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The ties that bind: Knowledge-seeking networks and auditor job performance

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The ties that bind: Knowledge-seeking networks and auditor job performance

Abstract

The dissemination of knowledge in audit firms is a critical process that has gone relatively unexamined by researchers. Using social network analysis to quantify the knowledge-seeking networks in a Big 4 audit firm in the U.S., we examine the association between the types and patterns of knowledge-seeking ties and individual auditor performance. Our initial finding is that auditor job performance is negatively associated with the number of knowledge-seeking ties. Further, our analyses demonstrate that this negative association is being driven by explicit knowledge-seeking rather than tacit knowledge-seeking activities and is stronger for higher-ranked auditors. Thus, knowledge-seeking by auditors may come at a cost, particularly when that knowledge is codifiable and when the seeking is done by those at higher levels of the firm. In a post-hoc analysis, we find that tacit knowledge-seeking ties to managers can be beneficial for auditor performance, and tacit knowledge-seeking ties to senior managers and partners is sometimes detrimental. In sum, this suggests that who is seeking knowledge and who is being sought for knowledge are both important for performance. Our findings may assist researchers to better understand how auditors leverage their social connections to learn, which in turn may affect audit efficiency and effectiveness. Further, audit firms might benefit from better understanding the consequences of knowledge-seeking from different sources and use this understanding to make decisions that maximize desirable information flows.

JEL Classification: M42

Keywords: Social Networks, Knowledge-Seeking, Auditor Performance

The ties that bind: Knowledge-seeking networks and auditor job performance

1. Introduction

Audits are performed by teams of individuals with differing levels of knowledge and expertise. Delivery of high-quality audits depends on the extent to which auditors collaborate and share knowledge (Danos, Eichenseher, & Holt, 1989; Vera-Muñoz, Ho, & Chow, 2006; Chow, Ho, & Vera-Muñoz, 2008). Despite the importance of knowledge-sharing, there is little evidence explicating how knowledge transfer affects auditor outcomes. In this paper we examine how knowledge sought by auditors and transmitted through social ties affects auditor performance. Auditors are often confronted with tasks for which they may not possess the requisite knowledge and as a result reach out to others for advice. Therefore, we focus on knowledge-seeking as the initial step in the process of informal knowledge dissemination. We capture knowledge-seeking ties that form voluntarily during the audit process in contrast to prior work that has examined hierarchical knowledge-sharing during workpaper reviews, which is mandated by auditing standards, and occurs after auditors have concluded audit procedures.

Benefits that auditors might acquire through knowledge-seeking ties can be understood as a form of social capital. Social capital is defined as “the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual” (Nahapiet & Ghoshal, 1998: 243). We adopt a social capital perspective and employ social network analysis to explore how knowledge-seeking ties influence auditor job performance. Knowledge-seeking relationships form webs of informal structure that create opportunities and impose limitations on the individuals within the network (Brass, 1984; Brass, 2011). There is an extensive body of research that documents the importance of social networks for the spread of knowledge in knowledge-intensive organizations (Hansen 1999; Cross &

Cummings, 2004).¹ However, there are several factors within the auditing context which may result in different findings. First, auditing is a highly regulated industry, within which a large degree of public trust is placed, with several layers of review within the audit team and the firm, as well as potential external reviews by third parties—namely, PCAOB and the courts.² Second, auditors adhere to a common set of standards, which also regulate some aspects of the flow of formal communication. Audit teams are hierarchical; auditors at different levels review the work papers of lower-ranked staff, which affects the communication structure. Third, the knowledge shared within and across audit teams can be tacit in nature, and tacit knowledge is arguably the biggest differentiator in audit quality (Tan & Libby, 1997). Fourth, the extent to which audit teams overlap likely influences how social networks are formed and the nature of knowledge flowing through the networks. Fifth, audit team membership is highly fluid, with some members possessing deep client-specific knowledge and others possessing only cursory levels of knowledge. Finally, there are substantial costs related to audit failures in terms of financial and reputational losses.

We explore the phenomenon of knowledge-seeking starting with a very basic question: is knowledge-seeking a benefit or detriment? Intuitively, auditors with large knowledge-seeking networks should have more access to information that positively influences individual performance, and recent research indicates that audit teams with more social ties perform better audits (Bianchi, 2018). However, along with the potential benefits of large networks comes the

¹ Recent research in finance documents the importance of venture capitalists' social ties for venture performance (Gompers, Mukharlayamov, & Xuan, 2016). Accounting research also shows that board of director networks matter for firm performance (Larcker, So, & Wang, 2013), and financial reporting quality (Omer, Shelley, & Tice, 2018).

² The financials certified by audit firms are signed by a certified public accountant to which certain regulations of conduct and activity apply. Among other things, auditors are required to follow Generally Accepted Auditing Standards and operate under the strict guidance of the American Institute of Certified Public Accountants (AICPA), Public Company Accounting Oversight Board (PCAOB), and additionally (for public clients) the Security and Exchange Commission. Audit failures are financially and reputationally costly to firms.

responsibility to maintain relationships with many people, which can impose constraints that negatively impact performance (Burt, 1992; Mehra, Kilduff, & Brass 2001). In addition to network size, we also explore the particular resources flowing through knowledge-seeking ties (explicit and/or tacit knowledge) and the roles of the human capital (in terms of rank) of both the knowledge seeker and the auditor being sought for advice (Brass, 2012).

To address our research question, we conducted a social network study with a Big 4 accounting firm in the U.S. We obtained proprietary employee data including age, race, gender, tenure with the firm, rank, highest degree obtained, university, certifications, and formal performance evaluations from the previous audit cycle. We created a social network questionnaire that presented respondents with a complete roster of audit professionals from the main regional office and a satellite location and asked them to select from the roster the individuals they knew, those they considered to be friends, those they worked with, and individuals they sought out for audit-related knowledge and advice (Marsden, 1987).

We asked supervisors to provide their evaluation of the performance of individual auditors using a holistic measure consisting of both task and contextual performance (Borman & Motowidlo, 1993). By using supervisor ratings, we achieved three objectives. First, the ratings are likely to be candid, since supervisors were informed that their responses would be confidential. Second, the ratings were provided by the people most likely to be responsible for the employees' performance reviews (Bretz, Milkovich, & Read, 1992, p. 331). Third, supervisor ratings have been found to be accurate measures of actual performance (Arvey & Murphy, 1998).³

³ In a study comparing 360 evaluations with objective assessment center scores, supervisor ratings were found to predict performance in the assessment center, making them "valid predictors of true performance" (Arvey & Murphy, 1998, p. 163).

We find that the size of auditors' knowledge-seeking network is negatively related to individual auditor performance. To better understand the factors driving this result, we explore the characteristics of the ties and the auditors themselves. We find that not all knowledge-seeking ties are detrimental for performance. Only explicit knowledge-seeking ties, defined as ties used to seek common or codified knowledge, are negatively related to auditor performance. Moreover, the negative association is strongest for those of higher rank; the same ties have no significant effect on those at a lower rank. We also find that the rank of those sought for knowledge matters for performance. Specifically, tacit knowledge-seeking ties to managers are beneficial for performance; ties to non-managers are not significant, and ties to senior managers/partners (or leadership) are detrimental when knowledge is sought by seniors. Although these results are tentative due to small samples for each rank, they nevertheless suggest that explicit knowledge-seeking by higher-ranked employees or tacit knowledge-seeking from leadership by lower-ranked employees can lead to costs — such as reputation loss — that negatively impact performance. Overall, our results complement prior work on tacit knowledge (Tan & Libby, 1997; Bol, Estep, Moers, & Peecher, 2018). Further, our results suggest that knowledge-seeking networks are an important aspect of auditor job performance; however, it is not simply the volume of ties, but instead tie content, the rank of the knowledge-seeker, and the rank of the one sought for knowledge that matter for performance.

Our findings underscore the unique factors affecting the impact of knowledge-seeking on performance in audit teams. Specifically, tacit knowledge sought from the appropriate source can enhance auditor performance, similar to the findings by Tan and Libby (1997) that tacit knowledge sharing increases audit quality. Additionally, in a context where formal lines of communication are delineated by the hierarchy, higher-ranked employees seeking explicit

knowledge that others may perceive they should already know, and lower-ranked employees seeking knowledge from higher ranks, may suffer reputational costs that outweigh any benefits. The fluidity of audit team membership, and the resulting diversity of knowledge on the team, may make it difficult for members with cursory knowledge to effectively integrate and utilize knowledge that they seek from those with deep, client-specific knowledge.

Our findings contribute to several lines of audit research. First, we take a social capital approach on knowledge-seeking, whereas most prior audit research takes a human capital approach focusing on knowledge possessed (e.g., Bonner & Lewis, 1990; Libby & Luft, 1993; Solomon, Shields, & Whittington, 1999; Owhoso, Messier, & Lynch, 2002). We also contribute to the emerging stream on auditor social networks, including work by Bianchi (2018) and Bianchi, Falsetta, Minutti-Meza, & Weisbrod (2019). Our results suggest the need to move beyond raw counts of coarse-grained ties and assumptions that network characteristics are universally beneficial or detrimental regardless of who has them.

We extend existing research on auditor interactions. Whereas traditional auditing research focuses on the individual as the level of analysis, social network analysis is built upon dyads—pairs of auditors—in the workplace. By examining the set of ties surrounding an individual, we provide a more comprehensive view of how knowledge is sought and thus extend current knowledge-sharing research that has examined information exchanges along formal lines such as communications with supervisors at the review stage (Ramsay, 1994). Our study explores the characteristics of knowledge-seeking across all auditors in the office and at all phases of the audit. Our finding of a negative relationship between the number of knowledge-seeking ties and auditor performance adds to the social networks literature that suggests some seemingly positive ties may have detrimental effects (e.g. Oldroyd & Morris, 2012; Soltis,

Agneessens, Sasovova, & Labianca, 2013). Further, we answer calls for a more nuanced view of advice networks by exploring domain-specific instead of general advice (Sykes, Venkatesh, & Johnson, 2014; Zhang & Venkatesh, 2013). Finally, we examine the effects of social networks in the presence of very strong organizational and institutional norms. Our findings call for greater focus on the context within which networks research is taking place (Emirbayer & Goodwin, 1994; Kilduff & Brass, 2010).

Overall, our results suggest that auditors seek audit-related knowledge from their social networks; however, seeking explicit knowledge - that can be accessed more efficiently elsewhere - is costly to auditor performance and reputation, especially when this knowledge is sought by higher-level auditors who, by virtue of their position, should already possess this knowledge. Further, the rank of those sought for knowledge also has implications for auditor performance. Seeking tacit knowledge from managers appears to yield performance benefits, consistent with the assumption that managers play a critical role in an audit firm that includes sharing relevant important knowledge while also being accessible to junior staff.

The remainder of the paper is organized as follows. Section 2 provides a review of auditing and related social network research and states our research question. Section 3 explains the data and research method. Section 4 describes the main results as well as some additional analyses.

Section 5 concludes the paper.

2. Literature review and research question

2.1 Knowledge-sharing in audits

Auditing is a knowledge-intensive profession and audit firms must manage knowledge that resides within the firm efficiently to remain competitive and earn profits (Gibbins & Wright, 1999; Chow et al., 2008). To perform an effective audit, auditors must possess knowledge about accounting and auditing standards, knowledge about industry trends, client-specific knowledge

such as the accounting information system, personnel, internal controls etc. Organizational knowledge can be categorized as either explicit or tacit (Polanyi, 1966). *Explicit knowledge*, referred to as “know-what”, is knowledge that is captured and disseminated through technology such as knowledge databases (checklists, pre-populated audit programs, plain language summaries of standards, decision making aids, etc.) that auditors can consult when necessary (Vera- Muñoz et al., 2006). *Tacit knowledge*, referred to as “know-how”, is defined as “habitual practices and mental models of individuals” (Vera-Muñoz et al., 2006, p. 135), and is more difficult to capture in a systematic way as it frequently manifests itself in the form of intuition or insights (Nonaka & Von Krogh, 2009) (e.g. who at the client to go to for specific information, how to efficiently execute complex tasks, etc.). Although auditors are expected to obtain explicit knowledge by accessing knowledge databases, auditors are also likely to seek knowledge directly from their peers. This is consistent with prior work that finds that employees are five times more likely to seek knowledge from their colleagues than other resources such as databases (Cross, Parker, & Borgatti, 2002).

We highlight advances in the auditor knowledge literature in Figure 1 and suggest this research may be examined along two dimensions: theoretical perspective (human capital vs. social capital) and specificity of knowledge (general vs. domain or context-specific). Human capital approaches that attempt to objectively measure quantities of knowledge should have near universal (although varying in magnitude) benefits to performance (e.g., Bonner & Lewis, 1990). Social capital approaches to knowledge could yield a wider range of potential benefits (knowledge acquisition, social support) but also might create some liabilities (these ties could expose knowledge deficiencies or lead to non-germane or even incorrect information, and they require time and energy to maintain).

In the top left, we see the study of Kallunki, Kallunki, Niemi, & Nilsson (2019), who find that the intellectual ability of an audit partner is significantly related to going-concern audit quality, income-increasing abnormal accruals, and audit fees. This is clearly a study of the human capital possessed by an auditor and, given the strong associations between general mental ability and job knowledge (Hunter, 1986), it could be positioned as a study of general knowledge (since some unspecified form of knowledge likely mediates their model). Studies positioned in the top right cell find that audit knowledge possessed by the auditor is positively associated with auditor task performance (Bonner & Lewis, 1990; Tan & Libby 1997; Solomon et al. 1999; Owoso et al. 1999; Contesotto et al. 2019). Tan & Libby (1997) shows that while technical knowledge differentiates employees of lower ranks, tacit managerial knowledge is the differentiating factor among managers. Bol et al. (2018) report that in the current audit environment, lower level employees with greater tacit managerial knowledge receive better performance evaluations. This work, which builds directly on Tan & Libby (1997), suggests that in recent years tacit managerial knowledge has become an important factor valued by firms. Again, we see a human capital approach used, as knowledge is studied as possessed by a given auditor. There is a high level of specificity surrounding the type of knowledge (tacit managerial) that creates benefits for the auditor.

To the extent that audit team members possess varying levels of knowledge, an effective audit depends on whether that knowledge is shared between team members (Vera-Muñoz et al., 2006). In the bottom left cell, a handful of studies have used surveys to examine the determinants of information sharing and how communication between auditors affects task performance.⁴

⁴ Nelson & Tan (2005) provide a comprehensive review of the studies that examine the effects of interpersonal interactions on task performance. Other studies examine whether knowledge acquired from one task can be transferred across other tasks. For example, Thibodeau (2003) finds that auditors with experience in auditing a client

Danos et al. (1989) find evidence consistent with the hierarchical nature of consultation within the audit team (i.e., auditors turn to their superiors for audit knowledge); most communication is within the office, and knowledge is contained within the team. Using data collected from interviews, Dirsmith & Covalleski (1985) provide additional insights consistent with the notion that social interactions are important for successful completion of audit tasks. Using an experiential questionnaire, Bobek, Daugherty, & Radtke (2012), report that when addressing an audit challenge, auditors turn both to audit team members and to those outside the team; they find that only knowledge-sharing with team members leads to successful resolution to audit challenges. Similarly, Westermann et al. (2015) emphasize that on-the-job interactions are critical to learning. Altogether, these studies suggest the importance of social relations in explaining auditor knowledge-seeking behavior; however, they do not formally capture and analyze these relations among auditors. Further, many of the studies above use data from at least two decades ago, which may not be representative of current audit methodologies and environment. The recent developments by Kallunki et al. (2019) and Bol et al. (2018) can be contrasted with studies such as Bianchi (2018) – bottom left of Figure 1 - who clearly leverages a social capital approach, finding that the ties formed when an auditor collaborates on multiple joint engagements help in the production of higher quality audits. Specifically, using data from Italy, where private firms are required to engage three auditors, Bianchi (2018) and Bianchi et al. (2019) find that auditor centrality in the professional network is positively related to audit quality and tax avoidance, providing initial evidence on the effects of social ties in auditing. An area of commonality between Bianchi (2018) and Kallunki et al. (2019) is the ambiguity surrounding the type of knowledge that is creating these benefits.

in the financial services industry can transfer their knowledge about collectability of loans when making evaluations regarding going concern opinion of clients not in the financial services industry.

Studies examining how audit-related advice from peers can affect the quality of audit judgments occupy the final cell in Figure 1. Kennedy, Kleinmuntz, & Peecher (1997) find that the perceived quality of a partner's decision depends on the partner's consultation process in the presence of weak authoritative guidance. Kadous, Leiby & Peecher (2013) find that social ties affect how auditors perceive the information they receive from their advisors. Specifically, non-expert auditors tend to put more weight on information they receive from advisors with whom they share a social bond, suggesting that auditors may not always rely on rational processes in their knowledge-seeking. Conversely, specialists do not favor advice from advisors with whom they share strong bonds, even when the advice is of good quality. Limitations of examining advice-seeking behavior using experiments include: 1) the experimental setting does not allow for the auditor to voluntarily select their advisors, and 2) it does not provide the opportunity to consider multiple sources of advice. In contrast, our research design allows us to identify and examine the number and types of knowledge-seeking activities of individual auditors. We examine the extent to which audit-related knowledge sought out by auditors and transmitted through social interactions affects auditor performance. In doing so, we leverage a social capital perspective by using social network analysis to explore patterns of informal relationships among auditors at various levels within a firm. The informal relationships we study are centered on specific types of knowledge (audit-specific: tacit and explicit). We note two unique features of the present study in relation to those in other cells. First, we utilize elements of human capital approaches by accounting for key markers such as the rank of both the auditor seeking knowledge and the coworker being sought for advice (these have been previously labeled as attribute- or resource-based approaches to social capital – Brass, 2012). Second, like Bol et al. (2018) or Tan & Libby (1997) we focus on more specific (rather than general) forms of

knowledge, but there is nuance within this dimension. For instance, while prior work has focused on tacit managerial knowledge - defined as knowledge about how to manage oneself, how to manage relationships with others, and how to manage a career - as a driver of performance, we focus on audit-related tacit and explicit knowledge. In capturing tacit knowledge related to the audit tasks, it is highly likely that our measure is one avenue through which an auditor can gain managerial tacit knowledge as studied in prior work (Tan & Libby, 1997).

Our study differs from Bianchi (2018) in that we ask auditors directly about who they go to for audit-related advice. This contrasts with prior studies which assemble networks using archival data on co-participation in audit engagements. Archival data serves as a proxy for likely communication, but it cannot capture the nuances of who is seeking knowledge from whom and the type of knowledge sought. Additionally, we focus on the job performance of individual auditors rather than the engagement-level outcomes (i.e., audit quality and tax avoidance) studied by Bianchi (2018) and Bianchi et al. (2019).

Finally, prior research has examined communication between auditors in the context of workpaper reviews where knowledge flows from reviewer to reviewee in the form of review notes. Generally, this research documents benefits from the review process (Trotman & Yetton 1985; Trotman, 1985; Ramsay, 1994). Importantly, Asare & McDaniel (1996) find that the social bond between reviewer and reviewee measured by the extent of familiarity can impact the effectiveness of the review process.⁵ While the review process is a critical component to knowledge-sharing, this form of hierarchical knowledge-sharing is mandated by auditing standards and occurs after auditors have concluded audit program procedures. Our study seeks to

⁵ Specifically, reviewers tend to be overconfident when reviewing routine tasks performed by a reviewee with whom they share a social bond but are skeptical when reviewing the work of those with whom they do not share a social bond.

understand auditor knowledge-seeking behavior that goes beyond what is prescribed by standards and considers a broader set of knowledge acquisition.

Nelson & Tan (2005) and DeFond & Zhang (2014) call for additional research on auditor interactions. We seek to contribute to this stream of literature using a different approach than that utilized in prior studies. Specifically, we utilize social network analysis to examine the role of auditor knowledge-seeking on individual auditor performance.

Research question: What (if any) effect do knowledge-seeking ties have on auditor job performance?

In looking for the types of knowledge-seeking relationships and networks that best represent the social capital of an auditor, we borrow a typology introduced in Brass' 2012 summary of the networks literature. Specifically, we focus on the general number of knowledge-seeking ties, the resources sought via the knowledge-seeking network (tacit or explicit), and an auditor attribute as a potential lever that impacts the effect of knowledge-seeking ties (auditor rank).

2.2 Knowledge-seeking ties and auditor performance.

The most basic property of any individual's network is known as *degree centrality*, defined as the number of ties an individual has with others in the network. In looking at the knowledge networks of two auditors from our sample in the top panel of Figure 2, two different degree centralities are represented. Circles represent individual auditors while the lines between them signify knowledge-seeking in the direction that the arrow points. Auditor A has a larger network (8 outgoing ties) while Auditor B has a smaller network (5 outgoing ties)⁶. One could

⁶ Within the larger social networks literature, this is referred to as "outdegree centrality". A measure of incoming ties would be labeled as "indegree centrality". Since we only explore outgoing ties in the present study, we use the term "degree centrality" for the sake of simplicity.

infer that Auditor A has more social capital and *ceteris paribus* should outperform Auditor B solely as a function of the size of their network (number of ties). Thus, an argument can be made that more knowledge-seeking ties provide greater benefits for auditor performance than fewer ties due to increased opportunities to accumulate knowledge.⁷

While conventional wisdom with relationships is “the more the better” we must acknowledge that relationships can be both beneficial and costly. There are a number of potential barriers that undermine the acquisition of information from a large network: individuals with large networks may suffer from information overload (O’Reilly, 1980; Eppler & Mengis, 2004; Bawden & Robinson, 2009; Oldroyd & Morris, 2012), or contradictory advice (Baugh & Scandura, 1999; Viator, 2001), which can lead to the discounting of information (Yaniv, 2004), or reputation loss due to admission of ignorance (Borgatti & Cross, 2003; Hoffman, Lee, & Grant, 2009; Agneessens & Wittek, 2012), all of which may hinder performance.⁸ In addition, maintaining a large number of relationships is a drain on time and energy (Burt, 1992; Mehra et al., 2001).

Despite the apparent importance of knowledge-sharing for successful completion of an audit, certain features of the audit environment may reduce auditors’ incentives to communicate and share knowledge. Budget or time pressures, workload, inadequate supervision, and high attrition rates in the profession are factors that impede knowledge-sharing (Chow et al., 2008; Westermann, Bedard, & Early, 2015). Thus, the extent to which auditors leverage their ties to obtain necessary auditing knowledge to improve their performance is unclear ex-ante.

⁷ See Mayhew (1980) for an extreme example of this structuralist perspective.

⁸ See Oldroyd & Morris (2012) for a discussion of human resource management tactics to avoid information overload and Hoffman et al. (2009) for a study on mitigating the effects of ‘losing face’ via advice seeking.

Overall, the preceding discussion suggests that there are conflicting logics and evidence suggesting that knowledge-seeking may be a benefit or a hindrance to individual auditor performance. Therefore, in our setting, we expect that the number of knowledge-seeking ties should matter for auditor performance but are unable to predict if this effect will be positive or negative.

2.3 Knowledge-seeking tie content and auditor performance.

One way in which we can attempt to resolve the potential conflicting influences of knowledge-seeking ties on auditor performance is to zoom in on the tie itself to explore its *content*: what is flowing within it. Consider the second panel of Figure 2. Auditor A and Auditor B are again represented with the same number of ties as before, but we can now see that not all these knowledge-seeking ties are the same. Specifically, we see that of Auditor A's 8 outgoing ties, 2 are used to access tacit knowledge while 6 are used to access explicit knowledge. Auditor B's network, while smaller than Auditor A's, contains more ties that are used to access tacit knowledge (4) and only one tie for accessing explicit knowledge. While we remain agnostic in terms of predicting which auditor will be a better performer when considering overall knowledge-seeking ties, we are more confident in making specific predictions for the effects of access to tacit and explicit knowledge through these ties.

Unlike explicit knowledge surrounding audits, which can be accessed via company databases, online archives, in books, and other places, tacit audit knowledge is embedded within the employee and is gained via direct experience or through observation (Argote, McEvily, & Reagans, 2003). Whereas explicit knowledge is assumed as a prerequisite for audit performance, tacit knowledge enhances the quality of that performance (Tan & Libby, 1997). The availability and use of tacit and explicit knowledge suggest that the potential perils associated with

knowledge-seeking should be more pronounced for explicit, rather than tacit, knowledge-seeking. Specifically, the sheer volume of explicit knowledge resources available to an auditor suggest that having many explicit knowledge-seeking ties should increase the likelihood of information overload (Oldroyd & Morris, 2012). Additionally, the expectation that auditors should possess a certain level of explicit knowledge to be able to perform an audit also suggests that reputational losses from having many explicit knowledge-seeking ties should be much greater than for tacit knowledge-seeking ties. Finally, the time and energy associated with accessing explicit knowledge via networks rather than repositories suggests that networks may be an inefficient channel for obtaining explicit knowledge (Borgatti & Cross, 2003). As such, auditors with more ties used to seek explicit knowledge should have lower performance ratings than those with ties used to seek to tacit knowledge.

2.4 Knowledge-seeking tie content, auditor characteristics, and auditor performance

We acknowledge that not all auditors are likely to accrue the same advantages and disadvantages from similar network positions. The networks literature shows that social capital influences the rate of return on human capital (Burt, 1992). With this in mind, we revisit a modified version of Figure 2 a final time. The bottom panel of Figure 2 represents two versions of the auditor we had been referring to as “Auditor A,” now called Auditor A^P and Auditor A^A. In this iteration, Auditor A^P is a partner and Auditor A^A is an associate. Despite identical networks, we expect very different outcomes for Auditor A^P and Auditor A^A.

Greater numbers of explicit knowledge-seeking ties would be a troubling commentary on the competency of the partner and would likely have deleterious reputational effects. Conversely, an auditor at a much lower rank should be able to gain more explicit knowledge from ties without being sanctioned for utilizing them. We expect the opposite for tacit knowledge-seeking,

where the experienced partner might be better able to leverage the complex information gained via these ties. The prediction is not clear for lower-rank auditors who may benefit from tacit-knowledge ties (Bol et al. 2018), but whose job responsibilities might not necessitate as much synthesis and use of tacit knowledge. In sum, for those of higher rank, we expect a negative relationship between explicit knowledge-seeking and job performance and a positive relationship between tacit knowledge-seeking and performance. Those lower in rank are likely to experience a positive relationship between explicit knowledge-seeking and performance but unclear benefits from tacit knowledge-seeking.

3. Research design and sample

3.1 Research Design

We use model (1) to test for the association between an auditor’s knowledge-seeking network and auditor performance:

$$\begin{aligned}
 AUDITOR_PERFORMANCE = & \beta_0 + \beta_1 KNOWLEDGE_SEEKING_VARIABLES \\
 & + \beta_2 OFFICE + \beta_3 RANK + \beta_4 GENDER \\
 & + \beta_5 PROFESSIONAL_ID + \beta_6 PAST_FORMAL_PERFORMANCE \quad (1)
 \end{aligned}$$

Our research question seeks to identify factors from the knowledge-seeking network that are associated with individual auditor job performance. As a result, while our independent variables are derived from the knowledge networks (general, tacit, explicit), all the measures presented in this section are measured at the individual auditor level.

3.1.1 Auditor Performance

To determine *AUDITOR_PERFORMANCE*, we first identified employees with supervisory responsibilities who should be familiar with an auditor’s performance. Early in our survey we asked respondents to “Please check the boxes next to the names of all the employees you have supervised over the last twelve months. (People for whom you completed an evaluation

form.)” We later asked those with supervisory responsibilities to rate all previously identified subordinates with the following instructions: “There are a number of ways to think about how well an employee is doing at his or her job. We’d like you to think about how well each of the employees you supervise: 1) fulfills the responsibilities specified in their job descriptions, 2) shows genuine concern and courtesy toward coworkers, even under the most trying situations, and 3) takes action to protect the organization from potential problems.” Supervisors rated subordinates on a 0-100 scale. For subordinates with multiple supervisors, we used the average supervisory rating of performance.

Our method for identifying supervisors and evaluating performance has several advantages. First, unlike a full 360-degree evaluation, we did not have peers rate a given auditor ensuring (via our qualifying question) that all our raters were ‘experts’ with the access and ability to conduct such an evaluation. Second, given the difficulties associated with accessing this population, we needed to use a single-item measure of performance that captures all elements of job performance to minimize the burden on the respondent and ensure high-quality data. Finally, most employees had multiple supervisors and on average employee performance evaluation using our instrument included feedback from 4 supervisors (ranging from 1 to 13). This is important given our knowledge of the biases and varying levels of competency found among performance raters (Pulakos & O’Leary, 2011; Bernardin, Thomason, Buckley, & Kane, 2016). We obtained performance evaluations for 51 auditors who participated in our study.⁹

Given that our measure is novel in the accounting literature, we also examined the construct, external criterion, and internal criterion validity of our performance measure. In terms of construct validity, the three dimensions that are included in our single-item measure tap into

⁹ Performance measures are not available for the partners in the sample.

the three core elements of employee performance: job performance, behaviors outside of formal responsibilities designed to help coworkers, and behaviors outside of formal job responsibilities designed to help the firm. The distinction between in-role and extra-role behavior is well established in the organizational literature (Katz, 1964), a series of studies distinguished task from extra-role behaviors (O'Reilly & Chatman, 1986) and extra-role behaviors directed at the organization from those directed at coworkers (Williams & Anderson, 1991). All three elements of employee performance are important for organizational functioning with extra-role behaviors crucial for efficiency and effectiveness (Organ, 1988). We also have reason to believe that all three elements of performance are crucial in an audit setting where auditors complete the work assigned to them by their supervisor (fulfills the responsibilities specified in their job descriptions); assist other members of the audit team with gathering documentation, completing tasks and increasing efficiency (shows genuine concern and courtesy toward coworkers, even under the most trying situations); and report concerns and potential issues about the audit to their supervisors on the audit team (takes action to protect the organization from potential problems). Further, given that many audits are conducted in teams, an outcome-driven measure such as audit quality might not clearly represent the performance of a specific team member. As such, we adopt a more process-driven approach to performance that allows a rater to evaluate the overall performance of an individual auditor. Evidence for criterion validity for such measures (in general) can be found in a study comparing immediate supervisor ratings with objective assessment center ratings of performance (Atkins & Wood, 2002). The authors find that, when compared to objective data, supervisor ratings are a valid measure of actual performance. Finally, while we were unable to obtain concurrent formal performance evaluations alongside our measure, the firm gave us access to formal evaluations from the previous audit cycle. As can

be seen in Table 2, there is a modest and significant correlation between the firm-supplied measure of *PAST_FORMAL_PERFORMANCE* and *AUDITOR_PERFORMANCE* ($b = .45, p = .001$)¹⁰. This finding suggests that our measure has sufficient internal criterion validity to serve as a strong representation of an auditor's actual performance at the time of data collection.

3.1.2 Knowledge-Seeking Network

The variable of interest in equation (1) is the *KNOWLEDGE_SEEKING_VARIABLES* which represents several items derived from the general knowledge-seeking network, tacit knowledge-seeking network, and explicit knowledge-seeking network.

Our participants first indicated to whom they turn for audit related knowledge and advice. *KNOWLEDGE_SEEKING_TIES* is equal to the number of people the auditor in question identified they seek out for auditing related knowledge. We then followed up with questions on the extent to which the knowledge sought is tacit or explicit. For the purposes of our survey, we define tacit knowledge as "Practical know-how (that) includes tricks of the trade and insights gained from experience, such as suggestions about how to approach unique challenges or issues." We asked employees to indicate on a 1-5 scale ranging from strongly disagree to strongly agree, the extent to which they mainly used their knowledge-seeking tie for these purposes. We retain responses of greater than or equal to 4 ("Agree") to construct the tacit knowledge-seeking network. The total number of people that received a 4 or 5 from a given auditor were counted as our measure of *TACIT_KNOWLEDGE_SEEKING_TIES*. We define

¹⁰ Two factors lead us to believe this is an appropriate correlation to suggest that our measure and the formal measure are assessing the same underlying variable. First, employee performance is not static. In a study of the importance of psychological capital for job performance over time, the authors reported correlations among subjective performance ratings over three time points varying from .51-.60 and correlations among objective (sales) performance ranging from .08-.23 (Peterson, Luthans, Avolio, Walumbwa, & Zhang, 2011) The improvements and setbacks of an individual employee between the time of the formal evaluation and our evaluation therefore limit the correlation between the measures. Second, our measure of performance has a much wider range (0-100) than the formal evaluation tool (0-3) which also increases the difficulty of finding a stronger correlation.

explicit knowledge as “Common knowledge includes everything that is not practical know-how, including proper accounting procedures, proper audit procedures, interpretations of standards, etc.” and repeat the process outlined above to establish the explicit knowledge-seeking network, with the count of others indicated as sought for explicit knowledge as an auditor’s *EXPLICIT_KNOWLEDGE_SEEKING_TIES*.

Finally, to test the role of auditor characteristics in shaping the relationship between knowledge-seeking and individual performance we construct two additional terms for our analyses. After mean-centering our tacit and explicit knowledge-seeking tie measures and our measure of rank, we interact these variables in order to create our interaction terms of *TACIT*RANK* and *EXPLICIT*RANK*.

We include five control variables in our analysis, *OFFICE*, *GENDER*, *RANK*, *PROFESSIONAL_ID*, and *PAST_FORMAL_PERFORMANCE*. We include *OFFICE* which is an indicator variable equal to 1 and 2, each indicating the two locations in the sample. *GENDER* is an indicator variable equal to 1 for females, 0 otherwise and *RANK* is an ordinal variable equal to the rank of the auditor, ranging from 1 (staff) to 6 (Partner). *PROFESSIONAL_ID* is measured following Bamber & Iyer’s (2002) process of adapting the organizational identification scale of Mael & Ashforth (1992). Items include: “I am very interested in what others think about my profession”, “When I talk about my profession, I usually say “We” rather than “They”, “My profession’s successes are my successes”, “When someone criticizes my profession, it feels like a personal insult”, and “When someone praises my profession, it feels like a personal compliment.” The five professional identification items load to one factor which explained 62.7% of the variance, with factor loadings ranging from .67 to .88. The Cronbach’s alpha (1951,

1988) is .85. *PAST_FORMAL_PERFORMANCE* is a proprietary performance measure used by the firm that contains four levels.

These variables are important controls given the relevance of each to potentially influence both social network structure as well as employee performance. Specifically, studies have shown the effects of gender in employee performance management (Greenhaus & Parasuraman, 1993) and in perceptions related to network position (Brands & Kilduff, 2013) and of the ability to attain certain network positions (Ibarra, 1992). *RANK* is specific to our context since in an auditing firm such as ours with a clear and strong hierarchy, those of a lower rank might seek more advice, and those of a higher rank might receive stronger performance evaluations. *OFFICE* is another context-driven control variable since one office is considerably smaller than the other, limiting knowledge-seeking options and creating a smaller set of performance evaluators. Prior research generally shows the importance of *PROFESSIONAL_ID* in the workplace (Russo, 1998) and it has been suggested to specifically be an antecedent to audit effectiveness (Bamber & Iyer, 2002) and might influence the propensity to form network ties. Finally, *PAST_FORMAL_PERFORMANCE* is a crucial control variable as it likely affects current performance and may influence the creation of knowledge-seeking ties (i.e. past poor performers may develop more knowledge-seeking ties in an attempt to improve before the next evaluation).

See Appendix A for additional discussion of our variables of interest related to equation (1) and a broader discussion of them in a social network context. Equation (1) is tested using standard hierarchical ordinary least squares (OLS) regression. Since OLS regression carries many assumptions and is not robust against multicollinearity, we carefully monitor

multicollinearity by measuring the variance inflation factors (VIFs) in each model and report no VIFs over a value of 2.6.

3.2 Sample

We use both proprietary archival and survey data in our study. Our data were collected from two offices of a “Big Four” accounting firm located in the Southeastern United States. The human resources department provided employee demographic data including employee age, gender, race, starting date with the firm, and rank. The subset of employees sampled were solely from the audit department. Of the 81 employees surveyed, 53 completed the survey for a response rate of 65 percent.¹¹ Table 1, panel A presents summary characteristics of auditors in the sample. The average (median) age of auditors is 30 (28) years old, 49 percent are women, and 83 percent are in the larger office. Average (median) tenure with the audit firm is 81 (55) months, ranging from less than one year to almost 40 years suggesting a good representation of experiences. Average level of professional identification (on a 5-point scale) is 3.77 (4) and average formal performance in the past audit cycle is 1.63 (2) on a 0-3 scale. The auditors surveyed varied in rank from entry level associates to partners. Panel B shows the frequency distribution by rank. Lower level staff (staff and staff-in-charge) make up about 46 percent of the sample, while senior managers and partners represent about 13 percent. Panel C shows the frequency distribution of auditors by university attended. Most auditors, about 67 percent, attended one of 3 universities, with the remaining auditors attending 14 other universities.

4. Results

¹¹ Respondents and non-respondents did not differ significantly in terms of auditor performance, past formal performance, office, rank, age, gender, or race. Respondents and non-respondents also did not differ in terms of how frequently they were noted as someone who was given knowledge (assessed via a separate network question). Given the strong correspondence between seeking knowledge and being given knowledge, this suggests that non-respondents likely did not differ in terms of knowledge-seeking.

The full knowledge-seeking network used as the basis for our analysis together with auditor performance scores is provided in Figure 3. In this figure, lines represent the knowledge tie between any 2 auditors, while arrows denote the direction of ties (i.e., incoming arrow indicates the auditor that is sought out for knowledge). Circles (squares) represent women (men), while the size of the circles and squares represents rank such that larger circles are higher ranking members of the firm. One thing to notice from the figure is that larger circles (squares) have more incoming arrows than smaller circles (squares), suggesting that individuals that are sought for knowledge are those with the most experience. All matrices and network variables were constructed using UCINET VI (Borgatti, Everett, & Freeman, 2002).

4.1 Auditor knowledge-seeking networks and auditor job performance

Table 2, panel A reports descriptive statistics for variables of interest and Panel B reports correlations among the variables in equation (1). Mean (median) performance evaluations (*AUDITOR_PERFORMANCE*) on our 100-point scale is 83.12 (83.5) with a 9.51 standard deviation, minimum of 50, and maximum of 98.5, suggesting reasonable variation for job performance. We note that each auditor seeks knowledge from approximately 6 other auditors. Panel B presents correlation coefficients between variables. We note the negative and significant correlation between auditor performance, and knowledge-seeking ties, and explicit knowledge-seeking ties and a positive correlation with rank.

The results from estimating equation (1) using OLS, which tests our predictions, are presented in Table 3. In terms of our control variables it appears that past performance is positively related to supervisor evaluation while professional identification is insignificant. This may suggest that while identifying with the profession may create the desire to perform well, this desire is insufficient to drive actual performance. We conjectured that the sheer volume of

knowledge-seeking ties that an auditor possesses would influence performance, but we were unsure whether these ties would help or hinder job performance. We find that having many knowledge-seeking ties is negatively associated with job performance (*KNOWLEDGE_SEEKING_TIES*, $\beta = -0.248$, $p = .097$). Turning to the content of these ties, we suggest that explicit-knowledge ties may hinder performance while tacit-knowledge ties may yield performance advantages. We control for total knowledge-seeking ties in model (2) in order to disentangle the potential effects of specific kinds of knowledge-seeking from the overall propensity to seek knowledge.¹² While our findings support the expected negative effect of explicit knowledge-seeking (*EXPLICIT_KNOWLEDGE_SEEKING_TIES*, $\beta = -0.387$, $p = .011$), tacit knowledge-seeking ties were not a significant predictor of auditor performance. It is noteworthy that the effect of the overall number of knowledge-seeking ties is no longer significant once we account for the use of those ties. This suggests that it is the content and not the volume of ties that shape the negative effect.

In order to better understand the insignificant association between tacit knowledge-seeking ties and auditor performance, we next explore the effects of tacit knowledge-seeking ties to others at various ranks in the organization. While a greater understanding of what is being transmitted through knowledge-seeking ties is important, volumes of research leveraging human capital approaches have demonstrated that not all sources of knowledge are equal. Recent work within social network analysis has received renewed interest as it embraces the idea that ties to some individuals will be more (or less) beneficial than ties to others (e.g., Grosser, Venkataramani, & Labianca, 2017). Given the well-documented role of both general mental ability (Hunter, 1986; Kallunki et al. 2019) and experience (Schmidt, Hunter, & Outerbridge,

¹² The results remain qualitatively similar when we remove *KNOWLEDGE_SEEKING_TIES* from model (2).

1986; Bonner, 1990) in the development of knowledge, we focus on coworker rank as a likely signal of knowledge and subsequent influence on the value of a given tie. To examine whether the rank of the knowledge giver matters we first group auditors into three categories by rank: *staff* (staff, staff-in-charge, and seniors), *managers* (manager), and *leadership* (senior manager and partner). We then count the number of tacit knowledge-seeking ties from an auditor to members of each group in order to create *TACIT_KNOWLEDGE_SEEKING_TO_STAFF*, *-MANAGERS*, and *-LEADERSHIP* and examine how the number of ties to each group is associated with performance.

The results of this analysis are shown in Table 4. Tacit knowledge seeking to lower-level staff is not significantly associated with auditor performance. However, seeking tacit knowledge from managers is significantly and positively associated with auditor performance (*TACIT_KNOWLEDGE_SEEKING_TO_MANAGERS*, $\beta = 0.476$, $p = .012$) whereas seeking knowledge from senior managers or partners is significantly and negatively related to auditor performance (*TACIT_KNOWLEDGE_SEEKING_TO_LEADERSHIP*, $\beta = -0.589$, $p = .001$). The results regarding tacit knowledge-seeking ties to managers are consistent with managers acting as knowledge depositories. Managers are in charge of the daily execution of audit tasks, supervision, assignment of staff, and mentoring; thus, managers are likely to be very knowledgeable and also very accessible to staff (Maister, 1982; Contesotto et al., 2019), who may find it easier and less costly to approach managers for tacit knowledge.

Conversely, the result that tacit knowledge-seeking ties to leadership are detrimental to performance is surprising, since partners and senior managers are likely to possess significant tacit knowledge due to their long experience in the profession. To understand what is driving this result, we examine whether the rank of the knowledge seeker relative to the knowledge giver

matters. While we did not have statistical power to conduct substantial subgroup analysis to test hypotheses at the level of individual rank, we did perform two exploratory analyses. First, we examined who was seeking knowledge from leadership. Of the 37 observed tacit knowledge-seeking ties to leadership, the majority were coming from the specific ranks of seniors (16) or managers (12) and the remaining ties are from staff or staff-in-charge (9). Second, since seniors represent a large portion of our sample ($n = 18$) we correlated the number of tacit knowledge-seeking ties to leadership from seniors with our measure of job performance. We find that the negative result of tacit-knowledge seeking to leadership is driven by seniors ($r = -.51, p = .045$). While highly tentative, this finding supports two potential explanations. First, that there may be negative reputational effects for lower-ranked auditors when seeking knowledge from leadership. Second, that some auditors may be better (or worse) equipped to process and leverage tacit knowledge than others. Lower-ranked auditors may not possess the broader view and experience needed to effectively interpret and apply tacit knowledge they receive from higher levels of leadership. For instance, the type of tacit knowledge received by a senior from leadership might be good for long term career advancement but may not be relevant or able to be properly utilized within the current job. However, we emphasize that given the small number of observations in each rank, readers should exercise caution when interpreting these results.

For our final analysis examining whether seeking explicit or tacit knowledge depends on the rank of the knowledge-seeker, we expect significant interactions between network position and formal rank such that tacit knowledge-seeking will be beneficial to those of higher rank and less impactful for those auditors at the lower ranks of the firm. As can be seen in Table 5, panel A, *RANK* and its interaction with tacit knowledge-seeking are not statistically significant and so this prediction is not supported in our data. We also expect that explicit knowledge-seeking

would be detrimental for those at a higher rank and beneficial for those at lower ranks. The interaction term of explicit knowledge-seeking and rank shown in panel B is significant ($EXPLICIT * RANK$, $\beta = -0.262$, $p = .062$). The nature of this interaction is plotted in Figure 4. Inspection of this interaction, along with simple slope analysis, confirmed that explicit knowledge-seeking is indeed harmful to performance for those at higher levels of the firm but is inconsequential for performance for those at the lower ranks. Our finding surrounding the particularly negative effects of explicit knowledge-seeking for those higher in the organizational hierarchy is consistent with the idea that there is a reputation loss that comes from certain kinds of knowledge-seeking by auditors of certain ranks. Overall, our results indicate that knowledge-seeking is detrimental when it becomes excessive and inefficient, is used to obtain information readily available elsewhere, is being sought from leadership by auditors at lower ranks, or is being sought by auditors who should not need it, given the experience and knowledge assumed to accompany their higher formal positions.

5. Discussion and Conclusion

The purpose of this paper is to better understand how social capital accrued from knowledge-seeking networks affects individual auditor performance. We utilize social network analysis to execute our analysis because it exploits the dyadic connections that form within organizations and are the smallest unit of measure relevant to the seeking and giving of knowledge. Our documented results provide evidence that characteristics of the knowledge network are related to auditor performance. We initially find that excessive knowledge-seeking is negatively related to auditor performance, but when splitting the knowledge ties into explicit and tacit types and accounting for the rank of the auditor seeking knowledge, we find that the negative association is driven by higher-ranked auditors seeking explicit knowledge. The idea

that some types of connections can be helpful for some elements of the job while others could hinder overall job performance certainly warrants further consideration and future study.

We also find that audit-related tacit knowledge-seeking ties to managers have a significant and positive effect on auditor performance, which corresponds to findings in previous research that tacit knowledge is an important differentiator in audit quality (Tan & Libby, 1997). However, tacit knowledge-seeking ties to leadership are detrimental, bolstering the suggestion laid out in the introduction that the hierarchical nature of audit teams affects their communication structure. Our additional tests, although highly exploratory, given their correlational nature and the small sample used in the sub-analysis, are consistent with the notion that seeking tacit knowledge from coworkers at higher levels appears to carry reputational costs for lower level auditors, or, alternatively, that lower-level auditors may not possess the experience and/or deep client-specific knowledge to effectively interpret and apply tacit knowledge received from leadership. A follow-up study could be designed to explore both the seeking and acquisition of different types of audit-related tacit knowledge from a variety of sources (in larger numbers) to better learn which types are obtainable via social ties and beneficial for performance.

While some of our findings are aligned with past research in social network analysis while others are divergent, we further the call for greater focus on the context within which networks research is taking place, to better understand the unanticipated effects of a given environment on social networks (Emirbayer & Goodwin, 1994; Kilduff & Brass, 2010). Replicating our study in a setting with different institutional and/or professional norms might yield a different pattern of results. Similarly, shifting focus to different actors in the audit setting (such as restricting the sample to higher ranks) or changing the nature of knowledge (exploring only managerial tacit knowledge) may illuminate other ways in which networks impact

individual performance and/or audit quality. We are hopeful that our context-focused approach to theorizing is adopted in future networks research both inside and out of the audit setting.

A potential caution when interpreting our results pertains to the possibility of reverse causality – that poorer performers seek more knowledge. Faced with (relatively) low performance, an auditor may choose to reach out to others for advice. This process may, in turn, further expose performance deficiencies, thus reducing future formal performance evaluations, for which there is some evidence of influence on social capital (Parker, Halgin, & Borgatti, 2016). To reduce these concerns, we control for past performance in all our analyses. Further, correlations between our variables reveal no significant associations between past performance and any of our network variables. Still, future research could explore these questions more explicitly by following new auditors as they enter a firm and examining if knowledge-seeking hinders performance, if knowledge-seeking is a response to poor performance, or if it is a spiraling effect where the two feed off of each other.

We acknowledge that our measure of auditor performance could be viewed as a limitation. By aggregating the three common facets of employee performance (task, organizational helping behaviors, and interpersonal helping behaviors), we are unable to explore the unique effects of knowledge-seeking on each facet. Also, while we were able to obtain past formal performance, we were unable to access formal performance evaluations for the period after our study, nor were we able to obtain a detailed performance evaluation instrument in order to determine what specific criteria the firm used in its evaluations. Future research should explore the role of knowledge-seeking on auditor performance including informal task and contextual performance, formal performance evaluations, and objective measures at the individual and team-level. Finally, our analyses used a small sample limited to two offices of a

Big 4 firm which may limit the generalizability of the results. We welcome replication of our study in larger settings or within specific segments of an audit firm (i.e. an exploration of the role of knowledge seeking among managers).

Our findings may assist researchers to better understand how auditors learn, which in turn directly affects audit efficiency and effectiveness. Moreover, audit firms might benefit from better understanding the consequences of various forms of seeking knowledge from different sources and use this understanding to make decisions that maximize desirable information flows. Our results suggest that managers are especially important to information flow. Finally, by better understanding how knowledge is shared within audit firms, regulators like the AICPA and PCAOB may gain insight into how to better evaluate the audit and review processes within firms.

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Appendix A

Discussion of Equation 1 from a Social Network Perspective

AUDITOR_PERFORMANCE. In order to measure auditor performance we asked each supervisor to rate all subordinates on a 0-100 scale in response to the following question: “There are a number of ways to think about how well an employee is doing at his or her job. We'd like you to think about how well each of the employees you supervise: 1) fulfills the responsibilities specified in their job descriptions 2) shows genuine concern and courtesy toward coworkers, even under the most trying situations, and 3) takes action to protect the organization from potential problems.” For employees with multiple supervisors, we took the average rating as our measure of auditor performance.

KNOWLEDGE_SEEKING_TIES. To calculate a measure of knowledge-seeking ties (also known as degree or out-degree centrality) we simply took the row sums of the knowledge-seeking network such that employees who reported seeking out many others for audit related advice and knowledge received higher scores and those who did not report as many outgoing ties received lower scores. Even though we had non-respondents, those employees were included in the calculation of centrality since even though they did not complete the survey there could still be benefits to employees seeking their knowledge. For instance, if an auditor reported seeking knowledge from 8 of their colleagues, but these happened to be employees who did not complete the survey, it would be misleading to report that the auditor sought no knowledge from coworkers.

TACIT_KNOWLEDGE_SEEKING_TIES. To calculate a measure of knowledge-seeking ties that were used to obtain tacit knowledge we examined a subnetwork derived from our primary network. Specifically, we asked respondents “For each of the people listed below, to whom you have gone for audit-related advice or knowledge, please rate your level of agreement with the following statement: The knowledge that I received from this person was mainly practical know-how or tricks of the trade.” They were then given a 1-5 scale ranging from “strongly disagree” to “strongly agree”. Since the values “4” and “5” represented “Agree” and “Strongly Agree” with the question, we recoded these responses as “1”s indicating a tacit knowledge-seeking tie.

EXPLICIT_KNOWLEDGE_SEEKING_TIES. The same procedure as above was used to calculate knowledge-seeking ties that were used to obtain explicit knowledge except the following prompt was used: “For each of the people listed below, to whom you have gone for work-related advice or knowledge, please rate your level of agreement with the following statement: The knowledge I received from this person was mainly about common knowledge.”

TACIT_KNOWLEDGE_SEEKING_TIES_TO_STAFF/MANAGERS/LEADERSHIP. To measure the number of tacit knowledge-seeking ties to employees at various levels of the firm, we first recoded employee rank such that a 1, 2, or 3 was recoded to a dummy variable indicating *STAFF*, a 4 was recoded as a dummy variable indicating *MANAGER*, and 5 or 6 was recoded as a dummy variable indicating *LEADERSHIP*. We utilized cellwise multiplication of the tacit knowledge seeking network and a dummy matrix where a “1” indicated the auditor was at the target level and a “0” otherwise. We then summed the rows of each of these three new matrices to isolate the number of ties to others at a given level of the firm.¹³

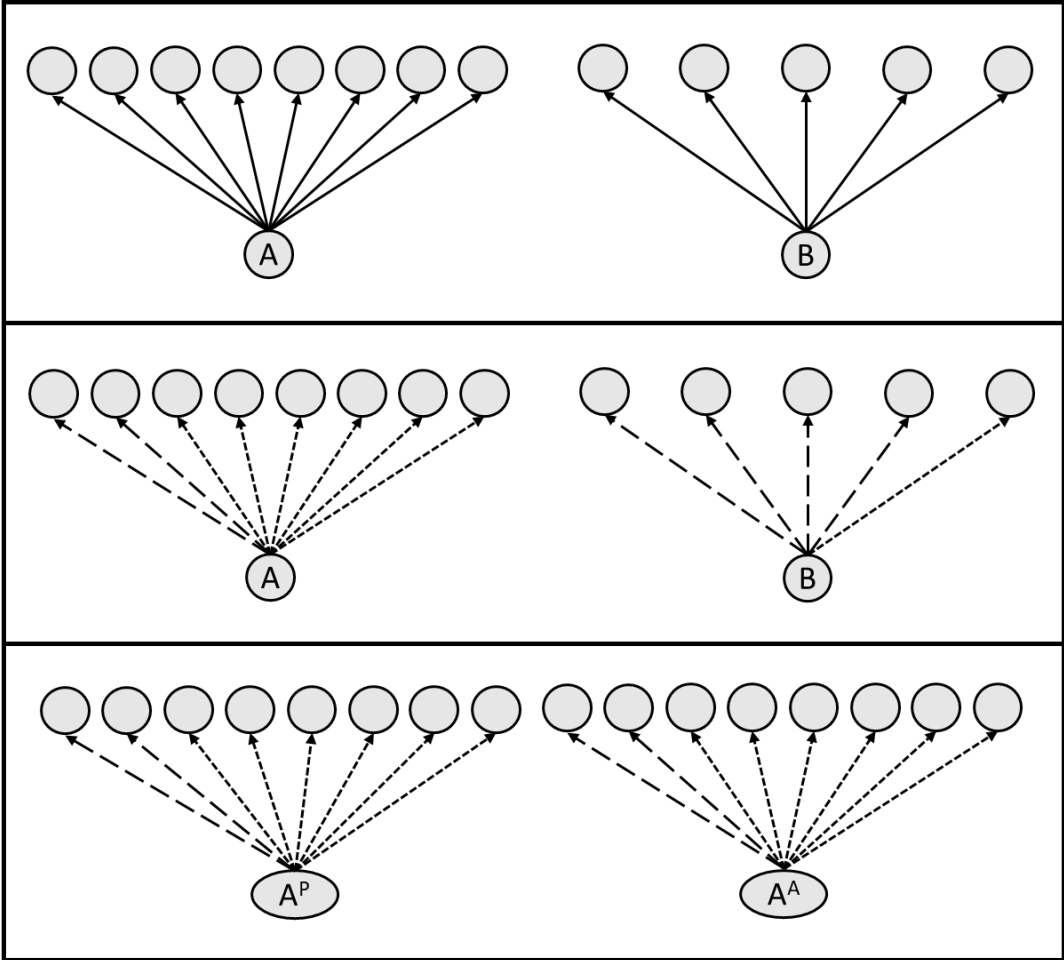
¹³ Full details and procedures used to create any of the networks are available upon request.

Study Variable	Description
<i>AUDITOR_PERFORMANCE</i>	Informal performance evaluation of a given auditor performed by supervisor(s) at the time of the survey.
<i>KNOWLEDGE_SEEKING_TIES</i>	The number of other coworkers an auditor went to for knowledge.
<i>TACIT_KNOWLEDGE_SEEKING_TIES</i>	The number of knowledge-seeking ties that were used for accessing tacit knowledge.
<i>EXPLICIT_KNOWLEDGE_SEEKING_TIES</i>	The number of knowledge-seeking ties that were used for accessing explicit knowledge.
<i>TACIT_KNOWLEDGE_SEEKING_TIES_TO_STAFF/MANAGERS/LEADERSHIP</i>	The number of tacit knowledge-seeking ties to coworkers at a given level of the firm.
<i>OFFICE</i>	Indicator variable equal to 1 and 2, each indicating the two office locations in the sample.
<i>RANK</i>	An ordinal variable equal to the rank of the auditor and ranging from 1 (staff) to 6 (partner).
<i>GENDER</i>	Indicator variable equal to 1 for females and 0 for males.
<i>PROFESSIONAL_ID</i>	Measured as the factor loading of five professional identification items based on Bamber & Iyer (2002).
<i>PAST_FORMAL_PRFORMANCE</i>	Formal performance measure for auditors in the sample obtained from the audit firm and ranging from 0 to 3.
<i>TACITxRANK</i>	The product of employee rank (standardized) and tacit knowledge-seeking ties (standardized).
<i>EXPLICITxRANK</i>	The product of employee rank (standardized) and explicit knowledge-seeking ties (standardized).

Figure 1 – A Typology of Auditor Knowledge Literature

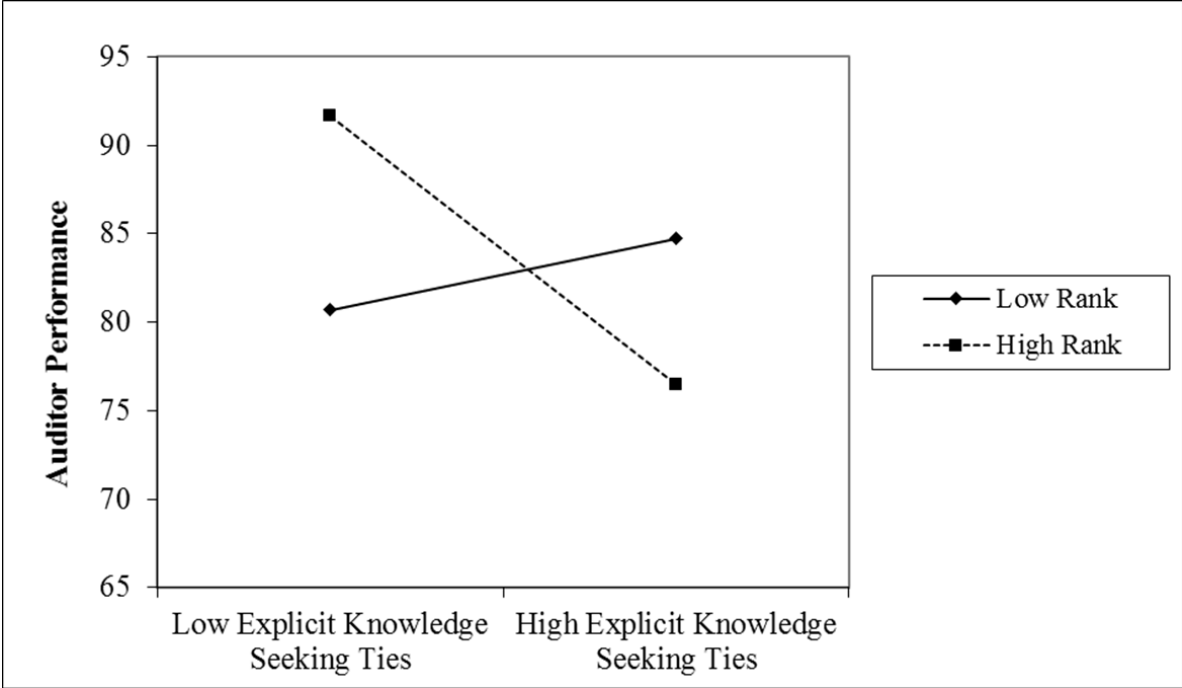
	General Knowledge	Specific Knowledge
Human Capital	Kallunki, J., J. P. Kallunki, L. Niemi, & H. Nilsson (2019).	Bonner & Lewis (1990) Tan & Libby (1997) Solomon, I., M.D. Shields, & O.R. Whittington (1999) Owhoso, V.E., W.F. Messier, & J.G. Lynch (2002) Bol, J.C., C. Estep, F. Moers, & M.E. Peecher (2018). Contesotto, C., W.R. Knechel, & R.A. Moroney (2019)
Social Capital	Dirsmith & Covalleski (1985) Danos, P., J. Eichenseher, & D. Holt (1989) Chow, C.W., J.L. Ho, & S.C. Vera-Munoz (2008) Bobek, D.D., B.E. Daugherty, & R.R. Radke (2012) Westermann, B.D., J. C. Bedard, & C.E. Early (2015) Bianchi, P. A. (2018).	Trotman (1985) Trotman & Yetton (1985) Ramsay (1994) Asare & McDaniel (1996) Kennedy, J., D.N. Kleinmuntz, & M. E. Peecher (1997) Kadous, K., J. Leiby, & M.E. Peecher (2013) (Current Study)

Figure 2 – Sample Knowledge Networks



(A) = auditor (unspecified) —————> = knowledge seeking (unspecified)
 (A^P) = auditor (partner) - - - - -> = tacit knowledge seeking
 (A^A) = auditor (associate) ·······> = explicit knowledge seeking

Figure 4 – Interaction Plot for Auditor Rank and Explicit Knowledge-Seeking Ties



High and low categories were determined by using +/- one standard deviation.

Table 1
Summary Characteristics of Individual Auditors (N=53-59)

Panel A: Summary Characteristics of Individual Auditors

	<u>Mean</u>	<u>Median</u>	<u>StDev</u>	<u>Min</u>	<u>Max</u>
Age	30.20	28	7.27	18.96	61.88
Gender (Women)	0.49	0	0.5	0	1
Large Office	1.83	2	0.36	0	1
Tenure with the audit firm (months)	81.64	55	83.36	8	464.86
Professional Identification	3.77	4	0.76	1	5
Past Performance	1.63	2	1.01	0	3

Panel B: Frequency Distribution by RANK

	<u>Number</u>	<u>Percent</u>
Staff	10	17%
Staff-in-charge	17	29%
Senior	18	31%
Manager	6	10%
Senior Manager	5	8%
Partner	3	5%
Total	59	100%

Panel C: Frequency Distribution by University

	<u>Number</u>	<u>Percent</u>
University 1	26	45%
University 2	8	14%
University 3	5	8%
Other	19	33%
Total	58	100%

Note: There are a total of 17 universities

Table 2
Descriptive Statistics and Correlations for Variables of Interest (N=43-59)

Panel A: Summary Statistics

	<u>Mean</u>	<u>Median</u>	<u>StDev</u>	<u>Min</u>	<u>Max</u>
<i>AUDITOR_PERFORMANCE</i>	83.12	83.5	9.51	50	98.5
<i>KNOWLEDGE_SEEKING_TIES</i>	6.04	5	3.75	0	18
<i>TACIT_KNOWLEDGE_SEEKING_TIES</i>	3.03	2	3.11	0	11
<i>EXPLICIT_KNOWLEDGE_SEEKING_TIES</i>	1.2	0	2.25	0	12
<i>TACIT_KNOWLEDGE_SEEKING_TIES_TO_STAFF</i>	1.47	1	1.95	0	7
<i>TACIT_KNOWLEDGE_SEEKING_TIES_TO_MANAGERS</i>	0.49	0	0.79	0	2
<i>TACIT_KNOWLEDGE_SEEKING_TIES_TO_LEADERSHIP</i>	0.79	0	1.06	0	4

Panel B: Correlations

	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>
1. <i>AUDITOR_PERFORMANCE</i>											
2. <i>KNOWLEDGE_SEEKING_TIES</i>	-0.34										
3. <i>TACIT_KNOWLEDGE_SEEKING_TIES</i>	-0.15	0.35									
4. <i>EXPLICIT_KNOWLEDGE_SEEKING_TIES</i>	-0.36	0.26	0.28								
5. <i>TACIT_KNOWLEDGE_SEEKING_TIES_TO_STAFF</i>	-0.11	0.35	0.19	0.86							
6. <i>TACIT_KNOWLEDGE_SEEKING_TIES_TO_MANAGERS</i>	0.00	0.27	0.11	0.83	0.64						
7. <i>TACIT_KNOWLEDGE_SEEKING_TIES_TO_LEADERSHIP</i>	-0.22	0.15	0.45	0.52	0.08	0.41					
8. <i>OFFICE</i>	-0.09	0.17	-0.10	0.20	-0.08	-0.00	-0.06				
9. <i>RANK</i>	0.29	-0.24	-0.12	-0.02	-0.37	-0.11	0.42	-0.07			
10. <i>GENDER</i>	-0.14	-0.05	0.13	0.06	0.11	0.06	0.12	-0.19	-0.20		
11. <i>PROFESSIONAL_ID</i>	-0.05	0.25	0.24	0.19	0.15	0.14	0.23	-0.10	0.05	0.11	
12. <i>PAST_FORMAL_PERFORMANCE</i>	0.45	-0.17	-0.16	0.03	-0.22	-0.13	0.11	0.16	0.59	-0.07	0.02

All values greater than |0.279| are significant at the $p < 0.05$ level or greater. Variables are defined in Appendix A.

Table 3
Auditor Performance, Knowledge Ties, and Knowledge Type

$$AUDITOR_PERFORMANCE = \beta_0 + \beta_1 KNOWLEDGE_SEEKING_VARIABLES + \beta_2 OFFICE + \beta_3 RANK + \beta_4 GENDER + \beta_5 PROFESSIONAL_ID + \beta_6 PAST_FORMAL_PERFORMANCE + \varepsilon$$

Variable	Model 1		Model 2	
	<u>Coefficient</u>	<u>p-value</u>	<u>Coefficient</u>	<u>p-value</u>
<i>KNOWLEDGE_SEEKING_TIES</i>	-0.248	0.097	-0.201	0.167
<i>TACIT_KNOWLEDGE_SEEKING_TIES</i>			0.106	0.469
<i>EXPLICIT_KNOWLEDGE_SEEKING_TIES</i>			-0.387	0.011
<i>OFFICE</i>	-0.104	0.512	0.027	0.864
<i>RANK</i>	0.015	0.935	0.111	0.518
<i>GENDER</i>	-0.054	0.712	-0.008	0.956
<i>PROFESSIONAL_ID</i>	0.015	0.918	0.082	0.546
<i>PAST_FORMAL_PERFORMANCE</i>	0.463	0.012	0.429	0.014
N	43		43	
Adj. R2	0.202		0.299	

This table reports the estimation of equation (1) using a sample of 43 audit professionals from a Big 4 public accounting firm. *AUDITOR_PERFORMANCE* is the informal performance evaluation of a given auditor provided by the supervisor(s) at the time of survey ranging from 0 to 100. *KNOWLEDGE_SEEKING_TIES* is equal to the number of coworkers an auditor went to for audit knowledge and advice. *EXPLICIT_KNOWLEDGE_SEEKING_TIES* is equal to the number of coworkers an auditor went to for explicit knowledge. *TACIT_KNOWLEDGE_SEEKING_TIES* is equal to the number of coworkers an auditor went to for tacit knowledge. *OFFICE* is an indicator variable equal to 1 and 2, each indicating the two office locations in the sample. *RANK* is an ordinal variable equal to the rank of the auditor and ranging from 1 (staff) to 6 (partner). *GENDER* is an indicator variable equal to 1 for females and 0 for males. *PROFESSIONAL_ID* is measured as the factor loading of five professional identification items based on Bamber & Iyer (2002). *PAST_FORMAL_PERFORMANCE* is the formal performance measure for auditors in the sample obtained from the auditor firm and ranging from 0 to 3.

Table 4**Post-hoc Analysis: Auditor Performance, Tacit Knowledge, and Coworker Rank**

$$AUDITOR_PERFORMANCE = \beta_0 + \beta_1 KNOWLEDGE_SEEKING_VARIABLES + \beta_2 OFFICE + \beta_3 RANK + \beta_4 GENDER + \beta_5 PROFESSIONAL_ID + \beta_6 PAST_FORMAL_PERFORMANCE + \varepsilon$$

Variable	Coefficient	p-value
<i>KNOWLEDGE_SEEKING_TIES</i>	-0.193	0.151
<i>TACIT_KNOWLEDGE_SEEKING_TIES_TO_STAFF</i>	-0.155	0.395
<i>TACIT_KNOWLEDGE_SEEKING_TIES_TO_MANAGERS</i>	0.476	0.012
<i>TACIT_KNOWLEDGE_SEEKING_TIES_TO_LEADERSHIP</i>	-0.589	0.001
<i>OFFICE</i>	-0.108	0.442
<i>RANK</i>	0.383	0.050
<i>GENDER</i>	0.129	0.348
<i>PROFESSIONAL_ID</i>	0.075	0.551
<i>PAST_FORMAL_PERFORMANCE</i>	0.408	0.012
N	43	
Adj. R2	0.202	

This table reports the results of a post-hoc analysis testing for the association between auditor performance and the auditor's tacit knowledge-seeking ties to other auditors (coworkers) of different ranks. *AUDITOR_PERFORMANCE* is the informal performance evaluation of a given auditor provided by the supervisor(s) at the time of survey ranging from 0 to 100. *KNOWLEDGE_SEEKING_TIES* is equal to the number of coworkers an auditor went to for audit knowledge and advice. *TACIT_KNOWLEDGE_SEEKING_TIES_TO_STAFF/MANAGERS/LEADERSHIP* is equal to the number of staff, managers, and those in the leadership, respectively, an auditor went to for tacit audit knowledge. *OFFICE* is an indicator variable equal to 1 and 2, each indicating the two office locations in the sample. *RANK* is an ordinal variable equal to the rank of the auditor and ranging from 1 (staff) to 6 (partner). *GENDER* is an indicator variable equal to 1 for females and 0 for males. *PROFESSIONAL_ID* is measured as the factor loading of five professional identification items based on Bamber & Iyer (2002). *PAST_FORMAL_PERFORMANCE* is the formal performance measure for auditors in the sample obtained from the auditor firm and ranging from 0 to 3.

Table 5**Auditor Performance, Knowledge Type, and Auditor Rank**

$$AUDITOR_PERFORMANCE = \beta_0 + \beta_1 KNOWLEDGE_SEEKING_VARIABLES + \beta_2 OFFICE + \beta_3 RANK + \beta_4 GENDER + \beta_5 PROFESSIONAL_ID + \beta_6 PAST_FORMAL_PERFORMANCE + \varepsilon$$

Variable	Model 1		Model 2	
	<u>Coefficient</u>	<u>p-value</u>	<u>Coefficient</u>	<u>p-value</u>
<i>KNOWLEDGE_SEEKING_TIES</i>	-0.262	0.090	-0.121	0.384
<i>TACIT_KNOWLEDGE_SEEKING_TIES</i>	-0.126	0.465		
<i>TACITxRANK</i>	-0.265	0.144		
<i>EXPLICIT_KNOWLEDGE_SEEKING_TIES</i>			-0.315	0.026
<i>EXPLICITxRANK</i>			-0.262	0.062
<i>OFFICE</i>	-0.015	0.930	-0.014	0.923
<i>RANK</i>	0.008	0.963	0.060	0.716
<i>GENDER</i>	0.025	0.876	0.016	0.906
<i>PROFESSIONAL_ID</i>	0.036	0.804	0.057	0.666
<i>PAST_FORMAL_PERFORMANCE</i>	0.478	0.010	0.377	0.024
N	43		43	
Adj. R2	0.207		0.356	

This table shows the results of the analysis testing for an association between auditor performance, auditor rank and the type of knowledge sought (Explicit or Tacit). *AUDITOR_PERFORMANCE* is the informal performance evaluation of a given auditor provided by the supervisor(s) at the time of survey ranging from 0 to 100. *KNOWLEDGE_SEEKING_TIES* is equal to the number of coworkers an auditor went to for audit knowledge and advice. *EXPLICIT_KNOWLEDGE_SEEKING_TIES* is equal to the number of coworkers an auditor went to for explicit knowledge. *TACIT_KNOWLEDGE_SEEKING_TIES* is equal to the number of coworkers an auditor went to for tacit knowledge. *OFFICE* is an indicator variable equal to 1 and 2, each indicating the two office locations in the sample. *RANK* is an ordinal variable equal to the rank of the auditor and ranging from 1 (staff) to 6 (partner). *GENDER* is an indicator variable equal to 1 for females and 0 for males. *PROFESSIONAL_ID* is measured as the

factor loading of five professional identification items based on Bamber & Iyer (2002). *PAST_FORMAL_PERFORMANCE* is the formal performance measure for auditors in the sample obtained from the auditor firm and ranging from 0 to 3.