that auditors at all ranks experience similar levels of preference for prompt, resolute decision making.[12]

The hypothesis-generation experiment demonstrates some important effects. The auditors who are higher in DNFC tend to truncate the hypothesis-generation task sooner, producing fewer causal hypotheses and demonstrating lower hypothesis quality. Further, those same auditors express greater confidence that they have identified the true hypothesis—a combination that bodes poorly for the ultimate correct assessment of causality. Bonner (2008, 93) notes that overconfidence in judgment is "potentially catastrophic" and that "the high monetary and reputation stakes associated with accounting-related JDM makes it critical to consider whether overconfidence affects JDM in accounting settings."

Limitations

The sample of auditors who chose to participate in this research may not be truly representative of auditors at large and Big-Four firms. The fact that the sample includes so many partners and managers could be because the list had more managers and partners or it could be because those individuals felt more comfortable responding. No

information on rank was available with the AICPA list. Further, the experiment is limited to a single audit case.

The purpose of the experiment was to determine whether DNFC *can* affect auditors' judgments in the ways predicted by the psychology literature. Whether such judgments are materially affected in actual practice remains an open question.

Contributions

The extent to which auditors seek and process information before forming a judgment can have important consequences in the conduct of an audit. Partners are at the highest level of accountability in the firm, and we found that partners are lower in DNFC. Such individuals tend to have a more extensive search for alternative hypotheses and more extensive information gathering before making a decision than higher DNFC individuals. Early identification of a characteristic that may be contributing to a rise to the rank of partner might be useful for accounting firms and allow for changes such as better training for future leaders in the firm. A better understanding of auditors and the decision-making process is fundamental to increasing public awareness and understanding of the limitations of the audit and a step towards increasing investor confidence in the accountants who produce the audit.

Assessment of an individual auditor's DNFC could be helpful in tailoring audit programs to overcome limitations related to an individual's information processing characteristics. Also, assessing individual differences in information processing and decision-making may be useful in forming audit teams (for example, pairing a low DNFC individual with a high DNFC individual). An assessment of an individual's DNFC could

also be helpful in customizing auditor training (for example, to help high/low DNFC auditors learn compensating techniques).

Nelson and Tan (2005, 50) “suggest that the following principles should be considered in thinking about the usefulness of studies involving individual characteristics: (1) relevance of individual characteristic to the issue; (2) presence of theory linking the individual characteristic to the task at hand; (3) validity and reliability of the individual characteristic construct; and (4) ease with which the individual characteristics can be captured in practice.” We believe that criterion (1) is met, since NFC affects the function of hypothesis generation, which is important in auditing as well as much decision-making with accounting data. As for item (2), the theory of lay epistemics links both hypothesis generation and confidence directly to NFC. The validity and reliability (3) of DNFC and the measuring instrument (NFCS) have been reasonably established in the psychology literature. Finally (4), the NFCS instrument is easy to administer, so that the individual characteristic can be captured easily in practice.

Suggestions for Future Research

The finding that accountants who are low in DNFC may spend more time at cognitive deliberation tasks is consistent with their consideration of more information and the testing of additional hypotheses. Which tasks other than hypothesis generation also might benefit from the more careful and extended attention of low-DNFC auditors? As with most research, the interesting questions often involve consideration of interaction effects—i.e., under what circumstances is low DNFC beneficial, and under what circumstances is it less beneficial or even detrimental? Likewise, for what tasks

are high-DNFC persons well suited and in which tasks, in addition to hypothesis generation, would this characteristic be detrimental to the audit process (cf. Kruglanski 2004, 162–163)?[13] A related issue worth addressing, given that the effects of high DNFC are detrimental to some key auditing tasks, is whether the effects can be moderated through measures such as specific training or strategic planning in the composition of audit team membership. To what degree do structured audit decision processes and group/team environments mitigate these individual differences?

The specific decisions made by auditors should be investigated to determine how those decisions might be affected by DNFC, both directly and indirectly with other factors (e.g., time pressure, litigation issues, questionable corporate cultures, etc.). DNFC may affect the evaluation of audit evidence as well as the search for confirming or disconfirming evidence. The study by Church (1991) indicates that auditors who are committed to their hypothesis (such as our auditors who express high levels of confidence that they have identified the correct hypothesis) will evaluate evidence as being more consistent with their hypothesis.

If higher ranking auditors in Big-Four CPA firms tend to be lower in DNFC, a broader issue is where those who are higher in DNFC eventually become employed. Are these individuals leaving auditing or even public accounting? As noted earlier, accounting students on average have relatively high DNFC scores. Additional research is essential in establishing whether there is indeed a selection process that leads high DNFC individuals to other careers outside public accounting. Further, if this is true, is it a U.S. phenomenon alone? Answers to some of these questions might raise concerns relevant to the recruiting of future accounting students.

Similarities between the characteristics of experts and the characteristics of low-DNFC individuals prompted us, in part, to investigate differences across the ranks of professional auditors. These similarities should motivate further research, which might enhance the understanding of professional expertise. If indeed a relationship exists, we would expect it to be complex—with DNFC only a single component and subject to the sort of contingencies noted above.

Finally, we would emphasize that NFC theory has applications throughout judgment and decision-making research in accounting. Are other areas of accounting impacted similarly to auditing? Investors or managers using accounting data are likely to be susceptible to the same “seizing and freezing” behavior and the related effects upon information search and hypothesis generation and evaluation.

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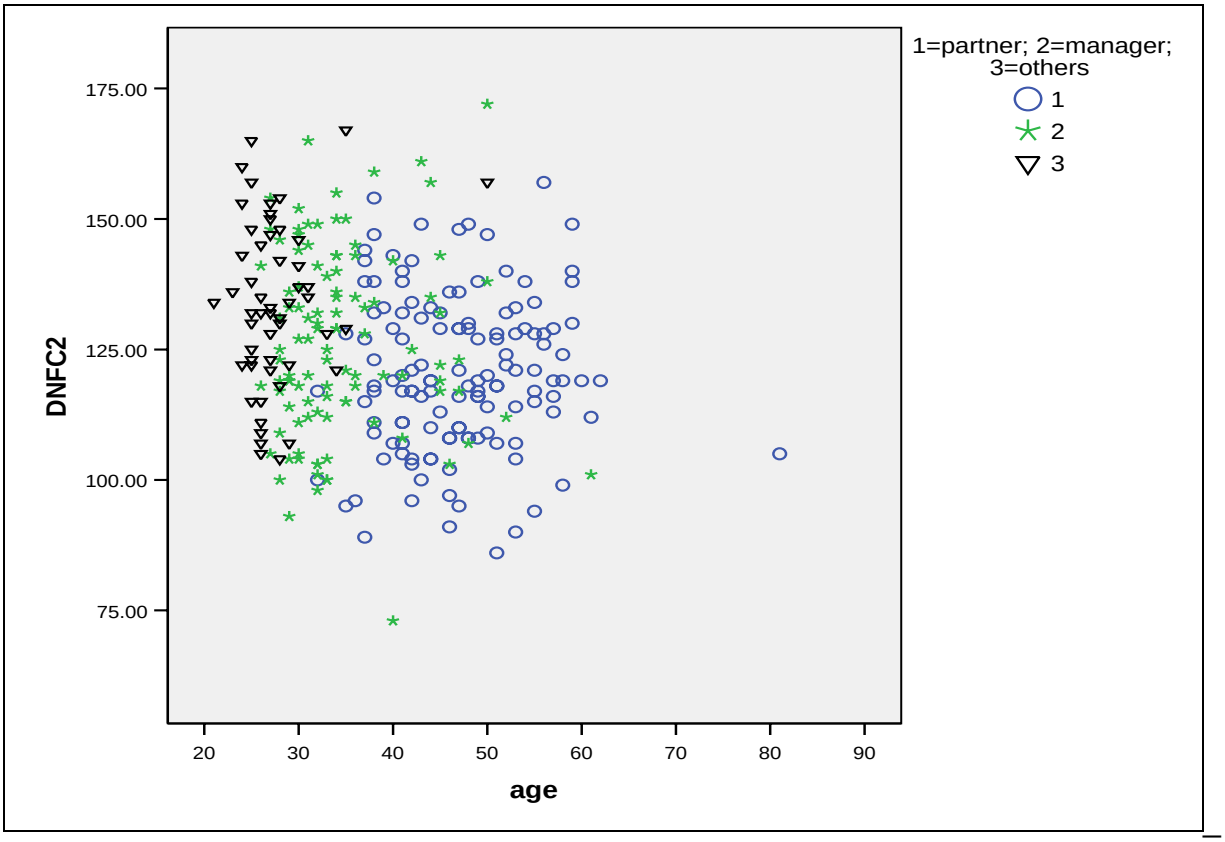
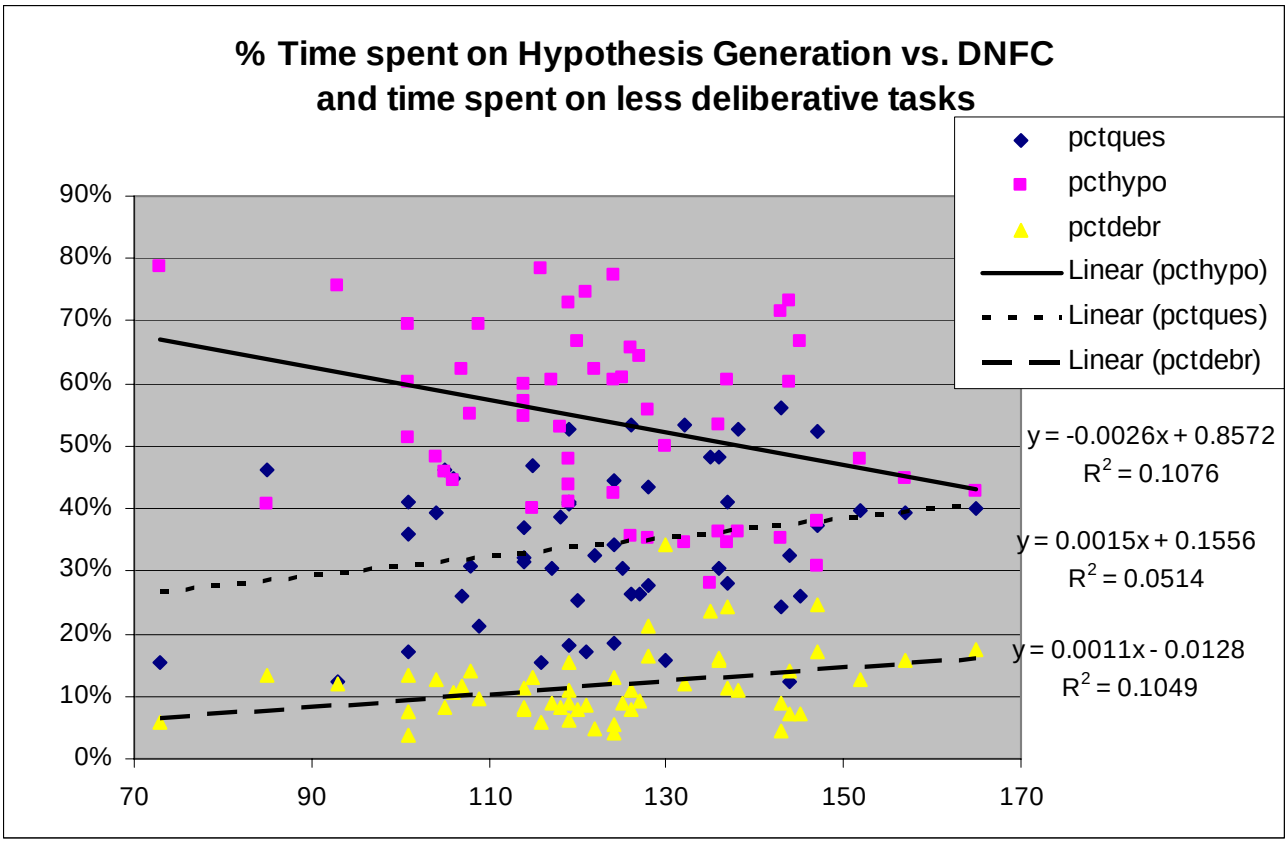
Figure 1: Plots Demonstrating Lack of Age-Related Trend in DNFC2 within Each Rank



Note: We envision omitting this figure from a published article.

Figure 2



Notes: pcthypo = percentage of time spent on hypothesis generation

pctques = percentage of time spent on NFCS questionnaire

pctdebr = percentage of time spent on debriefing questionnaire

Table 1: Examples of items from the Need for Closure Scale*

Need for Closure Facets	*Items*
Preference for Order	I enjoy having a clear and structured mode of life. I find that a well-ordered life with regular hours suits my temperament.
Preference for Predictability	I like to have friends who are unpredictable. I don't like to go into a situation without knowing what I can expect from it.
Decisiveness	When faced with a problem, I usually see the one best solution very quickly. I usually make important decisions quickly and confidently.
Discomfort with Ambiguity	I don't like situations that are uncertain. I feel uncomfortable when someone's meaning or intention is unclear to me.
Closed Mindedness	I feel irritated when one person disagrees with what everyone else in a group believes. I dislike questions that could be answered in many different ways.

Note: The full instrument appears in the "Experimental Materials.pdf" file, provided separately at www.profbailey.com/nfc/, and is available at

http://www.wam.umd.edu/~hannahk/nfcscale.html

Table 2: Responses Rates by Firm Affiliation and Rank

Panel A: Responses by Firm Affiliation

Firm	Number of Requests	Number of Responses	Response Rate
Deloitte & Touche	783	79	10.1%
Ernst & Young	735	76	10.3%
KPMG	453	69	15.2%
PriceWaterhouse Coopers	664	68	10.2%

Panel B: Responses by Rank within the Firm

Rank within the Firm	Number of Participants	Percent of Total
Staff	6	2.0%
Senior	43	14.7%
Supervisor	4	1.4%
Manager	105	36.0%
Partner	134	45.9%

Table 3: Mean Dispositional Need for Closure Scores by Rank

Rank:	Partner	Manager	Lower ranks (seniors, staff, supervisors)
n	134	105	53
Mean DNFC	151.93	156.90	163.45
Mean DNFC2	120.46	126.34	133.74

Table 4: Means and Standard Deviations by Rank for Each of the Subscales of the Need for Closure Scale

		Preference for Order		*Preference for Predictability*		*Decisiveness*		*Intolerance for Ambiguity*		*Closed Mindedness*	
	n	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Partner	134	36.60	7.27	27.49	4.28	31.47	5.05	33.43	5.51	22.93	4.07
Manager	105	39.90	7.37	27.95	5.70	30.56	4.79	34.23	5.46	24.27	4.17
Lower Ranks	53	42.45	7.28	29.83	5.24	29.72	5.14	35.94	6.04	25.51	3.80
Total	292	38.85	7.62	28.08	5.06	30.83	5.00	34.17	5.65	23.88	4.16

Table 5:

Correlations between DNFC2 Subscales and Dependent Variables

	% Time spent on Hypothesis Generation	Number of Hypotheses Generated	Total Quality of Hypotheses	Confidence in Hypotheses
Preference for Order	-0.246	-0.115	-0.218	0.360
	(0.038)	(0.206)	(0.058)	(0.004)
Preference for Predictability	-0.222	-0.161	-0.255	0.310
	(0.055	(0.124)	(0.032)	(0.012)
Discomfort with Ambiguity	-0.156	-0.196	-0.260	-0.020
	(0.132)	(0.080)	(0.030)	(0.443)
Closed Mindedness	-0.328	-0.176	-0.241	-0.022
	(0.008)	(0.104)	(0.041)	(0.438)

Note: Correlations are Spearman's r_s. One-tailed p-values appear in parentheses.

Appendix: Quality Scoring Rubric

The following scale was used as the basic scoring framework (subject to the exceptions stated below):

1 = Participant states the category over/understated, but is nonspecific about the account (example: current assets are overstated); or a specific account, such as "sales," is used that does not impact the ratios (i.e., not an asset/liability or contra asset/liability account).
2 = Participant gives the specific account that is over/understated (example: accounts receivable is overstated this year). Additionally, this specific account must be one that *impacts the ratios* (i.e., a specific asset/liability or an account contra to one of these assets or liabilities).
3 = Participant gives the specific account as noted in 2 above that might be over/understated and the reason *why* it is over/understated (example: accounts receivable is overstated *because* sales was overstated).
4 = Participant gives the specific account as noted in 2 above that might be over/understated, the reason *why* is given, and a more specific, *underlying cause* is presented (example: accounts receivable is overstated because sales was overstated—some of the next quarter's sales were booked during the last quarter of this year).
5 = Additional information is given beyond no. 4 above. This rating is rarely given. (example: accounts receivable is overstated because sales was overstated due to an early booking of next quarter's sales into the current year—the allowance for doubtful accounts is not increased because of the current nature of these sales—gross margin would be consistent over last year and the current year).

Exceptions to the "rules" above:

In some situations, the participants' comments do not fit into one of the very specific descriptions noted above, but the comments may involve a substantial analysis of related categories or accounts. In these cases, judgment was applied to determine the rating of the contribution using the above scale as guidance.

In particular, even though the instructions said, "In your answers, be specific about the accounts affected," we were lenient in the presence of extenuating circumstances. Our rationale was that, if pressed, the respondent giving an otherwise deep answer could name the account(s) involved. Consider the following hypothetical example:

> Because gross margin has remained fairly consistent, and changes in sales would be offset by changes in cash/accounts receivable, the quick and current ratios have moved consistently indicating that a change in inventory is not likely an issue…..so liabilities are probably understated.

The underlined conclusion is typically rated a "1" from the scale above. However, the detailed analysis by this person shows significant thought and analysis beyond a "1" rating.

A similar situation might arise if a person discusses a particular fraud that could have occurred and proceeds to indicate why it is that type of fraud and not a simple mistake. In such an instance, the hypothesis might have substantial merit even if the participant fails to name a specific account.

Endnotes

[1] For reviews, see Smith and Kida (1991) and Bouwman and Bradley (1997).

[2] The instrument is available at Kruglanski's website, http://www.wam.umd.edu/~hannahk/nfcscale.html.

[3] Among the constructs mentioned here, intolerance of ambiguity deserves special mention because of existing accounting research (e.g., Pincus 1990; Ho and Rodgers 1993; Lamberton et al. 2005). We believe that the construct validation research on the NFCS has been adequate, as reflected by the widespread acceptance of the instrument in psychology literature. Nonetheless, the "Discomfort with Ambiguity" component of DNFC is but one of the four subscales of DNFC that we study, and in the results that we report below it appears to have no more explanatory power than the other subscales, so that the results are not driven by the ambiguity component.

[4] Additional studies of the need for closure scale, which has been translated into a dozen languages (Mannetti et al. 2007), have shown that it can be reliably used in numerous countries including Italy, the Netherlands, Belgium, and Hong Kong (Chiu et al. 2000; Van Kenhove et al. 2001; Mannetti et al. 2002).

[5] According to Kruglanski et al. (2006, 86), "Results obtained with the Need for Closure Scale have typically replicated those obtained with various situational inductions of this motivation, providing convergent evidence for construct validity of the need for closure concept."

[6] For a review of the empirical evidence, see Kruglanski and Webster (1996).

[7] At that time (June–July 2002), Andersen was active but troubled. The few responses from members of that firm were deleted.

[8] Horhota (2004) found *higher* DNFC in a group of old adults than a group of young adults. As noted above, Cornelis et al. (2007) also find a positive relationship between age and DNFC in a broad sample.

[9] The target sample size relates to an alpha level of 0.05 for the one-tailed tests contemplated in the main regression analyses, and power of about 0.70 to detect a medium effect size (Cohen 1988, 87).

[10] Since the AICPA (www.cpa2biz.com) in 2006 would not sell e-mail addresses nor allow associating e-mail addresses or phone numbers with the names, we were limited to a postal contact. They also did not offer “Big 4” firm association as a selection option.

[11] Recorded times were resolved before calculating NFCS scores, to avoid bias. Omitting the nineteen participants who experienced interruptions does not change or weaken the results reported below.

[12] The importance that American society places on one’s ability to make a decision, so that decisiveness is seen as a sign of authority or intelligence, may offer an explanation. For example, Chiu et al. (2000, 252) note that “[r]elative to Chinese participants, American participants were more decisive; they had a greater preference for a quick and confident decision on one best solution to a problem. This finding is in line with the observations that Americans tend to adopt a linear and less

contextualized approach, whereas Chinese tend to prefer a dialectical and relatively contextualized approach to problem solving."

[13] Bonner (2008, 106), in a chapter on personality and individual differences, lends a suggestion that resonates surprisingly with the NFC literature: "Also, there may be interactions of these [person] variables with other variables that are unique to accounting tasks. For example, it might be interesting to examine the effects on auditors' JDM quality of the interaction of motivation to be accurate [fear of invalidity] due to, say, litigation concerns, and motivation to reach a desired conclusion [need for specific conclusions] due to, say, accountability to a client."