

# Cognitive Effects of Decomposition On Fraud-Risk Assessments

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## **Abstract:**

Regulators and the audit profession have always been concerned that auditors may unduly place a strong emphasis on management's attitude or character cues that indicate a low fraud risk to the detriment of opportunity and incentive cues that may be a sign of high fraud risk, and thus assess a lower overall fraud-risk than warranted. This study examines whether decomposing the assessment of fraud can lead to an increased sensitivity in incentive and opportunity risks in comparison to the categorization elicited by the standards. This study also examines what impact decomposition has on fraud-risk assessments when attitude cues indicate high fraud-risk and whether the decision to modify the audit plan and the extent of testing in response to the fraud risk assessment is significantly influenced by a decomposition of the fraud judgment.

In an experiment with 90 audit managers, auditors who decompose fraud assessments are significantly more sensitive to variations in incentive and opportunity risks than auditors who only categorize fraud-risk factors. This increased sensitivity is observed in both low and high risk settings. Further, auditor's sensitivity to changes in incentive and opportunity risks is even more heightened when fraud-risk factors related to management's attitude reflect a high risk environment. Finally, auditors who assess fraud with decomposition significantly perceive a higher need to revise audit plans and increase the extent of audit testing than do auditors who make categorization judgments alone.

**Keywords:** Fraud-risk assessments, judgment decomposition

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## INTRODUCTION

This research paper aims to determine the cognitive effects of decomposition in fraud-risk assessments. The current auditing standards (e.g., CICA Handbook 5135, ISA 240 and SAS 99) categorize fraud factors along three dimensions: Management's attitude or character, opportunities, and incentives. However, while standards urge auditors to consider these factors when making overall fraud-risk assessments, the decomposition of fraud-risk assessments into these three factors is not required.

Regulators, practitioners, and researchers have all expressed concerns that auditors rely heavily on their perception of management's attitude when this perception suggests low fraud risk (e.g., AICPA 2000; Heiman-Hoffman 1996; Jonas 2001). The potential drawback of such heavy reliance is that auditors, not realizing the difficulty of accurately perceiving management's attitude or not understanding the unreliable nature of such perceptions, may overlook *high* levels of incentive or opportunity risks in overall fraud-risk assessments, when they perceive management's attitude as indicative of *low* fraud risk.

Wilks and Zimbelman (2004) (hereafter WZ04) found that, when auditors anticipate making component assessments along the three fraud-risk factors *prior to* making an overall fraud-risk assessment, they are more sensitive to incentive and opportunity cues when compared to auditors who merely make an overall fraud-risk assessment. However, such increased sensitivity happens only when incentive and opportunity cues suggest *low* fraud risk. Hence, WZ04 confirmed that, when attitude cues indicate *low* fraud risk, even making component assessments prior to an overall fraud-

risk assessment may not sensitize auditors to incentive and opportunity cues suggestive of *high* fraud risk.

To understand better the cognitive effects of decomposition, this study attempts to distinguish the effects of anticipation of decomposition from the actual decomposition itself, i.e., to determine whether heightened sensitivity to incentive and opportunity cues is merely due to the expectation of decomposition or in fact due to the actual decomposition exercise itself. This is an important distinction because, if increased sensitivity to incentive and opportunity cues results from the decomposition mechanism itself, then auditing standards should require auditors to perform component assessments (decomposition) rather than just consider fraud-risk factors (categorization).

This study also explores whether decomposition impacts fraud-risk assessments when attitude cues indicate *high* fraud risk. While this condition is of lesser concern to audit policy makers, it is important to practitioners with respect to audit efficiency. WZ04 posit that, in their study, decomposition might have made auditors better realize that attitude risk was at a *low* level, and that this realization may have offset any attention to high-risk opportunity and incentive cues. Hence, this study attempts to determine whether decomposition offsets any increased attention to opportunity and incentive cues, when attitude risk indicates *high* fraud risk.

Finally, this study investigates the effects of decomposition on auditors' fraud-planning decisions. Prior fraud research (e.g., Asare and Wright 2004) has questioned the link between risk assessments and planning decisions. This study extends this line of

research by examining whether decomposition actually affects audit-planning decisions in addition to fraud-risk assessments themselves.

The next section presents the literature review and research hypotheses. The subsequent two sections describe the research methodology and present the results of the study. The final section is devoted to the discussion of findings and their implications.

## **BACGROUND AND HYPOTHESES**

Subjectivity in is often blamed for errors and inaccuracies in fraud-risk assessments. Judgment decomposition is one approach to reducing subjectivity in such assessments. Decomposition is the process of systematically dissecting a complex judgment into a series of smaller judgments that require fewer items of information and are presumably more easily and reliably carried out. The basic premise is that better judgments can be obtained by first decomposing the problem into smaller questions related to the vital pieces of information required to make the overall judgment (Anderson 1968, 1974; Kaplan 1975; Raiffa 1968). The advantages of a decomposed-judgment strategy have been known for over 50 years (Brunswick 1956), and research on clinical judgments (e.g., Einhorn 1972; Armstrong et al. 1975; Kleinmuntz et al. 1996) and on judgment of known quantities (e.g., MacGregor et al. 1988) has shown that decomposition of complex judgments into a series of simpler judgments results in more reliable and accurate judgments.

The goal of SAS No. 99 (AICPA 2002) is to have the auditor's consideration of fraud blended into the audit process and continually updated until the audit's completion. SAS No. 99 describes a process in which the auditor (1) gathers information needed to

identify risks of material misstatement due to fraud, (2) assesses these risks after taking into account an evaluation of the entity's programs and controls and (3) responds to the results. However, the primary criticism of the standard is that many procedures are suggested rather than required. For example, SAS No. 99 does not require decomposition of fraud-risk assessments into its components: attitude, opportunity, and incentive risks. It simply categorizes fraud factors along these dimensions.

WZ04 found that auditors who decompose fraud-risk assessments are more sensitive to opportunity and incentive cues when making their overall assessments than auditors who simply make an overall fraud-risk assessment. The question still remains as to whether categorization as implied by SAS No. 99 is enough to increase auditors' sensitivity to opportunity and incentive cues or if decomposition of fraud-risk components should be mandated. This is an important distinction because, if increased sensitivity to incentive and opportunity cues results from the decomposition mechanism, then auditing standards should require auditors to perform such exercise rather than just consider the categorization of fraud-risk factors as is now stated in SAS No. 99. Because, as mentioned above, decomposition of complex judgments into a series of simpler judgments results in more reliable and accurate judgments, it is expected that decomposition rather than categorization will provide greater sensitivity to opportunity and incentive cues; hence the following hypotheses:

**H1a:** Given a low management's attitude fraud-risk level, auditors who make component assessments prior to an overall assessment (decomposition) make *component assessments of opportunity and incentive risks* that are more sensitive to these risks than auditors who make categorical judgments prior to an overall assessment (categorization).

**H1b:** Given a low management's attitude fraud-risk level, auditors who make component assessments prior to an overall assessment (decomposition) make *overall fraud-risk assessments* that are more sensitive to opportunity and incentive risks than auditors who make categorical judgments prior to an overall assessment (categorization).

In their study, WZ04 focused on the effects of a fraud-triangle decomposition of fraud-risk assessments when attitude cues suggest low fraud risk. While they find that decomposition made auditors more sensitive to opportunity and incentive risks in a low risk setting, decomposition had no such effect in high risk setting (characterized by additional incentive and opportunities cues). They posit that decomposition might have made a low attitude risk more salient to auditors, which in turn might have offset any increased attention to high-risk opportunity and incentive cues.

This study explores whether decomposition also impacts fraud-risk assessments when attitude cues indicate high fraud risk. While this condition is of lesser concern to policymakers, it is important to audit practitioners in terms of audit efficiency. Since previous research has shown that auditors perceive attitude-risk factors as more important than opportunity-risk or incentive-risk factors (e.g., Heiman-Hoffman et al. 1996; Shelton et al. 2001) and that decomposition may make a high attitude risk more salient, it is expected that auditors, who decompose fraud risk assessments, will be more sensitive to changes in opportunity and incentive risks in settings characterized by high attitude risk level than in settings characterized by low attitude risk level; hence the following hypothesis:

**H2a:** Auditors' component assessments of opportunity and incentive risks are more sensitive to variation in these risks when they are made in *high* attitude risk settings than in *low* attitude risk settings.

**H2b:** Auditors, who decompose fraud-risk assessments, make overall fraud-risk assessments that are more sensitive to opportunity and incentive risks in *high* attitude risk settings than in *low* attitude risk settings.

With the exception of Mock and Turner (2005), previous research has shown a tenuous link between risk assessments and planning decisions (Zimbelman 1997; Glover et al. 2003; Asare and Wright 2004). For example, Zimbelman (1997) found that auditors who use a decomposition approach increased the extent of testing but did not modify the nature of their audit plans in response to changes in perceived fraud risk. In contrast, Mock and Turner (2005) found that auditors modified the nature, extent and/or timing of audit procedures, assigned more experienced audit team members to the audit, or added or deleted procedures in response to fraud risk assessments which were influenced by the identification and documentation of fraud risk factors. Nevertheless, because the risk environment portrayed in this case is general and does not focus on any specific element of the financial statements, this study is limited to investigating auditors' perception of the need (1) to revise audit plans in response to the presence of fraud cues and (2) to increase the extent of audit plans in response to increased fraud risk. In connection with the expected increase in sensitivity to fraud cues when using a decomposition approach, it is expected that auditors using decomposition will have a higher perception of the need to revise audit plans and to increase the extent of audit plans than will auditors who use a categorization approach. Hence the following hypotheses:

**H3a:** Auditors who make component assessments prior to an overall assessment (decomposition) will perceive a higher need to *revise audit plans* than auditors who make categorical judgments prior to an overall assessment (categorization).

**H3b:** Auditors who make component assessments prior to an overall assessment (decomposition) will perceive a higher need to *increase the extent of testing* than auditors who make categorical judgments prior to an overall assessment (categorization).

## RESEARCH METHOD

### Participants

A total of 90 managers from two of the Big 4 accounting firms in offices throughout Canada and the United States participated in this study.<sup>1</sup> Subjects were identified by a senior partner in each office, who personally contacted managers to secure their participation.<sup>2</sup> Managers were given a unique ID number allowing access to the research instrument, which was administered over the Internet.<sup>3</sup> Managers were split evenly over the firms and on average had 8.4 years (standard deviation 2.2) of audit experience.

### Materials and Procedures

This study uses the same case materials as WZ04, modified as appropriately to test the various hypotheses. The case is designed to simulate what audit managers review during the planning phase of an audit when assessing fraud risk. However, the audit environment is somewhat different. WZ04 collected data in December 2001 when the

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<sup>1</sup> Auditors of publicly-listed companies in the U.S. are subject to the regulatory requirements of the Public Company Accounting Oversight Board, whose governing board members are appointed by the U.S. Securities and Exchange Commission. Auditors of publicly-listed companies in Canada are subject to the regulatory requirements of the Canadian Public Accountability Board, whose Council of Governors includes the Chair of the Ontario Securities Commission, the Chair of the Québec Autorité des Marchés Financiers, the Chair of the Canadian Securities Administrators, the Federal Superintendent of Financial Institutions, and the President the Canadian Institute of Chartered Accountants.

<sup>2</sup> Because participants were all recruited within each firm, the rate of participation was 100%.

<sup>3</sup> A confidentiality agreement with the firms involved in the study assured participants of the confidentiality of their results and guaranteed that no identification of offices, firms, or individuals would be reported.

popular and business press was buzzing with headlines related to Enron, which had filed for bankruptcy, and Andersen, which was the target of multiple-billion-dollar class action lawsuit related to Enron. SAS No. 99 became effective for audits of financial statements for periods beginning on or after December 15, 2002. As part of its adoption on Interim Professional Auditing Standards, the Public Company Accounting Oversight Board created on July 30, 2002 by the Sarbanes-Oxley Act also adopted SAS No. 99 for audits of public companies performed by registered accounting firms. The data for this study was collected five years after the implementation date of SAS No. 99, hence investigating the full impact of the standard on auditor behavior (via training, policy manuals, implementation experience, etc.) and in a business climate that had subsided from the raw emotions of fraud-plagued post-'90s-boom corporate and Wall Street scandals and prior to the economic crisis that arose in late 2008.

Each participant accessed the case material by entering a unique identification number. Following a “consent to be a research participant” form, the case began with a brief synopsis of the fraud risk factors contained in SAS No. 99. As shown in Figure 1, the case continued by giving participants a brief description of the company, its industry and its products, and a summary of sales, net income and total assets for the past five years.

--- Insert Figure 1 about here ---

After reading the client description, participants were given a description of management designed to suggest that management's attitude was indicative of either *low-fraud risk* or *high-fraud risk*.<sup>4</sup> The descriptions read as follows:

#### Low-fraud risk

Most of the management team has been with Oltrak since your firm began auditing the company three years ago. The management team has been very easy to work with and shown a high level of competence. Furthermore, several sources of information indicate that the character of the management team is of a high quality. For example, the partner in charge of this audit has told you that the integrity of upper management is impeccable. He also commented to you that the CEO is one of the most honorable businessmen in the community. Most people in the business community characterize Oltrak as being very supportive of community value and high ideals. This characterization stems largely from the high ideals of the management team.

#### High-fraud risk

Most of the management team has been with Oltrak since your firm began auditing the company three years ago. The management team has not always been easy to work with but has shown a high level of competence. Furthermore, several sources of information indicate that the character of the management team is of a mixed quality. For example, the partner in charge of this audit has told you that the integrity of upper management has been questionable at times. He also commented to you that the CEO is one of the most visible businessmen in the community. A few people in the business community characterize Oltrak as being supportive of community value and high ideals. However, this characterization does not stem from the ideals of the management team.

After reading the management description, participants were asked to review a fraud checklist evaluated by the senior auditor and comprised of 40 fraud-risk factors (12 factors related to management's attitude, 13 factors related to opportunities, and 15 factors related to incentives). After reviewing the fraud checklist, participants in the decomposition group evaluated the risks of fraud attributable to management's attitude, opportunities, and incentives, then made an overall fraud-risk assessment, all on a scale from 1 (low) to 10 (high). Participants in the categorization group, first classified the

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<sup>4</sup> Sixty participants randomly received the *low-fraud risk* description while thirty others read the *high-fraud risk* description.

present fraud-risk factors as risks of fraud attributable to management's attitude, opportunities or incentives, and then made an overall fraud-risk assessment on the same scale, but without making component assessments for attitude, opportunity, and incentive risks. Following these tasks, each participant's perception of the need to revise audit plans in response to fraud-risk factors was elicited by asking the following question:

*In comparison with a typical audit client, to what extent would you modify your audit plan for this client to detect intentional misstatements?*

Participants responded to this question using a scale from -5 (decrease ability to detect fraud) to +5 (increase ability to detect fraud). Similarly to Glover et al. (2003), this measure comprises the nature, timing, and extent of testing in response to detecting fraud (i.e., the participant's overall planned audit response). Next, each participant's perception of the need to increase the extent of audit plans in response to fraud-risk factors was captured by asking the following question:

*In comparison with a typical audit client, to what extent would you modify the number of budgeted audit hours for this client?*

Participants responded to this question in two steps. The first step was to indicate whether they would increase, decrease or not change the number of budgeted audit hours in relation to a typical audit client; for participants who indicated a change in the number of budgeted hours, a second step was to indicate a percentage change.<sup>5</sup> Lastly, all participants completed a similar debriefing questionnaire, except that participants in the

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<sup>5</sup> Participants were asked for a percentage change rather than a number of hours to alleviate the potential problem of various baselines among subjects.

categorization group were also asked to provide component risk assessments in order to help compare component risk assessments between the two groups.

### **Research Design**

The experiment used an incomplete factorial between-subjects design in which the assessment method (categorization versus decomposition), and the risk level of opportunities and incentives (low versus high) and of management's attitude (low versus high) were manipulated. Participants were assigned randomly ex-ante to one of the six treatment combinations by means of unique ID that provided them access to the correct version of the instrument.

WZ04 found that auditors' component assessments of opportunity and incentive risks are more sensitive to variation in those risks when auditors anticipate making component assessments prior to their overall assessments. However, because auditors performing decomposition were notified at the beginning of the study of the impending component assessments, WZ04's experimental design was not able to distinguish the effects of anticipation of decomposition from the actual decomposition itself. A design that could more fully explore the cognitive effects of decomposition involves asking auditors to evaluate attitude, opportunity, and incentive risks immediately before making their overall fraud-risk assessments, but without notifying them at the beginning of the study of the impending component assessments. Hence, none of the participants were told at the beginning of the experiment that they would be asked to evaluate or categorize the risks of fraud attributable to management's attitude, opportunities, and incentives, prior to assessing the overall risk of financial statement fraud.

Relying on WZ04's instrument, component risk assessments were obtained by soliciting a response to the following three questions, presented in random order, on a scale of 1 (low) to 10 (high):

1. *What is the risk of financial statement fraud attributable to the incentives faced by management?*
2. *What is the risk of financial statement fraud attributable to the opportunities available to management?*
3. *What is the risk of financial statement fraud attributable to management's attitude or character?*

Participants in the decomposition group assessed the component fraud risks for management attitude, opportunity, and incentive, prior to making an overall fraud-risk assessment, which was obtained by soliciting a response to the following question, on a scale of 1 (low) to 10 (high):

*Based on all the information you have reviewed in this case, what is the overall risk of material financial statement fraud for this client?*

Participants in the categorization group classified the fraud-risk factors as relating to management attitude, opportunity, and incentive, prior to making an overall fraud-risk assessment; they also assessed the component fraud risks for management attitude, opportunity, and incentive in the debriefing questionnaire.<sup>6</sup> Once participants reached the debriefing questionnaire, they were not able to change any prior responses.

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<sup>6</sup> As noted by WZ04, while there is a danger that participants might use their component risk assessments to justify their previous overall fraud-risk assessment, it was necessary to elicit these assessments in order to compare these evaluations across all participants.

Within the fraud checklist, some opportunity and incentive risk factors, as well as certain management's attitude risk factors, were manipulated in order to create four experimental settings: *low* or *high* fraud risk due to opportunities and incentives, and *low* or *high* fraud risk due to management's attitude.<sup>7</sup> Combined with the assessment method (decomposition or categorization), this study encompassed six experimental conditions, as shown on Table 1, to which participants were randomly assigned.

--- Insert Table 1 about here ---

To maintain comparability with the WZ04 study, the same 40 fraud-risk factors were used in this study (see WZ04 for a discussion of the pilot testing of these fraud-risk factors) and, correspondingly, of the 28 factors pertaining to the opportunity and incentive categories, the same six relatively unimportant factors were always turned "turned on" (i.e., appearing as present on the fraud checklist) in all experimental conditions. Further, the same seven risk factors pertaining to the opportunity and incentive categories were "turned on" in the related high fraud-risk setting. Finally, three of 12 factors pertaining to the management's attitude category were "turned on" in the related high fraud-risk setting.<sup>8</sup> These three risk factors were selected using the same methodology as WZ04. The factors were categorized by at least 10 of their 12 pilot-study participants as unambiguously pertaining to the management's attitude category and the importance of these three factors was statistically undistinguishable from the remaining 24 risk factors ( $t = 0.504, p = 0.75$ , two-tailed). The 19 factors used in this study are presented on Table 2.

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<sup>7</sup> Importance of these factors had previously been tested by WZ04.

<sup>8</sup> These three risk factors along with the wording contained in the description of management were deemed sufficient to create the two conditions of *low* or *high* risk related to management attitude.

--- Insert Table 2 about here ---

## RESULTS

### **Assessment Methods: Hypotheses 1a and 1b**

Prior to testing Hypotheses 1a and 1b, a correlation analysis was performed to determine whether opportunity and incentive assessments were correlated with overall fraud-risk assessments. This step was necessary to provide evidence that component risks affect overall fraud risk and that increased sensitivity to opportunity and incentive risks flows from component risk assessments to overall fraud-risk assessments. The correlation matrix in Table 3 provide evidence that component risk assessments, considered either separately or combined, are significantly correlated with overall fraud-risk assessments.

--- Insert Table 3 about here ---

Hypothesis 1a states that auditor's component assessments of opportunity and incentive risks will be more sensitive to variations in these risks when auditors make component assessments prior to an overall assessment (decomposition) than when they make categorical judgments prior to an overall assessment (categorization). Data pertinent to this hypothesis are presented in panel A of Table 4. To test this hypothesis, each auditor's component assessments for risks due to opportunity and incentive were averaged. These measures were then examined using an analysis of variance (ANOVA) with risk level of opportunity/incentive and assessment method as explanatory variables.

--- Insert Table 4 about here ---

The results of the analysis, as shown in panel B of Table 4, indicate a main effect for risk level ( $p < 0.0001$ ), which suggests that participants' assessments of opportunity and incentive risks were sensitive to the manipulation of these risks. It is worth noting that the interaction with assessment method is also significant ( $p < 0.0001$ ). Thus, managers who evaluate component risks before making an overall fraud-risk assessment are more sensitive to opportunity and incentive risks (8.13 in the high risk setting versus 4.33 in the low risk setting,  $p < 0.0001$ ) than managers who assess these component risks after making an overall fraud-risk assessment (6.77 in the high risk setting versus 6.07 in the low risk setting,  $p = 0.248$ ). These results are consistent with the findings of WZ04 and support the notion that auditors who resort to fraud-triangle decomposition tend to make component assessments that are more sensitive to variations in opportunity and incentive risks.

In examining the simple effects of assessment method within risk conditions (panel A of Figure 2), it became obvious that decomposition made managers more sensitive to opportunity and incentive risks in both the *low* risk setting ( $p < 0.0001$ ) and the *high* risk setting ( $p = 0.003$ ). WZ04 had reported a nonsignificant difference in the mean component risk assessments between a holistic method and a decomposition method in the latter condition. However, by eliminating the anticipation effect from the decomposition group and focusing the categorization group on a classification task, this study was able to fully explore the cognitive effects of decomposition, which were revealed in both risk settings.

--- Insert Figure 2 about here ---

Hypothesis 1b states that auditors who make component risk assessments for attitude, opportunity, and incentives before making an overall fraud-risk assessment will make overall fraud-risk assessments that are more sensitive to variations in those component risks. Data relevant to this hypothesis are also presented in panel A of Table 4. To test this hypothesis, participants' overall fraud-risk assessments were examined using an ANOVA with risk level of opportunity/incentive and assessment method as explanatory variables.

The results of the analysis, as shown in panel C of Table 4, indicate a main effect for risk level ( $p < 0.0001$ ), which suggests that participants' overall fraud-risk assessments were sensitive to the manipulation of opportunity and incentive risks. Similar to the previous analysis, the interaction of risk with assessment method is also significant ( $p < 0.0001$ ). Thus, the overall fraud-risk assessments of managers who evaluate component risks before making an overall fraud-risk assessment are more sensitive to opportunity and incentive risks (7.33 in the high risk setting versus 3.87 in the low risk setting,  $p < 0.0001$ ) than managers who assess these component risks after making an overall fraud-risk assessment (6.00 in the high risk setting versus 5.40 in the low risk setting,  $p = .50$ ). These results are consistent with the findings of WZ04 and support the notion that auditors who resort to fraud-triangle decomposition tend to make overall fraud-risk assessments that are more sensitive to variations in opportunity and incentive risks.

In examining the simple effects of assessment method within risk conditions (panel B of Figure 2), it was again revealed that decomposition made managers more sensitive to opportunity and incentive risks in both the *low* risk setting ( $p = 0.004$ ) and the *high* risk setting ( $p = 0.013$ ). The previous remarks also apply in reconciling the nonsignificant difference in the mean overall fraud-risk assessments reported in WZ04 study with the results of this study that found a significant difference in both *low* and *high* risk settings.

### **Risk attributed to management's attitude of character: Hypotheses 2a and 2b**

Hypothesis 2a states that auditor's component assessments of opportunity and incentive risks will be more sensitive to variations in these risks when they are made in high attitude risk settings than in low attitude risk settings. Data pertinent to this hypothesis are presented in panel A of Table 5. To test this hypothesis, the average component assessments for risks due to opportunity and incentive were examined using an analysis of variance (ANOVA) with risk level of opportunity/incentive and of management's attitude as explanatory variables.

--- Insert Table 5 about here ---

The results of the analysis, as shown in panel B of Table 5, indicate a main effect for incentive/opportunity risk level ( $p < 0.0001$ ), which suggests that participants' assessments of opportunity and incentive risks were sensitive to the manipulation of these risks. It is worth noting that the interaction with management's attitude risk level is also significant ( $p < 0.0001$ ). Thus, managers who evaluate component incentive and opportunity risks when management's attitude risk level is high are more sensitive to

opportunity and incentive risks (9.40 in high risk setting versus 3.30 in low risk setting,  $p < 0.0001$ ) than auditors who evaluate these same risks when management's attitude risk level is low (8.13 versus 4.33,  $p < 0.001$ ). These results are consistent with the expectation that, in an audit environment characterized by a high risk level related to management's attitude or character, auditors are more sensitive to opportunity and incentive risks. In examining the simple effects of management's attitude risk level within opportunity and incentive risk conditions (panel A of Figure 3), it became obvious that management's attitude risk level made managers more sensitive to opportunity and incentive risks in both the *low* risk setting ( $p = 0.028$ ) and the *high* risk setting ( $p = 0.004$ ).

--- Insert Figure 3 about here ---

Hypothesis 2b states that auditor's overall fraud-risk assessments will be more sensitive to variations in opportunity and incentive risks when they are made in high attitude risk settings than in low attitude risk settings. Data relevant to this hypothesis are also presented in panel A of Table 5. To test this hypothesis, participants' overall fraud-risk assessments were examined using an ANOVA with risk level of opportunity/incentive and of management's attitude as explanatory variables.

The results of the analysis, as shown in panel C of Table 5, indicate a main effect for risk level ( $p < 0.0001$ ), which suggests that participants' overall fraud-risk assessments were sensitive to the manipulation of opportunity and incentive risks. Similar to the previous analysis, the interaction with management's attitude risk level is also significant ( $p < 0.0001$ ). Thus, managers who evaluate overall fraud-risk when

management's attitude risk level is high are more sensitive to opportunity and incentive risks (9.20 in high risk setting versus 2.73 in low risk setting,  $p < 0.0001$ ) than auditors who evaluate these same risks when management's attitude risk level is low (7.33 versus 3.87,  $p < 0.001$ ). These results are also consistent with the expectation that, in an audit environment characterized by a high risk level related to management's attitude or character, auditors are more sensitive to opportunity and incentive risks. Once again, in examining the simple effects of management's attitude risk level within opportunity and incentive risk conditions (panel B of Figure 3), it became obvious that management's attitude risk level made managers more sensitive to opportunity and incentive risks in both the *low* risk setting ( $p = 0.037$ ) and the *high* risk setting ( $p < 0.001$ ). In summary, when auditors operate in an environment indicative of a high management's attitude risk level, they seem to be more sensitive to the level of fraud risks attributable to incentives or opportunities than are auditors faced by an environment characterized by a low management's attitude risk level.

This study highlights the fact that the risk of fraud due management's attitude or character is not in itself a sufficient condition to heighten an overall fraud-risk assessment. Indeed, auditors alerted by the fact that fraud risks posed by management's attitude or character were high seemed to have paid even more attention to factors related to incentive and opportunities faced by management, and, when they found these factors to be at a low level of fraud-risk, they assessed an overall fraud risk that was even lower than that of auditors who operated in a low management's attitude risk environment. Similarly, when the factors related to incentives and opportunities were at a high level of fraud-risk, auditors who had already been alerted of high fraud risks posed by

management's attitude assessed an overall fraud risk that was much higher than that of auditors who operated in a low management's attitude risk environment. In that sense, not unlike the field of criminology where the an individual's attitude toward a specific crime is a precursor of a criminal action for which evidence of motive and opportunity will prove culpability (Sherman 2002; Geis 2006), management's attitude or character is a precursor of fraudulent financial reporting which will make more salient fraud factors related to incentives and opportunities.<sup>9</sup>

### **Audit plan revisions: Hypotheses 3a and 3b**

Hypothesis 3a states that auditors who make component assessments prior to an overall fraud-risk assessment will perceive a higher need to revise audit plans than auditors who make categorical judgments prior to an overall fraud-risk assessment. In order to examine the impact of the assessment method on audit plan revisions, the analysis was conducted on data reflective of an audit environment characterized by a low risk level attributable to management's attitude. Data pertinent to this hypothesis are presented in panel A of Table 6. To test this hypothesis, auditors' rating as to the extent that audit plans would be revised were averaged and examined using an analysis of variance (ANOVA) with risk level of opportunity/incentive and assessment method as explanatory variables.

--- Insert Table 6 about here ---

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<sup>9</sup> There were no significant differences between the experimental groups in the importance attached to the risk factors that pertained to incentives, opportunities, and management's attitude or character. Further, no single factor was significantly different in importance from the other two in total and between groups.

The results of the analysis, as shown in panel B of Table 6, indicate a main effect for risk level ( $p < 0.0001$ ), which suggests that participants' ratings of audit plan revisions were sensitive to the manipulation of opportunity/incentive risks. It is worth noting that the interaction with assessment method is also significant ( $p < 0.0001$ ). Thus, managers who evaluate component risks before making an overall fraud-risk assessment are more sensitive to opportunity and incentive risks when evaluating the extent of audit plan revisions (4.20 in the high risk setting versus 1.13 in the low risk setting,  $p < 0.0001$ ) than managers who assess these component risks after making an overall fraud-risk assessment (3.13 in the high risk setting versus 2.67 in the low risk setting,  $p = 0.500$ ). These results are consistent with the notion that auditors who resort to fraud-triangle decomposition tend to make component assessments that are more sensitive to variations in opportunity and incentive risks, which in turn translate into a greater variation in the decision to modify the audit plan.

An examination of the simple effects of assessment method within risk conditions revealed that decomposition made managers more sensitive to opportunity and incentive risks when deciding on the extent that they would modify the audit plan in both the *low* risk setting ( $p = 0.002$ ) and *high* risk setting ( $p = 0.040$ ).

Hypothesis 1b states that auditors who make component risk assessments for attitude, opportunity, and incentives before making an overall fraud-risk assessment will make perceive a higher need to increase the extent of testing than auditors who make categorical judgments prior to making an overall fraud-risk assessment<sup>10</sup>. Data relevant to

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<sup>10</sup> All but one participant chose to increase the number of budgeted hours in relation to a typical audit client, ranging from 10 to 75%. Perhaps the need to increase audit hours, even in an audit environment

this hypothesis are also presented in panel A of Table 6. To test this hypothesis, participants' revisions of the extent of testing were examined using an ANOVA with risk level of opportunity/incentive and assessment method as explanatory variables.

The results of the analysis, as shown in panel C of Table 4, indicate a main effect for risk level ( $p < 0.0001$ ), which suggests that participants' extent of testing revisions were sensitive to the manipulation of opportunity and incentive risks. Similar to the previous analysis, the interaction of risk with assessment method is also significant ( $p < 0.0001$ ). Thus, the revisions to the extent of testing from managers who evaluate component risks before making an overall fraud-risk assessment are more sensitive to opportunity and incentive risks (59.33% in the high risk setting versus 20.67% in the low risk setting,  $p < 0.0001$ ) than managers who assess these component risks after making an overall fraud-risk assessment (47.67% in the high risk setting versus 36.33% in the low risk setting,  $p = .019$ ). These results support the notion that auditors who resort to fraud-triangle decomposition tend to make decisions about the extent of testing that are more sensitive to variations in opportunity and incentive risks.

An examination of the simple effects of assessment method within risk conditions revealed that decomposition made managers more sensitive to opportunity and incentive risks when deciding on the extent of audit testing in both the *low* risk setting ( $p = 0.001$ ) and *high* risk setting ( $p = 0.015$ ).

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characterized by low risks attributable to management's attitude, incentives, and opportunities was cautionary since participants had limited knowledge of the company described in the case study.

## DISCUSSION

Regulators and the audit profession have always been concerned that auditors may unduly place a strong emphasis on management's attitude or character cues that indicate a low fraud risk to the detriment of opportunity and incentive cues that may be a sign of high fraud risk, and thus assess a lower overall fraud-risk than warranted. The current auditing standard (SAS 99 and CICA Handbook 5135) encourage auditors to consider fraud-risk factors in three separate categories; hence, it does not include the power that comes from decomposing a judgment in several parts. This study examines whether decomposing the assessment of fraud can lead to an increased sensitivity in incentive and opportunity risks in comparison to the mere classification scheme encompassed in the standards, when management's attitude cues point to a low fraud risk. The results of the experiment show that auditors who decompose fraud assessments are significantly more sensitive to variations in incentive and opportunity risks than auditors who only use a classification scheme of the fraud-risk factors. This increased sensitivity was observed in both low and high risk settings. Hence, in comparing the effects of categorization alone with decomposition, it seems that auditing standards should be revised to require the decomposition of fraud-risk assessments into its component attitude, incentive, and opportunity risks.

This study also examines what impact decomposition has on fraud-risk assessments when attitude cues indicate high fraud-risk. The results show that auditor's sensitivity to changes in incentive and opportunity risks are even more heightened when fraud-risk factors related to management's attitude reflect a high risk environment. When incentive and opportunity risks are high, auditors alerted of this environment give even

more weight to these risks than do auditors in an environment of low attitude risk. When incentive and opportunity risks are low, auditors prompted by high attitude risk recognize that attitude risk is a necessary but not sufficient condition to financial statement fraud and, absent of other risks, assess an overall fraud risk that is lower than that of auditors who operate in an environment of low attitude risk.

Finally, this study adds to the body of research that examined the linkage between judgment and decision, more specifically in fraud judgment. The results of the experiment show that auditors who assess fraud with decomposition significantly perceive a higher need to revise audit plans and increase the extent of audit testing than do auditors who make categorization judgments alone. The results supplement the findings of Mock and Turner (2005) by showing that the decision to modify the audit plan and the extent of testing in response to the fraud risk assessment was influenced significantly by not only the identification of fraud risk factors, but also by a decomposition of the fraud-risk assessment.

Future research could examine other judgment tasks to investigate whether decomposition of a judgment task into its components can lead to a more precise judgment and result in a direct linkage with the decisions related to the nature, extent and timing of audit procedures.

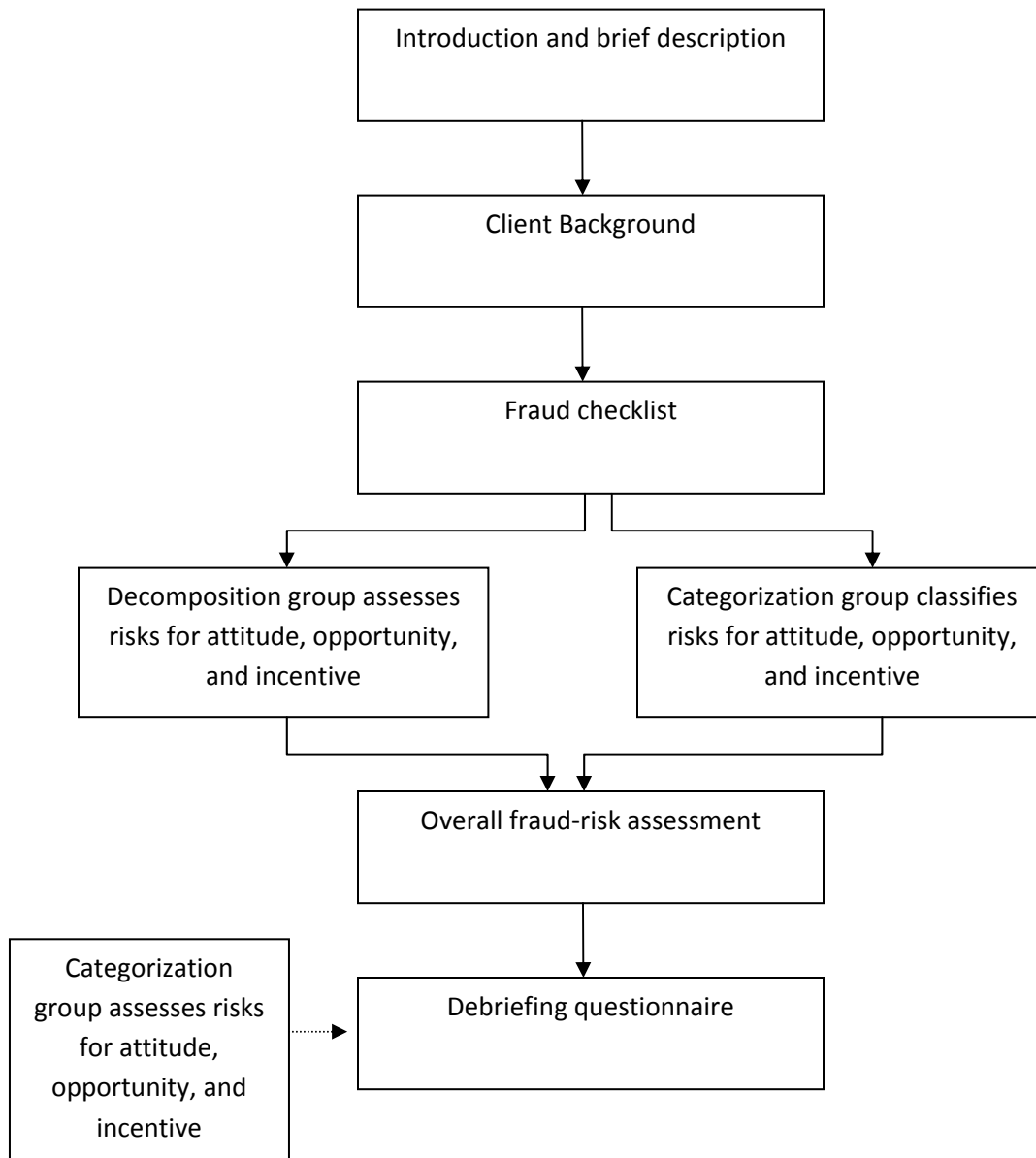
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Figure 1

## Experimental Procedures

**Notes:**

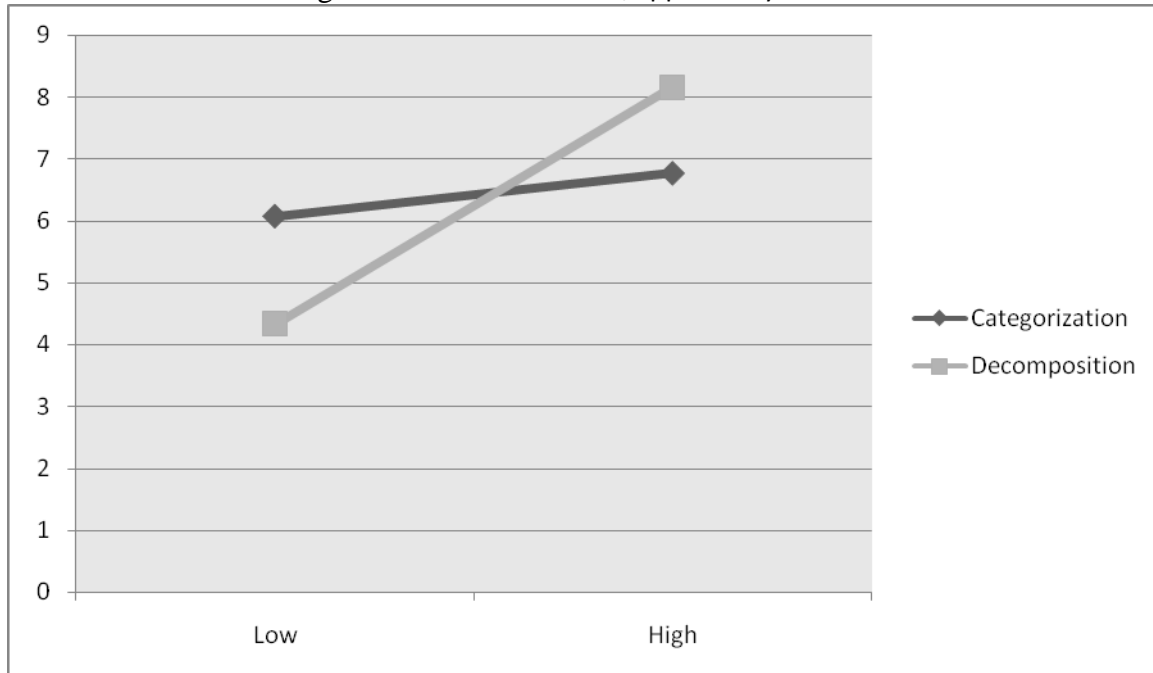
This figure represents the experimental procedures. One group of participants (decomposition group) assesses the component fraud risks for management attitude, opportunity, and incentive, prior to making an overall fraud-risk assessment. The other group of participants (categorization group) classifies the fraud-risk factors as relating to management attitude, opportunity, and incentive, prior to making an overall fraud-

risk assessment; then also assesses the component fraud risks for management attitude, opportunity, and incentive in the debriefing questionnaire.

Figure 2

Effects of decomposition on component incentive/opportunity risk assessments and overall fraud-risk assessments

**Panel A:** Estimated marginal means of incentive/opportunity risk assessments



**Panel B:** Estimated marginal means of overall fraud-risk assessments

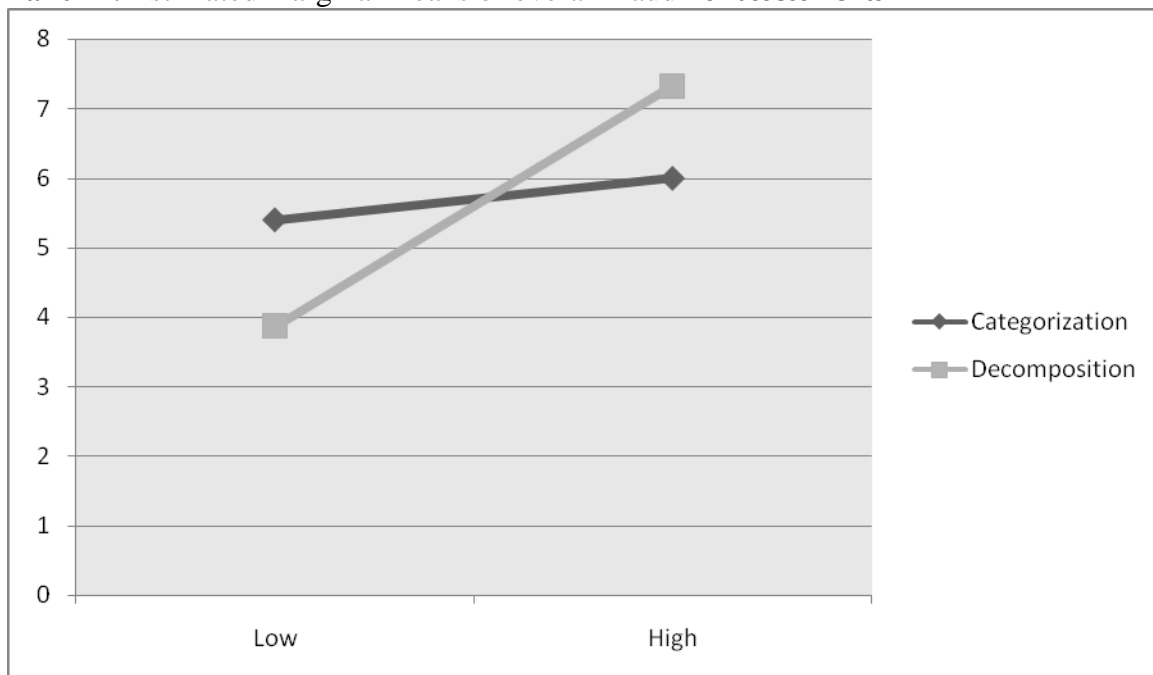
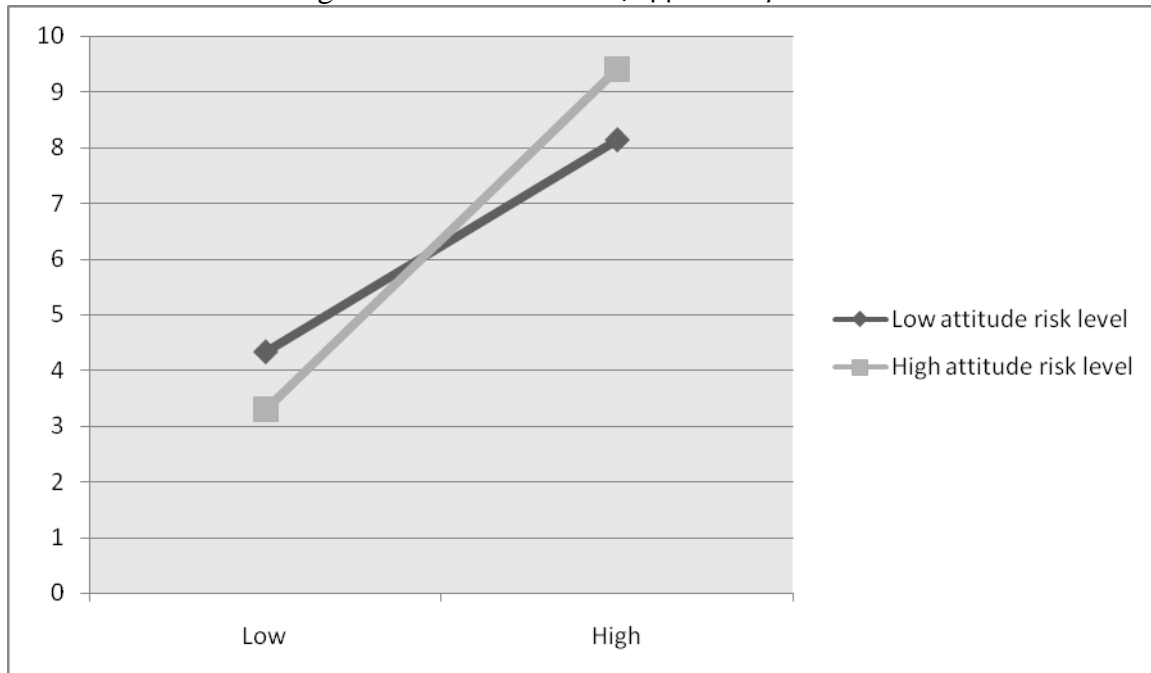


Figure 3

Effects of management' attitude risk level on component incentive/opportunity risk assessments and overall fraud-risk assessments

**Panel A:** Estimated marginal means of incentive/opportunity risk assessments



**Panel B:** Estimated marginal means of overall fraud-risk assessments

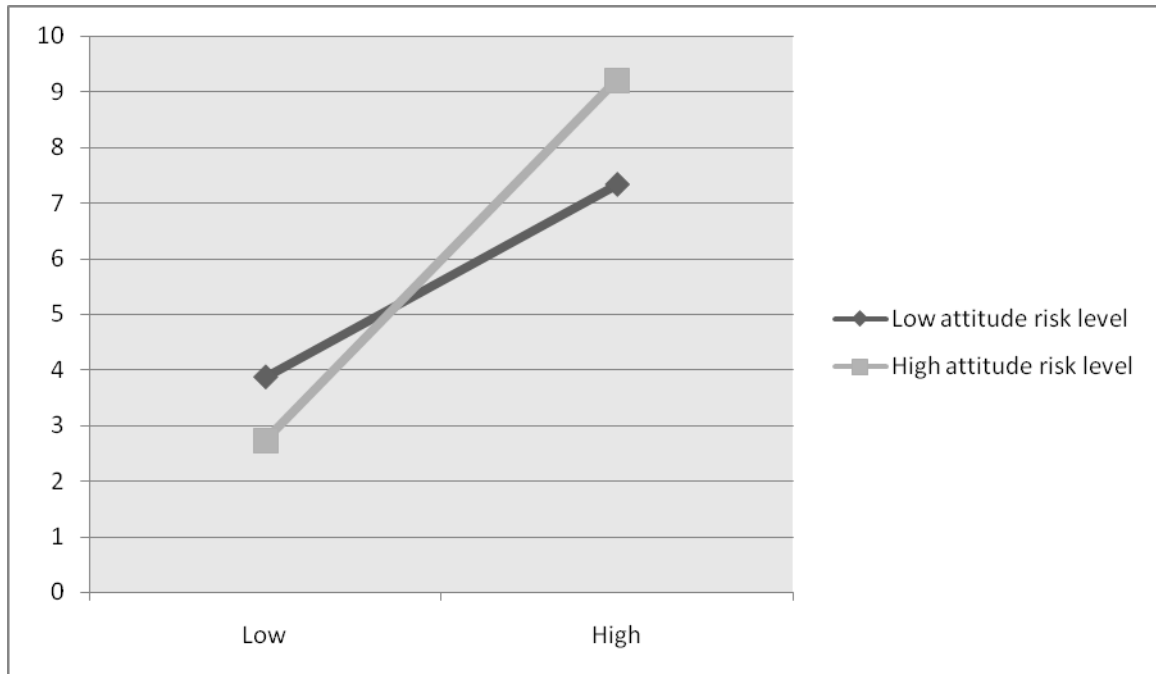


Table 1  
Experimental conditions

<b>Versions</b>	<b>Attitude Risk</b>	<b>Incentive/ Opportunity Risk</b>	<b>Method</b>
1	Low	High	Categorization
2	Low	High	Decomposition
3	Low	Low	Categorization
4	Low	Low	Decomposition
5	High	High	Decomposition
6	High	Low	Decomposition

**Notes:**

This table describes the six versions of the experimental case reflecting conditions of *low* or *high* fraud risk due to opportunities and incentives, and *low* or *high* fraud risk due to management's attitude, combined with the two assessment methods of *decomposition* or *categorization*.

Table 2  
Fraud risk factors manipulated in the experiment

<b>Panel A:</b> Factors present in all fraud-risk versions	Importance rating	Fraud categorization
1. High degree of competition or market saturation, accompanied by declining margins.	2.83	Incentive
2. Significant declines in customer demand and increasing business failures in either the industry or overall economy.	3.00	Incentive
3. Need to obtain additional debt or equity financing to stay competitive-including financing of major research and development or capital expenditures.	3.00	Incentive
4. Marginal ability to meet debt repayment or other debt covenant requirements.	3.25	Incentive
5. High vulnerability to rapid changes, such as changes in technology, product obsolescence, or interest rates.	2.67	Incentive
6. Significant operations located or conducted across international borders where differing business environments and cultures exist.	2.67	Opportunity
<b>Panel B:</b> Factors present in high fraud-risk versions related to incentive/opportunity (versions 1-2, 5-6)	Importance rating	Fraud categorization
1. Significant portions of management's compensation (e.g., bonuses, stock options) being contingent upon achieving aggressive targets for stock price, operating results, financial position, or cash flow.	3.92	Incentive
2. Management's personal guarantee of significant debts of the entity.	3.42	Incentive
3. Excessive pressure on management or operating personnel to meet financial targets set up by the board of directors or management, including sales or profitability incentive goals.	4.08	Incentive
4. Significant related party transactions not in the ordinary course of business or with related entities not audited or audited by another firm.	3.50	Opportunity
5. Assets, liabilities, revenues, or expenses based on significant estimates that involve subjective judgments	3.33	Opportunity
6. Significant, unusual, or highly complex transactions, especially those close to year end that pose difficult "substance over form" questions.	3.67	Opportunity
7. Significant bank accounts or subsidiary or branch operations in tax-haven jurisdictions for which there appears to be no clear business justification.	3.67	Opportunity

(The table is continued on the next page)

Table 2 (continued)

## Fraud risk factors manipulated in the experiment

<b>Panel C:</b> Factors present in high fraud-risk versions related to management's attitude (versions 5-8)	Importance rating	Fraud categorization
1. An ineffective means of communication and support of the entity's values or ethical standards by management or the communication of inappropriate values or ethical standards.	3.33	Attitude
2. Excessive interest by management in maintaining or increasing the entity's stock price or earnings trend.	4.17	Attitude
3. Frequent disputes with the current or predecessor auditor on accounting, auditing, or reporting matters.	4.08	Attitude

**Notes:**

This table describes the factors that were shown as present in the experimental case. An additional 24 factors were included in the checklist, but were shown as "not present" in the audit. The six factors in panel A were shown as present in all versions of the experimental case. The seven factors in panel B were shown as present only in the high fraud-risk versions related to incentive and opportunity. The three factors in panel C were shown as present only in the high fraud-risk versions related to management's attitude. Pilot test subjects in WZ04 had indicated, on a 5-point scale, the importance of each factor on fraud-risk assessments (1 = none, 2 = slight, 3 = moderate, 4 = high, 5 = extreme). The reported importance rating is the average of all pilot subjects.

Table 3  
Correlations between component incentive and opportunity risks,  
and overall fraud-risk assessments

	Fraud assessments	Incentive assessments	Opportunity assessments
Incentive assessments	0.790*		
Opportunity assessments	0.720*	0.503*	
Incentive and opportunity assessments combined	0.872*	0.883*	0.850*

**Notes:**

This table reports Pearson correlations for manager's overall fraud-risk assessments, assessments of incentive and opportunity risks, and the combination of these risk assessments.

\* Correlations are significantly different from 0,  $p$ -value < 0.01.

Table 4

Effects of decomposition on component incentive/opportunity risk assessments and overall fraud-risk assessments

<b>Panel A: Mean component risk and overall fraud-risk assessments (cell n = 15)*</b>				
Incentive/opportunity fraud-risk level	Incentive/opportunity risk assessment		Overall fraud-risk assessments	
	Categorization	Decomposition	Categorization	Decomposition
High	6.77 (1.05)	8.13 (0.92)	6.00 (1.25)	7.33 (1.18)
Low	6.07 (1.00)	4.33 (1.13)	5.40 (1.18)	3.87 (1.30)

<b>Panel B: ANOVA for incentive/opportunity risk assessments</b>				
	Mean square	F-value	$p^{\dagger}$	
Incentive/opportunity fraud-risk level	75.94	64.50	0.000	
Assessment method	.50	.43	0.258	
Incentive/opportunity risk level x Assessment method	36.04	30.61	0.000	

<b>Panel C: ANOVA for overall fraud-risk assessments</b>				
	Mean square	F-value	$p^{\dagger}$	
Incentive/opportunity fraud-risk level	62.02	41.02	0.000	
Assessment method	.15	.10	0.377	
Incentive/opportunity risk level x Assessment method	30.82	20.38	0.000	

**Notes:**

This table contains descriptive statistics and ANOVAs for 60 audit managers' fraud-risk assessments made on a scale from 1 (low) to 10 (high). Managers in the decomposition group first made three component risk assessments for management's attitude, opportunities, and incentives using the same scale. Managers in the categorization group made the same component risk assessments after making their overall fraud-risk assessments.

\* Standards deviations are in brackets.

<sup>†</sup>  $p$ -values are one-tailed.

Table 5  
Effects of management's attitude fraud-risk level on component  
Incentive/opportunity risk assessments and overall fraud-risk assessments

<b>Panel A: Mean component risk and overall fraud-risk assessments (cell n = 15)*</b>				
Incentive/opportunity fraud-risk level	Incentive/opportunity risk assessment		Overall fraud-risk assessments	
	High attitude risk level	Low attitude risk level	High attitude risk level	Low attitude risk level
High	9.40 (0.47)	8.13 (0.92)	9.20 (0.78)	7.33 (1.18)
Low	3.30 (0.92)	4.33 (1.13)	2.73 (1.03)	3.87 (1.30)

<b>Panel B: ANOVA for incentive/opportunity risk assessments</b>				
	Mean square	<i>F</i> -value	<i>p</i> <sup>†</sup>	
Incentive/opportunity fraud-risk level	367.54	399.14	0.000	
Management's attitude fraud-risk level	.20	.22	0.320	
Incentive/opportunity risk x Management's attitude risk	19.84	21.54	0.000	

<b>Panel C: ANOVA for overall fraud-risk assessments</b>				
	Mean square	<i>F</i> -value	<i>p</i> <sup>†</sup>	
Incentive/opportunity fraud-risk level	370.02	312.06	0.000	
Management's attitude fraud-risk level	2.02	1.70	0.099	
Incentive/opportunity risk x Management's attitude risk	33.75	28.46	0.000	

**Notes:**

This table contains descriptive statistics and ANOVAs for 60 audit managers' fraud-risk assessments made on a scale from 1 (low) to 10 (high). All managers used a decomposition assessment method, and made three component risk assessments for management's attitude, opportunities, and incentives using the same scale.

\* Standards deviations are in brackets.

<sup>†</sup> *p*-values are one-tailed.

Table 6  
Effects of decomposition on revisions of audit plans and extent of testing

<b>Panel A: Mean rating of the need to revise audit plans and the extent of testing (cell n = 15)*</b>				
Incentive/opportunity fraud-risk level	Extent of audit plan revisions		Extent of testing revisions	
	Categorization	Decomposition	Categorization	Decomposition
High	3.13 (0.92)	4.20 (0.56)	47.67% (10.67)	59.33% (10.83)
Low	2.67 (1.23)	1.13 (1.56)	36.33% (11.10)	20.67% (11.16)

<b>Panel B: ANOVA for extent of audit plans revisions</b>				
	Mean square	<i>F</i> -value	<i>p</i> <sup>†</sup>	
Incentive/opportunity fraud-risk level	46.82	35.82	0.000	
Assessment method	.82	.63	0.217	
Incentive/opportunity risk level x Assessment method	25.35	19.39	0.000	

<b>Panel C: ANOVA for extent of testing revisions</b>				
	Mean square	<i>F</i> -value	<i>p</i> <sup>†</sup>	
Incentive/opportunity fraud-risk level	9375.00	78.32	0.000	
Assessment method	60.00	.50	0.241	
Incentive/opportunity risk level x Assessment method	2801.67	23.41	0.000	

**Notes:**

This table contains descriptive statistics and ANOVAs for 60 audit managers' rating of the need to revise audit plans, made on a scale from -5 (decrease ability to detect fraud) to +5 (increase ability to detect fraud), and of the need to revise the extent of audit testing, expressed as a percentage by which managers would increase (positive) or decrease (negative) the number of budgeted hours.

\* Standards deviations are in brackets.

<sup>†</sup> *p*-values are one-tailed.