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#### Citation

LIM, Chee Yeow; SHEVLIN, Terry; WANG, Kun; and XU, Yanping. Tax knowledge diffusion through individual auditor network ties: Evidence from China. (2018). 1-57.

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**Tax knowledge diffusion through individual auditor network ties:  
Evidence from China**

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August 1, 2018

Acknowledgements.

We thank workshop participants at the Peking University, Remin University of China and Singapore Management University for their constructive comments. Lim acknowledges financial support from the School of Accountancy Research Center (SOAR) at Singapore Management University. Wang acknowledges financial support from the National Natural Science Foundation of China (Project 71372048). Shevlin acknowledges financial support from the Paul Merage School of Business at the University of California-Irvine.

# **Tax knowledge diffusion through individual auditor network ties: Evidence from China**

## **Abstract**

This study investigates whether network ties via sharing the same individual auditor influences the diffusion of tax avoidance knowledge. We find that firms with greater connection to low-tax firms through audit partners have lower effective tax rates (*ETRs*), consistent with tax avoidance knowledge being shared among firms through individual auditor network. The influence of audit network ties on tax avoidance at focal firms is stronger when partners' tenure in low-tax firms is longer, and when partners have social connection with the top executives of focal firms. In addition, audit fees of focal firms with auditor network ties to low-tax firms are significantly higher if their executives are not socially connected to partners, suggesting that audit partners benefit from sharing the tax avoidance knowledge with clients without social ties.

**Key words:** Network ties, audit partner, tax avoidance, school ties

**JEL codes:** G32, H26, M42

# **Tax knowledge diffusion through individual auditor network ties: Evidence from China**

## **I. INTRODUCTION**

Despite voluminous research providing explanations for cross-sectional variation in corporate tax avoidance (e.g. Rego 2003; Desai and Dharmapala 2006; Chen et al. 2010; Dyreng et al. 2010; McGuire et al. 2012, 2014; Hasan et al. 2014; Armstrong et al. 2012, 2015), there is limited evidence on how tax avoidance information is diffused among firms. One notable exception is Brown and Drake (2014). Using board interlocks as a proxy for network ties, they find that knowledge about tax-savings strategies and experience implementing these strategies are shared among firms via their director network ties. Our study focuses on tax avoidance in the context of social network ties formed by shared individual auditors among firms.<sup>1</sup> Specifically, we examine whether firms connected to low-tax firms through individual audit partner network ties, i.e., focal firms, increase their tax avoidance (i.e. achieve a lower effective tax rate).

Social structure affects economic outcomes through its effects on the flow of information among members of the system (Granovetter 2005). Connections obtained from social networks function as a conduit for the transfer of information and provide access to private information at relatively low costs. Prior literature suggests that social networks promote the diffusion of new ideas and thus influence corporate behavior (e.g. Cohen et al. 2008, 2010; Hochberg et al. 2007; Engelberg et al. 2012; Schmidt 2015; Chiu et al. 2013). Related to tax avoidance, Brown

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<sup>1</sup> As defined in Brown and Drake (2014, p. 483), social network ties refer to “the pattern of social relations, formal or informal, among members of a social system”. Following the literature, we do not distinguish tax avoidance (e.g., taking advantage of loopholes in tax laws, earning management) and illegal evasion (e.g., failing to report revenue or profit). We use ‘tax avoidance’ and ‘tax saving’ interchangeably in the paper.

(2011) finds that social ties via board interlocks and geographic peers influence the spread of a particular type of shelter use, namely adoption of corporate owned life insurance. Brown and Drake (2014) find that firms with greater board ties to low-tax firms are associated with more tax avoidance (i.e., lower Cash ETRs). Auditor network ties can facilitate information transfer among client portfolios due to information advantage (e.g., Aobdia 2015; Cai et al. 2016; Dhaliwal et al. 2016). We hypothesize that network ties of individual auditors to low-tax clients facilitate the learning and sharing of tax specific knowledge that can help other client firms to save taxes while providing auditing service.

Prior studies report evidence that auditors that provide tax services to their clients help client firms to avoid taxes, presumably because of the knowledge spillover from the audit services (e.g., Gleason and Mills 2011; McGuire et al. 2012; Klassen et al. 2016). Different from these studies, we examine the role of audit partner networks in diffusing tax-related information while providing auditing service to clients. Auditors accumulate a considerable amount of information about their clients through performing the audits and through formal or informal communications with senior executives and they generally contract with many companies, which allows auditors to be the information intermediary among their portfolios of clients. Recent studies provide evidence that audit firms can serve as conduits for the flow of information in mergers and acquisitions (Dhaliwal et al. 2016; Cai et al. 2016).

In this study, we focus on network ties among firms through sharing the same individual audit partner, rather than audit firm/office. This focus is because tax avoidance information is complex and implicit, and less likely to be transferred among individuals, even in the same audit office. We use the audit environment in China because the data on individual audit

partners are available for a long period. Moreover, the Chinese economy is generally based on social networks (*Guanxi*) and interpersonal relations, and less on arms lengths transactions than those in developed countries (Liu et al. 2011; Wong 2016). Hence, social connections between individual auditors and clients are more important in China than in other markets (Guan et al. 2016).

However, it is unclear whether auditor networks could help knowledge diffusion of tax avoidance. On the one hand, auditor network ties could be a channel through which clients receive knowledge on appropriate tax strategies. During the audit, audit partners have unique access to senior executives of their clients and acquire general information about a firm. Combined with information gathered during the conduct of financial reporting audits, the individual auditors will have a better understanding of the firms' tax saving strategies. Further, they may communicate with senior executive about the tax saving strategies which may be in the form of "soft talk" (Dhaliwal et al. 2016). Hence, individual auditors are well suited to spread tax planning strategies across firms, since they are connected to multiple firms and are likely aware of the tax strategies being implemented by clients. In addition, audit partners may spread tax-avoidance knowledge while auditing their clients to foster a good relationship with clients or earn higher audit fees. Anecdotal evidence suggests that firms may receive tax saving advices from their auditors. For example, legal court documents reveal that AEP initially considered corporate-owned life insurance shelter (COLI) at the suggestion of their auditor, Deloitte, Haskins and Sells (*AEP. Inc. v. U. S.*, 136 F. Supp. 2d 762). In China, auditors have the same incentive to share tax avoidance information to retain the clients due to the fierce

competition (Wei 2013).<sup>2</sup>

On the other hand, there are both litigation and reputation concerns that may prevent audit partners from sharing tax avoidance information with clients. First, the audit partners' contractual work is to provide audit service and audit opinions. They are not obligated to providing tax consulting to clients.<sup>3</sup> Second, tax avoidance strategies can be risky activities and could be challenged by tax authorities, thus exposing the partners to litigation risk (Stice 1991; Krishnan and Krishnan 1997; Rego and Wilson 2012). Third, being associated with tax avoidance could subject the audit partner to reputational costs. The media have recently reported many incidences of corporate tax avoidance by firms around the world, portraying the practice as highly controversial. By helping clients to avoid taxes, audit partners could expose themselves to negative publicity and media attention. If these concerns dominate, we will not observe the hypothesized relation. Hence, whether audit partner network ties to low-tax firms encourage or discourage client firms to implement tax avoidance strategies is an empirical question.

We define the individual audit partners that audit low-tax firms as connected partners. We find that firms with shared individual auditor network ties to low-tax firms report lower GAAP effective tax rates,<sup>4</sup> consistent with our hypothesis that audit partners help diffuse tax avoidance

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<sup>2</sup> Private conversations with 10 audit partners (2 from Big 4 and 3 from Top 10 (non-Big 4), and the remaining from other audit firms) reveal that audit partners from Big 4 will not discuss tax issues in general with clients unless they have some kind of personal connections. In contrast, audit partners from non-Big 4 firms are more forthcoming in sharing tax avoidance information with client firms to maintain good relation with clients.

<sup>3</sup> In addition, the AICPA Code of Professional Conduct (Section 301) states that "A member in public practice shall not disclose any confidential client information without the specific consent of the client". The CICPA has the same principles for auditors in China.

<sup>4</sup> Two common measures of effective tax rates are GAAP ETR and CASH ETR. In China, listed firms' cash flow statements do not provide the separate item for cash payment of income tax, but only report an aggregate number of cash payment for all taxes (including income taxes). Thus, we use GAAP ETR as our main measure for tax avoidance. In the robustness checks, we find similar results when we use an estimate of CASH ETR or other alternative measures of tax avoidance.

knowledge they gain from the low-tax firms to assist their clients in achieving greater levels of tax avoidance.

Auditors can help diffuse tax avoidance knowledge among clients in two stages: learning tax avoidance information from low-tax firms and then diffusing or transferring the information to focal firms. Hence, we explore whether the effect of partner network ties on tax avoidance at the focal firms varies with connected partners' *learning process* measured by partners' tenure with low-tax firms, and *transferring process* measured by the school ties between the connected partners and focal firms' top executives.<sup>5</sup> Longer tenure with low-tax firms allows the partners to better understand the tax avoidance strategies of clients. Social connection between connected partners and top executives may increase trust and the willingness to exchange information, which can affect the extent of knowledge diffusion among client portfolios and reduces apprehension about the veracity of the information being shared (Argote et al. 2003). Consistent with our expectation, we find that the effects of partner network ties on tax avoidance at focal firms are more pronounced when connected partners have longer tenure in low-tax firms and when connected partners have school ties with top executives at the focal firms.

We perform several tests to provide more insights to our main results. First, we conduct a change analysis to rule out the alternative explanation that partner-specific expertise rather than information diffusion from low-tax firms to focal firms drive our results. Specifically, we examine whether tax avoidance of focal firms changes in the year their existing audit partners started auditing a low-tax firm. Our results show that focal firms in the change sample have

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<sup>5</sup> This is consistent with prior studies (e.g., Cohen et al. 2008, 2010; Guan et al. 2016) who define the existence of social ties between audit partners and executives if they attended the same school.



significantly lower *ETRs* compared to the previous year, suggesting that audit partners bring *new* tax avoidance information from their low-tax firms to other clients. Second, we show that audit fees of focal firms with auditor network ties to low-tax firms are significantly higher if their executives are not connected to the partners, suggesting that audit partners could benefit from sharing the tax avoidance knowledge with non-socially connected clients. Third, we find that the effect of auditor partner network ties to low-tax firms on tax avoidance is attenuated in the subset of clients audited by Top 10 audit firms, consistent with the notion that Top 10 audit firms have more incentive to protect their reputation and less incentive to share tax avoidance information with clients. However, we still find greater tax avoidance for clients of Top 10 audit firms when connected partners have school ties with top executives at the focal firms.

We also conduct tests to address the concerns of endogeneity and measurement errors. We find that connections to high-tax firms by common audit partners do not affect focal firms' tax avoidance. This result alleviates the concerns that our results are mainly driven by selection bias. In addition, we find that the effect of partner networks to low-tax firms on tax avoidance exists independently of networks ties from common industry, geography, and board interlocks. Finally, our results are robust to four alternative measures of tax avoidance.

Our study is related to a concurrent study by Bianchi et al. (2016). Using partner data from Italy, Bianchi et al. (2016) find that audit partners develop knowledge and contacts through collaboration with audit partners of other audit firms. Such collaboration can be conduits of knowledge spillover which reduces the amount of taxes paid by their clients. Our study differs from Bianchi et al. (2016) in that we examine the accumulation and transfer of knowledge across different clients that engage the *same* partner for the audit works and our research design

allows us to identify the channels of information source about tax avoidance.

This study contributes to the literature in several ways. First, we extend prior work examining how knowledge of tax avoidance strategies disseminates across corporate social networks (Brown 2011; Brown and Drake 2014). We investigate the variation of corporate tax avoidance from the perspective of shared individual auditor network ties and provide novel evidence on the effect of such network ties on tax avoidance.

Second, this study contributes to general research on social ties. Current literature on social ties mostly focuses on the social ties arising from board interlocks and between board of directors and executives (e.g. Chiu et al. 2013; Hwang and Kim 2009, Krishnan et al. 2011). Brown and Drake (2014) proposed that one challenge for future research is “to investigate how interpersonal ties map into inter-organizational network phenomena” (p503). By examining the association between individual audit partner network ties and tax avoidance, our paper provides a new dimension of inter-firm network ties through shared auditors.

Third, we contribute to prior research relating to individual audit partners. Prior studies show that individual auditor characteristics influence audit outcomes (Gul et al. 2013; Lennox et al. 2014; Knechel et al. 2015; Aobdia et al. 2015; Li et al. 2017). We extend this line of enquiry by showing that individual audit partners also have an important bearing on tax avoidance of firms. Lastly, we provide new evidence that the effect of the network ties of audit partner is more pronounced when the partners and client executives have common school ties.

The remainder of the paper is organized as follows. Section II provides the institutional background in China, reviews the literature, and presents the research hypotheses. Section III describes the sample and research design. Section IV presents the main empirical results and

Section V report the results from the additional analyses. We conclude the paper in Section VI.

## **II. BACKGROUND, PRIOR LITERATURE AND HYPOTHESIS DEVELOPMENT**

### **Corporate taxation in China**

Before the economic reforms started in 1978, Chinese firms were mostly state-owned and hence non-independent entities. There was no corporate income tax in the central planning system. Starting from 1979, the Chinese government introduced a number of enterprise taxation reforms (Cai and Liu 2009). One of the most important reforms was enacted in 1994 when the government introduced the “Corporate Income Tax Code” that overhauled corporate taxation. Under the code, all domestic firms pay 33% corporate income tax, except for some preferential tax treatment for certain types of firms. In 2008, the government modified the corporate statutory tax rates. Under the new tax code, Chinese listed firms are generally subject to the same statutory tax rate of 25%.

The tax collection agencies were also reformed in 1994 as part of the introduction of “Corporate Income Tax Code.” After the reform, taxes are classified into central and local taxes, and a National Taxation bureau and provincial bureaus are responsible for collecting central taxes and local taxes separately. Both of them are under the supervision of the State Administration of Taxation. Corporate income tax is classified as a central tax and is collected by the National Taxation bureau and its branches in all provinces.

While most studies on tax avoidance focus on the U.S. market, tax avoidance is also prevalent in China.<sup>6</sup> Shevlin et al. (2012) find that Chinese listed firms shift income among

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<sup>6</sup> For example, the Chinese National Auditing Office uncovered 15.96 billion Chinese yuan or RMB as at October 2015 based on random investigation of selected firms in 6 provinces (<http://www.audit.gov.cn>). Fisman and Wei (2004) also reported pervasive tariff evasion in China.

consolidated group members to reduce taxes. Tang et al. (2017) find that the conflicts between central and local governments arising from the 2002 tax sharing reform have led to more tax avoidance by local government-controlled firms. Lin et al. (2017) find that ties to politicians by corporate boards of directors weaken the effectiveness of tax authorities in constraining tax avoidance in China. An important reason for the widespread tax avoidance activities in China is the weak enforcement of tax code and the difficulties encountered in collecting corporate tax, such as insufficient manpower in the collection agency to deal with the increasing number of firms, lack of training and skills in the collection agency to collect corporate income tax (Cai and Liu 2009). In addition, pervasive anecdotal evidence and cases suggest a huge demand for tax planning knowledge and that firms do pay close attention to tax saving strategies in China.<sup>7</sup>

### **Audit market in China**

The auditing market in China was established in the early 1980s. With the growth in the Chinese economy and stock market, the audit market in China has rapidly expanded. According to the Chinese Institute of Certified Public Accountants (CICPA), total audit fee revenues earned by the largest 100 audit firms in China are about RMB 58.4 billion in 2015, ranking the Chinese audit market among the major audit markets in the world. Another important feature of the Chinese audit market is that China's auditing standards require engagement auditors to sign the audit reports and this information is publicly available. Typically two engagement auditors sign each audit report with the more senior signing auditor mainly performing the review work and the relatively junior signing auditor mainly administering the fieldwork (Gul et al. 2013). An audit partner generally conducts several audit engagements during the year.

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<sup>7</sup> There are numerous books and training courses on tax planning that suggest various means to minimize corporate tax legally in China.

Unlike the U.S. market where the Big N audit firms have oligopolistic dominance, the Chinese audit market is less concentrated (Chen et al. 2010). The less concentrated market structure induces fierce competition among audit firms, which in turn creates pressure for audit partners to acquire and retain clients. Meanwhile, the number of listed companies in China is small relative to that of the audit firms qualified to audit them, such a buyer's market is likely to endow clients with more bargaining power and impose pressure on auditors fighting for their slice of the cake in the audit market (Chen et al. 2007; Chen et al. 2010). Beside the regular contractual auditing service, providing suggestions on tax avoidance is one important way for auditor to attract new clients or retain existing clients. In China, listed companies do not directly acquire tax consulting services from audit firms but they do rely on auditor's advice on tax strategies.<sup>8</sup> According to the news report, it is an "open secret" that auditors help their clients achieve better tax avoidance in China.<sup>9</sup>

### **Prior related literature**

Despite a large body of research on corporate tax avoidance, studies examining social connections between tax-avoiding firms is limited (Hanlon and Heitzman 2010). Building on theory related to the diffusion of innovations and institutional isomorphism,<sup>10</sup> Brown (2011) investigates the diffusion of aggressive corporate tax reporting among firms. She finds that network ties through board interlocks increase the likelihood of adopting a Corporate-Owned Life Insurance (COLI) tax shelter but the network ties via shared audit firm do not. Brown and

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<sup>8</sup> In our conversation with an audit partner, she shared with us an example of tax avoidance diffusion. She learned from one client that spending on IT system could be expensed for taxable income and shared this information immediately with other clients to help them lower their taxes.

<sup>9</sup> <http://finance.sina.com.cn/g/20050815/17581888261.shtml>

<sup>10</sup> Diffusion theory concerns the spread of innovations, where an innovation is not limited to an objectively "new" practice, but relates to any practice that is "new" to the firm considering its adoption.

Drake (2014) examine the spread (contagion) of tax savings strategies among firms through board interlocks and find that firms with greater board ties to low-tax firms have lower cash ETRs. Moreover, they find that sharing the same audit firm amplifies the effect of board ties to low-tax firms. Their evidence suggests that low-tax firms are privy to tax-specific knowledge or experience about tax saving strategies, and this knowledge and experience is shared via firms' social networks. Overall, prior studies suggest that the knowledge or experience about tax avoidance can be transferred via social ties among firms and shared intermediaries can serve as conduit for the flow of related knowledge or experience.

Prior studies have also examined the economic consequences of social network formed through shared audit firm. For example, Johnstone et al. (2014) study auditor sharing by suppliers and customers within a supply chain. They find that auditor sharing at the city level is associated with higher audit quality and lower audit fees for supplier companies. Cai et al. (2016) report that the combined M&A announcement returns is significantly higher for acquiring and target firms sharing the same audit firm, and that sharing a common audit firm reduces M&A uncertainty. Dhaliwal et al. (2016) find that sharing the same audit firm primarily benefits the acquiring firm in the form of higher acquirer announcement returns, lower deal premiums, and higher deal completion rates.

Auditors can influence corporate tax avoidance, even though they are not specifically contracted to provide tax consulting service to their clients.<sup>11</sup> Maydew and Shackelford (2007) suggest that public accounting firms are well positioned to provide corporate tax planning

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<sup>11</sup> In China, information on whether audit firms also provide tax consulting service to their auditing clients is not publicly available. However, our prediction does not rely on the amount of tax services provided to clients. The main thrust of the paper is that individual auditors who form part of network ties to low-tax firms can act as underlying conduits for the flow of tax avoidance strategies across clients.

because they possess a deep understanding of both the tax and financial reporting consequences of different avoidance strategies. McGuire et al. (2012) report evidence that either industry tax or overall expertise (both audit and tax) of external audit firms providing both audit and tax services are associated with greater tax avoidance for their clients. Their evidence suggests that the audit firms with tax or overall expertise help their clients to devise tax avoidance strategies that benefit the client firms.

In this study, we consider whether individual auditors act as tax planning intermediaries by facilitating both the implementation of tax strategies and the spread of tax planning strategies across client firms. Recently, researchers have been advocating for more research at the individual auditor level to better understand auditor behavior (e.g., DeFond and Zhang 2014; Lennox and Wu 2017). Auditing is inherently a judgmental decision-making process that is dependent on the abilities of partners who differ in their individual behaviors and attitudes (Ponemon and Gabhart 1990; Trompeter 1994; Ayers and Kaplan 2003). Consistent with this view, prior literature generally concludes that audit experience and industry expertise that determine audit quality resides at the individual auditor level rather than at the audit firm level (Gul et al. 2013; Zerni 2012; Goodwin and Wu 2014). Moreover, the auditing literature considers prior experience as the basis for auditor to acquire knowledge and develop expertise. Consistent with this “learning by doing” knowledge acquisition mode, Chen et al. (2014) find that individual auditors’ prior IPO auditing experience benefits the clients as reflected in higher audit quality during the IPO.

### **Hypothesis development**

Social connections can influence corporate behavior because they facilitate the diffusion

of new ideas or new practices and enable the connected firms to learn from each other's experiences (Haunschild 1993; Davis and Greve 1997; Brown and Drake 2014). Prior studies show that knowledge and experience about tax avoidance strategies can spread via social ties such as board interlocks, shared banks, and firms that are exposed to new tax avoidance practices through social connections could adopt the tax saving strategies after learning from the connected firms (Brown 2011; Brown and Drake 2014; Gallemore et al. 2017).<sup>12</sup>

We posit that shared individual auditors could promote the diffusion of knowledge or experiences about tax saving strategies for several reasons. First, as suggested by McGuire et al. (2012), auditors could benefit from knowledge spillover from audit to tax when they audit the clients. Auditors could acquire valuable knowledge when they audit low-tax clients, which are typically large and complex firms, capital intensive firms, and firms that face financial constraints (Dyreng et al. 2008; Wilson 2009; Edwards et al. 2016). Specifically, in conducting their audit work, individual auditors have frequent confidential communications with their clients' top management team and accumulate a considerable amount of private information about their clients, including client-specific tax saving strategies. Second, individual auditors are well suited to spread tax planning strategies across firms, because individual auditors contract with multiple companies. Prior research has shown that shared auditors facilitate the flow of information among the clients. For example, acting as useful information intermediaries, shared auditors can significantly reduce uncertainty throughout the M&A process (Cai et al. 2016; Dhaliwal et al. 2016). Aobdia (2015) documents that shared auditors

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<sup>12</sup> Gallemore et al. (2017) provide evidence that banks function as tax planning intermediaries. They find that bank clients experience significant tax reductions when they begin relationships with banks whose existing clients engage in greater tax planning.



transmit information among client portfolios that drives the similarities in their clients' decisions.

Finally, although auditors are limited on the services they can provide to audit clients for a fee, they have incentives to add value to their clients beyond the scope of the audit to retain existing clients and to build/keep a good relationship with them. One possible way for individual auditors to add value is to help clients to save taxes by using the tax-related experience or expertise they acquired from their other low-tax clients.

Therefore, based on the acquisition of client-specific tax-related strategies and the transfer of such information within auditors' client portfolios, it is reasonable to expect that shared individual auditors can act as conduits of tax avoidance diffusion among client firms. This incentive to provide tax avoidance strategies is likely amplified in the Chinese audit market because of the fierce competition (Chen et al. 2010). Hence, we state our first hypothesis in alternative form as follows:

*H1: Individual auditor network ties to low-tax firms are positively related to tax avoidance at the focal firm.*

Although we expect individual auditor network ties to low-tax firms to be positively related to tax avoidance at the focal firm, there are counter arguments against finding the hypothesized association. First, the audit partners are committed to provide audit services and opine on the quality of financial reporting, they are not obligated to provide consulting services on tax strategies. Second, tax strategies can be risky activities (Rego and Wilson 2012; Hasan et al. 2014) and audit partners can incur penalties and fines for helping clients with tax avoidance if challenged by the tax authority (Stice 1991; Krishnan and Krishnan 1997).

Aggressive tax avoidance has been shown to increase stock price crash risk (Kim et al. 2011) and news about a firm's involvement in tax shelters reduces stock price (Hanlon and Slemrod 2009). The potential loss in shareholders' wealth can also precipitate lawsuits against the auditor, thus increasing auditor litigation risk.

Third, being associated with tax avoidance could subject the audit partner to reputational costs. By helping clients to avoid taxes, audit partners could expose themselves to negative publicity and media attention. Hence, audit partners with network ties may want to preserve their reputation and deter their clients from aggressive tax avoidance strategies or require their clients to record higher tax reserves that could offset some of the potential benefits associated with tax avoidance strategies. Consequently, whether audit partners encourage or discourage client firms to implement tax avoidance strategies is an empirical question.

### **Learning process: the effect of partner tenure at low-tax firms**

In our primary analysis, we examine the role of individual audit partner network on tax avoidance information diffusion among partners' client portfolios. The precondition is that connected partners can learn tax avoidance knowledge from low-tax firms. Therefore, we next explore whether the effect of partner network on tax avoidance at the focal firms varies with connected partners' learning process.

The connected audit partners could "learn" tax-related strategies when they provide audit services to low-tax firms. Some of these can be applied quickly to other clients (e.g. some tax deduction policies), while others may take more time for auditors to fully understand (e.g. comprehensive or complex tax planning strategies). As learning theory in psychology (Lapre et al. 2000; Ritter and Schooler 2001) suggests, it takes time for an individual to acquire specific

knowledge. Consistent with this view, auditors experience a significant learning curve with new clients (Knapp 1991), and much of the knowledge acquired during an audit is client-specific (Kinney and McDaniel 1996). Over time, the partner becomes familiar with the client's business, nature of operations, and the accounting information system and learns more regarding the critical issues that necessitate specific attention (e.g., Knapp 1991; DeAngelo 1981; Carey and Simnett 2006; Beck and Wu 2006). Knechel et al. (2007) document that soft information (client-specific knowledge) is vital to auditors being able to plan effective audits, identify risk, and interpret evidence appropriately. Survey evidence also suggests that longer tenure allows the partners to build relationships with the client that can then aid in understanding the client's business (Daugherty et al. 2012). Based on the above reasoning, we state our second hypothesis as follows:

*H2: The effect of individual auditor network ties to low-tax firms on tax avoidance at the focal firm is stronger when connected partners have longer tenure in the low-tax firms.*

**Transfer process: The effect of school ties between audit partners and top executives at the focal firms**

As discussed earlier, audit partners are subject to potential risk of penalty or even lawsuits for sharing the information about tax strategies of low-tax firms with other clients. The existence of such risk could prevent auditors from sharing the tax saving strategies especially with clients that are not well-connected. Social ties are critical in China because Chinese culture has long been known for its emphasis on interpersonal relationships, also known as “*Guanxi*” in all economic and social transactions (Cheng and Rosett 1991; Bian 1997). Hence, social connections between individual auditors and clients become very important in communication between them (Guan et al. 2016). We expect audit partners that

are connected with focal firms' top executives are more likely to communicate tax avoidance information.

Following Guan et al. (2016), we focus on school ties arising from sharing an educational link, which is one specific form of social ties affecting the decision making process.<sup>13</sup> Individuals who attended the same schools are likely to have the same background and similar interests (McPherson et al. 2001). Connections forged through school ties enjoy enhanced interaction via in-jokes, shared traditions, and a sense of group belonging, as evidenced by alumni networks, newsletters, donations, and college sports events. Prior studies suggest that a common educational background fosters social ties and result in greater information sharing. Prior studies document that school ties can enhance value in mutual fund investments (Cohen et al. 2008), analyst recommendations (Cohen et al. 2010), venture capital investments (Hochberg et al. 2007), corporate investments, and financing decisions (e.g., Engelberg et al. 2012; Schmidt 2015), presumably by facilitating more efficient information transfer.<sup>14</sup>

We expect school ties between connected partners and top executives of the focal firms to affect auditor network ties on tax avoidance at the focal firms. Socially connected people tend to follow communal norms that promote mutual caring and trust (Silver 1990; Guan et al. 2016). Connected actors suffer disutility, either self-imposed (such as guilt) or imposed by

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<sup>13</sup> Other than common education experience, some prior studies also use employment history or club membership to measure social connection (e.g., Ke et al. 2018; Duchin and Sosyura 2013). In China, club membership is not a common social activity and employment history information is not publically available.

<sup>14</sup> For example, Cohen et al. (2008) show that fund managers invest more in socially connected firms with board members sharing education networks and the returns from these investments are higher. Cohen et al. (2010) find that sell-side analysts perform better if they share an alma mater with key executives of covered firms. Engelberg et al. (2012) provide evidence that cost of borrowing is lower when the employees of the borrower and banks have attended the same college. They further find that the credit ratings and stock performance of the lender improved afterwards.

others (such as disapproval or a bad reputation) when the communal norms are violated (Elster 1989). To the extent that the ties between connected partners and top executives can be seen as a communal norm that fosters mutual trust, we expect connected partners to be more willing to transfer tax avoidance information to top executives with school ties to avoid “not being nice” and to foster good friendship with such schoolmates. Moreover, interactions and greater comfort between individuals allow connected agents to better communicate subtle and sensitive information that would otherwise not be shared (Granovetter 2005). Some tax avoidance information could be sensitive and difficult to transmit. The school connection between executives at focal firms and audit partners increases the trust and willingness to exchange sensitive information, lowers information gathering costs, facilitates information transfer between economic agents, and results in better decision making (Kalmijn and Flap 2001; Ishii and Xuan 2014). Based on the above reasoning, we state our second hypothesis as follows:

*H3: The effect of individual auditor network ties to low-tax firms on tax avoidance at the focal firm is stronger when connected partners have school ties with clients' top executives.*

### **III. SAMPLE CONSTRUCTION AND RESEARCH DESIGN**

#### **Sample construction**

We begin with all Chinese companies listed in the A-share market between 1999 and 2015 and obtain financial statement and stock market data from the China Stock Market and Accounting Research (CSMAR) database. We begin with the year 1999 because the educational background of executives was available starting from that year. Data for individual audit partner data are also obtained from the CSMAR database. The sample selection procedures are outlined in Table 1. Consistent with prior research (e.g. Chen et al. 2010; Brown

and Drake 2014; Li et al. 2017), we exclude firms in the financial industries, and firm-year observations with negative pre-tax income as these firms likely have different objectives and opportunities for tax avoidance (Brown and Drake 2014). We also exclude observations where GAAP effective tax rates are larger than one or less than zero. To construct our measure of individual audit partner network ties to low-tax firms, we collected detailed partner-level information. We delete observations with missing individual audit partner data, and audit partners without any ties with other client firms. Finally, we remove observations with missing values for the control variables used in the empirical analysis. Our final sample consists of 18,610 firm-year observations. Panel B of Table 1 shows that the proportion of low-tax firms with shared auditor and without shared auditor has increased steadily over the years.

### **Measuring tax avoidance**

Following prior studies, we use GAAP effective tax rate (*ETR*) as our measure of tax avoidance. *ETR* is defined as the total tax expense divided by pre-tax income excluding special items. We do not suggest that firms are saving taxes because of illegal or improper means. We use GAAP *ETR* in the current year to identify low-tax firms and measure firms' tax avoidance instead of a three-year average measure used in Brown and Drake (2014) for the following reasons. First, unlike board directors, audit partners do not have a long-term auditing service contract with client firms who are more concerned about the current year's business and financial reporting consequences.<sup>15</sup> Second, as noted by Tang et al. (2017, p248), "the common mechanisms through which firms avoid taxes in China include shifting income to subsidiaries with a low tax rate by manipulating transfer prices, using different sales cutoff points for book

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<sup>15</sup> According to Gul et al. (2018), the incidence of partner change is about 40% in China. In other words, the turnover of partners is more frequent than that of board directors.

and tax purposes, capitalizing repairs and betterment expenditures for book, but expensing them for tax, and overstating the costs and expenses of related party transactions.” Some of these strategies could be done immediately and hence affect the *ETR* in the current year.<sup>16</sup> Third, the low-tax firms identified in our setting are relatively stable during our sample period; about 55% of low-tax firms are identified as low-tax firms in the following year. In our sensitivity tests, we also use several alternative measures of tax avoidance, including an estimated cash effective tax rate (*CASH\_ETR*) and modified measures of ETR. Our results continue to hold for these alternative measures of tax avoidance.

### **Measuring social network with low-tax firms**

Our main variable of interest is the formation of a social network through sharing the same audit partners with low-tax firms. Following prior studies (Chiu et al. 2013; Brown and Drake 2014), we construct two proxies, *PTIES* and *LPTIES*. *PTIES* is defined as the number of low-tax firms to which the focal firm is connected via a shared individual audit partner, scaled by the total number of firms to which the focal firm is connected via shared individual audit partner; while *LPTIES* is defined as the natural logarithm of one plus the number of low-tax firms to which the focal firm is connected via shared partners. In each year, we identify *low-tax firms* as those firms ranked in the lowest quintile based on the effective tax rate adjusted for the industry median (*ADJ\_ETR*).<sup>17</sup>

Table 2 presents descriptive statistics for our sample partitioned by quintiles based on

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<sup>16</sup> We are also aware that some tax avoidance mechanisms take more than a year to implement, such as establishing subsidiaries in tax havens. In the robustness checks, we use average ETR of rolling three years to proxy for tax avoidance, and our main results still hold.

<sup>17</sup> Consistent with Brown and Drake (2014), we construct our measure of low-tax ties to capture how successful a firm is in avoiding taxes relative to its industry peers. Our primary results are robust to using the ranked effective tax rate without industry adjustment. The industry classification is based on the definitions outlined in the China Securities Regulatory Commission (CSRC).

the industry-adjusted ETR. Firms in the lowest quintile (*Rank ETR=1*) have an average ETR of 7.80 percent, while firms in the highest quintile (*Rank ETR=5*) have an average ETR of 39.74 percent. We observe a similar pattern for the industry-adjusted ETR (*ADJ\_ETR*).

We report *TIES*, the total number of firms to which the focal firm is connected via shared partners in column (3), and our main variables of interest, *PTIES* and *LPTIES* in the last two columns. On average, the total number of firms to which the focal firm is connected via shared partner is about 4.5 across all quintiles of ETR. Within the lowest quintile of effect tax rate (*Rank ETR=1*), 15.31% of a firm's total ties to other firms via shared partners are connected to low-tax firms. In contrast, within the highest quintile of effect tax rate (*Rank ETR=5*), the average percentage of ties to low-tax firms through shared partners is 13.83%. The univariate test for the *PTIES* between the lowest and highest quintile is statistically significant ( $p < 0.01$ ). We find very similar pattern for *LPTIES*. Overall, the descriptive statistics in Table 2 are consistent with our prediction in H1 that individual auditor network ties to low-tax firms is positively associated with tax avoidance at the focal firm.

## Research design

We estimate the following OLS regression to test H1:

$$\begin{aligned}
 ETR = & \beta_0 + \beta_1 PTIES (LPTIES) + \beta_2 OTIES (LOTIES) + \beta_3 SIZE + \beta_4 ROA + \beta_5 LEV \\
 & + \beta_6 PPE + \beta_7 INTAN + \beta_8 MB + \beta_9 GROWTH + \beta_{10} AGE + \beta_{11} INVENT + \beta_{12} ROI \\
 & + \beta_{13} TACC + \beta_{14} CASH + Year/Industry/Region \text{ fixed-effects} + \varepsilon \quad (1)
 \end{aligned}$$

The dependent variable is *ETR*, the firm's effective tax rate.<sup>18</sup> The two main test variables are *PTIES* and *LPTIES*. We predict  $\beta_1$  to be negative, suggesting that network ties to low-tax firms is positively related to tax avoidance at the focal firm. We also include the number

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<sup>18</sup> Consistent with Brown and Drake (2014), we use the original effective tax rate *ETR* as the dependent variable. Our inferences remain unchanged if we use the industry-adjusted *ETR* as the dependent variable.



of low-tax firms that the focal firm is connected via shared audit office (*OTIES* and *LOTIES*) to examine the possibility of tax-related information diffusion through the audit office. Prior studies provide mixed evidence as to whether audit firm/office acts as conduits of information transfer of tax avoidance (Brown 2011; Brown and Drake 2014).

We include various firm characteristics to control for other factors that may affect firms' tax avoidance (Brown and Drake 2014; Chen et al. 2010; McGuire et al. 2012; Li et al. 2017; Tang et al. 2017). We control for firm size (*SIZE*) because larger firms may have access to more tax-planning strategies, resulting in lower taxes. On the other hand, larger firms may also be subjected to heavier political pressure and greater scrutiny from the government, resulting in less tax avoidance. We control for firm performance (*ROA*) since firms with low profitability have less incentives to avoid taxes. We control for firm's leverage (*LEV*), capital intensity (*PPE*), intangible assets (*INTAN*) and inventory intensity (*INVENT*) because prior research suggests that firm's complexities in operations are associated with tax avoidance (e.g. Rego 2003; Chen et al. 2010; McGuire et al. 2012; Brown and Drake 2014). Chen et al. (2010) suggest that growing firms may undertake more investments in tax-favored assets that generate timing differences in the recognition of tax expenses. Therefore, we control for firm growth measured by growth rate in sales (*GROWTH*) and market-to-book ratio (*MB*). We control for the level of firm's cash holdings (*CASH*) since financially constrained firms are likely to avoid more taxes (Edwards et al. 2016). In China, income from certain investments, such as interest income from government bonds, is tax-exempt. Hence we include *ROI*, which is defined as investment income scaled by total assets, to control for the firm's return on investment. Lastly, we control for the level of total accruals (*TACC*) since Frank et al. (2009) find that financial

reporting quality is related to tax avoidance. All control variables are measured contemporaneously as the dependent variables, since we expect these factors to associate with tax avoidance contemporaneously (Chen et al. 2010). The detailed definitions of these variables are presented in the Appendix. In all regressions, we include indicator variables to control for year, industry and region-fixed effects.<sup>19</sup>

## IV. MAIN ANALYSIS

### Descriptive statistics

Table 3 reports the descriptive statistics of key variables used in our analysis. To mitigate the undue influence of extreme observations and potential coding errors, we winsorize all the continuous variables at 1% and 99% percent. The mean and median tax avoidance measure, effective tax rate (*ETR*) are 20.8% and 17.5%, respectively, consistent with prior studies (e.g. Li et al. 2017). On average, 14.4% of partner network ties to other firms are connected to low-tax firms, while 13.4% of network ties are connected through shared audit offices. The descriptive statistics for the other independent variables are also presented in Table 3.

### Effect of partner network ties to low-tax firms on firm's tax avoidance

Table 4 presents the results of estimating Equation (1). In columns (1) and (2), we only include firms' shared audit office network ties to low-tax firms (*OTIES* and *LOTIES*, respectively). The coefficients for these two variables are negative but insignificant, suggesting that shared audit office with low-tax firms itself does not act as a conduit for diffusion of tax

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<sup>19</sup> The region refers to the province where the listed companies are located. Following Tang et al. (2017), we control for region-fixed effects since preferential tax policies vary substantially across regions in China.

avoidance practices. This finding is in line with Brown (2011) who finds no evidence of tax information diffusion through shared audit firm. We conjecture that partner network ties to low-tax firms are more likely to facilitate the flow of tax avoidance strategies. In columns (3) and (4), we add *PTIES* and *LPTIES* as our main test variables, respectively. Consistent with H1, the coefficients on both test variables are negative and significant at the 1% level. The results indicate that, all else equal, partner network ties to low-tax firms are associated with greater tax avoidance at the focal firms, as reflected in lower ETRs. Compared with a baseline unconditional mean value of *ETR* of 20.8 percent (see Table 3), a one standard deviation change in *PTIES* is associated with a 5.78 (=1.2/20.8) percent reduction in *ETR*.

With regard to the control variables, the coefficients on *SIZE*, *ROA*, *MB* are negative and statistically significant, indicating that firms that are larger, more profitable, and firms that have higher growth opportunities have lower ETRs. Further, more leveraged, older firms, and firms that have more inventories report higher ETRs. These results are generally consistent with prior studies.

### **Learning process: effect of partner tenure at low-tax firms**

In H2, we predict that the effect of partner network ties to low-tax firms on tax avoidance is more pronounced when connected partners have a longer tenure in low-tax firms due to acquisition of knowledge through learning. To test H2, we partition partners network ties to low-tax firms into two types: *PTIES*<sub>long tenure</sub> (*LPTIES*<sub>long tenure</sub>) and *PTIES*<sub>short tenure</sub> (*LPTIES*<sub>short tenure</sub>). Tenure is considered as long when the connected partners' tenure in the low-tax firms is greater than the median value of tenure. We expect the connected partners to learn tax avoidance knowledge more efficiently in low-tax firms with longer tenure. H2 predicts that the coefficient on *PTIES*<sub>long tenure</sub> (*LPTIES*<sub>long tenure</sub>) is more negative than the coefficient on

$PTIES_{short\ tenure}$  ( $LPTIES_{short\ tenure}$ ).

We report the results in Table 5. In Column (1), we find that both coefficients on  $PTIES_{long\ tenure}$  and  $PTIES_{short\ tenure}$  are negative and statistically significant. More importantly, the coefficient on  $PTIES_{long\ tenure}$  is significantly more negative than  $PTIES_{short\ tenure}$  ( $p=0.0630$ ). In Column (2), we obtain similar results for the log-transformed measure of network ties. Overall, the results in Table 5 are consistent with H2.

### **Transfer process: effect of school ties between connected partners and top executives at the focal firms**

In H3, we predict that the effect of partner network ties to low-tax firms on tax avoidance is more pronounced when connected partners have school ties with top executives at the focal firms. To test H3, we partition partners network ties to low-tax firms into two types:  $PTIES_{with\ school\ ties}$  ( $LPTIES_{with\ school\ ties}$ ) where the connected partners have school ties with top executives at the focal firms and  $PTIES_{without\ school\ ties}$  ( $LPTIES_{without\ school\ ties}$ ) where the connected partners have no school tie with top executives at the focal firms. Similar to Guan et al. (2016), top executives include the board chair, the CEO and the CFO, who are likely to significantly influence tax planning and who are likely to have frequent communications with engagement partners during the auditing process. We define the existence of school tie if any of the client company's top executives has a common alma mater with the connected partners.<sup>20</sup> H3 posits that the school ties between connected partners and top executives enhance the trust and hence the more likely the transfer of tax-related knowledge to the focal firms. A finding that the coefficient on  $PTIES_{with\ school\ ties}$  ( $LPTIES_{with\ school\ ties}$ ) is more negative than the

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<sup>20</sup> This definition is consistent with Guan et al. (2016). The school tie here indicates whether any of related parties attended the same universities for either undergraduate or graduate degrees, regardless of having attended the school in the same periods, on the same campuses, or for the same majors.

coefficient on  $PTIES_{without\ school\ ties}$  ( $LPTIES_{without\ school\ ties}$ ) would provide evidence consistent with H3.

Table 6 reports the results for testing H3. Both coefficients on  $PTIES_{with\ school\ ties}$  ( $LPTIES_{with\ school\ ties}$ ) and  $PTIES_{without\ school\ ties}$  ( $LPTIES_{without\ school\ ties}$ ) are negative and significant at conventional levels. The F-test reported in the table shows that the coefficient on  $PTIES_{with\ school\ ties}$  ( $LPTIES_{with\ school\ ties}$ ) is significantly more negative than the coefficient on  $PTIES_{without\ school\ ties}$  ( $LPTIES_{without\ school\ ties}$ ) ( $p=0.0544$  and  $p=0.0355$ , respectively). The results are consistent with H3, which indicates that partner network ties to low-tax firms has a stronger effect on tax avoidance at the focal firms when the connected partners have school ties with top executives at the focal firm.

## V. ADDITIONAL ANALYSIS

We conduct a series of additional analysis to provide greater insight to our main results. Because the results for our two main variables  $PTIES$  and  $LPTIES$  are similar, in the interest of parsimony, we only report results based on  $PTIES$  in the following tables.

### Change analysis

Although we use a battery of control variables in our regressions, we may still omit some important firm or partner characteristics that are associated with low-tax firms that results in higher tax avoidance. For example, it is possible that some partners have tax expertise which is not “spillover” from auditing services or they have some kind of connections to tax regulators, so they can help their clients to avoid more taxes independently of their network ties with low-tax firms. We use a change specification to mitigate such concern. Specifically, to control for unobserved partner characteristics, we use a reduced sample where the firms do not change any

partner during the year t. We identify the set of firms that begin with no partner ties to low-tax firms in year t-1 but become partner-connected to low-tax firms due to partners' client portfolios change. This set of firms represents our treatment firms. Our control firms are firms that are not partner-connected to low-tax firms in both year t-1 and t.<sup>21</sup> We then estimate the following model:

$$\begin{aligned} \Delta ETR = & \beta_0 + \beta_1 \Delta PTIES + \beta_2 \Delta OTIES + \beta_3 \Delta SIZE + \beta_4 \Delta ROA \\ & + \beta_5 \Delta LEV + \beta_6 \Delta PPE + \beta_7 \Delta INTAN + \beta_8 \Delta MB + \beta_9 \Delta GROWTH \\ & + \beta_{10} \Delta AGE + \beta_{11} \Delta INVENT + \beta_{12} \Delta ROI + \beta_{13} \Delta TACC + \beta_{14} \Delta CASH \\ & + Year/Industry/Region \text{ fixed-effects} + \varepsilon \end{aligned} \quad (2)$$

The dependent variable ( $\Delta ETR$ ) is the change of a firm's effective tax rate from year t-1 to year t, where year t is the year when treatment firms become partner-connected to low-tax firms due to a change in partners' client portfolios. Likewise, all other variables are calculated as changes from year t-1 to year t.

We report the results from estimating the change model in Table 7. The coefficient on  $\Delta PTIES$  in column (1) is negative and significant at the 5% level, indicating that establishing a new partner tie to a low-tax firm helps the focal firms to avoid more taxes. Because our sample consists of firms that do not change partners during the year, the change from no partner ties to partner ties is due entirely to tax avoidance knowledge learned in the new low-tax firms.<sup>22,23</sup> In column (2), we find that the coefficient on  $\Delta PTIES_{with \text{ school ties}}$  is negative and

<sup>21</sup> Our sample consists of 3,381 observations where neither of the treatment nor control firms change partners from year t-1 to year t. Of these, 1,090 observations represent treatment firms and 2,291 observations represent control firms.

<sup>22</sup> We also examine the tax avoidance change for firms whose partners are connected to low-tax firms in year t-1 but not connected to low-tax firms in year t. We find no significant change in tax avoidance due to loss of partner ties to low-tax firms.

<sup>23</sup> In Table 5, we find that partners with short tenure also help clients to lower their ETR but the decline in ETR is significantly smaller compared to partners with long tenure. Combining this with the results reported in Table 7, the evidence suggests that partners learn about tax information starting from the first year of engagement (i.e. when tenure is short). The decline in ETR in the first year of engagement is not due to the knowledge specificity of the partner, but rather due to the learning effect, and this learning effect is amplified when tenure increases.

significant at the 5% level while the coefficient on  $\Delta PTIES_{without\ school\ ties}$  is insignificant, suggesting that the school ties between connected partners and top executives at the focal firms enhance the effect of partner ties on tax avoidance.

### **Audit fees analysis**

We next analyze whether the individual audit partners' ties to low-tax firms influence audit fees. As discussed earlier, the connected partners may share the tax saving information obtained from other low-tax firms to their clients to keep good relationship with the client or to charge higher audit fees. We use the following model to test whether audit fees are systematically higher in the presence of partner ties to low-tax firms.

$$\begin{aligned}
 Ln(Fee) = & \beta_0 + \beta_1 PTIES + \beta_2 OTIES + \beta_3 SIZE + \beta_4 ROA \\
 & + \beta_5 LEV + \beta_6 PPE + \beta_7 INTAN + \beta_8 MB + \beta_9 GROWTH + \beta_{10} AGE \\
 & + \beta_{11} INVENT + \beta_{12} ROI + \beta_{13} TACC + \beta_{14} CASH \\
 & + Year/Industry/Region\ fixed-effects + \varepsilon
 \end{aligned} \tag{3}$$

where  $Ln(Fee)$  is the natural logarithm of annual audit fees. We report the results in Table 8. In column (1), the coefficients on  $PTIES$  is insignificant, suggesting that the connected partners do not charge higher audit fees for the transfer of tax-sharing strategies. However, in column (2), the coefficient on  $PTIES_{without\ school\ ties}$  is positive and significant at the 5% level, indicating that the connected partners charge higher audit fees by providing tax saving strategies obtained from other low-tax firms if they have no school ties with the top executives at the focal firm. The results suggest an economic reason why connected partners are willing to share tax saving strategies from low-tax firms to focal firms, especially when there are no social ties between them.

### **Audit firm type and the effect of partner network ties**

We examine the effect of shared partner ties with low-tax firms on firm's tax avoidance

for Top 10 versus Non-Top 10 audit firms. This analysis provides some insight into whether the Chinese evidence provided in this paper can be generalized to other markets that are dominated by large audit firms. Large audit firms may implement better quality control procedures and provide high quality audits (Fang et al. 2017). Consequently, reputation/litigation costs may be larger for auditors in large audit firms. Therefore, we expect the effect of partner network ties to low-tax firms on tax avoidance to be attenuated in large audit firms.

Following prior literature (Fang et al. 2017; He et al. 2017), we classify Top 10 audit firms and Non-Top 10 audit firms according to their market share of audited clients in China. We estimate the regression separately for Top 10 and Non-Top 10 audit firm sub-samples. The regression results are reported in Table 9. In columns (1) and (2), we find that the coefficients on *PTIES* are negative and significant only in Non-Top 10 audit firm sub-samples, suggesting that the effect of partner ties to low-tax firms on tax avoidance is attenuated in Top 10 audit firms. In contrast, we find that the coefficient on *PTIES<sub>with school ties</sub>* in columns (3) and (4) is negative and significant for both Top 10 and Non-Top 10 audit firms. Overall, the results indicate that the connected partners also share the tax saving information from other low-tax firms with clients in Top 10 audit firms when they have school ties with top executives at the focal firms.

### **Endogeneity concerns**

In our main analysis, we treat individual audit partner network ties as exogenous, but like other studies on social network, our study is also subject to endogeneity concerns (Brown and Drake 2014). Endogenous partner-client matching may suggest that firms seek to select



audit partners who likely have experience at tax avoidance and *vice versa*. As argued by Brown and Drake (2014), if the endogenous selection is driving our results and tax avoidance is merely a consequence of selection process, then the partner network effect should be symmetrical and firms with partners' high-tax ties should exhibit less tax avoidance (i.e., have higher ETRs). We replace the identity of "low-tax" with "high-tax" using the same approach and re-estimate the results. As shown in Table 10, the coefficients on *HPTIES*, *HPTIES*<sub>long tenure</sub>, *HPTIES*<sub>short tenure</sub>, *HPTIES*<sub>with school ties</sub>, and *HPTIES*<sub>without school ties</sub> are all insignificant. The asymmetric results suggest that tax avoidance (i.e., lower ETRs) at the focal firms is associated with their low-tax ties via shared audit partners but not its high-tax ties, consistent with firms acquiring knowledge and information related to tax saving strategies from shared audit partner networks with low-tax firms.

### **Alternative networks: common industry, geography or board interlocks**

Previous literature documents the spread (contagion) or information transfer occurs between firms in common industries, between spatially proximate firms or between firms with board interlocks (Chiu et al. 2013; Brown 2011; Brown and Drake 2014; Cai et al. 2014). We conduct additional tests to explore the interaction effect of partner network ties to low-tax firms and other types of network with low-tax firms on focal firm's tax avoidance.

Firms in the same industry or same geographical network often use similar tax saving strategies. We construct *PTIES*<sub>same ind</sub> (*PTIES*<sub>same reg</sub>) as the number of low-tax firms the focal firm is connected via shared partners within the same industry/province and *PTIES*<sub>dif ind</sub> (*PTIES*<sub>dif reg</sub>) as the number of low-tax firms the focal firm is connected via shared partners outside of its industry/province.

We present the results for the networks through industry and geographical location in columns (1) and (2) of Table 11. In column (1),  $PTIES_{same\ ind}$  and  $PTIES_{dif\ ind}$  are both negative and significant. The F-test shows that the two coefficients are not significantly different. We also find very similar results in column (2) for the connectedness through same regions versus different regions. Overall, the results indicate that the role of audit partner networks to low-tax firms on tax avoidance exists independently from common industry or common geography.

We next explore the interactive effects between partner network ties and board interlocks. Brown and Drake (2014) document that information on a range of tax avoidance strategies is shared among firms through their board interlocks. In column (3), we explore whether the effect of partner ties is enhanced when board interlocks exist. We separate  $PTIES$  into two groups based on whether the focal firm and low-tax firms have any board interlock. Specifically,  $PTIES_{interlocks}$  is defined as the number of low-tax firms the focal firm is connected via shared partners and shared board interlocks, and  $PTIES_{no\ interlocks}$  is defined as the number of low-tax firms the focal firm is connected via shared partners but no shared board interlocks. The results in column (3) of Table 11 indicate no significant difference in ETR between the focal firm and low-tax firms that have board interlock versus those without board interlock. This evidence suggests that shared partners with low-tax firms influence focal firm's tax avoidance independently of board interlocks.

### **Controlling for firm fixed-effect**

Although we use a battery of control variables in our regressions, we may still omit some important firm characteristics that are associated with low-tax firms that results in higher tax avoidance. To mitigate such a concern, we re-estimate the regressions by including firm

fixed-effect in the models. Our untabulated results indicate that our main results remain after controlling for firm fixed-effects.

### **Review partner versus engagement partner**

In China, each firm has two partners to sign off the audit report, and in most cases, the two partners share the same legal liability (Lennox et al. 2014). We explore whether there exists any difference for partner network ties formed by review partner versus engagement partner. Our untabulated results indicate that the review partner and engagement partner play similar roles in transferring tax saving information among client portfolios.

### **Alternative measures for tax avoidance**

We use four alternative measures for tax avoidance to test the robustness of our results. First, Chinese listed firm are subject to varying applicable tax rates (ATRs) that arise from numerous tax preferential policies. Following Amiram et al. (2012) and Tang et al. (2017), we use a modified ETR measured as ETR minus the firm's ATR (*ModETR*) to mitigate the concern that the ETRs are merely picking up ATRs. Second, following Brown and Drake (2014) and Gallemore et al. (2017), we use a three-year average measure of ETR to proxy for tax avoidance. Specifically, we define ETR3 as the sum of total tax expense each year over the three-year period, divided by the sum of pre-tax income over the same period. Our third measure of tax avoidance is the cash ETR (Dyreng et al. 2008; Brown and Drake 2014). Following Li et al. (2017), we use an indirect method to calculate cash ETRs defined as the current portion of total tax expense plus start-of-the-year tax payable minus end-of-the-year tax payable, divided by pre-tax income. Our fourth measure of tax avoidance is ETR computed based on operating cash flow since accrual-based earnings management may affect pre-tax accounting income and

consequently, the ETR (Hanlon and Heitzman 2010). Following Tang et al. (2017), we use cash flow from operations instead of pre-tax income in the denominator to calculate ETRs denoted as  $ETR_{cashflow}$ .

We then identify low-tax firms and calculate the partner network ties to low-tax firms based on the above four alternative measures of tax avoidance. We report the results in Table 12. Overall, our main inferences remain unchanged for these alternate measures of tax avoidance.

## VI. CONCLUSION

In this study, we investigate whether network ties formed by audit partners affect tax avoidance. We hypothesize that network ties of individual auditors to low-tax clients facilitate the learning and sharing of tax specific knowledge that can help client firms to save taxes. Consistent with our expectation, we find that tax avoidance is positively associated with a firm's audit partner network ties to low-tax firms. Further, we find that connected partners are more likely to learn from other low-tax firms when they have longer tenure, and more likely to share the tax saving information from other low-tax firms when they have additional school ties with top executives at the focal firm. We also find evidence that connected partners charge higher audit fees for sharing tax information if they have no school ties with top executives at the focal firms. Although we do not find evidence that connected partners help clients to reduce taxes for clients of Top 10 audit firm, we do find that these partners help clients of Top 10 audit firms to avoid taxes when they have common school ties with top executives at the focal firms. The effect of network ties of auditors to low-tax clients persists after controlling for the presence of other alternative networks such as common industry, geography and board

interlocks. Our results are also robust after controlling for the endogeneity concerns of client-auditor matching, firm fixed effects, and other alternative measures of tax avoidance.

Our study directly responds to the call in Hanlon and Heitzman (2010) for more research on the social connections between low-tax firms and makes an incremental contribution to the literature on tax avoidance. We extend this line of enquiry by showing that network ties of audit partners to low-tax clients facilitate the learning and sharing of tax specific knowledge that results in more tax avoidance.

A caveat in our study is the generalizability of the finding to other economies given that social connection is relatively more important in the relationship-based Chinese economy. Future research may explore the effect of auditor network ties on tax avoidance on more market-based economics such as the U.S. when data on partner information is available.

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**Table 1 sample selection and distribution**

## Panel A: sample selection

	N
Observations available over period 1999-2015 with non-missing total assets	29633
Less:	
Observations in the financial or insurance industry	348
Observations with negative pretax income	3647
Observations with unusual effective tax rates ETR (larger than 1 or less than 0)	1236
Observations with missing auditor information	2042
Observations without auditor ties with other firms	2128
Observations with missing data necessary to calculate firm-level variables	1622
<b>Final sample</b>	<b>18610</b>

## Panel B: sample distribution by year

Year	No of firms with partner connection to low-tax firms (1)	No of firms without partner connection to low-tax firms (2)	No. of firms in each year (3) =(1+2)	Percentage over total by year (4) = (3)/Total
1999	238	257	495	2.66%
2000	311	297	608	3.27%
2001	385	280	665	3.57%
2002	387	363	750	4.03%
2003	424	397	821	4.41%
2004	396	422	818	4.40%
2005	336	434	770	4.14%
2006	366	477	843	4.53%
2007	425	552	977	5.25%
2008	370	576	946	5.08%
2009	451	600	1051	5.65%
2010	573	751	1324	7.11%
2011	695	832	1527	8.21%
2012	811	934	1745	9.38%
2013	830	969	1799	9.67%
2014	770	986	1756	9.44%
2015	633	1082	1715	9.22%
<b>Total</b>	<b>8401</b>	<b>10209</b>	<b>18610</b>	<b>100%</b>

**Table 2 Comparisons among Quintiles of ETRs**

	<i>N</i>	<i>ETR</i>	<i>ADJ ETR</i>	<i>TIES</i>	<i>PTIES</i>	<i>LPTIES</i>
<b><i>Rank ETR=1</i></b>	3728	0.0780 (0.0770)	-0.1102 (-0.1027)	4.5692 (4.0000)	0.1531 (0.0000)	0.4035 (0.0000)
<b><i>Rank ETR=2</i></b>	3722	0.1404 (0.1358)	-0.0367 (-0.0335)	4.7319 (4.0000)	0.1467 (0.0000)	0.4115 (0.0000)
<b><i>Rank ETR=3</i></b>	3721	0.1846 (0.1685)	0.0006 (0.0000)	4.5195 (4.0000)	0.1415 (0.0000)	0.3868 (0.0000)
<b><i>Rank ETR=4</i></b>	3722	0.2394 (0.2321)	0.0545 (0.0497)	4.4970 (4.0000)	0.1411 (0.0000)	0.3823 (0.0000)
<b><i>Rank ETR=5</i></b>	3717	0.3974 (0.3519)	0.2199 (0.1683)	4.3594 (4.0000)	0.1383 (0.0000)	0.3612 (0.0000)

This table presents descriptive statistics for the mean and median (in parenthesis) comparing network ties to low-tax firms via shared partners for quintiles of *ETRs*. See Appendix for complete variable definitions.

**Table 3 Descriptive Statistics for Key Variables**

VARIABLES	N	Mean	Std. Dev	P25	Median	P75
<i>ETR</i>	18,610	0.2080	0.1350	0.1300	0.1750	0.2610
<i>PTIES</i>	18,610	0.1440	0.2130	0.0000	0.0000	0.2500
<i>LPTIES</i>	18,610	0.3890	0.4640	0.0000	0.0000	0.6930
<i>OTIES</i>	18,610	0.1340	0.0869	0.0909	0.1350	0.1670
<i>LOTIES</i>	18,610	1.8460	1.1100	1.0990	1.7920	2.5650
<i>SIZE</i>	18,610	21.7000	1.1530	20.8700	21.5400	22.3400
<i>ROA</i>	18,610	0.0592	0.0462	0.0252	0.0483	0.0798
<i>LEV</i>	18,610	0.4480	0.1980	0.2990	0.4530	0.6000
<i>PPE</i>	18,610	0.2530	0.1750	0.1180	0.2210	0.3600
<i>INTAN</i>	18,610	0.0420	0.0491	0.0103	0.0279	0.0542
<i>MB</i>	18,610	3.6820	2.8150	1.8440	2.8230	4.5170
<i>GROWTH</i>	18,610	0.2520	0.5690	0.0077	0.1430	0.3240
<i>AGE</i>	18,610	8.1220	5.5040	3.0000	7.0000	12.0000
<i>INVENT</i>	18,610	0.1640	0.1510	0.0647	0.1260	0.2100
<i>ROI</i>	18,610	0.0074	0.0168	0.0000	0.0011	0.0073
<i>TACC</i>	18,610	-0.0018	0.0723	-0.0434	-0.0055	0.0350
<i>CASH</i>	18,610	0.1840	0.1320	0.0902	0.1480	0.2410

This table presents descriptive statistics for key variables used in our regression analysis. The sample period is 1998-2015. All the continuous variables are winsorized at 1 and 99 percent. See Appendix for complete variable definitions.

**Table 4 Regression of tax avoidance on a firm's partner ties to low-tax firms**

VARIABLES	Dependent Variable = ETR			
	(1)	(2)	(3)	(4)
<i>PTIES</i>			-0.012*** (-3.059)	
<i>LPTIES</i>				-0.008*** (-3.042)
<i>OTIES</i>	-0.020 (-1.284)		-0.011 (-0.707)	
<i>LOTIES</i>		-0.002 (-1.263)		-0.001 (-0.852)
<i>SIZE</i>	-0.006*** (-2.866)	-0.005*** (-2.848)	-0.005*** (-2.848)	-0.006*** (-2.895)
<i>ROA</i>	-0.398*** (-9.288)	-0.398*** (-9.305)	-0.398*** (-9.290)	-0.400*** (-9.240)
<i>LEV</i>	0.052*** (3.306)	0.052*** (3.310)	0.052*** (3.286)	0.052*** (3.301)
<i>PPE</i>	-0.007 (-0.477)	-0.007 (-0.471)	-0.007 (-0.497)	-0.007 (-0.495)
<i>INTAN</i>	0.033 (0.943)	0.033 (0.942)	0.034 (0.953)	0.033 (0.930)
<i>MB</i>	-0.002** (-2.420)	-0.001** (-2.420)	-0.001** (-2.403)	-0.002** (-2.433)
<i>GROWTH</i>	-0.002 (-0.964)	-0.002 (-0.956)	-0.002 (-0.992)	-0.002 (-0.972)
<i>AGE</i>	0.003*** (8.846)	0.003*** (8.824)	0.003*** (8.832)	0.003*** (8.801)
<i>INVENT</i>	0.098*** (6.272)	0.098*** (6.273)	0.098*** (6.259)	0.098*** (6.244)
<i>ROI</i>	-0.789*** (-7.732)	-0.789*** (-7.749)	-0.791*** (-7.777)	-0.791*** (-7.770)
<i>TACC</i>	-0.105*** (-5.370)	-0.105*** (-5.340)	-0.106*** (-5.357)	-0.106*** (-5.362)
<i>CASH</i>	0.029** (2.305)	0.029** (2.334)	0.029** (2.297)	0.029** (2.325)
Constant	0.225*** (4.965)	0.223*** (4.909)	0.224*** (4.966)	0.228*** (5.015)
Year Fixed Effects	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes
Region Fixed Effects	Yes	Yes	Yes	Yes
Observations	18,610	18,610	18,610	18,610
Adjusted R-squared	0.160	0.160	0.160	0.160

This table presents the regression results of tax avoidance on firm's shared partner ties to low-tax firms. \*, \*\*, and \*\*\* indicate significance at the 0.1, 0.05 and 0.01 levels for two-tailed tests. All regressions include year, industry and region fixed effects, and standard errors are clustered by firm and by year. All continuous variables are winsorized at 1 and 99 percent. See the Appendix for complete variable definitions.



**Table 5 Learning Process: Effect of Partner Tenure at Low-tax Firms**

VARIABLES	Dependent Variable = ETR	
	(1)	(2)
<i>PTIES</i> long tenure	-0.020*** (-3.174)	
<i>PTIES</i> short tenure	-0.007** (-1.972)	
<i>LPTIES</i> long tenure		-0.010*** (-3.560)
<i>LPTIES</i> short tenure		-0.005*** (-2.679)
<i>OTIES</i>	-0.013 (-0.798)	
<i>LOTIES</i>		-0.001 (-0.919)
<i>SIZE</i>	-0.002 (-1.187)	-0.003 (-1.242)
<i>ROA</i>	-0.367*** (-8.596)	-0.367*** (-8.536)
<i>LEV</i>	0.035** (2.395)	0.036** (2.460)
<i>PPE</i>	-0.016 (-1.132)	-0.016 (-1.127)
<i>INTAN</i>	0.026 (0.751)	0.025 (0.727)
<i>MB</i>	-0.001** (-2.294)	-0.001** (-2.351)
<i>GROWTH</i>	-0.001 (-0.649)	-0.001 (-0.621)
<i>AGE</i>	0.003*** (10.477)	0.003*** (10.416)
<i>INVENT</i>	0.113*** (7.112)	0.113*** (7.089)
<i>ROI</i>	-0.806*** (-7.916)	-0.806*** (-7.912)
<i>TACC</i>	-0.136*** (-6.781)	-0.136*** (-6.778)
<i>CASH</i>	0.016 (1.342)	0.017 (1.392)
Constant	0.172*** (3.356)	0.176*** (3.410)
Year Fixed Effects	Yes	Yes
Industry Fixed Effects	Yes	Yes
Region Fixed Effects	Yes	Yes
Observations	18,610	18,610
Adjusted R-squared	0.156	0.157
F-test: ( <i>L</i> ) <i>PTIES</i> long tenure = ( <i>L</i> ) <i>PTIES</i> short tenure	3.46* p=0.0630	2.91* p=0.0878

This table presents the regression results of tax avoidance on firm's shared partner ties to low-tax firms based on whether the connected partners' tenure in the low-tax firms is long or short. \*, \*\*, and \*\*\* indicate significance at the 0.1, 0.05 and 0.01 levels for two-tailed tests. All regressions include year, industry and region fixed effects, and standard errors are clustered by firm and by year. All continuous variables are winsorized at 1 and 99 percent. See the Appendix for complete variable definitions.

**Table 6 Transfer Process: Effect of School Ties between Connected Partners and Top Executives**

VARIABLES	Dependent Variable = ETR	
	(1)	(2)
<i>PTIES</i> with school ties	-0.047*** (-2.585)	
<i>PTIES</i> without school ties	-0.010* (-1.708)	
<i>LPTIES</i> with school ties		-0.026*** (-3.046)
<i>LPTIES</i> without school ties		-0.007** (-2.422)
<i>OTIES</i>	-0.016 (-1.010)	
<i>LOTIES</i>		0.000 (0.208)
<i>SIZE</i>	-0.006*** (-2.638)	-0.006*** (-2.711)
<i>ROA</i>	-0.418*** (-9.599)	-0.419*** (-9.619)
<i>LEV</i>	0.050*** (3.802)	0.050*** (3.790)
<i>PPE</i>	-0.005 (-0.339)	-0.005 (-0.336)
<i>INTAN</i>	0.015 (0.368)	0.014 (0.349)
<i>MB</i>	-0.001 (-1.436)	-0.001 (-1.487)
<i>GROWTH</i>	-0.002 (-0.611)	-0.002 (-0.571)
<i>AGE</i>	0.003*** (7.345)	0.003*** (7.371)
<i>INVENT</i>	0.120*** (6.874)	0.120*** (6.866)
<i>ROI</i>	-0.706*** (-6.674)	-0.707*** (-6.673)
<i>TACC</i>	-0.117*** (-5.200)	-0.117*** (-5.214)
<i>CASH</i>	0.039*** (2.608)	0.039*** (2.600)
Constant	0.244*** (4.689)	0.246*** (4.747)
Year Fixed Effects	Yes	Yes
Industry Fixed Effects	Yes	Yes
Region Fixed Effects	Yes	Yes
Observations	10,260	10,260
Adjusted R-squared	0.173	0.173
F-test: ( <i>L</i> ) <i>PTIES</i> with school ties = ( <i>L</i> ) <i>PTIES</i> without school ties	3.70* p=0.0544	4.43** p=0.0355

This table presents the regression results of tax avoidance on firm's shared partner ties to low-tax firms based on whether the connected partners and top executives have school ties. \*, \*\*, and \*\*\* indicate significance at the 0.1, 0.05 and 0.01 levels for two-tailed tests. All regressions include year, industry and region fixed effects, and standard errors are clustered by firm and by year. All continuous variables are winsorized at 1 and 99 percent. See the Appendix for complete variable definitions.

**Table 7 Effect of change in a firm's partner ties to low-tax firms on change in tax avoidance**

VARIABLES	Dependent Variable = $\Delta$ ETR	
	(1)	(2)
$\Delta$ PTIES	-0.018** (-1.990)	
$\Delta$ PTIES <sub>with school ties</sub>		-0.096** (-2.260)
$\Delta$ PTIES <sub>without school ties</sub>		-0.020 (-1.516)
$\Delta$ OTIES	0.015 (0.537)	0.011 (0.337)
$\Delta$ SIZE	-0.020** (-2.335)	-0.015 (-1.279)
$\Delta$ ROA	-0.511*** (-6.877)	-0.576*** (-5.207)
$\Delta$ LEV	0.079** (2.205)	0.134*** (2.902)
$\Delta$ PPPE	0.023 (0.560)	0.028 (0.544)
$\Delta$ INTAN	-0.065 (-0.605)	-0.135 (-0.866)
$\Delta$ MB	0.001 (0.507)	-0.000 (-0.148)
$\Delta$ GROWTH	-0.007 (-1.343)	-0.008 (-1.139)
AGE	0.000 (0.496)	0.001 (0.971)
$\Delta$ INVENT	0.073 (1.335)	0.089 (1.200)
$\Delta$ ROI	-0.575*** (-2.917)	-0.413** (-1.987)
$\Delta$ TACC	-0.080*** (-2.661)	-0.131*** (-2.912)
$\Delta$ CASH	0.016 (0.568)	0.024 (0.571)
Constant	-0.005 (-0.310)	-0.002 (-0.086)
Year Fixed Effects	Yes	Yes
Industry Fixed Effects	Yes	Yes
Region Fixed Effects	Yes	Yes
Observations	3,381	1,908
Adjusted R-squared	0.091	0.120

This table presents the regression results using change specification. The regressions are based on a reduced sample where both of partners retain in the focal firms and no partner ties to low-tax firms in prior year. \*, \*\*, and \*\*\* indicate significance at the 0.1, 0.05 and 0.01 levels for two-tailed tests. All regressions include year, industry and region fixed effects, and standard errors are clustered by firm and by year. All continuous variables are winsorized at 1 and 99 percent. See the Appendix for complete variable definitions.

**Table 8 Firm's Audit Partner Ties to Low-Tax firms and Audit Fees**

VARIABLES	Dependent Variable = Ln(Fee)	
	(1)	(2)
<i>PTIES</i>	0.024 (1.294)	
<i>PTIES</i> <i>with school ties</i>		0.002 (0.024)
<i>PTIES</i> <i>without school ties</i>		0.064** (2.037)
<i>OTIES</i>	-0.034 (-0.658)	-0.068 (-0.940)
<i>SIZE</i>	0.360*** (28.938)	0.375*** (28.941)
<i>ROA</i>	0.059 (0.359)	-0.006 (-0.030)
<i>LEV</i>	0.105** (2.007)	0.114** (2.187)
<i>PPE</i>	-0.060 (-1.065)	-0.074 (-0.893)
<i>INTAN</i>	0.388*** (2.912)	0.368** (2.350)
<i>MB</i>	0.015*** (4.751)	0.016*** (4.663)
<i>GROWTH</i>	-0.009 (-1.163)	-0.016 (-1.288)
<i>AGE</i>	-0.002 (-1.402)	-0.002 (-0.966)
<i>INVENT</i>	-0.213*** (-3.888)	-0.274*** (-3.750)
<i>ROI</i>	0.633 (1.557)	0.287 (0.545)
<i>TACC</i>	-0.169*** (-2.768)	-0.247*** (-3.987)
<i>CASH</i>	-0.134** (-2.510)	-0.113 (-1.558)
Constant	5.170*** (20.130)	5.138*** (17.563)
Year Fixed Effects	Yes	Yes
Industry Fixed Effects	Yes	Yes
Region Fixed Effects	Yes	Yes
Observations	16,434	9,268
Adjusted R-squared	0.573	0.594

This table presents the regression results of auditing fee on firm's shared partner ties to low-tax firms. \*, \*\*, and \*\*\* indicate significance at the 0.1, 0.05 and 0.01 levels for two-tailed tests. All regressions include year, industry and region fixed effects, and standard errors are clustered by firm and by year. All continuous variables are winsorized at 1 and 99 percent. See the Appendix for complete variable definitions.

**Table 9 Audit Firm Size and Effect of Shared Partners Network Ties**

VARIABLES	Dependent Variable = ETR			
	(1) Top 10	(2) Non-Top10	(3) Top 10	(4) Non-Top10
<i>PTIES</i>	0.001 (0.158)	-0.022*** (-3.660)		
<i>PTIES</i> with school ties			-0.053** (-2.199)	-0.046* (-1.859)
<i>PTIES</i> without school ties			0.004 (0.400)	-0.024*** (-2.723)
<i>OTIES</i>	0.007 (0.273)	-0.002 (-0.115)	-0.007 (-0.207)	-0.009 (-0.467)
<i>SIZE</i>	-0.003 (-1.293)	-0.007*** (-2.869)	-0.006** (-1.962)	-0.007** (-2.526)
<i>ROA</i>	-0.383*** (-7.379)	-0.416*** (-8.027)	-0.462*** (-7.447)	-0.391*** (-6.914)
<i>LEV</i>	0.044*** (2.973)	0.058*** (2.891)	0.056*** (2.971)	0.049*** (2.838)
<i>PPE</i>	-0.009 (-0.512)	-0.007 (-0.390)	0.006 (0.287)	-0.017 (-0.926)
<i>INTAN</i>	0.029 (0.576)	0.037 (0.964)	-0.008 (-0.143)	0.022 (0.431)
<i>MB</i>	-0.002** (-2.454)	-0.001 (-1.488)	-0.002** (-1.973)	-0.000 (-0.354)
<i>GROWTH</i>	-0.002 (-0.688)	-0.003 (-0.975)	-0.003 (-0.750)	-0.001 (-0.204)
<i>AGE</i>	0.002*** (5.945)	0.003*** (6.840)	0.002*** (4.542)	0.003*** (6.270)
<i>INVENT</i>	0.126*** (5.834)	0.081*** (4.920)	0.132*** (4.857)	0.108*** (5.174)
<i>ROI</i>	-0.645*** (-4.478)	-0.898*** (-7.413)	-0.569*** (-3.366)	-0.798*** (-6.379)
<i>TACC</i>	-0.128*** (-3.652)	-0.087*** (-3.294)	-0.131*** (-3.808)	-0.098*** (-3.440)
<i>CASH</i>	0.019 (1.179)	0.044*** (2.755)	0.041* (1.904)	0.048** (2.464)
Constant	0.099 (1.618)	0.289*** (5.402)	0.187** (2.439)	0.306*** (4.532)
Year Fixed Effects	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes
Region Fixed Effects	Yes	Yes	Yes	Yes
Observations	7,885	10,725	4,728	5,532
Adjusted R-squared	0.181	0.158	0.196	0.175

This table presents the regression results of tax avoidance on firm's shared partner ties to low-tax firms for Top 10 audit firms and Non-Top 10 audit firms. \*, \*\*, and \*\*\* indicate significance at the 0.1, 0.05 and 0.01 levels for two-tailed tests. All regressions include year, industry and region fixed effects, and standard errors are clustered by firm and by year. All continuous variables are winsorized at 1 and 99 percent. See the Appendix for complete variable definitions.

**Table 10 Endogeneity concerns: effect of a firm's partner ties to high-tax firms on tax avoidance**

VARIABLES	Dependent Variable = ETR		
	(1)	(2)	(3)
<i>HPTIES</i>	0.001 (0.152)		
<i>HPTIES</i> <sub>long tenure</sub>		0.002 (0.282)	
<i>HPTIES</i> <sub>short tenure</sub>		0.000 (0.060)	
<i>HPTIES</i> <sub>with school ties</sub>			-0.000 (-0.011)
<i>HPTIES</i> <sub>without school ties</sub>			0.005 (0.635)
<i>HOTIES</i>	-0.011 (-0.864)	-0.011 (-0.872)	-0.005 (-0.298)
<i>SIZE</i>	-0.006 (-1.555)	-0.006 (-1.555)	-0.005 (-0.957)
<i>ROA</i>	-0.521*** (-12.039)	-0.521*** (-12.044)	-0.476*** (-8.382)
<i>LEV</i>	0.032** (2.069)	0.032** (2.069)	0.049** (2.270)
<i>PPE</i>	0.012 (0.714)	0.012 (0.715)	0.024 (1.058)
<i>INTAN</i>	0.000 (0.004)	0.000 (0.004)	0.006 (0.099)
<i>MB</i>	-0.001** (-1.986)	-0.001** (-1.985)	-0.002* (-1.747)
<i>GROWTH</i>	-0.002 (-0.712)	-0.002 (-0.716)	-0.003 (-1.128)
<i>AGE</i>	0.007 (1.052)	0.007 (1.048)	0.005 (0.477)
<i>INVENT</i>	0.073*** (4.115)	0.073*** (4.116)	0.100*** (3.967)
<i>ROI</i>	-0.622*** (-6.372)	-0.623*** (-6.372)	-0.452*** (-3.613)
<i>TACC</i>	-0.077*** (-4.618)	-0.077*** (-4.617)	-0.087*** (-3.709)
<i>CASH</i>	0.026* (1.732)	0.026* (1.733)	0.046** (2.288)
Constant	0.299*** (3.792)	0.299*** (3.791)	0.275** (2.448)
Year Fixed Effects	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes
Region Fixed Effects	Yes	Yes	Yes
Observations	18,610	18,610	10,260
Adjusted R-squared	0.172	0.180	0.183

This table presents the regression results after considering endogeneity concerns. \*, \*\*, and \*\*\* indicate significance at the 0.1, 0.05 and 0.01 levels for two-tailed tests. All regressions include year, industry and region fixed effects, and standard errors are clustered by firm and by year. All continuous variables are winsorized at 1 and 99 percent. See the Appendix for complete variable definitions.

**Table 11 Alternative networks: common industry, geography and board interlocks**

VARIABLES	Dependent Variable = ETR		
	(1)	(2)	(3)
<i>PTIES</i> <i>same ind</i>	-0.013* (-1.817)		
<i>PTIES</i> <i>dif ind</i>	-0.011* (-1.957)		
<i>PTIES</i> <i>same reg</i>		-0.014** (-2.484)	
<i>PTIES</i> <i>dif reg</i>		-0.010* (-1.669)	
<i>PTIES</i> <i>interlocks</i>			-0.034** (-2.245)
<i>PTIES</i> <i>no interlocks</i>			-0.011*** (-2.796)
<i>OTIES</i>	-0.011 (-0.708)	-0.011 (-0.690)	-0.011 (-0.727)
<i>SIZE</i>	-0.005*** (-2.847)	-0.005*** (-2.853)	-0.005*** (-2.832)
<i>ROA</i>	-0.399*** (-9.320)	-0.398*** (-9.296)	-0.399*** (-9.311)
<i>LEV</i>	0.052*** (3.283)	0.052*** (3.288)	0.052*** (3.282)
<i>PPE</i>	-0.007 (-0.498)	-0.007 (-0.496)	-0.007 (-0.495)
<i>INTAN</i>	0.034 (0.953)	0.034 (0.959)	0.033 (0.938)
<i>MB</i>	-0.001** (-2.418)	-0.001** (-2.413)	-0.001** (-2.406)
<i>GROWTH</i>	-0.002 (-0.996)	-0.002 (-0.994)	-0.002 (-0.990)
<i>AGE</i>	0.003*** (8.900)	0.003*** (8.867)	0.003*** (8.848)
<i>INVENT</i>	0.098*** (6.258)	0.098*** (6.257)	0.098*** (6.279)
<i>ROI</i>	-0.791*** (-7.792)	-0.791*** (-7.784)	-0.790*** (-7.756)
<i>TACC</i>	-0.106*** (-5.381)	-0.106*** (-5.354)	-0.106*** (-5.363)
<i>CASH</i>	0.029** (2.299)	0.029** (2.274)	0.029** (2.317)
Constant	0.224*** (4.958)	0.224*** (4.964)	0.223*** (4.956)
Year Fixed Effects	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes
Region Fixed Effects	Yes	Yes	Yes
Observations	18,610	18,610	18,610
Adjusted R-squared	0.160	0.160	0.160

This table presents the regression results of tax avoidance on firm's different types of shared partner ties to low-tax firms. \*, \*\*, and \*\*\* indicate significance at the 0.1, 0.05 and 0.01 levels for two-tailed tests. All regressions include year, industry and region fixed effects, and standard errors are clustered by firm and by year. All continuous variables are winsorized at 1 and 99 percent. See the Appendix for complete variable definitions.

**Table 12 Alternative Measures for Tax Avoidance**

VARIABLES	Dependent Variable = Tax Avoidance Measures			
	(1) ModETR	(2) ETR3	(3) Cash ETR	(4) ETR <sub>cashflow</sub>
<i>PTIES</i>	-0.010** (-2.011)	-0.017** (-2.034)	-0.014* (-1.722)	-0.014* (-1.749)
<i>OTIES</i>	-0.003 (-0.221)	-0.028 (-1.472)	-0.021 (-1.341)	0.005 (0.295)
<i>SIZE</i>	0.000 (0.031)	-0.006*** (-3.425)	-0.004 (-1.626)	-0.007*** (-3.585)
<i>ROA</i>	-0.863*** (-14.223)	-0.381*** (-7.788)	-0.986*** (-12.678)	0.595*** (8.713)
<i>LEV</i>	-0.059*** (-3.446)	0.055*** (3.968)	0.026* (1.844)	0.041*** (2.861)
<i>PPE</i>	-0.008 (-0.599)	-0.032** (-1.995)	0.025* (1.797)	-0.056*** (-3.563)
<i>INTAN</i>	0.031 (0.938)	0.087** (2.144)	0.079* (1.673)	-0.002 (-0.042)
<i>MB</i>	0.000 (0.725)	-0.001 (-1.326)	0.002** (2.332)	-0.004*** (-4.228)
<i>GROWTH</i>	-0.003 (-1.560)	-0.000 (-0.117)	-0.035*** (-6.929)	0.008* (1.883)
<i>AGE</i>	0.000 (0.447)	0.002*** (5.551)	0.003*** (5.102)	0.001** (2.246)
<i>INVENT</i>	0.085*** (5.618)	0.122*** (5.980)	0.112*** (8.010)	0.093*** (4.292)
<i>ROI</i>	-0.722*** (-6.589)	-0.820*** (-5.882)	-0.653*** (-6.866)	-0.908*** (-5.983)
<i>TACC</i>	-0.083*** (-5.569)	-0.241*** (-7.394)	0.021 (1.048)	1.663*** (19.561)
<i>CASH</i>	0.038*** (3.228)	0.036** (2.084)	0.036* (1.684)	0.017 (0.876)
Constant	-0.006 (-0.136)	0.208*** (4.853)	0.272*** (5.054)	0.273*** (5.550)
Year Fixed Effects	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes
Region Fixed Effects	Yes	Yes	Yes	Yes
Observations	18,610	14,466	15,057	14,325
Adjusted R-squared	0.110	0.198	0.147	0.337

This table presents the regression results for alternative measures of tax avoidance. The control variables are measured as three-year averages in Column (2) when *ETR3* is the dependent variable. \*, \*\*, and \*\*\* indicate significance at the 0.1, 0.05 and 0.01 levels for two-tailed tests. All regressions include year, industry and region fixed effects, and standard errors are clustered by firm and by year. All continuous variables are winsorized at 1 and 99 percent. See the Appendix for complete variable definitions.



## Appendix: Variable Definitions

Variable	Definition
<b>Tax avoidance and control variables</b>	
<i>ETR</i>	Total tax expense scaled by pretax income.
<i>ModETR</i>	Modified ETR, measured as the firm's effective tax rate (ETR) minus firm's applicable tax rate (ATR)
<i>ETR3</i>	Three-year ETR, measured as the sum of tax expense scaled by the sum of pre-tax income in years t to t+2
<i>Cash ETR</i>	Current income tax expense, minus end-of-the-year tax payable, plus start-of-the-year tax payable, divided by pretax income.
<i>ETR<sub>cash,flow</sub></i>	Total tax expense scaled by operating cash flows
<i>Ln(Fee)</i>	The natural logarithm of annual audit fees.
<i>SIZE</i>	Natural log of total assets at the end of year t
<i>ROA</i>	Pre-tax income scaled by total assets at the end of the year
<i>LEV</i>	Total liability scaled by total assets at the end of the year
<i>PPE</i>	Net PPE for year t scaled by the total assets at the end of the year t
<i>INTAN</i>	The sum of intangible assets scaled by the total assets at the end of the year t.
<i>MB</i>	Market to book ratio, measured as market value of equity divided by book value of equity.
<i>GROWTH</i>	Growth rate in sales, measured as the difference between sales and lagged sales divided by the lagged sales.
<i>AGE</i>	The number of years since the firm was listed on the stock exchange.
<i>INVENT</i>	Inventory intensity, measured as the proportion of inventory to total assets.
<i>ROI</i>	Return on investment, measured as investment income to total assets.
<i>TACC</i>	Total accruals, measured as net income minus operating cash flow, dividend by total assets.
<i>CASH</i>	Cash holding, measured as cash and cash equivalents scaled by total assets.
<i>TOP10</i>	An indicator variable that equals one if the company is audited by the Top 10 accounting firm, zero otherwise.
<b>Partner ties variables</b>	
<i>TIES</i>	The total number of firms that the focal firm is connected to via shared individual audit partners.
<i>PTIES</i>	The number of low-tax firms the focal firm is connected to via shared individual audit partners scaled by the firm's total partner ties (NTIES/TIES).
<i>LPTIES</i>	The natural logarithm of one plus the number of low-tax firms the focal firm is connected to via shared individual audit partners.
<i>PTIES<sub>long tenure</sub></i>	The number of low-tax firms the focal firm is connected to via shared individual audit partners where the connected partners have long tenure in the low-tax firms, scaled by the firm's total partner ties. We define long tenure as the partner tenure is greater than the median value of low-tax firms sample.
<i>PTIES<sub>short tenure</sub></i>	The number of low-tax firms the focal firm is connected to via shared individual audit partners where the connected partners have short tenure in the low-tax firms, scaled by the firm's total partner ties. We define short tenure as the partner tenure is less than the median value of low-tax firms sample.
<i>LPTIES<sub>long tenure</sub></i>	The natural logarithm of one plus the number of low-tax firms the focal firm is connected to via shared individual audit partners where the connected partners have long tenure in the low-tax firms.
<i>LPTIES<sub>short tenure</sub></i>	The natural logarithm of one plus the number of low-tax firms the focal firm is connected to via shared individual audit partners where the connected partners have short tenure in the low-tax firms.

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<i>PTIES<sub>with school ties</sub></i>	The number of low-tax firms the focal firm is connected to via shared individual audit partners where the shared partner(s) and top executives (CEO, CFO or Chair) of focal firm have school ties, scaled by the firm's total partner ties.
<i>PTIES<sub>without school ties</sub></i>	The number of low-tax firms the focal firm is connected to via shared individual audit partners where the shared partner(s) and top executives (CEO, CFO or Chair) of focal firm have no school ties, scaled by the firm's total partner ties.
<i>LPTIES<sub>with school ties</sub></i>	The natural logarithm of one plus the number of low-tax firms the focal firm is connected to via shared individual audit partners where the shared partner(s) and top executives (CEO, CFO or Chair) of focal firm have school ties.
<i>LPTIES<sub>without school ties</sub></i>	The natural logarithm of one plus the number of low-tax firms the focal firm is connected to via shared individual audit partners where the shared partner(s) and top executives (CEO, CFO or Chair) of focal firm have no school ties.
<i>PTIES<sub>same ind</sub></i>	The number of low-tax firms the focal firm is connected to via shared individual audit partners where the focal firm and its network firms are in the same industry, scaled by the firm's total partner ties.
<i>PTIES<sub>dif ind</sub></i>	The number of low-tax firms the focal firm is connected to via shared individual audit partners where the focal firm and its network firms are in the different industries, scaled by the firm's total partner ties.
<i>PTIES<sub>same reg</sub></i>	The number of low-tax firms the focal firm is connected to via shared individual audit partners where the focal firm and its network firms are in the same province location, scaled by the firm's total partner ties.
<i>PTIES<sub>dif reg</sub></i>	The number of low-tax firms the focal firm is connected to via shared individual audit partners where the focal firm and its network firms are in the different province locations, scaled by the firm's total partner ties.
<i>PTIES<sub>interlocks</sub></i>	The number of low-tax firms the focal firm is connected to via shared individual audit partners where the focal firm and low-tax firms have board interlocks, scaled by the firm's total partner ties.
<i>PTIES<sub>no interlocks</sub></i>	The number of low-tax firms the focal firm is connected to via shared individual audit partners where the focal firm and low-tax firms have no board interlocks, scaled by the firm's total partner ties.
<i>HPTIES</i>	The number of high-tax firms the focal firm is connected to via shared individual audit partners scaled by the firm's total partner ties.
<i>HPTIES<sub>long tenure</sub></i>	The number of high-tax firms the focal firm is connected to via shared individual audit partners where the connected partners have long tenure in the high-tax firms, scaled by the firm's total partner ties.
<i>HPTIES<sub>short tenure</sub></i>	The number of high-tax firms the focal firm is connected to via shared individual audit partners where the connected partners have short tenure in the high-tax firms, scaled by the firm's total partner ties.
<i>HPTIES<sub>with school ties</sub></i>	The number of high-tax firms the focal firm is connected to via shared individual audit partners where the shared partner(s) and top executives (CEO, CFO or Chair) of focal firm have school ties, scaled by the firm's total partner ties.
<i>HPTIES<sub>without school ties</sub></i>	The number of high-tax firms the focal firm is connected to via shared individual audit partners where the shared partner(s) and top executives (CEO, CFO or Chair) of focal firm have no school ties, scaled by the firm's total partner ties.
<i>OTIES</i>	The number of low-tax firms the focal firm is connected to via shared audit office scaled by the firm's total audit office ties.
<i>LOTIES</i>	The natural logarithm of one plus the number of low-tax firms the focal firm is connected to via shared audit office.
<i>HOTIES</i>	The number of high-tax firms the focal firm is connected to via shared audit office scaled by the firm's total audit office ties.

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