DO HIGHER-RANKING AUDITORS BEHAVE MORE SKEPTICALLY?
THE ROLE OF FIRM CULTURE IN FOSTERING PROFESSIONAL SKEPTICISM

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The intention is to restructure the paper over the next few months and
your comments will be very valuable.

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ABSTRACT

Auditors are required to apply professional skepticism throughout the audit process: when searching for information, when forming a judgment, and when deciding on which actions to take. Consequently, audit firms have a vested interest in fostering professional skepticism. Extant conceptual models propose that knowledge is a central driver of professional skepticism, yet a common measure of knowledge - experience - has proven to be an unreliable proxy: it does not take into account that auditors have to learn from experience to develop knowledge. Insights from psychology and management studies emphasize that this learning does not occur automatically, but that it can be fostered at the firm level through a supportive learning culture. Based on these streams of research, the present study explores two main questions. First, do auditors of higher ranks engage in more or less skeptical information search, and do they formulate more or less skeptical judgments? Second, does a firm's learning culture interact with rank to foster professional skepticism? We observed information search behaviors and recorded judgments of 166 auditors across ranks using a representative audit task. Our results show that higher-ranking auditors do not consistently engage in more skeptical information search or judgment, but those who worked in a supportive learning culture consistently engaged in more skeptical information search and formed more skeptical intentions to act. A supportive learning culture is therefore essential for enabling the ongoing development of knowledge, and exercising professional skepticism.

Keywords: professional skepticism, information search, judgment, rank, learning culture

JEL descriptors: M42 – Auditing, D83 – Learning

 1. **Introduction**

Auditors are required to support their judgments with sufficient relevant and reliable evidence. Yet, oversight bodies such as the Financial Reporting Council (FRC) and the Public Company Accounting Oversight Board (PCAOB) have repeatedly observed that auditors' judgments are not consistently supported by suitable evidence (FRC 2015; PCAOB 2016). To ensure that judgments are well supported, the FRC (2016), the PCAOB (2016), as well as audit researchers (Nelson 2009; Hurtt et al. 2013; Nolder and Kadous 2018) emphasize the need for auditors to display professional skepticism. From a regulation perspective, professional skepticism is described as "an attitude that includes a questioning mind and a critical assessment of audit evidence. The auditor uses the knowledge, skill, and ability called for by the profession of public accounting to diligently perform, in good faith, and with integrity, the gathering and objective evaluation of evidence." (SAS No. 1, AU 230.07-09). From an academic perspective, a variety of definitions exist for the concept itself (most recently reviewed by Nolder and Kadous 2018), yet conceptual models agree that professional skepticism is expressed in the way auditors collect and process information, in how they formulate judgments, and in how they act (Nelson 2009; Hurtt et al. 2013; Nolder and Kadous 2018). A central question for audit firms then becomes how to foster professional skepticism so that judgments are well-supported and appropriate given relevant and reliable evidence.

Conceptual models of professional skepticism specify a range of antecedents at different levels (Nelson 2009; Hurtt et al. 2013; Nolder and Kadous 2018). A foundational antecedent in all three conceptual models is auditor knowledge. Both Nelson (2009) and Hurtt et al. (2013) emphasize that auditors can only exercise professional skepticism if they have appropriate knowledge of which evidence characteristics indicate audit risk, errors, or even fraud. What makes knowledge such a critical antecedent is that it is necessary for other antecedents to be effective: an auditor who is incentivized to behave skeptically will not be effective in applying professional skepticism if he or she lacks the knowledge how to be skeptical. Extant findings on the knowledge - skepticism relationship, however, reveal two important insights. First, the relationship is not straightforward, and second, knowledge does not develop automatically from experience. Most audit papers use rank or experience as proxies for knowledge (e.g. Agoglia, Beaudoin,

and Tsakumis 2009; Quadackers, Groot, and Wright 2014). Results of these studies, however, are inconclusive. Some studies show that more experience is associated with forming more skeptical judgments (Agoglia, Beaudoin, and Tsakumis 2009; Quadackers, Groot, and Wright 2014), yet other studies show the opposite (Payne and Ramsay 2005; Phillips 1999; Shaub and Lawrence 1996). These inconsistent findings reveal that rank and experience may not fully capture an auditors' knowledge. Studies in auditing (e.g. Bonner, Libby, and Nelson 1997; Libby and Luft 1993; Bédard 1991), but specifically in the wider judgment and psychology research (e.g. Madsen and Desai 2010; Metcalfe 2017; Kahneman and Klein 2009) have consistently shown that specific conditions need to be present to enable learning from experience to develop new knowledge. This means that to foster professional skepticism, the development of individual knowledge needs to be facilitated.

The professional skepticism literature addresses knowledge development as training, finding it is effective at preparing auditors for structured, if complex, tasks that can easily be anticipated (Bonner, Libby, and Nelson 1996; Bonner and Walker 1994; Plumlee, Rixom, and Rosman 2015). However, within the domain of auditing, tasks vary in their predictability and task characteristics are subject to constant change (Westermann, Bedard, and Earley 2015; Shanteau 1992; Einhorn 2012). Under these conditions, training is not the most effective manner of fostering the development of new knowledge - rather, auditors need to develop knowledge ad hoc during practice (Noe, Clarke, and Klein 2014; Westermann, Bedard, and Earley 2015). Studies focusing on this kind of adaptive knowledge development in auditors are still scarce, but in the few studies that exist, participants report to learn more from daily practice than from formal training (Hicks et al. 2007; Westermann, Bedard, and Earley 2015; Bishop 2017). Research on management and work psychology has revealed one essential condition for enabling this ongoing learning at the workplace: a supportive learning culture. Such a culture means that "an organization [is] skilled at creating, acquiring, and transferring knowledge and at modifying behavior to reflect new knowledge and insights" (Garvin 1993, 80). It implies that individuals can admit to mistakes or to not knowing, that they can challenge judgments and ask 'why', that they reflect on their experiences and that they can gain insights from others to improve their performance continuously over time (Noe, Tews, and McConnell Dachner 2010; Flores et

al. 2012; Eldor and Harpaz 2016; Edmondson 2004; Cerasoli et al. 2018). A supportive learning culture is influenced top-down through firm policy, tone at the top, and especially through role-modelling, which makes it a mechanism through which firms can foster desirable behaviors, such as knowledge development for professional skepticism (Cha and Edmondson 2006; Vera and Crossan 2016; Chadwick and Raver 2015). Within auditing, research has focused on different kinds of culture, e.g. professionalism within firms (e.g. Jenkins et al. 2008), tone at the top (e.g. Perreault, Wainberg, and Luippold 2012), incentive structures (e.g. Coram and Robinson 2017), partner values (e.g. Carpenter and Reimers 2013), or national culture (e.g. Nolder and Riley 2014), but little evidence exists on the influence of firm culture on professional skepticism (as mentioned in the framework by Glover and Prawitt 2014).Yet, the concept of learning culture itself has not been explored in the audit context.

In this paper, we build on insights from audit and management and work psychology studies to explore two central questions. First, we explore the relationship between rank and professional skepticism, focusing on auditors' information search behaviors and their formulation of judgments and intentions to act. We capture these behaviors across a range of measures using a representative audit task (Nolder and Kadous 2018; Bedard and Mock 1990; Quadackers, Groot, and Wright 2014). This approach allows connecting skeptical information search to judgments and intentions to act, which have thus far been studied separately in extant skepticism research (Nolder and Kadous 2018). Second, we explore whether a supportive learning culture can enhance professional skepticism. We assume, based on the learning culture literature, that auditors who work in a supportive learning culture are able to develop more professional knowledge, which in turn fosters professional skepticism (Nelson 2000; Hurtt et al. 2013; Nolder and Kadous 2018). Based on this assumption, we hypothesize that auditors engage in a more skeptical information search and form more skeptical judgments when they have worked for some time in a supportive learning culture. Relating professional skepticism to the concept of firm learning culture has several advantages. It extends the notion of knowledge development beyond training, considering the unpredictable and changing task environment of auditing. Culture can be actively managed at the firm and the team level, adding a valuable tool for firms to foster professional skepticism, along with other knowledge-driven performance. By looking at the

interaction between rank and firm learning culture, we explore a potential explanation for the mixed findings on the rank - skepticism relationship to date.

In this study, 166 auditors across the associate - partner spectrum completed two instruments. First, participants worked on an accounts receivables task in which they interact with a virtual information board, allowing us to observe a range of information search behaviors in line with Nolder and Kadous (2018). In contrast to studies that rely on self-reported information, our approach directly observes participants' interactions with the information items provided, recorded and measured by an existing computer program. This methods lowers self-serving bias in data collection and allow to discover complex patterns at the individual and group level (Willemsen and Johnson 2010; Payne 1976). After searching for information, participants formulated a judgment, indicated their confidence, and their intentions to act. Second, participants completed a validated scale measuring their actual perceived learning culture (Marsick and Watkins 2003). By focusing on auditors' perceptions rather than manipulating learning culture, we consider that culture is deeply embedded in the work environment and will affect auditors over time through ongoing socialization and signaling (Chadwick and Raver 2015; Flores et al. 2012; Wolfe Morrison 2012). Prior studies have shown that perceptions, rather than a normative notion of culture affect behavior, meaning that there is a large variance in how culture is perceived even by members of the same firms and the same units (Eldor and Harpaz 2016; Gold, Gronewold, and Salterio 2014; Carpenter, Dirsmith, and Gupta 1994; Salancik and Pfeffer 1978). We observe differences in skeptical information search, judgment and intention to act across auditors' actual rank and across their perceived learning culture. Our results reveal that, in line with earlier findings on rank, a higher rank does not guarantee more skeptical information search, judgments, or intentions to act; we found a large variance between and within ranks. Associates engaged in the most extensive and most targeted information search, and they formulated the most accurate judgments. Managers and partners, surprisingly, engaged in less targeted search and did not outperform their senior colleagues in terms of accuracy or intention to act. Once we included the interaction between rank and learning culture, significant differences emerged. Auditors of manager rank and above engaged in consistently more skeptical information search behaviors when they worked in a supportive learning

culture, leading to even more skeptical intentions to act. Their peers working in a less supportive learning culture engaged in consistently less diagnostic and targeted information search, and formulated significantly less skeptical intentions to act. A low learning culture was associated with more attention on client documentation over financial information, in attention focus, and in accuracy. This shows that not the amount of experience, but the ability to learn from one's experience, drives professional skepticism, in line with the theoretical models of Nelson (2009), Hurtt et al. (2013) and Nolder and Kadous (2018). The observation that firm culture mostly affected auditors of manager rank and above supports the notion that culture is deeply embedded in the work environment and takes effect over time (Chadwick and Raver 2015; Wolfe Morrison 2012). This makes culture less attractive as a 'quick fix', but supports the need for creating a supportive firm learning culture for sustained audit quality.

The remainder of this study is organized as follows. After developing our hypotheses on professional skepticism, rank, and learning culture, we describe our chosen method and development of measures, along with our analysis strategy. We then report and discuss our findings by hypothesis in the context of extant literature, limitations, and implications for practice and future research.

2. Background and Development of Hypotheses

Professional skepticism as information search, judgment, and intention to act

There are nearly as many conceptualizations of professional skepticism as there are studies on the topic. Some studies view professional skepticism as a stable trait (e.g. Hurtt 2010; Popova 2013), others view the concept as an attitude that develops over time (e.g. Nolder and Kadous 2018), yet other studies do not specifically define the concept itself (e.g. Nelson 2009; Quadackers, Groot, and Wright 2014). Despite these different views, the three main conceptual models of professional skepticism agree on one thing: professional skepticism becomes visible in how auditors search for and process information, by the judgments and actions they take (Nelson 2009; Hurtt et al. 2013; Nolder and Kadous 2018). The first model

by Nelson (2009) proposes that evidential input is processed, leading to a judgment and, under certain conditions, to an action, whose outcomes can be observed, before the cycle begins again. Hurtt et al. (2013) emphasize that judgments also have observable outcomes what serve as an input for skeptical action. Finally, Nolder and Kadous (2018) place more emphasis on not only the characteristics of the information the auditor collects, but especially on how auditors process this information to form a skeptical judgment. Their model also specifies a difference between having the intention to act and actually following up on this intention. Based on this synthesis of existing models, in this study we approach professional skepticism in terms of auditors' information search, judgment, and intention to act.

The first moment at which professional skepticism is exercised is during information search, when auditors collect information on which to base their judgment (Nolder and Kadous 2018). Information search is the first step in the decision-making process; it influences how information is processed and on which basis a judgment is formed (Einhorn and Hogarth 1981; Wheeler and Arunachalam 2008; Kaplan and Reckers 1989). In their review, Nolder and Kadous (2018) specify four behaviors of searching for and processing information: understanding issues, gathering facts, considering alternatives and performing analysis. These four categories follow the cognitive processing stages specified by (Bonner 2008). After developing an overview of the situation at hand, auditors engage in information search by gathering facts. This gathering is followed up by the processing of information, encompassing how information is interpreted and combined into specific hypotheses (Bonner 2008). Given the complexities of each of these steps, this study focuses on information search as the necessary precondition for information processing and judgment formation. According to Nolder and Kadous (2018), for information search to be skeptical, it needs to meet five criteria: it needs to be extensive, broad, diagnostic, targeted and open. In this study, we focus on three of these criteria. First, a skeptical information search is extensive; it covers a sufficient amount of information from a variety of angles that create a clear overview (Turner 2001). Second, for information search to be skeptical, it needs to consider the underlying quality of information available. A diagnostic search prioritizes informative and factual items over lower-quality input (Blay, Kadous, and Sawers 2012). Finally, the information search needs to be targeted. A targeted information search is

effortful and deliberate rather than passively skimming available items (Barrick and Spilker 2003; Bedard and Mock 1990). In this study, we explore in how far participants engage in (a) extensive, (2) diagnostic, and (3) targeted information search.

Next, professional skepticism is exercised when forming judgments and when deciding on which actions to take. Judgment is central to the audit process, and it confronts auditors with varying degrees of uncertainty, unpredictability, and complexity (Nelson 2009; Hurtt et al. 2013; Nolder and Kadous 2018; Abdolmohammadi 1999). In dealing with these challenges, auditors need to determine at which point they have sufficient evidence for forming a judgment/deciding on one's actions, and how best to manage possible risks (Nolder and Kadous 2018). Following the structure described by Nolder and Kadous (2018), in this study we focus on auditors' judgments and the extent to which they intent to engage in skeptical actions. Judgments represent how auditors perceive the case, e.g. perceived fraud risk (Rose 2007; Asare and Wright 2004) or beliefs about client truthfulness (Quadackers, Groot, and Wright 2014). Intentions to act describe which behaviors auditors intend to engage in to address the situation they are in. Would they ask the client to provide additional information, should time be allocated differently across procedures, or would you request an adjustment on the client's part? As specified by Nelson (2009), these intentions can translate into actions given auditors' knowledge, traits, and firm incentives. Following the professional skepticism models by Nelson (2009), Hurtt et al. (2013), and by Nolder and Kadous (2018), we first explore the relationship between extensive, diagnostic, and targeted search with auditors' judgments and intentions to act, leading to the following baseline hypothesis:

HYPOTHESIS 1. *Skeptical information search (extensive, diagnostic, and targeted search) is positively related to skeptical judgments/intention to act.*

Knowledge as a central antecedent of professional skepticism

The three conceptual models of professional skepticism list a series of antecedents that drive skeptical information search, and judgment/intention to act (Nelson 2009; Hurtt et al. 2013; Nolder and Kadous

2018). A central antecedent featured in all three models is auditor experience and/or knowledge that affects how information is searched and processed and how judgments are formed (Nelson 2009; Hurtt et al. 2013; Nolder and Kadous 2018). In these models, knowledge is introduced as a necessary pre-condition for other antecedents to work effectively. For example, an auditor may be incentivized to behave skeptically, but if he or she lacks the knowledge, incentives will not be as effective. For Nelson (2009, 7), auditors "must understand the directional implications of evidence for audit risk, and also must be able to apply their knowledge of evidential patterns and error/non-error frequencies to determine whether a given set of evidence suggests heightened risk." Hurtt et al. (2013, 51) add that "experience allows auditors to develop domain knowledge and knowledge of patterns that will enable them to determine when evidence does not 'add up'". Knowledge is often approximated through auditors rank and/or experience, building on the assumption that with experience, auditors automatically develop the necessary knowledge to perform well, and that those auditors who fail to do so will not advance in the firm (Hurtt et al. 2013; Nelson 2009).

Extant audit research has studied the concept of knowledge in two main ways. On the one hand, audit expertise models (e.g. Libby and Tan 1994; Libby and Luft 1993; Bedard 1991) and studies on training for skepticism and fraud detection (e.g. Nelson 1993; Hubbard Ashton 1991; Earley 2001; Plumlee, Rixom, and Rosman 2015) have focused on which content knowledge auditors need to develop in order to perform optimally, e.g. knowledge on error frequencies. An underlying assumption of this research stream is that the exact knowledge auditors require can be known in advance and taught explicitly. Under conditions of ongoing change or in unprecedented situations requiring professional judgment, however, this assumption is not met (Francis 2011; Knechel et al. 2013; PCAOB 2016; FRC 2015). When knowledge content cannot be anticipated and/or taught explicitly, the exact content of knowledge itself becomes less important; rather, it is the relevance of auditors' past experience that will affect performance with a given task (Kahneman and Klein 2009; Klein 2008). The second research stream on auditor knowledge acknowledges that not content, but relevance of experience is critical for auditors, approximating knowledge through overall years of experience, through rank, or through experience within specific industries or with specific standards or technologies (e.g. Moroney 2007; Wright 2001; Vera-Muñoz, Kinney Jr, and Bonner 2001; Carpenter,

Dirsmith, and Gupta 1994). This stream bases the proxies of knowledge on the assumption that with more experience, auditors develop more relevant context-specific knowledge that enables them to e.g. deliver higher audit quality. Hurtt et al. (2013, 51) summarize this argument as follows: "experience allows auditors to develop domain knowledge of patterns that will enable them to determine when evidence does not 'add up'". Both research streams on knowledge emphasize a positive relationship between knowledge and performance: with more knowledge, auditors understand the task at hand, know how to respond, which cues to search for, and how to formulate adequate judgments.

Based on this shared assertion, generally, a positive relationship is expected between rank and professional skepticism in terms of information search and judgment/intention to act. Looking at information search first, in Tubbs' (1992) study, higher-ranking auditors recalled more (atypical) errors in working papers and fewer incorrect items, and were found to engage in more targeted information search because of meaningful knowledge structures (Frederick, Heiman-Hoffman, and Libby 1994). Some studies also positively link rank and skeptical judgment and (intention to) act. For example, accurately assessing fraud risk (Agoglia, Beaudoin, and Tsakumis 2009; Knapp and Knapp 2001), formulating a wider variety of possible explanations, specifically non-error explanations and budgeting more hours to complete a task that requires skepticism (Quadackers 2009), or continuously expressing more skeptical beliefs and intentions to act across a battery of questions (Shaub and Lawrence 1996). These results lend support to the reasoning that experience enables the acquisition of knowledge, which in turn relates positively to professional skepticism.

However, not all studies support this positive relationship. Regarding information search, Rose (2007) and Phillips (1999) did not find a significant relationship between experience and attention to indicators of aggressive reporting, and Shaub and Lawrence (1996) found that compared to staff auditors, CPA were less likely to perform additional analysis when facing client risk. Similar findings exist for judgments/intentions to act. For example, Phillips (1999) discovered that higher-ranking auditors were less likely to believe that fraud had occurred when detecting aggressive reporting than their senior colleagues, and Payne and Ramsay (2005) found that staff auditors were more skeptical of their client's truthfulness.

Consequently, rank is not consistently related to professional skepticism, providing insufficient insight into the role of knowledge for information search and judgment / intention to act.

Both research streams on auditor knowledge offer explanations for these divergent findings. On the one hand, expertise research in auditing explicitly distinguishes experience and knowledge. For example, Bédard (1991, 144) states that "one can have considerable experience and not be an expert", and Libby and Luft (1993, 429) clarify that "one should not expect all more experienced auditors to show superior performance at all tasks. [...] When combined with the diminishing effects of exposure on learning, continuous improvement on any one task is unlikely". The second stream of research on the other hand emphasizes the relevance of past experience. Higher-ranking auditors may over-rely on pattern recognition based on past experiences; under complex or unreliable conditions, this may cause them to overlook details or to suffer from confirmation bias (Wheeler and Arunachalam 2008; Tversky and Kahneman 1974). The differing findings for the rank - skepticism relationship may then derive from the difference between experience and knowledge that are not accounted for by using rank as a proxy without taking into account the context in which auditors have made their experiences[1]. Based on these differing findings, we formulate two hypotheses about the rank - skepticism relationship. We will explore empirically which scenario, the positive or the negative, receives more support from our analysis.

HYPOTHESIS 2a. *Auditors of higher rank will engage in more extensive information search.*

HYPOTHESIS 2b. *Auditors of higher rank will engage in more diagnostic information search.*

HYPOTHESIS 2c. *Auditors of higher rank will engage in more targeted information search.*

HYPOTHESIS 2d. *Auditors of higher rank will formulate more skeptical judgments/intentions to act.*

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[1] Two more explanations are provided in literature that only have an indirect effect on knowledge development. Auditors of higher ranks develop a closer bond with their clients, possibly leading to lower skepticism (Quadackers 2009; Bazerman, Loewenstein, and Moore 2002). Moreover, in fraud-related tasks, more experienced auditors may display less skeptical behaviors if they have little practical experience with fraud (Hubbard Ashton 1991; Rose 2007; Carpenter, Durtschi, and Gaynor 2011). Since the first explanation has an indirect effect on knowledge development and we do not rely on a fraud-based task, we do not further consider these reasons in the current study.

Fostering professional skepticism: the moderating influence of firm learning culture

In this study, we propose that the mixed findings on the rank - skepticism relationship can be parsed by taking into account drivers of developing knowledge from experience (Libby and Tan 1994; Westermann, Bedard, and Earley 2015). For structured tasks, extant literature has found evidence that training contributes to skeptical information search and judgments (Carpenter, Durtschi, and Gaynor 2011; Plumlee, Rixom, and Rosman 2015), yet little evidence exists on knowledge development for unstructured or unpredictable tasks as they occur in daily practice (Westermann, Bedard, and Earley 2015). Consequently, in this study we explore a condition facilitating the creation of knowledge from daily work experience - the concept of firm learning culture as a means of enabling knowledge development as part of daily practice, allowing flexible learning as challenges and changes occur in a changing environment (Garvin 1993; Edmondson 2004; Marsick and Watkins 2003).

A firm's culture is deeply embedded in the work environment as is expressed through symbols, language use and most importantly, through actions (Chadwick and Raver 2015; Flores et al. 2012; Marsick and Watkins 2003). Being this embedded implies that all firms have a culture, whether it is deliberately created or emerged as a side-product, e.g. concerning how 'we in this firm' value quality (Jenkins et al. 2008) or how 'we' manage errors (Gold, Gronewold, and Salterio 2014). A firm's learning culture specifically addresses how members of a firm value learning as part of their daily practice by identifying skills needed for future performance and providing opportunities for developing those skills, by encouraging critical questioning of procedures and judgments, by fostering learning from errors through open communication, grounded in an atmosphere of trust and accountability (Edmondson 2008; Marsick and Watkins 2003; Cerasoli et al. 2018). These facets are established through tone at the top as well by behaviors of leaders across hierarchical levels, reflecting a deliberate effort to create a supportive learning culture (Cha and Edmondson 2006; Vera and Crossan 2016; Chadwick and Raver 2015). Extant research has shown that individual attitudes and behaviors are driven by perceptions of culture, rather than by an absolute, normative, culture concept (Eldor and Harpaz 2016; Carpenter, Dirsmith, and Gupta 1994; Gold,

Gronewold, and Salterio 2014). Salancik and Pfeffer 's (1978) social information processing approach argues that professionals' attitudes derive from past experiences and cues from the social environment, allowing individuals to adapt to changing circumstances and to behave differently across environments. The more salient these cues are, and the more relevant they are perceived to be, the larger the expected influence on attitudes and behaviors (Salancik and Pfeffer 1978). This perspective is supported by the notion that the perceptions of culture can vary significantly, even within one organization, even within one office (Eldor and Harpaz 2016; Carpenter, Dirsmith, and Gupta 1994; Flores et al. 2012). In this study, we therefore focus on individual auditors' perceptions of the degree to which their work environment values learning from experience as part of the audit process.

Prior research on learning culture has revealed several positive relationships. At the individual level, studies have found evidence for increased engagement at work (Noe, Tews, and McConnell Dachner 2010; Eldor and Harpaz 2016), job satisfaction (e.g. Egan, Yang, and Bartlett 2004; Moradi et al. 2013), and knowledge development (Flores et al. 2012; Cerasoli et al. 2018; Cannon and Edmondson 2005). At the firm level, a learning culture has been associated with higher organizational (e.g. Hung et al. 2010; Moon and Lee 2013) and financial performance (e.g. Škerlavaj et al. 2007; Wang and Yang 2007), as well as innovation (e.g. Ismail 2005; Baer and Frese 2003). A supportive firm learning culture therefore potentially not only benefits professional skepticism, but other firm outcomes at the same time.

No immediate evidence exists on the effects of a supportive learning culture in the setting of auditing, Studies on other types of culture have however found positive relationships; Jenkins et al. (2008) find a positive relationship between general firm culture and audit quality, Bamber and Iyer (2002, 2007) found that auditors who identify with their firm also identify more strongly as audit professionals, which was associated with lower trust in client information, and Gold, Gronewold, and Salterio (2014) find that auditors who read a scenario describing a supportive error culture were more likely to report errors. Westermann, Bedard, and Earley (2015) interviewed a series of partners on their perceptions of on-the-job learning, recording the following quote: "I think you do it [coaching] because it is part of our culture and if you don't, then the person is going to make the same mistakes again and again, I guess the overall reward

is the ultimate advancement" (Westermann, Bedard, and Earley 2015, 24). Based on these findings, we propose that auditors' work environment can significantly contribute to the development of knowledge from different experiences, routine and non-routine, increasing the odds that auditors are equipped with sufficient relevant knowledge when dealing with unanticipated challenges, with complex judgments, and with a changing environment. Accounting for the opportunity to develop knowledge from experience along with a driver for ongoing learning, the concept of learning culture adds a flexible, manageable manner of fostering professional skepticism and judgment quality. We expect that auditors who work in a supportive learning culture are able to develop more knowledge, and therefore, will be able to engage in more skeptical information search and to form more skeptical judgments and intentions to act, leading us to the final of our hypotheses, illustrated in Figure 1.

HYPOTHESIS 3a. *Firm learning culture positively moderates the relationship between rank and extensive information search.*

HYPOTHESIS 3b. *Firm learning culture positively moderates the relationship between rank and diagnostic information search.*

HYPOTHESIS 3c. *Firm learning culture positively moderates the relationship between rank and targeted information search.*

HYPOTHESIS 3d. *Firm learning culture positively moderates the relationship between rank and skeptical judgments/intentions to act.*

FIGURE 1 ABOUT HERE

3. **Methods**

Sample and settings

Three offices from one Big 4 firm participated in this study. In total, 178 auditors from all function levels completed an online case and questionnaire[2]. Of the 178 initial observations, 166 were complete and included in the analysis, based on the following criteria: a) completed the online case to the last page (6 responses excluded), (b) completed the survey (4 responses excluded), c) did not provide the same answer to each survey question (2 responses excluded). After applying these criteria, the odd missing value remains for individual variables either due to variance in behaviors measured or due to answers that could not be interpreted with certainty. In office A, which is split across two locations, 58 auditors completed a web-based case and a survey endorsed by the office on an individual basis. In offices B (39 participants) and C (69 participants), participants took part in a voluntary workshop during which they completed the online case and survey. Office leaders in locations B and C endorsed the workshops as part of regular firm events on quality management. The sample includes 42 associates, 64 seniors, and 60 managers and partners; 108 participants are male, and 58 are female. On average, participants had 7.71 years of audit experience with a wide distribution (SD=7.803).

Procedure and task design

In this study, we explore auditors' skeptical information search and judgment/intention to act by observing their behavior in representative case. Working together with the participating Big 4 firm, the case is based on an actual audit file with which the firm was dissatisfied and in hindsight would have managed differently. Based on the element of the file that caused problems later, together we built a case that challenged participants to engage in information search in order to form adequate judgments/intentions to act. Table 1 provides an overview of the research procedure and case elements provided to participants. Participants took between 12 and 36 minutes to complete this case.

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[2] The online case was administered in English at offices B and C, and in Dutch at office A, based on dominant working language. The survey uses previously validated items and was therefore always administered in English.

TABLE 1 ABOUT HERE

The underlying case was designed based on three principles. First, it needed to pose a relevant and accessible task to all participating auditors in an area relevant for professional skepticism. Analyses of audit failures have revealed that accounts receivable are a frequent source of lowered audit quality and even fraud (Beasley, Carcello, and Hermanson 2001; Payne and Ramsay 2005; Knapp and Knapp 2001). The participating Big 4 firm also perceived the audit of accounts receivable as critical for audit quality, so this became the focus of the case. Most participants indicated that they had experience with auditing accounts receivable (89.7%), in different roles such as assisting (19.1%), executing (16.8%), supervising / reviewing (38.2%) or advising audit teams (25.9%). In the final case, auditors were informed that their client's accounts receivable grew disproportionately to their turnover in the past year. The client's CFO states that there are two large debtors with outstanding positions that exceed materiality. It is the task of the participants to assess the likelihood of each debtor settling its outstanding position.

Second, the case needed to facilitate a wide variety of information search behaviors. We achieved this goal by varying the quality of the information provided to participants. Standards require that auditors support their judgments with sufficient relevant and reliable evidence (PCAOB 2010; IAASB 2016), yet these properties are often unknown to auditors at the time of the audit (e.g. Nolder and Kadous 2018; Einhorn and Hogarth 1981). To simulate this situation, we provide participants with three groups of information items, as outlined in Table 1 under information search. First, documentation of work completed by the client reveals a superficial approach: Debtor A reports having misplaced the invoice and promises to settle immediately, Debtor B was not contacted and instead, the CFO has reviewed the debtor's website. In addition, the client provides information on the two debtors' payment history, showing that Debtor A is unusually late in settling their position, while Debtor B's payment terms have been consistently longer. This indicates different levels of risk associated with both debtors, and the information was designed to be insufficient for forming a well-supported judgment on the two debtors. Second, for both debtors, we provide the balance sheet, profit and loss statement, and the cashflow. These items reveal that Debtor A has a

negative overall cash flow, while Debtor B is financially healthy. Based on this information, the risk associated with each debtor reverses, but is not absolute. Consequently, we expect participants' judgments to reflect how well they have interacted with the financial information compared to the documentation provided by the client. Third, participants can access a range of information items that are not helpful to them, e.g. a sector report, a recent back statement, and a list of creditors. This information is not false, but also does not change the way the financial information can be interpreted. After having viewed these items, it should be clear to auditors that they do not add value to their judgment.

Finally, we rely on observable information search behaviors of participants using an information board. This method presents participants with a pre-defined number of information items and captures their interactions with the items (Ford et al. 1989). We used the tool MouselabWEB (Willemsen and Johnson 2008) to display an information board with 20 items, of which four detail the client's own work, six items with financial information on the two debtors, and ten other items. MouselabWEB records which boxes are opened, for how long, how often, and in which order. This feature requires minimal subjective coding by researchers, and makes it difficult to display socially desirable behaviors (Willemsen and Johnson 2010). Based on the metrics recorded by MouselabWEB, we operationalize information search behaviors based on established concepts in judgment and decision making research (Queen et al. 2012; Hanoch et al. 2011; Willemsen, Böckenholt, and Johnson 2011) and in line with the overview by Nolder and Kadous (2018). The designed case was piloted with eight audit practitioners at the senior, manager and partner level, but no fundamental changes were made to the case information. The case was perceived to be equally realistic across ranks.

Measures of information search

We operationalize information search behaviors across three dimensions: extensive search, diagnostic search, and targeted search (Nolder and Kadous 2018). Table 2 outlines the information search variables and their operationalizations.

The first dimension, extensive search, is a broad measure how amount of information search, but does not provide insight into the quality of this amount. *Information accessed* captures how many percent of the information each participant accessed at least once, and *total time spent* captures how much time participants spent accessing information, in minutes. Both measures are generated automatically by MouselabWEB (Willemsen and Johnson 2010; Ford et al. 1989). According to Nolder and Kadous (2018), professional skepticism is indicated by a more extensive information search.

Second, we explore two measures of diagnostic search, the degree to which information search focuses on relevant and reliable evidence (Nolder and Kadous 2018). To capture diagnosticity, we rely on the different categories of information provided to participants. *Time spent on financial items* is the total time, in minutes, that participants opened the boxes with the financial information on the two debtors. Note that the financial information was kept simple. Based on the way the case information was designed, higher values of this variable represent a more diagnostic information search. In addition, we also explore how participants divided their time across the financial items and the documentation provided by the client by calculating the ratio between them. This information is captured in the variable *time on financial/client items*. Values smaller than one represent a time focus on client documentation, values larger than 1 imply that participants spent more time on financial items. Based on the design and underlying quality of these two categories of information, diagnostic search is represented by an increased focus on financial items.

Third, we explore Nolder and Kadous' (2018) principle of targeted search, where information is selected in a deliberate and meaningful manner. We operationalize targeted search in two ways. First, *attention focus* is measured by the standard deviation of time spent across all items. A high standard deviation represents more attention to some items than to others, while a low standard deviation indicates equal attention to all items on the board, regardless of quality (Willemsen and Johnson 2010). In addition, we explore the *order of access* by comparing the order in which information items were displayed with the order in which participants opened the boxes. Due to the Western background of all participants, we operationalize order of presentation as going from left to right and from top to bottom. Agreement between order of presentation and order of access is calculated using Krippendorff's alpha, a flexible reliability

indicator that ranges from 0 (no similarity) to 1 (perfect similarity) (Hayes and Krippendorff 2007). This indicator takes into account missing values or different amounts of items opened, which compensates weaknesses of e.g. rank-order correlation measures (Bedard and Mock 1990; Hess, Queen, and Ennis 2013). A correlation of 1 indicates a perfect match between the two, interpreted as less skeptical information search, compared to a correlation closer to 0, which indicates a search order independent of order of presentation, a score of -1 indicated that a participant accessed all information items in the opposite order (Bedard and Mock 1990; Nolder and Kadous 2018). A higher score on attention focus and a lower score on order of access indicate more targeted information search.

TABLE 2 ABOUT HERE

Measures of judgment and intention to act

After interacting with the information board, participants were asked to make a judgment and to formulate their intention to act (see Table 3). The case information reveals different likelihoods that the two debtors will settle their outstanding position. One debtor assured the client to pay immediately, but also has a significantly negative cashflow. No record is available of any contact between the client and the other debtor, but the website revealed that it is a large and healthy organization able to settle. Our first measure of judgment capitalizes on whether participants correctly identify this difference in underlying risk. Participants indicated, in percent, how likely they think each debtor is likely to settle. The variable *judgment accuracy* is calculated as the difference between the likelihoods assigned to the two debtors. A positive difference indicates a judgment representative of the task information, a value of 0 indicates that participants did not differentiate between debtors, and a negative value describes a mismatch between task information and a participant's judgment. Next, participants indicated, in percent, their *judgment confidence*. In line with hypothesis 1, we expect that the more skeptical the information search, the more accurate the judgment and the more confident participants will be in their judgment.

We also operationalize participants' intention to act. First, participants could indicate if they wished to access information other than the items provided, and if so, which items they missed. The variable *information request* reports the number of these items listed by participants. Additionally, the variable *adjustment request* captures whether participants would request their client to adjust their allowance for bad debt, yes or no. We hypothesize that the more skeptical the information search, the more likely participants will be to request additional information as well as an adjustment, in line with hypothesis 1.

TABLE 3 ABOUT HERE

Measures of rank and firm learning culture

Rank in this study is measured based on participants' self-indicated function level at the time of participation. Rank takes into account both responsibilities as well as amount of general audit experience (Payne and Ramsay 2005; Quadackers, Groot, and Wright 2014). To explore hypothesis 2, we compare three groups: associates, seniors, and managers/partners. *Learning culture* is measured through Marsick and Watkins' (2003) Dimensions of the Learning Organization Questionnaire (DLOQ), and specifically, through the scales that measure individual perceptions of culture, 'opportunity for learning' and 'inquiry and dialogue'. Both scales measure individuals' perceptions of support for learning in the firm environment[3].

The DLOQ is validated and popularly used in management and organizational behavior studies to capture individuals' perceptions of whether their firm facilitates learning from experiences while they are happening (Eldor and Harpaz 2016; Egan, Yang, and Bartlett 2004). 'Opportunity for learning' explores in how far money, time and support are available for engaging in a variety of learning activities, including

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[3] The choice to capture participants' actual perceived culture rather than manipulating it e.g. in the case description, is based on the way the concept of firm culture is defined. First, in the management and organizational behavior literature, culture is defined as a latent concept that is embedded deeply in the work environment (Naveh, Katz-Navon, and Stern 2015; Garvin, Edmondson, and Gino 2008; Garvin 1993; Eldor and Harpaz 2016). Consequently, it only takes effect over time, making the concept hard to manage and manipulate in the short term (Chadwick and Raver 2015; Flores et al. 2012; Wolfe Morrison 2012). Approaching culture as a latent concept, we take both rank and culture into account as they occur in the workplace, auditors' actual rank and auditors' actual perceived culture, to explore their joint relationship with professional skepticism.

items such as "In my organization, people openly discuss mistakes in order to learn from them" and "In my organization, people help each other learn". The 'inquiry and dialogue' scale focuses on whether it is appropriate for individuals to ask critical questions across ranks, whether views are exchanged openly and respectfully, and whether mistakes are viewed as an opportunity for learning, rather than for punishment. Example items include "In my organization, people give open and honest feedback to each other" and "In my organization, people are encouraged to ask 'why' regardless of rank". To test whether both scales load on a higher-order concept, we employed principal component analysis (PCA) to test whether both scales can be aggregated into a single construct (Field 2011). We employed principal component extraction with varimax rotation. The sample's adequacy for dimension reduction were confirmed by the Kaiser-Meyer-Olkin Measure that was higher than 0.8 (MSA = 0.881), and Bartlett's test of sphericity, which was significant with $p = 0.000$. We next followed Field's (2011) three criteria for determining aggregation. First, two components were found with eigenvalues larger than one, explaining 41% and 10% of variance, respectively. Second, the scree plot revealed a sharp change in slope at the one-component mark, and third, the component plot located all items in the same quadrant grouped along a continuous line. Two of the three criteria suggest that aggregating items of both scales into one shared component. Reliability analysis of the resulting variable reveals a high Cronbach alpha of 0.861. To explore hypotheses 3, we will compare auditors who score low vs. high on the *learning culture* component, median-splitting participants into two groups.

Analysis

We apply three analysis strategies to address our hypotheses. First, we explore the relationship between information search behaviors and judgment/intention to act through correlations. Second, we explore differences across ranks and across learning culture through ANOVA with post-hoc analyses. Based on the difference in group size and on the fact that group membership is not random, we do not assume equal variance across groups, so we rely on the Games-Howell post-hoc test that does not rely on overall significance of the main ANOVA (Shingala and Rajyaguru 2015). Tests of homogeneity of variance indeed

indicated differences in variance across groups for more than half of the post-hoc tests conducted, validating the choice of Games-Howell. Additional testing using Tukey's post-hoc test on those post-hocs with equal variance revealed contrasts with the same direction and similar magnitudes. For consistency reasons, we therefore only report outcomes of the Games-Howell test. In addition, we report omega square as an effect size, which is interpreted as follows: $\omega^2 > 0.01$ represents a small effect, $\omega^2 > 0.06$ is a medium effect, and a large effect is found where $\omega^2 = 0.140$, following Field (2011). Third, we apply conditional process analysis based on Hayes (2019) to test the overall conceptual model involving rank, learning culture, information search behavior, judgment, and intention to act. We evaluate the fit of the model using the F-statistic and variance explained either through R square for continuous outcome variables, and pseudo-R square for dichotomous outcomes. Variance explained is interpreted as small for $R^2 > 1\%$, as medium for $R^2 > 9\%$, and as large for $R^2 > 25\%$ (in line with Koeslag-Kreunen et al. 2018).

4. Results

Descriptive findings

Table 5 Panel A reports the overall descriptives for the information search variables. Looking at extensive search first, on average, we found that participants accessed 63.9% of the available information and spent 5.380 minutes interacting with the information board. With respect to diagnostic information search, participants accessed the financial information on the two debtors for an average of 1.314 minutes, and on average, participants focused equally on the six financial items and on the four items of client documentation with a mean ratio of 1.023. With respect to targeted search, we found that the average standard deviation of time spent across information items was 0.151 minutes, taking into account each individual click on boxes on the information board. Five participants had a standard deviation of zero, and one participant achieved the highest value of 1.25 minutes. Finally, the overall order of access was quite independent of order of presentation with an average of 0.141 out of 1. The standard deviations of each of

the measures indicate that we observe significant variance to be explores through the hypotheses. Table 5 Panel C reports the overall descriptive findings for judgment/intention to act. We found that participants, on average, formed an accurate judgment with a mean difference between debtors of 15.2%, and reported an average confidence of 63.7%. 40.9% of the participants either made an inaccurate judgment or did not report any difference between the debtors. 26.5% indicated a confidence level at or below chance level, while 25.2% scored at or above 80%. Participants requested an average of 0.934 additional items of information, and 67.3% requested the client to adjust their allowance for bad debt.

Hypothesis 1 – the relationship between information search and judgment/intention to act

The first hypothesis explores in how far extensive, diagnostic, and targeted search correlate with skeptical judgment/intention to act, across all participants (see Table 4). Judgment accuracy correlated positively and significantly with four of the six information search behaviors, namely with information accessed (r=0.248, p=0.001), total time spent (r=0.155, p=0.048), time on financial items (r=0.203, p=0.009), and with attention focus (r=0.167, p=0.0.033). Judgment confidence only correlates positively with information accessed (r=0.153, p=0.052). Information request correlated significantly with extensive search ($r_{accessed}$=0.159, p=0.042; r_{time}=-0.316, p=0.000), and with diagnostic search ($r_{financial}$=0.160, p=0.040; r_{ratio}=0.158, p=0.047), and correlated positively with attention focus (r=0.166, p=0.000). The same variables also correlate significantly and positively with adjustment request[4]. The correlations provide support for Hypothesis 1, and based on these correlations, we continue analyzing Hypotheses 2 and 3.

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[4] Incidentally, we also asked participants to respond to Hurtt's Professional Skepticism Scale (HPSS, Hurtt 2010), and to indicate whether they had participated in a training on professional skepticism in the past year. This second question was asked based on the focus in training of the participating Big 4 firm at the time. We related the measures of information search behavior and judgment/intention to act as a means of exploring the role of these two measures of skepticism in the current dataset. We hypothesized positive and significant relationships. Firstly, we found a significant and positive correlation between HPSS and training participation (r=0.499, p=0.000). However, HPSS correlated negatively with information accessed (r=-0.198, p=0.012) and attention focus (r=-0.137, p=0.079), as well as negative correlations with judgment accuracy (r=-0.161, p=0.039) and judgment confidence (r=-0.152, p=0.053). Trait skepticism, in our sample, was negatively related to skeptical information search and judgment/intention to act (contrary to findings reported by e.g. Plumlee, Rixom, and Rosman 2012; Hurtt et al. 2013).

TABLE 4 ABOUT HERE

Hypothesis 2 – Differences in professional skepticism by rank

The second hypothesis explores whether rank is associated positively or negatively with information search and judgment/intention to act. Table 5 panels A and B report the ANOVA and post-hoc tests comparing scores on the six information search behaviors, and Table 5 panels C and D compare scores for judgment/intention to act across associates, seniors, and managers/partners.

   Extensive search. We found that associates scored lowest on extensive information search. They opened the least number of boxes (F=6.738, p=0.002, ω^2=0.065, see Table 6 Panel A), and spent the least amount of time on information items (F=2.337, p=0.100, ω^2=0.016, see Table 6 Panel A). Post-hoc analyses revealed that seniors outscored the other ranks on information accessed, with an average 74% of boxes - 21% more boxes than associates (p=0.001) and 14% more boxes than managers/partners (p=0.030; see Table 5 Panel B). Moreover, seniors and managers/partners spent similar total time on information items (p=0.728), and seniors spent 1.013 minutes more than associates (p=0.053). With respect to extensive search, we find that associates consistently engage in the least extensive information search, that seniors engaged consistently in the most extensive information search, with managers/partners in the middle. These findings lend partial support to Hypothesis 2a: instead of a linear function, we appear to find a concave relationship.

   Diagnostic search. Looking at diagnostic information search next, we found a significant overall effect for time on financial items (F=3.663, p=0.028, ω^2=0.031, see Table 5 Panel A), as well as for time on financial/client items (F=2.461, p=0.089, ω^2=0.018, see Table 5 Panel A). Post-hoc tests reveal that as with extensive search, associates engaged in the least diagnostic search, spending significantly less time on financial items and engaging more with client documentation over financial items than both seniors and managers/partners. At the same time, the post-hoc tests do not reveal significant differences between seniors and managers/partners: they engaged in comparably diagnostic information search. With respect to

hypothesis 2b, we therefore conclude that the relationship between rank and diagnostic information search is positive, but not necessarily linear.

Targeted search. Third, we found significant main effects for both measures of targeted information search, both for attention focus (F=2.927, p=0.056, ω^2=0.023; see Table 5 Panel A) and for order of access (F=9.822, p=0.000, ω^2=0.097; see Table 5 Panel A). In this category, we saw that managers/partners scored the lowest. Post-hoc analyses revealed significant differences among ranks for order of access: managers/partners' acquisition pattern matched order of presentation most closely at an alpha of 0.221, compared to 0.115 for seniors (p=0.016) and 0.062 for associates (p=0.000). In contrast to the previous two dimensions of information search, results for targeted search reveal a negative relationship with rank, not supporting hypothesis 2c.

Judgment/intention to act. Finally, we found significant overall effects for judgment accuracy (F=3.648, p=0.028, ω^2=0.031; see Table 5 Panel C), judgment confidence (F=2.730, p=0.068, ω^2=0.021; see Table 5 Panel B), and information request (F=6.750, p=0.002, ω^2=0.066; see Table 5 Panel C). Seniors formed the most accurate judgments with a mean percentage of 22.5%, outscoring associates by 14.7% (p=0.057) and managers/partners by 9.7% (p=0.110). They were also the most confident group, significantly outscoring managers/partners by 8.3% (p=0.064). For information request, we found that associates requested, on average, 0.746 fewer additional items than seniors (p=0.002) and 1.036 items fewer than managers/partners (p=0.000), while again the difference between seniors and managers/partners was not significant (p=0.582). We did not find any main or post-hoc effects for adjustment request. With respect to judgment/intention to act, we conclude that seniors formed the most accurate and confident judgments, and that associates were least likely to request additional information, providing mixed support for hypothesis 2d.

TABLE 5 ABOUT HERE

Hypothesis 3 – Differences in professional skepticism by rank and culture

The third hypothesis explores whether auditors display more skeptical information search behaviors and formulate more skeptical judgments/intentions to act when they work in a supportive learning culture, taking into account their rank. Table 6 reports the differences between the three ranks and the two categories of learning culture scores for the six information search behaviors (Panels A and B), and the four measures of judgments/intentions to act (Panels C and D). Figure 2 illustrates significant post-hoc findings for this hypothesis.

Extensive search. First, we found significant overall effects for information accessed (F=3.606, p=0.004, ω^2=0.073, see Table 6 Panel A) and for total time spent (F=1.632, p=0.154, ω^2=0.019). Post-hoc analyses revealed that in a low learning culture, seniors accessed 31.4% more information than associates (p=0.025, see Table 6 Panel B) and 21.6% more information than managers/partners (p=0.027). No significant differences were found between ranks in a high learning culture, or within ranks by learning culture. For total time spent, we found that in a low learning culture, associates spent 1.15 minutes fewer than seniors (p=0.028), and 1.12 minutes fewer than managers/partners (p=0.080) Again, no differences were found between ranks in a high learning culture or within ranks by learning culture. These findings do not lend support to Hypothesis 3a: a high learning culture was not associated with more extensive information search at either rank.

Diagnostic search. For diagnostic search, we found a significant overall effect for time spent on financial items (F=2.812, p=0.018, ω^2=0.052, see Table 6 Panel A), and for time on financial/client items (F=6.812, p=0.000, ω^2=0.148). Post-hoc tests reveal that with a high learning culture, managers/partners spent 1.23 more on financial information (p=0.080, see Table 6 Panel B) and were more focused on financial information over client documentation than associates (p=0.009) and seniors (p=0.040). We also found that in a low learning culture, seniors were significantly more focused on financial information over client documentation, compared to managers/partners (p=0.043). Critically, we find two significant differences between high and low learning culture within the rank of managers/partners: with a high learning culture, managers and partners spent 0.87 minutes more on financial information (p=0.080), and focused more on financial information over client documentation (difference=1.241, p=0.022). These post-hoc findings are

illustrated in Figure 2 Panels A and B. These results provide support for hypothesis 3b: with a high learning culture, rank and diagnostic search are positively and significantly related.

Targeted search. Third, we find significant overall differences for attention focus (F=2.328, p=0.045, ω^2=0.039, see Table 6 Panel A) and order of access (F=5.287, p=0.000, ω^2=0.115). Post-hoc analyses show that with a low learning culture, seniors exert more focus on some information items over others, compared to managers/partners (0.109 minutes more in standard deviation, p=0.033), with no differences between ranks for high learning culture. We also find that managers/partners focus significantly more on some items over other in a high learning culture, compared to their peers in a low learning culture (difference of 0.08 minutes in standard deviation, p=0.046). Similarly, we find that regarding order of attention, managers/partners in a low learning culture followed the order of presentation more closely than associates (difference of 0.183 in alpha, p=0.016), and seniors with a low learning culture (difference of 0.159 in alpha, p=0.020), as well as their peers with high learning culture (difference of 0.120 in alpha, p=0.081). These post-hoc findings are illustrated in Figure 3 Panels C and D. We therefore conclude that learning culture is associated with increased targeted information search in managers/partners, lending support to Hypothesis 3c.

Judgment/intention to act. Among the four variables for judgment/intention to act, we only found one significant main effect for information request (F=4.032, p=0.002, ω^2=0.085, see Table 6 Panel C), but insignificant main effects for judgment accuracy (F=1.846, p=0.107, ω^2=0.025), judgment confidence (F=1.267, p=0.281, ω^2=0.008), and adjustment request (F=0.903, p=0.481, ω^2=-0.003). Post-hoc analyses, however, reveal significant differences between ranks and learning culture for both information request and for adjustment request, illustrated in Figure 2 Panels E and F, respectively. In a low learning culture, associates requested 0.88 items fewer than seniors (p=0.089), and even 1.54 items fewer than managers/partners (p=0.021). No differences between ranks were found for a high learning culture. At the same time, we find a significant difference within the manager/partner group: those with a high learning culture requested 0.90 more additional information items than those with a low learning culture (p=0.051). Similarly, managers/partners with a high learning culture were significantly more likely to request their

client to adjust their bad debt allowance (difference of 24.2%, p=0.048). We conclude that learning culture is associated with more skeptical intentions to act, but is unrelated to skeptical judgment, lending partial support to hypothesis 3d.

TABLE 6 ABOUT HERE

FIGURE 2 ABOUT HERE

Testing the conceptual model

Having explored the differences between ranks and by scoring above- or below-median on learning culture, we conclude our analysis by testing the overall conceptual model described in Figure 1. We employ conditional process analysis as described by (Hayes 2019), which allows for the testing of several types of relationships concurrently. Our conceptual model introduces a double mediation: rank is hypothesized to be related to information search, which in turn is related to judgment and intention to act. Moreover, the model includes a moderation effect of learning culture (as a continuous variable) on the relationship between rank and information search behavior. To illustrate how our data relates to the conceptual model, we use information accessed, judgment accuracy, and adjustment request as examples. Using Hayes' template 83 in his version 3 PROCESS macros for SPSS, we estimated a moderated serial mediation model as illustrated in Figure 3. The model is tested through three sub-models with information accessed, judgment accuracy, and adjustment request as dependent variables, respectively. All coefficients and variance explained are estimated with gender, office location, participants' Hurtt's Professional Skepticism Scale (HPSS, Hurtt 2010), the role they usually have in executing the task at hand, and whether or not they were familiar with the underlying task of the case we provided.

The first sub-model explores the moderation effect of learning culture on the relationship between rank and information accessed. This first model is significant overall (F=4.849, p=0.000; R^2=0.246, see Sub-Model 1 Figure 3), and includes significant coefficients for the rank of senior (coefficient=1.099, p=0.058), learning culture (coefficient=0.177, p=0.094), and a significant interaction

between the rank of senior and learning culture on information accessed (coefficient=-0.201, p=0.099). The R^2 change due to the overall interaction is not significant (p=0.185); the interaction is only significant for the rank of senior as evidenced by the coefficient in the model. We also found significant coefficients for the covariates of location (coefficient=0.093, p=0.002) and task familiarity (coefficient=0.129, p=0.094). This first sub-model therefore reveals a significant interaction between the rank of senior and learning culture on information accessed, explaining a large percentage of variance in the dependent variable. The first sub-model therefore lends support to hypothesis 3 for the rank for senior. The second sub-model focuses on judgment accuracy in relation to rank and information accessed. This model is also significant overall (F=2.932, p=0.005; R^2=0.134, see Sub-Model 2 Figure 3). This model reveals a full mediation between rank, information accessed, and judgment accuracy. The relationship between information accessed and judgment accuracy was significant (coefficient=14.318, p=0.075), but the relationship with the rank of senior is not (coefficient=5.908, p=0.330). Two covariates were found to have significant coefficients: task familiarity (coefficient=13.896, p=0.065), and task role (coefficient=4.689, p=0.091). The second sub-model lends support to hypothesis 1 through a full mediation. The third sub-model is a logistic model based on the dichotomous nature of the 'adjustment request' variable. The overall model is, again, significant (ModelLL=71.041, p=0.000; Cox and Snell Pseudo-R^2=0.359, Nagelkerke Pseudo-R^2=0.502, see Sub-Model 3 Figure 3). The results for this sub-model reveal a partial mediation of judgment accuracy between information accessed and adjustment request. We find a negative relationship between the rank of senior and adjustment request (coefficient=-2.259, p=0.002), but positive relationships for information accessed (coefficient=1.474, p=0.067) and judgment accuracy (coefficient=0.050, p=0.000). Rank by itself therefore related negatively to intention to act, but positively when seniors had accessed more information items, and when the resulting judgment was more accurate. We also found significant coefficients for the relationship between task role and adjustment request (coefficient=0.860, p=0.004).

Overall, there is a conditionally significant direct effect of senior rank on adjustment request (effect=-2.259, p=0.002), and significant positive indirect effects between rank and adjustment request via information accessed and judgment accuracy, specifically for seniors in a low and medium learning culture

(effect$_{16thpercentile}$=0.392, bootstrapped 90% C.I. ranging between 0.017 and 0.918; effect$_{50thpercentile}$=0.256, bootstrapped 90% C.I. ranging between 0.011 and 0.613). The overall index for moderated mediation, however, was not significant for seniors (index=-0.296). Notably, HPSS was not significantly related to any of the three outcomes of the sub-models. This finding further illustrates Hypothesis 2, adding the nuance that behavior and judgment partially outweigh rank when it comes to formulating intentions to act. This insight is supported by the significant variance explained in information search, judgment, and intention to act.

FIGURE 3 ABOUT HERE

5. Discussion

Summary of Findings:

- H1: observed behaviors of information search correlate significantly and in the expected directions with judgments/intentions to act

- H2: Rank is positively associated with diagnostic information search and with judgment/intentions to act; rank is negatively associated with targeted search, and there is a concave finding for extensive search

- H3: Learning culture interacts with the highest ranks of managers/partners and leads to significantly more diagnostic and targeted information search and more skeptical intentions to act, either performing as well as seniors (time on financial items, order of access, adjustment request), or preventing a drop that appeared with a low learning culture (time on financial/client items, attention focus), or just outscoring seniors (information request); conditional process model has medium to large variance explained

What is different:

- Observed behaviors, and not just one, but a battery of behaviors to test and re-test relationships

- Culture only significantly associated with differences in behavior and intentions to act at the highest ranks: knowledge is developed from continuous learning from experience during work (in line with expertise and workplace learning literature, different from focus on training, education, certification

- Methods: no manipulations, but actual perceived culture and actual ranks, no vignettes, no direct questions about skepticism or perceived risk

Regulators, audit firms, and academics agree that professional skepticism is a critical driver of audit quality by fostering well-supported judgments (FRC 2015; PCAOB 2016; Nelson 2009; Hurtt et al. 2013; Nolder and Kadous 2018). Based on the three conceptual models by Nelson (2009), Hurtt et al. (2013), and Nolder and Kadous (2018), we explore the development of knowledge from work experience as a central driver of skeptical information search and judgments/intentions to act. To achieve this goal, we looked at the interaction between auditors' rank, representing their actual experience and responsibilities, and their perceived firm learning culture, the degree to which their work environment values and supports knowledge development (Eldor and Harpaz 2016; Flores et al. 2012). Capturing auditors' interactions with an information board in a case allowed us to observe actual behaviors as well as their relationship with skeptical outcomes, adding to existing studies relying on self-reported measures of skepticism (Nolder and Kadous 2018), and to experimental designs in which professional skepticism is deliberately triggered (a reviewed by Hurtt et al. 2013).

Regarding the rank - skepticism relationship, our study shows that higher-ranking auditors do not consistently engage in more skeptical information search and do not necessarily formulate more skeptical judgments/intentions to act, in line with previous mixed findings (Frederick, Heiman-Hoffman, and Libby

1994; Shaub and Lawrence 1996; Payne and Ramsay 2005; Quadackers 2009). Specifically, we find that rank was positively related to extensive and partially to diagnostic search, as well as to one of the two intentions to act, but was negatively related to targeted search and to judgment confidence. For judgment accuracy, we found that seniors outperformed their associate and manager/partner colleagues. Looking at our results through an expertise lens, the changes in behaviors across ranks can be viewed as a trajectory of learning and professionalization (Bedard 1991; Libby and Luft 1993; Bonner 1999). First, associates did not engage in particularly diagnostic information search and did not (yet) translate the provided information into accurate judgments and skeptical intentions to act. Seniors, the group who reported to be mostly an active preparer in the task, accessed the highest number of information items and had the highest focus in attention, along with the most accurate, and confident, judgments. Between these two ranks, auditors appear to have developed knowledge that guides them in how to effectively search for information and how to translate evidence into a judgment. A different picture emerges at the manager/partner rank. On the one hand, participants spent the most time searching for information, and of this time, spent the most on the financial items provided; on the other hand, auditors of these ranks focused their attention the least and followed the order of display more closely than the other ranks. They also were the least confident group, but requested the most additional information. These divergent findings indicate that more experience does not necessarily mean more knowledge on how to skeptically search for information and how to form skeptical judgments and intentions to act, in line with expertise research within and outside auditing (Bedard 1991; Bedard and Mock 1990; Harteis and Billett 2013; Zimmerman 2006). Studies on professionals outside of auditing have previously shown that experienced individuals tend to over-rely on past experience, engaging in routine processes even when these routines are not applicable to the task at hand (Kahneman and Klein 2009). In this study, the low score of managers/partners on targeted search may mean that more routine and less deliberation was used in navigating the information board.

Parsing these results further, we found that overall, working in a supportive learning culture was associated with more skeptical information search and intention act, mostly at the manager/partner level. This group engaged spent significantly more time on financial information, displayed higher attention focus

and more independent order of access than managers/partners working in a less supportive learning culture. Additionally, seniors engaged in fewer reacquisitions of other items when working in a supportive learning culture. Learning culture and rank also interacted in determining intentions to act. Managers/partners in a supportive learning culture were far more likely to request additional information and to require the client to adjust the bad debt allowance, than those managers/partners working in a less supportive learning culture. We did not find significant differences for search extend, and for judgment accuracy/confidence. When testing the conceptual model, we found a negative direct relationship between rank and adjustment request, but a positive mediation relationship with a full mediation for information search and a partial mediation for judgment accuracy; These paths emphasize that the process of arriving at an intention to act can override what is embodied by rank alone. Looking at these results through the lens of research using rank/experience as a proxy for knowledge, these findings emphasize that experience is an unreliable proxy for knowledge on its own (e.g. Moroney 2007; Wright 2001; Vera-Muñoz, Kinney Jr, and Bonner 2001; Carpenter, Dirsmith, and Gupta 1994). Considering learning culture along with rank helped explain variance of behaviors and intentions to act among auditors of the same rank. The observation that these differences occurred mostly at the higher ranks also supports insights from management and work psychology studies that learning culture is deeply embedded in the work environment and that it affects individuals over time (Chadwick and Raver 2015; Flores et al. 2012; Marsick and Watkins 2003; Edmondson 2008; Garvin 1993). Consequently, audit firms benefit from creating a supportive learning environment to maintain and even increase skeptical information search and judgments/intentions to act.

The findings of this study add to insights on expertise research in auditing, as well as to studies using rank/experience as a proxy for knowledge. First, by including the auditor's environment explicitly, we extend the classic expertise models summarized by Libby and Tan (1994, 703): "where experience creates opportunities for the acquisition of knowledge, while ability and effort determine the amount of knowledge acquired given that experience". Knowledge development is not only driven by an individuals' experiences and motivation, but also by the opportunities for learning afforded by the work environment (Chadwick and Raver 2015; Vera and Crossan 2016; Flores et al. 2012; Cerasoli et al. 2018). This also

highlights that experience and knowledge cannot be equated, especially under conditions of ongoing change or unpredictable situations requiring professional judgment; experience along with opportunity for learning and representativeness for the current situation are more informative of performance (Kahneman and Klein 2009). Second, our findings also add to existing conceptual models of professional skepticism. Nelson (2009), Hurtt et al. (2013), and Nolder and Kadous (2018) treat individual and environmental antecedents as fairly separate. Allowing for interactions between the two categories not only improves the understanding of how skeptical information search, processing, and judgment/intention to act can be fostered, but also broadens research on skepticism beyond the trait/state and incentive perspectives (as also called for by Cohen, Dalton, and Harp 2017; Hurtt et al. 2013; Nolder and Kadous 2018).

The results of this study are subject to several limitations that need to be taken into account when interpreting the results. First, our measures of information search and judgment/intention to act are contingent on the design of our case and the information categories provided to participants. Like other case-based designs, this approach cannot mirror actual complexities and social interactions underlying auditors' judgments. Task complexity is modelled here through differing information quality in the task, based on an actual client file of the participating Big 4. This differentiation forms a consistent baseline for evaluating skeptical information search. Second, and related to the first point, we provided all participants with the same task. This design choice was necessary to compare ranks across the same measures and on a task that all participants are familiar with. The risk of this design lies in the different roles that participants engage in, creating a potentially confounding factor. We explored this notion by asking participants to indicate whether they felt this task was a routine task for them. On average, 45.2% of participants agreed that the task was a routine task for them, and no differences were found between ranks or roles. This rating confirms that the case presented a balance of skepticism-inducing and skepticism-preventing elements across ranks. At the same time, the fact that seniors outscore the other ranks on judgment and partially also on information search hints at the presence of this confounding factor. When including learning culture, however, this pattern was not found anymore, implying that task role may not be as influential as knowledge in this relationship, in line with audit expertise research (Libby and Luft 1993; Bedard 1991). Given that

auditors of different ranks approach judgment tasks differently based on their knowledge, future research may explore (a) whether relationships between information search behaviors and judgments are linear (Causholli 2016), and (b) whether the relationships between behavior and outcome differ across participants. Based on the findings reported in this study, we would expect decreasing marginal returns on extensive information search, but linear positive relationships for targeted search, as well as stronger associations between information search behaviors and judgments/intentions to act for auditors with more underlying knowledge. Third, in this study, we chose to capture auditors' actual perceptions of their firm learning culture, rather than manipulating this variable. Relying on a validated scale for capturing auditors' perceptions is in line with studies in management and work psychology. This approach takes into account that culture is deeply embedded in the work environment and that individuals perceive culture differently even in the same workplace. These properties are unlikely to be effectively captured by a case-based manipulation. The finding that firm learning culture related to differences in information search and judgment mostly at higher ranks further emphasizes this point: culture is not a 'quick fix', but takes effect over time, jointly with experience (Flores et al. 2012; Chadwick and Raver 2015). Westermann, Bedard, and Earley (2015) have stated that traditional experimental designs have not accounted for the wider (firm) environment in a contextualized manner, calling for more research on knowledge development through other methods. Based on the interaction effects found in this study, we expect that firm learning culture may relate positively to other outcomes besides professional skepticism. Auditors with better-developed knowledge may engage the client in a more effective manner; they may be able to better contribute to team judgments or to more quickly adopt new methodologies or technologies. Future research, where possible, may benefit from a longitudinal approach, tracing auditors' learning and experience over time. This approach would allow answering questions such as: do auditors engage in different learning behaviors to adapt to demands by different clients, supervisors or regulations? Does learning culture leverage the effect of different types of audit experience, such as fraud- or error-, client- or industry-specific experience? Does learning culture enable auditors to use existing procedures more efficiently? Finally, this study's findings are contingent on our sampling strategy. Participants work at one Big 4 firm in one country, which reduces

noise in the data with respect to the methodology used, formal training received, and tasks associated with rank, but which may also determine the range within which culture is perceived. Future research is needed to determine whether larger differences in culture perceptions exist between or within firms/locations, providing an additional source of variance to be studied.

"Culture is learned behavior - it's not a by-product of operations. It's not an overlay. We create our organizational culture by the actions we take; not the other way around" (Whitehurst 2016) - this characterization illustrates that learning culture is a mechanism that audit firms can actively manage to foster professional skepticism. Creating a supportive learning culture relies on messages and behaviors by leaders at all levels of the organization (Edmondson 2008; Cha and Edmondson 2006). Leader behaviors at all levels determine learning culture. Overt behaviors that foster a supportive learning culture include inviting contribution by auditors at all levels, inviting critical thinking and constructive challenging of decisions, asking for honest feedback as well as providing timely and helpful feedback to others, as well as engaging in shared reflections on performance and how to improve in the future (Edmondson 2008; Metcalfe 2017; Marsick and Watkins 2003; Putz et al. 2012; Vera and Crossan 2016; Chadwick and Raver 2015). In conversations with practitioners, auditors also shared a series of small-scale behaviors that encouraged learning. Lower-ranking auditors emphasized having informal one-on-one time with higher-ranking colleagues, and being allowed to listen in on higher-level judgments. Higher-ranking auditors built trust, a pre-condition for shared learning, e.g. by getting to know colleagues at all levels in the beginning of an engagement, increasing face-to-face contact, and actively inviting contribution by lower ranks first. Leading by role-modelling these behaviors has previously been shown to be effective under certain conditions. First, a focus on learning should be paired with a focus on accountability. (Edmondson 1999) demonstrated that work teams engaged in more learning activities when they perceived a supportive work environment along with being given challenging tasks and autonomy. The interview study by Westermann, Bedard, and Earley (2015, 3), however, highlights several threats to a supportive learning culture in the current audit environment: "decreased coaching opportunities, including reduced face-to-face feedback, reduced partner presence at the client location, and increased time/work demands. Regulatory pressure and

complexity of accounting rules have resulted in reallocating original work to more senior ranks (e.g. managers), reducing opportunities for seniors and staff to learn from experience". Firms need to re-evaluate the efficiencies afforded by e.g. new technologies in comparison for decreased opportunities for learning and developing necessary knowledge to be(come) an effective professional. Second, it is important that similar messages about the firm's learning culture are being sent across levels. When tone at the top emphasizes that learning is valued and supported with the necessary resources, but lower-level leaders emphasize short-term efficiency and punish mistakes, 'disenchantment' may occur, leading to a range of negative outcomes (Cha and Edmondson 2006). Interestingly, two recent studies have found that skeptical behavior is not necessarily values by engagement partners, who influence tone at the top, as well as learning culture (Brazel et al. 2016; Cohen, Dalton, and Harp 2017). These two studies each found that partners evaluate staff auditors negatively when they behaved skeptically without uncovering a significant issue in a file. Cohen, Dalton, and Harp (2017) even find a positive relationship between professional skepticism and turnover intention. This is a significant warning sign for firms to pay close attention to the messages being sent to auditors about which behaviors and which quality of work is encouraged and rewarded. Third, learning needs to be valued and supported in the long-run; it takes time to build a supportive learning culture, and even more time to affect auditors' knowledge and professional skepticism (Chadwick and Raver 2015; Flores et al. 2012). Under these conditions, creating a supportive learning culture is a valuable tool for improving audit quality; ongoing reports on insufficiently supported judgments along with increasing public pressure provide firms with an immediate sense of urgency for change (IFIAR 2015; PCAOB 2016; FRC 2015) and consequently, with an opportunity for longer-term efforts to foster professional skepticism through a supportive firm learning culture.

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TABLE 1

Research procedure and case

Phase	Description
Case Description	Description of hypothetical client, including neutral transcription of past relationships with the client; assignment: audit the client's accounts receivable, focusing on two large debtors (provided on paper, not part of further information search measures)
Information Search	Access to an information board with 1) *Documentation* of work completed by the client (2 items documenting superficial work done by the client, 2 items in payment history of the two debtors as reported by the client) 2) *Financial information* items on the two debtors (6 items providing relevant information on the debtors' financial health: balance sheets, profit and loss statements, and cashflows) 3) *Other information* items (10 items, do not contain information that change the interpretation of the financial information, but also no false information, e.g. sector report, client bank statement)
Judgment	Participants indicate, in percent, how likely they think the two debtors are to settle their outstanding positions, along with a percentage rating of how confident they feel in their own judgment
Intention to Act	Participants indicate whether they would have liked to access additional information, and if so, which information they missed, and participants indicated whether they would request their client to adjust their allowance for bad debt or not
Survey	Finally, participants responded to a validated scale measuring their personal perception of their actual firm's learning culture, and to demographic questions including actual rank

TABLE 2

Operationalizing information search measures following Nolder and Kadous (NK, 2018)

Panel A: Extensive search	
Variable	Operationalization
Information Accessed	Amount of available items accessed (in percent)
Total Time Spent	Total time spent on accessing items (in min.)
Panel B: Diagnostic search	
Variable	Operationalization
Time on Financial Items	Time spent on financial information items on two debtors (in min.)
Time on Financial/Client Items	Ratio of time spent on financial items over time spent on documentation provided by the client (< 0 = more time on client documentation, 0 = equal time spent, >0 = more time on financial items)
Panel C: Targeted search	
Variable	Operationalization
Attention Focus	Standard deviation of time spent on financial and other items (in min.)
Order of Access	Krippendorff's alpha comparing consistency between order of presentation and order of access of items (between 0 and 1)

TABLE 3

Operationalizing judgment and intention to act

Panel A: Judgment		
Variable	Operationalization	Link to NK
Judgment Accuracy	difference likelihood of debtors defaulting; positive = accurate, 0 or negative = inaccurate judgment (in percent)	B5 Belief
Judgment Confidence	average confidence that participants express in the accuracy of their own judgment (in percent)	F2 Feeling

Panel B: Intention to Act		
Variable	Operationalization	Link to NK
Information Request	the number of additional information items participants would have liked to access (frequency)	I4 Intentions
Adjustment Request	whether or not participants would request their client to adjust their bad debt allowance (dichotomous)	I1 Intentions

TABLE 4

Hypothesis 1 – Correlations between information search and judgment/intention to act

	Judgment Accuracy	Judgment Confidence	Information Request	Adjustment Request
Information Accessed	0.248***	0.153*	0.159**	0.276**
Total Time Spent	0.155**	-0.040	-0.316***	0.160**
Time on Financial Items	0.203***	-0.004	0.160**	0.222***
Time on Financial/Client Items	0.091	0.031	0.185**	0.252***
Attention Focus	0.167**	0.066	0.166**	0.193**
Order of Access	0.118	0.073	0.000	0.001

Notes: significance denoted as *p<0.10, **p<0.05, ***p<0.01. Variables are operationalized as follows:

Information Accessed	Percentage of information items accessed (20 items)
Total Time Spent	Total time spent on accessing information items (20 items)
Time on Financial Items	Time spent on financial items on the two debtors (6 items)
Time on Financial/Client Items	Ratio of time spent on financial over client items (across 10 items)
Attention Focus	Standard deviation of time spent across all items
Order of Access	Reliability between item order of presentation and order of access
Judgment Accuracy	Difference in judgment of likelihood of payment of the two debtors
Judgment Confidence	Reported confidence in judgments, in percent
Information Request	Number additional items participants wanted to access additionally
Adjustment Request	Requiring client to adjust accounts receivable, yes or no

TABLE 5

Hypothesis 2 – ANOVA comparing information search and judgment/intention to act across ranks

Panel A: Information Search Main Findings

	Overall (N=166) M (SD)	Associates (N=42) M (SD)	Seniors (N=64) M (SD)	Man./Part. (N=60) M (SD)	Difference F Statistic (p-value; ω^2)
Information Accessed	0.639 (0.315)	0.535 (0.290)	0.744 (0.287)	0.600 (0.332)	6.738*** (0.002; 0.065)
Total Time Spent	5.380 (2.630)	4.716 (1.982)	5.728 (2.413)	5.475 (2.630)	2.337* (0.100; 0.016)
Time on Financial Items	1.314 (1.341)	0.888 (0.787)	1.321 (0.876)	1.606 (1.883)	3.663** (0.028; 0.031)
Time on Financial/Client Items	1.023 (0.953)	0.743 (1.341)	1,080 (0.806)	1,158 (1.213)	2.461* (0.089; 0.018)
Attention Focus	0.151 (0.156)	0.133 (0.102)	0.187 (0.171)	0.125 (0.165)	2.927* (0.056; 0.023)
Order of Access	0.141 (0.196)	0.062 (0.107)	0.115 (0.137)	0.221 (0.260)	9.833*** (0.000; 0.097)

Panel B: Information Search Significant Post-Hoc Findings

Variable	Rank Contrast	Difference	SE	p-value
Information Accessed	S > A	0.209	0.057	0.001
	S > MP	0.144	0.056	0.030
Total Time Spent	S > A	1.013	0.430	0.053
Time on Financial Items	S > A	0.433	0.164	0.026
	MP > A	0.718	0.272	0.026
Time on Financial/Client Items	S > A	0.338	0.147	0.059
	MP > A	0.415	0.192	0.082
Order of Access	S > A	0.052	0.024	0.077
	MP > A	0.159	0.037	0.000
	MP > S	0.106	0.038	0.016

Panel C: Judgment and Intention to Act Main Effects

	Overall (N=166) M (SD)	Associates (N=42) M (SD)	Seniors (N=64) M (SD)	Man./Part. (N=60) M (SD)	Difference F Statistic (p-value; ω^2)
Judgment Accuracy	15.216 (28.806)	7.786 (34.145)	22.484 (27.136)	12.833 (25.451)	3.648** (0.028; 0.031)
Judgment Confidence	63.698 (19.698)	63.805 (17.801)	68.361 (19.218)	60.075 (20.920)	2.730* (0.068; 0.021)
Information Request	0.934 (1.461)	0.286 (0.596)	1.032 (1.481)	1.322 (1.726)	6.750*** (0.002; 0.066)
Adjustment Request	0.673 (0.471)	0.667 (0.477)	0.656 (0.712)	0.712 (0.457)	0.233 (0.793; -0.010)

Panel D: Judgment/Intention to Act Significant Post-Hoc Findings

Variable	Rank Contrast	Difference	SE	p-value
Judgment Accuracy	S > A	14.698	6.296	0.057
Judgment Certainty	S > MP	8.286	3.654	0.064
Information Request	S > A	0.746	0.208	0.002
	MP > A	1.036	0.294	0.000

Notes: significance denoted as *p<0.10, **p<0.05, ***p<0.01. Effect sizes of ω^2 are interpreted as small at ω^2>0.01, medium at ω^2>0.06, and large as ω^2=0.140, following Field (2011). For post-hoc findings, ranks are shortened to A = associates, S = seniors, and MP = managers/partners. Variables are operationalized as follows:

Information Accessed	Percentage of information items accessed (20 items)
Total Time Spent	Total time spent on accessing information items (20 items)
Time on Financial Items	Time spent on financial items on the two debtors (6 items)
Time on Financial/Client Items	Ratio of time spent on financial over client items (across 10 items)
Attention Focus	Standard deviation of time spent across all items
Order of Access	Reliability between item order of presentation and order of access
Judgment Accuracy	Difference in judgment of likelihood of payment of the two debtors
Judgment Confidence	Reported confidence in judgments, in percent
Information Request	Number additional items participants wanted to access additionally
Adjustment Request	Requiring client to adjust accounts receivable, yes or no

TABLE 6

Hypothesis 3 - ANOVA comparing information search and judgment/intention to act across ranks and learning culture

Panel A: Information Search Main Findings

Variable	Associates (N=42)		Seniors (N=64)		Managers/Partners (N=60)		Difference
	low LC	high LC	low LC	high LC	low LC	high LC	F Statistic
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	(p-value; ω^2)
Information Accessed	0.453	0.569	0.767	0.709	0.550	0.680	3.606***
	(0.274)	(0.293)	(0.243)	(0.346)	(0.341)	(0.307)	(0.004; 0.073)
Total Time Spent	4.421	4.834	5.909	5.446	5.079	6.113	1.632
	(1.857)	(2.048)	(2.561)	(2.184)	(2.348)	(2.974)	(0.154; 0.019)
Time on Financial Items	0.807	0.920	1.368	1.244	1.271	2.145	2.812**
	(0.849)	(0.774)	(0.957)	(0.737)	(1.292)	(2.507)	(0.018; 0.052)
Time on Financial/Client Items	0.690	0.763	1.133	0.991	0.701	1.942	6.511***
	(0.720)	(0.650)	(0.910)	(0.598)	(0.588)	(1.579)	(0.000; 0.148)
Attention Focus	0.156	0.123	0.200	0.167	0.092	0.179	2.328**
	(0.133)	(0.088)	(0.196)	(0.125)	(0.093)	(0.232)	(0.045; 0.038)
Order of Access	0.084	0.055	0.109	0.125	0.267	0.147	5.287***
	(0.149)	(0.089)	(0.136)	(0.140)	(0.261)	(0.246)	(0.000; 0.115)

Panel B: Information Search Significant Post-Hoc Findings

Variable	Rank Contrast	Difference	SE	p-value
Information Accessed	$S_{low} > A_{low}$	0.314***	0.088	0.007
	$S_{low} > MP_{low}$	0.217***	0.068	0.006
Total Time Spent	$S_{low} > A_{low}$	1.152**	0.419	0.028
	$MP_{low} > A_{low}$	1.115*	0.502	0.080
Time on Financial Items	$MP_{high} > MP_{low}$	0.874*	0.564	0.080
	$MP_{high} > A_{high}$	1.226*	0.541	0.080
Time on Financial/Client Items	$S_{low} > MP_{low}$	0.432**	0.176	0.043
	$MP_{high} > A_{high}$	1.180***	0.365	0.009
	$MP_{high} > S_{high}$	0.951**	0.366	0.040
	$MP_{high} > MP_{low}$	1.241**	0.358	0.022
Attention Focus	$S_{low} > MP_{low}$	0.109***	0.035	0.008

	$MP_{high} > MP_{low}$	0.087**	0.051	0.046
Order of Access	$MP_{low} > A_{low}$	0.184**	0.062	0.016
	$MP_{low} > S_{low}$	0.159***	0.048	0.005
	$S_{high} > A_{high}$	0.070*	0.032	0.090
	$MP^{low} > MP^{high}$	0.120*	0.067	0.081

Panel C: Judgment/Intention to Act Main Findings

	Associates (N=42)		Seniors (N=64)		Managers/Partners (N=60)		Difference
Variable	low LC	high LC	low LC	high LC	low LC	high LC	F Statistic
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	(p-value; ω^2)
Judgment Accuracy	12.917	5.733	24.079	19.958	9.730	17.826	1.846
	(29.807)	(36.001)	(27.604)	(26.764)	(25.792)	(24.625)	(0.107; 0.025)
Judgment Confidence	59.667	65.517	69.211	66.957	60.257	59.783	1.267
	(12.449)	(19.530)	(17.783)	(21.729)	(19.821)	(23.035)	(0.281; 0.008)
Information Request	0.333	0.267	0.923	1.208	0.972	1.870	4,032***
	(0.651)	(0.583)	(1.612)	(1.250)	(1.483)	(1.961)	(0.002; 0.085)
Adjustment Request	0.667	0.667	0.684	0.609	0.622	0.864	0.903
	(0.492)	(0.479)	(0.471)	(0.499)	(0.492)	(0.351)	(0.481; -0.003)

Panel D: Judgment/Intention to Act Significant Post-Hoc Findings

Variable	Rank Contrast	Difference	SE	p-value
Judgment Accuracy	$S_{low} > MP_{low}$	14.349*	6.167	0.058
Information Request	$S_{high} > A_{high}$	0.942***	0.277	0.005
	$MP_{high} > A_{high}$	1.603***	0.423	0.002
	$MP_{high} > MP_{low}$	0.898*	0.478	0.051
Adjustment Request	$MP_{high} > MP_{low}$	0.242**	0.110	0.048

Notes: significance denoted as *p<0.10, **p<0.05, ***p<0.01. Effect sizes of ω^2 are interpreted as small at $\omega^2 > 0.01$, medium at $\omega^2 > 0.06$, and large as $\omega^2 = 0.140$, following Field (2011). For post-hoc findings, ranks are shortened to A = associates, S = seniors, and MP = managers/partners. Variables are operationalized as follows:
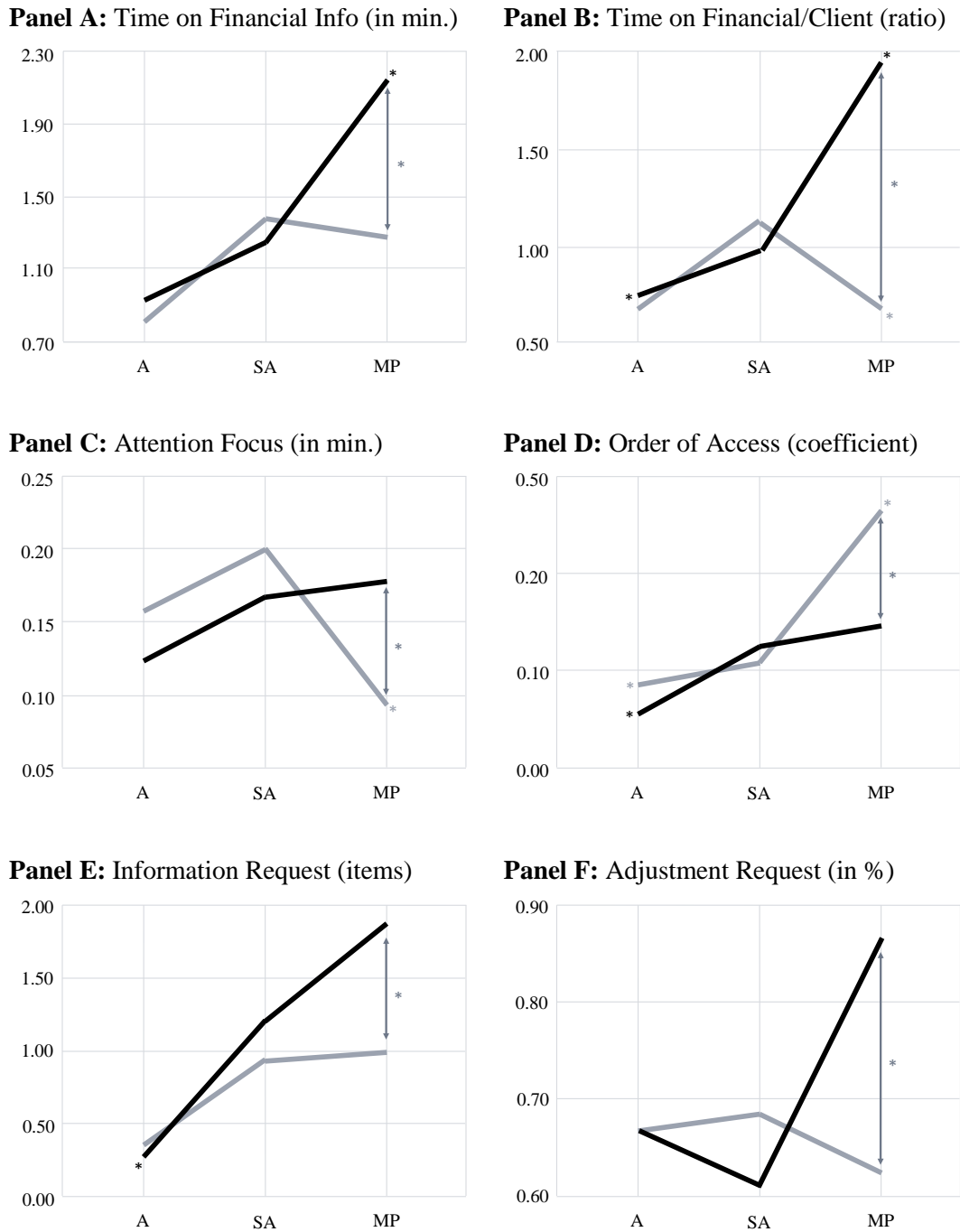
Information Accessed	Percentage of information items accessed (20 items)
Total Time Spent	Total time spent on accessing information items (20 items)
Time on Financial Items	Time spent on financial items on the two debtors (6 items)
Time on Financial/Client Items	Ratio of time spent on financial over client items (across 10 items)

|	
Attention Focus	Standard deviation of time spent across all items
Order of Access	Reliability between item order of presentation and order of access
Judgment Accuracy	Difference in judgment of likelihood of payment of the two debtors
Judgment Confidence	Reported confidence in judgments, in percent
Information Request	Number additional items participants wanted to access additionally
Adjustment Request	Requiring client to adjust accounts receivable, yes or no

Figure 1   Conceptual model and hypotheses
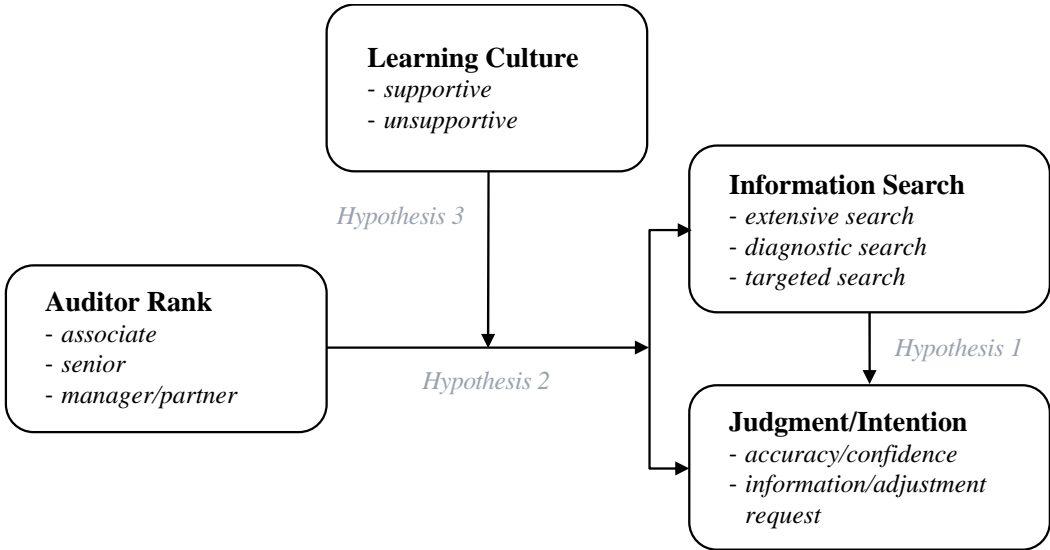
Figure 2   Hypothesis 3 - Comparison of information search by rank and culture

Panel A: Time on Financial Info (in min.)

Panel B: Time on Financial/Client (ratio)

Panel C: Attention Focus (in min.)

Panel D: Order of Access (coefficient)

Panel E: Information Request (items)

Panel F: Adjustment Request (in %)

Notes: graphs illustrate the results of post-hoc analyses on the differences in information search across ranks by culture (above-median = black; below-medium = grey). Results shown for significant findings within ranks and between learning culture. Significant differences between groups are denoted as *p<0.10, **p<0.05, ***p<0.01.

Figure 3 Conditional process analysis of the conceptual model using Hayes' PROCESS macros (see Figure 1)
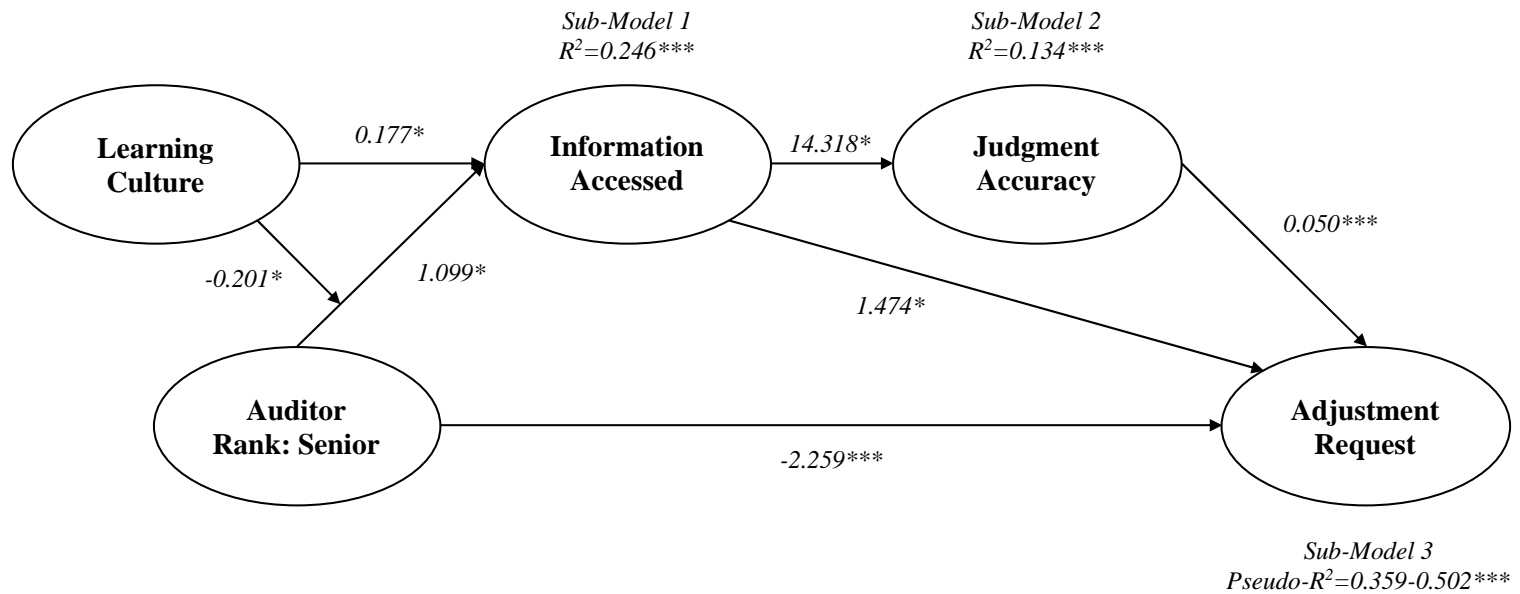
Notes: Only significant relationships are illustrated in the figure; coefficients are reported based on models including the following covariates: gender, location, HPSS, task familiarity, and which role participants usually have in the task; significant findings for covariates are reported in the results section. Coefficients reported across relationships are unstandardized. Significance is denoted as *p<0.10, **p<0.05, ***p<0.01. Significance of Sub-Model 1: F(10,149)=4.849, p=0.000, R^2=0.246; Significance of Sub-Model 2: F(8,151)=2.932, p=0.005, R^2=0.134; Significance of Logistic Sub-Model 3: ModelLL(9)=71.041, p=0.000, Cox and Snell Pseudo-R^2=0.359, Nagelkerke Pseudo-R^2=0.502.