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*University of Central Florida*

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UNDER-RESEARCHED AREAS OF AUDIT QUALITY: INPUTS, FIRMS, AND  
INSTITUTIONS

by

JARED EUTSLER  
B.S. Grand Canyon University 2006  
M.A.I.S Arizona State University 2008

A dissertation submitted in partial fulfillment of the requirements  
for the degree of Doctor of Philosophy  
in the Kenneth G. Dixon School of Accounting  
in the College of Business Administration  
at the University of Central Florida  
Orlando, Florida

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Major Professor: Greg Trompeter

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## ABSTRACT

Francis (2011) lists three under-researched units of analysis that affect audit quality: inputs, firms, and institutions. This dissertation analyzes how each of these units of analysis contributes to audit quality. Study 1 examines audit inputs, specifically, characteristics of the individual auditor that affect professional skepticism. Study 2 examines how firm staffing decisions affect audit quality. Study 3 examines how the Public Company Accounting Oversight Board (“PCAOB”), as a regulatory institution, promotes audit quality through their risk-based inspection program.

The first study reports the results of two experiments that examine professional skepticism as a function of moral agency. Consistent with the theory of moral disengagement (through moral agency), the results suggest that common audit firm human resource practices used to promote audit quality (i.e. hiring creative individuals, and advertising public accounting’s role as protecting the capital markets) may unintentionally decrease professional skepticism through increasing moral disengagement. Results of Experiment 1 demonstrate creative auditors are more skeptical. However, they are also more prone to engage in less skeptical behavior as they fabricate more creative moral justifications (a specific method of moral disengagement) when working under time pressure. Further, Experiment 2 suggests that moral disengagement is increased when firms frame their public interest responsibilities as protecting the ‘capital markets.’ The use of this label unintentionally dehumanizes the individuals that make up the public, and as a result, it decreases professional skepticism. Alternatively, altering the frame of the public interest responsibilities to protecting individuals

(such as more familiar individual investors) increases humanization and increases professional skepticism.

The second study examines how firms affect audit quality. Audit regulators view audit firm staffing as key input affecting audit quality and have suggested that it has value as a potential indicator of audit quality. Further, regulators (such as the IAASB) have called for audit firms to avoid cutting staff (including in periods of economic contraction), as reductions in staff could have a negative impact on audit quality. However, little empirical evidence exists to support how firm-level staffing maps into engagement-level audit quality. This study evaluates the extent to which firm-level staffing affects audit quality. Audit firm employment is obtained from the 1991-2014 rankings of the top 100 U.S. public accounting firms and analyzed across multiple measures of audit quality. In multivariate tests, firm staffing (such as number of partners) and firm leverage (as measured by total partners divided by total professional staff) are associated with audit quality. This analysis provides support for claims made by regulators, about the value of potential labor related audit quality indicators proposed by the PCAOB. Further, decreases in partners or staff (from year to year) are negatively associated with audit quality supporting regulatory claims that audit firm staff cuts have a detrimental impact on audit quality.

The third study examines the relationship between the PCAOB, as an institution, and audit quality. The PCAOB uses a risk-based selection process to identify engagements for inspection and states that their inspection findings are an indicator of audit quality. However, critics argue that the risk-based selection program produces reports that are not representative of the overall audit quality for the firm. This study creates a selection model, investigates the extent to which inspection findings are representative of overall firm audit quality, and examines the

extent to which the inspection process may improve audit quality. Inspection reports of annually inspected firms from 2004 to 2012 are analyzed in combination with the financials of their issuer clients. Results suggest that inspection report findings can be generalized to the audit quality of those deficient accounts for the issuer client base exhibiting the highest levels of selection risk. Specifically, when audit firms have increased levels of revenue related to inspection deficiencies, their high selection risk clients have higher average discretionary revenues for the year inspected. Further, the analysis suggests that the PCAOB risk-based inspection process is effective in improving audit quality of deficient accounts for clients exhibiting the highest levels of selection risk in the subsequent year. The results indicate a negative association between prior levels of revenue specific inspection deficiencies and future levels of discretionary revenues for high selection risk clients.

This work is dedicated to everyone I've shared a beer with... and Tinsley.

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## INTRODUCTION

External stakeholders depend on quality audits as part of their decision-making in the financial markets. However, while audit regulators and standard setters have engaged in activities to promote audit quality, they have explained the difficulty in defining the very construct they seek to promote (IAASB 2013; PCAOB 2013). Often, regulators (and researchers) define or examine audit quality according to the outputs of the audit. This includes the correctness of audit opinions, the extent to which auditing standards were followed, and the characteristics of the audited financial statements (Francis 2011; IAASB 2013; PCAOB 2013).

Still, despite the difficulty in defining the construct, several audit quality frameworks have been provided by researchers (e.g. Francis 2011) and regulators (IAASB 2013; PCAOB 2013) describing factors that lead to or are associated with audit quality. Specifically, Francis (2011) describes six different units of analysis that could impact audit quality. These include audit inputs, audit processes, accounting firms, audit industry and audit markets, institutions, and economic consequences of audit outcomes. While some units of analysis have been largely studied, Francis describes that some of the units of analysis have been under-researched. These include audit inputs, accounting firms, and institutions.

As a consequence, this dissertation uses behavioral and archival methodologies to provide empirical analysis into the effects that these units of analysis have on audit quality. In doing so, the three studies introduce different theoretical frameworks from cognitive psychology, sociology, law, and economics to explain how these units relate to audit quality. The significant findings and theoretical lens of each study are described below.

Study 1 uses Bandura's (1999) theory of moral disengagement to examine the role of audit inputs and audit firms in impacting audit quality. Characteristics of the auditors (audit inputs) employed by accounting firms impact audit quality. The study finds that creative auditors are more skeptical and provides support for why accounting firms express desire to hire creative individuals. However, when auditing under conditions mimicking time budget pressure, a common feature of audits, creative auditors become the least skeptical. Further, the study conducts a second experiment investigating the role of the firm in promoting audit quality. When audit firms frame their public interest responsibilities in terms of protecting the capital markets, moral disengagement increases, leading to decreases in professional skepticism and audit quality.

Study 2 further examines the role that audit firms play in producing quality audits. Using economic theories of the production function of the accounting firm, the study explores how audit firm staffing and changes in staffing affect audit quality. The results suggest that audit firm staffing levels (as assessed through the numbers of professionals employed by the firms and the relative ratio of partners to staff) and staffing cuts (decreases in the number of partners or staff) are associated with audit quality.

Finally, Study 3 explores the role that the Public Company Accounting Oversight Board (PCAOB), as a regulatory institution, has in promoting audit quality. Although its inspection regime has been criticized by researchers, audit firms, and the profession, this study finds that the program is effective of communicating and improving audit quality. Using the theory of risk-based inspection from law literature, support is provided that the inspection reports signal and improve account specific audit quality to those regulatees possessing the highest risk.

The findings from these studies provide empirical analysis of the effect that each of these units of analysis contributes to audit quality. Using different theoretical lenses, the three studies

contribute to an overall framework for audit quality by expanding the knowledge of under-researched units of analysis and incorporating new theories from external literatures.

Accordingly, audit quality is impacted by the actions of audit firms (in who they hire, the incentives they use, and their human resource strategies), individual auditors (including personal characteristics), as well as the regulatory agencies overseeing auditors.



# **STUDY ONE: EXPLAINING REDUCTIONS IN PROFESSIONAL SKEPTICISM WITH MORAL DISENGAGEMENT**

## **Abstract**

This study reports the results of two experiments that examine professional skepticism as a function of moral reasoning and moral agency—how individuals define standards and regulate behavior. Consistent with the theory of moral disengagement, the results suggest that common audit firm human resource practices used to promote audit quality (i.e. hiring creative individuals and advertising public accounting’s role as protecting the capital markets) may unintentionally decrease professional skepticism through increasing moral disengagement. Results of Experiment 1 demonstrate creative auditors are more skeptical. However, they are also more prone to engage in less skeptical behavior as they fabricate more creative moral justifications (a specific method of moral disengagement) when working under time pressure. Further, Experiment 2 suggests that moral disengagement is increased when firms frame their public interest responsibilities as protecting the ‘capital markets.’ The use of this label unintentionally dehumanizes the individuals that make up the public, and as a result, it decreases professional skepticism. Alternatively, altering the frame of the public interest responsibilities to protecting individuals (such as more familiar individual investors) increases humanization and increases professional skepticism.

## I. Introduction

Professional skepticism is essential to effective auditing. It is required by Generally Accepted Auditing Standards (GAAS) and is a determinant of audit quality (Nelson 2009). Lack of skepticism is described as a primary cause of audit failure (Carmichael and Craig Jr 1996) and malpractice claims against auditors (Anderson and Wolfe 2002). Meanwhile, the Securities and Exchange Commission (SEC) in Accounting and Auditing Enforcement Releases (AAERs)<sup>1</sup> and the Public Company Accounting Oversight Board (PCAOB) in inspection reports<sup>2</sup> have faulted auditors for failing to exercise sufficient professional skepticism. Accordingly, lack of professional skepticism is a problem in external audits and it has consequences for auditors.

Nelson (2009) and Hurtt et al. (2013) provide models of professional skepticism that describe auditor personal characteristics, including moral reasoning, as factors which affect professional skepticism. These models suggest that auditors with higher moral reasoning abilities are better able to identify, and less likely to engage in, inappropriate behavior and propose there is a direct relationship between moral reasoning (and possibly moral courage) and skeptical action (Hurtt et al. 2013; Nelson 2009). If skeptical actions are dependent on moral reasoning, then they could be described, in part, as moral actions. Moral actions are a product of moral cognition (including moral reasoning and knowledge) and moral agency (assignment of standards and regulation of behavior) (Bandura 1999). Existing literature on professional skepticism has not examined the personal characteristics and social influences that are embedded into the agentic theories of moral action, which may be used to explain skeptical behavior.

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<sup>1</sup> See, for example, AAER No. 1451, 1945, 2236, and 2232.

<sup>2</sup> See, for example, PCAOB Release No. 104-2005-027A, 104-2009-059A, 104-2012-004A.

The theory of moral disengagement examines moral agency by explaining how individuals alter the perceptions of morality associated with potential behaviors allowing them to engage in principle-inconsistent manners (also “dishonest” or “immoral”) (Bandura 1999).<sup>3</sup> In the external audit, moral disengagement could result in principle-inconsistent behaviors, translating to audit ineffectiveness and decreases in professional skepticism. The possible erosion of skepticism due to moral disengagement is important to study because small changes in the context or social situation can change how individuals evaluate morality and ultimately behave (Bartels et al. 2015). For that reason, this study presents the results of two experiments designed to examine two contexts in audit human resource (HR) processes susceptible to increasing moral disengagement. Although both of these contexts are intended to improve audit quality, they may unintentionally inhibit skepticism by increasing moral disengagement through moral justifications and dehumanization.

Experiment 1 examines how creativity, a trait desired by audit firms, can lead to increased moral justifications which could decrease professional skepticism. Audit firms express desire to hire creative individuals (Deloitte 2015a; EY 2015b; Grant Thornton 2015; KPMG 2015b; KPMG 2015c; PWC 2015). This is not surprising as the positive benefits of creativity in the workplace are well documented (e.g., Amabile et al. 1996; Eisenberger and Rhoades 2001; Oldham and Cummings 1996; Shalley, Gilson, and Blum 2000). Domain specific research suggests that training auditors to use more creative thought patterns leads to increased skepticism (Marchant 1989; Plumlee, Rixom, and Rosman 2014). However, creativity also has a dark-side. Creativity is associated with increases in dishonest behavior because creative individuals have a

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<sup>3</sup> Individuals can alter perceptions of morality through by reducing the morality associated with positive behaviors, or increasing morality associated with negative behaviors.

stronger ability to engage in more creative moral justifications (Gino and Ariely 2012). As a method of moral disengagement, moral justifications represent rationalizations of principle-inconsistent behaviors that allow agents to act immorally and still perceive themselves as good people. In the audit, increased moral disengagement from moral justifications could cause decreases in professional skepticism. Theoretically, creative auditors may be more likely to respond to incentives to engage in self-serving behavior (time budget pressure) as a result of a more creative justification process. To test this, Experiment 1 is a 2 X 2 experiment that manipulates creativity (prime and control) and time pressure (high and low). Moral justifications are analyzed by examining the interaction between creative prime and time pressure. The results suggest that creative auditors are more skeptical (in control exception decisions and follow-up work recommendations). However, when creative auditors are exposed to time pressure (as an incentive to engage in self-serving behavior), they become the least skeptical auditors.

Experiment 2 examines the effect that the frames audit firms use to describe their public interest responsibilities has on the individual auditor's humanization of the public, and ultimately, professional skepticism. Audit firms often refer to their public interest responsibilities in terms of 'protecting the capital markets' (EY 2015a; Deloitte 2015b; KPMG 2015a; PWC 2016). However, referring to the public as 'capital markets' may result in dehumanization of the public. 'Capital markets,' as a semantic label, fails to attribute the 'human essence'<sup>4</sup> to the myriad of individuals that comprise the public. Dehumanization can occur in subtle, everyday ways (Haslam et al. 2005) and allow individuals to act immorally or engage in self-serving behaviors in the workplace (Moore et al. 2012). The effect of dehumanization in the audit is

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<sup>4</sup> 'Human essence' is a term used by Leyenes et al. (2003) and Haslam et al. (2005) which refers to human characteristics that are uniquely human, essentialized characteristics that define personal identity, or secondary emotions that can be attributed or denied to a group.

explored using the same experimental case in a 1 X 3 design manipulating three levels of dehumanization: capital markets (high), institutional investors (medium), and individual investors (low). The results suggest that labeling the public as ‘capital markets’ increases dehumanization and decreases professional skepticism. However, providing a more humanizing face to the specific individuals in the public (e.g. describing auditors as being responsible to protecting investors, retirees, etc.) increases professional skepticism.

This research contributes toward understanding the theoretical process in which personal characteristics, contextual factors, and their interactions affect professional skepticism (Hurt et al. 2013; Nelson 2009). First, this study documents that creativity, an auditor characteristic, is positively associated with professional skepticism. Next, the theory of moral disengagement is used to examine how moral agency affects professional skepticism. The results provide evidence that moral disengagement, through moral justifications and dehumanization, presents a threat to professional skepticism. However, situational adjustments such as minimizing pressure and/or re-framing public interest responsibilities may increase professional skepticism.

The following section reviews research on professional skepticism. Second, the theory of moral engagement is explored in Section III. Relevant literature is reviewed and hypotheses are developed in Section IV. Section V describes Experiment 1 and Section VI describes Experiment 2. The final section provides discussion and concluding remarks.

## II. Professional Skepticism

Auditing standards have not defined professional skepticism with precision and academic literature has been inconsistent with its definition (Nelson 2009). However, a popular definition in academia describes it as a heightened assessment of risk that an assertion is incorrect

conditional on the evidence available to the auditor (Nelson 2009). Nelson (2009) and Hurtt et al. (2013) provide models that describe various factors which affect professional skepticism. The models suggest that skepticism is a function of individual characteristics of the auditor (knowledge, traits, personality) and contextual factors (incentives) in the audit environment.

Several experimental studies test the relationship between skepticism and audit judgments. Skeptical auditors are more likely to document higher fraud risk, recommend more follow-up testing, and less likely to believe management explanations (Quadackers, Groot, and Wright 2014). Similarly, Hurtt et al. (2012) found that skeptical auditors behave differently than non-skeptical auditors. Their results suggest skeptical auditors are more likely to find contradictions and more likely to develop alternative explanations. Further, skepticism is found to be positively related to the search for additional evidence and allocation of additional time for follow-up (Robinson, Curtis, and Robertson 2013).

Other studies have examined methods of increasing professional skepticism. Parlee et al. (2014) found that metaphors can prime auditors to be more skeptical. Primed with metaphors, skeptical auditors are more likely to provide higher risk assessments, to perceive that fraud is the cause of a fluctuation, and to assess a greater need for a fraud risk specialist. Similarly, Plumlee et al. (2014) found that mental models, such as divergent thinking, can increase skepticism. Westermann et al. (2014) described that certain sources of accountability increase skepticism, while excessive documentation requirements and time budget pressure decrease skepticism.

### III. Moral Disengagement

In his theory of moral disengagement, Bandura (1999) argued that humans are moral agents. As moral agents, their moral agency (assignment of moral standards and regulation of moral

behavior) is embedded in social situations and is dependent upon both the social context and the people with whom they transact their affairs. Moral agents strive to act in ways that give them satisfaction and build their sense of self-worth. Additionally, they refrain from actions that violate their moral standards causing self-condemnation. As a result, they behave morally through self-regulation of their conduct, consistent with their moral standards (Bandura 1986, 1991, 1999). Bandura argued that self-regulatory mechanisms are activated by specific contexts where they serve the purpose of ensuring moral behavior (consistent with moral standards). The theory of moral disengagement describes that the self-regulatory mechanisms can be bypassed with specific psychological maneuvers. These maneuvers either diminish the immorality of the act (through *justifications* that rationalize immoral acts as moral), diminish the potential effects of the act (consequences of immoral behavior are made to be not as bad), or diminish the victim (*dehumanizing* the victim by viewing them as sub-human) (Bandura 1999).

Employing these maneuvers allow agents to behave in contradiction to moral standards without self-censure and self-condemnation. Thus, decreases in self-regulatory mechanisms results in moral disengagement which is evidenced by principle-inconsistent, immoral, or antisocial behavior (Bandura 1999). While moral disengagement is frequently examined in atrocities such as genocide (Bandura 1999), it is also viewed in subtle, everyday ways (Haslam 2006). For example, in the workplace, moral disengagement causes individuals to engage in more self-serving behavior (Moore et al. 2012).

According to Bandura's model, moral action is determined by moral cognition (including components moral reasoning and moral knowledge) and moral agency (as described above). Existing research into the role of moral reasoning in the audit has focused on components of moral cognition (i.e. the combination of moral knowledge and moral reasoning). For example, an

auditor's propensity to act skeptically is impacted by their ethical predisposition (Nelson 2009) and their moral reasoning ability (Hurt et al. 2013). Specifically, moral reasoning provides a link between the auditor's incentives and the judgments they make (Nelson 2009). Higher levels of ethical development or moral reasoning are associated with higher levels of professional skepticism (Hurt et al. 2013; Nelson 2009).

Existing research has demonstrated that auditors with higher stages of moral development (better able to identify moral issues) are more sensitive to management integrity (Ponemon 1993; Ponemon and Gabhart 1993), more likely to identify inappropriate behavior (Ponemon and Gabhart 1993), less likely to under report time (Ponemon 1992), and less likely to compromise assessments (Falk et al. 2000). Further, auditors with higher stages of moral development are more sensitive to independence issues and to ethical issues in contextually related ethical dilemmas (Sweeney and Roberts 1997). In summary, research exploring auditors' moral cognition has demonstrated that it impacts audit judgments and professional skepticism. However, the relationship between morality and skepticism documented by research lacks integration with moral agency.

Moral agency is the link between moral cognition and moral action (Bandura 1999). In essence, it serves as the underlying process which determines whether an individual engages in a moral action after identifying a moral issue. Existing research, described above, has shown that moral cognition (identification of issues) is related to professional skepticism. Consistent with this argument, Nelson (2009, 18) describes that moral reasoning "...can be viewed as identifying a level of incentive that changes the effect of moral principles." However, beyond identifying a moral issue, the ultimate moral action (e.g. skeptical action) will be a function of moral agency. As a result, this study examines the effect of moral agency on skeptical actions using the theory



of moral disengagement. Moral agency is analyzed through two types of moral disengagement: moral justification and dehumanization.<sup>5</sup>

#### IV. Hypothesis Development

The following section develops the hypotheses which are tested in two experiments. First, the section presents a hypothesis related to creativity and professional skepticism. Second, it presents how moral disengagement is expected to have a negative relationship with skepticism. Moral disengagement, through moral justifications, can be created by contextual factors (time budget pressure) and interactive effects between personal and contextual factors (creativity and time pressure). Finally, the section describes how moral disengagement can result from dehumanization. Dehumanization is explored through the frame firms use to define their public interest responsibilities, and how as a result, this can threaten professional skepticism.

#### **Creativity and Professional Skepticism**

Creativity is the ability to produce work that is novel and appropriate (Amabile 1983; Sternberg and Lubart 1999). In business, creativity is defined as the ability to produce original ideas that are appropriate—useful and actionable (Amabile 1998). A large body of literature addresses the benefits of creative thinking in several domains. Creative thinking is touted as a solution to solving problems effectively (Mumford and Gustafson 1988), coping with changes in

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<sup>5</sup> Role Morality shares a complementary theoretical space as Moral Disengagement. Radtke (2008) uses Applbaum's (1995, 13) definition of role morality as "claiming moral permission to harm others in ways that if not for the role, would be wrong." Further, the descriptions provided include hints at Justifications ("justification of the act of role morality logically follows" (Radtke 2008, 283)) and Dehumanization ("because accounting is technical and mathematical in nature, it dehumanizes individuals" (McPhail 2001; Radtke 2008, 280)). Where role morality defines the engagement of "wrong" behavior under the guise of the role (such as professional), this study examines the engagement of self-serving, "wrong" behavior inside one role as the professional auditor (rather than contrasted between their professional and private lives).

day-to-day lives (Runco 1994), and succeeding in the marketplace (Goldenberg, Mazursky, and Solomon 1999; Oldham and Cummings 1996). Creativity allows individuals to come up with useful and novel ideas (Amabile 1983; Sternberg and Lubart 1999), to ask more questions (Furman 1998; Sternberg and Lubart 1999), generate a more diverse set of hypotheses (Elstein, Shulman, and Sprafka 1978; Marchant 1989; Popper 1977; Runco 1994), and to engage in problem-finding and problem-solving processes (Runco 1994). Further, creativity can also be valuable in promoting effectiveness in pattern recognition tasks (Cropley 1999) and provide benefits in strategic reasoning (Urbany and Montgomery 1998).

These benefits are not lost on accountants. Creativity is important in accounting (Arthur Andersen & Co. et al. 1989; Albrecht and Sack 2000; Bryant, Stone, and Wier 2011). Recruiting materials for the largest audit firms express their desire to hire creative individuals. The EY (2015b) career page has expressed, “we look for people who are inspired by the chance to think creatively.” KPMG’s (2015c) career page has stated they look for individuals who have “problem-solving abilities,” and that their, “interview process is designed to identify motivated, creative and focused individuals” (KPMG 2015b). Likewise, PWC (2015) has advised applicants that they look for individuals who will, “be creative in your thinking.” Deloitte (2015a) similarly has expressed, “we look for individuals who are creative and passionate about making an impact every day through meaningful value added work.” Lastly, Grant Thornton’s (2015) career page has reiterated, “We pride ourselves on a creative culture that cherishes independence of thought and thirst for knowledge.” It appears, that in the opinion of audit firms, creativity is a desirable, and perhaps essential, trait for their staff.

Generally, creativity is not explicitly described in audit literature, perhaps in part because the phrase ‘creative accounting’ has a strong negative connotation in accounting. However, many

studies use analogous language (referencing key components of the creative process) to describe the potential impact of creativity in auditing. These analogous terms include problem-solving (Nelson 2009), hypothesis generation (Cianci and Bierstaker 2009), pattern recognition (Bedard and Biggs 1991), questioning mind (Hurtt 2010), and strategic reasoning<sup>6</sup> (Hoffman and Zimbelman 2009). Accordingly, creativity has been proposed as a possible solution to increase audit quality and/or professional skepticism through using creative thought processes such as analogical reasoning (Marchant 1989) and divergent thinking (Plumlee, Rixom, and Rosman 2014). Auditors taught analogical reasoning and hypothesis generation skills, as a method of problem-solving, apply these skills to unstructured tasks to better explain unexpected fluctuations (Marchant 1989). Plumlee et al. (2014) demonstrated that teaching divergent (developing more hypotheses) and convergent (ruling out weak hypotheses) thinking skills increases auditor professional skepticism.<sup>7</sup>

As documented above, many benefits of creativity are associated with professional skepticism. This includes asking more questions, generating a more diverse set of hypotheses, engaging in problem-solving processes (e.g., Amabile 1983; Elstein, Shulman, and Sprafka 1978; Furman 1998; Marchant 1989; Popper 1977; Runco 1994; Sternberg and Lubart 1999). Further, the Hurtt (2010) skepticism scale has included elements of creativity such as probing, questioning, and inquisitiveness. These skills, or traits, are also mentioned as important elements

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<sup>6</sup> Strategic reasoning is examined as an aspect of fraud brainstorming. Statement on Auditing Standards (“SAS”) No. 99 (AU 316) requires auditors to engage in fraud brainstorming sessions to consider ways management could perpetrate fraud (AICPA 2002) and emphasizes the importance of professional skepticism. Brainstorming, a creative technique (McFadzean 1998) and strategic planning are suggested as ways to help auditors create “more, and more creative fraud-detection procedures.” As such, creativity could improve audit quality in fraud procedures, which are inextricably linked in standards requiring professional skepticism.

<sup>7</sup> The two main components underlying creative performance are divergent thinking (Guilford 1968, 1982) and cognitive flexibility (Spiro and Jehng 1990).

in the (Nelson 2009) and (Hurt et al. 2013) professional skepticism models. Given that creativity<sup>8</sup> is highly associated with professional skepticism, it follows:

*H1: More (less) creative auditors will engage in more (less) skeptical behaviors.*

## **Moral Justification**

Moral justifications represent a specific form of moral disengagement proposed by Bandura (1999). Individuals can engage in moral justifications by rationalizing (to themselves) that otherwise principle-inconsistent actions are moral, serve a social purpose, or are socially acceptable (Bandura 1999). By reclassifying conduct that could be detrimental to others as otherwise moral and beneficial to society, they act in contradiction to their moral standards and avoid any internal conflict associated with cognitive dissonance (Festinger 1962). With sufficient moral justifications, individuals preserve views of themselves as moral agents while they act immorally, harming others, without self-censure (Bandura 1999).

## **Time pressure and Professional Skepticism**

Time pressure provides an incentive to complete the audit efficiently and may lead to moral justification. When the pressure to meet time budgets is of sufficient strength, and sufficiently internalized, it presents a moral dilemma. Auditors must choose between competing goals of deriving satisfaction from performing high quality audit procedures or from completing the audit on budget. As a result, auditors can engage in moral justifications that prioritize meeting the time pressure over audit quality. Moral justifications re-associate the principle-

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<sup>8</sup> Creativity has been explored in literature as a stable trait representing creative potential (e.g., Gough 1979) and a temporary mindset that is impacted by situational factors such as positive affect (e.g., Isen, Daubman, and Nowicki 1987), incentives (e.g., Kachelmeier, Reichert, and Williamson 2008), and primes (e.g., Gino and Ariely 2012). This research performs analysis of creativity focused on the temporary mindset as it can be experimentally controlled.

inconsistent behavior (succumbing to time pressure) with pro-social meanings (conducting an audit on budget). This re-association results in moral disengagement. As described below, existing research has documented possible evidence of moral justifications by showing a positive association between time pressure and dysfunctional (self-serving) audit behavior.

Numerous studies have shown the adverse effects of time budget pressure on audit performance and decision-making. Time budget pressure can have a negative effect on the audit and the auditor (Alderman and Deitrick 1982). As such, time pressure is linked to dysfunctional audit behavior such as charging fewer hours than actually worked (i.e. eating hours), accepting weak explanations for fluctuations, and signing off on work-papers prematurely (Kelley and Margheim 1990; Lightner, Adams, and Lightner 1982; Otley and Pierce 1995; Raghunathan 1991). These dysfunctional behaviors provide evidence of the prioritization of meeting time budgets at the expense of performing quality audit procedure, in other words, the result of moral justifications. Time pressure also affects auditor testing strategies. Time pressure is associated with increases in efficiency at the detriment of audit effectiveness (McDaniel 1990). In addition, time pressure causes auditors to allocate attention away from subsidiary tasks (such as noticing fraud cues) (Braun 2000) and it decreases the extent and depth of testing chosen by auditors (Asare, Trompeter, and Wright 2000). Together, these studies provide evidence of the underlying incentive for auditors to stay within time budget and that auditors will engage in dysfunctional behavior to meet the budget.

Time pressure is also related to professional skepticism. The Hurtt et al. and Nelson models have incorporated time pressure as a mechanism that can negatively affect professional skepticism. Further, survey data from Westermann et al. (2014) suggested that time budget pressure may attenuate skepticism. These studies provide evidence that time pressure can cause

dysfunctional audit behaviors including decreases in professional skepticism.<sup>9</sup> The studies described above are consistent with the possibility that moral justifications can rearrange moral standards to prioritize meeting the time pressure at the expense of professional skepticism.

*H2: Auditors will engage in less (more) skeptical behavior in the presence of high (low) time pressure.*

### Time Pressure, Creativity, and Professional Skepticism

While prior accounting research focuses on the positive attributes of creativity, research has also documented possible negative effects. Amabile et al. (1996, 2) stated that just as creativity can be used for good and constructive ends, it “can be applied to evil and destructive ends.” Individuals who are creative, through natural disposition or priming, are more likely to engage in dishonest behavior such as cheating (Gino and Ariely 2012). In the workplace, creativity is associated with more unethical acts, including lying for money (Vincent and Kouchaki 2015). Also, creative employees are more likely to engage in unethical behavior as reported by their supervisors (Vincent and Kouchaki 2015). The increased dishonest behavior is explained by the findings of Gino and Ariely (2012). Their findings suggest that creativity allows individuals to fabricate more creative moral justifications, finding more creative ways to reclassify dishonest behavior as socially acceptable. Thus, when creative individuals face an ethical dilemma, in which they weigh self-interest against the desire to maintain a positive view

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<sup>9</sup> Although most theoretical frameworks and empirical studies suggest a negative association between time pressure and professional skepticism, there are some indications that time pressure can increase professional skepticism. Glover (1997) suggests that time pressure can improve audit quality by causing auditors to engage in effective filtration strategies. Robinson et al.’s (2013) findings agree with Glover’s, suggesting that time pressure has a positive relationship with state skepticism. However, due to the weight of the evidence predicting a negative association, a directional hypothesis is provided.

of oneself (Mead et al. 2009), they are more likely to act in their self-interest caused by a greater ability to (creatively) justify dishonest actions (Gino and Ariely 2012).<sup>10</sup>

Nelson (2009) proposed that different characteristics of the auditor could interact with incentives to determine professional skepticism in judgment and action. One such interaction is between creativity (a personal characteristic) and time pressure (an incentive). The theoretical argument presented by Gino and Ariely (2012) would suggest that auditors who are more creative (through disposition [trait] or priming [mindset]) are more likely to engage in moral justification. As a result, they act in their own self-interest when facing an ethical dilemma, like that presented by time budget pressure. Thus, it is predicted that when facing an ethical dilemma (caused by time pressure), creative auditors will have a greater ability to justify acting to maximize their self-interest (meeting the time budget) while maintaining the perception they performed a high quality (skeptical) audit. This is stated as a formal hypothesis:

*H3: More creative auditors in the presence of high time pressure will engage in the least skeptical behavior.*

## **Dehumanization**

An agent's self-regulatory mechanisms evaluate the potential victims that would be impacted by immoral behavior (Bandura 1999).<sup>11</sup> If the people who would be impacted by the behavior are humanized persons (viewed as people with feelings, hopes, and concerns), it is more difficult for the agent to engage in immoral acts without suffering from self-censure (Bandura 1999). Alternatively, dehumanization occurs when the agent views potential victims as

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<sup>10</sup> Support for the theoretical argument, instead of the alternative that creative potential was used to devise more creative dishonest behaviors, was provided as creative individuals were more likely to engage in dishonest behavior when the situation was ambiguous, not when the moral decision was obvious (Gino and Ariely 2012).

<sup>11</sup> Dehumanization results from how an agent views others who might be impacted by immoral behavior and does not refer to how individuals feel in relation to the social or situational environment in which they are embedded.

sub-human (Bandura 1999) and/or lacking the ‘human essence’ (Haslam 2006; Haslam and Loughnan 2014). Dehumanization decreases self-regulatory mechanisms, allowing the agent to act immorally without self-censure.

Dehumanization is frequently examined in the infliction of physical harm, such as the ability of soldiers to kill in combat and genocide (Bandura 1999). However, theoretical models examine dehumanization in milder, everyday forms (Haslam 2006; Haslam and Loughnan 2014). Haslam (2006) and Haslam et al. (2005) described the denial of the ‘human essence’ through the failure to attribute traits that reflect human nature. An example is the dehumanization of business people who are viewed as rational, cold, automata, soulless machines (Haslam 2006).

Public accounting firms may unintentionally engage in this denial of the ‘human essence’ in framing their public interest responsibilities. Often, audit firms define their role in the public interest as protecting the ‘capital markets’. For example:

- EY (2015a)- “The insights and quality services we deliver help build trust and confidence in the capital markets and in economies the world over.”
- PWC (2016)- “In the capital markets, the audit is a vehicle of trust because it provides assurance over the integrity of companies’ financial reporting.”
- KPMG (2015a)- “Financial statement audits give assurance over information used by investors and the capital markets... KPMG professionals – innovating to better serve the capital markets and society as a whole.”
- Deloitte (2015b)- “Our people remain dedicated to serving investors and the capital markets, and to building confidence in the independent audit process.”

Reference to the public as the ‘capital markets’ is an example of failing to attribute hopes, feelings, and concerns to the public; including individual stakeholders and market participants. In



doing so, the claim portrays the public as the market; efficient, rational, cold, automata (Haslam 2006). This dehumanized designation provides an opportunity for auditors to engage in dehumanization, leading to moral disengagement and resulting in reduced levels of professional skepticism in the audit. Alternatively, Bandura (1999) provided that humanization can have the opposite effect. “People’s recognition of the social linkage of their lives and their vested interest in each other’s welfare help to support actions that instill them with a sense of community. The affirmation of common humanity can bring out the best in others” (Bandura 1999, 202). Thus, the following hypothesis is presented,

*H4: Dehumanization of the public interest will result in lower levels of professional skepticism.*

The hypothesized relationships are shown in Figure 1, which depicts moral justifications and dehumanization as components of moral disengagement according to Bandura’s (1999) model. The specific relationship between moral disengagement and professional skepticism is not tested (as it is the theoretical internal process), only the outcome, lower professional skepticism, is analyzed.

## V. Experiment 1

### **Participants**

Participants were 94 experienced auditors obtained from professional contacts (n=14) and a survey panel provider (n=80).<sup>12</sup> Participants were invited to enter the experiment if they successfully passed a series of screening questions. To enter, participants had to confirm they worked for an accounting firm, had fewer than 10 years of experience, and worked in the audit

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<sup>12</sup> Excluding the sample recruited from firm contacts does not change the inferences or results presented.

function of the audit firm. In addition to the 94 who completed the materials, participants were screened out if they did not adequately attend to attitude and manipulation checks. Seven participants were screened out because they did not respond to an attention check asking them to select disagree on a specific question (Meade and Craig 2012). Further, nine participants were excluded because they answered a question about the time budget manipulation incorrectly.

The participants had 4.8 years of audit experience, with 76.6 percent of the sample having reported full time work experience. They come from a range of firms including Big N (25.5 percent) and national firms (30.8 percent). Further, 90.4 percent of the population have experience working with audit engagement time budgets. They also have experience with the experimental task as 85.1 percent report having experience auditing cash and 84.0 percent auditing internal controls. There were no significant differences between the demographic variables among the experimental conditions.

### **Experimental task**

This study manipulated creativity (prime or control) and time budget pressure (high and low) in a 2x2, between-participants experimental design. Participants completed a computerized internal control case (Eutsler, Norris, and Trompeter 2015). The experimental task required participants to complete internal control testing for cash disbursements by deciding if transactions were control exceptions or not, documenting conclusions, and recommending an audit response.<sup>13</sup>

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<sup>13</sup> The PCAOB (2012) views testing of internal controls as an important area to exercise professional skepticism. “Appropriately applying professional skepticism is critical to obtaining sufficient appropriate audit evidence to determine whether the financial statements are free of material misstatement and, in an integrated audit, whether internal controls over financial reporting are operating effectively” (p 12).

Participants were provided with an explanation of control testing and then were introduced to the task. The task requires them to complete internal control testing started by another staff auditor. Their responsibilities included evaluating six cash disbursements that were flagged for further questioning during the original testing and were forwarded to the auditee's controller for further explanation. A description of the controls, initial concerns, and the controller responses are provided in Appendix A.

The participants were provided a vendor master file (VMF) list and an authorized signer sheet (with signatures and authorization amounts). For each cash disbursement, the participants were provided with a copy of the check, an initial concern expressed by the other staff auditor who started the task, and the controller's response. After reviewing the materials, they were asked to make audit judgments which serve as the dependent variables used to assess professional skepticism.

Eutsler et al. (2015) found the experimental materials were effective in assessing professional skepticism. For this experiment, three pre-testers (experienced auditors) validated the realism of the error types and supporting materials. Sixty-three graduate students pretested an early version of the experimental materials finding successful manipulation of the creativity and time pressure manipulations on the dependent variables. Further, pretesting with 77 students enrolled in an undergraduate audit class supported the effectiveness of the dehumanization manipulation. An experimental task flow diagram for Experiment 1 is provided in Figure 2; the diagram for Experiment 2 is provided in Figure 3. The manipulations, manipulation checks, and other control variables are described below.

## Experimental design

### Independent Variables

**Creativity manipulation.** Participants were randomly assigned to either a creative priming or a control condition. Creative priming has been shown to be effective in establishing a creative mindset (Fitzsimons, Chartrand, and Fitzsimons 2008; Sassenberg and Moskowitz 2005; Gino and Ariely 2012). The creative prime was employed with a scrambled sentence test (Bargh and Chartrand 1999, 2000; Chartrand and Bargh 1996). The sentence scramble required participants to construct fifteen grammatically correct, four-word sentences from sets of five words. The creative prime was made of twelve sentences that include words related to creativity and three sentences that do not contain words related to creativity.<sup>14</sup> In the creative prime condition, the three sentences that did not include words related to creativity were sentences used in the control condition. The participants in the control group received control sentences that have been implemented as a control condition for this task (Bargh and Chartrand 2000), none of which included words related to creativity. The sentences provided for both conditions are presented in Appendix B.

**Time budget pressure manipulation.** Time budget is manipulated in the experimental case in two different conditions: low and high. Time budget pressure is used instead of time limit pressure because it is more reflective of the audit work environment for tasks performed by junior audit team members (Asare, Trompeter, and Wright 2000). Low and high time pressure manipulations were used instead of present and absent because the prevalence of time budgets would make it unlikely that auditors would work in an audit environment void of any time

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<sup>14</sup> The words related to creativity are: creative, original, inventiveness, novel, new, innovative, invention, creativity, ingenious, imagination, originality, and ideas (Gino and Ariely 2012).

budget pressure. Participants in the high (low) time pressure condition were instructed that the audit team budgeted for them to complete this task in 10 (30) minutes (as the task was already started by another member of the audit team), but that they should expect it to take about 20 (in both conditions) minutes for the task to be completed based on past engagements.<sup>15</sup> The participants were told that they could take longer, if necessary, to test and document their results. Participants were provided count-up and count-down timers on the page.<sup>16</sup>

### Dependent Variables

The dependent variable of professional skepticism was analyzed in two different ways.<sup>17</sup> The first measure reflects the audit judgment. Participants were asked to classify the questionable cash disbursement as a control exception or not. More items identified as control exceptions indicated higher levels professional skepticism. Second, skeptical auditors are likely to recommend further follow-up testing (Quadackers, Groot, and Wright 2014). Thus, the participants were provided four alternatives for follow-up testing. These included: performing no additional work, increasing the sample size, reducing reliance on the control and finding a compensating control, or increasing the level of control risk associated with the account or assertion and performing more substantive testing. The participants were told that the three options requiring more work will add an approximate 30 minutes, 1 hour, and 2 hours to the audit, respectively.

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<sup>15</sup> Ten minutes is a duration slightly shorter than required by three experienced auditors who served as pre-testers.

<sup>16</sup> The count up time presents a digital clock that starts at 0 seconds and increases in increments of 1 second. Count down timers start at 10 minutes and decrease in increments of 1 second. The clocks do not have alarms indicating the time budget has been reached, but continue to count.

<sup>17</sup> A third method, the participant's assessment of the sufficiency of the controller's explanation, was also collected based on Peecher (1996). When used as a dependent variable, none of the independent variables were significant. Correspondingly, the results using this as a DV are not included.

## **Analysis**

Generalized Estimating Equations (GEE) was the statistical method used to analyze the results. GEE is a regression-based analysis capable of performing analysis of correlated responses and a set of predictors because it relies on a less restrictive assumption (than independence) for the variance/covariance matrix (Diggle, Liang, and Zeger 1995; Liang and Zeger 1986). Thus, it allows for testing repeated measures with non-continuous outcome variables. The use of GEE was necessary because the study design presents checks as a repeated measure item for each participant (i.e. checks 1 through 6) and used two different non-continuous dependent variables: one dichotomous (control exception decision [yes/no]) and one ordinal (extent of follow-up [none/low/medium/high]).

In this experiment, the dichotomous dependent variable (control exception) was regressed using a logistic regression model predicting the repeated binary decision. The ordinal dependent variable (extent of follow-up) was fitted with a proportional odds model—a cumulative logit regression model. Both GEE models were calculated using an exchangeable correlation matrix. Between-subjects independent variables tested in the GEE estimation were creativity (creative prime/control) and time budget pressure (high/low) which were included as dichotomous variables. The within-subjects variable in all models was “checks”.

Eutsler et al. (2015) designed two of the six checks to be “distractor” items—Checks 2 and 4. In their study, a majority of their pre-testers and study participants believed checks 1,3,5, and 6 to be control exceptions. Alternatively, disbursements 2 and 4 were rated as control exceptions by less than half of their participants. Beyond design characteristics, these two checks also had different statistical properties reflected with negative item to total correlations and significantly different intercept coefficients when included in multivariate models. Consistently,

this iteration of the experiment found that check 2 had a negative item-to-total correlation, and that both checks 2 and 4 have the smallest percentage of the population agreeing that they were control exceptions at less than 50 percent (27.6 percent and 46.8 percent, respectively). Further, when included with all other checks in a GEE analysis, these checks had significant negative coefficients for both sets of dependent variables. As a result of design and unique distributional properties characteristics, checks 2 and 4 were excluded from the analysis.

## Results

### Manipulation Check Results

**Creativity manipulation check.** After the experimental case, participants completed the Remote Association Task (RAT) (Mednick 1962) to assess the effectiveness of the creativity prime. RAT is a common measure for assessing creativity by identifying associations between words related under a common theme (Koberg and Hood 1991; Koberg and Chusmir 1987; Fong 2006; Gino and Ariely 2012). The task asked participants to find the common word that links three words. For example, “manners”, “round”, and “tennis”, are all linked by the word “table”. The participants were presented with 17 three-word combinations and were asked to solve as many items as they could in five minutes, at which they were directed to the next page. The results of the manipulation check suggest that the creative manipulation was effective. There is a significant difference ( $t=-1.65$ ,  $p=0.05$ , one-tailed<sup>18</sup>) between the creative prime condition ( $M=5.81$   $SD=3.99$ ) and the control condition ( $M=4.52$   $SD=3.59$ ).

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<sup>18</sup> All remaining variables are presented two-tailed unless designated as one-tailed.

Bargh and Chartrand (2000) suggest engaging in a debriefing to ensure participants were not cognizant of the relation between the priming manipulation and the subsequent experimental task. Accordingly, upon completion participants were asked if they noticed a particular pattern or theme to the words in the scrambled sentence tests. Two of the participants in the creative condition noted that the sentence scramble contained words related to creativity (one- ‘creativity’, one- ‘originality’). Excluding these two participants from the analysis did not affect any inferences presented in this paper. Thus, they were included in the final analysis.

**Time pressure manipulation check.** After completing the case, participants were asked the extent to which they experienced time pressure on a 7-point fully labeled scale (ranging from 1=Strongly Disagree to 7=Strongly Agree).<sup>19</sup> There is a significant difference for the time pressure manipulation check ( $t=-3.34$ ,  $p>0.01$ ) between the high time pressure ( $M=5.15$   $SD=2.34$ ) and low time pressure ( $M=3.63$   $SD=2.08$ ) conditions.

## Univariate Results

Descriptive statistics for participants’ responses of mean control exception judgments are provided in Panel A of Table 1. The data are tabulated examining the control exception decision as a function of the two independent variables: time pressure (high and low) and creativity (prime and control).<sup>20</sup> Analysis of the means suggests the lowest skepticism is in the high time pressure/creative condition ( $M=2.33$   $SD=1.43$ ). The remaining three conditions have similar means, with the most skepticism in the low time pressure/creative ( $M=3.33$   $SD=1.20$ ), followed

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<sup>19</sup> The manipulation check asks the extent the participant felt pressured to finish the task in a timely fashion. Response options were presented on a 7-point, fully labeled scale to maximize variance (Eutsler and Lang 2015).

<sup>20</sup> Data presented for the mean recommendation follow-up, and those excluding checks 2 and 4 are also analyzed and provide similar results. The control exception determination variable was used to provide insights into the univariate and multivariate effects on professional skepticism which was not as evident in the repeated measurement analysis.



by the high time pressure/control condition ( $M=3.14$   $SD=1.04$ ), and the low time pressure/control condition ( $M=2.88$   $SD=1.60$ ). ANOVA results, untabulated, reveal a significant interaction effect ( $F [1,90]= 5.19$ ,  $p=0.03$ ), but no significant main effects. An interaction graph is presented in Figure 4. This suggests a significant ordinal interaction, which is tested with a -3 (high time/creative), 1, 1, 1 contrast. This contrast is significant ( $Z=-2.52$ ,  $p=0.01$ ). This analysis provides preliminary support for H3, with formal testing of hypotheses occurring in the next section. The multivariate analysis uses a GEE Model to test hypotheses. This statistical model allows for the testing of a repeated measurement (by check) of ordinal response items (for both the control exception determination and follow-up recommendation).

#### Multivariate Results

**GEE.** Table 2 presents the results of the analysis for the creativity and time pressure manipulations on two dependent variables—the control exception decision (Panel A) and the extent of follow-up procedures (Panel B). First, for the control exception decision, there is a significant main effect for the creative prime variable ( $\beta =0.64$ ,  $Z=1.88$ ,  $p=0.03$ , one-tailed). This supports H1, suggesting that creativity is positively associated with professional skepticism. Next, the results do not support H2 predicting a negative association between time pressure and skepticism. Third, the interaction between time pressure and creative prime is significant ( $\beta=-1.15$ ,  $Z=-2.36$ ,  $p=0.02$ ). Similar to the pattern tested with the ANOVA, this interaction was tested within the GEE model with contrast weights -3 (high pressure/creative), 1, 1, 1 which is significant at  $p=.07$ , one-tailed. Together, this provides evidence for H3 that creative auditors

who were under time pressure engage in some moral justification process which decreases skepticism.<sup>21</sup>

Panel B of Table 2 presents the results using extent of recommended follow-up procedures as the dependent variable. These results are consistent with the analysis presented above. First, there is a significant main effect for the creative prime variable ( $\beta = 0.59$ ,  $Z = 1.86$ ,  $p = 0.03$ , one-tailed). This provides additional support for H1 suggesting that creativity is positively associated with professional skepticism. Next, the main effect for time pressure is not significant ( $p = 0.18$ ). Third, the interaction between time pressure and creative prime is significant ( $\beta = -0.82$ ,  $Z = -1.80$ ,  $p = 0.03$ , one-tailed). Results from the planned contrast (-3,1,1,1) suggest that the creative auditors under high time pressure were the least skeptical ( $p = .03$ , one-tailed). The results of the model analyzing recommended follow-up display are similar to the control exception decision. Mainly, creative auditors were more skeptical, unless they were under pressure which may cause the creative auditors to more creatively justify self-serving behavior (prioritize meeting the audit budget).

#### Additional Analysis

**Creativity trait.** Gino and Ariely (2012) demonstrate that both creative disposition and creative primed individuals showed a propensity toward dishonest behavior in ethical dilemmas.

To control for this possible effect, the Gough (1979) creativity scale<sup>22</sup> was introduced as a

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<sup>21</sup> Other tests of disordinal interactions are not significant, suggesting an ordinal interaction. Contrast weights 2,2,-1,-3 and -1,1,-2,2 for TP0C0,TP0C1, TP1C0, and TP1C1, respectively, are not significant.

<sup>22</sup> Gough's (1979) Creative Personality Scale provides 30 adjectives that are linked positively or negatively with creative personalities and asks participants if the adjective does or does not describe them—the net creativity score is the net between positive and negative adjectives. This measure is widely applied as a measure of creative personalities (Barron and Harrington 1981; Fesist and Sternberg 1999; Gino and Ariely 2012; Gough 1979; Schaefer 1972; Tierney and Farmer 2002; Zhou and Oldham 2001). Schaefer (1972) finds temporal stability of this scale using a five-year follow-up, documenting correlations ranging from .7 to .8.

control variable as an assessment of the participant's creative trait. There is not a significant difference between the experimental conditions for this scale ( $F=1.52$   $p=0.21$ ). In separate regressions, the Gough variable, and its median split, were introduced into the GEE models with all two- and three-way interactions with creative prime and time pressure. When included as a standalone control variable in the model, the creative trait variable was positively associated with skepticism and is significant in the follow-up recommendation GEE ( $p=.04$ , one-tailed). In this same regression, the creative prime and creative prime/time pressure interaction remained significant ( $p=.05$ ). However, when included with the interactions, the creative trait and all additional higher-order interactions are not significant. Adding the creativity trait variable (and interactions) does not change the inferences presented in the above analysis that the creative prime and its interaction with time pressure affect professional skepticism. Next the median split of the creative trait variable was used to replace the creative prime in the analysis, and the creative prime was included as a control variable. This analysis does not find significance for the creative trait variable, but its interaction was negative and significant ( $\beta =-.79$ ,  $Z=-1.57$ ,  $p=.05$ , one-tailed) in the control exception decision. As a result, the results suggest main effects for both the creative prime and creative trait variables, although the results of the trait are weaker. It also appears that the creative trait does not supersede the experimentally induced creativity.

**Moral disengagement controls.** Moore et al. (2012) created a moral disengagement scale. Each of Bandura's (1999) eight types of moral disengagement, including subscales for justification and dehumanization, are comprised of three questions. Overall, trait propensity to morally disengage is an eight item scale, consisting of one question from each of the eight subscales (Moore et al. 2012). The full subscales for moral disengagement and moral justification components were included in the analysis of Experiment 1. Neither variable is

significant when integrated into the GEE Models (moral justification not significant at  $p > .63$  and trait justification at  $p > .80$ ).

However, there is evidence that moral disengagement occurred in the creative prime/high time pressure interaction cell. The participants who scored high on the moral disengagement scale (median split) in this cell are significantly less skeptical ( $t=2.53$ ,  $p=.02$ ) in determining control exceptions ( $M=1.67$   $SD=1.23$   $n=12$ ) than those who scored low on this scale ( $M=3.00$   $SD=1.34$   $n=12$ ). The results are similar with the extent of follow-up ( $t=2.50$ ,  $p=.02$ ). Next, this split was analyzed with the justification subscale (median split). There is a significant difference ( $t=1.67$ ,  $p=.05$ , one-tailed) on extent of follow-up between those who scored high on trait justification recommending less follow-up ( $M=3.00$   $SD=2.08$   $n=13$ ) than those who scored lower ( $M=4.73$   $SD=2.97$   $n=11$ ). No differences are significant for the control exception decision.

Further, the theory of moral disengagement suggests that individuals who engage in moral justification will act ‘unethically’ but still convince themselves that they acted ethically. In this case, they would act without professional skepticism and still think they did. The post-follow-up questionnaire asked two questions about the participant’s perceptions of the quality to which they performed the procedures. ‘To what extent do you agree that the procedures you performed were of (1) high quality, and you (2) maintained a skeptical mindset?’ In the interaction cell (high time pressure/creative) there was no difference found in perception of quality for the population split on skepticism levels or on moral disengagement levels. Overall, ultimate judgments or propensity to engage in moral disengagement do not appear to be related to the perception of the quality of the work performed by the participants. The results of this analysis are consistent with the possibility that moral disengagement and moral justifications appear to be the theoretical process for the decrease in professional skepticism.

**Other control variables.** Participants completed the Hurtt Professional Skepticism Scale (“HPSS”) (Hurtt 2010) as a potential covariate for the testing model, controlling for trait skepticism. HPSS has a mean of 139.81 (SD=15.42). There is not a significant difference between the experimental conditions for HPSS ( $F=0.04$   $p=0.99$ ). When included in the GEE Models, this variable is not significant. In addition to those explained above, other control variables tested in this model that are not significant include firm size and years of experience. BIGN is a significant control variable. In the model, it has a significant positive coefficient, but its inclusion does not affect the statistical inferences presented in this paper. Therefore, it was excluded from the model.

## **Discussion**

Overall, the results suggest that creative auditors are more skeptical and support why creativity is a desirable trait demanded by audit firms. However, as identified by Gino and Ariely (2012), creativity (both trait and mindset) has a dark side. This dark side allows individuals to creatively engage in justifications of self-serving behavior. This paper provides support for this theory in the audit. Specifically, creative auditors become less skeptical when faced with time pressure. Further, additional analysis shows that the individuals who scored high on trait justification or moral disengagement scales were the least skeptical individuals in this cell. Still, they maintained the perception they performed a high quality audit. All these results are consistent with the theory of moral disengagement, supporting that a specific method of moral disengagement, justifications, has a negative effect on professional skepticism.

## VI. Experiment 2

Experiment 2 is used to test H4, which predicts a relationship between dehumanization (as a second, distinct form of moral disengagement) and professional skepticism. The experiment manipulates levels of dehumanization in a 1 X 3 between-subjects design presenting alternative frames that firms can use to describe their public interest responsibilities. Experiment 2 used the same experimental materials as Experiment 1 but replaced the previously used manipulations with the independent variable (and manipulation checks) described below.

### **Participants**

Participants were Masters students recruited from two universities. One is a private university in the west, the other a large public university in the southeastern United States. A substantial portion of the participants have experience— 62.5 percent report having work experience with an accounting firm. Overall, 23.4 percent of the population have experience working for a Big 4 and 29.7 percent of the population have experience working for a national firm. Further, 29.7 percent of the population have experience auditing cash and 34.0 percent of the population have experience auditing internal controls. Across the sample, HPSS has a mean of 132.03 (SD=17.38). All demographic information was evaluated across the experimental conditions and no significant differences were found for any work experience variables or HPSS. However, there is a significant difference found for Dehumanization Trait (Moore et al. 2012) ( $F=3.74$   $p=0.03$ ). Accordingly, because it has a theoretical relationship with the dependent variable and is significant in the GEE models, it was included as a control variable.

## **Experimental design**

### Independent Variable

**Dehumanization.** The dehumanization variable was operationalized at three levels through descriptions of the constituencies that comprise the public stakeholders. The base condition is based on how audit firms often frame their public interest responsibilities in terms of ‘protecting the capital markets.’ For example, recruiting materials used by a Big 4 firm state, “The insights and quality services we deliver help build trust and confidence in the capital markets and in economies the world over” (EY 2015a). Thus, for the first condition stated, “Your manager would like to remind you that quality audits are important to help protect the capital markets.”

The second two conditions added a more humanizing description in place of the “capital markets”. Under one condition, “capital markets” was replaced with mention of specific individuals, “pension and hedge fund managers.” This manipulation personifies the capital markets by naming individuals, but it was unlikely that the auditor participants would have relationships with pension and hedge fund managers that would lead to an increased inference of an increased ‘human essence’. The final condition described the audit’s role in protecting groups of individuals that the auditor participants were likely familiar, leading to increased humanization. These include “individual investors such as retirees, employees, and small business owners.” It is expected the auditors will be more skeptical in this condition as humanization increases.

## **Results**

### Manipulation Check Results

Studies of dehumanization suggest that individuals assign fewer adjectives related to ‘the human essence’ to individuals who are dehumanized (Leyens et al. 2003; Haslam 2006; Haslam

et al. 2005). This study examines the effectiveness of the humanization manipulation by comparing the frequency of adjectives, having a high or low relation to human nature, that are selected to describe the individuals in each condition. Participants were given a list of 32 words (Haslam et al. 2005) and asked to select up to 10 words to describe those individuals. Participant responses that include fewer words that describe elements high in human nature suggests higher levels of dehumanization (Haslam et al. 2005). The adjectives and the degree they represent human nature (high/low) are provided in Appendix C.

Descriptive statistics including response frequencies for individual adjectives, respective humanization level, and total number of words selected for each humanization level are provide in Table 3 (results for the capital markets, institutional investors, and individual investors are presented in panels A, B, and C, respectively). Using the framework of Haslam et al. (2005), two values were calculated representing the humanization of the participants used to describe the individuals in their condition. The first was the total of high humanizing adjectives (e.g. sum of number of words selected from the left column in Appendix C) and the second was the total of low humanizing adjectives (e.g. sum of the words selected from the right column). The participants selected adjectives as predicted, selecting more (fewer) humanizing (dehumanizing) descriptors across the manipulations. On average, participant's adjective selection represents decreasing levels of humanization from individual investors (high humanize words=3.54 [low humanize words=2.33]), to institutional investors (2.90[2.70]), and to capital markets conditions (2.35 [3.50]). Separate ANOVAs were analyzed for the counts of high and low humanization adjectives as dependent variables and the public interest frame as the independent variable. There is a significant effect for the public interest frame for the high humanization adjectives



( $F[2,63]=2.31$   $p=.05$ , untabulated), but not for the low humanization adjectives ( $p=.24$ ). Overall, this shows that humanization manipulation is effective.

### Multivariate Results

Multivariate results for participants' responses of control exception decision are provided in Table 4. The GEE models were regressed with the capital markets condition as the reference level, because it represents the status quo of firms framing their public interest responsibilities. The GEE model<sup>23</sup> does not reveal a significant main effect for humanization variable evaluated through the combined assessment of individual investors ( $p=0.40$ ) and institutional investors ( $p=0.63$ ) as part of the three condition manipulation. However, the trait dehumanization control variable is significant ( $B=0.09$ ,  $Z=1.74$ ,  $p=0.04$ , one-tailed). As the humanization variable includes three conditions, they were analyzed for differences with planned contrasts.

The planned contrasts for participants' responses of control exception decision are provided in Panel B of Table 4. Planned contrast 2 (individual investors), -1 (institutional investors), and -1 (capital markets) is significant ( $Z=-1.45$ ,  $p=0.07$ , one-tailed). Further, the planned contrast between individual investors and institutional investors is significant ( $Z=-1.61$ ,  $p=0.05$ , one-tailed). However, the planned contrast between capital markets and individual investors is not significant ( $Z=-0.85$ ,  $p=0.40$ ). Likewise, the planned contrast between capital markets and institutional investors is not significant ( $Z=0.48$ ,  $p=0.63$ ). Due to the lack of significance of difference between capital markets and individual investors in the simple effects

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<sup>23</sup> Consistent with the previous analysis Checks 2 and 4 had significantly different intercept coefficients for both control exception decisions and for extent of follow-up recommended, and were excluded from the analysis.

planned contrasts, least squares means (also known as predicted population means<sup>24</sup>), untabulated, were used to evaluate the effects of the manipulation. Least squares means adjusts means for differences in sample size and control variables and presents significance levels for the means difference than zero. This analysis suggests that means for individual investors  $\bar{M}=0.47$  ( $Z=2.45$ ,  $p=.01$ ) is significantly different than zero. While, means for institutional investors est.  $\bar{M} = .00$  ( $Z=0.00$   $p=.99$ ) and for capital markets est.  $\bar{M} = .17$  ( $Z=.60$   $p=.57$ ) are not significant. No significant main effects were found in the GEE Model using extent of follow-up as the dependent variable (Panel C) or its planned contrast follow-up (Panel D). This analysis provides support for H4 suggesting that dehumanization decreases as a result of the framing of the public interest and that this framing also affects audit judgments. Framing the public interest in terms of protecting the ‘capital markets’ may inhibit professional skepticism. However, putting a more human face on the individuals (identifying the capital markets as including retirees, small business owners, and employees saving for retirement) may increase professional skepticism.

## VII. Conclusion

Professional skepticism is a key component of audit quality (Nelson 2009). Models of professional skepticism describe moral reasoning as a personal characteristic that affects skeptical actions (Hurt et al. 2013; Nelson 2009). Using the theory of moral disengagement (through moral justifications and dehumanizing), this study provides evidence that moral agency may be the link between moral reasoning and skeptical action. Specifically, this study examines how common audit firm HR practices, intended to increase audit quality (hiring creative auditors

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<sup>24</sup> Least squares means generalize the simple average for unbalanced data and complicated models allowing for the comparison of means controlling for differences in sample sizes or control variables across manipulations and can provide the basis of hypothesis testing (Cai 2014).

and describing the audit's role in protecting the capital markets), may decrease professional skepticism. However, attending to the possible increase of moral disengagement can increase professional skepticism. This can be accomplished by describing the capital markets in terms of individuals familiar to the auditors or limiting pressure for creative auditors. The conclusions reached should provide practical solutions to increase professional skepticism (or avoid decreasing professional skepticism) in the function of the external audit.

### **Creativity**

This study highlights some of the potential benefits and pitfalls of creative auditors. Creativity can improve audit quality, as suggested by the results. Creative auditors may be more skeptical, ask more/better questions, generate a more diverse set of hypotheses, and better engage in problem solving. The creative, questioning mind can be useful in questioning clients, the adequacy procedures, or the work of subordinate auditors as part of the review process. However, creativity can also have a negative impact on profession skepticism. Nelson (2009) describes that situational pressures, such as time pressure, might decrease skepticism and proposes possible interactive affects with personal characteristics. This research supports this assertion. If pressured to act in their self-interest, the creative auditor will be one that is more creative in "how" they get their work done, rather than creative in the quality of work they generate.

Whether to gain benefit of creative auditors, or avoid the potential downside, it may be useful to identify creative auditors. As explored in this study, creativity has components that include the creative potential (personal characteristic) of individuals and situational variables which may increase or decrease creativity (Amabile 1996; Hunter, Bedell, and Mumford 2007).

Creativity is hard to predict and its benefit depends on how the requirements of the work-place, task, and creative potential align (Caroff and Lubart 2012). This provides an opportunity for researchers to explore what types of creativity are beneficial in the external audit as matched with the specific tasks the external auditor conducts.

In general, creativity is linked to various aspects of individual characteristics (e.g., intelligence and personality) or to specific conditions of the work environment. First, personality traits related to creativity include openness and divergent thinking (Scratchley and Hakstian 2001). Caroff and Lubart (2012) add several other personality dimensions they find are positively associated with creativity for managers including abilities related to idea evaluation, persuasion, and need for success. Beyond trying to infer creative ability from personality traits, Chavez-Eakle, Eakle, and Cruz-Fuentes (2012) summarize personality tests that can assess creative potential. This includes assessments based on responding to items that describe the person being assessed (e.g., Gough 1979) and tasks such as the RAT (Mednick 1962). Yet, all of these tests may or may not be related to accounting because “Creativity and personality have multiple and multidimensional relations.... (Chávez-Eakle, Eakle, and Cruz-Fuentes 2012, 81).” This provides an opportunity for future research to distinguish the ability of these assessments as diagnostic tools to translate into effectiveness in auditing.

Beyond personality variables, the situation can include aspects of the physical and social environment that can support the creative process (the attitude equivalent). For example, physical environment conditions featuring bright lighting, windows, cooler colors, lower complexity, and plants are positively associated with creativity (Ceylan, Dul, and Aytac 2008). Further, social factors of the work environment impact creativity. Hunter, Bedell and Mumford (2007) conduct a meta-analysis finding many work environment factors associated with creativity. The KEYS

scale (Amabile et al. 1996) can be used to assess the extent the work environment supports the creative process. This model describes that work environment factors positively associated with creativity include challenging work, organizational encouragement, work group supports, freedom, supervisory encouragements, and sufficient resources. Alternatively, organizational impediments and workload pressure are negatively associated with creativity (Amabile et al. 1996). Further, creative output can be increased from incentives to be creative (Kachelmeier, Reichert, and Williamson 2008). As such, it appears there are many opportunities for research to identify environmental factors related to auditor creativity that impact audit judgment.

### **The Auditor and the Public Interest**

Auditors often define their public interest in terms of protecting the capital markets. Even if this action is well intentioned to motivate auditors, it may decrease professional skepticism. The results of this study provide a more effective frame for promoting professional skepticism and audit quality. Instead of labeling the public interest in terms of a nebulous ‘capital markets’, describing individuals that are more familiar to auditors can have a positive effect on humanization, professional skepticism, and audit quality.

In this study, this manipulation worked for junior auditors. However, this effect may lose benefit for more experienced auditors. For example, senior members of the engagement team might be more familiar with investors, hedge fund managers, more retirees, business owners and therefore, may infer a different type of ‘capital markets.’ However, as the materials advertising the public interest in terms of the ‘capital markets’ are often recruiting materials targeted at junior auditors, the junior auditors may be the ones more exposed. As a result, the question

remains, how else could the ‘capital markets’ be referenced to increase skepticism and how transitory is this effect?

### **Moral Agency and the Auditor**

This study examines two of the theoretical processes in Bandura’s theory of moral disengagement. As both show significant effects on professional skepticism, it raises questions of how other methods of moral disengagement may affect skepticism. Others identified by Bandura include: euphemistic labeling, advantageous comparison, displacement of responsibility, displacement of responsibility, and attribution of blame. These remain possible outlets that could impact professional skepticism or audit judgments. Further, this study examines two separate methods of moral disengagement, opportunities exist to compare the additive or multiplicative properties of multiple moral disengagement forces. Research into other potential mechanisms that may impact moral disengagement could translate into increased knowledge of how the auditor’s moral agency affects professional skepticism and the quality of the audit.

Appendix A:  
Check Cases and Explanations

**Control Disbursements Tested by Participants**

Check	Initial Concern	Client Response
1	Vendor is not listed on VMF list.	"We wrote this check as a one-time order to the contractor (Gordon Miles) who was working on our new machining project. The consultant (Nathan Scott, who is on the VMF list) required us to use Gordon Miles to do the installation and implementation. This was a one time disbursement to this contractor "through the consultant", we do not expect to ever use this contractor again and didn't think it would be worth our time to put it on the VMF list. In hindsight it would have been easier to make it out to Nathan."
2	Signature does not match signature card at all.	"Andy sprained his right hand while on a fishing trip. It serves him justice for calling in sick that day! It really caused a lot of problems around the office. He was forced to sign checks with his left hand instead of his right which made the signature different. "
3	Signature departs from signature card, but it is initialed by the person	"That is not my signature, but those are my initials. I was really busy with month end close and didn't have time to sign those checks. Those checks had to get out. I had my secretary sign those checks for me and reviewed them before they were sent out. The initial notes my approval of payment."
4	Check exceeds authorized signature amount by a slight amount.	"That amount only exceeds their amount by ten cents! That is not an exception, that's not a material departure, it is not even a dollar over the authorized amount, which I remind you is listed in whole dollars and is not specified in cents. "
5	Check exceeds authorized signature amount, but is initialed by someone else.	"Andy mistakenly signed that check when it was above his authorized threshold. We noticed the difference, and I initialed the check as it was under my authorized limit."
6	Check over \$10,000 has signature from an authorized signer who has an authorized limit over \$10,000 and one signature from an authorized signer whose limit is under \$10,000.	"The check is over \$10,000 and has two signatures. Is not that what the control says? No one has ever bothered us about this before. "

**Controls tested by participants**

- 1 All checks disbursed over \$10,000 must have two signatures;
- 2 All checks should be manually signed by authorized signers only;
- 3 All checks should not exceed the signers authorized amount;
- 4 No checks for large amounts should be written to "petty cash" and no checks at all should be written to "cash"; and,
- 5 Checks are made out to approved vendors on Vendor Master File (VMF) list.

Appendix B:  
Creative Prime and Control Sentences

<b>Creative Prime</b>	<b>Control</b>
writes she creative spells stories	good dislikes recognizes she deals
ate she it all selfishly	ate she it selfishly all
an original whistle friend tune	ball the throw toss silently
produced he inventive pencils artwork	he observes occasionally people watches
I mail send over it	I mail send it over
a suggest novel that's proposal	prepare the gift wrap neatly
new shop product buy the	the push wash frequently clothes
solutions innovative clue problems solve	picked throw apples hardly the
invention save his made millions	they obedient him often meet
ball the normally hoop toss	ball the hoop toss normally
teacher the encouraged instruct creativity	a smile parrot what great
ingenious think provided suggestions they	saw hammer he train the
use feel just imagination your	maintain she to composure try
the rhythm demonstrated originality poems	sky the seamless red is
ideas his book exciting were	a have June holiday wedding



Appendix C:  
Dehumanization Manipulation Check

<b>Adjectives High in Human Nature</b>	<b>Adjectives Low in Human Nature</b>
Ambitious	Broad-Minded
Analytic	Humble
Imaginative	Polite
Sympathetic	Thorough
Active	Contented
Curious	Even-tempered
Friendly	Relaxed
Fun-loving	Selfless
High-Strung	Disorganized
Insecure	Ignorant
Irresponsible	Rude
Reserved	Stingy
Impatient	Simple
Impulsive	Timid
Jealous	Uncooperative
Shy	Unemotional

Note: Adjectives and directions are obtained from Table 5 of (Moore et al. 2012).

Appendix D:  
Research Instrument

**EXPERIMENT 1**

**Moral Disengagement Survey:**

**Directions:** Statements that people use to describe themselves are given below. Please select the response that indicates how you *generally* feel. There are no right or wrong answers. Do not spend too much time on any one statement.<sup>25</sup>

1. It is okay to spread rumors to defend those you care about.
2. It is alright to lie to keep your friends out of trouble
3. Playing dirty is sometimes necessary in order to achieve noble ends.
4. Taking something without the owner's permission is okay as long as you're just borrowing it.
5. Considering the ways people grossly misrepresent themselves, it's hardly a sin to inflate your own credentials a bit.
6. People shouldn't be held accountable for doing questionable things when they were just doing what an authority figure told them to do.
7. People can't be blamed for doing things that are technically wrong when all their friends are doing it too.
8. Taking personal credit for ideas that were not your own is no big deal.
9. Some people have to be treated roughly because they lack feelings that can be hurt.
10. It's okay to treat badly somebody who behaves like scum.
11. Violent criminals don't deserve to be treated like normal human beings.
12. People who get mistreated have usually done something to bring it on themselves.

**Sentence Scramble:**

Instructions: For each set of five words below, make a grammatically correct, four word sentence and write it down in the space provided.

For example: flew eagle plane around the = The eagle flew around.

***Creative Condition:***

1. writes she creative spells stories
2. ate she it all selfishly
3. an original whistle friend tune
4. produced he inventive pencils artwork
5. I mail send over it
6. a suggest novel that's proposal
7. new shop product buy the
8. solutions innovative clue problems solve
9. invention save his made millions

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<sup>25</sup> NOTE: Provided on a 7 pt. fully labeled scale (Strongly Agree to Strongly Disagree, the first is provided as an example

10. ball the normally hoop toss
11. teacher the encouraged instruct creativity
12. ingenious think provided suggestions they
13. use feel just imagination your
14. the rhythm demonstrated originality poems
15. ideas his book exciting were

***Control Condition***

1. good dislikes recognizes she deals
2. ball the throw toss silently
3. he observes occasionally people watches
4. ate she it selfishly all
5. prepare the gift wrap neatly
6. the push wash frequently clothes
7. picked throw apples hardly the
8. they obedient him often meet
9. send I mail it over
10. a smile parrot what great
11. ball the hoop toss normally
12. saw hammer he train the
13. maintain she to composure try
14. sky the seamless red is
15. a have June holiday wedding

**Main Experiment Instructions:** Note: HIGH TIME PRESSURE and *LOW TIME PRESSURE*

**Welcome to the Fitex Audit Engagement! Your audit task:**

You have been assigned to complete test of controls procedures for the Fitex International Inc. audit engagement. Testing of controls is important because it help sets the risk level for the audit, setting the foundation for a quality audit.

The controls that you are testing are listed on the next page. Another staff auditor started testing these controls, and identified 6 cash disbursements that they were not sure if the disbursements were control exceptions or not. The staff auditor asked the client's controller (Peter Tremblay) for an explanation of the unusual transactions.

**Your job is to review the explanation provided by the Peter and decide if the disbursement is a control exception or not.** Then you will document your conclusion for the audit work papers.

You are nearing the end of fieldwork and there is very little <plenty of> time allotted for the testing of cash disbursements left in the time budget (**10 minutes** <30 minutes>). Based on past performance of similar testing procedures (evaluating 6 cash disbursements), you should expect this task to take you about 20 minutes. **If you take**

**this long, you will go over budget.** <If you take this long, you will have time to spare>

As is typical, you will be evaluated based on your ability to meet time budget and the overall quality of your audit decisions and documentation. To help you stay on budget you will be provided a timer.

Click next to begin test of controls.

Remember there is **very little (10 minutes)** <plenty of time (30 minutes)> allotted for the testing of cash disbursements left in the time budget for this task.

The following two links contain evidence you will need for testing (these links will open in a new tab). The first document contains each authorized signature approval amount and the signatures. The second list contains the list of all of the approved vendors (i.e. the VMF list). You will want to use these documents to:(1) verify signatures,(2) verify authorized amounts, and(3) check if a vendor is on the VMF.

The controls that you are testing include:

- 1)All checks disbursed over \$10,000 must have two signatures.
- 2)All checks should be manually signed only by authorized signers.
- 3) All checks should not exceed the signers authorized amount.
- 4)No checks for large amounts should be written to "petty cash" and no checks at all should be written to "cash."
- 5)Checks are made out to approved vendors on Vendor Master File (VMF) list.

1. Flagged Check: 5142: Initial Concern: Vendor is not listed on VMF list.

Fitex Inc.,  
1984 SW Central Suite 600  
Orlando, FL 32875

5142

2/5/2012  
Date

PAY TO THE ORDER OF Gordon Miles \$ 11954.57

Eleven Thousand Nine Hundred Fifty Four Dollars And Fifty Seven Cents DOLLARS

FOR: Equipment installation

*Nathan Scott*  
*Peter Vramblay*

⑆ 222222 ⑆ 123 1115 55 ⑆ 5142

TWO SIGNATURES ARE REQUIRED FOR CHECKS OVER \$10,000.00

Peter's Response (5142):

*"We wrote this check as a one-time order to the contractor (Gordon Miles) who was working on our new machining project. The consultant (Nathan Scott, who is on the VMF list) required us to use Gordon Miles to do the installation and implementation. This was a one time disbursement to this contractor "through the consultant", we don't expect to ever use this contractor again and didn't think it would be worth our time to put it on the VMF list. In hindsight it would have been*

easier to make it out to Nathan."

1a. What is the likelihood that the controller's explanation provides a sufficient explanation that the transaction is not a control exception? (0=The explanation is insufficient, the transaction is control exception ; 100= The explanation is sufficient, the transaction is not a control exception):

0%-100% (in 10% increments)

1b. Do you believe this item is a control exception or is not a control exception?

Control Exception

Not a Control Exception

1c. Document the reasoning for your decision:

1d. Only respond to this question if you concluded that the item is a control exception:

Recommend an appropriate audit response to your audit team for this specific control (ranging from least severe to most severe):

Try to identify root of cause by expanding test of controls over disbursements by increasing the sample size (will add approximately 30 minutes to audit).

Reducing reliance on control and finding an additional compensating control over cash disbursements and testing compensating control (will add approximately 1 hour to audit).

Increasing level of control risk associated with account (or assertion) and performing more substantive testing (will add approximately 2 hours to audit).

2. Flagged Check: 5228: Initial Concern: Signature doesn't match signature card at all.

F-tex Inc.  
1984 SW Central Suite 600  
Orlando, FL 32875

5228

4/17/2012  
Date

PAY TO THE ORDER OF Taylor Matthews \$ 928.78

Nine Hundred Twenty Eight Dollars And Seventy Eight Cents DOLLARS

Andrew McAbride

FOR Plumbing Repair

⑆ 222222 ⑆ 123 1115 55 ⑆ 5228

TWO SIGNATURES ARE REQUIRED FOR CHECKS OVER \$10,000.00

Peter's Response (5228):

"Andy sprained his right hand while on a fishing trip. It serves him justice for calling in sick that day! It really caused a lot of problems around the office. He was forced to sign checks with his left hand instead of his right which made the signature different. "

Questions 2a.-2d.

3. Flagged Check: 5333: Initial Concern: Signature departs from signature card, but it is initialed by the person.

Fitex Inc.,  
1984 SW Central Suite 600  
Orlando, FL 32875

5333

7/2/2012  
Date

PAY TO THE ORDER OF Roboto Industries \$ 6520.60

Six Thousand Five Hundred Twenty Dollars And Sixty Cents DOLLARS

FOR Manufacturing Supplies

222222 123 1115 55 5333

TWO SIGNATURES ARE REQUIRED FOR CHECKS OVER \$10,000.00

*PT Peter Troublay*

Peter's Response (5333):

*"That is not my signature, but those are my initials. I was really busy with month end close and didn't have time to sign those checks. Those checks had to get out. I had my secretary sign those checks for me and reviewed them before they were sent out. The initial notes my approval of payment."*

Questions 3a.-3d.

4. Flagged Check: 5441: Initial Concern: Check exceeds authorizes signature amount by a slight amount.

Fitex Inc.,  
1984 SW Central Suite 600  
Orlando, FL 32875

5441

8/28/2012  
Date

PAY TO THE ORDER OF Spade and Archer \$ 2500.10

Two Thousand Five Hundred Dollars And Ten Cents DOLLARS

FOR Internet Ad Buys

222222 123 1115 55 5441

TWO SIGNATURES ARE REQUIRED FOR CHECKS OVER \$10,000.00

*PT Peter Troublay*

Peter's Response (5441):

*"That amount only exceeds the limit by ten cents! That isn't an exception, that's not a material*

departure, it is not even a dollar over the authorized amount, which I remind you is listed in whole dollars and isn't specified in cents. "

Questions 4a.-4d.

5. Flagged Check: 5522: Initial Concern: Check exceeds authorized signature amount, but is initialed by someone else.

Fitex Inc.,  
1984 SW Central Suite 600  
Orlando, FL 32875

**5522**

9/8/2012  
Date

PAY TO THE ORDER OF McMahon and Tate \$ 1533.17

One Thousand Five Hundred Thirty Three Dollars And Seventeen Cents DOLLARS

FOR Tax services

AM *Andy McBride*

⑆ 222222 ⑆ 123 1115 55 ⑆ 5522

TWO SIGNATURES ARE REQUIRED FOR CHECKS OVER \$10,000.00

Peter's Response (5522):

"Andy mistakenly signed that check when it was above his authorized threshold. We noticed the difference, and I initialed the check as it was under my authorized limit."

5a.-5d.

6. Flagged Check: Check 5525: Initial Concern: Check over \$10,000 has one signature with a signer over \$10,000 and one who is under \$10,000.

Fitex Inc.,  
1984 SW Central Suite 600  
Orlando, FL 32875

**5525**

9/21/2012  
Date

PAY TO THE ORDER OF Josh Hinds \$ 86178.97

Eighty Six Thousand One Hundred Seventy Eight Dollars And Ninety Seven Cents DOLLARS

FOR Office remodel

*Kimberly T. Heisee*  
*Cindy Farge*

⑆ 222222 ⑆ 123 1115 55 ⑆ 5525

TWO SIGNATURES ARE REQUIRED FOR CHECKS OVER \$10,000.00

Peter's Response (5525):

"The check is over \$10,000 and has two signatures. Isn't that what the control specifically says? No one has ever bothered us about this before. "

6a. -6d.

## Overall Risk Assessment

Based on all the information you reviewed in this case, what is your control risk assessment for cash disbursements at Fitex?<sup>26</sup>

### Follow-up Questions: Please answer to the best of your ability.<sup>27</sup>

1. To what extent do you agree that you felt pressured to finish this task in a timely fashion?
2. To what extent do you agree that the procedures you performed were of high audit quality?
3. To what extent do you agree that you maintained a skeptical mindset while performing these procedures?
4. To what extent do you agree that it is more difficult to document control exceptions instead of transactions that are not control exceptions?
5. To what extent do you agree that it is better for the audit to find that these items were control exceptions or were not control exceptions?
6. To what extent do you agree that auditors are likely to find items that are not control exceptions?

Based on the introduction to the case, how many minutes were allotted in the time budget to perform this task? (*Note: This is not the time that was left on the timer after you completed the task and it is not the time you estimated the task should have taken for you to complete. Please enter whole numbers*)\_\_\_\_\_

Click next after completing test of controls to begin demographic questions.

## DEMOGRAPHICS:

*Hurt's Skepticism Scale (Hurt 2010)*

*Creative Disposition Measure (Gough 1979)*

*Word Association Test (RAT, Mednick 1972)*

WORD ASSOCIATION TEST The goal in this task is to find a word that is logically linked to all three of the words provided. For example: (1) Manners Round Tennis \_ Table; (2) Wedding Circle Tone\_ Ring. Thus, the word "table" is a solution because it links the words "manners-round-table" (i.e., table manners, round table, table tennis). The word "Ring" is a

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<sup>26</sup> Answered on a 7-point, fully labeled very low risk to very high risk.

<sup>27</sup> Answered on a 7-point fully labeled scale from strongly disagree to strongly agree



solution because it links the words “wedding-circle-tone” (i.e., Wedding Ring, a ring is circular, and Ring Tone). In the space below, try to solve as many items as you can. Work as fast as you can without sacrificing accuracy. **YOU HAVE FIVE MINUTES** (i.e., 300 seconds) **TO WORK ON THIS**. Please do not use any help other than your own knowledge. When you click next, the timer will begin and the time will start.

- Blank White Lines \_\_\_\_\_
- Magic Plush Floor \_\_\_\_\_
- Thread Pine Pain \_\_\_\_\_
- Stop Petty Sneak \_\_\_\_\_
- Envy Golf Beans \_\_\_\_\_
- Chocolate Fortune Tin \_\_\_\_\_
- Barrel Root Belly \_\_\_\_\_
- Broken Clear Eye \_\_\_\_\_
- Pure Blue Fall \_\_\_\_\_
- Widow Bite Monkey \_\_\_\_\_
- Chamber Staff Box \_\_\_\_\_
- Mouse Sharp Blue \_\_\_\_\_
- Hall Car Swimming \_\_\_\_\_
- Square Cardboard Open \_\_\_\_\_
- Ticket Shop Broker \_\_\_\_\_
- High Book Sour \_\_\_\_\_
- Gold Stool Tender \_\_\_\_\_

Do you have experience working for a public accounting firm?

- Yes
- No

Was/is this accounting firm employment full-time, part-time, or an internship? (Select N/A if you have not worked for an accounting firm and multiple options if applicable)?

- Full-time employment
- Part-time employment
- Internship
- N/A

How many years of experience? \_\_\_\_\_

How would you classify the size of this audit firm?

- Big 4
- Mid-tier
- Regional
- Local

In this position, did/do you have experience performing work under time budgets or deadlines?

- Yes
- No

Do you have experience performing audit procedures for cash accounts?

- Yes
- No

Do you have experience performing test of controls procedures?

- Yes
- No

Briefly, what do you think this experiment was trying to study?

When you completed the scrambled sentence test, did you notice anything unusual about the words?

- Yes
- No

What did you find to be unusual?

Did you notice any particular pattern or theme to the words that were included in the scrambled sentence test?

- Yes
- No

What pattern or theme did you notice with the words in the scrambled sentence test?

## **EXPERIMENT 2**

### **Welcome to the Fitex Audit Engagement! Your audit task:**

You have been assigned to complete test of controls procedures for the Fitex International Inc. audit engagement. Testing of controls is important because it help sets the risk level for the audit, setting the foundation for a quality audit.

The controls that you are testing are listed on the next page. Another staff auditor started testing these controls, and identified 6 cash disbursements that they were not sure if the disbursements were control exceptions or not. The staff auditor asked the client's controller (Peter Tremblay) for an explanation of the unusual transactions.

**Your job is to review the explanation provided by the Peter and decide if the disbursement is a control exception or not.** Then you will document your conclusion for the audit work papers.

You are nearing the end of fieldwork and there is **very little** time left in the cash disbursements budget (**10 minutes**). Based on past performance of similar testing procedures (evaluating 6 cash disbursements), you should expect this task to take you

about 20 minutes. **If you take this long, you will go over budget.**

As is typical, you will be evaluated based on your ability to meet time budget and the overall quality of your audit decisions and documentation. To help you stay on budget you will be provided a timer.

**<Individual Investors:>**

<Your audit manager would like to remind you that quality audits are important to help protect the capital markets. Capital markets include many people that rely on your work including **individual investors** (trying to build a portfolio), **retirees** (depending on their savings to live off), **employees** (saving for retirement, much like yourself), and **small business owners** (needing access to capital to grow their businesses).>

**[Institutional Investors:]**

[Your audit manager would like to remind you that quality audits are important to help protect the capital markets. Capital markets include many people that rely on your work including institutional investors, such as **pension funds** and **hedge funds** (trying to generate returns and grow portfolios). ]

**{Capital Markets:}**

{ Your audit manager would like to remind you that quality audits are important to protect the capital markets. Capital markets rely on your work and are key to the efficient and effective functioning of the national and global economies. }

**Select up to 10 words (you do not need to select all 10)** you believe describe the capital markets (including individual investors, retirees, employees, and small business owners) as described above.

<input type="checkbox"/> Active	<input type="checkbox"/> Curious
<input type="checkbox"/> Friendly	<input type="checkbox"/> fun-loving
<input type="checkbox"/> contented	<input type="checkbox"/> even-tempered
<input type="checkbox"/> relaxed	<input type="checkbox"/> selfless
<input type="checkbox"/> impatient	<input type="checkbox"/> impulsive
<input type="checkbox"/> jealous	<input type="checkbox"/> shy
<input type="checkbox"/> simple	<input type="checkbox"/> timid
<input type="checkbox"/> uncooperative	<input type="checkbox"/> unemotional
<input type="checkbox"/> ambitious	<input type="checkbox"/> analytic
<input type="checkbox"/> imaginative	<input type="checkbox"/> sympathetic
<input type="checkbox"/> broad-minded	<input type="checkbox"/> humble
<input type="checkbox"/> polite	<input type="checkbox"/> thorough
<input type="checkbox"/> high-strung	<input type="checkbox"/> insecure
<input type="checkbox"/> irresponsible	<input type="checkbox"/> reserved
<input type="checkbox"/> disorganized	<input type="checkbox"/> ignorant
<input type="checkbox"/> rude	<input type="checkbox"/> stingy

*Click next to begin the test of controls. When you click next the timer will begin.*

**Note: All other experimental materials the same as Experiment 1.**

## Appendix E: UCF IRB Approval



University of Central Florida Institutional Review Board  
Office of Research & Commercialization  
12201 Research Parkway, Suite 501  
Orlando, Florida 32826-3246  
Telephone: 407-823-2901 or 407-882-2276  
[www.research.ucf.edu/compliance/irb.html](http://www.research.ucf.edu/compliance/irb.html)

### Approval of Exempt Human Research

From: UCF Institutional Review Board #1  
FWA00000351, IRB00001138  
To: Jared A. Eutsler  
Date: August 03, 2015

Dear Researcher:

On 08/03/2015, the IRB approved the following minor modifications to human participant research that is exempt from regulation:

Type of Review: Exempt Determination  
Modification Type: Changes have been made to the experimental design and to each of the manipulations. In addition, minor revisions have been made to study materials. Revised study documents have been uploaded in iRIS and a revised consent document has been approved for use.  
Project Title: Study of Auditor Decision Making  
Investigator: Jared A. Eutsler  
IRB Number: SBE-15-11200  
Funding Agency:  
Grant Title:  
Research ID: N/A

This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these changes affect the exempt status of the human research, please contact the IRB. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

In the conduct of this research, you are responsible to follow the requirements of the [Investigator Manual](#).

On behalf of Sophia Dziegielewski, Ph.D., L.C.S.W., UCF IRB Chair, this letter is signed by:

A handwritten signature in black ink that reads "Joanne Muratori".

Signature applied by Joanne Muratori on 08/03/2015 11:34:07 AM EDT

IRB manager

Appendix F:  
Study One Tables and Figures

**TABLE 1**  
**Mean Control Exception Judgments, Experiment 1**

**Mean Control Exception Judgments (Standard Deviation)**

	Creative Prime		Row Means
	Control	Creative	
<b>Time Pressure</b>			
Low	2.88 (1.59) n=24	3.33 (1.20) n=24	3.10 (1.41) n=48
High	3.14 (1.03) n=22	2.33 (1.43) n=24	2.72 (1.31) n=46
Column Means	3.00 (1.34) n=46	2.83 (1.40) n=48	2.91 (1.37) n=94

Note: Participants were asked to decide if a cash disbursement was a control exception or not. There were two manipulations in the case. First, Creativity was manipulated by the prime and control conditions. Time Pressure was manipulated between low and high pressure scenarios.

**TABLE 2**  
**GEE Analysis, Experiment 1**

**Panel A: Control Exception Decision**

<b>Variable</b>	<b>Coefficient</b>	<b>Z-Value</b>	<b>Sig.</b>
TimePressure	0.55	1.60	0.11
Creative	0.64	1.88	0.03*
TimePressure X Creative	-1.15	-2.36	0.02

**Panel B: Extent of Follow-up Procedures**

<b>Variable</b>	<b>Coefficient</b>	<b>Z-Value</b>	<b>Sig.</b>
TimePressure	0.42	1.34	0.18
Creative	0.59	1.86	0.03*
TimePressure X Creative	-0.82	-1.80	0.03*

---

Note: Participants were asked to decide if a cash disbursement was a control exception or not. There were two manipulations in the case. First, Creativity was manipulated by the prime and control conditions. Time Pressure was manipulated between low and high pressure scenarios.

\* indicates one-tailed test.

**TABLE 3**  
**Top Ten Most Frequently Selected Descriptors by Condition, Experiment 2**

<b>Panel A: Capital Markets (n=24)</b>			<b>Panel B: Institutional Investors (n=20)</b>			<b>Panel C: Individual Investors (n=20)</b>		
<b>Descriptor</b>	<b>Humanization</b>		<b>Descriptor</b>	<b>Humanization</b>		<b>Descriptor</b>	<b>Humanization</b>	
	<b>Mean</b>	<b>Level</b>		<b>Mean</b>	<b>Level</b>		<b>Mean</b>	<b>Level</b>
Active	60.0%	High	Impulsive	60.0%	High	Impatient	83.3%	High
Impulsive	55.0%	High	Active	55.0%	High	Active	54.2%	High
Contented	50.0%	Low	Impatient	55.0%	High	Impulsive	54.2%	High
Simple	50.0%	Low	Even-tempered	45.0%	Low	Even-tempered	41.7%	Low
Impatient	40.0%	High	Contented	40.0%	Low	Contented	37.5%	Low
Disorganized	40.0%	Low	Jealous	30.0%	High	Reserved	37.5%	High
Even-tempered	35.0%	Low	Simple	30.0%	Low	Curious	33.3%	High
Timid	30.0%	Low	Thorough	30.0%	Low	Simple	33.3%	Low
Reserved	30.0%	High	High Strung	25.0%	High	High Strung	33.3%	High
Polite	20.0%	Low	Reserved	25.0%	High	Jealous	25.0%	High
<i>Number High Humanize Words</i>	2.35			2.90			3.54	
<i>Number Low Humanize Words</i>	3.50			2.70			2.33	

Note: Participants were asked to select which words described the participants mentioned in each condition. The ten most frequently selected words were listed for each manipulation, and total words selected by level of humanization were provided in each table.



**TABLE 4**  
**GEE Analysis, Experiment 2**

**Panel A: GEE Analysis- Control Exception Decision**

<b>Variable</b>	<b>Coefficient</b>	<b>Z-Value</b>	<b>Sig.</b>
Individual Investors	0.29	0.85	0.40
Institutional Investors	-0.17	-0.48	0.63
DehumanizeTrait	0.09	1.74	0.08*

**Panel B: Planned Contrasts- Control Exception Decision**

<b>Contrast</b>	<b>Z-Value</b>	<b>Sig.</b>
IndvInvestors vs. InstInvestors and CapitalMarkets	1.45	0.07*
IndvInvestors and CapitalMarkets vs. InstInvestors	-1.15	0.25
IndvInvestors and InstInvestors vs. CapitalMarkets	0.18	0.85
IndvInvestors vs. CapitalMarkets	0.85	0.40
IndvInvestors vs. InstInvestors	1.61	0.05*
InstInvestors vs. CapitalMarkets	-0.48	0.63

**Panel C: GEE Analysis- Extent of Follow-up Procedures**

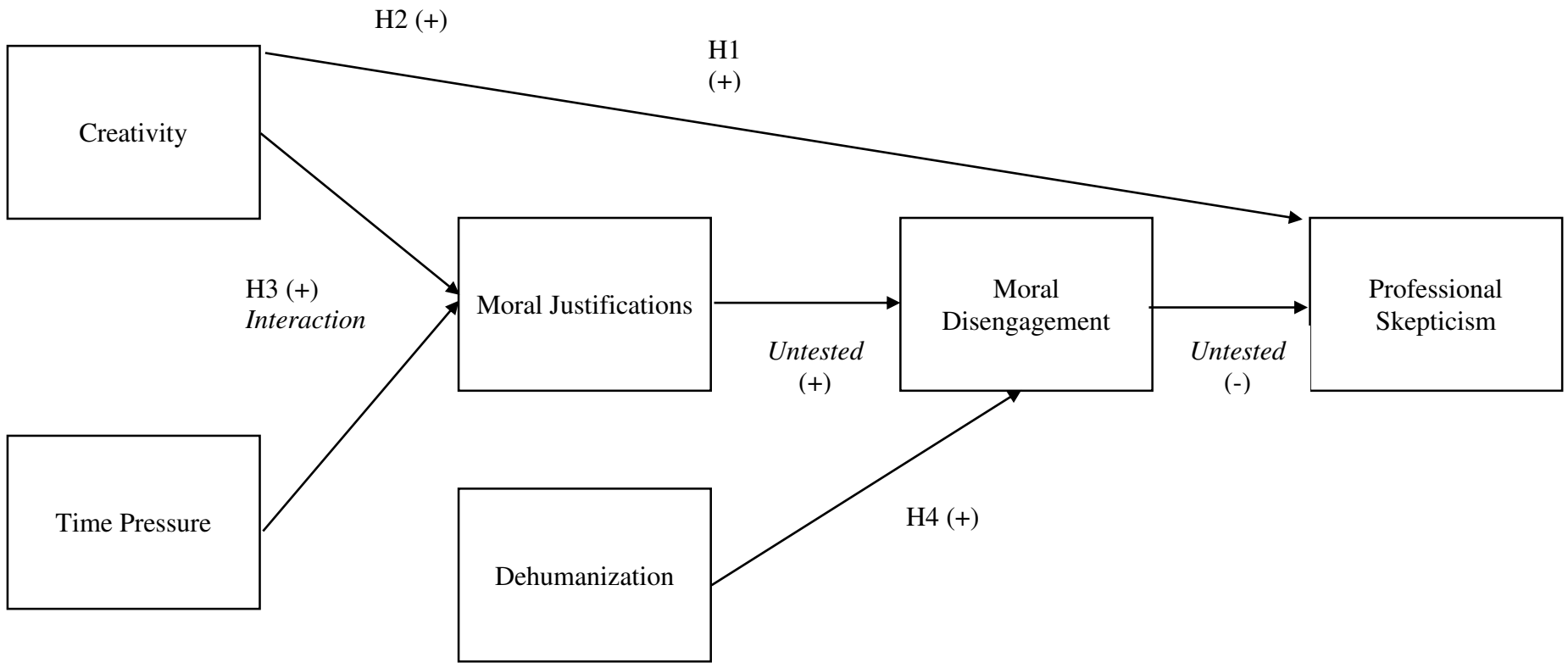
<b>Variable</b>	<b>Coefficient</b>	<b>Z-Value</b>	<b>Sig.</b>
Individual Investors	0.10	0.29	0.77
Institutional Investors	-0.23	-0.60	0.55
DehumanizeTrait	0.08	1.56	0.12

**Panel D: Planned Contrasts- Extent of Follow-up Procedures**

<b>Contrast</b>	<b>Z-Value</b>	<b>Sig.</b>
IndvInvestors vs. InstInvestors and CapitalMarkets	0.82	0.41
IndvInvestors and CapitalMarkets vs. InstInvestors	-0.94	0.35
IndvInvestors and InstInvestors vs. CapitalMarkets	-0.19	0.85
IndvInvestors vs. CapitalMarkets	0.29	0.77
IndvInvestors vs. InstInvestors	1.10	0.27
InstInvestors vs. CapitalMarkets	-0.60	0.55

Note: Participants were asked to decide if a cash disbursement was a control exception or not. There was one manipulation in this case, public interest frame which varied between protecting capital markets, institutional investors, or individual investors.

\* indicates one-tailed test.



**FIGURE 1**  
**Theoretical Model**

*Phase 1: Pre-Experiment*

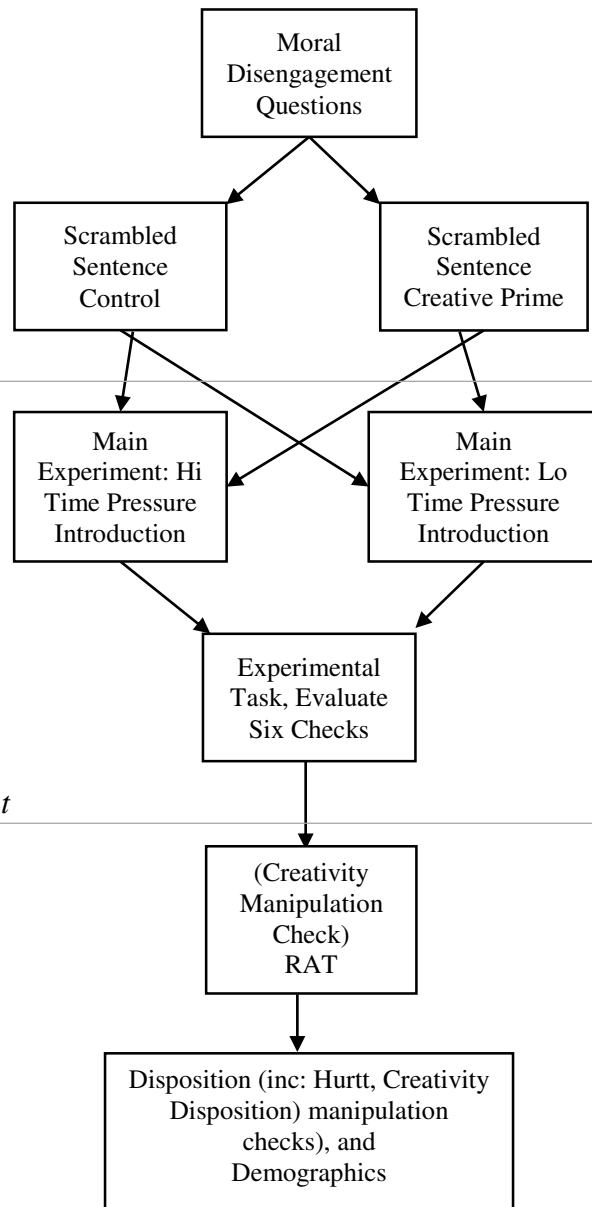
---

*Phase 2: Experiment*

---

*Phase 3: Post-Experiment*

---



**FIGURE 2**  
**Task Flow Diagram, Experiment 1**

*Phase 1: Pre-Experiment*

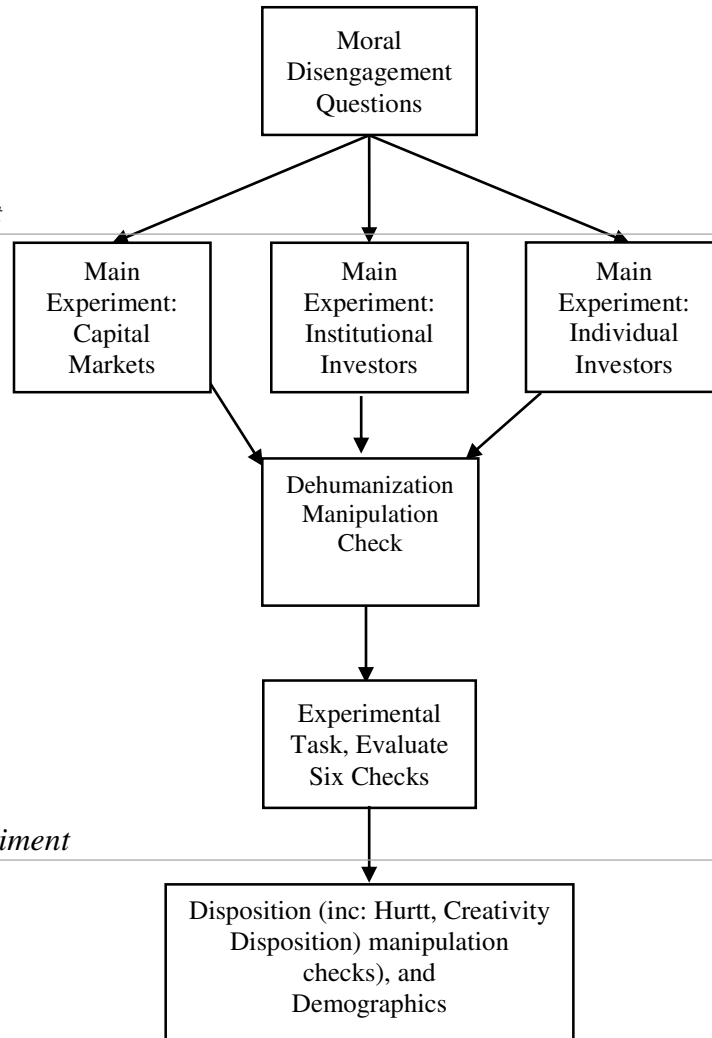
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*Phase 2: Experiment*

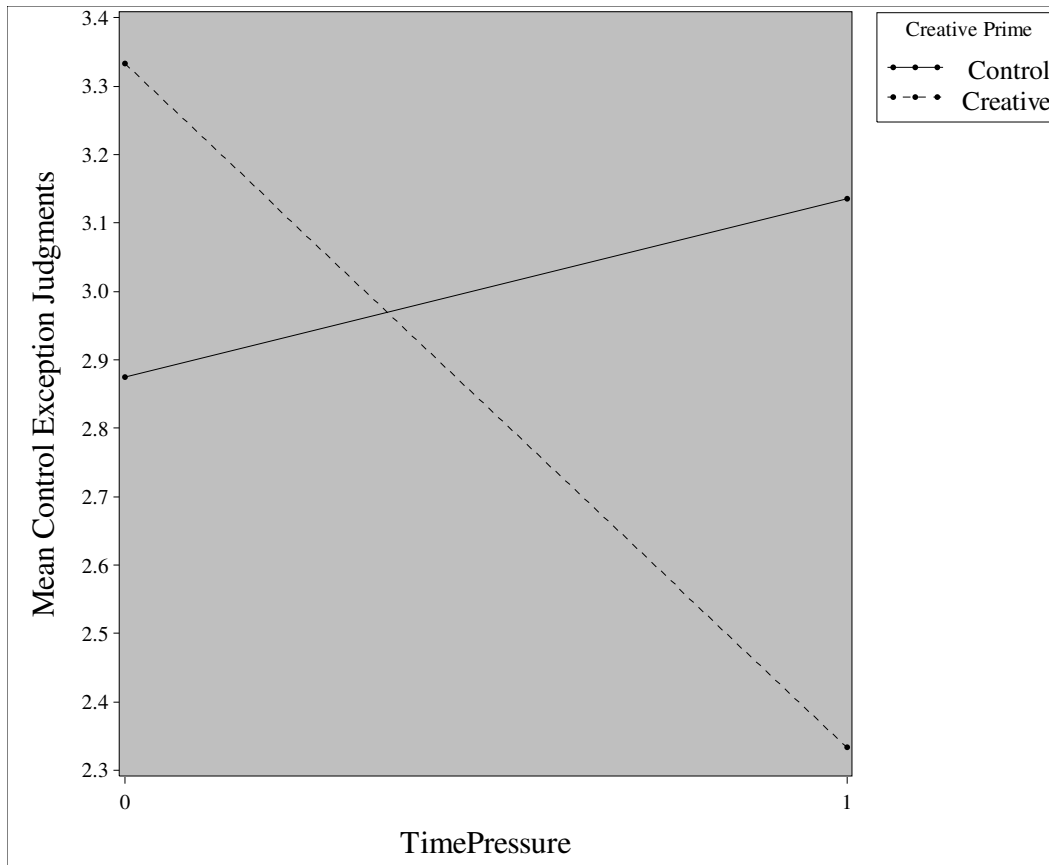
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*Phase 3: Post-Experiment*

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**FIGURE 3**  
**TASK FLOW DIAGRAM, EXPERIMENT 2**



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This figure presents a plot of the results where the dependent variable is Mean Control Exception Judgments The independent variables were Time Pressure (High and Low) and Creative Prime (Creative Prime and Control).

---

**FIGURE 4**  
**Plot of The Effects of Time Pressure and Time Pressure On Mean Control Exception Judgments**

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## **STUDY TWO: AUDIT FIRM STAFFING AND ENGAGEMENT AUDIT QUALITY**

### **Abstract**

Audit regulators view audit firm staffing as a key input affecting audit quality and have suggested that it has value as a potential indicator of audit quality (PCAOB 2013; IAASB 2013). Further, regulators have called for audit firms to avoid cutting staff (including in periods of economic contraction), as reductions in staff could have a negative impact on audit quality (IAASB 2013). However, little empirical evidence exists to support how firm-level staffing maps into engagement-level audit quality (Francis 2011). This study evaluates the extent to which firm-level staffing affects audit quality. Audit firm employment is obtained from the 1991-2014 rankings of the top 100 U.S. public accounting firms and analyzed across multiple measures of audit quality. In multivariate tests, firm staffing (such as number of partners) and firm leverage (as measured by total partners divided by total professional staff) are associated with audit quality. This analysis provides support for claims made by regulators, about the value of potential labor related audit quality indicators proposed by the PCAOB. Further, decreases in partners or staff (from year to year) are negatively associated with audit quality supporting regulatory claims that audit firm staff cuts have a detrimental impact on audit quality. This paper expands on the theory of the production function of the professional accounting firm by examining audit quality as an output to the audit process.

## I. Introduction

Audit quality frameworks presented by regulators suggest that audit firm staffing has a causal relationship with audit quality. The Public Company Accounting Oversight Board (“PCAOB”) is considering requiring disclosure of labor related (staffing) audit quality indicators (“AQIs”). The PCAOB (2013, 2015b) believes these AQIs will provide insights into audit firm inputs and process, and their disclosure may facilitate attempts to assess audit quality. Similarly, the International Auditing and Assurance Standards Board (“IAASB”) and the Financial Reporting Council (“FRC”) have included firm staffing into their audit quality frameworks and have called for firms to avoid personnel cuts (including in response to recessions) as cuts may have negative ramifications for audit quality (Christodoulou 2009; IAASB 2013).

In contrast, audit firms and the profession deemphasize the value of staffing based AQIs and disagree with claims that the firms would take actions that could threaten audit quality. First, in response to the PCAOB’s (2013) Audit Quality Framework, the Center for Audit Quality (“CAQ”) released its own framework for AQIs (CAQ 2014). This framework excluded specific quantitative labor related metrics proposed by the PCAOB. Second, PWC disagreed with IAASB and FRC comments about cutting personnel in periods of economic contraction. Its rebuttal expressed that its staffing actions would “never compromise audit quality on cost grounds” (Christodoulou 2009, 1). Taken together, while regulators stress the importance of audit firm staffing on audit quality, the firms’ and profession’s positions contradict the regulatory claims.

Academic literature supports the opinions expressed by the regulators, describing a positive relationship between audit firm staffing and audit quality. “The quality of an audit is greatly influenced by the level of inputs into the audit process” (Knechel et al. 2012, 393), including the personnel available to be used by the firm (Knechel et al. 2012). In general,

literature reviews on audit quality highlight the key relationship between audit labor inputs and audit quality (Causholli et al. 2010; Francis 2011). However, there is little empirical evidence investigating the relationship between audit firm staffing (levels<sup>28</sup>, ratios, or changes) and audit quality. This is due to the lack of access to data of firm staffing (Francis 2011; Causholli et al. 2010). The lack of empirical research is problematic for regulators assessing how proposed AQIs or other regulatory actions relate to audit quality. In relation to AQIs, Francis (2011, 139) states, “The problem is that there is insufficient research to know if this kind of aggregated data can tell us anything about audit quality.” Francis (2011, 140) adds “These are not rigorously investigated measures that have been shown to systematically map to engagement-level audit quality. There would seem to be enormous potential for synergies between regulators and accounting firms working together with auditing scholars to evaluate the kinds of metrics that might be useful indicators of both overall accounting firm quality and engagement-specific audit quality.”

In response, this paper seeks to map firm-level staffing data (nature and mix of labor resources used by the audit firm) into engagement-level audit quality. First, this paper explores the relationship between the firm’s labor resources and audit quality. Audit firm employment data is obtained from annual rankings of public accounting firms from 1991 through 2014. In multivariate tests, the findings support that levels of firm staffing and firm leverage (the ratio of partners to staff) are positively associated with audit quality. The staffing data examined provides support for the potential value of specific labor related AQIs to communicate audit quality. Firm-level data, although it includes substantial noise, is associated with engagement-level audit quality. This finding supports regulators’ claims that labor related AQIs could offer

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<sup>28</sup> Levels of staff or levels of partners reference the *number* of staff or the number of partners.



insights to audit committees, regulators, standard setters, and investors in their assessments of audit quality.

Second, this paper addresses the validity of the concerns about cuts to audit staff expressed by the FRC and IAASB. Specifically, it examines the relationship between the general economic environment (with a focus on economic downturns), changes in firm staffing, and audit quality. This analysis provides support for the regulatory concerns about staff cuts by providing evidence that firms tend to decrease staffing around recessions. Further, those decreases in personnel are associated with lower audit quality. Overall, this paper contributes to literature about the production function of the professional accounting firm. The results demonstrate that certain aspects of firm staffing, and changes in firm staffing, affect the quality of the financial statements as an output to the auditing function.

The remainder of this paper is organized as follows: Section II reviews regulators and audit quality, Section III reviews prior literature and develops the hypotheses, and Section IV describes the sample and data. Section V reports the analysis and results, Section VI discusses additional tests and limitations, and Section VII provides a summary and conclusion.

## II. Regulators and Audit Quality

The U.S. Treasury (2008) recommended that the PCAOB consider requiring disclosure of AQIs. AQIs serve as a specific form of audit firm transparency<sup>29</sup> which may be valuable to assess auditors. As a result, the PCAOB released an audit quality framework describing their position

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<sup>29</sup> Audit firm transparency is increasingly considered in the regulation of public accounting firms. Transparency has been adopted in by The European Union (“The European Eighth Directive”), Japan, and Canada (Deumes et al. 2012). Transparency benefits the public by allowing for increased assessment of auditors, which should cause an increase in public confidence related to the audit process and audit quality (CAQ 2014).

on AQIs (PCAOB 2014). The PCAOB's framework states that disclosure of items thought to be related to audit quality could promote audit quality by creating a market where audit firms can compete on dimensions of audit quality (including inputs and processes) instead of fees (PCAOB 2014). Francis (2011) stated that there may be merit in firm disclosure and transparency, but suggested that measures or indicators of audit quality need vetting. Currently, the PCAOB is evaluating the potential disclosure of various AQIs to the public. Also, the final AQIs (specific quantitative metrics), disclosure target (whether the disclosure is to regulators, audit committees, or to the broader public such as investors), and disclosure medium (the form of the report and who provides it) are under debate (PCAOB 2013, 2015b).

The PCAOB's (2013) Audit Quality Framework groups potential AQIs into three segments: inputs, processes, and results. Many of the AQIs related to the firm's use of labor resources and measures of firm staffing are categorized as audit inputs. AQIs related to labor inputs include the ratio of partners to staff (leverage), staff workloads, turnover of audit personnel, and headcount composition. These are consistent with the suggestions of the U.S. Treasury (2008) which called for public disclosure of various AQIs including experience of firm employees, competence and technical resources, workload (engagement-level workload data), and leverage. Overall, the proposed indicators suggest that higher levels of professional staff to partners, partner workload, and staff utilization can lead to a decrease in audit quality. The decrease in audit quality would result from a decrease in the supervision and review of audit staff or reflect the reallocation of audit work from more experienced to less experienced auditors.

More recently, the PCAOB (2015b) released a concept statement on the AQI project. It included AQIs related to Audit Professionals as a replacement to the Audit Inputs category. The concept release called for comment on a narrower list of 28 potential AQIs. Many of proposed

AQIs are associated with audit firm staffing and labor including: firm-level and/or engagement-level AQIs for staffing leverage, partner and professional staff workload, turnover of audit personnel. The complete list of AQIs related to Audit Professionals is provided in Table 5.

In response to the PCAOB's (2013) framework on audit quality, the CAQ (2014) issued their own AQI framework. Consistent with the views of the PCAOB and IAASB, the CAQ incorporates metrics related to firm labor resources. Unlike the PCAOB's AQI framework, the CAQ's framework does not include metrics related to headcounts of audit firm staff and leverage ratios. Instead, the CAQ favors disclosure of AQIs related to experience and workload for key engagement personnel—partners, engagement quality reviewers, and managers. The differences in which these two bodies encourage disclosure of firm labor resources as AQIs could indicate that the CAQ does not believe these metrics are related to audit quality or that the disclosure of these items is a political issue for the profession.

Further, the IAASB (2013) has also issued an audit quality framework outlining factors that it associates with audit quality which includes labor based processes and metrics. One point the IAASB framework emphasizes is concern that financial considerations should not drive audit firm actions that may have a negative effect on audit quality. Specifically, this includes “cost cutting (including by reducing partners and staff) in the audit practice (for example, during times of economic downturn) to the detriment of audit quality” (IAASB 2013, 28).

### III. Prior Research and Hypothesis Development

#### **Prior Research on Accounting Firm Labor**

Research on audit firm labor resources has focused on the production function of audit firms.

This literature investigates the competition between audit firms (e.g., Simunic 1980; Pearson and

Trompeter 1994), the efficiency of audit firms (e.g., Davis, Ricchiute, and Trompeter 1993; Dopuch et al. 2003; Knechel, Rouse, and Schelleman 2009) or how different factors affect audit effort<sup>30</sup> (as assessed by fees, hours, and allocation of staff) (e.g., Bell, Doogar, and Solomon 2008; Hackenbrack and Knechel 1997; O'Keefe, Simunic, and Stein 1994).

The production function of the firm is based on the assumption that audit firms seek to minimize the cost of audit service inputs given the exogenous client firm characteristics while simultaneously achieving a desired level of assurance (O'Keefe, Simunic, and Stein 1994).

Research has generally demonstrated that client specific features associated with size, complexity, and risk result in increased audit effort (hours, seniority allocation, or fees) (Davis, Ricchiute, and Trompeter 1993; Dopuch et al. 2003; Knechel, Rouse, and Schelleman 2009; O'Keefe, Simunic, and Stein 1994; Simunic 1980). Audit staff allocation is related with audit effort, where senior auditors are allocated to audit clients with characteristics indicating increased risk (Bell, Doogar, and Solomon 2008; Hackenbrack and Knechel 1997; O'Keefe, Simunic, and Stein 1994; Stein, Simunic, and O'Keefe 1994).

Literature reviews by Causholli et al. (2010), Knechel et al. (2012), and Francis (2011) have documented that audit labor is a key input to audit production and audit quality. An increase in audit effort (through hours worked or seniority of personnel) comes with increased costs, but produces a higher quality audit. Due to lack of accounting firm personnel data available to researchers, few studies have been able to provide empirical evidence into the relationship between audit labor and audit quality. Beyond the audit production literature cited above, findings of Ettredge et al. (2014), suggest that personnel cuts (as a result of fee pressure)

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<sup>30</sup> Audit effort refers to the total allocation of audit firm resources (including but not limited to hours, seniority and specialist) to the detection of internal control weaknesses or material misstatements.

may have a deleterious effect on audit quality, as adequate staffing is a necessary precursor to audit quality. Further, Caramanis and Lennox (2008) showed a positive association between audit effort (as proxied by total hours) and audit quality (income increasing accruals) for the audits of Greek companies. These results, along with much of the literature on the production function of the accounting firm, suggest specific factors of individual engagements impact engagement-level staffing. Further, these staffing decisions impact engagement-level audit quality. However, the relationship between firm-level staffing and audit quality, as suggested by the PCAOB's (2013, 2015b) framework, has yet to be empirically supported.

In their framework for audit quality, the PCAOB (2013) describes audit staffing as an important indicator of audit quality. A specific AQI that it describes is firm headcount by levels of experience. This is consistent with the view that audit quality is influenced by the levels of inputs into the audit process (Knechel et al. 2012). Existing research on the production function of the audit firm suggests that increased hours indicate higher audit effort. Higher levels of professional staff imply a greater capacity for audit effort (in terms of potential audit hours). Higher levels of partners suggest a higher supervisory capacity. Thus, it is predicted that levels of staff or partners have a positive association with audit quality.

*H1: After controlling for size, risk, and complexity of clients, the number of professional individuals employed by the audit firm is positively associated with audit quality.*

### **Leverage and Audit Quality**

The PCAOB (2013) believes that audit leverage, the ratio of partners divided by staff, has potential as an AQI. Leverage can provide insights into audit quality because, "If partners have excessive responsibility for the oversight of staff, they may not have sufficient time to execute and/or supervise and review appropriate audit procedures, thereby possibly affecting audit

quality” (PCAOB 2013, 18). Statement on Auditing Standard (“SAS”) No. 108 (AU 311) (AICPA 2006), Planning and Supervision, requires auditors to properly supervise assistants performing audit procedures. Leverage could be a quantitative representation of the firm’s ability to properly supervise staff. Further, the PCAOB’s explanation of the potential value of leverage as an AQI is consistent with the production theories of the audit which suggest that the use of more senior staff represents higher audit effort (Bell, Doogar, and Solomon 2008; Hackenbrack and Knechel 1997; O’Keefe, Simunic, and Stein 1994). Higher ratios of partners to staff suggests that the firm can adequately supervise audit staff or that partners are engaged more in audit testing (both representing the potential for higher audit effort). Yet, if leverage exceeds an upper threshold, it may indicate that an audit firm is understaffed, which could threaten audit quality. Therefore, it is predicted that, on the margin, firm leverage (ratio of partners to staff) will have a positive association with audit quality.

*H2: To an upper threshold, leverage (ratio of partners to staff) will be positively associated with audit quality.*

### **Decreases in Firm Labor**

A specific AQI that the PCOAB has proposed is firm headcount by levels of experience. Headcounts of professional personnel by experience level can be evaluated over time to examine changes in staffing levels. Decreases in firm-level employment at seniority levels can potentially relate to audit quality. Audit production function research suggests that decreases in audit engagement staffing represent decreases in audit effort (or capacity for audit effort) (Bell, Doogar, and Solomon 2008; Davis, Ricchiute, and Trompeter 1993; Hackenbrack and Knechel 1997; O’Keefe, Simunic, and Stein 1994).

Professional accounting firms experience high turnover levels, historically around 16-18 percent (Rosenberg 2013). High levels of turnover are necessary to keep their pyramid shaped operating structure<sup>31</sup>. Consequently, turnover is more common in the lower ranks (Kaplan, Keinath, and Walo 2001) as the firms have an ‘up or out’ career path (Cohen and Single 2001; Hooks 1996; Istvan 1991). Part of the high turnover is attributed to individuals leaving public accounting to work in industry for higher compensation (Rosenberg 2013). Another factor contributing to high turnover is involuntary dismissals<sup>32</sup> where firms dismiss personnel to keep an efficient (pyramid shaped) operating structure. The IAASB (2013) expresses concern about cutting auditors, as cuts could negatively affect audit quality. However, firms dismiss this notion, stating that they would never engage in employment actions that jeopardize audit quality (Christodoulou 2009).

When firms fail to hire sufficient levels of personnel to replace departing staff, they experience a net decline in professional staff. Decreases in professional staff signal the firms’ ability to conduct less testing procedures. When firms do not promote enough new partners to replace leaving or retiring partners, they experience a net decline in partners. Decreases in partners reflect a decline in the most experienced individuals in the firm, auditors who have presumably succeeded within the firm for a decade or more. Decreases in partners suggest a decrease in the overall supervisory capacity of firms or that more work is being allocated to less

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<sup>31</sup> PCAOB board members, such as Lew Ferguson, have expressed concern that the pyramid shaped structure may not be optimal for audit quality (PCAOB 2015a).

<sup>32</sup> Management literature explains that involuntary dismissals can negatively affect performance through a “survivor syndrome” (Cascio, Young, and Morris 1997). Layoffs can negatively impact company performance (Cascio, Young, and Morris 1997) by negatively affecting remaining employees by increasing overload and job insecurity (Hamel and Prahalad 1994; Keenoy 1994), and increasing feelings of anger, depression, fear, distrust, and hurt (Noer 1993). Sweeney and Quirin (2009) found survivor syndrome in accountants including post-layoff stress, job insecurity, job satisfaction, affective commitment, and turnover intentions. However, the data available for this study can not measure “layoffs”, only net decreases in personnel. Albeit, layoffs may be more common during recessions.

experienced auditors. Audit effort comes at a cost, but translates to higher audit quality. Thus, a decrease in professional staff and/or a decrease in partners will be negatively associated with audit quality.<sup>33</sup>

*H3: Decreases in firm audit personnel are negatively associated with audit quality.*

### **Decreases in Firm Leverage**

A decrease in leverage could suggest a diminished ability to properly supervise auditing assistants according to AU 311 (AICPA 2006). A decrease in leverage (partners/staff) suggests that, relative to the number of staff auditors, the firm has fewer partners to review the work of staff auditors.<sup>34</sup> The decreased ability to supervise could have negative affect on audit quality as the firm has a lower capacity to properly review assistants. Alternatively, it could suggest a reallocation of audit work from senior auditors to more inexperienced auditors which could also signal lower audit effort (Bell, Doogar, and Solomon 2008; Hackenbrack and Knechel 1997; O'Keefe, Simunic, and Stein 1994) and threaten audit quality. Thus, it is proposed:

*H4: Decreases in firm leverage will be negatively associated with audit quality.*

### **Decreases in Firm Staffing During Economic Contraction and Audit Quality**

The following paragraphs explore how changes in firm employment are structurally different in periods of economic contraction. This section first presents arguments that would

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<sup>33</sup> Decreases in firm staffing are proposed to be related to audit quality, where decreases in labor decrease the potential audit effort capacity of the firm. The relationship between audit quality and the levels of potential effort depends on maintaining a consistent client base (for all public and private companies demanding audit services). This paper assumes consistency in firm wide audit services from year to year. The analysis conducted is also performed by examining changes in professionals per issuer client (as private client information is not available), the results are consistent with those presented.

<sup>34</sup> Assuming that the majority of the time spent by partners relates to supervisory or review and activities and that the majority of the time spent by staff is related to performing audit procedures.



support the regulatory assertion that audit quality would be diminished during recessions. It is followed with the firm's position that cuts would not affect audit quality.

IAASB and FRC comments suggest that cutting auditors during periods of economic contraction increases the probability of lower audit quality (Christodoulou 2009; IAASB 2013). Recessions increase pressure for audit firms to concentrate on their bottom line at the expense of audit quality (Christodoulou 2009; IAASB 2013). Recession driven reductions in investments in the audit function (including recruitment, training, or systems) are argued to have a negative influence on audit quality (Christodoulou 2009). Further, given the increased audit risks during recessions, cuts in personnel may come when firms can least afford to reduce their auditing capacity (Anderson Anderson & Brown 2010; ACFE 2009; CA 2009).<sup>35</sup> However, in response firms disagreed with the assertion they would threaten audit quality with cuts to investments in the auditing production function (Christodoulou 2009).

During periods of economic contraction, voluntary turnover decreases as public accounting firm employees wait out the recession for better job opportunities (Rosenberg 2013). Yet, firms still depend on a natural attrition of staff to maintain an efficient operating structure. The decrease in turnover increases economic pressure in firms as they have higher expenses (more salaries) as fewer employees voluntarily leave. Further, audit firms experience top line pressure as clients pressure firms to decrease audit fees during recessions (Ettredge, Fuerherm, and Li 2014). Still, firms face pressure to remain profitable and do so by managing expenses

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<sup>35</sup> Fraud risk increases during recessions (Anderson Anderson & Brown 2010; ACFE 2009; CA 2009) Further, less internal resources devoted to finding fraud or misstatements as recession can prompt businesses to cut costs (Cascio, Young, and Morris 1997), including those related to internal controls (Anderson Anderson & Brown 2010; Pachta 2009). During the latest recession, many groups expressed concern that fraud would increase (Pachta 2009; ACFE 2009; CA 2009; CAQ 2010; Deloitte 2010). Evidence corroborates that occupational fraud increased during the latest recession (Pachta 2009; ACFE 2009).

(Christodoulou 2009; Harrington 2010). Audit firms have managed employee costs by laying-off employees, outsourcing their work, or offering transfers to lower paying positions

(Christodoulou 2009; Harrington 2010; McKenna 2008).

Consequently, during recessions firms have increased control over staff turnover as they have greater discretion in who leaves the firm as voluntary turnover decreases. With this discretion, the firms do not cut average or high performing staff. Instead, they fire the worst performers according to forced ranking techniques—expelling those who ‘couldn’t cut it in the Big 4’ (McKenna 2008). Thus, if the firms retain more of their best auditors and dismiss more of their lower performing auditors, the average skill of the audit workforce increases. This may be why audit firms claim their actions would “never compromise audit quality on cost grounds” (Christodoulou 2009).<sup>36</sup> Yet, although average auditor quality may increase through firms firing the least qualified auditors, they are still cutting individuals with extensive accounting knowledge (i.e. cutting the worst of the best) and decreasing overall (but still qualified) capacity.

The above paragraphs regarding changes in firm staffing levels during recessions outline arguments made by the regulators who claim staff cuts have a negative effect on audit quality and the auditors who claim they would never jeopardize audit quality. The disparity between the two arguments leads to the following research question. Is there something distinct about periods of economic contraction that changes the association between changes in firm-level staffing and audit quality? The following question will be tested by re-examining H3 and H4 during periods of recession.

*RQ1: Is there a different relationship between decreases in firm staffing (professional staff, partners, and leverage) and audit quality during periods of economic contraction?*

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<sup>36</sup> Accordingly, all of the Big 4 firms reiterate that audit quality is their top, highest, or number one priority (Deloitte 2013; EY 2013; KPMG 2014; PWC 2013).

## IV. Sample and Data

### **Data and Test Variables**

Firm employment information is obtained from Public Accounting Report's (1991-1997) and Accounting Today's (1998-2014) annual surveys of accounting firms. These firm rankings only include US firms and offices (Accounting Today 1998-2014). Both reports provide the same information on firm labor resources including the number of professional staff and partners. The reports also include an allocation of the percentage of domestic net revenue derived from Accounting and Auditing (A&A), Tax Services (TAX), and Management Advisory Services (MAS). If firms do not respond to the survey, the surveyor will conduct independent research and provide estimates. If estimates are made, the public accounting firms are provided the opportunity to comment on estimates before the data is published. The annual rankings have been analyzed in prior research to estimate the production function of accounting firms (see Banker, Chang, and Cunningham 2003).

Overall, the rankings from 1991-2014 include 212 different audit firms over the 23-year period, where the average firm is ranked 10.8 times. Twenty-two firms are ranked once, and 24 firms are ranked in all 23 years. The auditors listed in the annual rankings are matched to Audit Analytics and Compustat databases. One hundred and thirty-eight ranked auditors are matched with issuer observations in Compustat or Audit Analytics.

### Test Variables

The annual rankings provide audit firm staffing data used to compile the test variables including levels and changes in partners, professional staff, and leverage. The test variable used

to assess the impact of levels of staff is the natural log of partners (LNPART).<sup>37</sup> H1 predicts a positive relationship between LNPART and audit quality.

Regarding firm leverage<sup>38</sup> (partners/staff), a mean plot of leverage across deciles yields an inverted 'U' shape. This indicates that leverage is not independently distributed across the size of the ranked firms. Due to this distribution, an unadjusted leverage score does not provide useful insights into the impact leverage has on audit quality. Including the unadjusted values in the linear analysis would contrast some weighting of small and large sized accounting firms (higher leverage) against medium size accounting firms (lower leverage). To address this, firm leverage variables are median adjusted by decile using the count of total professionals (sum of partners and staff) presented in the firm rankings by fiscal year (LEV\_MA).

While higher levels of LEV\_MA are expected to improve audit quality on the margin (H2), if LEV\_MA exceeds some upper threshold, it may suggest that an engagement is understaffed. Thus, to control for the possible effects of non-linearity in the relationship between audit quality and leverage, LEV\_SQ (the square of LEV\_MA) is included in the model. Including a squared term estimates a quadratic function between leverage and audit quality, allowing for estimation of a relationship where over-staffed firms (under-partnered) and understaffed firms (over-partnered) may both produce low quality audits. In estimating dependent variables that have a negative relationship with audit quality (accruals and restatements), a negative coefficient for LEV\_MA and a positive coefficient for LEV\_SQ would produce a convex shape (U-shaped) function between leverage and the dependent variable (Davis, Soo, and

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<sup>37</sup> Alternatively, the natural log of the number of professional staff (LNSTAFF) could be used to evaluate the size of the audit firm. LNPART and LNSTAFF are not incorporated in the same model due to the high correlation between the two ( $r=.84$ ). Analysis with LNSTAFF yields the same statistical results.

<sup>38</sup> Variable LEV refers to the unadjusted values provided in the descriptive statistics.

Trompeter 2009). This would be consistent with audit quality improving as leverage increases but decreasing as leverage exceeds an upper threshold.

The test variables for decreases in staff, partners, and leverage are operationalized as dichotomous variables that demarcate decreases in staffing from year t-1 to year t. The change variables are created consistent with management literature on downsizing (e.g., Ahmadjian and Robinson 2001; Bruton, Keels, and Shook 1996; Cascio, Young, and Morris 1997; Guthrie and Datta 2008; Wayhan and Werner 2000), downsizing firms are indicated with a 1; all others with a 0. Using a dichotomous measure to represent changes is advantageous for two reasons. First, its coefficient is easier to interpret than a continuous measure that captures both increases and decreases in employment. Second, the dichotomous change variable does not assume consistency of the coefficient across valences (Ahmadjian and Robinson 2001; Guthrie and Datta 2008). Prior literature has found the effects of employee growth and downsizing are not symmetrical (McKinley 1992).

Researchers typically choose an arbitrary numerical workforce reduction to represent downsizing. The most common cutoff is 5 percent (Ahmadjian and Robinson 2001; Cascio, Young, and Morris 1997; McKinley, Mone, and Barker 1998; Morris, Cascio, and Young 2000; Littler and Innes 2004). But, public accounting firms rarely reduce staffing at high levels, rather they rely on small cuts (McKenna 2008).<sup>39</sup> Thus, decreases of personnel are operationalized at the 1 percent threshold.<sup>40</sup>

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<sup>39</sup> According to Francine McKenna (2008), the public accounting firms reduce, “staff surgically, in a thousand little cuts, across practices, geographies, offices, so that each person thinks they are unique. Those cut are often made to feel inferior and a failure, as most often the cuts are characterized as performance related and a result of forced ranking techniques.”

<sup>40</sup> In addition to the 1 percent threshold, thresholds of 0, 3, and 5 percent measures are also evaluated. These alternative classification criteria resulted in no substantive change in study results and conclusions. Statistical conclusions reached from the analysis presented are robust across these alternative thresholds. In the discretionary

Decreases of partners or professional staff greater than 1 percent are indicated with DECSTAFF or DECPART (respectively) equal to 1; else 0.<sup>41</sup> Likewise, decreases in audit firm leverage are captured by indicator variable DECLEV. DECLEV is an indicator variable where 1 represents a decrease in leverage greater than 1 percent; otherwise 0. To address RQ1, all change variables are interacted with a recession indicator variable based on fiscal years that NBER classified as a recession. Recession takes on a 1 for fiscal years 1991, 2001, 2007-2009; else 0. Interactions with the recession variable are marked with a “R\_” preceding the variable name. Decreasing levels of staff, partners, and leverage (and the recession interactions) are expected to have a negative association with audit quality.<sup>42</sup>

The staffing variables listed in firm rankings include allocations of the percentage of personnel working in each service lines of the firm (e.g. TAX and MAS). AUDREVPCT is included to control for personnel that may not contribute to the audit quality of issuer clients. AUDREVPCT is calculated as the percentage of revenues earned from auditing as reported by the rankings and is intended to control for the percentage of the firm’s personnel that are not engaged in the audit function.<sup>43</sup> This variable is expected to be positively associated with audit quality as it reflects the firm’s specialization in audits. LNCLIENTS is the natural log of the number of unique clients listed in Audit Analytics or Compustat in the fiscal year. LNCLIENTS

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accrual sample presented in this paper, 0,1,3, and 5 percent thresholds represent approximately 315, 287, 242, and 170 of the 1066 audit firm-year observations.

<sup>41</sup> The analyses do not include the loss of clients from the collapse of Arthur Andersen in the sample.

<sup>42</sup> Interactions with the RECESSION can miss some years that presented economic difficulties but were not recessionary. The interaction variables are also interacted with GDP growth and changes in unemployment rates, with all suggesting similar statistical conclusions that audit staffing, including in times of various measures economic contraction, affecting audit quality.

<sup>43</sup> AUDREVPCT is not a perfect control as the percentage of revenue derived from audit services may not represent the percentage of firm staffing involved in the audit function.

is expected to be positively associated with audit quality as it controls for the overall size of the audit firm and changes in the number of clients for the audit firm<sup>44</sup>.

The test variables are evaluated against two different measures of audit quality; restatements and absolute performance adjusted discretionary accruals. Both proxies have a unique set of control variables used to explain audit quality. The dependent variables and control variables are described below.

### Restatements

The first measure used to assess the effects of staffing on audit quality is restatements. A restatement represents a lapse in audit quality where a material error was published in audited financial statements.<sup>45</sup> The dependent variable (RESTATE) is a dichotomous variable taking a value of 1 if a set of audited financial statements is restated (based on Audit Analytics).<sup>46</sup> The following model is based on the analysis of Lobo and Zhao (2013), with negative coefficients representing higher audit quality.<sup>47</sup> Variables are explained in greater detail in Appendix A.

$$\text{RESTATE} = \beta_0 + \beta_1 \text{LNPART} + \beta_2 \text{LEV\_MA} + \beta_3 \text{LEV\_SQ} + \beta_4 \text{DECSTAFF} + \beta_5 \text{R\_DECSTAFF} + \beta_6 \text{DECPART} + \beta_7 \text{R\_DECPART} + \beta_8 \text{DECLEV} + \beta_9 \text{R\_DECLEV} + \beta_{10} \text{LAGRESTATE} + \beta_{11} \text{FSCOREPROB} + \beta_{12} \text{SALESVOL} + \beta_{13} \text{WEAKNESS} +$$

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<sup>44</sup> As part of the analysis, level variables, and changes variables were also assessed by dividing them by the number of issuer clients listed in available databases. These results were similar to those presented in this study. However, the adjusted values were ultimately not used. Alternatively, controls related to auditor size (BIGN, SIZE, and LNCLIENTS) were used because of missing client observations in available databases that were prejudicial against smaller firms included in this study. As argued in the Conclusion of this paper, the best way to measure these effects would be to have engagement-level data or some higher aggregation of data across offices, industries, etc. However, this information is not currently publically available—perhaps the motivation behind the AQI project.

<sup>45</sup> Consistent with research (Blankley, Hurtt, and MacGregor 2012; Hennes, Leone, and Miller 2008) the analysis drops restatements due to clerical errors.

<sup>46</sup> Due to limitations in data availability in Audit Analytics for Restatements and Audit Fee variables, the testing includes observations from 1999 through 2013.

<sup>47</sup> Several other control variables were included in this model based on the Lobo and Zhao (2013) but were subsequently removed to present a more parsimonious model. These include variables for audit fees, company age, external financing demand, cash flows, interest coverage ratios, and negative equity. All are not significant in this restatement analysis, and with the exception of the audit fee variable, Lobo and Zhao made no directional predictions for these controls.

$$\beta_{14} \text{ MERGER} + \beta_{15} \text{ FIN} + \beta_{16} \text{ SIZE} + \beta_{17} \text{ DEBT} + \beta_{18} \text{ CURACC} + \beta_{19} \text{ SALES GROWTH} + \beta_{20} \text{ LOSS} + \beta_{21} \text{ BIGN} + \beta_{22} \text{ AUDREVPCT} + \beta_{23} \text{ LNCLIENTS} + \beta_{24} \text{ RECESSION} + \text{YEAR\_FE} + \text{INDUSTRY\_FE} + e \quad (1)$$

The control variables expected to be positively associated with restatements include: prior year's restatement (LAGRESTATE), probability of material misstatement (FSCOREPROB) (Dechow et al. 2011), revenue volatility (SALESVOL), the number of internal control weaknesses (WEAKNESS), merger or acquisition activity (MERGER), new financing (FIN), current accruals (CURACC), revenue growth (SALES GROWTH), and negative net income (LOSS). Control variables expected to be negatively associated with restatements include: total assets (SIZE), leverage (DEBT), and auditor size (BIGN). For unique control variables included in this study, AUDREVPCT is expected to be negatively associated with restatements, LNCLIENTS and RECESSION are expected to be positively associated with audit quality. The probit models are estimated with multilevel random effects<sup>48</sup> for industry (2-digit SIC) and year, to control for omitted variables related to year or industry (Francis and Yu 2009).

#### Abnormal Accruals

The second model explores the relationship between the PCAOB inspection process and staffing variables related to audit quality using absolute performance adjusted discretionary accruals (ABSACCRUALS). Variable definitions are provided in Appendix A.

$$\text{ABSACCRUALS} = \beta_0 + \beta_1 \text{ LNPART} + \beta_2 \text{ LEV\_MA} + \beta_3 \text{ LEV\_SQ} + \beta_4 \text{ DECSTAFF} + \beta_5 \text{ R\_DECSTAFF} + \beta_6 \text{ DECPART} + \beta_7 \text{ R\_DECPART} + \beta_8 \text{ DECLEV} + \beta_9 \text{ R\_DECLEV} + \beta_{10} \text{ SALES GROWTH} + \beta_{11} \text{ SALESVOL} + \beta_{12} \text{ CFO} + \beta_{13} \text{ WEAKNESS} + \beta_{14} \text{ SIZE} + \beta_{15} \text{ DEBT} + \beta_{16} \text{ LOSS} + \beta_{17} \text{ ZSCORE} + \beta_{18} \text{ BTM} + \beta_{19} \text{ CURACC} + \beta_{20} \text{ BIGN} + \beta_{21} \text{ MERGER} + \beta_{22} \text{ FIN} + \beta_{23} \text{ AUDREVPCT} + \beta_{24} \text{ LNCLIENTS} + \beta_{25} \text{ RECESSION} + e \quad (2)$$

<sup>48</sup> Fixed effects in a discrete choice model bias coefficients and understates standard error levels (Gibbons and Hedeker 1994). As an alternative, random effects estimate cluster-specific effects and standard errors, controlling for possible omitted, cluster related (industry-year), variables without biasing coefficients and standard errors.



The control variables for this model are based on DeFond and Zhang's (2014) list of the commonly used control variables for investigating discretionary accruals as a measure of audit quality. These commonly used control variables include size, leverage, loss, sales growth, operating cash flow, BIGN, market to book, total accruals, equity debt issuance. Control variables expected to have a positive association with audit quality include: issuer scaled operating cash flows (CFO), client size (SIZE), book to market ratio (BTM), and auditor size (BIGN). Control variables expected to have a negative association with audit quality (positively associated with the discretionary accruals) include: sales growth (SALESGROWTH), revenue volatility (SALESVOL), number of material weakness (WEAKNESS), leverage (DEBT), loss (LOSS), Altman's (1983) Z-Score (ZSCORE), total accruals (CURACC), BIGN, merger or acquisition activity (MERGER), new financing (FIN). Further, AUDREVPCT and LNCLIENTS are expected to be negatively associated with accruals, RECESSION is expected to be positively associated with audit quality.

The dependent variable for this analysis is the absolute value of performance adjusted discretionary accruals (ABSACCRUALS). Discretionary accruals are estimated based on the Jones (1991) using the performance adjusted model (Kothari, Leone, and Wasley 2005). Discretionary accruals are estimated at the industry-year level from 1991-2013. Industry year combinations not having 10 observations are removed from the analysis. The estimation models exclude financial companies (6000-6999) and utilities (4900-4999). Variables are winsorized at 1 percent by industry and year. As the dependent variable is constructed cross-sectionally with time and industry fixed effects, fixed effects are not incorporated in the final multivariate analysis (Francis and Yu 2009; Reichelt and Wang 2010). As firms may manage earnings up or

down, this research examines the absolute value of abnormal discretionary accruals as a measure of audit quality (signed accruals are explored in additional analysis).

## V. Analysis and Results

### Univariate Analysis

#### Firm Labor Resources (H1-H4)

Table 6 compares the descriptive statistics of characteristics of the audit firms (Panel A) and their issuer clients (Panel B) based on whether the firm decreased professional staff that year (split on DECSTAFF).<sup>49</sup> Panel A shows that there is not a significant difference for audit firms who decrease staff for characteristics including NUMPART, NUMSTAFF, LEV, LNCLIENTS, and USREV. The only statistical difference between the firms based on DECSTAFF is change in domestic revenues (CHGPERCTUSREV). DECSTAFF firms have a mean increase of total US Revenue of 4 percent compared to 14 percent for the control group ( $p < .0001$ ).

Panel B examines the differences in characteristics of the issuer clients (the variables listed in Equations 1 and 2) based on whether the audit firm decreased professional staff (split on DECSTAFF). Examination of the table suggests that significant differences are likely caused by temporary pressure related to economic contraction, which also presents pressure on audit firms to decrease their staffing levels. This is evidenced with significant differences for variables RECESSION, SALESGROWTH, and LOSS. RECESSION has a significant difference between the two groups with 21 percent of the DECSTAFF observations being in recessionary years vs.

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<sup>49</sup> These univariates are also evaluated by splitting on variable DECPART and were statistically similar. DECSTAFF is used because there are more firms that decrease staff (28 vs. 24 percent) and DECSTAFF more closely follows recessions. DECPART has the outlier at 1994 and more closely represents the regulatory concern of matching to the years which present fiscal pressure.

15 percent of the control observations ( $p < .0001$ ). These firms also appear to be facing fiscal pressure for clients audited by a DECSTAFF firm as SALESGROWTH is lower for these companies (1 percent vs. 6 percent [ $p < .0001$ ]), and the frequency of LOSS is higher (45 percent vs. 42 percent [ $p < .0001$ ]). However, aspects of companies that do not change in response to recessionary environments are not significant (like the characteristics of the audit firms). For example, SIZE is not significantly different ( $p = .23$ ).

Examination of the dependent variable based on DECSTAFF provides support for the hypothesis that decreases in staff negatively affect audit quality. The dependent variables, YEARRESTATED and ABSACCRUALS, have significant differences split on DECSTAFF. YEARRESTATED is significantly higher for DECSTAFF (.08 vs. .05,  $t = -18.35$ ,  $p < .0001$ ). ABSACCRUALS is significantly higher for DECSTAFF (.16 vs. .14,  $t = -5.17$ ,  $p < .0001$ ).

#### Research Question

Table 7 examines aspects of audit firm structure that are hypothesized to be associated to audit quality for years 1991-2013. This span includes three recession cycles: 1991, 2001, and 2007 to 2009. The table shows that the recessionary periods (and the proximal subsequent years) have a greater percentage of firms that decrease staff (DECSTAFF) and partners (DECPART). DECSTAFF and DECPART appear to be maximized when average total US Revenues decreases from the previous period. The years with the highest percentage of firms decreasing staff (DECSTAFF) are 1992, 2002, 2009 and 2010; decreasing partners (DECPART) are 1992, 1994, 2003, 2010, and 2011. This pattern supports regulatory concern that fiscal pressures caused by recessionary periods causes audit firms to decrease personnel. However, it appears that decreases in professional staff lags recessions, with cuts in partners lagging recessions and cuts in staff.

## Multivariate Analysis

### Restatements

The results of the restatement analysis are presented in Table 8. Column I provides the testing for the hypotheses and Column II investigates the research question. The analysis includes evaluation of the effect of the number of partners (H1), leverage (H2), decreases in professional staff and partners (H3), decreases in leverage (H4), and the interaction between the decreases variables in recession years (RQ1).<sup>50</sup>

Column I shows that many of the control variables for the restatement analysis are significant in the predicted directions. These include LAGRESTATE, WEAKNESS, MERGER, FIN, and LOSS having a positive association with restatements; SIZE having a significant negative association with restatements. Besides these control variables, some of the unique controls for this study are significant. RECESSION is significant and positive as predicted, suggesting that financial statements filed during periods of economic contraction are more likely to be restated. Also, AUDREVPCT is negative and significant, suggesting that firm specialization in audits (instead of other functions such as tax and MAS) is associated with higher audit quality.

H1 predicts that audit quality is associated with firm personnel levels. This is tested with independent variable LNPART which is marginally significant.<sup>51</sup> LNPART is significant with

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<sup>50</sup> Separate regressions were used to introduce the test independent test variables. The inclusion order of the independent variables did not alter the significance or direction of coefficients of other independent variables. For brevity, the full regression with all independent test variables is presented in this paper.

<sup>51</sup> BIGN is also not significant. There are multiple independent variables which could be correlated with the overall size of the firm, BIGN, LNCLIENTS, and LNPART. All of these share a correlation of  $r > .85$ . When LNPART and LNCLIENTS are not included in the restatement regression, BIGN is approaching significance with a negative coefficient. When BIGN and LNCLIENTS are excluded from the regression, LNPART is approaching significance with a negative coefficient. It appears, that the overall size of the firm impacts audit quality, but the number of partners, beyond size, LNPART does not have an additional effect on the frequency of restatements.

one-tailed tests ( $p=.03$  in the regression presented in Column I, and  $p=.04$  in Column II). H2 predicts that audit quality is positively associated with firm LEV\_MA. The multivariate results suggest this coefficient is negative and significant ( $\beta=-1.125$ ,  $p<.001$ ). LEV\_SQ, the quadratic component of leverage, is expected to have a positive coefficient, suggesting a U-shaped relationship between median adjusted leverage and restatements. The multivariate tests, support this ( $\beta=16.172$   $p<.0001$ ). Together, the negative coefficient of LEV\_MA, and the positive coefficient of LEV\_SQ suggest a function where restatements decline as median adjusted leverage increases until it reaches an approximate value of 0.03. At this point, restatements begin to rise with median adjusted leverage, yet never fully reach the higher levels of restatements found with low median adjusted leverage values. This quadratic shape corroborates the PCAOB's assertion that leverage could be a valuable indicator of audit quality. Specifically, leverage improves audit quality, but only across a relevant range as over- or under-staffing has a negative effect on audit quality.

The hypotheses predict that decreases in the staffing variables analyzed are expected to be negatively associated with audit quality. The results show that decreases in staff (DECSTAFF) are associated with lower audit quality providing support for H3 ( $\beta=.055$ ;  $p=.038$ ). The results do not suggest that decreases in partners (DECPART) or leverage (DECLEV) are negatively associated with audit quality.

The research question is explored in Column II. This column includes the change variables interacted with RECESSION. The results suggest that decreases in staff during recession has a significant negative coefficient ( $\beta=-0.142$ ,  $p=.01$ ). This provides evidence to the firms' perspective that cuts during recessionary periods do not negatively impact audit quality. Other interactions with the recession variable are not significant for other decreasing variables.

Also, the inclusion of these interactions does not change previous significant results or change the direction of coefficients.

#### Discretionary Accruals Results Tests

The results of the analysis using absolute performance adjusted discretionary accruals (ABSACCRUALS) as a measure of audit quality are presented in Table 9. Column I provides the testing for the hypotheses and Column II investigates the research question. As increased levels of absolute discretionary accruals reflect lower audit quality (as the auditor is less able to constrain abnormal accruals), negative coefficients equate to higher levels of audit quality.

The results in Table 9 show that many of the control variables are significant in the predicted directions across the models. These include SALESGROWTH, SALESVOL, CFO, WEAKNESS, SIZE, DEBT, ZSCORE, BTM, CURACC, MERGER, and FIN. LNCLIENTS is negative and significant in this analysis. Further, RECESSION is significant and positive suggesting higher levels of accruals during periods of economic contraction ( $p < .003$ ).

The results presented in Table 9 (Column I) provide support for H1, levels of partners (LNPART) are negatively associated with absolute discretionary accruals ( $\beta = -.017$   $p < .0001$ ). After controlling for BIGN and number of clients, the number of partners is positively associated on audit quality. Interestingly, variable BIGN, a common control variable for audit quality, is not significant. In this model, it appears that variable LNPART may be a better predictor of audit quality than BIGN. LNPART includes more granulation in the size of audit firms than indicator variable BIGN. Still, this finding is consistent with DeAngelo's (1981) finding that firm size is related to audit quality.

Further, the analysis finds that LEV\_MA is not significant, but LEV\_SQ is significant in the predicted direction ( $\beta=.952$   $p=.023$ ). This is consistent with the U-shaped relationship documented in the restatement analysis. Interpretation of the coefficients suggests that absolute discretionary accrual levels decrease as median adjusted leverage increases until LEV\_MA reaches a turning point of 0.023, consistent with the turning point calculated in the restatement regression (0.03). At such point, the accrual levels rise with increases in LEV\_MA. This relationship supports for H2, suggesting that leverage is associated with audit quality. However, this is not a linear relationship as under-staffing of partners or staff can have a negative effect on audit quality. As an illustration, suppose that a given decile had a median leverage equal to the mean leverage (LEV) provided in Table 6 of .22 (combined DECSTAFF and control). A turning point for the median adjusted data of .03 (equal to that calculated for restatements and just higher than accrual's), would suggest an unadjusted turning point for the given decile of .25 (partners/staff). In this decile, audit quality improves as leverage increases to 1 partner for every 4 staff. At this point, the addition of any more partners will have a negative effect on audit quality.

Next, the results show that decreases in partners (DECPART) are associated with lower audit quality providing support for H3 ( $\beta=.006$ ,  $p<.001$ ), that changes in staffing negatively impact audit quality. Finally, DECLEV is significant in a direction opposite than predicted, perhaps explained by the nature of the quadratic relationship described in the testing of LEV\_MA and LEV\_SQ. Table 9 also provides results of tests for the decreasing test variables during recessionary periods (Column II). Decreasing staff during recessions (R\_DECSTAFF) is negatively associated with audit quality ( $\beta=.013$ ,  $p=.05$ ), providing support for the regulatory

perspective that cuts in staff during recessions have a negative impact on audit quality. Also, R\_DECLEV is significant in the predicted direction ( $\beta=.017$ ,  $p=.005$ ).

## **Discussion**

The results are consistent with the claims made by regulators, suggesting that increased transparency into the structure of the public accounting firm may provide the public with additional insights into audit quality. This study finds an association between *firm-levels* of partners and professional staff and audit quality, even after controlling for the size of the audit firm (BIGN and LNCLIENTS). The findings suggest that leverage has value as a potential AQI. LEV\_MA is associated with audit quality for restatements. Importantly, LEV\_SQ has positive coefficient with the dependent variables, suggesting an inverted U-shape relationship with audit quality (in regressions of restatements and discretionary accruals). These results suggest that on the margin, leverage improves audit quality to an upper threshold. However, when the threshold is exceeded, increased leverage has a negative association with audit quality. As an AQI, leverage has benefit as an AQI when comparing across peer groups, but could provide misleading direction if non-peer group examples are made. Also, potential users of AQIs may find a stronger association between staffing levels and audit quality if they are provided with staffing levels closer to the audit of interest (whether it be firm audit personnel, audit personnel per industry, audit personnel per office, or audit personnel per engagement). The extent to which AQIs should be aggregated is currently under debate by the PCAOB. Although this study finds firm-level aggregated data to be associated with audit quality, disaggregated data should provide for increased insights and better benchmarks (much like it does for auditors in performing analytical procedures (Trompeter and Wright 2010)).



Further, this study provides evidence that decreases in partners and staff are negatively associated with audit quality. Decreases in firm-level staffing are generalizable to the audit production of individual engagements. As such, decreases in staffing levels are associated with audit quality (however, results of decreases in staffing during recessions bring mixed results). Contrary to the CAQ's framework, but consistent with the audit quality framework posited by the regulators, counts of personnel and related information can be an important indicator of audit quality. Still, more research should be done to understand how firm-level staffing maps into the staffing of engagements. A limitation of the data is the specific number of partners or professional staff that work in the audit function is not available. Assessing cuts closer to the level of production could help determine if the results are driven by economic theory (e.g. capacity for production) or psychology related (e.g. loss of morale and/or increased fear). Further, research could investigate the value of alternative measure of staffing variables relating closer to the specific audit including various levels of aggregation such as overall audit staff, audit staff by industry, by office, or by engagement.

This study also contributes other interesting findings. First, firms that derive a higher portion of revenues from the audit function are associated with higher levels of audit quality. This may support assertions made that other service lines (i.e. TAX and MAS) detract from audit quality. This is consistent with regulator concerns expressed by PCAOB board member Lew Ferguson, about the negative impact current expansions of advisory practices and consulting may have on audit quality (PCAOB 2015a). Further, there is increased audit risk during periods of economic contraction. The variable for periods of economic contraction used in this study has positive associations with restatements and accrual levels after controlling for year effects. Also, levels of partners are positively associated with audit quality while the dichotomous variable

referencing BIGN is not. The finding is consistent with the assertion that audit quality is associated with firm size (DeAngelo 1981). However, it suggests opportunities in how studies of audit quality control for audit firm size by using data more granular than a dichotomous variable.

## VI. Additional Tests

Issuer clients face different incentives to manage accruals up or down. The analysis uses absolute value of discretionary accruals as a measure of audit quality, evaluating the auditor's ability to constrain large accruals in either direction. As a supplemental test, companies are bifurcated based on whether they have positive or negative accruals and are analyzed in separate regressions. The results yield similar statistical conclusions as those presented above.

A public accounting firm's operating structure may change as a result of mergers between firms or separations (i.e. partners leave to start or join a new firm), which could also affect quality. To control for this, the accounting ranking publications' mention of mergers or name changes were used to create dichotomous variables to control for shifts in operating structure. First, the regressions included a dichotomous independent variable to control for their potential effect. Second, the regressions were run excluding all firm-year observations where the firms underwent changes. Either method for controlling for the effect of operational changes in audit firms yielded no significant differences in the results presented in this paper.

Firms may change their staffing levels in relation to their number of clients. LNCLIENTS was included as a control variable in the primary analysis and it should absorb some of the covariation with its change counterpart. To more directly test this association, the percentage change in clients listed in Audit Analytics or Compustat was used instead of levels variable LNCLIENTS. Analysis using the change variable did not affect the results.

As stated in the description of the data, the US Revenues presented only include domestically derived revenues and US-based offices. However, the audit quality calculations from audits in Compustat and Analytics also include issuers based in foreign countries. The foreign-based issuers are dropped from the analysis and the results are unaffected.

The study includes a large time frame which has seen many structural changes in how audit firms perform audits. Included in this are the switch to and from the business process audit (Robson et al. 2007), increased adoption of audit support system technologies (Dowling and Leech 2007), and increased outsourcing of firm activities (Lyubimov, Arnold, and Sutton 2012), all of which may require the adopting firms to need less domestic staff. Still, median adjustments to leverage should control for structural changes in the audit firms in response to these events. But, to test that these alternative hypotheses are not driving the results, the preceding analyses were repeated with separate regressions by year. The results do not suggest that any time span (early, middle, or later) in the sample is driving the results. This suggests that the results are not driven by structural changes in the way audits are conducted or staffed, but rather by the ultimate staffing decisions which are made at the firm-level.

## VII. Conclusion

This research investigates the association between audit firm staffing and audit quality. The PCAOB is assessing different informational metrics that the public might find useful to evaluate auditors. The proposal of these labor related AQIs (headcount, leverage, etc.) have coincided with regulatory calls for audit firms to avoid cutting personnel during recessionary periods as these cuts may have a negative effect on audit quality (IAASB 2013). To date, there is little evidence to support the claims made by regulators of the potential value of these AQIs (Francis

2011) or labor related actions. To address this issue, this study examines potential AQIs recommended by regulators and evaluates claims made by audit regulators regarding changes in staffing and their effects on audit quality. In doing so, it contributes to the overall conversation regarding AQIs, audit firm structure, and audit quality.

The results suggest that potential AQIs proposed by the PCAOB are associated with audit quality. Firm-level number of partners and staff are positively associated with audit quality. Also, the findings suggest that leverage has an inverted U-shape association with audit quality. This is consistent with the theory that on the margin, leverage has a positive association with audit quality, but extreme leverage reduces audit quality. Consistent with regulatory claims, descriptive data suggests that firms respond to recessions by decreasing personnel levels in an apparent act to manage expenses. Further, multivariate analysis supports regulatory concern that decreases in firm-level staff and partners are associated with lower audit quality.

A limitation of this paper is that it can only evaluate the impact of audit quality at the firm-level, based on the limitation of data. Yet, this study finds value with firm-level audit quality indicators. Firm structure at the firm or office level might impact audit quality differently (e.g., Francis and Yu 2009). Further, segregation of staffing employment information along service lines could be useful in trying to predict audit quality outcomes. More research could be conducted to assess the value of AQIs at firm-, industry-, and engagement-levels to provide the best assessments of audit quality. Further, additional work should be done to examine the rest of the AQIs proposed by regulators. Others noted by the PCAOB (2015b) include workload, use of specialists, experience levels, turnover, use of outsourcing/off-shoring, and training.

## Appendix A: Variable Descriptions

<i>Variable</i>	<i>Variable Description</i>
AAREV	The amount (\$) of revenue earned from Auditing and Accounting for the accounting firm as reported in Top 100 public accounting firm list in year t.
ABSACCRUALS	The absolute amount of company i's abnormal accruals (TA-ETA).
AUDREVPCT	The percentage of US revenues earned through auditing as reported by the top 100 reports.
BIGN	Dummy variable that takes the value of 1 if the auditor of record is a Big N firm, otherwise 0;
BTM	Book-to-market ratio as calculated by Compustat items $((ceq)/(prcc\_f*csho))$ ;
CFO	Cash flow from operating activities from the current year scaled by total assets from the prior year.
CHGUSREV	Percent change in the total firm revenues reported in Top 100 public accounting firm list from year t-1 to year t.
CNTCLIENT	The number of clients that are listed in Audit Analytics or Compustat in the fiscal year.
CURACC	Change in noncash current assets from year t -1 to t scaled by average total assets. $((\Delta\text{Current assets} - \Delta\text{Cash and short-term investments}) - (\Delta\text{Current liabilities} - \Delta\text{Debt in current liabilities} - \Delta\text{Taxes payable} - \text{Depreciation}) / \text{Average total assets. } ((\Delta\text{ACT} - \Delta\text{CHEt}) - (\Delta\text{LCTt} - \Delta\text{DLCT} - \Delta\text{TXPt}) - \Delta\text{DPt}) / \text{AT}$
DEBT	A company's total assets less stockholders' equity of common shareholders divided by total assets at its fiscal year - end.
DECLLEV	Dichotomous variable where 1 indicates a decrease in leverage, from year t-1 to t, of greater than 1%; else 0.
DECPART	Dichotomous variable where 1 indicates a decrease in number of Partners, from year t-1 to t, of greater than 1%; else 0.
DECSTAFF	Dichotomous variable where 1 indicates a decrease in number of professional staff, from year t-1 to t, of greater than 1%; else 0.
FIN	1 if the sum of new long - term debt plus new equity exceeds 2 percent of lagged total assets and zero otherwise.
FSCOREPROB	Predicted probability of misstatements based on the misstatement detection model of Dechow et al. (2011).
LAGRESTATE	1 if the audited financials of the prior year were restated and zero otherwise (from Audit Analytics).
LEV	The number of partners divided by the number of professional staff.
LEV_MA	The number of partners divided by the number of professional staff median adjusted by total professional deciles by year.
LEV_SQ	The squared value of LEV_MA.

<i>Variable</i>	<i>Variable Description</i>
LNCLIENTS	The natural log of the number of clients that are listed in Audit Analytics or Compustat in the fiscal year.
LNPART	The natural log of the number of partners reported in Top 100 public accounting firm list in year t.
LOSS	Dummy variable that takes the value of 1 if net income is negative, and 0 otherwise;
MERGER	1 if the company had an acquisition that contributed to sales ( $AQS_t > 0$ ) and zero otherwise.
NUMPARTNERS	The number of partners reported in Top 100 public accounting firm list in year t.
NUMPARTNERS	The number of partners reported in Top 100 public accounting firm list in year t.
NUMPROFSTAFF	The number of professional staff reported in Top 100 public accounting firm list in year t.
NUMPROFSTAFF	The number of professional staff reported in Top 100 public accounting firm list in year t.
R_DECLEV	DECLEV interacted with an indicator variable Recession (which takes on a 1 for fiscal years 1991, 2001, 2007-2009; else 0).
R_DECPART	DECPART interacted with an indicator variable Recession (which takes on a 1 for fiscal years 1991, 2001, 2007-2009; else 0).
R_DECSTAFF	DECSTAFF interacted with an indicator variable Recession (which takes on a 1 for fiscal years 1991, 2001, 2007-2009; else 0).
RECESSION	Indicator variable which takes on a 1 for fiscal years 1991, 2001, 2007-2009; else 0.
SALESGROWTH	Percentage change in net income from the prior year to the current year.
SALESVOL	The standard deviation of total revenue scaled by total assets from t-2 through current year.
SIZE	The natural logarithm of total assets (AT).
USREV	The total firm revenues reported in Top 100 public accounting firm list in year t.
WEAKNESS	number of material internal control weaknesses reported in Audit Analytics for the firm in year t;
YEARRESTATED	1 if the audited financials of the prior year were restated and zero otherwise (from Audit Analytics).
ZSCORE	Altman (1983) Z-score. Calculated as: $(1.2 * (\text{NetWorkingCapital} / \text{TotalAssets}) + 1.4 * (\text{RetainedEarnings} / \text{TotalAssets}) + 3.3 * (\text{EBIT} / \text{TotalAssets}) + 0.6 * (\text{TotalEquity} / \text{TotalLiabilities}) + 0.999 * (\text{TotalRevenue} / \text{TotalAssets}))$
ABSACCRUALSit	the difference between $TA_{it}$ and $ETA_{it}$ .

Appendix B:  
Study Two Tables and Figures

<b>TABLE 5</b>	
<b>PCAOB AQI'S Related to Audit Professionals Staffing</b>	
<u>Operational Input</u>	<u>Audit Quality Indicator</u>
<i>Availability</i>	<ul style="list-style-type: none"> <li>1. Staffing Leverage</li> <li>2. Partner Workload</li> <li>3. Manager and Staff Workload</li> <li>4. Technical Accounting and Auditing Resources</li> <li>5. Persons with Specialized Skill and Knowledge</li> </ul>
<i>Competence</i>	<ul style="list-style-type: none"> <li>6. Experience of Audit Personnel</li> <li>7. Industry Expertise of Audit Personnel</li> <li>8. Turnover of Audit Personnel</li> <li>9. Amount of Audit Work Centralized at Service Centers</li> <li>10. Training Hours per Audit Professional</li> </ul>
<i>Staffing</i>	<ul style="list-style-type: none"> <li>11. Audit Hours and Risk Areas</li> <li>12. Allocation of Audit Hours to Phases of the Audit</li> </ul>

Note: Table Describes AQI's related to Labor in PCAOB's (2015) Concept Release.

**TABLE 6**  
**Descriptive Statistics: Differences Between Audit Firms and Issuer-Clients on DECSTAFF**

<i>Variable</i>	<i>DECSTAFF</i>			<i>Control</i>			<i>Difference</i>	
	<i>n</i>	<i>Mean</i>	<i>SD</i>	<i>n</i>	<i>Mean</i>	<i>SD</i>	<i>T-Stat</i>	<i>Sig.</i>
<b>Panel A: Differences of Audit Firm Characteristics</b>								
AAREV	568	139.09	546.94	1413	152.61	587.26	0.49	
NUMSTAFF	571	1116.64	3789.96	1413	1447.27	5273.20	1.56	
NUMPART	562	169.08	616.25	1404	179.69	959.12	0.29	
LEV	562	0.21	0.26	1404	0.23	1.64	0.41	
CNTCLIENT	269	252.99	686.56	764	222.86	592.09	-0.64	
USREV	571	300.59	1128.36	1413	359.61	1358.40	0.99	
CHGUSREV	571	0.04	0.11	1413	0.14	0.17	15.40	****
<b>Panel B: Differences of Issuer-Client Characteristics</b>								
LEV_MA	50832	-0.01	0.04	136300	-0.02	0.04	-18.96	****
LEV_SQ	50832	0.00	0.00	136300	0.00	0.00	-17.81	****
LNPART	50832	6.67	1.57	136300	6.77	1.51	11.97	****
DECLEV	50832	0.22	0.42	136300	0.74	0.44	235.86	****
R_DECLEV	50832	0.03	0.18	136300	0.10	0.30	57.66	****
DECPART	50832	0.57	0.49	136300	0.13	0.34	-186.41	****
R_DECPART	50832	0.05	0.21	136300	0.01	0.08	-41.99	****
DECSTAFF	50832	1.00	0.00	136300	0.00	0.00	.	.
R_DECSTAFF	50832	0.21	0.41	136300	0.00	0.00	-116.02	****
YEARRESTATED	50832	0.08	0.27	136300	0.05	0.22	-18.35	****
ABSACCRUALS	23929	0.16	0.44	69127	0.14	0.35	-5.17	****
LAGRESTATE	47703	0.07	0.26	128094	0.06	0.24	-10.06	****
FSCOREPROB	27661	0.25	0.40	76123	0.27	0.40	3.99	****
SALESVOL	34876	0.13	0.22	100485	0.13	0.21	-1.18	
CFO	50832	-2.34	4.25	136300	-2.04	4.05	13.66	****
WEAKNESS	50832	0.03	0.23	136300	0.03	0.25	4.61	****
MERGER	50832	0.06	0.24	136300	0.07	0.26	12.15	****
FIN	47751	0.46	0.50	128260	0.50	0.50	16.50	****



<i>Variable</i>	<i>DECSTAFF</i>			<i>Control</i>			<i>Difference</i>	
	<i>n</i>	<i>Mean</i>	<i>SD</i>	<i>n</i>	<i>Mean</i>	<i>SD</i>	<i>T-Stat</i>	<i>Sig.</i>
SIZE	44153	5.60	2.55	119870	5.61	2.49	1.18	
DEBT	44062	0.67	1.02	119625	0.65	0.92	-4.18	****
CURACC	32175	-0.00	0.31	88423	0.00	0.20	2.02	*
SALESGROWTH	44886	0.01	0.58	121639	0.06	0.58	17.85	****
LOSS	50832	0.45	0.50	136300	0.42	0.49	-10.05	****
BIGN	50832	0.72	0.45	136300	0.76	0.43	17.73	****
ZSCORE	34361	-10.12	602.09	94145	-4.67	467.61	1.52	
BTM	46310	0.59	0.77	124425	0.54	0.69	-11.57	****
AUDREVPCT	49741	0.51	0.11	136300	0.45	0.13	-87.62	****
LNCLIENTS	47559	6.85	1.70	128641	6.81	1.70	-4.55	****
RECESSION	50832	0.21	0.41	136300	0.15	0.36	-27.84	****

*\*p < .05, \*\*p < .01, \*\*\*p < .001, \*\*\*\*p < .0001*

Note: Variable Descriptions are provided in Appendix A.

**TABLE 7**  
**Descriptive Statistics: Changes in Audit Firm Characteristics by Year**  
Mean (SD)

<u>Year</u>	<u>US Rev</u>	<u>Partners</u>	<u>Staff</u>	<u>LEV</u>	<u>DECPART</u>	<u>DECSTAFF</u>
<i>Overall</i>	325.72 (1283.14)	145.82 (430.76)	1249.92 (4489.61)	0.18 (0.07)	0.24 (0.43)	0.28 (0.45)
<i>1991</i>	139.1 (465.49)	121.46 (354.11)	965.75 (3218.11)	0.21 (0.08)	.	.
<i>1992</i>	141.94 (478.53)	117.66 (339.82)	907.08 (3042.53)	0.21 (0.08)	0.41 (0.5)	0.5 (0.5)
<i>1993</i>	130.36 (474.15)	101.77 (302.65)	812.36 (2926.48)	0.21 (0.08)	0.28 (0.45)	0.38 (0.49)
<i>1994</i>	161 (557.51)	115.9 (334.43)	964.37 (3344)	0.21 (0.08)	0.4 (0.49)	0.36 (0.48)
<i>1995</i>	181.89 (636.65)	118.95 (343.48)	1016.17 (3524.26)	0.2 (0.08)	0.25 (0.44)	0.3 (0.46)
<i>1996</i>	208.39 (738.62)	121.74 (357.04)	1107.53 (3913.76)	0.2 (0.1)	0.25 (0.43)	0.29 (0.46)
<i>1997</i>	267.56 (928.37)	143.63 (405.38)	1388.43 (4741.85)	0.19 (0.09)	0.11 (0.31)	0.21 (0.41)
<i>1998</i>	330.83 (1248.69)	153.69 (484.79)	1609.76 (6084.2)	0.19 (0.07)	0.15 (0.36)	0.19 (0.39)
<i>1999</i>	374.68 (1424.96)	162.68 (519.25)	1727.74 (6624.23)	0.18 (0.07)	0.18 (0.38)	0.14 (0.35)
<i>2000</i>	354.37 (1351.54)	151.1 (468.24)	1410.91 (5069.6)	0.17 (0.06)	0.23 (0.42)	0.25 (0.44)
<i>2001</i>	339.09 (1260.53)	150.9 (454.5)	1301.35 (4610.34)	0.17 (0.06)	0.23 (0.43)	0.3 (0.46)
<i>2002</i>	258.94 (986.97)	142.75 (462.83)	1085.7 (4115.89)	0.18 (0.06)	0.22 (0.41)	0.42 (0.5)
<i>2003</i>	282.57 (1069.5)	138.28 (429.32)	1015.76 (3561.71)	0.18 (0.06)	0.35 (0.48)	0.38 (0.49)
<i>2004</i>	300.96 (1115.83)	141.01 (427.88)	1065.8 (3625.46)	0.17 (0.06)	0.28 (0.45)	0.24 (0.43)
<i>2005</i>	354.61 (1288.62)	145.63 (428.85)	1168.91 (3816.02)	0.16 (0.06)	0.13 (0.34)	0.12 (0.33)
<i>2006</i>	378.24 (1389.81)	147.28 (429.69)	1237.54 (4103.35)	0.16 (0.06)	0.16 (0.36)	0.08 (0.27)
<i>2007</i>	412.24 (1520.35)	154.95 (448.18)	1333.28 (4463.57)	0.16 (0.06)	0.12 (0.32)	0.15 (0.36)
<i>2008</i>	449.27 (1649.28)	163.23 (468.39)	1395.53 (4693.11)	0.15 (0.05)	0.13 (0.34)	0.18 (0.38)
<i>2009</i>	438.36 (1581.23)	171.06 (482.16)	1345.52 (4454.62)	0.16 (0.06)	0.19 (0.39)	0.53 (0.5)
<i>2010</i>	450.44 (1621.51)	170.84 (468.7)	1372.68 (4651.58)	0.17 (0.06)	0.36 (0.48)	0.54 (0.5)
<i>2011</i>	470.98 (1737.02)	169.41 (470.16)	1462.26 (5187.93)	0.17 (0.06)	0.32 (0.47)	0.31 (0.47)

<u>Year</u>	<u>US Rev</u>	<u>Partners</u>	<u>Staff</u>	<u>LEV</u>	<u>DECPART</u>	<u>DECSTAFF</u>
	504.09	171.87	1332.61	0.16	0.23	0.15
2012	(1881.71)	(479.78)	(5181.04)	(0.06)	(0.43)	(0.36)
	560.03	180.16	1766.56	0.15	0.27	0.17
2013	(2082.6)	(505.63)	(6325.60)	(0.06)	(0.45)	(0.38)

US Rev- Total firm revenue; Partners-number of partners; Staff-number of professional staff; LEV-ratio of partners to professional staff; DECSTAFF- 1 if a firm decreased their staff greater than 1 percent in the fiscal year; DECPART- 1 if a firm decreased their staff greater than 1 percent in the fiscal year.

**Note 1:** All information obtained from Public Accounting Report and Accounting Today surveys.

**Note 2:** Excludes firms that do not have any A&A Revenue, and consulting firms American Express Tax and Business, Centerprise Advisors Inc., Century Business Services, E.K. Williams/General Business Services, Triple Check, H&R Block Tax Services, and Padgett Business Services.

**Note 3:** Andersen's last year in these rankings is 2001.

**TABLE 8**  
**Restatements Tests**  
*DV: Restatement*

<i>Variable</i>	<i>Column I</i>		<i>Column II</i>	
	<i>Coeff.</i>	<i>Sig.</i>	<i>Coeff.</i>	<i>Sig.</i>
DECPART	0.001		-0.019	
R_DECPART	.		0.073	
DECSTAFF	0.055 *		0.100 **	
R_DECSTAFF	.		-0.142 *	
DECLEV	-0.034		0.000	
R_DECLEV	.		-0.097	
LNPART	-0.053		-0.050	
LEV_MA	-1.125 **		-1.134 **	
LEV_SQ	16.172 ***		16.911 ****	
INTERCEPT	-2.717 ****		-2.758 ****	
LAGRESTATE	1.874 ****		1.875 ****	
FSCOREPROB	0.021		0.021	
SALESVOL	0.062		0.062	
WEAKNESS	0.245 ****		0.245 ****	
MERGER	0.158 ****		0.159 ****	
FIN	0.145 ****		0.145 ****	
SIZE	0.019 ***		0.019 ***	
DEBT	-0.022		-0.022	
CURRACC	-0.098		-0.098	
SALESGROWTH	0.008		0.009	
LOSS	0.070 ***		0.070 ***	
BIGN	0.001		-0.001	
AUDREVPCT	-0.222 *		-0.216 *	
LNCLIENTS	0.043 *		0.041	
RECESSION	0.906 ****		1.021 ****	
R <sup>2</sup>	20.1%	.	20.1%	.
N	87733	.	87733	.
FIXED EFFECTS	Industry and Year	.	Industry and Year	.

\* $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ , \*\*\*\*  $p < .0001$

NOTE1: See variable descriptions in Appendix A.

**TABLE 9**  
**Discretionary Accrual Tests**  
*DV: ABSACCRUALS*

<i>Variable</i>	<i>Column I</i>		<i>Column II</i>	
	<i>Coeff.</i>	<i>Sig.</i>	<i>Coeff.</i>	<i>Sig.</i>
DECPART	0.006	*	0.007	**
R_DECPART	.		-0.009	
DECSTAFF	0.003		0.000	
R_DECSTAFF	.		0.013	*
DECLEV	-0.010	****	-0.013	****
R_DECLEV	.		0.017	**
LNPART	-0.017	****	-0.018	****
LEV_MA	0.044		0.043	
LEV_SQ	0.952	*	0.918	*
INTERCEPT	0.196	****	0.201	****
SALESGROWTH	0.054	****	0.054	****
SALESVOL	0.152	****	0.152	****
CFO	-0.188	****	-0.188	****
WEAKNESS	0.024	****	0.024	****
SIZE	-0.008	****	-0.008	****
DEBT	0.048	****	0.048	****
LOSS	0.002		0.002	
ZSCORE	-0.000	****	-0.000	****
BTM	-0.005	***	-0.005	***
CURRACC	-0.136	****	-0.136	****
BIGN	-0.007		-0.007	
MERGER	0.020	****	0.020	****
FIN	0.011	****	0.011	****
AUDREVPCT	-0.004		-0.006	
LNCLIENTS	0.006	**	0.007	**
RECESSION	0.027	****	0.015	**

	<i>Column I</i>		<i>Column II</i>	
R <sup>2</sup>	20.9%	.	20.9%	.
Adjusted R <sup>2</sup>	20.8%	.	20.8%	.
N	82494	.	82494	.
FIXED EFFECTS	No	.	No	.

*\*p<.05, \*\* p <.01, \*\*\* p <.001, \*\*\*\* p<.0001; NOTE1: See variable descriptions in Appendix A*

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## **STUDY THREE: THE PCAOB RISK-BASED INSPECTION PROGRAM: AN ASSESSMENT OF ITS ABILITY TO COMMUNICATE AND PROMOTE AUDIT QUALITY**

### Abstract

The Public Company Accounting Oversight Board (“PCAOB”) uses a risk-based selection process to identify engagements for inspection and states that its inspection findings are an indicator of audit quality. However, critics argue that the risk-based selection program produces reports that are not representative of the overall audit quality for the firm. This study creates a selection model, investigates the extent inspection findings are representative of overall firm audit quality, and examines the extent to which the inspection process may improve audit quality. Inspection reports of annually inspected firms from 2004 to 2012 are analyzed in combination with the financials of their issuer clients. Results suggest that inspection report findings can be generalized to the audit quality of those deficient accounts for the issuer client base exhibiting the highest levels of selection risk. Specifically, when audit firms have increased levels of revenue related to inspection deficiencies, their high selection risk clients have higher average discretionary revenues for the year inspected. Further, the analysis suggests that the PCAOB risk-based inspection process is effective in improving audit quality of deficient accounts for clients exhibiting the highest levels of selection risk in the subsequent year. The results indicate a negative association between prior levels of revenue specific inspection deficiencies and future levels of discretionary revenues for high selection risk clients.

## I. Introduction

The Public Company Accounting Oversight Board (“PCAOB”) implements a risk-based program to evaluate the auditors of public companies. The inspection program targets issuer<sup>52</sup> audit engagements that provide the highest risk to the capital markets.<sup>53</sup> After the inspection, the PCAOB reports specific audit deficiencies<sup>54</sup> found without identifying the issuers that were inspected (i.e. the specific audit engagements). The PCAOB believes that inspection report findings provide insights into firm audit quality (PCAOB 2015a). However, critics of the PCAOB’s risk-based inspection program assert that inspection findings are not necessarily representative of audit quality across the firms’ issuer client portfolio, because the PCAOB does not use a random selection process where all clients have an equal probability of inspection (CAQ 2012; Church and Shefchik 2012; DeFond 2010; EY 2015; Gunny and Zhang 2013; Peecher and Solomon 2014; PWC 2013; Shefchik 2014).

Yet, criticisms of the PCAOB’s risk-based inspection program may be tangential to the regulator’s underlying decision for adopting a risk-based approach. Black’s (2010; Black and Baldwin 2010) theory of risk-based regulation describes that a significant benefit of adopting a risk-based inspection program is to allow for the effective deployment of scarce resources to minimize societal risks by targeting high-risk regulatees. Theoretically, the risk-based inspection program allows the PCAOB to effectively deploy scarce resources to improve audit quality for audit firms’ engagements possessing the highest levels of risk to the capital markets.

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<sup>52</sup> The term “Issuer” is used to define a Securities and Exchange Commission (“SEC”) registrant that issues financial statements.

<sup>53</sup> Market Risk is defined as a combination of issuer size and engagement audit risk (PCAOB 2007).

<sup>54</sup> Audit deficiencies are also referred to as “inspection findings”, “findings”, “inspection errors”, or “deficiencies”. PCAOB inspection reports with deficiencies are also referred to as “deficient reports.”

This study evaluates two key features related to the PCAOB's risk-based inspection program—its ability to communicate and promote audit quality. The extent to which PCAOB inspection reports communicate audit quality is explored by examining the association between levels of account specific findings and the audit quality for those deficient accounts. Specifically, the analysis investigates whether inspection findings are generalizable to the audit quality of all issuer audits in the firm's portfolio or only to those clients with the highest likelihood of selection (highest levels of selection risk) as specified by the selection factors identified by the PCAOB, firms, and the profession. The communicative ability of inspection reports is important to test because the PCAOB has maintained that its inspection reports are informative of audit quality while critics have questioned the value of inspection findings. Further, empirical research has found mixed results of whether PCAOB inspection reports provide information content (e.g., Lennox and Pittman 2010; Nagy 2014) and has suggested that deficient reports cannot be generalized to audit quality for annually inspected firms (Gunny and Zhang 2013).

Second, this study investigates the extent to which the risk-based inspection program promotes audit quality. The ability of the PCAOB's inspection process to improve audit quality is tested by examining the association between levels of account specific inspection findings and account level audit quality in the subsequent fiscal year. The potential for the risk-based inspection program to improve audit quality is important to evaluate because, while other dimensions of the inspection process have been criticized (i.e. its communicative ability), it is not yet known if the risk-based inspection program contributes to the PCAOB's mission of improving audit quality or protecting the public interest.

To address this, a selection model is developed to approximate the PCAOB's risk-based selection criteria based on the comments of the PCAOB (PCAOB 2005, 2007, 2008), audit firms

(Deloitte 2013; EY 2013), and the profession (CAQ 2012).<sup>55</sup> The inspection report's ability to communicate audit quality is tested by examining the association between levels of PCAOB findings<sup>56</sup> for revenue accounts and the audit firm's ability to constrain earnings management of revenues (discretionary revenues [Stubben 2010]). Second, the PCAOB's ability to use the inspection process to promote audit quality is tested by examining the relationship between revenue specific inspection findings in year t-1 and discretionary revenues in year t.

First, the results suggest that PCAOB inspection reports contain informational content that can be generalized to the audit quality of the firm's riskiest clients. There is a positive association between a firm's level of revenue specific inspection findings and the discretionary revenues for their issuer clients exhibiting the highest levels of selection risk. This is consistent with the theory that PCAOB reports provide information with the *type* of inspection findings documented and these deficiencies are generalizable to the audit quality for the firm's riskiest clients. Second, this study finds improvements in audit quality as firms' revenue specific findings in year t-1 have a negative relationship with their clients' discretionary revenues in year t, for issuer clients exhibiting the highest selection risk. Results are consistent with Black's (2010) theory, suggesting the risk-based inspection process is effective in improving compliance amongst regulatees possessing the highest risk. Hence, evidence suggests that the PCAOB's risk-based inspection program contributes toward the regulator's mission of improving audit quality.

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<sup>55</sup> The PCAOB keeps the actual selection criteria model a secret. However, audit firms know which engagements are chosen for inspection and have the ability to model selection criteria and have explicit knowledge of what accounts are inspected.

<sup>56</sup> The term 'levels' references the number of inspection findings. However, the phrase 'number of inspection findings' may be misleading as this study controls for PCAOB's inspection effort as well, as more inspection findings are expected if the PCAOB engages in more inspection effort. Therein, *levels of inspection findings* refers to the number of inspection findings divided by the total number of offices inspected by the PCAOB.



This paper makes several contributions to existing literature and to practice. The first contribution is the derivation of an inspection selection risk model which provides insights into how inspection reports communicate audit quality and how the inspection process promotes audit quality. The results suggest that this selection model may be useful for researchers, regulators, investors, and audit committee members in evaluating audit quality from inspection report results. Second, this paper contributes to the debate on the informational content of inspection reports, providing evidence that inspection reports have value in the *type* of deficiencies that are documented, rather than overall counts or error rates. Further, this study has theoretical contributions as it introduces a new theory to evaluate the PCAOB's inspection program. Empirical evidence supports Black's theory of risk-based inspection prediction that the risk-based inspection program would improve compliance (audit quality) of the highest risk regulatees (engagements).

The rest of this paper is organized as follows: section II reviews risk-based inspection, section III builds the hypotheses, and section IV describes the sample and data. Section V reports the analysis, results, and additional tests. Finally, section VI provides a conclusion.

## II. Risk-Based Inspection

### **Risk-based Inspection Overview**

The risk-based inspection process is a component of risk-based regulation which attempts to manage societal or institutional risk by a strategic allocation of regulatory resources (Black 2010; Black and Baldwin 2010). Due to the constrained resources available to regulators, the approach has gained favor and has been adopted globally, including in the regulation of food safety

(FDA<sup>57</sup>), environmental protection (EPA<sup>58</sup>), health industry (MHRA<sup>59</sup>), and financial services (FINRA<sup>60</sup>) (Black 2008; Black 2010; Black and Baldwin 2010). Black (2010; Black and Baldwin 2010) identify that, among others, a major motivation for regulators to adopt a risk-based inspection program is to effectively deploy scarce regulatory resources to improve compliance of regulatees which pose the highest risk.

Risk-based inspection is conducted through a sequential process described by Black (2010; Black and Baldwin 2010). The first step is to (1) determine the regulator's objectives and risk appetite. Since risk-based regulation is based on risks rather than rules, the regulator defines the risks it seeks to manage instead of the rules they have to enforce (Black 2010; Black and Baldwin 2010). The next steps are for the regulator to (2) assess hazards and adverse events in regulated firms, the probability of occurrence, and the nature or likelihood of impact; and (3) assign scores or rankings to regulated firms on the basis of these assessments (this step can be either highly qualitative or quantitative). Finally, (4) inspection and supervisory resources are allocated to regulatees exhibiting the highest risk according to the scores or rankings.

### **The PCAOB's Risk-based Inspection Program**

Section 104 of SOX requires the PCAOB to conduct periodic inspections of audit firms who have issuer clients, but remains silent to how the PCAOB should carry out the inspection program. The PCAOB has adopted a risk-based inspection program which focuses on the riskier parts of a public accounting firm's client portfolio (Gunny and Zhang 2013; PCAOB 2008;

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<sup>57</sup> <http://www.fda.gov/Food/GuidanceRegulation/RetailFoodProtection/FoodCode/ucm187947.htm>

<sup>58</sup> <http://www.epa.gov/compliance/resources/policies/state/grants/fifra/08-10-appendix4d.pdf>

<sup>59</sup> <http://www.mhra.gov.uk/Howweregulate/Medicines/Inspectionandstandards/GoodClinicalPractice/Riskbasedinspections/>

<sup>60</sup> <https://www.finra.org/web/groups/industry/@ip/@reg/@notice/documents/notices/p125204.pdf>

Wegman 2006). Within the PCAOB, internal assessments (risk-based scoring of engagements) are conducted with a joint effort between the Office of Research and Analysis (ORA) and Registrations and Inspections (DRI)(PCAOB 2007). The PCAOB has not publicly released the criteria used to select engagements of audit firms or the actual engagements (clients) inspected (with which various selection models could be tested). However, they have stated that the probability an engagement is selected (selection risk) is based on a combination of the audit risk posed by an issuer engagement and the risk posed by the auditor (PCAOB 2008). The PCAOB inspects audit engagements that they believe have a high-risk of issuer material misstatement (CAQ 2012; including the size and complexity of issuer clients Deloitte 2013]) and/or a high-risk of audit deficiencies (such as prior negative inspection results [Deloitte 2013]; or office client turnover [PCAOB 2015c]; Gunny and Zhang 2013; PCAOB 2007, 2008).<sup>61</sup> Specific factors considered by the PCAOB in their inspection strategy have been discussed by the PCAOB (including individual board members), the profession, and the firms. A detailed discussion of the factors included in the PCAOB's internal selection risk model are included in Appendix B.

#### External views of the PCAOB's Risk-based Inspection Program

Although there are benefits to regulating with a risk-based inspection program, the PCAOB's risk-based selection process is the subject of public criticism. The primary criticism is that the audit deficiencies documented in inspection reports are not representative of the firm's average audit quality across the firm's extended client base because the issuers that are inspected are not representative of the firm's public company practice (CAQ 2012). Instead, the PCAOB's

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<sup>61</sup> Former PCAOB (2008) Chairman, Mark Olson clarified that these are areas that present the most significant challenges (audit, accounting, and SEC compliance), not those that would be most likely to have the most findings.

risk-based targeting process results in scrutinizing engagements, and high-risk areas in those engagements that are likely atypical of client portfolios (Church and Shefchik 2012).

Consequently, high levels of findings may not reflect poor audit quality, but rather “that the PCAOB is good at screening” (Peecher and Solomon 2014, 1).

The regulatees also criticize the risk-based inspection program. Precisely, firms claim that the inspection process is designed to find errors (PWC 2013), so they caution report users to expect that a “substantial number of inspections will result in negative findings” (EY 2015, 2). From these statements, the firms appear concerned that decision makers will attempt to infer audit quality from inspection reports. Further, beyond cautioning users against using inspection reports to assess audit quality, firms also express disagreement with inspection report findings.

Research has documented high levels of disagreement with inspection reports. Nearly 40 percent of triennially inspected audit firms (Hermanson, Houston, and Rice 2007)<sup>62</sup> and 62.5 percent of annually inspected firms (Church and Shefchik 2012) expressed disagreements with the PCAOB in their inspection reports. Due to the high frequency of disagreement, the PCAOB warns that corporate boards should be skeptical of common responses audit firms use to explain inspection findings in defense of their audit quality. These common forms of disagreement attempt to isolate deficiencies from overall firm audit quality. Some common firm defenses identified by the PCAOB include that the inspection finding “was a single event”, “there was a difference in professional judgment”, or it “was just a documentation problem” (PCAOB 2012).<sup>63</sup>

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<sup>62</sup> Hermanson et al. (2007) reported 189 total audit deficient reports: 33 Firms no response or omitted, 83 agreed, 73 disagreed. Of the 73 that disagreed: 59 defended, and 14 provided no defense.

<sup>63</sup> Based on the documentation defense, firms could be defining audit quality in terms of reaching the appropriate audit opinion, while the PCAOB appears to define it both in terms of the correctness of the opinion and the quality of the process (i.e. the appropriateness tests, evaluation, and documentation). The auditing standards state that

## The PCAOB's Views of their Risk-based Inspection Program

The PCAOB explicitly states that its inspection reports are an indicator of firm audit quality. In its Audit Quality Indicator (AQI) project, which seeks to provide quantitative measures that may provide insights into audit quality, the PCAOB expresses that the number and nature of inspection findings are indicators of audit quality (PCAOB 2013, 2015a). Yet, the PCAOB has also stated that inspection reports may be limited in their capacity to communicate a firm's level of overall audit quality. In guidance directed to inform board members on the inspection process, the PCAOB recognizes that the deficiencies documented in inspection reports may not be representative of *average* firm audit quality and inspection findings cannot be extrapolated to reach broader conclusions about audit quality (the absence or presence of deficiencies) throughout the *unreviewed* issuer base (PCAOB 2012; Deloitte 2013).

These two comments made by the PCAOB may appear to be contradictory. However, comments from PCAOB Inspections Director, Helen Munter, may reconcile any discrepancies. According to Munter, there is a tendency for report users to incorrectly focus on numbers of total deficiencies or deficiency percentages instead of placing their focus on the specific *types* of deficiencies identified (PCAOB 2015d). Inspection reports may provide value in the specific types and nature of findings as they may suggest areas of weakness for audit firms. These areas of weakness may relate to the underlying audit processes which contribute to audit quality, suggesting potential value for findings as an indicator of audit quality. Alternatively, and consistent with the guidance provided to boards, the number of deficiencies, changes in deficiencies, or overall error rates may not generalize to average firm audit quality.

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documentation is an "essential element of audit quality" (AU 339; SAS 103)(AICPA 2006). However, appropriate documentation does not guarantee audit quality. There still remain questions about the extent inspections findings, related to documentation, relate to and promote audit quality.

## V. Hypotheses Development

### **Communicating Audit Quality**

Researchers, firms, and the profession argue that PCAOB reports are not generalizable as a signal of audit quality (CAQ 2012; Church and Shefchik 2012; DeFond 2010; Peecher and Solomon 2014; PWC 2013; Shefchik 2014), a component of informational content. Empirical research investigating the informational content of inspection reports provides mixed results. For example, the informational content of inspection reports is frequently evaluated in terms of audit market reactions (auditor retention and engagement decisions) after the release of inspection reports. Using this methodology, Lennox and Pittman (2010) did not find evidence of negative client turnover in response to deficient inspection reports and suggest that PCAOB inspection reports do not provide informational content. Alternatively, Daugherty et al. (2011), Abbott et al. (2012), and Nagy (2014) found significant associations between inspection reports and client turnover suggesting inspection reports provide informational content.<sup>64</sup>

Gunny and Zhang (2013) used a different methodology to examine the informational content of PCAOB inspection reports. They evaluated the report's ability to generalize to the audit quality for the firm's issuer clients. Gunny and Zhang (2013) found that triennially inspected audit firms with deficient reports have lower audit quality (higher abnormal accruals and a greater propensity to restate) than firms with clean inspection reports.<sup>65</sup> Yet, they did not

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<sup>64</sup> Lennox and Pittman (2010) examine deficient reports as the log of one plus the number of inspection findings. Daugherty et al. (2011), Abbott et al. (2012), and Nagy (2014) examine deficient reports as either reports with at least one inspection finding, or an audit deficiency indicating a departure from GAAP.

<sup>65</sup> Gunny and Zhang (2013) classify inspection reports with no audit deficiencies as clean, those with one or more audit deficiencies as deficient, and those with audit deficiencies that were a "failure to identify a departure from GAAP" and/or that resulted in a "restatement" of the financial statements as seriously deficient.

find evidence that deficient inspection reports generalize to the audit quality of annually inspected audit firms.

These studies investigated ‘deficient’ PCAOB inspection reports in terms of total number of findings (Lennox and Pittman 2010), the presence of findings (Daugherty, Dickins, and Tervo 2011), or degrees of deficiency reported (i.e. deficient vs. seriously deficient, see Gunny and Zhang 2013). Such operationalizations are not consistent with the comments of Munter (PCAOB 2015d) which suggest that the *type*, not *number*, of inspection findings provide insights into the firm’s audit quality. Consistent with Munter’s hypothesis, this study examines the informational content of the levels of *account specific (type of)* inspection findings. It is expected that increased levels of inspection findings for a specific account could indicate a weakness in firm methodology or quality control for that specific account.

Levels of account specific audit deficiencies could provide insights into the quality of the audit firm’s methodology as audit firms design support systems to enforce consistent application of methodology across engagements. To ensure consistency, firms implement audit support systems that restrict auditors to follow the firm’s prescribed methodology (Dowling 2009; Dowling and Leech 2007). Restrictive audit support systems replicate the way specific accounts are audited for all clients—providing the opportunity for the consistent application of a weakness in methodology. Hence, increased findings for a specific account may reflect widespread methodology or quality control weaknesses for those accounts in the firm which impact audit quality across the firm’s extended portfolio of clients. This leads to the first hypothesis,

*H1a: Levels of PCAOB inspection deficiencies will be negatively associated with audit quality of deficient accounts for the registered audit firms’ issuer client base for the inspected year.*

Comments from the profession and researchers suggest that inspection deficiencies may not be generalizable to the extended client base. Instead, the risk-based inspection program may produce findings that are generalizable to the clients exhibiting the highest selection risk (CAQ 2012; Church and Shefchik 2012; Peecher and Solomon 2014; Shefchik 2014). Further, weaknesses in methodology, or failure to apply methodology, are more likely to be evident in clients that have higher selection risk because these engagements have an increased likelihood of material misstatements and/or audit deficiencies (PCAOB 2007, 2008). Thus, increased levels of inspection findings for a specific account, reflecting the quality of the firm's methodology, may be associated with lower levels of audit quality of those deficient accounts only for issuer clients possessing the highest levels of selection risk.

*H1b: Levels of PCAOB inspection deficiencies will be negatively associated with audit quality of deficient accounts for the registered audit firms' issuer client base with the highest selection risk for the inspected year.*

### **Promoting Audit Quality**

The PCAOB's mission is to improve audit quality (PCAOB 2014b) and it has instituted education and incentive programs in its inspection process to achieve this end. First, the inspection process includes elements designed to educate auditors on how to improve audit quality. The PCAOB uses its Root Cause Analysis program to identify underlying factors (positive and negative) that affect audit quality and share best practices amongst firms (PCAOB 2014a). Further, the inspection process includes working with auditors on remedial actions to address the causes of deficiencies (PCAOB 2014a). Common remedial actions include modifications to audit methodology, additional training of partners and staff, modifications to firm policies and procedures, and increased monitoring (PCAOB 2014a; Carcello, Hollingsworth, and Mastrolia 2011).



The PCAOB has built incentives into its inspection process that penalize audit firms reputationally by disclosing deficiencies when firms do not improve their quality control, audit methodology, or audit quality (Peecher, Solomon, and Trotman 2013). The first incentive is the threat of potential disclosure of a non-public stage two inspection report if the audit firm does not address deficiencies in its quality control system (Carcello, Hollingsworth, and Mastrolia 2011). Public disclosure of this report presents financial incentives as audit firms are more likely to lose market share in response to the release of a second stage report (Nagy 2014). Second, increased findings can spell increased scrutiny in future rounds of inspection (Carcello, Hollingsworth, and Mastrolia 2011) as the PCAOB targets firm problem areas in subsequent inspection cycles (EY 2013; Deloitte 2013; PCAOB 2008) which may lead to additional findings in future reports.

Empirical research corroborates the notion that the inspection process may improve audit quality. First, Carcello et al. (2011) found that audit quality improves (discretionary accruals decrease) for Big 4 auditors following the implementation of the inspection program. Further, two studies found that inspection findings decrease in subsequent inspection cycles—possibly suggesting improvements in audit quality. Daugherty et al. (2011) found that deficiencies for triennially inspected firms decrease significantly in the second round of inspection. Church and Shefchik (2012) also found a decrease in deficiencies for annually inspected audit firms.<sup>66</sup>

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<sup>66</sup> A decline in inspection findings could suggest other possibilities rather than an improvement in audit quality. For example, it could represent learning and responding to the inspection program (Church and Shefchik 2012), inspection report lag has allowed for reports to be issued more quickly (Church and Shefchik 2012), lower quality auditors have left the market and higher quality auditors remain (Daugherty, Dickins, and Tervo 2011), PCAOB inspections have declined in rigor (Daugherty, Dickins, and Tervo 2011), or that the PCAOB inspections have targeted different firms, accounts, or levels of risk (Hermanson, Houston, and Rice 2007).

Taken together, the inspection process includes education and incentive programs for firms to improve their audit quality; increased levels of account specific inspection findings will likely amplify education (remedial) efforts and incentives. This leads to the second hypothesis,

*H2a: Levels of PCAOB inspection deficiencies will have a positive association with audit quality of deficient accounts in the subsequent fiscal period for the registered audit firms' issuer client base.*

Yet, Black's theory suggests that the compliance benefits derived from the risk-based inspection process are likely to be concentrated in the engagements possessing the highest levels of risk. A major motivation for adopting a risk-based inspection program is the effective deployment of scarce resources to improve compliance of the regulatees possessing the highest risk—not to improve compliance of all regulatees (Black 2010; Black and Baldwin 2010). Risk-based regulation prioritizes decreasing overall market risks by addressing the risks posed by the highest risk regulatees. Thus, findings generated from the inspection process could improve compliance (audit quality) among only the riskiest portions of the audit firm's issuer client portfolio (those providing the highest risk to the capital markets).

Evidence suggests that in response to the PCAOB's risk-based program, firms attempt to anticipate which issuer engagements will be selected for inspection and allocate more effort to those audits (Shefchik 2014). Survey data shows that audit partners of large firms adjust their audit plans based on the perceived likelihood of PCAOB selection (Houston and Stefaniak 2012). Further, Shefchik (2014) found that an auditor's effort increases for high-risk clients in a risk-based inspection regulation environment when auditors face resource constraints. As the PCAOB inspection process targets problem areas (Carcello, Hollingsworth, and Mastrolia 2011; Deloitte 2013; EY 2013; PCAOB 2008), audit firms with higher levels of inspection findings can

strategically allocate resources to deficient accounts in future audits, focusing on high selection risk clients. Thus, improvements in audit quality can result from firm audit quality management.

Although there could be improvements in audit quality across the extended client base, Black's theory of risk-based inspection and the possibility of audit quality management suggest that improvements in audit quality is more likely for the riskiest engagements. Thus, the second hypothesis expects that previous levels of findings will be associated with improvements in audit quality in future periods for engagements possessing the highest levels of selection risk.

*H2b: Levels of PCAOB inspection deficiencies will have a positive association with audit quality of deficient accounts in the subsequent fiscal period for the registered audit firms' issuer client base with the highest selection risk.*

## VI. Sample and Data

Inspection findings are obtained from the PCAOB inspection reports of annually inspected audit firms (firms auditing more than 100 issuers). These firms include BDO USA, Crowe Horwath, Deloitte, EY, PwC, KPMG, Grant Thornton, and McGladery.<sup>67</sup> Reports are examined and coded for fiscal years 2004 to 2012 (reports issued through the end of 2013). The inspection reports are combined with fiscal results from Compustat (both annual and quarterly results<sup>68</sup>) and audit specific information from Audit Analytics. Inspection reports are joined with these databases based on the fiscal year of the audit engagement (not the year when the report is subsequently

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<sup>67</sup> Firms that have been inspected by the PCAOB as annually inspected firms, but not included in this study include KPMG (Canada), Tait Weller Baker, Malone Bailey, and Moore and Associates. KPMG (Canada) is not included as it was the only Big 4 firm that is considered an annually inspected affiliate firm in Canada and does not provide an equal comparison to the work (and inspection findings) provided by the other Big 4 firms in Canada. Thus, only US based issuers are examined, all other issuers headquartered in Canada are removed from the sample. Tait Weller Baker, Malone Bailey, and Moore and Associates are much smaller than the other annually inspected firms and inspection finding ratios that are outliers due to denominator effects.

<sup>68</sup> Quarterly results are necessary in order to compute the discretionary revenue model.

released). These inspection reports are associated with 30,642 issuer-years reported in Compustat and Audit Analytics; after subtracting issuers with missing data, 13,458 remain for testing.

### **Discretionary Revenue Model**

The constructs for specific account findings and audit quality of deficient accounts are operationalized with revenues. Revenue related accounts or processes are one of the most prevalent sources of inspection findings (Church and Shefchik 2012; PCAOB 2014a; PCAOB 2015d). Further, the financial markets place significant weight on revenues (Callen, Robb, and Segal 2008) and revenue restatements (Anderson and Yohn 2002; Callen, Livnat, and Segal 2006; Palmrose, Richardson, and Scholz 2004). Therefore, this study examines the association between revenue related inspection findings and the audit firm's constraint of the earnings management of revenues (as evidenced by lower discretionary revenues) (Stubben 2010) as a proxy for higher audit quality of revenues. The full testing model is presented below. Variable definitions are provided in Appendix A.

$$\begin{aligned}
 \text{ABNRMLREVSQ} = & b_0 + b_1 \text{RISK} + b_2 \text{REVERRORS} + b_3 \text{REVERRORS\_RISK} + \\
 & b_4 \text{LAGREVERRORS} + b_5 \text{LAGREVERRORS\_RISK} + b_6 \text{SALESGROWTH} + \\
 & b_7 \text{SALESVOLATILITY} + b_8 \text{CFO} + b_9 \text{WEAKNESS} + b_{10} \text{SIZE} + b_{11} \text{DEBT} + b_{12} \\
 & \text{LOSS} + b_{13} \text{ZSCORE} + b_{14} \text{BTM} + b_{15} \text{TTLACC} + b_{16} \text{BIGN} + b_{17} \text{MERGER} + b_{18} \text{FIN} \\
 & + e \quad (1)
 \end{aligned}$$

Discretionary revenues (ABNRMLREVSQ) serve as the dependent variable, representing a measure of revenue manipulation (Stubben 2010). Lower levels of discretionary revenues suggest higher levels of audit quality for this account (Krishnan and Yu 2012). Previous tests of discretionary revenues show they have a positive association with financial misstatements (McNichols and Stubben 2008; Stubben 2010) and are more powerful at detecting misstatements than performance matched discretionary accruals (Stubben 2010). Further, discretionary

revenues have been used to test financial reporting quality and earnings management (Call et al. 2014; Hope, Thomas, and Vyas 2013; Simpson 2013) and the impact of the external audit on revenue quality (a measure of audit quality) (Krishnan and Yu 2012).

ABNRMLREVSQ is estimated on the annual level for each issuer based on the quarterly results of the company. Discretionary revenues are modeled with Equation 2 which estimates changes in accounts receivable ( $\Delta AR$ ) on the sum of changes in revenue in the first three quarters ( $\Delta R1\_3$ ) and the changes in revenue in the fourth quarter ( $\Delta R4$ ). The residual of the regression represents discretionary revenues, the changes in accounts receivable unexplained by changes in quarterly revenues. Variable definitions are explained in Appendix A.

$$\Delta AR_{it} = \alpha + \beta \Delta R1\_3_{it} + \beta \Delta R4_{it} + \epsilon_{it} \quad (2)$$

To estimate discretionary revenues, all revenue and receivable variables are deflated by average total assets. Quarterly revenues are obtained from quarterly filings: R1\_3 is obtained from the year to date total revenues reported in the company's third quarter and R4 from the revenues reported in fourth quarter results. ABNRMLREVSQ is estimated at the industry-year level, according to the industry groups described by Stubben (2010). This analysis excludes industry-year combinations without at least 10 observations and issuers in the financial and utility industries. Variables are winsorized at 1 percent by industry and year.<sup>69</sup> Consistent with the analysis of Kothari et al. (2005) and Stubben (2010), models are computed with scaled and unscaled intercepts (by average total assets). As the dependent variable is constructed cross-sectionally with time and industry fixed effects, fixed effects are not incorporated in the estimation of Equation 1 (Francis and Yu 2009; Reichelt and Wang 2010).<sup>70</sup>

<sup>69</sup> Consistent with Francis and Yu (2009), several variables were winsorized with specific lower and upper limits. SALES-GROWTH's maximum value is winsorized at 20, DEBT's upper value at 20, CFO at -10 and 10.

<sup>70</sup> Analysis was also conducted with fixed effects; the results were consistent with those presented.

## Selection Risk Variable

Black (2010; Black and Baldwin 2010) describes that in a risk-based inspection program, the regulator will assign scores or rankings to regulated firms. The PCAOB has not disclosed its specific selection risk criteria used to construct the scores for the regulated accounting firms.<sup>71</sup> However, comments from the PCAOB (PCAOB 2005, 2007, 2015c, 2015d), the profession (CAQ 2012), the audit firms (EY 2013; Deloitte 2013), and past research on inspection findings (Hermanson, Houston, and Rice 2007; Church and Shefchik 2012) indicate factors considered by the PCAOB to select audit engagements. This study creates a selection risk variable (SELECTRISK) that captures the attributes identified as components of the PCAOB's selection risk model. SELECTRISK is calculated by summing attributes (represented as a series of a dichotomous variables) that represent the likelihood that an *individual audit engagement* or a *specific office of the firm* is selected for inspection. The major components of SELECTRISK are briefly explained below and described in detail in Appendix B. SELECTRISK is composed of four different risk areas:

*SELECTRISK=f(accounting issues, nature of issuer, issuer financial performance, auditor); (3)*

Each risk area includes multiple risk variables defined in Table 10. Risks related to *accounting issues* include items that represent risky accounts or common PCAOB findings (such as accounts related to fair value). Risks related to the *nature of issuer* include items such as the size and geographical dispersion of the issuer (both are positively related to selection risk).

*Issuer financial performance* is based on the extreme performance measurements provided by

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<sup>71</sup> The selection model created in this paper is not validated due to unavailability of data as the PCAOB has not released its inspection criteria or the actual engagements they have inspected.

Beneish (1997). Finally, *auditor* risk factors include audit characteristics which may increase audit deficiencies at the office level (such as client turnover, restatements, and office size).

Risk factors from these four areas are summed for a composite value for SELECTRISK (described in Panel E of Table 10). For 92,336 observations with data available in Compustat and Audit Analytics during 2004 through 2012, the mean selection score is 2.51 (std=2.01) with a minimum value of 0 and a maximum value of 16. The score at percentiles include 10<sup>th</sup> = 0, 25<sup>th</sup> =1, 50<sup>th</sup> =2, 75<sup>th</sup> = 4, and 90<sup>th</sup> =5. Issuers in the top decile for an audit firm- year in SELECTRISK are demarcated as engagements having a high selection risk with indicator variable RISK. As RISK includes components that have positive (issuer size and auditor office size [e.g., Francis and Yu 2009]) and negative associations (extreme performance measures [Beneish 1997]) with audit quality, no directional prediction is made for the relationship between RISK and discretionary revenues.

#### Test Variables

There are four test variables included in the analysis, one for each hypothesis. The information to construct these variables is obtained from the population of inspection reports for annually inspected firms available on the PCAOB website. Inspection reports are coded for the errors documented for each anonymous issuer listed in the firm's inspection report. The coding system documents the number of specific inspection findings related to revenue accounts or revenue auditing processes. From this, a gross count of inspected issuers with revenue findings is computed. Examples of revenue specific findings are provided in Appendix C.

The first set of test variables examine the extent to which the findings documented in a firm's inspection report are generalizable to the audit quality of the firm's issuer base. The levels

of findings variable, REVERRORS, is calculated by dividing the number of clients with revenue errors by the total offices inspected by the PCAOB.<sup>72</sup> A positive coefficient for this variable suggests that revenue specific findings are generalizable to the audit quality of revenues accounts for the firm's extended client base providing support for H1a. REVERRORS\_RISK is calculated as the interaction between REVERRORS and RISK (the selection risk variable). A positive coefficient for REVERRORS\_RISK would suggest that the level of revenue inspection findings is generalizable to the average audit quality of revenues for the issuer client base with the highest selection risk (H1b).

The second set of test variables evaluates the extent that deficiencies identified in the inspection process promote audit quality in future periods. LAGREVERRORS represents the value of REVERRORS in the subsequent fiscal year (i.e. year t+1) and is used to test if the previous year's inspection findings affect the audit quality of revenues in future periods (H2a). A negative coefficient suggests that revenue errors in year t-1 have a negative association with discretionary revenues (or a positive association with audit quality) in year t. LAGREVERRORS\_RISK is the interaction between LAGREVERRORS and RISK and is used to test H2b. A negative coefficient for this variable suggests that increased levels of revenue findings in the prior year's inspection improve audit quality for revenues across the firm's extended client portfolio for issuer clients exhibiting the highest selection risk.

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<sup>72</sup> Dividing by the number of offices inspected, obtained from the inspection report, controls for the PCAOB's inspection effort and the size of the audit firm. It is likely that as the PCAOB engages in more inspection effort, there will be an increased number of findings. The number of clients inspected in a given year may be a better denominator, but it is not available for all inspected firms in all years. Offices inspected information is available for all firms and all years and, in years available, is highly correlated with the number of engagements inspected.



## Control Variables

The control variables included in this model are based on the common control categories used to investigate audit quality according to DeFond and Zhang (2014) and are expanded to include discretionary revenue specific control variables used by Krishnan and Yu (2012). For studies using discretionary accruals as a measure of audit quality, DeFond and Zhang (2014) recommend control variables for size, leverage, loss, sales growth, operating cash flows, Big N, market-to-book, total accruals, and equity and debt issuance/transactions.

Client size (SIZE) is calculated as the natural log of total assets. Leverage (DEBT) is the ratio of total liabilities to total assets. LOSS takes a value of 1 if the firm has negative net income. LOSS has added importance in testing audit quality with discretionary revenues as revenues are more likely to be manipulated as a key factor in the valuation of loss firms (Bagnoli, Kallapur, and Watts 2001; Bowen, DuCharme, and Shores 1995; Callen, Robb, and Segal 2008; Davis 2002; Trueman, Wong, and Zhang 2000, 2001). Sales growth (SALESGROWTH) is calculated as the year-over-year change in revenues. Operating cash flows (CFO) is the ratio of operating cash flows to lagged total assets. BIGN indicates Big 4 accounting firms. Book-to-Market (BTM) is calculated as the ratio of the book value of assets divided by the market value of the issuer's equity. Total Accruals (TTLACC) are the total accruals divided by lagged total assets. Debt issuance (FIN) takes a value of 1 if the sum of new long-term debt plus new equity exceeds 2 percent of lagged total assets and zero otherwise. For equity transactions, MERGER is equal to 1 if the company had an acquisition that contributed to sales and zero otherwise.

In addition to the above variables, this analysis includes other control variables such as those used in Krishnan and Yu (2012) who investigate discretionary revenues as a measure of

audit quality. The model controls for the number of internal control weaknesses (WEAKNESS). Revenue volatility (SALESVOL) is calculated as the standard deviation of revenues over the last three years and may impact discretionary revenues. Further, issuers with a weaker financial condition may be more likely to manipulate revenues so the model controls for financial condition where ZSCORE represents Altman's Z-Score (Altman 1968; Altman 1983). Consistent with prior research (including Krishnan and Yu [Krishnan and Yu 2012]), SALESGROWTH, SALESVOL, CFO, FIN, MERGER, ZSCORE, and WEAKNESS are expected to have a positive relationship with discretionary revenues. DEBT, BIGN, BTM, SIZE, and TTLACC are expected to have a negative relationship with discretionary revenues.

## VII. Analysis and Results

Table 11 presents the descriptive statistics for the variables used in the analysis. As the risk-based inspection process is a key focus of this paper, Table 11 presents the descriptive statistics comparing the high selection risk sample to the sample not identified as having a high selection risk. First, there is not a significant difference between the high-risk and non-high-risk sample on the primary dependent variable (ABNRMLREVSQ;  $p=.127$ ).<sup>73</sup> Per design of the selection risk variable, there is not a significant difference between BIGN and non-BIGN firms on RISK as selection risk is calculated for each firm. On average, firms have .17 revenue specific inspection findings per office inspected (REVERRORES), where there are no significant differences between high-risk clients and the rest of the sample ( $p=.065$ ). Table 11 shows significant differences between many of the control variables based on the selection risk variable, suggesting that RISK identifies companies who are larger and riskier. Variables where issuers identified as having high

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<sup>73</sup> All p-values are presented as two-tailed tests, unless otherwise noted.

selection risk have significantly higher values include SALESGROWTH, SALESVOLATILITY, CFO, WEAKNESS, SIZE, DEBT, LOSS, MERGER, and FIN. Alternatively, high selection risk companies had significantly lower values for ZSCORE.

Test variables are grouped (where lagged and interacted values are regressed with base values) and introduced separately in regressions to examine the singular and joint effects of the inspection results and to determine the extent (i.e. firm-wide or high-risk clients) variables are associated with audit quality. Table 12 presents four regressions (I-IV) that tests hypotheses H1a, H1b, H2a, and H2b, respectively. Column I displays the results for REVERRORS, column II the results for REVERRORS and REVERRORS\_RISK, column III the results for REVERRORS and LAGREVERRORS, and column IV the results for the full model (specified in Equation 1).

Table 12 reports the regressions of discretionary revenues. Control variables DEBT, ZSCORE, BTM, TTLACC, and MERGER are positively associated with ABNRMLREVSQ. SALESGROWTH and CFO are negatively associated with discretionary revenues. A directional prediction was not made for RISK. When RISK interacted variables are included in the regression, RISK has a negative or non-significant coefficient. When no RISK interacted variables are included, RISK's coefficient is significant and positive.

The first test variable, REVERRORS, examines the relationship suggesting that revenue related inspection findings are generalizable to the audit quality of revenues for the extended client base (H1a). Column I of Table 12 shows that support is not provided for this relationship ( $p=.507$ ). H1b predicts that revenue specific findings are generalizable to the revenue accounts of the firm's riskiest clients (REVERRORS\_RISK). The multivariate tests support this hypothesis ( $\beta=.019$ ,  $p=.0001$ ). Further, Column IV of Table 12 (the model containing all test variables), also

provides support for H1b as the coefficient for REVERORRS\_RISK remains positive and significant ( $\beta=.03$ ,  $p=.0001$ ).

Second, this analysis evaluates the extent to which the PCAOB inspection process affects future levels of audit quality. First, LAGREVERERRORS is significant and negative in Column III ( $\beta=-.004$ ,  $p=.014$ ). Inferences from this test suggest improvements in account level audit quality across the extended client base from levels of previous inspection findings, providing support from H2a. However, H2b predicts that improvements in the audit quality of revenues will occur for the riskiest clients (LAGREVERERRORS\_RISK). When LAGREVERERRORS\_RISK is included in Column IV, it is negative and significant ( $\beta=-.027$ ,  $p<.001$ ) providing support for H2b. When LAGREVERERRORS\_RISK is included in the regression IV, LAGREVERERRORS is no longer significant.<sup>74</sup> Overall, these results suggest improvements in audit quality for issuers exhibiting the highest selection risk (H2b).

## Discussion

Understanding the risk-based nature of the PCAOB inspection program allows for a greater ability to understand how the inspection program communicates and promotes audit quality. Specifically, the results suggest that PCAOB inspection reports provide informational content as account specific inspection findings are generalizable to the audit quality of the same accounts of the riskiest clients (H1b). This provides evidence that increased levels of inspection findings for *specific accounts* can be generalized to the audit quality of those *specific accounts* for the firm's clients exhibiting the highest selection risk (those who are most likely to have

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<sup>74</sup> To investigate this relationship further, the sample of issuers is bifurcated on RISK. Separate regressions are run with both groups. These results are consistent with the results provided in column IV of Table 12. LAGREVERERRORS is significant only in the group designated as having a high selection risk.

misstatements and for those misstatements to go undetected). Accordingly, the *type* of findings appears to provide insights into broader aspect of the firm’s methodology and its execution of that methodology across the riskiest clients in a firm’s portfolio.

Further, it appears that the PCAOB’s inspection process is effective in promoting audit quality according to their mission. The inspection efforts, which include education and incentive programs, improve audit quality in specific areas where firms have weaknesses. Overall, increased levels of account specific findings are associated with improvements in audit quality for deficient accounts. This effect is driven by improvements in account level audit quality of the riskiest clients (H2b), suggesting that the riskiest clients may receive more attention from audit firms in the subsequent year. The results provide empirical evidence for Black’s (2010) theory of risk-based inspection and may suggest evidence of audit quality management.

### **Additional Tests**

#### Alternate Model of Discretionary Revenue

Stubben (2010) provides an alternate measure of discretionary revenues (referred to as “the conditional revenue model”) based on Petersen and Rajan’s (1997) theories of trade credit and the work of Callen et al. (2008). The conditional model estimates discretionary revenues on company size, age, revenue growth rates, and gross margins. The results are presented with the quarterly based model in Table 13. Results yield the same statistical conclusions as Stubben’s quarterly based discretionary revenue model, providing additional support for H1b and H2b.

## Increasing and Decreasing Revenue Manipulation

Stock compensation and bonuses tied to earnings targets provide incentives for managers to increase earnings (i.e. increase discretionary revenues). However, there exist alternative incentives to minimize revenues to smooth earnings growth, avoid regulator pressure, or to minimize taxes (Jones 1991; Healy and Wahlen 1999). Accordingly, both of Stubben's discretionary revenue models are analyzed using their absolute values as dependent variables. The results of these regressions are presented in Table 13.

The statistical conclusions are similar, providing additional support for H1b and H2b. First, for the absolute quarterly discretionary revenues, the coefficient for REVERRORS\_RISK is significant and positive, indicating that inspection report findings generalize to the audit quality of the highest risk clients ( $\beta=.235$ ;  $p=.003$ ). However, this model suggests improvements in audit quality across the extended client base (LAGREVERRORS;  $\beta=-.080$ ;  $p=.002$ ) instead of the subset of the portfolio exhibiting the highest selection risk (LAGREVERRORS\_RISK  $p=.694$ ). Next, the results for the absolute conditional revenue model suggest that revenue errors are generalizable to clients with the highest selection risk (REVERRORS\_RISK  $\beta=.733$ ;  $p=.001$ ). However, the absolute conditional model suggests improvements in audit quality for high-risk clients (LAGREVERRORS\_RISK  $\beta=-.476$ ;  $p=.027$ ) and improvements in the average audit quality across the firm's portfolio of issuer clients (LAGREVERRORS  $\beta=-.198$ ;  $p=.006$ ).

## Discretionary Accruals and General Audit Quality

Next, the operationalizations of revenue specific findings and audit quality of revenues may incidentally reflect *overall* audit quality instead of *account specific* audit quality. To test that the analysis conducted is assessing account specific audit quality (instead of general audit

quality), two additional tests are performed. The first test examines the relationship between revenue specific findings (REVERRORS) and absolute performance adjusted discretionary accruals (Kothari, Leone, and Wasley 2005). If this test does not reveal associations between discretionary accruals and revenue errors, it may provide evidence that the discretionary revenue dependent variable is measuring account specific audit quality. Column I in Table 14 presents the results. This regression does not find a significant association between REVERRORS or REVERRORS\_RISK and discretionary accruals. However, it indicates a negative significant association with future audit quality (LAGREVERRORS [ $\beta=-.017$ ;  $p=.05$ ]). This test provides evidence that the discretionary revenue dependent variable measures an account specific metric of audit quality.

The second test examines the relationship between total errors documented in inspection reports and discretionary accruals. If this model does not find associations between total errors and an alternative measure of audit quality, it would provide evidence that the revenue specific errors represent the audit quality of that account and not overall audit quality. As a by-product, this test assesses the generalizability of total findings to average audit quality. To analyze this, discretionary accruals are regressed on the total number of inspection errors (ERRORS).<sup>75</sup> Results are presented in Column II of Table 14.

This regression does not find significance between ERRORS and audit quality as a proxy for discretionary accruals. Total errors do not appear to generalize to the entire issuer client base of the inspected audit firm. This result is consistent with claims made by researchers, audit firms, and the profession which suggest aggregate levels of inspection findings are not representative of

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<sup>75</sup> ERRORS are calculated as the total number of inspection findings in an inspection report divided by the number of offices inspected. The lagged and risk-interacted variables are calculated the same as revenue specific findings.

average levels of audit quality. Although, results also suggest that the PCAOB inspection process may have firm-wide effects on improvements of audit quality (LAGERRORS). Together, the additional analysis suggests that the initial measures reflect revenue specific inspection findings and revenue specific audit quality (rather than total errors or overall audit quality).

### VIII. Summary and Conclusion

This study examines the PCAOB's risk-based inspection program. Using comments from the PCAOB, profession, and firms this study develops a model of selection risk. The selection risk model is then used to investigate two critical aspects of the risk-based inspection program—how the inspection process communicates and promotes audit quality. First, this study evaluates the informational content of PCAOB inspection reports. The results suggest that account specific findings (for revenues) are generalizable to the audit quality of the deficient account for the firm's client base exhibiting the most selection risk. As the analysis models selection risk (rather than using engagements inspected), it suggests that inspection findings may reflect weaknesses in firm-wide audit methodology and quality control, rather than documentation deficiencies, one off differences, or matters of professional judgment as suggested by the audit firms.

Next, this study investigates the PCAOB inspection process' ability to improve audit quality (PCAOB 2014b). Specifically, it tests Black's (2010; Black and Baldwin 2010) theory of risk-based inspection which suggests that risk-based regulation is effective in increasing compliance of the regulatees possessing the highest risk. In testing the association between inspection findings and audit quality in subsequent fiscal periods, this research establishes an association between past revenue specific findings and the audit firm's increased constraint of earnings management of revenues for their issuer clients possessing the highest selection risk.



This provides evidence that the PCAOB inspection process improves audit quality in the year following the PCAOB's inspection.

Additional analysis shows the results are robust to alternative measures of discretionary revenues and specification tests including alternate measures of audit quality or inspection errors. The supplemental tests suggest that revenue specific audit quality is associated with revenue specific findings rather than general audit quality or general audit findings. This study has limitations in that it only tests the relation between one type of finding and audit quality. Other work may be done to investigate the relation between other forms of audit quality and account specific findings (such as taxes). Further, the risk-based selection model is based on the comments of the PCAOB, the firms, and the profession. Further testing and verification of this model could be beneficial in analyzing the PCAOB's risk-based inspection program.

The results provide interesting contributions to research and practice. First, this study provides a model of selection risk which report users can apply to evaluate firm audit quality. Next, this paper empirically tests a new theory to the auditing literature which predicts the effectiveness of the risk-based inspection program. With this selection risk model and theory, the results suggest that the PCAOB is meeting its regulatory mission of improving audit quality—a finding which should be useful to those charged with governance of the PCAOB or evaluating the effectiveness of SOX. Relatedly, these findings suggest that according to the PCAOB's AQI concept release, inspection findings may be an effective indicator of audit quality (PCAOB 2015b). Finally, the results may suggest that in response to the risk-based inspection program, audit firms engage in audit quality management, where audit firms attempt to anticipate inspections and allocate more resources to riskier audits (Church and Shefchik 2012; Shefchik

2014). Therein, the PCAOB must determine if the risk-based inspection approach is improving average audit quality in the market or if it is creating other unintended consequences.

## Appendix A: Variable Definitions

<i>SALESGROWTH</i>	= Percentage change in net income from the prior year to the current year.
<i>SALESVOLATILITY</i>	= The standard deviation of total revenue scaled by total assets from t-2 through current year.
<i>CFO</i>	= Cash flow from operating activities from the current year scaled by total assets from the prior year.
<i>WEAKNESS</i>	= number of material internal control weaknesses reported in Audit Analytics for the firm in year t;
<i>SIZE</i>	= The natural logarithm of total assets [AT].
<i>CFOVOLATILITY</i>	= The standard deviation of total operating cash flows scaled by total assets from t-2 through current year.
<i>DEBT</i>	= A company's total assets less stockholders' equity of common shareholders divided by total assets at its fiscal year - end.
<i>LOSS</i>	= Dummy variable that takes the value of 1 if net income is negative, and 0 otherwise;
<i>ZSCORE</i>	= Altman's (1983) Z-Score. Calculated by: $ZScore = 1.2 * (WCAP/AT) + 1.4 * (RE/AT) + 3.3 * (EBIT/AT) + 0.6 * ((AT-LT)/LT) + 0.999 * (REVT/AT)$ ;
<i>BTM</i>	= Book value of assets divided by the company's market value of equity.
<i>TTLACC</i>	= Total Accruals divided by lagged total assets.
<i>BIGN</i>	= an indicator variable that equals 1 if the firm is audited by Deloitte & Touche, Ernst & Young, KPMG, or PricewaterhouseCoopers, and 0 otherwise; and, otherwise 0;
<i>MERGER</i>	= 1 if the company had an acquisition that contributed to sales [AQS t > 0] and zero otherwise.
<i>FIN</i>	= 1 if the sum of new long - term debt plus new equity exceeds 2% of lagged total assets and zero otherwise.
<i>RISK</i>	= Indicator variable takes the value of 1 if the issuer is in the top decile of selection risk for a given fiscal year.
<i>REVERRORS_RISK</i>	= REVERRORS interacted with RISK.
<i>LAGREVERRORS</i>	= Number of revenue specific PCAOB inspection findings divided by number of offices inspected by PCAOB for the prior fiscal year inspected (year t-1).
<i>LAGREVERRORS_RISK</i>	= LAGREVERRORS interacted with Risk
<i>REVERRORS</i>	= Number of revenue specific PCAOB inspection findings divided by number of offices inspected by PCAOB for fiscal year inspected (year t).
<i>ERRORS_RISK</i>	= ERRORS interacted with RISK.

<i>LAGERRORS</i>	=	Number of PCAOB inspection findings divided by number of offices inspected by PCAOB for the prior fiscal year inspected (year t-1).
<i>LAGERRORS_RISK</i>	=	<i>LAGERRORS</i> interacted with Risk
<i>ERRORS</i>	=	Number of PCAOB inspection findings divided by number of offices inspected by PCAOB for fiscal year inspected (year t).
<i>ABNRMLREVSQit</i>	=	Residual of regression of $\Delta AR_{it}$ on $\Delta R1\_3it$ and $\Delta R4it$ .
$\Delta AR_{it}$	=	Change in Accounts Receivable
$\Delta R1\_3it$	=	the total revenues from the first three quarters
$\Delta R4it$	=	revenues in the fourth quarter

## Appendix B: PCAOB Selection Risk Factors

Black (2010; Black and Baldwin 2010) describes that in a risk-based inspection program, the regulator will assign scores or rankings to regulated firms. Although the PCAOB has not disclosed their selection risk criteria, comments from the PCAOB, the profession, and the audit firms provide indications of the criteria used to select audit engagements. Factors included in the PCAOB's internal selection risk model are included such as:

- the nature of the issuer (e.g. complexity) (CAQ 2012; Deloitte 2013; PCAOB 2008),
- client market capitalization (CAQ 2012; Deloitte 2013),
- demonstration of a poor history of SEC compliance (PCAOB 2005; Wegman 2006),
- client industry (specific accounting issues) (CAQ 2012; Deloitte 2013; PCAOB 2008),
- presence of emerging accounting issues (EY 2013),
- location (e.g. operations in emerging markets) (CAQ 2012; Deloitte 2013; EY 2013),
- performing audit work that other accounting firms have declined (PCAOB 2005),
- audit partners (e.g. those with a negative inspection history) (CAQ 2012; Deloitte 2013),
- firm findings from prior inspections (including firm methodologies) (PCAOB 2008),
- problem offices (including previous findings) (Deloitte 2013; EY 2013),
- work of affiliates (PCAOB 2008), and
- the PCAOB also selects some non-risky clients and tries to rotate between offices, clients, and partners (CAQ 2012) and includes some random selection (EY 2013).

This appendix describes the construction of a selection risk model based on attributes that have been identified as components of the PCAOB's selection risk model. The selection risk variable SELECTRISK is a composite score calculated by summing attributes that represent the

likelihood that an *individual audit engagement* is selected for PCAOB inspection or that represent the likelihood that a *specific office of the firm* is selected for inspection. The components of SELECTRISK are explained below, each variable is defined in Table 10. SELECTRISK is evaluated as,

$SELECTRISK=f(\text{accounting issues, nature of issuer, issuer financial performance, auditor}); \quad (2)$

### **Risk Factors Associated with Accounting Issues**

The PCAOB incorporates certain high-risk accounts and emerging accounting issues into their selection process. Accordingly, issuers that have non-zero balances, high balances, or large changes in the specific accounts on which the PCAOB focuses have a greater chance of being chosen by the selection risk-based model. Accounting issue risk signified by any of the following accounts are designated with a 1, where all of the accounting issue risks are summed toward the total selection risk score. The accounting issues are listed in Panel A of Table 10. First, the PCAOB screening process includes accounts related to taxes, estimates, mergers and acquisitions, and hard-to-value investments (EY 2015; PCAOB 2015d). Respectively, these risks are included in this model by distinguishing issuers in the highest and lowest deciles<sup>76</sup> in changes in tax benefits (TAXCHG\_LO and TAXCHG\_HI), high levels or changes in intangible assets (INTANRATIO\_HI and INTANRATIO\_CHG\_HI), the presence of acquisitions or restructuring (ACQUISITION or RESTRUCTURING), and high balances and increases in Level 3 Assets (L3RATIO\_HI and L3CHG\_HI).

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<sup>76</sup> Deciles are frequently used in the selection risk model. Deciles were chosen arbitrarily over larger or smaller groups of issuers. Deciles were ultimately chosen as they are commonly used in accounting research (e.g., Butler and Lang 1991; Dechow and Ge 2006; Dempsey 1989; Chen and Church 1996; Patatoukas and Thomas 2011). However, sensitivity testing with different cutoffs are examined, analysis is consistent when cutting the issuers into 10% increments as 5% and 20% groups.

Further, Church and Shefchik (2012) report common deficiencies found in PCAOB inspection reports, implying that these are areas that draw increased PCAOB scrutiny. Accounting issues identified in their study include revenue (including software revenue recognition), fair value measurement (including acquisitions), long-term contracts, and other accounting estimates. Accordingly, indicator variables noting the presence of capitalized software (SOFTWARE), long-term construction contracts (CONSTRUCTION), and derivative contracts (DERIVATIVES) are included in the selection risk model.

### **Risk Factors Related to the Nature of the Issuer**

The nature of the issuer, including size and location, is associated with increased selection risk (CAQ 2012; Deloitte 2013; EY 2015; PCAOB 2008). Risks related to the nature of the issuer are described in Table 10 Panel B. First, the PCAOB considers issuer size in its selection model (CAQ 2012; Deloitte 2013; EY 2015; PCAOB 2008). As such, SELECTRISK incorporates two size variables that indicate issuers in the top decile of market value (MKTV\_HI) and total assets (ASSET\_HI).<sup>77</sup> Further, large changes in market value or assets could be related to audit risk and incorporated into selection risk models. Therefore, the highest and lowest deciles of changes in market capitalization (MKTVCHG\_HI and MKTVCHG\_LO) are used to indicate increased selection risk.<sup>78</sup> Changes in assets are also included as the largest and smallest deciles, but are computed as decile changes per industry year (ASSETCHG\_HI and

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<sup>77</sup> These two size variables measure different aspects of size. The majority of 'total assets' dollars are measured at book value (this could under-value the actual size of firms). Further, total assets could under-represent the company's size if they use operating leases to procure assets instead of purchasing assets, or using capital leases. The PCAOB describes using size more frequently in terms of market capitalization. However, market value information is not as readily available, especially for smaller issuer clients. Additionally, market capitalization can suffer from over- or under-valuations by the equity markets (see further discussion: Moeller, Schlingemann, and Stulz 2004). Thus, the two size components, and changes are used. Changes in total assets reflect acquiring or disposing of assets. Changes in market value reflect changes in equity valuations.

<sup>78</sup> The lowest decile likely reflects companies that have a large decline in market value. Also, signifying an increase in risk.

ASSETCHG\_LO). Evaluating changes in assets at an industry year level controls for companies that are more inherently risky because, in terms of assets, they are growing or shrinking faster than their industry peers. Second, audits in emerging markets have a higher likelihood of selection (CAQ 2012; Deloitte 2013; EY 2015; PCAOB 2008). This analysis operationalizes emerging location audits with two variables. The first distinguishes issuers headquartered in emerging markets (EMERGINGMKT) according to the countries classified in the Morgan Stanley Capital International (MSCI) Emerging Markets Index.<sup>79</sup> The second identifies issuers with more than three geographic segments (SEGMENTS). A cutoff of three segments is used assuming that most companies have significant operations beyond North America, Europe, or other non-emerging markets; the fourth, or higher, would be more likely to be in an emerging market.

### **Risk Factors Associated with Issuer Financial Performance**

The Board's model also includes measures of an issuer's financial performance to determine the likelihood an *individual audit engagement* will be selected for inspection. These factors are listed in Panel C of Table 10. The PCAOB selects inspections based on the risk of material misstatement and auditing deficiencies (PCAOB 2007). Beneish (1997, 1999) presents a model that provides timely indications of material misstatements. Beneish's model uses ratios to detect misstatements from issuers experiencing extreme financial performance.

Extreme financial performance, high or low, presents increased audit risk. Therefore, this model incorporates factors related to the likelihood of material misstatements based on Beneish

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<sup>79</sup> The countries include Brazil, Chile, China, Colombia, Czech Republic, Egypt, Greece, Hungary, India, Indonesia, Korea, Malaysia, Mexico, Peru, Philippines, Poland, Russia, Qatar, South Africa, Taiwan, Thailand, Turkey and United Arab Emirates. See [https://www.msci.com/resources/factsheets/index\\_fact\\_sheet/msci-emerging-markets-index-usd-net.pdf](https://www.msci.com/resources/factsheets/index_fact_sheet/msci-emerging-markets-index-usd-net.pdf).



(1997, 1999).<sup>80</sup> Beneish's (1997, 1999) significant indexes suggest extreme financial performance which increase the likelihood of material misstatement. For these indexes, the largest and smallest decile<sup>81</sup> are designated with a value of 1. The calculations of these variables are defined in Beneish (1997, 1999). The risk factors include Days Sales in Receivables Index (DSRI\_HI and DSRI\_LO), Gross Margin Index (GMI\_HI) and GMI\_LO), Asset Quality Index (AQI\_HI and AQI\_LO), Days Sales in Inventory Index (DSII\_HI and DSII\_LO), Sales Growth Index (SGI\_HI and SGI\_LO), and Leverage Index (LEVI\_HI and LEVI\_LO).<sup>82</sup>

### **Risk Factors Associated with the Auditor**

The final component of SELECTRISK is the likelihood a *specific office of the firm* is selected for inspection. Different components of selection risk for auditors include accepting work that other accounting firms have declined (PCAOB 2005; Wegman 2006), problem offices (Deloitte 2013; EY 2013), and specific problem audit partners (CAQ 2012; Deloitte 2013). The component of SELECTRISK that captures the propensity for an office to be selected includes large increases in clients, large losses of clients, office size, restatements, and average selection risk of issuer clients at a particular office. These variables are listed in Table 10 Panel D. Rather than examining these in terms of largest decile, offices in the highest tercile of the following values inside a particular firm-year indicate an increased likelihood of selection.<sup>83</sup>

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<sup>80</sup> DeChow et al. (2011) is also considered as a model to calculate material misstatement. Their model has different objectives including evaluating non-financial information and relies on accrual levels and other non-financial information (i.e. stock returns and issuances). Therein, the Beneish (1997, 1999) evaluation of extreme performance contains multiple ratios that each present their own risk, rather than the combination of risks to come up with an overall score as DeChow et al. (2011). Interestingly, many of the components of AS 12 align with the risks described by the PCAOB about the detection of material misstatement.

<sup>81</sup> Smallest decile likely represents the largest decrease, indicating possible reversals of prior misstatements.

<sup>82</sup> Beneish also finds significance with accrual levels to total assets; however, inclusion of this variable may be problematic since the dependent variables in this analysis include discretionary accruals.

<sup>83</sup> From 2003 through 2013 the PCAOB inspected on average 30.3 percent of the annually inspected accounting firm's offices. This percentage is closer to terciles than deciles.

Five variables are created related to the likelihood an office is selected. First, the PCAOB selection model targets audit firm offices with high turnover (PCAOB 2015c). High levels of client losses may suggest problems with the auditor; alternatively, large gains in clients could suggest insufficient staffing. Two variables, NEWCLIENTS and LOSTCLIENTS, examine large gains or losses (respectively) for an office in a fiscal year. The third variable distinguishes office size. Although office size is positively associated with increased audit quality (Francis and Yu 2009), it could present an increased likelihood of selection risk. Larger offices (OFFSIZE) allow the PCAOB to inspect more clients in one location, ostensibly including larger clients.

Fourth, restatements represent lower audit quality. Restatements can precede the inspection process (a restatement increases the likelihood of inspection), or restatements can arise from the inspection process (PCAOB inspectors find errors requiring restatement of the financial statements). More restatements for an office (OFFRESTATE) could reflect a problem office or problem partner. Fifth, if the overall portfolio of an office comprises clients exhibiting more risk, the office has a higher likelihood of inspection. Thus, the component for selection risk of individual engagements (i.e. the sum of factors relating to accounting issues, nature of issuer, and issuer financial performance) is averaged across offices. Firm offices in the top third (as the PCAOB inspects an average of 30.3 percent of offices for a firm in a year) of individual engagement selection risk are indicated as OFFRISK equal to 1.

### **Total Selection Risk Score**

Corresponding sub-scores for office and individual engagements are summed for a composite value for SELECTRISK (this is further described in Panel E of Table 10). Issuers in the top decile for an audit firm-fiscal year of SELECTRISK are indicated as engagements having a high selection risk with indicator variable RISK.

Appendix C:  
Examples of Revenue Findings in Reports of Annually Inspected Firms

**Deloitte 2005 (p4):**

“The issuer incorrectly recorded revenue from two of its four revenue-producing agreements net of certain reimbursed costs. In accordance with Emerging Issues Task Force (“EITF”) No. 99-19, *Reporting Revenue Gross as a Principal versus Net as an Agent*, the revenue under these agreements should have been presented on a gross basis. The Firm should have identified and addressed this error before issuing its audit report.”

**Ernst & Young 2006 (p5):**

The issuer's business is technology-intensive and includes processing large volumes of customer data. The Firm chose not to test the operating effectiveness of information technology controls. It failed to test the completeness and accuracy of computer-generated information that the Firm used to perform audit procedures on revenue and accounts receivable. The Firm also failed to perform sufficient substantive audit procedures with respect to revenue, including unbilled revenue. The Firm failed to test, other than through analytical review of issuer-prepared reports, unbilled revenue.

**KPMG 2007 (p6):**

In this audit, the Firm failed to obtain sufficient audit evidence to determine that revenue related to certain licensing arrangements was not recognized prematurely. The issuer entered into time-based licensing arrangements for multiple software products that provided different start dates for the various products subject to each such arrangement.

**PwC 2008 (p6)**

The issuer sells software products under licenses and subscription agreements, as well as professional and maintenance services. For certain of its bundled sales, the issuer used the stated renewal rates included in its agreements with customers when determining vendor-specific objective evidence of fair value of its postcontract customer support (“PCS”). The Firm's work papers identified a significant range in the renewal rates charged to the issuer's customers for PCS. In evaluating whether such rates were substantive as required by Statement of Position 97-2, *Software Revenue Recognition*, and related interpretations, the Firm failed to consider whether the stated rates were consistent with the issuer's normal pricing practices.

**BDO 2009 (p5):**

The Firm failed to perform sufficient procedures to test the completeness and accuracy of revenue and claims for two other operating segments, which represented approximately half of the issuer's total recorded revenue. The issuer used outside parties to process and report revenue and certain claims for these two segments. The Firm placed substantial reliance on controls when auditing revenue and claims originating from these two segments.

**Grant Thornton 2010 (p6):**

In this audit, the Firm failed to perform sufficient procedures to test the issuer's recognition of revenue from contracts accounted for under the percentage-of-completion method. Specifically, the Firm failed to test costs incurred to date, including indirect cost allocations, beyond comparing certain costs to reports that were not tested. The Firm also failed to sufficiently test the estimated costs to complete, because the Firm's procedures were limited to inquiries of management.

**McGladrey & Pullen 2011 (p7):**

The Firm failed to sufficiently test the issuer's revenue. The Firm used analytical procedures to test the majority of revenue, but due to deficiencies in these procedures, they provided little to no substantive assurance. Specifically, for certain of these procedures, the Firm developed its expectations using data from the issuer's systems that represented a significant component of the amount being tested, and this data had not been tested. Further, the Firm failed to define thresholds for investigation of significant differences from its expectations.

Appendix D:  
Study Three Tables and Figures

**TABLE 10**  
**Selection Risk Formula: Variable Names and Definitions**

<i>Variable</i>	<i>Variable Description</i>
<b>PANEL A: Risk Factors Related to Accounting Issues</b>	
TAXCHG_LO	: 1 if the issuer is in the bottom decile of issuers in the increase of net deferred tax benefits (TXNDB) in the fiscal year; Else 0;
TAXCHG_HI	: 1 if the issuer is in the top decile of issuers in the increase of net deferred tax benefits (TXNDB) in the fiscal year; Else 0;
INTANRATIO_HI	: 1 if the issuer is in the top decile of issuers in the ratio of intangible assets (INTAN) to total assets (AT) in the fiscal year; Else 0;
INTANCHG_HI	: 1 if the issuer is in the top decile of issuers in the increase of intangible assets (INTAN) from year t-1 to year tin the fiscal year; Else 0;
ACQUISITION	: 1 if Compustat variables AQS or AQEPSDERALT are not zero; Else 0;
RESTRUCTURING	: 1 if Compustat variable RCP is not zero; Else 0;
L3RATIO_HI	: 1 if the issuer is in the top decile of issuers in the ratio of level three assets (AUL3) to total assets (AT) in the fiscal year; Else 0;
L3CHG_HI	: 1 if the issuer is in the top decile of issuers in the increase of level three assets (AUL3) from year t-1 to year tin the fiscal year; Else 0;
CONSTRUCTION	: 1 if Compustat variable PPENC is not zero; Else 0;
SOFTWARE	: 1 if Compustat variable CAPSFT is not zero; Else 0;
DERIVATIVES	: 1 if Compustat variables DERAC or DERALT are not zero; Else 0;
<b>PANEL B: Risk Factors Associated to Nature of Issuer</b>	
MKTV_HI	: 1 if the issuer is in the top decile of issuers in market value (MKVALT) in the fiscal year; Else 0;
ASSET_HI	: 1 if the issuer is in the top decile of issuers in total assets (AT) in the fiscal year; Else 0;
MKTVCHG_HI	: 1 if the issuer is in the top decile of issuers in the increase of market capitalization (MKVALT) in the fiscal year; Else 0;
MKTVCHG_LO	: 1 if the issuer is in the bottom decile of issuers in the increase of market capitalization (MKVALT) in the fiscal year; Else 0;

ASSETCHG_HI	: 1 if the issuer is in the top decile of issuers in the increase of total assets (AT) in the fiscal year and industry (2-digit SIC); Else 0;
ASSETCHG_LO	: 1 if the issuer is in the bottom decile of issuers in the increase of total assets (AT) in the fiscal year and industry (2-digit SIC); Else 0;
EMERGINGHQ	: 1 if the issuer is headquartered (Compustat variable LOC) in a location identified by the MSCI Emerging Market Index; Else 0;
GEOSEGRISK	: 1 if the issuer has more than 3 geographic segments; Else 0;

**PANEL C: Risk Factors Associated to Issuer Financial Performance**

DSRI_HI	: 1 if the issuer is in the top decile of issuers in Days Sales in Receivables Index $(RECT_t/SALE_t)/(RECT_{t-1}/SALE_{t-1})$ in the fiscal year; Else 0;
DSRI_LO	: 1 if the issuer is in the bottom decile of issuers in Days Sales in Receivables Index $(RECT_t/SALE_t)/(RECT_{t-1}/SALE_{t-1})$ in the fiscal year; Else 0;
GMI_HI	: 1 if the issuer is in the top decile of issuers in Gross Margin Index $((SALE_{t-1}-COGSt-1)/SALE_{t-1})/((SALE_t-COGSt)/SALE_t)$ in the fiscal year; Else 0;
GMI_LO	: 1 if the issuer is in the bottom decile of issuers in Gross Margin Index $((SALE_{t-1}-COGSt-1)/SALE_{t-1})/((SALE_t-COGSt)/SALE_t)$ in the fiscal year; Else 0;
AQI_HI	: 1 if the issuer is in the top decile of issuers in Asset Quality Index $(1-(ACT_t+PPENT_t)/AT_t)/(1-(ACT_{t-1}+PPENT_{t-1})/Att-1)$ in the fiscal year; Else 0;
AQI_LO	: 1 if the issuer is in the bottom decile of issuers in Asset Quality Index $(1-(ACT_t+PPENT_t)/AT_t)/(1-(ACT_{t-1}+PPENT_{t-1})/Att-1)$ in the fiscal year; Else 0;
DSII_HI	: 1 if the issuer is in the top decile of issuers in Days Sales in Inventory Index $(INVT_t/SALE_t)/(INVT_{t-1}/SALE_{t-1})$ in the fiscal year; Else 0;
DSII_LO	: 1 if the issuer is in the bottom decile of issuers in Days Sales in Inventory Index $(INVT_t/SALE_t)/(INVT_{t-1}/SALE_{t-1})$ in the fiscal year; Else 0;
SGI_HI	: 1 if the issuer is in the top decile of issuers in Sales Growth Index $(SALE_t)/(SALE_{t-1})$ in the fiscal year; Else 0;
SGI_LO	: 1 if the issuer is in the bottom decile of issuers in Sales Growth Index $(SALE_t)/(SALE_{t-1})$ in the fiscal year; Else 0;

LEVI\_HI : 1 if the issuer is in the top decile of issuers in Leverage Index  $(LT_t/AT_t)/(LT_{t-1}/AT_{t-1})$  in the fiscal year; Else 0;

LEVI\_LO : 1 if the issuer is in the bottom decile of issuers in Leverage Index  $(LT_t/AT_t)/(LT_{t-1}/AT_{t-1})$  in the fiscal year; Else 0;

**PANEL D: Risk Factors Associated with the Auditor**

NEWCLIENTS : 1 if the office is in the top tercile of a firm for percentage of new clients in a fiscal year; Else 0;

LOSTCLIENTS : 1 if the office is in the top tercile of a firm for percentage of lost clients in a fiscal year; Else 0;

OFFSIZE : 1 if the office is in the top tercile of audit fees for a firm in a fiscal year; Else 0;

OFFRESTATE : 1 if the office is in the top tercile of restatements for a firm-year; Else 0;

OFFRISK : 1 if the office is in the top tercile of risk of individual engagements for a firm (Average of Risk Factors related to Accounting Issues, Nature of Issuer, and Issuer Financial Performance).

**PANEL E: Total Selection Risk Score**

SELECTRISK =Risk Factors Related to Accounting Issues+ Risk Factors Associated to Nature of Issuer+ Risk Factors Associated to Issuer Financial Performance+ Risk Factors Associated with the Auditor;

RISK = 1 if SELECTRISK is in top decile for a firm-year.

**TABLE 11**  
**Univariate Statistics: Differences Between Variables on SELECTRISK**

Variable	Full Sample			High Selection Risk			Not High Selection Risk			Difference	
	n	Mean	SD	n	Mean	SD	N	Mean	SD	T-Stat	Sig.
ABNRMLREVSQ	15622	-0.00	0.03	1536	-0.01	0.05	14086	-0.00	0.02	1.53	
ABNRMLREVS	15955	-0.04	0.74	1596	-0.05	1.29	14359	-0.04	0.66	0.37	
SALESGROWTH	28786	0.13	0.39	2814	0.30	0.69	25972	0.11	0.33	-	****
										25.29	
CFO	30642	-0.29	1.87	2844	-0.04	0.67	27798	-0.32	1.95	-7.41	****
WEAKNESS	24888	0.14	0.78	2338	0.21	0.96	22550	0.13	0.76	-4.43	****
SIZE	30590	6.60	2.12	2844	6.88	2.63	27746	6.57	2.06	-7.39	****
DEBT	30491	0.62	0.66	2837	0.65	0.81	27654	0.62	0.64	-2.21	*
LOSS	30642	0.32	0.47	2844	0.46	0.50	27798	0.30	0.46	-	****
										17.60	
ZSCORE	23582	1.07	14.39	2352	-1.68	16.90	21230	1.38	14.05	9.80	****
BTM	27642	0.62	0.68	2698	0.62	0.78	24944	0.62	0.67	0.44	
TTLACC	19151	-0.10	1.15	1976	-0.13	0.39	17175	-0.09	1.20	1.24	
BIGN	30642	0.83	0.37	2844	0.84	0.37	27798	0.83	0.37	-0.57	
MERGER	30642	0.08	0.28	2844	0.25	0.43	27798	0.07	0.25	-	****
										33.65	
FIN	30642	0.56	0.50	2844	0.68	0.47	27798	0.54	0.50	-	****
										14.38	

\* $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ , \*\*\*\*  $p < .0001$



**TABLE 12**  
**Discretionary Revenue Tests**  
*DV: Discretionary Revenues*

<i>Variable</i>	<i>Column I</i>		<i>Column II</i>		<i>Column III</i>		<i>Column IV</i>	
	<i>Coeff.</i>	<i>Sig.</i>	<i>Coeff.</i>	<i>Sig.</i>	<i>Coeff.</i>	<i>Sig.</i>	<i>Coeff.</i>	<i>Sig.</i>
RISK	0.002	*	-0.002		0.002	*	0.001	
REVERRORES	-0.001		-0.003		0.000		-0.003	
REVERRORES_RISK	.		0.019	***	.		0.030	****
LAGREVERRORES	.		.		-0.004	*	-0.001	
LAGREVERRORES_RISK	.		.		.		-0.027	****
INTERCEPT	-0.008	****	-0.008	****	-0.007	****	-0.007	****
SALESGROWTH	-0.004	****	-0.004	****	-0.004	****	-0.004	****
SALESVOL	-0.001		-0.001		-0.001		-0.001	
CFO	-0.009	****	-0.008	****	-0.009	****	-0.009	****
WEAKNESS	-0.000		-0.000		-0.000		-0.000	
SIZE	0.000		0.000		0.000		0.000	
DEBT	0.004	****	0.004	****	0.004	****	0.004	****
LOSS	-0.001		-0.000		-0.001		-0.001	
ZSCORE	0.001	****	0.001	****	0.001	****	0.001	****
BTM	0.001	**	0.001	**	0.001	**	0.001	**
TTLACC	0.005	***	0.005	***	0.005	***	0.005	**
BIGN	0.000		0.000		0.000		0.000	
MERGER	0.002	**	0.002	**	0.002	**	0.002	**
FIN	0.000		0.000		0.000		0.000	
R2	9.73%	.	1.95%	.	1.47%	.	3.04%	.
Adjusted R <sup>2</sup>	9.61%	.	1.82%	.	1.33%	.	2.90%	.
N	12805	.	12796	.	12805	.	12796	.
FIXED EFFECTS	No	.	No	.	No	.	No	.

\* $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ , \*\*\*\*  $p < .0001$   
NOTE1: See variable descriptions in Appendix A.

**TABLE 13**  
**Discretionary Revenue Tests: Additional Tests**  
*DV: Discretionary Revenues*

<i>Variable</i>	<i>Quarterly Model (from Tbl 3)</i>		<i>Abs. Quarterly Model</i>		<i>Conditional Revenue Model</i>		<i>Abs. Conditional Revenue Model</i>	
	<i>Coeff.</i>	<i>Sig.</i>	<i>Coeff.</i>	<i>Sig.</i>	<i>Coeff.</i>	<i>Sig.</i>	<i>Coeff.</i>	<i>Sig.</i>
REVERRORS	-0.003		0.036		0.044		0.118	
REVERRORS_RISK	0.030	****	0.235	**	0.534	***	0.733	**
LAGREVERRORS	-0.001		-0.080	**	-0.058		-0.198	**
LAGREVERRORS_RISK	-0.027	****	-0.030		-0.347	*	-0.476	*
INTERCEPT	-0.007	****	0.085	****	-0.048		0.562	****
SALESGROWTH	-0.004	****	0.071	****	-0.008		0.520	****
SALESVOL	-0.001		0.108	****	-0.116	*	-0.012	
CFO	-0.009	****	-0.116	****	-0.313	****	-0.735	****
WEAKNESS	-0.000		0.004		-0.003		-0.031	*
SIZE	0.000		-0.003		-0.007		-0.040	****
DEBT	0.004	****	-0.021	*	0.090	****	-0.116	****
LOSS	-0.001		-0.025	**	0.046	*	0.127	****
ZSCORE	0.001	****	-0.004	****	0.008	****	-0.014	****
BTM	0.001	**	-0.005		0.015		-0.021	
TTLACC	0.005	**	0.010		0.258	****	-0.030	
BIGN	0.000		-0.022		0.015		0.103	**
MERGER	0.002	**	-0.015		0.046	*	-0.153	****
FIN	0.000		-0.007		0.012		0.005	
RISK	0.001		-0.035		-0.047		0.188	***
R <sup>2</sup>	3.04%	.	1.95%	.	1.47%	.	9.73%	.
Adjusted R <sup>2</sup>	2.90%	.	1.82%	.	1.33%	.	9.61%	.
N	12796	.	12796	.	12805	.	12805	.
FIXED EFFECTS	No	.	No	.	**	.	**	.

\*p<.05, \*\* p <.01, \*\*\* p <.001, \*\*\*\* p <.0001

NOTE1: See variable descriptions in Appendix A.

**TABLE 14**  
**Discretionary Accrual Tests**  
*DV: Discretionary Accrual*

<i>Variable</i>	<i>Column I</i>		<i>Column II</i>	
	<i>Coeff.</i>	<i>Sig.</i>	<i>Coeff.</i>	<i>Sig.</i>
REVERRORS	0.004	.	.	.
REVERRORS_RISK	0.024	.	.	.
LAGREVERRORS	-0.017 *	.	.	.
LAGREVERRORS_RISK	-0.014	.	.	.
ERRORS	.	.	0.000	.
ERRORS_RISK	.	.	-0.003	.
LAGERRORS	.	.	-0.005 *	.
LAGERRORS_RISK	.	.	0.000	.
INTERCEPT	0.163 ****	.	0.167 ****	.
SALESGROWTH	0.045 ****	.	0.045 ****	.
SALESVOL	0.117 ****	.	0.117 ****	.
CFO	-0.150 ****	.	-0.150 ****	.
WEAKNESS	0.003 *	.	0.003 *	.
SIZE	-0.011 ****	.	-0.011 ****	.
DEBT	0.012 ***	.	0.011 ***	.
LOSS	-0.036 ****	.	-0.036 ****	.
ZSCORE	-0.002 ****	.	-0.002 ****	.
BTM	-0.007 ***	.	-0.007 ***	.
TTLACC	-0.351 ****	.	-0.350 ****	.
BIGN	-0.013 ***	.	-0.014 ***	.
MERGER	-0.020 ****	.	-0.020 ****	.
FIN	0.001	.	0.001	.
RISK	0.043 ****	.	0.047 ****	.
R <sup>2</sup>	26.5%	.	26.5%	.
Adjusted R <sup>2</sup>	26.4%	.	26.4%	.
N	15541	.	15541	.
FIXED EFFECTS	No	.	No	.

\*p<.05, \*\* p <.01, \*\*\* p <.001, \*\*\*\* p<.0001; NOTE1: See variable descriptions in Appendix A.

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