How Does Intrinsic Motivation Improve Auditor Judgment in Complex Audit Tasks?

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ABSTRACT
Intrinsic motivation is generally thought to be positively associated with performance on a variety of tasks; however, there is only sparse experimental evidence supporting this idea and we know little about the specific mechanisms behind any effect. We develop theory about how auditors’ intrinsic motivation for their jobs can improve their judgments about complex accounting estimates. We experimentally test whether a prompt to make auditors’ intrinsic motivation for their jobs salient improves specific information processing behaviors necessary for high quality judgments in complex audit tasks. It does: prompted auditors attend to a broader set of information, process information at a deeper level, and request more relevant additional evidence. Supplemental analyses show that these processing behaviors mediate between salient intrinsic motivation and an improved ability to identify a biased complex estimate. We replicate these effects of salient intrinsic motivation using a trait measure of intrinsic motivational orientation as our independent variable. Our theory and analyses indicate that auditors’ intrinsic motivation for their work provides unique value for improving judgment quality, particularly in the context of performing complex audit tasks. Our study supports the view that high quality cognitive processing can improve auditors’ professional skepticism by providing a foundation for skeptical judgments.

Key Words: Intrinsic Motivation, Cognitive Processing, Complex Estimate, Professional Skepticism, Auditor Judgment
1. Introduction

Audit quality is key to financial reporting quality. However, regulators have noted persistent problems with audit quality surrounding fair values and other complex estimates (PCAOB 2014, 2016). In interviews conducted in 2010, auditors implicate specific shortcomings in their own judgment and the underlying information processing that cause them to overrely on management assertions (Griffith, Hammersley, and Kadous 2015a). The PCAOB’s report on the results of the 2015 inspection cycle reveals that testing complex estimates remains one of the top areas of audit deficiencies, and the specific concerns remain much the same—auditors do not sufficiently test management’s assumptions and the underlying data and do not adequately consider information that goes beyond and contradicts management’s assumptions (PCAOB 2016). While there are likely multiple causes of the continued audit deficiencies in this area (e.g., Christensen, Glover, and Wood 2012; Bratten, Gaynor, McDaniel, Montague, and Sierra 2013; Glover, Taylor, and Wu 2015), the nature of the issues suggests that improving auditors’ information processing has the potential to improve audit quality in this important area. In particular, a broader and deeper consideration of evidence relevant to management’s assertions is needed.

The purpose of this paper is to examine whether and how auditors’ intrinsic motivation can address the judgment problems that auditors experience in auditing complex estimates and, by extension, other complex audit tasks. Intrinsic motivation refers to the propensity for individuals to engage in activities that interest them, and, in doing so, to learn, develop, and expand their capacities (Ryan and Deci 2000). Although intrinsic motivation is generally thought to be associated with superior task performance, there is a lack of evidence for a causal relationship and a lack of theory about specific mechanisms (Cerasoli, Nicklin, and Ford 2014). Therefore,
predictions about whether intrinsic motivation would improve auditors’ performance in complex audit tasks and, if so, how this would occur, have considerable tension.

Based on a review of the literature on intrinsic motivation and related phenomena, we develop theory predicting that auditors whose intrinsic motivation is salient will engage in better information processing behaviors than auditors whose intrinsic motivation is not salient. In particular, we expect the former to attend to a broader set of information cues, process them more deeply, and consider more relevant evidence before reaching a conclusion, as compared with the latter. These improvements in cognitive processing should enhance performance on complex audit tasks. Moreover, because they address the specific shortcomings underlying deficiencies in auditor judgments about complex estimates (e.g., PCAOB 2008; Griffith et al. 2015a), we further predict that these improvements in cognitive processing behaviors will benefit auditors’ judgments about the complex estimate.

To test our hypotheses, we conduct an experiment in which 95 senior-level auditors are tasked with auditing a client’s step-one analysis of a goodwill impairment test. The client concluded that the estimated fair value of its business unit exceeded the carrying value, and thus the step-one test was satisfied. However, the case contains seeded cues that indicate that the fair value is overstated and the step-one analysis is biased. Relying on the assumption that auditors have some level of intrinsic motivation for their jobs but that this intrinsic motivation is not always salient, we adapt an intervention from prior research that has participants rank order a list of possible intrinsic motivators for their job (Amabile 1985). The intervention is designed to increase the salience of auditors’ intrinsic motivation for their jobs relative to that in the control condition, in which auditors are asked to rank order a list of factors unrelated to job motivation.
We find that auditors whose intrinsic motivation is salient identify more seeded issues with the fair value, identify more issues requiring deep processing, and request more relevant additional audit evidence than do auditors in the control condition. They do not identify more false positive cues than auditors in the control condition. In other words, auditors with salient intrinsic motivation exhibit superior cognitive processing. These auditors also assess the client’s biased fair value as less reasonable and are more likely to consult immediately with their supervisor about the estimate than are auditors in the control condition, though this latter effect is marginally significant. Structural equations model (SEM) analyses confirm that auditors’ improved judgments are driven by the specific improvements in cognitive processing that our theory identifies.

To provide corroborating evidence that it is the salience of intrinsic motivation that drives these improvements in auditors’ cognitive processing and judgments about a complex estimate, we re-analyze the data with a different operationalization of our construct. Instead of our intervention, we use a trait-level measure of intrinsic motivational orientation (i.e., the extent to which an individual’s intrinsic motivation is typically salient) as an independent variable. These results largely replicate the main results.

Finally, we show that, consistent with theory, these results are unique to intrinsic motivation. Our design includes a condition in which we manipulate the salience of auditors’ extrinsic motivation by having auditors rank order a list of possible extrinsic motivators (i.e., recognition and other external rewards) for their job. Salient extrinsic motivation, whether arising from a prompt or from a stable trait, does not improve the cognitive processes or judgments that we examine. Together, these results indicate strong support for the idea that intrinsic motivation
provides unique value in improving the cognitive processes necessary for high quality audit judgment in complex audit tasks.

This study is important for several reasons. First, practitioners and academics have expressed concerns about how auditors can be motivated to improve audit quality given the complex and rapidly changing nature of financial statement auditing (Peecher, Solomon, and Trotman 2013). Effective use of financial incentives for motivation requires that regulators or firms tie incentives to particular audit outcomes or audit actions, ex ante. Identifying appropriate audit actions ex ante is difficult for audits of complex estimates because significant professional judgment is required (Griffith et al. 2015a). Moreover, financial incentives tend to be ineffective for complex tasks, and sometimes they even impair performance on these tasks (Glucksberg 1962; McGraw and McCullers 1979; Bonner and Sprinkle 2002). Our supplemental results corroborate the idea that extrinsic motivation does not improve performance in the complex task we study. Our main results indicate that making auditors’ intrinsic motivation salient is a promising means of improving auditors’ judgments in complex audit tasks including auditing complex estimates.

Second, this study contributes to psychology and accounting research by demonstrating how intrinsic motivation can improve task performance. Despite devoting considerable attention to intrinsic motivation, researchers have not established the means by which intrinsic motivation improves performance on complex tasks. Prior research shows that intrinsically motivated individuals persist longer on tasks (e.g., Fazio 1981), but persistence is not always sufficient for improved performance, especially in complex tasks. This study establishes a causal relationship between the salience of intrinsic motivation and specific cognitive processing behaviors, and it shows that these cognitive processing differences lead to improvements in judgment.
performance in our setting. By providing evidence about the specific mechanisms involved, this study allows future researchers in accounting and other fields to better predict when intrinsic motivation will and will not improve decision performance.

Third, our study may be useful to practitioners who wish to employ intrinsic motivation to improve audit quality in complex tasks. Prior research has shown that intrinsic (epistemic) motivation is associated with increased demand for evidence (Peytcheva, Wright, and Majoor 2014), but it has not demonstrated impacts of intrinsic motivation on breadth and depth of processing or on judgment quality. In addition, it has not established whether increased evidence demand was effective. Our study shows that making an auditor’s intrinsic motivation salient, whether by an intervention such as ours or by other means, can improve the quality of auditors’ judgment.

Finally, this paper extends the prior literature that studies auditors’ information processing behavior by focusing on a set of specific, yet broad processes that are fundamental to high quality judgments across a variety of complex decision tasks. While prior research has examined how to prompt auditors to better identify conflicting evidence and evaluate evidence in an unbiased manner (Griffith, Hammersley, Kadous, and Young 2015b) and to collect more evidence (Rasso 2015), the design of our experiment enables us to separately examine the breadth of information auditors attend to, the depth of their information processing, and their demand for additional relevant and irrelevant information before reaching a conclusion.¹ We

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¹ Our measures of cognitive processing differ from those investigated in Griffith et al. (2015b) and Rasso (2015). First, we separately examined the depth and the breadth of auditors’ processing, whereas Griffith et al. (2015b) did not differentiate between these two aspects. We achieved this by employing a design that differentiates between cues that require a shallow and a deep level of processing and between cues that are central and peripheral to the audit task. Second, to measure requests for additional relevant information, we asked auditors to list additional evidence they would request and had coders distinguish relevant from irrelevant items. On the other hand, Rasso (2015) measured the number of times auditors requested evidence (regardless of its relevance) and the time auditors spent on the task. While the measures in Rasso (2015) are mainly effort based, our measures also take into account whether auditors correctly identify the relevant missing evidence in their requests.
provide empirical evidence on how these fundamental information evaluation and information search behaviors affect audit judgments and audit quality. The results contribute to the emerging literatures on the importance of critical thinking to audit quality and to professional skepticism (e.g., Griffith et al. 2015b; Nolder and Kadous 2015).

2. Background and hypothesis development

Background

Auditors experience difficulty auditing fair values and other complex estimates. The difficulties arise, at least in part, because audit work is changing. Reporting standards require companies to disclose more forward-looking information, including complex estimates, in their financial statements (PCAOB 2014; Peecher et al. 2013). Auditing forward-looking information is challenging due to the unobservable nature of certain key assumptions that drive the estimates (PCAOB 2009; Christensen et al. 2012). This makes it difficult for audit firms and regulators to specify ex ante the scope and content of audit work. Determining how much evidence is sufficient, which evidence is appropriate, and which analyses auditors should perform requires significant judgment (Griffith et al. 2015a). We propose that making auditors’ intrinsic motivation for their work salient provides unique value in improving auditors’ cognitive processing in ways that promote high quality judgment, particularly in the context of performing complex tasks such as audits of complex estimates.

Hypothesis development

Intrinsic motivation is defined as the drive to engage in an activity primarily for the pleasure and satisfaction inherent in the activity itself (Ryan and Deci 2000). These internal rewards arise
from overcoming challenges, achieving competence, and satisfying curiosity, rather than from any external consequences for performing the task (Lepper and Henderlong 2000). For example, an intrinsically motivated auditor may seek out tough assignments at work because she enjoys building knowledge and meeting the challenges that the assignments provide.

Intrinsic motivation is often contrasted with *extrinsic motivation*, which is defined as the drive to perform an activity primarily for its external consequences (Ryan and Deci 2000). External rewards and penalties that arise from performing a task include monetary compensation or penalties, recognition, and evaluation. For example, an extrinsically motivated auditor may seek out tough assignments at work because she values the recognition from colleagues and the opportunities for promotion that she will get from completing the assignments. While prior accounting research has studied the effects of various extrinsic incentives on auditors’ decision making (Nelson and Tan 2005; Trotman 2014), we examine whether and how the salience of auditors’ intrinsic motivation influences their judgments and their underlying cognitive processing.

When an individual’s intrinsic motivation is salient, she focuses on intrinsic aspects (task enjoyment, learning, etc.) of an activity. The salience of intrinsic motivation is influenced by both contextual and individual (trait) factors. That is, stable individual differences in intrinsic motivational orientations exist, in that individuals who exhibit a high level of intrinsic motivational orientation tend to place more importance on intrinsic factors when carrying out a variety of tasks (Amabile, Hill, Hennessey, and Tighe 1994). However, individuals can also be temporarily oriented to a particular motivation type when contextual factors make it more salient (e.g., Amabile 1985). This temporarily induced motivation salience has been shown to influence decision behavior on subsequent tasks. For example, simply having one think about her intrinsic
motivation leads to better performance in a subsequent anagram task (Gillet, Vallerand, Lafrenière, and Bureau 2013) and higher psychological well-being after taking an exam (Burton, Lydon, D'Alessandro, and Koestner 2006).²

Prior research relevant to intrinsic motivation has mainly identified associations between either trait-level intrinsic motivational orientation or task instructions to focus on learning rather than performance and students’ performance in school-related activities, such as learning textbook material or solving puzzles. These studies tend to show that the effects of these predictors on task performance depend on characteristics of the task (Gagné and Deci 2005; Utman 1997). In particular, intrinsic motivation and related task instructions are positively associated with performance on tasks that require conceptual learning (e.g., writing an essay about the main points of an article or recalling words based on their meaning in a sentence) but is not typically associated with performance on tasks that rely on rote learning (e.g., recalling rote details of an article or recalling words based on their rhyme) (Benware and Deci 1984; Graham and Golan 1991; Grolnick and Ryan 1987).

While many studies have shown that intrinsic motivation and related instructions are positively associated with performance on certain types of tasks, there is limited evidence about whether the link is causal and even less about how intrinsic motivation improves task performance. That is, the bulk of the literature consists of correlational studies that relate self-reported task enjoyment or motivation to performance measures (Cerasoli et al. 2014). These studies largely do not examine process and are unable to capture cognitive processing variables. Only a few studies manipulate intrinsic motivation or its salience, and none of these examine

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² Similarly, implicitly activating the concept of an extrinsic incentive, such as money, without actually providing the incentive motivates individuals to work harder (Mogilner 2010) and show increased self-control (Boucher and Kofos 2012).
process measures. These studies are intriguing, but they provide no direct evidence of how intrinsic motivation impacts decision performance. Additionally, the learning tasks and behaviors studied in prior research (e.g., solving puzzles, writing an essay, recalling words, etc.) are much simpler than the tasks that auditors face, so the results of prior studies do not map directly to meaningful audit tasks.

Based on a synthesis of these prior studies, we propose that salient intrinsic motivation affects task performance through its impact on decision makers’ use of different cognitive processing behaviors. We develop our expectation by extending current theory about intrinsic motivation, as well as by comparing characteristics of tasks that are more or less sensitive to the influence of intrinsic motivation. We infer from these studies that intrinsic motivation is most beneficial to tasks that require attending to a broad set of information, processing information deeply, and reviewing sufficient relevant evidence before reaching a conclusion. We explain how we make these inferences below.

First, we expect that salient intrinsic motivation affects the range of information cues a decision maker attends to. Individuals driven mainly by their intrinsic motivation are engaged in the process of solving the task. That is, they are focused on improving their competence and satisfying their curiosity (Lepper and Henderlong 2000). Driven by curiosity and their internal need for competence, they tend to adopt an open mind towards new information and they persist

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3 Of 154 papers summarized in a recent meta-analysis on intrinsic motivation (Cerasoli et al. 2014), five manipulate intrinsic motivation. The rest are correlational studies, which provide little evidence on the direction of the causal relationship between intrinsic motivation and task performance. This is problematic, as people tend to enjoy doing the things they do well. We identified three additional experimental studies in our literature search, but none of these examine process, either. Another set of studies manipulates task instructions (i.e., they assign “learning goals” versus “performance goals”) rather than manipulating intrinsic motivation or its salience. Among these, those that come closest to examining decision process use either students’ self-reported learning strategies (Vansteenkiste, Simons, Lens, Sheldon, and Deci 2004) or performance in recalling words or details of learning materials as dependent measures (Grolnick and Ryan 1987; Graham and Golan 1991; Vansteenkiste, Simons, Lens, Soenens, and Matos 2005). These studies find that framing the goal of a task in intrinsic terms encourages self-reported “deep” learning strategies and improves performance on recall that requires a conceptual understanding of study materials.
autonomously in gathering information (Hennessey 2000; Cerasoli et al. 2014). Therefore, we expect that decision makers with salient intrinsic motivation will examine a wider range of potentially relevant cues in their quest to “figure it out” than will other decision makers.

Second, a number of studies support the idea that intrinsic motivation facilitates a critical and deep analysis of information. For example, asking children to focus on the interesting and challenging aspects of a task improves their subsequent cued recall when deep information processing is required (i.e., encoding is based on categorical or semantic cues), but not when only shallow processing is required (i.e., encoding is based on rhyming cues) (Graham and Golan 1991). In addition, framing the purpose of studying a nutritional article in intrinsic (i.e., physical fitness) versus extrinsic (i.e., physical attractiveness) terms improves early adolescents’ conceptual learning of the article, but not their rote learning (Vansteenkiste et al. 2005). These results imply that intrinsic motivation improves performance on certain tasks because it encourages effortful deep comprehension and integration of information. Thus, we expect that decision makers whose intrinsic motivation is salient will tend to process information more deeply.

Third, theory and prior research suggest that intrinsic motivation encourages individuals to collect sufficient evidence to support their conclusion (Condry and Chambers 1978). Although searching for more evidence may be effortful, to the extent that doing so will satisfy one’s intrinsic motivation to gain knowledge, achieve competence, and ultimately solve the problem, the benefits could outweigh the costs for individuals who are driven by these rewards. Thus, we expect that decision makers with salient intrinsic motivation will gather more information relevant to the task at hand.
To summarize, prior research on intrinsic motivation supports the idea that intrinsically motivated individuals are more engaged and invested in their tasks than are other individuals. Prior research also suggests that intrinsic motivation is positively associated with performance on relatively complex, but not rote, tasks in academic learning settings. These ideas allow us to hypothesize how salient intrinsic motivation affects auditors’ specific cognitive processing behaviors. In particular, we expect that salient intrinsic motivation encourages auditors’ use of a broad set of cues, deep integration of information, and consideration of adequate relevant evidence before reaching a conclusion. The following hypotheses formally state these predictions:

**HYPOTHESIS 1a.** Auditors whose intrinsic motivation is salient will attend to a wider set of information cues than will auditors whose intrinsic motivation is not salient.

**HYPOTHESIS 1b.** Auditors whose intrinsic motivation is salient will process information more deeply than will auditors whose intrinsic motivation is not salient.

**HYPOTHESIS 1c.** Auditors whose intrinsic motivation is salient will request more relevant audit evidence than will auditors whose intrinsic motivation is not salient.

Recall that previous research does not provide theory or evidence on the mechanisms by which intrinsic motivation operates. Thus, these hypotheses are novel. In addition, the success of our tests hinges upon two assumptions specific to the audit setting. First, our hypotheses require that auditors have sufficient intrinsic motivation for their jobs such that making it salient can change behavior. In other words, a prompt will be ineffective if there is nothing to prompt. If auditors’ intrinsic motivation is not always salient. If

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4 This is a reasonable concern because accounting students are primarily motivated by the perceived financial rewards of an accounting career rather than an interest in accounting (Madsen 2015).
auditors’ intrinsic motivation is already highly salient, prompting it would have little effect. Thus, our tests are joint tests of our theory and these two assumptions.

As we noted earlier, we believe that broader, deeper, and more integrative processing is critical to high quality judgments and actions in complex audit tasks, including audits of complex estimates. In particular, the problems that auditors experience in this area that result in overreliance on management’s assertions include failing to adequately evaluate management’s assumptions (in light of conflicting information), failing to critically examine available evidence, and failing to gather sufficient support before reaching conclusions (PCAOB 2008; Griffith et al. 2015a; PCAOB 2016). To the extent that auditors with salient intrinsic motivation attend to a broader set of cues, process evidence more deeply, and request more relevant audit evidence, they should be better able to identify problems or errors underlying a biased accounting estimate, particularly if these problems become clear only with deeper processing. This implies that auditors whose intrinsic motivation is salient will be more likely than other auditors to recognize that a biased complex estimate is unreasonable. This leads to our second hypothesis:

HYPOTHESIS 2. Auditors whose intrinsic motivation is salient will evaluate a biased estimate as less reasonable than will auditors whose intrinsic motivation is not salient.

Finally, we examine how salient intrinsic motivation affects the immediacy of auditors’ communication of problems with the estimate to their supervisors. Raising audit issues in a timely manner is critical to an effective and efficient audit. Issues indicating a problem with reported numbers necessitate further inquiry of the client, modification of audit programs in the immediate and related areas, and collection of additional evidence, in addition to possible negotiations with the client about the content of the financial report. If an auditor identifies an
issue and records it, but does not immediately raise it with a supervisor, the issue may go unnoticed for some time, delaying the process and limiting auditors’ options for effective resolution (Low and Tan 2011) or limiting auditors’ willingness to pursue the issue later (Kadous, Kennedy, and Peecher 2003).

Because auditors whose intrinsic motivation is salient are expected to engage in superior cognitive processing of relevant information (H1) and to be more likely to recognize the biased estimate as unreasonable (H2), we further expect they are more likely to recognize the urgency of the situation and call the issues to their supervisor’s attention immediately.

HYPOTHESIS 3. Auditors whose intrinsic motivation is salient are more likely to call a biased estimate to their supervisor’s attention immediately than are auditors whose intrinsic motivation is not salient.

3. Research Method

We tested our hypotheses in an experiment in which auditors evaluate a complex accounting estimate. We manipulated the salience of participants’ intrinsic motivation. We also separately manipulated the salience of participants’ extrinsic motivation to allow us to rule out a more general motivational effect than the hypothesized one. Our overall design is 1 x 3 (motivational orientation: control, intrinsic, and extrinsic). Participants were 95 experienced audit seniors.\(^5\)

We used audit seniors as our participants because prior research indicates that seniors are typically the primary preparers of major steps in the process of auditing complex estimates.

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\(^5\) We received 98 completed instruments. We excluded data from three participants who rated their effort at 0 on a Likert scale ranging from 0 (“I didn’t work hard at all on this task”) and 10 (“I worked extremely hard on this task”). These participants spent significantly less time on the task and answered more comprehension check questions incorrectly than other participants. However, inferences do not change if we retain these observations.
(Griffith et al. 2015a). The majority of the participants were recruited from two Big 4 firms, and their audit experience ranges from 31 to 84 months (average 40 months).

**Task**

Participating auditors were asked to perform an audit of a client’s step-one analysis of a goodwill impairment test. The client used a discounted cash flow model to estimate the fair value of its business unit. Four important assumptions (projections for future revenue, operating expenses, capital expenditures, and the estimated discount rate) underlie the client’s discounted cash flow model. Auditors were told that their firm’s specialist team had already evaluated the discount rate assumption and determined that the discount rate used in the model was appropriate. Their task was to evaluate the other three assumptions and form a preliminary conclusion about the overall reasonableness of the fair value.

The case comprised five sections. The first section included background information about the company and the goodwill impairment test that had been prepared by the client, including the step-one analysis and the discounted cash flow model supporting the analysis. The next four sections summarized the audit evidence related to each of the four key assumptions: revenue projections, operating expense projections, capital expenditures projections, and the discount rate. At the beginning of the discount rate section, participants were reminded that the specialist team had reviewed all the evidence in this section and concluded that the discount rate used in the model was appropriate.

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6 We estimated all of the models including firm as an indicator variable. Firm was not significant for any dependent variable, either alone or in interaction with other independent variables. Therefore, we exclude the firm factor from the models reported in this paper.

7 We adapted the case from Griffith et al. (2015b). We modified the original case by seeding additional issues and differentiating them by the level of cognitive processing needed to identify them. We also modified the extent of the task and rearranged the locations of the seeded issues in the case so that some appear in a case section that is clearly relevant to an assumption auditors are assigned, whereas others are presented in a section that does not require a specific assessment. See the description of the seeded cues in the text for more details.
Importantly, although the case materials did not ask auditors to assess the discount rate assumption separately since the specialist team had already evaluated it, auditing standards require them to review all the information in the discount rate section in order to form an overall conclusion about the fair value. Prior research indicates that key information relevant to complex estimates may appear in another part of the audit (Griffith et al. 2015b). Therefore, it is particularly important that auditors are able to incorporate information from multiple sources, including reports prepared by specialists, when auditing complex estimates. Auditors tend to over-rely on specialists in the audit of fair values and they fail to examine the work performed by specialists adequately (PCAOB 2009; Griffith 2016). Our instrument design allows us to investigate one possible cause of this over-reliance.

We seeded two types of cues indicating problems with the fair value throughout the case: surface cues and deep cues. These cues vary in the level of processing required to identify them. Surface cues can be identified based on test results that are used to directly evaluate management's assumptions. For example, the revenue sensitivity analysis showed that a 1 percent decrease in projected revenue growth could lead to a failure of step-one of the goodwill impairment test. On the other hand, deep cues require auditors to comprehend and integrate information at a deeper level. To identify deep cues, auditors need to connect the implications of multiple pieces of information and/or make an inference about what the evidence implies. For example, in order to recognize that the company’s projected revenue growth was overly aggressive given the cautious market outlook, auditors need to relate two pieces of information

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8 AU sec. 336, *Using the Work of a Specialist*, requires that “The auditor should (a) obtain an understanding of the methods and assumptions used by the specialist, (b) make appropriate tests of data provided to the specialist, taking into account the auditor's assessment of control risk, and (c) evaluate whether the specialist’s findings support the related assertions in the financial statements.” International Standards on Auditing (ISA) 620, *Using the Work of an Auditor's Expert*, has similar requirements (see ISA 620.12). When internal specialists are used, AS No. 10 requires auditors to treat internal specialist as they would other audit team members (i.e., they must review internal specialists’ work in the same way as they would another audit team members’ work).
(i.e., management’s projected revenue growth, which is discussed in the revenue assumption section of the case, and the market outlook, which is discussed in the discount rate assumption section of the case) and interpret them jointly.

Cues are further categorized as central or peripheral. Peripheral cues are either partially or entirely based on information presented in the discount rate section. They are considered peripheral because auditors were not asked to form a separate reasonableness evaluation for the discount rate assumption. Therefore, although relevant to the overall reasonableness assessment of the fair value, peripheral cues may not appear “central” to auditors’ assigned task of auditing the other specific assumptions. Central cues, on the other hand, are based on information in their related assumption sections only (revenue, operating expense, and capital expenditures projections). Appendix 1 lists the eight seeded cues and their classifications.

After reading the case, auditors assessed the overall reasonableness of the fair value, decided what action they would take next regarding the fair value, listed issues that they wanted to discuss with their managers, and listed additional evidence they would request from the client.⁹ Auditors then answered comprehension checks and demographic questions. Finally, auditors completed the Work Preference Inventory (WPI) that measures individual differences in intrinsic and extrinsic motivational orientations.

**Independent variable**

We manipulated the salience of intrinsic motivation via a brief intervention at the beginning of the experiment, before the case described above was presented. Following prior research (Amabile 1985), in the salient intrinsic motivation condition we asked auditors to review a list of

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⁹ Auditors who decided to conclude on the fair value without contacting their manager were asked to give reasons for their conclusion instead of listing issues and additional evidence requests.
intrinsically-oriented reasons that they like their job and rank them in the order of importance to them. We manipulated the salience of extrinsic motivation using the same procedure with a list of extrinsically-oriented reasons auditors might like their job. We adapted both lists of reasons from Amabile et al. (1994). Although the particular ranks that auditors assign to the reasons are not important, the act of reading, thinking about, and applying to themselves the intrinsic (or extrinsic) reasons that they like their job makes that particular motivation type salient and carries over to subsequent tasks (Amabile 1985). Auditors assigned to the control condition were asked to rank order a list of reasons why they dine out. This keeps task procedure and timing similar across the control and experimental conditions, but the content in the control condition is not related to motivational orientation and should not change auditors’ motivational orientation. See Appendix 2 for the lists provided in each condition.

**Dependent variables**

We measured six primary dependent variables: total number of valid cues identified, number of peripheral cues identified, number of deep cues identified, number of valid evidence requests, overall reasonableness of the fair value, and decision about what action auditors would take next. Auditors’ assessment of the overall reasonableness of the fair value was collected on an 11-point Likert scale, ranging from 0 (not at all likely to be reasonable) to 10 (extremely likely to be reasonable). We use this dependent variable to test Hypothesis 2. We seeded issues indicating

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10 We follow the prior literature, which manipulates the salience of intrinsic motivation by having participants rank order (Amabile 1985) or endorse (Burton et al. 2006; Gillet et al. 2013) a list of intrinsic motivators for conducting a task. We did not employ a manipulation check question in our study because we expect our intervention to influence participants without their awareness (Bargh and Chartrand 2000), which makes developing an effective manipulation check question challenging. We observe that the prior research that manipulates the salience of intrinsic motivation does not tend to employ manipulation check questions.
that management’s fair value estimate is biased upward, so lower values represent better judgment.

Auditors chose an action from four options: (1) conclude that the fair value is reasonable; (2) continue audit work under the assumption that the fair value is reasonable but delay making a final conclusion until talking to their manager about one or more issues the next time the manager is on site; (3) do not make a conclusion but call their manager immediately regarding issues that may indicate the fair value is not reasonable; or (4) conclude that the fair value is materially overstated. Audit seniors typically do not conclude on complex estimates (Griffith et al. 2015a), so we expected majority of the participants to choose between options (2) and (3) that are differentiated by how urgently auditors want to report discovered issues to their manager. 11 Immediate communication of an issue gives auditors more time to adapt audit procedures to address the issues and improve audit quality (Low and Tan 2011), and makes auditors less likely to become committed to inappropriate reporting choices (Kadous et al. 2003). Following prior research (Griffith et al. 2015b), for our main test of Hypothesis 3 we code this variable as contacting the manager immediately (option 3) or not (option 1 and 2). 12

Auditors’ listing of the issues that they wanted to discuss with their manager and their additional information requests were coded to test Hypothesis 1. A research assistant and one author, both with more than two years of Big 4 auditing experience, independently coded the types of issues identified while blind to experimental condition. They first coded the issues into one of four categories: surface issues, deep issues, other valid issues, and invalid issues. To be coded as a surface (deep) issue, the issue identified must be closely associated to one of the

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11 Of the 95 participants in our study, only 11 chose option (1) (four, three and four participants in control condition, intrinsic motivation condition and extrinsic motivation condition, respectively). No participants chose option (4).

12 An ordered logistic regression model that does not impose dichotomization on the data (i.e., all three options are retained in the model) leads to same inferences as reported in our main results.
seeded surface (deep) cues in Appendix 1. Other valid issues are issues that indicate problems with the fair value but are not associated with any of the seeded cues. For example, issues concerning the appropriateness of the peer firms used in the benchmarking analysis are coded here. Issues that do not indicate problems with the fair value are coded as invalid issues, as are errors.

Next, for issues coded as valid issues (i.e., surface issues, deep issues and other valid issues), the coders independently determined whether the issues were based on information at least partially presented in the discount rate section. Issues based on the discount rate section are coded as peripheral issues, whereas issues based on the other three assumption sections only are coded as central issues.

The coders’ initial agreement rate was 91.1 percent. Cohen’s Kappa, a measure of inter-rater agreement over and above that expected by chance, was 0.89 ($p < 0.001$). The coders met to reconcile coding differences, and the reconciled coding is used in the analysis. Recall that auditors were told that their firm’s specialist team had evaluated the appropriateness of the discount rate. Our theory predicts that auditors whose intrinsic motivation is salient will attend to a broader set of cues, including those in the discount rate section that they are not specifically assigned to review. We use two measures, the number of total valid issues identified and the number of peripheral issues identified, as our dependent measures to test Hypothesis 1a. Auditors who process cues deeply are likely to identify more deep issues than are other auditors. We use the number of deep issues identified as our dependent measure to test Hypothesis 1b.

Finally, auditors listed additional evidence they would request from the client. Two research assistants, both with over two years of Big 4 audit experience and blind to experimental condition, independently coded the requested evidence as either valid or invalid requests.
Information requests that are relevant to testing management’s assumptions and that are not already provided in the case are coded as valid requests. All other items are coded as invalid.\textsuperscript{13} Inter-rater agreement was 78.0 percent, and Cohen’s Kappa was 0.56 ($p < 0.001$). The two coders met to reconcile coding differences, and the reconciled coding is used to test Hypothesis 1c.

4. Results

Tests of hypotheses

Because our hypotheses concern whether and how salient intrinsic motivation improves auditors’ cognitive processing and skeptical judgments, our primary tests of hypotheses compare the intrinsic motivation condition with the control condition, in which no motivation has been made salient.\textsuperscript{14} We report results of additional contrasts (intrinsic vs. extrinsic motivation, extrinsic motivation vs. control) in our tables for purposes of differentiating hypothesized effects of salient intrinsic motivation from other motivational effects. We discuss the additional comparisons in the supplemental analyses.

Our first hypothesis predicts that auditors whose intrinsic motivation for their job is salient attend to a wider set of cues (Hypothesis 1a), process information at a deeper level (Hypothesis 1b), and request more relevant additional evidence before reaching a conclusion (Hypothesis 1c) than do other auditors. Table 1 provides descriptive statistics (Panel A) and contrast tests (Panel

\textsuperscript{13} An example of a valid request is “advertising agency contract” from the management to support the claim that the new contract will reduce advertising and marketing expense by 5.5 percent from FY14 to FY15. An example of an invalid request is “client sales projection” because the latter was provided in the case materials.

\textsuperscript{14} The extrinsic motivation condition does not meet ceteris paribus conditions in that it differs from the intrinsic motivation condition in both the salience of intrinsic motivation and the salience of extrinsic motivation. That said, inferences do not change if we use the average of the extrinsic motivation and the control conditions as the comparison group, except that the $p$-value for H3 increases from 0.053 to 0.165.
B) for the various categories of issues identified and evidence requested. The patterns of means in Panel A are consistent with our predictions.

[Insert Table 1 here]

Given the nature of the distributions of our dependent variables for this hypothesis, we used negative binomial regression models to test our contrasts. The contrasts in Panel B reveal that auditors in the intrinsic motivation condition identified more total valid cues \((p = 0.010)\) and peripheral issues \((p = 0.017)\), more deep cues \((p = 0.005)\), and they requested more relevant additional evidence \((p = 0.042)\), than did auditors in the control condition, supporting Hypotheses 1a, 1b, and 1c, respectively.

The fact that auditors with salient intrinsic motivation identified more peripheral issues suggests that those auditors were more likely to extend procedures to work performed by the specialist than were auditors whose intrinsic motivation was not salient. This is consistent with the idea that auditors’ over-reliance on specialists’ conclusions in auditing fair values (see Griffith 2016) could occur because auditors’ intrinsic motivation is not salient while they perform the task on the job. Overall, results support the predictions that auditors whose intrinsic motivation is salient tend to use a broader set of cues, process information at a deeper level, and request more relevant evidence before reaching a conclusion than auditors whose intrinsic motivation is not salient.

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15 The dependent measures for Hypothesis 1 are counted data. Ordinary linear regression is not appropriate for counted data because their restricted range causes biased parameter estimates and the natural correlation between counts and their variances causes biased test statistics (e.g., Gardner, Mulvey, and Shaw 1995). Instead, a general linear model with a link to a Poisson distribution is preferred, unless data are overdispersed (the variance is larger than the model assumes), in which case a negative binomial distribution is preferred (Gardner et al. 1995; Agresti 2012). The negative binomial distribution is similar to the Poisson distribution, except that it has a second parameter that permits the variance to exceed the mean. Because several of our dependent variables (i.e., deep issues, total valid issues, valid requests) show overdispersion based on a likelihood-ratio test of the dispersion parameter alpha equaling zero \((p < 0.100)\), we use a link to a negative binomial distribution to test our contrasts.
Our second hypothesis proposes that auditors whose intrinsic motivation is salient make better reasonableness assessments than do other auditors. The fair value is biased by the seeded issues, so lower reasonableness assessments are better in our study. Table 2 provides descriptive statistics (Panel A) and contrast tests of Hypothesis 2 (Panel B). Auditors’ assessed reasonableness of the fair value is lower in the intrinsic motivation condition than in the control condition ($p = 0.009$), supporting Hypothesis 2.

[Insert Table 2 here]

Hypothesis 3 investigates whether auditors in the intrinsic motivation condition are more likely to contact their manager immediately to discuss the issues they found in the fair value estimate than auditors in the control condition. Table 3 shows descriptive statistics by condition (Panel A) and contrasts from a logistic regression model (Panel B). Planned contrasts in Panel B show that auditors in the intrinsic motivation condition were marginally more likely to contact their manager immediately than those in the control condition ($p = 0.053$), providing partial support for Hypothesis 3. In summary, auditors whose intrinsic motivation is salient exhibit better information processing and higher quality audit judgments about a biased estimate than do auditors whose intrinsic motivation is not salient.

[Insert Table 3 here]

**Supplemental analyses**

In this section, we perform additional analyses to demonstrate that auditors whose intrinsic motivation is salient do not sacrifice efficiency to achieve better decision performance and to verify that the effects of salient intrinsic motivation on auditors’ assessments of the biased management estimate are attributable to the specific cognitive processing differences that we hypothesized. We also provide evidence on the effects of trait intrinsic motivational orientation
on auditors’ cognitive processing and audit judgments. Finally, we examine the effects of the salient extrinsic motivation on auditors’ performance.

*Efficiency of information processing*

Our results demonstrate that auditors in the intrinsic motivation condition are more effective than other auditors at identifying valid cues. Our theory predicts that this occurs because auditors with salient intrinsic motivation process information in a deep and integrative way. We investigate whether our results are instead driven by auditors’ tendency to report more issues regardless of their appropriateness in the intrinsic motivation condition. If this were the case, then auditors whose intrinsic motivation is salient would identify more valid cues, but they would also identify more invalid cues, potentially resulting in inefficient audits.

Results demonstrate that salient intrinsic motivation does not cause auditors to identify more “false positive” signals (see Table 1). Auditors in the intrinsic motivation condition identified 0.44 invalid issues and made 0.44 invalid information requests, on average. This performance is not significantly different from the 0.33 invalid issues ($p = 0.549$) and 0.67 invalid requests ($p = 0.219$) observed in the control condition. Auditors with salient intrinsic motivation appear to engage in better processing—they more effectively identify relevant cues without raising irrelevant cues.

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16 Auditors in the intrinsic motivation condition took the same amount of time to finish the task ($p = 0.620$) and reported the same effort level ($p = 0.852$) as auditors in the control condition. However, we note that our task is more constrained (both in time and possible decision inputs) than similar audit tasks in the natural environment. Theory predicts that auditors with salient intrinsic motivation may persist longer in tasks without these constraints, suggesting that auditors with salient intrinsic motivation may spend more time on engaging tasks. Nonetheless, it is interesting that we observed the predicted differences in cognitive processing and judgments in our experiment despite these constraints and despite a lack of differences in time spent or perceived effort. This indicates that salient intrinsic motivation need not result in inefficiencies in natural tasks.
Process analysis—the mediating roles of cue type

We next perform path analyses to test whether the hypothesized and observed differences in cognitive processing behaviors led auditors in the intrinsic motivation condition to evaluate the biased estimate as less reasonable than auditors in the control condition. Since we embedded several types of cues in the case, we first perform a factor analysis (not tabulated) of the five key cognitive processing measures: surface issues, deep issues, central issues, peripheral issues, and valid evidence requests. We find two factors with eigenvalues greater than 1.00; together they account for 79 percent of the variance. A varimax rotation yields clear loadings, with deep issues, peripheral issues, and valid evidence requests loading heavily on the first factor and surface and central issues loading on the second factor. Identification of deep issues and peripheral issues, as well as valid evidence requests, require a relatively high level of cognitive processing, so we refer to the first factor as “High Processing Cues” in the following analyses. Identifying surface and central issues does not require high levels of cognitive processing, so we refer to the second factor as “Low Processing Cues” in the following analyses. The factor analysis results provide additional support that our categorization of surface versus deep cues and central versus peripheral cues is reasonable.

We test whether the posited process is at work by fitting a structural equations model (see Figure 1) to the data. We model the independent variable as the intrinsic motivation condition versus the control condition. The goodness-of-fit statistics show that our model fits the data well ($\chi^2 = 2.262, p = 0.323$; Comparative Fit Index = 0.985; and Root Mean Squared Error of Approximation = 0.045). The path coefficients are significant and in the expected directions, though the relationship between intrinsic motivation and identification of Low Processing Cues does not reach significance ($p = 0.143$). The indirect effect of salient intrinsic motivation on

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17 Rotated loadings ranged from 0.68 to 0.94. Cross-loadings ranged from 0.06 to 0.30.
assessed reasonableness of the fair value through High Processing Cues is significant ($p < 0.05$), while the indirect effect through Low Processing Cues is not ($p > 0.05$).18, 19

[Insert Figure 1 here]

The structural equations model results support the conclusion that the difference in reasonableness assessments between the intrinsic motivation condition and the control condition is driven by improved identification of High Processing Cues (i.e., deep cues, peripheral cues, and requests for valid evidence) in the intrinsic motivation condition. This implies that intrinsic motivation is most beneficial when auditors work on complex audit tasks that require auditors to think about evidence deeply, integrate seemingly irrelevant peripheral information, and realize what additional information is still missing in order to reach a high quality conclusion.

Effects of individual differences in intrinsic motivational orientation

Our analyses thus far have focused on how our prompt that increases the salience of intrinsic motivation affects auditors’ cognitive processing and audit judgments. In this section, we investigate the effects of stable individual differences in intrinsic motivational orientation on these same dependent measures. To the extent that individuals who score higher on trait measures of intrinsic motivational orientation have salient intrinsic motivation when they complete the experimental task, we should observe similar results if we substitute an indicator of high trait intrinsic motivational orientation for our manipulation.

18 We used the bias-corrected bootstrapping method for the test of indirect effects (Preacher and Hayes 2008). The bootstrapping method is preferred over the Sobel test, because the Sobel test assumes the shape of the sampling distribution to be approximately normal, which is rarely the case when the sample size is small (Hayes and Scharkow 2013). The 95 percent bias-corrected confidence interval for High Processing Cues is (-.737, -.059), and the 95 percent bias-corrected confidence interval for Low Processing Cues is (.635, .044).

19 Traditional mediation analyses (not tabulated) confirm these results. High processing cues fully mediate the effect of salience of intrinsic motivation on auditors’ reasonableness assessments. Low processing cues do not mediate this relationship because their use is not affected by the independent variable.
We measured participants’ trait level differences in intrinsic and extrinsic motivational orientations using the Work Preference Inventory (WPI) (Amabile et al. 1994) in our post-experimental questionnaire. The WPI measures stable individual differences in the extent to which individuals are intrinsically and extrinsically motivated towards what they do. It contains 30 items, with 15 items assessing the level of intrinsic motivational orientation and 15 items assessing the level of extrinsic motivational orientation. Prior research shows that the intrinsic and extrinsic scales assessed in the WPI are largely independent (i.e., intrinsic and extrinsic motivational orientations are not polar opposites) (Amabile et al. 1994). In addition, because the WPI measures stable individual differences rather than situational motivation salience, we expected WPI scores to be unassociated with experimental condition. We first verify there is no significant difference in WPI scores across conditions (all \( p \)-values > 0.10).

We then re-perform our tests of hypotheses using an indicator variable for high trait intrinsic motivational orientation score as the independent variable. Consistent with our theory, we find that auditors who exhibit a high level of trait intrinsic motivational orientation identified more total valid cues (\( p = 0.021 \)), more deep cues (\( p = 0.011 \)), and requested a marginally higher amount of relevant additional evidence (\( p = 0.067 \)) than auditors who exhibit a low level of trait intrinsic motivational orientation. In addition, auditors with a high level of trait intrinsic motivational orientation provide marginally lower reasonableness assessments (\( p = 0.055 \)) and are more likely to contact the manager immediately (\( p = 0.023 \)) than auditors who are not highly

\[\text{20 We use top 25 percent and bottom 25 percent split for these analyses. Using a median split gives qualitatively similar, although weaker, results. Unless specified otherwise, all } p \text{-values reported for this analysis are one-tailed.}\]
intrinsically motivated. These results corroborate the main results and provide converging evidence that salient intrinsic motivation is the causal construct.21

Effects of the salience of extrinsic motivation

Our theory indicates that intrinsic motivation has unique value for improving judgments in complex judgment tasks. To demonstrate that unique value, in this section we examine whether and how auditors’ salient *extrinsic* motivation influences their decision performance in our task. Salient extrinsic motivation likely improves some auditor decision behaviors, but we do not expect it to improve the cognitive processes that we investigate. In particular, individuals focused on external rewards or penalties tend to approach a task in a “completion mode” (Butler 2000) and tend to take shortcuts to their desired extrinsic goal (Nolen 1996). Extrinsic incentives direct the individual’s attention to a narrow aspect of the task, causing them to attend to central cues and ignore less obviously relevant peripheral cues (Easterbrook 1959). This implies examination of a relatively narrow set of cues and shallow, versus deep, thinking. Therefore, we do not expect the extrinsic motivation intervention to improve auditors’ cognitive processing or their performance in the complex audit task we employed.

Consistent with expectations, auditors whose extrinsic motivation was salient did not identify more valid issues, deep issues, or peripheral issues than their counterparts in the control condition, nor did they make more valid evidence requests or evaluate the biased assumptions as less reasonable (see Tables 1 and 2). In all of these regards, the performance of auditors whose

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21 We also find that trait intrinsic motivational orientation and our intervention significantly interact \((p = 0.04)\) for auditors’ reasonableness assessments such that the prompt to increase salience of intrinsic motivation lowers reasonableness assessments more for auditors who are not chronically intrinsically oriented (i.e., those who score in the bottom 25 percentile of the trait scale) than for auditors who are chronically intrinsically oriented (i.e., those who score in the top 25 percentile of trait scale). The larger effect of situationally induced motivational orientation for individuals whose intrinsic motivation is not naturally salient is consistent with findings in the prior literature (Levesque and Pelletier 2003).
extrinsic motivation was salient was indistinguishable from that of auditors in the control condition. On the other hand, auditors whose extrinsic motivation was salient were equally as likely as auditors whose intrinsic motivation was salient to contact their manager immediately, although this latter result should be interpreted with caution as the contrast comparing the extrinsic motivation and control conditions does not reach significance, \( p = 0.114 \).

Further analysis reveals that auditors in the extrinsic motivation condition who chose to contact their manager immediately identified fewer valid issues (1.57 issues), on average, than did auditors in the intrinsic motivation condition making this choice (2.60 issues; two-tailed \( p = 0.072 \)). This difference is worrisome because an incomplete information set can influence supervisors’ judgments about the work performed, preliminary conclusions reached, and the additional audit work needed, resulting in biased audit conclusions (Rich, Solomon, and Trotman 1997). These results highlight the importance of engaging in an appropriate decision process to support audit judgments and actions. That is, a high willingness to report upwards is unlikely to compensate for a lack of valid evidence to report. They also demonstrate that salient intrinsic motivation provides unique benefits in improving auditors’ cognitive processing that may not be achievable using conventional extrinsic incentives. In summary, the pattern of the results for salient extrinsic motivation is very different from the predicted and observed effects of salient intrinsic motivation. This is consistent with the theory that intrinsic and extrinsic motivations are two different types of motivation with distinct advantages for particular tasks.

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\(^{22}\) Using a trait-based indicator of extrinsic motivational orientation, constructed from the extrinsic motivation questions from the WPI in the same way as the trait-based indicator of intrinsic motivational orientation discussed above, largely corroborates these results. We find that auditors who score high on trait extrinsic motivational orientation did not identify more total valid cues (\( p = 0.332 \)), deep cues (\( p = 0.741 \)), or additional evidence (\( p = 1.000 \)), and identified only (marginally) more surface cues (\( p = 0.060 \)) than auditors with low trait extrinsic motivation. In addition, auditors with high extrinsic motivational orientation did not make different reasonableness assessment (\( p = 0.106 \)) and were no more likely to contact the manager immediately (\( p = 0.674 \)) than those scoring low on trait extrinsic motivational orientation. The similar results across two operationalizations suggest that the effects of our intervention to increase the salience of extrinsic motivation are not driven by the specific manipulation we used, but rather by the underlying construct.
5. Discussion and Conclusions

Motivation is a key determinant of judgment quality (Libby and Luft 1993). While the prior auditing literature has primarily focused on extrinsic incentives, we demonstrate that increasing the salience of auditors’ intrinsic motivation can improve auditor judgments in complex audit tasks. We show that auditors whose intrinsic motivation for their job is salient, whether attributable to a stable trait or to an intervention, attend to a broader set of information, process cues at a deeper level, and request more relevant additional evidence than do other auditors. These more desirable cognitive processing behaviors specifically address documented shortcomings in auditor judgment, and they therefore allow intrinsically motivated auditors to make better judgments about a biased complex estimate than do other auditors.

The changing nature of audit work provides a unique opportunity to re-examine how to effectively motivate auditors. It is challenging for regulators and audit firms to specify ex ante the scope of audit work needed to properly audit a complex estimate and its underlying assumptions. Our theory and results indicate that making auditors’ intrinsic motivation for their job salient facilitates the critical analysis that is necessary for high performance on such tasks. It appears that intrinsic motivation provides unique value over that provided by the extrinsic incentives that audit firms and regulators employ. Thus, our study answers the call for research investigating effective means of motivating auditors to improve audit quality given the rapidly changing nature of financial statement auditing (Peecher et al. 2013).

Our study suggests solutions for improving auditor judgment for complex tasks including auditing estimates. Most directly, our research suggests that firms could use an intervention, such as ours, that makes intrinsic motivation salient to stimulate high quality cognitive
Alternatively, firms could hire and retain auditors with high intrinsic motivational orientation for their work, or they could selectively assign individuals with this trait to tasks that require higher quality cognitive processing. Other methods of making intrinsic motivation salient could also be effective. For example, research in management indicates that firms can encourage intrinsic motivation through autonomy-supportive work climates and visionary leadership (Gagné and Deci 2005). A firm culture and leadership style that articulates a compelling vision of the future, acknowledges individual employees’ perspectives, and emphasizes personal development is associated with high levels of employee intrinsic motivation (Piccolo and Colquitt 2006). In addition, a large body of research has identified factors, including particular reward structures and a controlling work environment, that could undermine or “crowd out” intrinsic motivation (Deci, Koestner, and Ryan 1999). Firms can leverage this literature to foster auditors’ intrinsic motivation.

We note that, like this study, several recent studies examine interventions that can influence auditors’ judgments about complex estimates. These interventions include changing the framing of auditors’ work (Maksymov, Nelson, and Kinney 2016), training auditors to think differently (Plumlee, Rixom, and Rosman 2014), and putting auditors in a mindset more conducive to critical analysis (Griffith et al. 2015b). We believe it is appropriate that researchers generate

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23 For example, firms could occasionally poll auditors about what factors they like most about their jobs. Our study shows that by controlling the set of items included on the list, firms could manipulate the salience of intrinsic motivation. Such polls could be strategically placed immediately before complex tasks, or they could be used on a periodic basis. In order to be successful in practice, the effect of the intervention would have to persist for a reasonable amount of time and remain effective with repetition. We did not test these issues; however, there is evidence outside of our study that motivational primes have long-lasting effects on behavior (Vansteenkiste et al. 2004) and that a teacher’s repetition of focus on intrinsic motivation for a period of months continues to impact students’ motivation and performance (Black and Deci 2000; Aunola, Leskinen, and Nurmi 2006). Other research has demonstrated that primes similar to our intervention appear to be more effective when used repeatedly and over longer periods (e.g., Higgins, Bargh, and Lombardi 1985; Emmons and McCullough 2003). Such primes can set into motion an “upward spiral” of performance (Brooks 2014). In our case, because high performers are more likely to engage in and enjoy future similar tasks, intrinsic motivation prompts that increase performance may make individuals more receptive to future intrinsic motivation prompts (Garland, Gaylord, and Fredrickson 2011). Future research could examine these issues.
multiple possible solutions—auditors need a toolkit to address the critical decision problems they face in this context. Intrinsic motivation is an important addition to this toolkit—it increases the breadth and depth of processing, as well as auditors’ ability to identify additional relevant evidence, and thus should have broad applicability to improving auditor decision making in various complex tasks. In this regard, our study adds to the growing literature emphasizing that how auditors process evidence is critical to audit quality.

Our work can be viewed as contributing to the literature on professional skepticism. In auditing complex estimates, auditors consistently experience shortcomings in information processing that (1) can be characterized as a lack of critical assessment of available evidence and (2) result in overreliance on management assertions (Griffith et al. 2015a; PCAOB 2016). This situation has led regulators to assert that auditors often fail to apply an appropriate level of professional skepticism in these key audit judgments (PCAOB 2012; Hurtt, Brown-Liburd, Earley, and Krishnamoorthy 2013). Our view is that auditors may not make sufficiently skeptical judgments because they have not obtained or sufficiently evaluated the evidence needed to support skeptical judgments. We demonstrate a case in which improving cognitive processing allows auditors to make more appropriately skeptical judgments about a complex estimate. In so doing, our research suggests that professional skepticism is not just reflected in auditors’ judgments and actions (e.g., Nelson 2009), but is also reflected in the quality of auditors’ cognitive processing (see also Griffith et al. 2015b; Nolder and Kadous 2015). This view is consistent with auditing standards’ focus on skepticism as a critical assessment of the evidence (AS 1015 and ISA 200) and also with auditors’ assertion that faulty cognitive processing impedes the exercise of professional skepticism, especially for complex tasks such as auditing estimates (Ranzilla, Chevalier, Hermann, Glover, and Prawitt 2011).
Finally, our research complements findings in other studies that investigate how auditors use specialists in audits of fair value and how the use of specialists affects audit quality (e.g., Griffith 2015, 2016; Joe, Vandervelde, and Wu 2015). In particular, this study addresses regulators’ and academics’ concern that auditors over-rely on specialists’ work in auditing fair values. Our study suggests that this may occur, at least in part, because auditors view the evidence in specialists’ work as “peripheral” to their main task, and they do not give it adequate scrutiny. The results of the current study also indicate that making auditors’ intrinsic motivations for their job salient is an effective means of mitigating the over-reliance issue.
# Appendix 1

Description of seeded cues

<table>
<thead>
<tr>
<th>No.</th>
<th>Type</th>
<th>Assumption</th>
<th>Description of the cue</th>
<th>Location of the cue</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Surface</td>
<td>Revenue projections</td>
<td>Benchmarking analysis for revenue shows that the company’s projected revenue growth rate is higher than peer firms’.</td>
<td>Revenue</td>
</tr>
<tr>
<td>2</td>
<td>Surface</td>
<td>Revenue projections</td>
<td>Revenue sensitivity analysis shows a 1% decrease in the company's revenue projection will result in a step-one test failure.</td>
<td>Revenue</td>
</tr>
<tr>
<td>3</td>
<td>Deep</td>
<td>Revenue projections</td>
<td>Projected revenue growth is not consistent with overall market/industry outlook.</td>
<td>Revenue and Discount rate</td>
</tr>
<tr>
<td>4</td>
<td>Deep</td>
<td>Revenue projections</td>
<td>The company consistently over-projected growth in the past, which casts doubt on the accuracy of the current projections.</td>
<td>Revenue</td>
</tr>
<tr>
<td>5</td>
<td>Deep</td>
<td>Revenue projections</td>
<td>The projected revenue growth of product C is not guaranteed due to a new competing product/prior product delays/lack of prior product history.</td>
<td>Discount rate</td>
</tr>
<tr>
<td>6</td>
<td>Deep</td>
<td>Operating expense projections</td>
<td>The company plans to increase sales staff by 10% in the next three years, resulting in a significant increase in employment expense. This is not factored into company's operating expense assumption.</td>
<td>Discount rate and Operating expense</td>
</tr>
<tr>
<td>7</td>
<td>Deep</td>
<td>Capital expenditures projections</td>
<td>The company is building a new $14M office building. This is not included in the capital expenditures budget.</td>
<td>Discount rate and Capital expenditures</td>
</tr>
<tr>
<td>8</td>
<td>Deep</td>
<td>Capital expenditures projections</td>
<td>The company’s expected capital expenditure growth is slower than industry analysts’ projection.</td>
<td>Capital expenditures and Background</td>
</tr>
</tbody>
</table>

**Notes:**

This appendix summarizes the eight seeded cues, the type of each cue, the assumption that it implicated, and where the seeded cue was located in experimental materials. Surface cues are cues that can be identified based on test results that are used to directly evaluate management's assumptions. Deep cues require auditors to connect two pieces of information together and/or make inference about what the evidence implies. Cues that are located at least partially in the discount rate section are peripheral cues, while those located wholly in the other sections are central cues.
## Appendix 2
Motivational orientation manipulations

<table>
<thead>
<tr>
<th>Condition</th>
<th>Reasons</th>
</tr>
</thead>
</table>
| **Intrinsic** | 1. I enjoy learning about a client’s business.  
2. I feel good when I solve complex audit tasks.  
3. My job provides me with opportunities for increasing my analytical skills.  
4. Curiosity is the driving force behind much of what I do.  
5. I want to find out how good I really can be at my work.  
6. I enjoy the challenges that my job provides me on a daily basis.  
7. No matter what the outcome of a project, I am satisfied if I feel I gained a new experience. |
| **Extrinsic** | 1. I’m motivated by the monetary rewards my job provides me.  
2. I’m motivated by the promotion goals I have for myself.  
3. My friends and family have encouraged me to go into auditing.  
4. I’m motivated by the recognition I can earn from other people.  
5. I prefer working on audit tasks with clearly-specified procedures.  
6. I’m motivated by future career opportunities outside audit firms.  
7. I want my audit team members to be impressed with my work. |
| **Control** | 1. I like restaurants that provide a variety of food options.  
2. I want to try restaurants that have good reviews or are highly recommended by my friends.  
3. I prefer restaurants that are family-friendly.  
4. I enjoy restaurants that have excellent service.  
5. I like restaurants that offer healthy and nutritious food.  
6. I like restaurants that provide reasonably-priced dishes.  
7. I enjoy restaurants with good ambience. |

**Notes:**
This appendix lists the motivations that participants were asked to rank in the three experimental conditions. Each participant received only the list relevant to his or her assigned experimental condition. Items for the intrinsic and the extrinsic motivation conditions relate to auditors’ job performance and are based on items used in Work Preference Inventory (WPI) (Amabile et al. 1994). The reasons listed in the intrinsic (extrinsic) motivation condition are developed from WPI items that are found strongly associated with people’s intrinsic (extrinsic) motivation based on data collected from approximately 2,500 participants over an 8-year period. Items in the control condition relate to reasons for choosing a restaurant.
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———. 2012. Staff audit practice alert no. 10, maintaining and applying professional skepticism in audits.


———. 2016. Staff inspection brief, preview of observations from 2015 inspections of audit of issuers.


Figure 1  Mediating roles of cognitive processing on reasonableness assessments

Notes:
The figure summarizes the structural equations model that demonstrates how cognitive processing mediates between motivation condition and assessed reasonableness of the fair value. The model fits the data well ($\chi^2 = 2.262, p = 0.323$; Comparative Fit Index = 0.985; and Root Mean Squared Error of Approximation = 0.045). All $p$-values are two-tailed.

Intrinsic Motivation is coded as 1 for auditors in the intrinsic motivation condition and 0 for auditors in the control condition. High Processing Cues and Low Processing Cues are latent variables based on factor analysis of several cue types. High Processing Cues relates to identification of deep issues, peripheral issues, and valid evidence requests. Low Processing Cues relates to identification of surface issues and central issues. Assessed Reasonableness of Fair Value corresponds to auditors’ assessments of the reasonableness of the fair value.
TABLE 1
Issues identified and evidence requests

Panel A: Descriptive statistics for issues identified: Mean (Standard Deviation)

<table>
<thead>
<tr>
<th>Condition</th>
<th>n</th>
<th>Surface issues</th>
<th>Deep issues</th>
<th>Other valid issues</th>
<th>Total valid issues</th>
<th>Invalid issues</th>
<th>Central issues</th>
<th>Peripheral issues</th>
<th>Valid requests</th>
<th>Invalid requests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>33</td>
<td>0.27 (0.57)</td>
<td>0.36 (0.65)</td>
<td>0.55 (0.67)</td>
<td>1.18 (1.13)</td>
<td>0.33 (0.69)</td>
<td>0.82 (0.92)</td>
<td>0.36 (0.70)</td>
<td>0.30 (0.59)</td>
<td>0.67 (0.78)</td>
</tr>
<tr>
<td>Intrinsic</td>
<td>32</td>
<td>0.53 (0.62)</td>
<td>0.97 (1.28)</td>
<td>0.50 (0.67)</td>
<td>2.00 (1.78)</td>
<td>0.44 (0.80)</td>
<td>1.19 (1.06)</td>
<td>0.81 (0.97)</td>
<td>0.75 (1.70)</td>
<td>0.44 (0.62)</td>
</tr>
<tr>
<td>Extrinsic</td>
<td>30</td>
<td>0.20 (0.41)</td>
<td>0.40 (0.62)</td>
<td>0.57 (0.57)</td>
<td>1.17 (1.05)</td>
<td>0.60 (0.81)</td>
<td>0.87 (0.73)</td>
<td>0.30 (0.60)</td>
<td>0.40 (0.67)</td>
<td>0.70 (0.84)</td>
</tr>
</tbody>
</table>

Panel B: Contrasts based on negative binomial regression model for issues identified: Z (p-value)

<table>
<thead>
<tr>
<th></th>
<th>Surface issues</th>
<th>Deep issues (H1b)</th>
<th>Other valid issues</th>
<th>Total valid issues (H1a)</th>
<th>Invalid issues</th>
<th>Central issues</th>
<th>Peripheral issues (H1a)</th>
<th>Valid requests (H1c)</th>
<th>Invalid requests</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1: Intrinsic &gt; Control*</td>
<td>1.62 (0.105)</td>
<td>2.55 (0.005)</td>
<td>0.24 (0.810)</td>
<td>2.33 (0.010)</td>
<td>0.60 (0.549)</td>
<td>1.48 (0.139)</td>
<td>2.13 (0.017)</td>
<td>1.73 (0.042)</td>
<td>1.23 (0.219)</td>
</tr>
<tr>
<td>Intrinsic vs. Extrinsic</td>
<td>2.06 (0.039)</td>
<td>2.28 (0.023)</td>
<td>0.36 (0.719)</td>
<td>2.31 (0.021)</td>
<td>0.76 (0.447)</td>
<td>1.24 (0.215)</td>
<td>2.41 (0.016)</td>
<td>1.22 (0.222)</td>
<td>1.36 (0.174)</td>
</tr>
<tr>
<td>Extrinsic vs. Control</td>
<td>0.59 (0.555)</td>
<td>0.22 (0.826)</td>
<td>0.10 (0.920)</td>
<td>0.00 (1.000)</td>
<td>1.35 (0.177)</td>
<td>0.20 (0.841)</td>
<td>0.41 (0.682)</td>
<td>0.49 (0.624)</td>
<td>0.17 (0.865)</td>
</tr>
</tbody>
</table>

* We use a p-value from a one-tailed test for directional predictions (indicated row and bold columns only). All other p-values are two-sided.
Notes:
This table reports descriptive statistics and contrast tests for various types of issues identified and for evidence requests. Main dependent measures for our hypothesis tests are presented in bold print. Two coders who were blind to condition first classified issues as (1) seeded surface cues, (2) seeded deep cues, (3) other valid issues that indicate problems with the fair value but are not associated with the seeded cues, or (4) invalid issues that do not indicate problems with the fair value. Total valid issues represents the sum of classification #1 - #3 above. The two coders further classified all valid issues as (1) central issues that are based on information presented in the related assumption section only (revenue projections, operating expense projections, capital expenditures projections) or (2) peripheral issues that are based, at least in part, on information presented in the discount rate section.

Two coders who were blind to condition coded evidence requests as (1) valid requests if the requested evidence is relevant to testing management’s assumption and is not already provided in the case or (2) invalid requests, otherwise.

Condition was manipulated as intrinsic motivation salient (a rank order task that increases the salience of intrinsic motives), extrinsic motivation salient (a rank order task that increases the salience of extrinsic motives), and control (a rank order task that is not expected to change the salience of either intrinsic or extrinsic motivation).
TABLE 2
Reasonableness of the fair value estimate

**Panel A:** Descriptive statistics: Mean (Standard Deviation)

<table>
<thead>
<tr>
<th>Condition</th>
<th>n</th>
<th>Reasonableness of the fair value estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>33</td>
<td>6.12 (1.98)</td>
</tr>
<tr>
<td>Intrinsic</td>
<td>32</td>
<td>4.97 (1.94)</td>
</tr>
<tr>
<td>Extrinsic</td>
<td>30</td>
<td>5.57 (1.79)</td>
</tr>
</tbody>
</table>

**Panel B:** Contrasts based on ANOVA

<table>
<thead>
<tr>
<th></th>
<th>df</th>
<th>t</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>H2: Intrinsic &lt; Control*</td>
<td>92</td>
<td>2.43</td>
<td>0.009</td>
</tr>
<tr>
<td>Intrinsic vs. Extrinsic</td>
<td>92</td>
<td>1.23</td>
<td>0.222</td>
</tr>
<tr>
<td>Extrinsic vs. Control</td>
<td>92</td>
<td>1.15</td>
<td>0.253</td>
</tr>
</tbody>
</table>

* We use a p-value from a one-tailed test for this directional prediction. All non-indicated p-values are two-sided.

**Notes:**
The dependent variable measures auditors’ responses to “…how likely is it that the fair value of [Company’s] U.S. reporting unit is reasonable?” on a scale of 0 (not at all likely) to 10 (extremely likely). The fair value estimate contained seeded errors; therefore, smaller numbers represent better audit judgment quality.

The condition manipulation is described in the notes to Table 1.
TABLE 3
Decision to contact manager immediately

Panel A: Decision by condition

<table>
<thead>
<tr>
<th>Condition</th>
<th>N</th>
<th>Decision to contact manager immediately</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>33</td>
<td>9/33 (27.27%)</td>
</tr>
<tr>
<td>Intrinsic</td>
<td>32</td>
<td>15/32 (46.88%)</td>
</tr>
<tr>
<td>Extrinsic</td>
<td>30</td>
<td>14/30 (46.67%)</td>
</tr>
</tbody>
</table>

Panel B: Contrasts based on logistic regression model

<table>
<thead>
<tr>
<th></th>
<th>Z</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>H3: Intrinsic &gt; Control*</td>
<td>1.62</td>
<td>0.053</td>
</tr>
<tr>
<td>Intrinsic vs. Extrinsic</td>
<td>0.00</td>
<td>1.000</td>
</tr>
<tr>
<td>Extrinsic vs. Control</td>
<td>1.58</td>
<td>0.114</td>
</tr>
</tbody>
</table>

* We use a p-value from a one-tailed test for this directional prediction. All non-indicated p-values are two-sided.

Notes:
The dependent variable is auditors’ decision whether to contact their manager immediately. The fair value estimate contained seeded errors; therefore, contacting the manager immediately represents better audit decision quality.

The condition manipulation is described in the notes to Table 1.