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ABSTRACT

Audit offices function as semi-autonomous units within their audit firm network and individual partners have much autonomy in the course of their engagements. Therefore, maintaining a uniform level of quality across engagements is difficult to achieve for audit firms. We hypothesize that differences in audit quality between audit offices and partners from the same audit firm increase with the complexity of an audit firm's network structure. The network structure of an audit firm increases in complexity with the number of local offices, number of individual audit partners, and their spatial distribution (i.e., the geographic dispersion of its offices and partners). To test this, we examine auditors' going-concern reporting decisions for a sample of 23,086 firm-year observations from 25 European countries for the period 2011-2019. Consistent with prior research using data from the US, we find evidence consistent with larger audit offices providing higher quality audits (i.e., there is a positive association between audit office size and the likelihood of going-concern opinions). However, our data do not provide evidence that that this office size effect increases as a function of the complexity of audit firm's network structure.

Keywords: audit offices; audit quality; spatial distribution; geographic distance

Audit Firms' Network Structure and Audit Quality

INTRODUCTION

Audit firms exert substantial effort into standardizing the audit process to maintain internal consistency in audit quality across engagements (Downey and Bedard 2019).[1] For example, firm-wide training programs, standardized audit programs, and firm-wide policies and procedures contribute to internal consistency (Carson 2009).[2] Audit firms, however, operate as intra-corporate networks of semi-autonomous offices (e.g., Francis and Yu 2009; Seavey et al. 2018), with audit partners having substantial autonomy. Rather than audit quality being perfectly uniform across offices and partners, audit quality thus varies significantly across audit offices (e.g., Cameran et al. 2020; Choi et al. 2010; Francis and Yu 2009; Francis and Michas 2013) and partners (for reviews, see Lennox and Wu 2018; Hardies et al. 2021) within the same audit firm.

Audit quality is affected by both firm (DeAngelo 1981) and office-level audit characteristics (Francis et al. 1999). Intuitively, office-level factors are expected to be substantially because most operational decisions are locally made. The practice office is the decision-making unit in the firm where auditors contract with clients, oversee audits, and issue audit reports (Reynolds and Francis 2000) in addition to the acquisition of

[1] KPMG (2018), for example, notes that they strive to deliver consistent audit quality 'throughout the network in line with the requirements and intent of professional standards and within a strong system of quality controls.'

[2] For instance, Ernst & Young LLP (2019) notes that they employ 'a unified tone and facilitate large-scale investments in technology, methodology, and training that would be difficult for any member firm to achieve on its own.'

expertise and assignment of personnel to engagements (Bills et al. 2016). Therefore, various researchers have asserted that auditors' behavior is best examined at the local office level (e.g., Francis et al. 1999; Reynolds and Francis 2000; Defond and Francis 2005; Krishnan 2005). More recently, research has documented various associations between partner-level characteristics such as gender and industry expertise and audit quality (e.g., Chi and Chin 2011; Hardies et al. 2015; Ittonen and Trønnes 2014). Overall, this body of research suggests that audit quality varies across audit offices and partners *within the same audit firm*.

The literature on office size implies that it captures within-audit firm differential audit quality (DeFond and Zhang 2014). There remains, however, the question of whether this "size effect" is larger in audit firms that have a more complex network structure.[3] Therefore, we investigate whether within-firm differences (i.e., differences between offices within the same audit firm) are affected by audit firms' network complexity (i.e., the number of offices and partners and their geographic dispersion). We argue that monitoring, knowledge sharing, and resource sharing become less efficient in more spatially distributed firms. As a result, heterogeneity within firms should increase.

We provide insight into differential audit quality due to differences in audit firms' network structure, which may prove valuable to regulators, standards makers, and audit firms. Regulators can use this information to identify audit firms where audits are more likely to be of lower quality. Standard-setters may be able to use this information to

[3] The "size effect" is referred to throughout the paper as a convenience for indicating the relationship between the size of an office and audit quality.

develop standards that emphasize the potential for quality-control problems in the offices of multi-location audit firms. According to Segal-Horn and Dean (2009), audit firms that invest in internal consistency can offer greater service quality, speed, efficiency, shared knowledge, flexibility, and responsiveness than competing firms with weak internal consistency.

This study contributes to different literature streams: the growing body of knowledge about the size of audit offices and the more general literature about heterogeneity within audit firms. Our study is the first to evaluate the relationship between the audit office size and audit quality among publicly traded companies in Europe. Based on our research, we identified only one study about the "size effect" conducted by Sundgren and Svanström (2013), which used data from the Swedish private audit market. This study makes substantial contributions to the growing body of literature about geographical distance as prior studies that addressed geographic proximity in an audit context used data from the U.S (Defond et al. 2018; Hollingsworth et al. 2020; Jensen et al. 2015; Beck et al. 2019; Choi et al. 2012).

The remainder of the paper is structured as follows. The related literature is reviewed. We develop our hypothesis that differences in audit quality between audit offices from the same audit firm can be attributed to the audit firm's spatial distribution. We then present the empirical test design, including definitions of key variables. Data are described and results of the hypothesis tests and additional (sensitivity) tests are reported. The last section summarizes and concludes the paper.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Heterogeneity in Audit Firms

Client companies and capital market participants expect consistency in vision, policies, and quality across offices of global audit firms (Maijoor and Vanstraelen 2012). Audit standards and regulations also aim for a uniform "floor" for audit quality (Knechel 2013). Furthermore, audit firms have incentives to maintain a (more or less) uniform level of quality across engagements and offices to protect their reputation and brand name.[4] The accounting literature shows that the negative reputational consequences of audit failures are not limited to the parties directly involved, but have spillover effects on other clients, audit partners, and offices affiliated to the involved audit firm (e.g., Cheng et al. 2020; He et al. 2016; Skinner and Srinivasan 2012; Weber and Zhang 2008). Therefore, audit firms invest heavily in internal quality controls, standardized audit programs, and firm-wide training (e.g., Aobdia 2019).

However, maintaining a (more or less) consistent level of quality across engagements and offices is difficult to achieve. Audit offices function as semi-autonomous units within their audit firm network and individual partners have much autonomy in the course of their engagements. As discussed by Beck et al. (2019), this decentralized structure has emerged over time because of the benefits of acquiring idiosyncratic local information and the need for face-to-face client interaction (see also Malhotra and Morris 2009). Audit

[4] To this end, audit firms have quality control systems in place (Aobdia 2020). Evidence in Ege et al. (2020) suggests that member firms of the the Big 6 networks indeed consistently apply the unique global audit methodologies of their network.

firms' geographically decentralized structure is advantageous because idiosyncratic local information and knowledge about clients is valuable for professional services such as auditing (Knechel et al. 2020). The acquisition of idiosyncratic local information and client knowledge is facilitated by geographic proximity between clients and their auditors, both at the audit office-level (Choi et al. 2012) and partner-level (Francis et al. 2021).

Consistent with these arguments, the extant empirical research on audit offices and audit partners has documented substantial inter-office (e.g., Choi et al. 2010; Ferguson et al. 2003; Francis and Yu 2009; Francis et al. 2013; Reynolds and Francis 2000) and inter-partner variation (e.g., Cameran et al. 2020; Gul et al. 2013; Knechel et al. 2015; Zerni 2012; for an overview see Hardies et al. 2021; Lennox and Wu 2018) in audit quality and audit fees within the same audit firm. The results of these studies are consistent with the argument that audit firms' decentralized structure makes it hard to maintain a (more or less) consistent level of quality across engagements and offices.

Audit Firms' Network Structure and Audit Quality

Beck et al. (2019) provide relative direct evidence that the variation in audit quality within audit firms stems from their decentralized structure. Their results suggest that geographic dispersion impedes auditors' interactions within their firm (i.e., between partners in different offices), resulting in lower quality audits in smaller offices that are further away from a large office. Specifically, Beck et al. (2019) show that monitoring and knowledge sharing become less effective as geographic proximity between audit offices increases. Monitoring is an important mechanisms within audit firms to reduce agency costs (e.g., Balachandran and Ramakrishnan 1987), which in turn helps audit firms to

uphold audit quality and protect their reputation. Likewise, knowledge sharing within audit firms improves both audit efficiency and audit quality (e.g., Duh et al. 2020; Vera-Muñoz et al. 2006).

Relatedely, Seavey et al. (2018) document that audit quality is higher in audit offices that are more connected within their audit firm network (i.e., are closer, on average, to the other offices of their firm). This provides further support for the idea that audit offices' position in their audit firm's network affects audit engagement quality. Based on this prior literature and Christie et al. (2003)'s theory on firm decentralization, we therefore hypothesize that the difficulty of maintaining a consistent level of audit quality within an audit firm increases as a function of the complexity of an audit firm's network structure. That is, we expect more variation in audit quality across audit offices and partners within the same audit firm if the audit firms' network structure is more complex.

The complexity of an audit firm's network structure is not only defined by its geographic distribution (i.e., the geographic distance between its offices and partners), but also by its size (i.e., the number of local offices and individual audit partners). The agency problems that confront audit firms increase with the size of the partnership. For example, moral hazard becomes more pronounced in larger partnerships (Jensen and Meckling 1976). The chances of free-riding also increase with partnership size because the costs of monitoring other partners are absorbed by a given partner, while the benefits are spread across all partners (Holmstrom 1982; Huddart and Liang 2005). Therefore, monitoring is more challenging in larger firms (Hillman 2000). As the complexity of an audit firm's network structure increases, both monitoring and knowledge sharing

become harder. Hence, we expect that audit firms' ability to maintain a consistent level of audit quality across their offices and partners decreases as a function of their network's complexity. Therefore, we predict that:

H1: Heterogeneity in engagement-level audit quality (across offices and partners within the same audit firm) is positively associated with the complexity of audit firms' network structure (i.e., the number of offices and partners and their geographic dispersion within the audit firm)

SAMPLE SELECTION AND DESCRIPTIVE STATISTICS

Sample Selection

Data for this study comes from three sources. First, all auditor data (e.g., audit office locations, partner identities, audit opinions) were obtained from the *Audit Analytics – Europe* database. Second, all financial statement data were retrieved from *Orbis* and *Refinitiv Eikon*.

Our sample selection starts with all firms in the *Audit Analytics – Europe* database (Panel A of Table 1). The sample period begins in 2011 and ends in 2019. We excluded 2,679 observations from non-European countries or where country information was missing. Next, we dropped 20,815 observations from small (non-Big 6) auditors. We also dropped 150 observations for which information about the location of the local office was unavailable. In line with prior research, we also excluded 11,744 observations from firms in the financial services sector. After deleting 9,033 observations with missing information for our control variables, this sample selection procedure yielded a final sample of 23,086 firm-year observations from 3,577 unique client firms. The sample

includes data from 25 different European countries (Panel B of Table 1), with the most observations being from the UK (n = 5,519), France (n = 3,728), Sweden (n = 2,106), Germany (n = 2,081), Italy (n = 1,376), Poland (n = 1,224), and Switzerland (n = 1,021).

Descriptive Statistics

Audit Firms' Network Structure

The 23,086 firm-year observations in our sample were audited by 885 unique Big 6 offices, which are distributed as follows: PwC (213), KPMG (179), EY (171), Deloitte (151), BDO (94), and GT (77). Each audit office can appear up to nine times over the sample period (2011 through 2019). Our final sample contains observations from a total of 5,164 "office-years".

We observe much variation in the complexity of the network structure of the different audit firms. Table 2 shows that the number of local offices, the number of individual audit partners, and their spatial distributions varies widely, both across firms and across countries (i.e., within the same audit firm in different countries). First, the number of local offices varies widely between different audit firms in the same country. For example, EY had, on average, 15 offices in the UK, while KPMG had 25 offices in the UK. In France, KPMG had 17 offices, but PwC only 11. In Sweden, PwC and EY had 21 offices, but Deloitte only 8. Such variation is also not restricted to larger countries, but also occurs in relatively smaller countries such as Belgium, Cyprus, Denmark, the Netherlands, and Switszerland. In Belgium, KPMG had 3 offices, while the other Big 4 firms had 5 offices. In Cyprus, KPMG had 4 offices, while the other Big 4 firms had only 2 offices. In Denmark, KPMG and EY had 8 offices, Deloitte 10, and PwC 12. In the Netherlands, PwC

had 4 offices and KPMG and EY 6. In Switzerland, PwC had 13 offices, but Deloitte only 3. Furthermore, the number of local offices varies widely between countries within the same audit firm. For example, KPMG had, on average, 25 offices in the UK, 19 in Germany, 19 in France, 15 in Sweden, 11 in Italy, 8 in Denmark, 8 in Switzerland, 7 in Norway, 6 in the Netherlands, 5 in Finland, 4 in Austria, 4 in Cyprus, 3 in Belgium, 3 in Poland, and only 1 in countries such as Croatia, Greece, Ireland, Latvia, Luxembourg, Malta, and Portugal. Importantly, such variation does not simply stem from differences in country size or the size of the local audit markets. For example, Deloitte had, on average, 17 offices in both the UK and France, but only 11 in Germany. Likewise, Deloitte had, on average, 5 offices in Belgium and in the Netherlands, but 10 in Denmark.

Second, also the number of individual audit partners varies widely between different audit firms in the same country and within the same audit firm across countries. For example, in Austria, Deloitte and PwC had, on average 8 audit partners, while KPMG had 18 audit partners. In France, PwC had 64 partners, while the other Big 4 firms each had more than 90 partners. In Germany, Deloitte had only 33 audit partners, while EY had 68, PwC 72, and KPMG 84. In Sweden, Deloitte had 34 audit partners, while PwC had 94 partners. In the UK, EY had 81 partners, while KPMG had 154 partners. Within KPMG, the number of audit partners varied, for example, from 13 in Belgium, to 24 in Cyprus, 21 in Denmark and the Netherlands, and 40 in Switszerland. Within EY, the number of audit partners varied, for example, from 46 in Italy, to 68 in Germany, 71 in Sweden, 81 in the UK, and 99 in France.

Third, there is substantial variation in the spatial distribution of audit firms (i.e., in the geographic dispersion of offices and partners within the audit firm). The average geodesic distance in kilometres for all office pairings of a single national audit firm (*CONNECT*) varies across countries, with less dispersion in smaller countries such as Belgium, Cyprus, Denmark, the Netherlands, and Switzerland, than in larger countries such as France, Germany, Sweden, and the UK. For example, for PwC, *CONNECT* is 25 km in Belgium, 46 km in the Netherlands, 53 km in Cyprus, 59 in Denmark, 62 km in Switzerland, 216 km in the UK, 230 km in Sweden, 259 km in Germany, and 319 km in France. Furthermore, there is also substantial variation across audit firms in the same country. For example, in Cyprus, *CONNECT* is 38 km for KPMG, while it is 53 km for the other Big 4 firms. In Denmark, it is 59 km for PwC, while it is 122 km for Deloitte. In France, it is 1,043 km for BDO, while it is around 300 km for the other audit firms. In the UK, it is 127 km for GT, 131 km for BDO, 216 km for PwC, 220 km for Deloitte, 246 km for KPMG, and 339 km for EY.

Overall, our descriptive statistics clearly show that there is substantial variation in the complexity of audit firms' network structure, both in terms of the number of local offices and number of individual audit partners as in the geographic dispersion of these offices and partners within the national audit firm.

Client Company Descriptive Statistics

Table 3 reports the summary statistics of all variables used in this study. A total of 854 firm-year observations (3.7 percent) received a going-concern during our sample period. Untabulated results show that the rate of going-concerns varied substantially between

different European countries, being low in countries such as Austria (0.3%), Finland (0.4%), and Sweden, and higher in countries such as Croatia (13.6%), Ireland (18.9%), Spain (8.2%), and the UK (6.5%).

Table 4 reports correlations between all variables. *GC* is weakly correlated with audit office size (r = -0.02). The strongest correlation between *GC* and any of the independent variables is with having received a *GC* in the prior year (*PRIORGC*: r = 0.50), profits in the current year (*DUMMY_PL*: r = -0.24), profits in the prior year (*DUMMY_PRIORPL*: r = -0.22), the probability of bankruptcy (*ZSCORE*: r = -0.19), and client size (*SIZE*: r = 0.16). The highest correlations between independent variables are between client size (*SIZE*) and other client characteristics such as the number of subsidiaries (*SUB*: r = 0.52) and leverage (*LEVERAGE*: r = 0.33). The number of local offices within an audit firm and the number of partners are very highly correlated (r = 0.90).

RESEARCH DESIGN

The primary focus of our analyses is auditors' going concern reporting because auditors have discretion about this decision (e.g., Chen et al. 2019) and because this information is available for all countries in our sample. To test hypothesis H1, we construct the empirical model specified as follows, in line with prior research (e.g., Reynolds and Francis 2000; Francis and Yu 2009; Hossain et al. 2018; Lennox 1999):

$$GC = \alpha + \beta_1 OFFSIZE + \beta_2 NUM\_OFFICES/NUM\_PARTNERS + \beta_3 CONNECT + \beta_4 OFFSIZExNUM\_OFFICES/NUM\_PARTNERS + \beta_5 OFFSIZExCONNECT + \beta_6 INFLUENCE + \beta_7 REPORTLAG + \beta_8 PRIORGC + \beta_9 IND\_LEADER + \beta_{10} SUB + \beta_{11} DUMMY\_PL + \beta_{11} LAGDUMMY\_PL + \beta_{12} SIZE + \beta_{13} LEV + \beta_{14} ZSCORE + COUNTRYFE + YEARFE + INDUSTRYFE$$

Our dependent variable, *GC*, takes a value of 1 if a going-concern opinion is issued, 0 otherwise. The independent variable *OFFSIZE* is the natural logarithm of the total audit fees of all clients of a local office in fiscal year *t*. The literature suggests that larger audit offices are associated with higher audit quality (e.g., Francis and Yu 2009; Reichelt and Wang 2010), so we expect a positive coefficient on *OFFSIZE*.

An audit firms' network structure is defined by the number of offices and partners and their geographic dispersion within their firm (cf. Malhotra and Morris 2009). *NUM_OFFICES* and *NUM_PARTNERS* refer to the number of local offices and signing partners in the audit firm's national network. We include either *NUM_OFFICES* and *NUM_PARTNERS* in our models because of the very high correlation between these two variables (r = 0.90).

Additionally, *CONNECT* is the geographical distance between local offices within a national audit firm network (cf. Seavey et al. 2018). To measure *CONNECT*, we collected the latitude and longitude of the cities with a local audit office, using Google Map API in Python. Next, we generated all possible office pairings for all local offices of the same national audit firm and calculated the geodesic distance (i.e., the shortest distance in kilometres between two points on an ellipsoid).[5]

Equation (1) measures *CONN*, which is the average geodesic distance d_{ij} in kilometers between office *i* and office *j* for all (*i*, *j*) office pairings of the same audit firm in a particular country:

[5] We calculated the shortest path between two points on an ellipsoid (i.e., the geodesic) with Stata's geodist() function.

(1) $l_i = \frac{1}{n}\sum_j d_{ij}$

Equation (2) measures *CONNECT*[6] , which takes the inverse of l_i:

(2) $C_i = \frac{1}{l_i} = \frac{n}{\sum_i d_{ij}}$

H1 predicts that heterogeneity in engagement-level audit quality is positively associated with the complexity of audit firms' network structure. Accordingly, we examine whether the effect of office size (*OFFSIZE*) is larger when the complexity of audit firms' network structure increases. The effect of audit office size on engagement-level audit quality is well-documented and represents an important element of within-firm quality variation. Hence, we expect a positive coefficient for *OFFSIZExNUM_OFFICES*, *OFFSIZExNUM_PARTNERS* and *OFFSIZExCONNECT*.

Additionally, the model controls for other factors that may influence auditors' propensity to issue going-concern opinions. We include *INFLUENCE* which is the ratio of the client's fees for all services to the sum of fees for all clients of the engagement office for a given year, to control for auditor's office-level incentives concerning influential clients (Francis and Yu 2009; Seavey et al. 2018). *IND_LEADER* is an indicator variable equal to 1 if the audit firm has the largest annual market share of audit fees within a two-digit SIC code for each city. Previous research shows that auditors are more likely to issue a GC when they are industry specialists (e.g. Lim et al. 2008). *SUB* is the number of

[6] The average of the inverse distances was calculated to avoid values that span small ranges (low variation), following Seavey et al. (2018). In addition, *CONNECT* is then multiplied by -1 such that a higher value corresponds to greater dispersion within an audit firm.

subsidiaries, reflecting the complexity of business operations that may increase the possibility of errors and irregularities. We also control for various client risk factors that have been linked explicitly to the reporting of going-concern opinions in prior research. *SIZE*, the natural log of total assets, is used to measure company size. We expect *SIZE* to negatively correlate with the dependent variable because larger clients are more likely to avoid bankruptcy and less likely to fail. We also include *LEV*, the client's total liabilities deflated by total assets, as a measure of leverage. We expect a positive coefficient for *LEV* because auditors are more likely to issue GCs to riskier clients (e.g. Hardies et al. 2016). Following Francis and Yu (2009), we also include *DUMMY_PL* and *LAGDUMMY_PL*, which take the value of 1 if the company reported a profit in the current or previous year, respectively. We expect negative coefficients for *DUMMY_PL* and *LAGDUMMY_PL* because firms reporting losses are more likely to fail and, therefore, more likely to receive GCs.

Companies are also more likely to receive a going-concern opinion if they received one in the prior year as well. The dummy variable *PRIORGC* takes the value of 1 if a company received a going concern in the prior period. *REPORTLAG* is the number of calendar days that lapse between fiscal year-end and release of audit opinion. The likelihood of a GC is higher when the audit report lag is longer, either because an auditor must do more work to determine the company's ability to continue or because the more time the auditor spends on an audit, the more likely it is that the auditor will uncover financial problems which cast doubt on the company's ability to continue (see Carson et al. 2012). Altman *ZSCORE* measures the probability of bankruptcy. Lastly, we also

include country, industry (2-digit SIC), and year fixed effects in all models. The inclusion of country fixed effects allows us to control for unobservable differences across countries that may affect audit quality. We also cluster standard errors by client firm in all regressions to avoid inflated *z-stat*istics. Detailed definitions of all variables are summarized in the Appendix A.

RESULTS

Table 5 reports the results of our regression analyses to test H1. Model 1 reports the effect of office size (*OFFSIZE*) on going-concern reporting before accounting for audit firms' network complexity. We estimate this model as a baseline comparison to prior research that has examined the association between audit office size and audit quality (e.g., Francis & Yu 2009). In line with prior research, we find that office size is positively associated with the likelihood that a client company receives a going-concern opinion (*OFFSIZE* = 0.138; *z-stat.* = 4.022). Control variables are largely in line with prior research as well, except for *LEV* for which we find no association with going-concern reporting.

Models 2 and 3 report the results for the full model, including our interaction variables that test if the effect of office size depends on the complexity of audit firms' network structure. Due to the very high correlation between *NUM_OFFICES* and *NUM_PARTNERS*, Model 2 includes *NUM_OFFICES* and Model 3 includes *NUM_PARTNERS*. The coefficient on *OFFSIZE* is similar as in Model 1 of Table 5 (*OFFSIZE* = 0.114; *z-stat.* = 2.143 in Model 2 and *OFFSIZE* = 0.148; *z-stat.* = 2.818 in Model 3), suggesting a positive association between audit office size and audit quality. The results for our interactions provide little evidence that the association between office size

and going-concern reporting becomes stronger as audit firms' network structure becomes more complex. There is no evidence in our data that the number of offices (Model 2: *OFFSIZExNUM_OFFICES* = 0.001; *z-stat.* = 0.283) or the number of partners (Model 3: *OFFSIZExNUM_PARTNERS* = -0.266; *z-stat.* = -0.507) moderates the effect of office size on auditors' going-concern reporting decisions. Our data also provide little evidence that the spatial distribution of the audit firm moderates this relation (*OFFSIZExCONNECT* = -1.651; *z-stat.* = -1.721 in Model 2 and *OFFSIZExCONNECT* = -1.559; *z-stat.* = -1.604 in Model 3).

SENSITIVITY AND ROBUSTNESS TESTS

Financial Distress

Our main sample contains both companies with and without obvious, observable signs of financial distress. However, many prior studies limit their going-concern analyses to subsamples of clients that are obviously financially distressed, arguing that a going-concern opinion decision is most salient for financially distressed clients (e.g, Hardies et al. 2016; Reynolds and Francis 2000; Francis and Yu 2009). Therefore, in Table 6, we report regression results for when we restrict our sample to those firm-year observations from companies with obvious, observable signs of financial distress (n = 6,291). Model 1 reports the results of office size (*OFFSIZE*) on going-concern reporting before accounting for audit firms' network complexity. In line with results for the full sample, we find a positive association between office size and the likelihood that a client company receives a going-concern opinion (*OFFSIZE* = 0.119; *z-stat.* = 3.310). Models 2 and 3 report the results for the full model, including our interaction variables that test if

the effect of office size depends on the complexity of audit firms' network structure. Due to the very high correlation between *NUM_OFFICES* and *NUM_PARTNERS*, Model 2 includes *NUM_OFFICES* and Model 3 includes *NUM_PARTNERS*. The coefficient on *OFFSIZE* is similar in these models as in Model 1 of Table 6 (*OFFSIZE* = 0.141; *z-stat.* = 2.342 in Model 2 and *OFFSIZE* = 0.209; *z-stat.* = 3.567 in Model 3), suggesting a positive association between audit office size and audit quality.

Results for our interactions variables differ somewhat for this sample than for the full sample. Our data provide some evidence that the spatial distribution of the audit firm moderates the relation between office size and auditors' going-concern reporting (Model 2: *OFFSIZExCONNECT* = -5.342; *z-stat.* = -2.398; Model 3: *OFFSIZExCONNECT* = -4.336; *z-stat.* = -2.087). Our data also provide some evidence that the number of partners in an audit firm moderates this relation (Model 3: *OFFSIZExNUM_PARTNERS* = -1.274; *z-stat.* = -2.476), but not that the number of offices moderates this relation (Model 2: *OFFSIZExNUM_OFFICES* = -0.003; *z-stat.* = -1.003). However, contrary to our predictions, these results suggest that the complexity of audit firms' network structure *decreases*, rather than increases, the heterogeneity in engagement-level audit quality.

Alternative Measures for *CONNECT*

We examine the robustness of our results by testing two alternative measures to capture the spatial distribution of audit offices and partners within their audit firm. First, we use the Spatial Distribution Index (*SDI*) (O'Leary and Cummings 2007). The spatial distribution index uses geodesic or "crow-flies" distances between locations that are weighted based on the number of members at the sites. Accordingly, we calculate the

geodesic distances between offices in kilometres (similar to *CONN*), weighted by the number of partners at each office, based on a matrix of all possible, non-redundant, partner-to-partner connections using Equation (3). Higher values of *SDI* correspond to a greater degree of geographic dispersion within an audit firm:

$$(3) \qquad SDI = \frac{\sum_{i-j}^{k}(km_{i-j} * n_i * n_j)}{(N^2 - N)/2}$$

km_{i-j}: kilometres between offices *i* and *j*
k: the total number of offices in an audit firm
n_i and n_j: Number of partners in office *i* and *j*
N: total number of audit partners across all audit offices in an audit firm

Models 1 and 2 in Panel A of Table 7 include the interaction terms *OFFSIZExSDI* *OFFSIZExNUM_OFFICES*, and *OFFSIZExNUM_PARTNERS* in the full sample and financially distressed sample. Results from Model 1 provide some evidence for a negative effect of *OFFSIZExSDI* on auditors' going-concern reporting (full sample: *OFFSIZExSDI* = -1.107; *z-stat.* = -2.181; financially distressed sample: *OFFSIZExSDI*= -1.812; *z-stat.* = -3.307), but results from Model 2 do not (full sample: *OFFSIZExSDI* = -0.770; *z-stat.* = -1.088; financially distressed sample: *OFFSIZExSDI*= -0.975; *z-stat.* = -1.304). In line with our earlier results, our data provide no evidence that the number of offices (full sample: *OFFSIZExNUM_OFFICES* = 0.007; *z-stat.* = 1.900; financially distressed sample: *OFFSIZExNUM_OFFICES* = 0.007; *z-stat.* = 1.576) or the number of partners full sample: *OFFSIZExNUM_PARTNERS* = 0.489; *z-stat.* = 0.542; financially distressed sample: *OFFSIZExNUM_OFFICES* = -0.333; *z-stat.* = -0.337) moderate the effect of office size on auditors' going-concern reporting.

Second, we use the Herfindahl index (*HINDEX*) as an alternative measure to capture the geographic dispersion of audit offices and partners within an audit firm. Analogous to Firoozi et al. (2019), we measure the dispersion of partners within an audit firm by examining where the members of the same office are located relative to each other.[7] *HINDEX* is calculated using Equation 4 by summing the squares of the audit partner fractions within each office:

(4) $HHI = \sum_{i=1}^{T} \left(\frac{c_i}{N}\right)^2$

T: Number of offices of an audit firm
c_i: Number of partners in office *i*
N: Total number of partners in an audit firm

We multiple *HINDEX* by -1 such that a higher value corresponds to greater geographic dispersion within an audit firm. Panel B of Table 7 includes the interaction terms *OFFSIZExNUM_OFFICES, OFFSIZExNUM_PARTNERS* and *OFFSIZExHINDEX* for the full and financially distressed samples. Our data provide no evidence that the spatial distribution of audit offices and partners within their audit firm, as measured by *HINDEX*, moderates the effect of audit office size and auditors' going-concern reporting (Model 1, full sample:. *OFFSIZExHINDEX*= 0.001; *z-stat.* = 0.616; Model 1, financially distressed sample: *OFFSIZExHINDEX*= 0.002; *z-stat.* = 0.960; Model 2, full sample: *OFFSIZExHINDEX*= 0.001; *z-stat.* = 1.057; Model 2, financially distressed sample).

[7] Firoozi et al. (2019) used the Herfindahl Index as a measure of information asymmetry between all of the directors on the same board.

In line with our earlier results, our data provide little evidence that the number of offices (full sample: *OFFSIZExNUM_OFFICES* = -0.002; *z-stat.* = -0.385; financially distressed sample: *OFFSIZExNUM_OFFICES* = -0.008; *z-stat.* = -1.808) or the number of partners full sample: *OFFSIZExNUM_PARTNERS* = -0.786; *z-stat.* = -1.293; financially distressed sample: *OFFSIZExNUM_OFFICES* = -2.059; *z-stat.* = -3.383) moderate the effect of office size on auditors' going-concern reporting.

Alternative Measures for *OFFSIZE*

In our main analyses, we measured the size of an audit office by means of the natural logarithm of the total audit fees of all clients of a local office in fiscal year *t*. However, prior research has also used other measures of office size, such as the natural logarithm of total assets of clients audited by the audit office in a year and the total number of clients of a local engagement office in a year. Accordingly, we re-estimate our earlier models with alternative measure for audit office size. Specifically, Panel A of Table 8 shows results for when audit office size is either measured by means of the total assets of clients audited by an audit office, and Panel B of Table 8 shows results when audit offices size is measured by the total number of clients of a local engagement office.

We find evidence for a positive effect of audit office size on auditors' going-concern reporting when office size is measured by their clients' total assets, although results are weaker for the full sample (Model 1: *OFFSIZE* = 0.056; *z-stat.* = 1.280; Model 2: *OFFSIZE* = 0.082; *z-stat.* = 1.943) than in the sample of financially distressed firms (Model 1: *OFFSIZE* = 0.100; *z-stat.* = 2.104; Model 2: *OFFSIZE* = 0.152; *z-stat.* = 3.426). In line with our earlier results, we find no evidence that either the number of offices or the number of

partners moderates the relation between office size and auditors' going-concern reporting. Our data provide some evidence that the spatial distribution of the audit firm moderates the relation between office size and auditors' going-concern reporting (Model 1, full sample: *OFFSIZExCONNECT* = -1.731; *z-stat.* = -2.099; Model 1, financially distressed sample: *OFFSIZExCONNECT* = -2.533; *z-stat.* = -2.330; Model 2, full sample: *OFFSIZExCONNECT* = -1.627; *z-stat.* = -1.927; Model 2, financially distressed sample: *OFFSIZExCONNECT* = -2.106; *z-stat.* = -2.134), but again in the opposite direction of our predictions.

Contrary to our prior findings, we find no evidence for a positive effect of audit office size on auditors' going-concern reporting when office size is measured by their number of clients. Results of these analyses also provide little evidence that the complexity of audit firms' network structure moderates this relation.

DISCUSSION AND CONCLUSION

This study tests how the audit firms' network structure affects the relation between audit office size and audit quality. First, we find evidence that audit office size is positively associated with audit quality as measured by going concern reporting. in the models which measure spatial distribution in terms of distance. However, our results do not support the assertion that this office size effect increases as a function of the complexity of audit firm's spatial distribution. These results are generally robust to a variety of alternative definitions and sensitivity tests. However, the results of the number of offices and partners are mixed. This might be attributed to the barriers that can be removed by adopting ICTs in audit firms. The majority of technology investments that

improve audit quality also lead to more efficient audits. This is especially true for investments in staff training, software and IT equipment, and standardized audit programs that reduce recurring costs, in addition to investments in the national and international network of a firm that reduces coordination and operating costs for engagements that span geographical regions (Sirois et al. 2016). As knowledge sharing technology continues to evolve rapidly, audit firms are turning to information technology applications such as webcasts, online training, and internal databases to assist in knowledge exchange (Duh et al. 2020). Additionally, by drawing on the literature on information and communications technology literature, Chen and Kamal (2016) argue that adopting ICT within a firm can reduce the economic costs of internal coordination by improving the quality and speed of information processing and decision making and agency costs through enhanced monitoring.

Our study has certain limitations, both in terms of development and design. First, audit quality is notoriously difficult to define and measure (Duh et al. 2020; Knechel et al. 2012), so future research could examine alternative proxy measures. In addition, researchers may investigate whether spatial distribution affects the extent of within-firm heterogeneity through lower audit fees (because of greater efficiency) or higher audit fees (as a result of higher quality). Third, as private businesses account for the majority of the E.U. economy market for audit services (van Tendeloo and Vanstraelen 2008), future research can consider data on private firms in European countries. Finally, as with any cross-country study, our research is affected by multiple institutional factors that are hard to distinguish.

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Appendix A: Variable Definitions

Variable	Definition and Measurement	Source
Dependent Variable		
GC	Indicator variable equals one (and zero otherwise) if the audit firm issues a going concern opinion for a client in year t.	Audit Analytics
Independent Variable		
OFFSIZE	The natural logarithm of total audit fees of all clients of the audit office in a year	Audit Analytics
Moderator Variables		
NUM_OFFICES	Number of city-based offices in the firm in a particular country	Audit Analytics
NUM_PARTNERS	Number of signing partners in the firm in a particular country	Audit Analytics
CONNECT	A measure of network connectedness. It is calculated as the average geodesic distance dij between office i and office j for all (i,j) office pairings of the same audit firm in a particular country as per Equation (2) as a measure of geographic dispersion of offices.	Audit Analytics / Google Map API
Control Variables		
INFLUENCE	The ratio of the client's fees for all services to the sum of fees for all clients of the engagement office for a given year	Audit Analytics
REPORTLAG	The number of days between the fiscal year-end and the signature date of the audit report.	Audit Analytics
PRIORGC	Dummy variable of 1 (and 0 otherwise) if a company received a going concern in the prior period.	Audit Analytics
IND_LEADER	Indicator variable equal to 1 (and 0 otherwise) if the audit firm has the largest annual market share of audit fees within a two-digit SIC code, for each city	Audit Analytics
SUB	Number of subsidiaries for a client firm.	Orbis
DUMMY_PL	Dummy variable 1 (and 0 otherwise) if P&L is positive	Orbis

LAGDUMMY_PL	Dummy variable 1 (and 0 otherwise) if P&L is positive in the previous fiscal year	Orbis
SIZE	Natural logarithm of client's total assets.	Orbis
LEV	Client's total liabilities deflated by total assets.	Orbis
ZSCORE	The Altman Z-score as a measure of bankruptcy.	Refinitiv Eikon

TABLE 1: Sample Composition

Panel A: Sample Selection Process

Firm-year observations from *Audit Analytics – Europe* for the period 2011–2019	67,507
Less: Observations with missing country data or from non-European countries	(2,679)
Less: Observations not audited by large auditors (Big 4, BDO, GT)	(20,815)
Less: Observations with missing audit office data	(150)
Initial Sample	43,863
Less: Observations from the financial services sector	(11,744)
Less: Observations with missing values for control variables	(9,033)
Final Sample	23,086

Panel B: Observations per Country

Country	***n***
Austria	345
Belgium	561
Bulgaria	22
Croatia	81
Cyprus	150
Denmark	657
Finland	808
France	3,728
Germany	2,081
Greece	135
Hungary	64
Ireland	403
Italy	1,376
Latvia	62
Lithuania	60
Luxembourg	158
Malta	70
Netherlands	643
Norway	772
Poland	1,224
Portugal	242
Spain	798
Sweden	2,106
Switzerland	1,021
UK	5,519
Total	**23,086**

TABLE 2: Descriptive Statistics for Audit Firm's Network Structure

	Number of Offices					Number of partners					*CONNECT*				
	Mean	**SD**	**Q1**	**Median**	**Q3**	**Mean**	**SD**	**Q1**	**Median**	**Q3**	**Mean**	**SD**	**Q1**	**Median**	**Q3**
Austria															
BDO	1	0	1	1	1	5	1	5	5	6	0	0	0	0	0
Deloitte	2	0	2	2	2	8	2	7	8	9	10	1	8	11	11
EY	3	0	3	3	3	9	1	8	9	10	22	1	22	22	22
GT	1	0	1	1	1	4	1	3	5	5	0	0	0	0	0
KPMG	4	0	4	4	4	18	1	18	18	19	55	10	47	62	64
PwC	2	0	2	2	2	8	2	6	7	11	11	0	11	11	11
Belgium															
BDO	7	2	7	7	8	10	2	10	11	12	26	3	22	25	28
Deloitte	5	1	4	4	6	21	1	19	21	22	24	3	23	24	27
EY	5	1	4	5	5	15	2	14	16	17	22	3	20	22	24
GT	1	0	1	1	1	2	1	1	2	2	0	0	0	0	0
KPMG	3	1	2	2	4	13	1	12	13	14	30	3	29	32	32
PwC	5	0	4	5	5	11	1	10	11	11	25	2	23	24	27
Bulgaria															
BDO	1	0	1	1	1	2	0	2	2	2	0	0	0	0	0
Deloitte	1	0	1	1	1	3	1	3	4	4	0	0	0	0	0
EY	1	0	1	1	1	4	1	3	4	5	0	0	0	0	0
KPMG	1	0	1	1	1	7	2	6	7	8	0	0	0	0	0
Croatia															
BDO	1	0	1	1	1	4	1	4	5	5	0	0	0	0	0
Deloitte	1	0	1	1	1	5	1	3	5	5	0	0	0	0	0
EY	1	0	1	1	1	3	1	2	3	3	0	0	0	0	0
KPMG	1	0	1	1	1	6	1	5	5	6	0	0	0	0	0
PwC	1	0	1	1	1	10	3	8	10	11	1	0	1	1	1

	Number of Offices					Number of partners					*CONNECT*				
	Mean	**SD**	**Q1**	**Median**	**Q3**	**Mean**	**SD**	**Q1**	**Median**	**Q3**	**Mean**	**SD**	**Q1**	**Median**	**Q3**
Cyprus															
BDO	1	0	1	1	1	1	0	1	1	1	0	0	0	0	0
Deloitte	2	0	2	2	2	7	2	6	7	9	53	0	53	53	53
EY	2	1	1	2	2	5	1	4	6	6	53	0	53	53	53
KPMG	4	0	4	4	4	24	5	19	25	27	38	5	34	36	39
PwC	2	0	2	2	2	17	3	15	18	20	53	0	53	53	53
Denmark															
Deloitte	10	2	9	10	11	33	3	30	31	35	122	49	67	121	184
EY	8	2	8	9	10	24	6	22	26	27	84	13	76	89	95
GT	1	0	1	1	1	2	1	1	2	4	0	0	0	0	0
KPMG	8	4	3	10	10	21	11	8	26	29	100	26	88	95	103
PwC	12	2	11	13	14	39	3	39	40	41	59	16	38	67	70
Finland															
BDO	2	0	2	2	2	2	1	2	2	3	4	0	4	4	4
Deloitte	4	0	3	4	4	6	1	5	6	7	43	22	9	55	57
EY	8	0	7	8	8	23	2	21	23	25	225	35	190	234	239
KPMG	5	1	4	5	6	22	3	20	23	25	212	79	197	248	258
PwC	10	3	7	11	13	32	5	28	34	35	151	46	115	123	199
France															
BDO	4	1	3	3	4	6	2	4	6	7	1,043	1,482	208	238	2,371
Deloitte	17	3	16	18	19	92	8	87	91	94	312	27	314	315	329
EY	14	1	13	14	14	99	6	96	101	103	290	36	261	294	298
GT	9	2	8	10	10	29	1	29	29	30	229	40	195	224	263
KPMG	19	2	18	19	19	92	7	89	93	96	243	28	224	239	245
PwC	11	1	10	11	11	64	2	62	64	66	319	29	295	315	341

	Number of Offices					Number of partners					*CONNECT*				
	Mean	**SD**	**Q1**	**Median**	**Q3**	**Mean**	**SD**	**Q1**	**Median**	**Q3**	**Mean**	**SD**	**Q1**	**Median**	**Q3**
Germany															
BDO	15	2	13	15	17	28	4	25	30	32	255	16	240	259	263
Deloitte	11	2	9	11	12	33	4	30	32	37	314	19	295	313	334
EY	17	1	16	17	17	68	3	67	69	70	267	3	264	266	270
GT	5	1	4	5	5	12	1	11	12	12	275	65	219	245	328
KPMG	19	2	18	20	20	84	7	77	84	91	255	7	251	253	260
PwC	18	1	17	18	18	72	5	69	74	75	259	6	258	259	262
Greece															
Deloitte	1	0	1	1	1	8	1	8	9	9	8	0	8	8	8
EY	1	0	1	1	1	6	1	5	6	7	0	0	0	0	0
GT	3	0	2	3	3	22	3	19	22	23	229	57	200	212	294
KPMG	1	0	1	1	1	5	1	4	5	6	0	0	0	0	0
PwC	2	0	2	2	2	9	2	7	9	10	4	0	4	4	4
Hungary															
BDO	1	0	1	1	1	4	2	2	5	6	0	0	0	0	0
Deloitte	1	0	1	1	1	4	1	3	4	5	0	0	0	0	0
EY	1	0	1	1	1	5	1	4	5	6	0	0	0	0	0
PwC	1	0	1	1	1	4	1	4	5	5	0	0	0	0	0
Ireland															
BDO	1	0	1	1	1	2	1	1	2	3	0	0	0	0	0
Deloitte	2	0	2	2	3	9	2	7	8	11	85	11	76	76	97
EY	1	0	1	1	1	4	1	4	4	5	0	0	0	0	0
GT	1	0	1	1	1	3	1	3	3	4	0	0	0	0	0
KPMG	1	0	1	1	1	17	2	15	17	18	0	0	0	0	0
PwC	2	0	1	2	2	9	1	8	9	10	121	0	121	121	121

	Number of Offices					Number of partners					*CONNECT*				
	Mean	**SD**	**Q1**	**Median**	**Q3**	**Mean**	**SD**	**Q1**	**Median**	**Q3**	**Mean**	**SD**	**Q1**	**Median**	**Q3**
Italy															
BDO	7	1	6	6	8	20	7	21	23	24	219	23	193	214	237
Deloitte	11	1	10	11	11	40	3	37	40	42	168	24	149	170	172
EY	12	1	11	12	13	46	4	44	46	48	169	10	166	170	176
GT	3	1	2	4	4	4	1	4	4	4	153	69	65	177	195
KPMG	11	1	10	11	11	31	3	28	31	35	212	14	198	217	219
PwC	14	2	13	15	15	44	2	42	45	46	193	9	188	190	198
Latvia															
BDO	1	0	1	1	1	2	1	1	2	2	0	0	0	0	0
Deloitte	1	0	1	1	1	2	0	2	2	2	0	0	0	0	0
EY	1	0	1	1	1	2	1	1	2	2	0	0	0	0	0
KPMG	1	0	1	1	1	1	0	1	1	1	0	0	0	0	0
PwC	1	0	1	1	1	2	1	1	2	2	0	0	0	0	0
Lithuania															
Deloitte	1	0	1	1	1	1	1	1	1	2	0	0	0	0	0
EY	1	0	1	1	1	3	1	3	3	4	0	0	0	0	0
GT	2	0	2	2	2	3	1	3	3	3	113	0	113	113	113
KPMG	2	0	2	2	2	3	1	3	3	4	113	0	113	113	113
PwC	1	0	1	1	1	2	0	2	2	2	0	0	0	0	0
Luxembourg															
BDO	2	1	1	2	2	3	1	2	3	3	1	0	1	1	1
Deloitte	1	0	1	1	1	8	2	8	9	9	5	0	5	5	5
EY	1	0	1	1	1	7	1	7	7	8	0	0	0	0	0
GT	1	0	1	1	1	3	1	2	3	3	0	0	0	0	0
KPMG	1	0	1	1	1	7	1	6	7	8	0	0	0	0	0
PwC	1	0	1	1	1	7	1	6	6	8	0	0	0	0	0

	Number of Offices					Number of partners					*CONNECT*				
	Mean	**SD**	**Q1**	**Median**	**Q3**	**Mean**	**SD**	**Q1**	**Median**	**Q3**	**Mean**	**SD**	**Q1**	**Median**	**Q3**
Malta															
BDO	1	0	1	1	1	1	0	1	1	1	0	0	0	0	0
Deloitte	1	0	1	1	1	2	1	2	2	3	0	0	0	0	0
GT	1	0	1	1	1	1	0	1	1	1	0	0	0	0	0
KPMG	1	0	1	1	1	4	1	3	4	4	0	0	0	0	0
PwC	1	0	1	1	1	6	1	6	6	8	2	0	2	2	2
Netherlands															
BDO	3	1	3	3	3	5	1	4	5	6	60	10	52	60	65
Deloitte	5	1	4	5	6	17	2	15	17	19	59	8	57	59	64
EY	6	1	6	6	7	25	2	24	25	27	56	8	48	58	64
GT	2	1	1	2	2	3	1	3	3	4	49	0	49	49	49
KPMG	6	1	5	6	6	21	4	18	20	26	43	7	39	42	51
PwC	4	1	4	4	4	22	2	20	22	24	46	8	37	47	49
Norway															
BDO	5	2	4	4	6	11	2	8	11	12	234	87	206	243	260
Deloitte	5	0	4	5	5	16	2	13	16	17	195	34	173	190	204
EY	10	1	9	10	11	37	4	34	38	39	196	36	156	202	220
KPMG	7	1	6	7	8	20	2	19	20	20	324	64	255	351	380
PwC	9	1	8	9	10	29	3	26	30	31	223	44	189	200	253
Poland															
BDO	4	1	3	4	5	18	3	16	18	20	142	31	131	149	168
Deloitte	2	1	1	1	2	22	5	18	24	25	233	9	219	236	240
EY	2	0	2	2	2	20	3	17	21	22	169	117	125	125	125
GT	1	0	1	1	2	7	2	6	6	8	20	0	20	20	20
KPMG	3	1	3	3	4	18	3	18	18	20	89	44	56	66	148
PwC	5	1	5	5	6	17	3	15	18	20	162	8	158	162	164

	Number of Offices					Number of partners					*CONNECT*				
	Mean	**SD**	**Q1**	**Median**	**Q3**	**Mean**	**SD**	**Q1**	**Median**	**Q3**	**Mean**	**SD**	**Q1**	**Median**	**Q3**
Portugal															
BDO	1	0	1	1	1	3	1	2	3	3	270	0	270	270	270
Deloitte	2	0	2	2	2	9	2	9	9	11	270	0	270	270	270
EY	2	0	2	2	2	4	1	4	4	5	255	32	270	270	270
KPMG	1	1	1	1	2	6	1	5	6	6	337	83	270	270	426
PwC	2	0	2	2	3	10	2	10	10	11	259	18	237	270	270
Spain															
BDO	3	1	2	2	4	9	2	7	8	10	130	69	108	108	108
Deloitte	7	1	6	7	8	36	5	35	38	39	216	14	204	214	224
EY	5	1	4	5	6	20	3	20	22	23	214	24	196	209	240
GT	2	0	2	2	2	4	1	3	5	5	108	0	108	108	108
KPMG	6	1	6	6	7	20	5	15	19	26	218	13	207	218	220
PwC	7	1	6	8	8	29	1	28	29	30	216	9	212	217	219
Sweden															
BDO	4	1	3	4	4	10	3	8	11	13	167	86	123	130	141
Deloitte	8	2	7	8	9	34	6	30	36	40	331	17	318	327	344
EY	21	2	20	21	21	71	7	66	68	81	267	12	256	265	276
GT	7	1	6	7	8	14	3	12	14	16	160	20	150	153	171
KPMG	15	2	13	16	16	51	6	50	50	56	258	9	248	259	265
PwC	21	2	19	21	22	94	10	88	97	100	230	6	224	230	237
Switzerland															
BDO	6	1	6	6	6	10	2	9	10	11	62	12	59	68	69
Deloitte	3	0	3	3	4	8	2	6	9	10	113	6	104	114	120
EY	8	1	8	9	9	42	3	38	42	44	50	4	46	52	54
KPMG	8	1	7	8	9	40	2	39	40	43	60	6	57	59	66
PwC	13	1	13	13	14	66	4	66	66	68	62	2	61	62	63

	Number of Offices					Number of partners					*CONNECT*				
	Mean	**SD**	**Q1**	**Median**	**Q3**	**Mean**	**SD**	**Q1**	**Median**	**Q3**	**Mean**	**SD**	**Q1**	**Median**	**Q3**
UK															
BDO	11	1	10	11	11	61	8	59	61	68	131	15	126	137	139
Deloitte	17	1	16	17	17	108	8	101	109	114	220	21	208	210	243
EY	15	1	14	15	16	81	5	81	82	84	339	20	320	338	349
GT	19	2	16	18	20	59	7	55	62	63	127	8	120	126	136
KPMG	25	1	24	25	25	154	10	153	154	157	246	12	236	248	259
PwC	24	2	23	23	26	143	3	141	143	145	216	13	206	213	228

TABLE 3: Full Sample Descriptive Statistics

Variables	N	Mean	SD	Min	p25	p50	p75	Max
GC	23,086	0.037	0.19	0	0	0	0	1
OFFSIZE	23,086	16.0	2.39	7.14	14.1	16.0	17.9	20.1
NUM_OFFICES	23,086	12.8	7.21	1	7	13	18	29
NUM_PARTNERS	23,086	62.5	42.8	1	25	61	91	166
CONNECT	23,086	0.0088	0.029	0	0.0038	0.0044	0.0069	1.02
INFLUENCE	23,086	0.18	0.29	0.000015	0.0068	0.037	0.19	1
SIZE	23,086	6.19	2.28	-4.02	4.58	6.02	7.69	15.5
LEV	23,086	3.61	22.4	0.064	1.46	1.83	2.59	1304.0
DUMMY_PL	23,086	0.72	0.45	0	0	1	1	1
DUMMY_PRIORPL	23,086	0.73	0.44	0	0	1	1	1
PRIORGC	23,086	0.027	0.16	0	0	0	0	1
REPORTLAG	23,086	84.4	29.3	30	62	81	103	180
IND_LEADER	23,086	0.25	0.43	0	0	0	0	1
SUB	23,086	62.8	138.2	0	6	17	54	1635
ZSCORE	23,086	15.3	8.57	0.0010	7.91	15.3	22.6	30.3

TABLE 4: Pairwise Correlations

	GC	OFFSIZE	NUM_OFFICES	NUM_PARTNERS	CONNECT	INFLUENCE	SIZE	LEV	DUMMY_PL	DUMMY_PRIORPL	PRIORGC)	(REPORTLAG	IND_LEADER	SUB	ZSCORE
GC	1.000														
OFFSIZE	-0.016**	1.000													
NUM_OFFICES	-0.026***	0.236***	1.000												
NUM_PARTNERS	-0.011*	0.338***	0.898***	1.000											
CONNECT	-0.007	0.058***	0.165***	0.154***	1.000										
INFLUENCE	-0.025***	-0.631***	-0.081***	-0.154***	-0.038***	1.000									
SIZE	-0.163***	0.346***	-0.059***	-0.036***	-0.004	0.062***	1.000								
LEV	0.011*	-0.004	0.002	0.007	0.005	-0.031***	-0.061***	1.000							
DUMMY_PL	-0.238***	0.047***	-0.010	0.005	-0.008	0.067***	0.331***	-0.069***	1.000						
DUMMY_PRIORPL	-0.215***	0.049***	-0.007	0.010	-0.002	0.064***	0.334***	-0.074***	0.605***	1.000					
PRIORGC	0.504***	-0.014**	-0.027***	-0.014**	-0.012*	-0.023***	-0.154***	0.007	-0.196***	-0.212***	1.000				
REPORTLAG	0.245***	-0.186***	-0.029***	-0.041***	0.005	-0.022***	-0.433***	0.068***	-0.304***	-0.284***	0.193***	1.000			
IND_LEADER	-0.040***	0.122***	-0.011*	0.019***	0.001	-0.017***	0.194***	-0.022***	0.064***	0.072***	-0.033***	-0.092***	1.000		
SUB	-0.065***	0.264***	0.061***	0.091***	0.017**	0.067***	0.516***	-0.032***	0.158***	0.156***	-0.054***	-0.245***	0.114***	1.000	
ZSCORE	-0.190***	-0.037***	0.083***	0.073***	0.009	0.018***	-0.033***	0.059***	0.356***	0.330***	-0.161***	-0.219***	-0.002	-0.036***	1.000

**** p<0.01, ** p<0.05, * p<0.1*

TABLE 5: Audit Firms' Network Structure and Audit Quality in the Full Sample

	Model 1			Model 2			Model 3		
	Baseline Regression			Number of Offices			Number of Partners		
Variables	**Coeff.**	**p-val**	**z-stat**	**Coeff.**	**p-val**	**z-stat**	**Coeff.**	**p-val**	**z-stat**
OFFSIZE	0.138***	0.000	4.022	0.114**	0.032	2.143	0.148***	0.005	2.818
CONNECT				23.486*	0.082	1.739	22.239	0.104	1.625
OFFSIZExCONNECT				-1.651*	0.085	-1.721	-1.559	0.109	-1.604
NUM_OFFICES				-0.010	0.834	-0.210			
OFFSIZExNUM_OFFICES				0.001	0.777	0.283			
NUM_PARTNERS							5.273	0.528	0.632
OFFSIZExNUM_PARTNERS							-0.266	0.612	-0.507
INFLUENCE	0.745***	0.002	3.127	0.741***	0.002	3.112	0.794***	0.001	3.250
SIZE	-0.096***	0.003	-2.945	-0.095***	0.004	-2.896	-0.097***	0.003	-2.969
LEV	-0.001	0.432	-0.786	-0.001	0.436	-0.778	-0.001	0.430	-0.789
DUMMY_PL	-1.144***	0.000	-8.332	-1.145***	0.000	-8.342	-1.144***	0.000	-8.360
DUMMY_PRIORPL	-0.239*	0.071	-1.807	-0.238*	0.072	-1.796	-0.236*	0.074	-1.784
PRIORGC	2.860***	0.000	18.752	2.866***	0.000	18.751	2.864***	0.000	18.596
REPORTLAG	0.016***	0.000	9.368	0.016***	0.000	9.384	0.016***	0.000	9.416
IND_LEADER	-0.128	0.305	-1.026	-0.135	0.283	-1.073	-0.145	0.248	-1.155
SUB	-0.003**	0.016	-2.407	-0.003**	0.016	-2.407	-0.003**	0.015	-2.424
ZSCORE	-0.068***	0.000	-9.070	-0.068***	0.000	-9.080	-0.068***	0.000	-9.064
Constant	-7.701***	0.000	-7.248	-7.379***	0.000	-6.141	-7.868***	0.000	-6.668
Observations	23,086			23,086			23,086		
COUNTRY FE	YES			YES			YES		
INDUSTRY FE	YES			YES			YES		
YEAR FE	YES			YES			YES		
Pseudo R2	0.449			0.449			0.449		

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

TABLE 6: Audit Firms' Network Structure and Audit Quality in Financially Distressed Companies

	Model 1			Model 2			Model 3		
	Baseline Regression			Number of Offices			Number of Partners		
Variables	**Coeff.**	**p-val**	**z-stat**	**Coeff.**	**p-val**	**z-stat**	**Coeff.**	**p-val**	**z-stat**
OFFSIZE	0.119***	0.001	3.310	0.141**	0.019	2.342	0.209***	0.000	3.567
CONNECT				71.437**	0.014	2.469	58.432**	0.031	2.158
OFFSIZExCONNECT				-5.342**	0.016	-2.398	-4.336**	0.037	-2.087
NUM_OFFICES				0.047	0.333	0.968			
OFFSIZExNUM_OFFICES				-0.003	0.316	-1.003			
NUM_PARTNERS							19.886**	0.016	2.412
OFFSIZExNUM_PARTNERS							-1.274**	0.013	-2.476
INFLUENCE	0.650**	0.015	2.438	0.800***	0.003	2.970	0.941***	0.001	3.420
SIZE	-0.118***	0.001	-3.338	-0.122***	0.001	-3.458	-0.129***	0.000	-3.643
LEV	-0.001	0.474	-0.717	-0.001	0.462	-0.735	-0.001	0.443	-0.766
DUMMY_PRIORPL	-0.049	0.710	-0.372	-0.045	0.736	-0.338	-0.043	0.746	-0.324
PRIORGC	2.540***	0.000	17.769	2.541***	0.000	17.757	2.531***	0.000	17.684
REPORTLAG	0.014***	0.000	8.514	0.014***	0.000	8.452	0.014***	0.000	8.429
IND_LEADER	-0.095	0.506	-0.665	-0.112	0.436	-0.779	-0.124	0.391	-0.859
SUB	-0.002	0.116	-1.570	-0.002	0.106	-1.615	-0.002*	0.095	-1.671
ZSCORE	-0.062***	0.000	-7.491	-0.063***	0.000	-7.473	-0.063***	0.000	-7.464
Constant	-4.789***	0.000	-6.290	-5.193***	0.000	-5.015	-6.168***	0.000	-6.314
Observations	6,291			6,291			6,291		
COUNTRY FE	YES			YES			YES		
INDUSTRY FE	YES			YES			YES		
YEAR FE	YES			YES			YES		
Pseudo R2	0.356			0.358			0.359		

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

TABLE 7: Audit Firms' Network Structure and Audit Quality using Alternative Measures of *CONNECT*

Panel A: Spatial Distribution Index *SDI*

	Model 1: Number of Offices						Model 2: Number of Partners					
	Full Sample			Financially Distressed			Full Sample			Financially Distressed		
Variables	**Coeff.**	**p-val**	**z-stat**	**Coeff.**	**p-val**	**z-stat**	**Coeff.**	**p-val**	**z-stat**	**Coeff.**	**p-val**	**z-stat**
OFFSIZE	0.126**	0.014	2.463	0.161***	0.005	2.815	0.165***	0.001	3.193	0.228***	0.000	4.045
SDI	16.991**	0.036	2.099	27.586***	0.001	3.251	11.261	0.346	0.942	14.448	0.240	1.176
OFFSIZExSDI	-1.107**	0.029	-2.181	-1.812***	0.001	-3.307	-0.770	0.277	-1.088	-0.975	0.192	-1.304
NUM_OFFICES	-0.107*	0.072	-1.797	-0.103	0.126	-1.531						
OFFSIZExNUM_OFFICES	0.007*	0.057	1.900	0.007	0.115	1.576						
NUM_PARTNERS							-6.146	0.686	-0.404	5.795	0.721	0.357
OFFSIZExNUM_PARTNERS							0.489	0.588	0.542	-0.333	0.736	-0.337
INFLUENCE	0.905***	0.000	3.766	0.926***	0.001	3.356	0.896***	0.000	3.681	0.950***	0.001	3.427
SIZE	-0.135***	0.000	-4.076	-0.129***	0.000	-3.651	-0.135***	0.000	-4.057	-0.129***	0.000	-3.649
LEV	-0.001	0.605	-0.517	-0.001	0.419	-0.808	-0.001	0.623	-0.491	-0.001	0.428	-0.793
DUMMY_PRIORPL	-0.677***	0.000	-5.485	-0.041	0.757	-0.309	-0.679***	0.000	-5.506	-0.042	0.751	-0.317
PRIORGC	2.880***	0.000	19.005	2.515***	0.000	17.646	2.884***	0.000	19.006	2.519***	0.000	17.615
REPORTLAG	0.017***	0.000	10.088	0.014***	0.000	8.462	0.017***	0.000	10.171	0.014***	0.000	8.466
IND_LEADER	-0.127	0.310	-1.016	-0.113	0.432	-0.786	-0.132	0.291	-1.056	-0.122	0.397	-0.846
SUB	-0.003**	0.020	-2.317	-0.002*	0.098	-1.655	-0.003**	0.020	-2.323	-0.002*	0.088	-1.705
ZSCORE	-0.081***	0.000	-10.273	-0.063***	0.000	-7.589	-0.081***	0.000	-10.243	-0.063***	0.000	-7.523
Constant	-7.689***	0.000	-6.167	-5.357***	0.000	-5.281	-8.277***	0.000	-6.685	-6.428***	0.000	-6.648
Observations	23,086			6,291			23,086			6,291		
COUNTRY FE	YES			YES			YES			YES		
INDUSTRY FE	YES			YES			YES			YES		
YEAR FE	YES			YES			YES			YES		
Pseudo R2	0.437			0.359			0.437			0.358		

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Panel B: Herfindahl Index *HINDEX*

	Model 1: Number of Offices						Model 2:Number of Partners					
	Full Sample			Financially Distressed			Full Sample			Financially Distressed		
Variables	**Coeff.**	**p-val**	**tstat**	**Coeff.**	**p-val**	**tstat**	**Coeff.**	**p-val**	**tstat**	**Coeff.**	**p-val**	**tstat**
OFFSIZE	0.219**	0.044	2.013	0.330***	0.008	2.671	0.272***	0.002	3.058	0.386***	0.000	3.952
HINDEX	-0.004	0.838	-0.205	-0.009	0.719	-0.359	-0.013	0.492	-0.687	-0.016	0.464	-0.732
OFFSIZExHINDEX	0.001	0.538	0.616	0.002	0.337	0.960	0.001	0.291	1.057	0.002	0.195	1.295
NUM_OFFICES	0.008	0.899	0.127	0.092	0.174	1.360						
OFFSIZExNUM_OFFICES	-0.002	0.700	-0.385	-0.008*	0.071	-1.808						
NUM_PARTNERS							11.591	0.217	1.235	29.835***	0.002	3.153
OFFSIZExNUM_PARTNERS							-0.786	0.196	-1.293	-2.059***	0.001	-3.383
INFLUENCE	0.887***	0.000	3.642	0.923***	0.001	3.289	0.966***	0.000	3.878	1.078***	0.000	3.799
SIZE	-0.134***	0.000	-4.021	-0.125***	0.000	-3.501	-0.137***	0.000	-4.121	-0.133***	0.000	-3.738
LEV	-0.001	0.690	-0.398	-0.001	0.497	-0.679	-0.001	0.681	-0.411	-0.001	0.490	-0.690
DUMMY_PRIORPL	-0.679***	0.000	-5.482	-0.037	0.778	-0.282	-0.678***	0.000	-5.479	-0.040	0.764	-0.300
PRIORGC	2.880***	0.000	19.106	2.519***	0.000	17.651	2.878***	0.000	19.000	2.506***	0.000	17.654
REPORTLAG	0.017***	0.000	10.159	0.015***	0.000	8.607	0.017***	0.000	10.182	0.015***	0.000	8.606
IND_LEADER	-0.107	0.392	-0.856	-0.085	0.556	-0.589	-0.124	0.322	-0.990	-0.103	0.477	-0.711
SUB	-0.003**	0.020	-2.335	-0.002*	0.075	-1.784	-0.003**	0.019	-2.339	-0.002*	0.070	-1.809
ZSCORE	-0.081***	0.000	-10.207	-0.063***	0.000	-7.436	-0.081***	0.000	-10.213	-0.063***	0.000	-7.445
Constant	-8.521***	0.000	-4.556	-7.140***	0.000	-3.848	-9.455***	0.000	-5.853	-8.306***	0.000	-5.670
Observations	23,086			6,291			23,086			6,291		
COUNTRY FE	YES			YES			YES			YES		
INDUSTRY FE	YES			YES			YES			YES		
YEAR FE	YES			YES			YES			YES		
Pseudo R2	0.437			0.359			0.437			0.360		

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

TABLE 8: Audit Firms' Network Structure and Audit Quality using Alternative Measures of *OFFSIZE*

Panel A: Office Size in terms of Total Clients Assets

	Model 1: Number of Offices						Model 2: Number of Partners					
	Full Sample			Financially Distressed			Full Sample			Financially Distressed		
Variables	**Coeff.**	**p-val**	**z-stat**	**Coeff.**	**p-val**	**z-stat**	**Coeff.**	**p-val**	**z-stat**	**Coeff.**	**p-val**	**z-stat**
OFFSIZE	0.056	0.201	1.280	0.100**	0.035	2.104	0.082*	0.052	1.943	0.152***	0.001	3.426
CONNECT	16.717**	0.042	2.029	23.371**	0.020	2.324	15.738*	0.062	1.868	19.624**	0.038	2.078
OFFSIZExCONNECT	-1.731**	0.036	-2.099	-2.533**	0.020	-2.330	-1.627*	0.054	-1.927	-2.106**	0.033	-2.134
NUM_OFFICES	-0.011	0.664	-0.435	0.013	0.599	0.526						
OFFSIZExNUM_OFFICES	0.002	0.535	0.620	-0.002	0.474	-0.715						
NUM_PARTNERS							1.797	0.676	0.418	8.069*	0.054	1.923
OFFSIZExNUM_PARTNERS							-0.067	0.880	-0.151	-0.956**	0.024	-2.263
INFLUENCE	0.543**	0.016	2.405	0.636**	0.015	2.438	0.568**	0.013	2.476	0.741***	0.005	2.804
SIZE	-0.089***	0.007	-2.699	-0.121***	0.001	-3.374	-0.092***	0.006	-2.745	-0.128***	0.000	-3.538
LEV	-0.001	0.427	-0.794	-0.001	0.458	-0.743	-0.002	0.425	-0.798	-0.001	0.444	-0.765
DUMMY_PL	-1.154***	0.000	-8.425				-1.155***	0.000	-8.450			
DUMMY_PRIORPL	-0.243*	0.067	-1.835	-0.048	0.716	-0.363	-0.242*	0.067	-1.829	-0.046	0.728	-0.348
PRIORGC	2.883***	0.000	18.822	2.560***	0.000	17.887	2.883***	0.000	18.700	2.554***	0.000	17.796
REPORTLAG	0.016***	0.000	9.358	0.014***	0.000	8.459	0.016***	0.000	9.402	0.014***	0.000	8.452
IND_LEADER	-0.122	0.330	-0.975	-0.104	0.464	-0.733	-0.133	0.289	-1.061	-0.114	0.426	-0.796
SUB	-0.003**	0.020	-2.334	-0.002	0.122	-1.545	-0.003**	0.019	-2.344	-0.002	0.113	-1.583
ZSCORE	-0.068***	0.000	-9.146	-0.063***	0.000	-7.534	-0.068***	0.000	-9.124	-0.063***	0.000	-7.523
Constant	-6.076***	0.000	-6.036	-3.707***	0.000	-5.545	-6.306***	0.000	-6.341	-4.104***	0.000	-6.605
Observations	23,086			6,291			23,086			6,291		
COUNTRY FE	YES			YES			YES			YES		
INDUSTRY FE	YES			YES			YES			YES		
YEAR FE	YES			YES			YES			YES		
Pseudo R2	0.449			0.357			0.449			0.358		

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Panel B: Office Size in terms of Number of Clients

	Model 1: Number of Offices						Model 2: Number of Partners					
	Full Sample			Financially Distressed			Full Sample			Financially Distressed		
Variables	**Coeff.**	**p-val**	**z-stat**	**Coeff.**	**p-val**	**z-stat**	**Coeff.**	**p-val**	**z-stat**	**Coeff.**	**p-val**	**z-stat**
OFFSIZE	0.071	0.449	0.757	0.038	0.720	0.359	0.135	0.131	1.511	0.180*	0.064	1.853
CONN	7.128**	0.032	2.150	12.111*	0.091	1.691	6.913**	0.037	2.091	9.892**	0.048	1.978
OFFSIZExCONNECT	-2.849**	0.016	-2.398	-5.989	0.153	-1.430	-2.772**	0.019	-2.342	-4.719*	0.075	-1.781
NUM_OFFICES	0.001	0.963	0.046	0.000	0.986	0.017						
OFFSIZExNUM_OFFICES	0.005	0.397	0.846	0.002	0.680	0.412						
NUM_PARTNERS							3.137	0.315	1.004	5.151	0.114	1.580
OFFSIZExNUM_PARTNERS							0.052	0.957	0.054	-1.183	0.209	-1.257
INFLUENCE	0.475**	0.046	1.999	0.344	0.192	1.306	0.532**	0.029	2.187	0.488*	0.069	1.821
SIZE	-0.066**	0.034	-2.117	-0.088***	0.008	-2.639	-0.070**	0.024	-2.257	-0.092***	0.006	-2.743
LEV	-0.001	0.422	-0.803	-0.001	0.459	-0.740	-0.001	0.409	-0.826	-0.001	0.432	-0.786
DUMMY_PL	-1.156***	0.000	-8.405				-1.158***	0.000	-8.446			
DUMMY_PRIORPL	-0.248*	0.062	-1.868	-0.057	0.665	-0.433	-0.243*	0.067	-1.834	-0.050	0.704	-0.380
PRIORGC	2.885***	0.000	18.792	2.564***	0.000	17.932	2.883***	0.000	18.658	2.554***	0.000	17.840
REPORTLAG	0.016***	0.000	9.249	0.014***	0.000	8.402	0.016***	0.000	9.293	0.014***	0.000	8.374
IND_LEADER	-0.085	0.496	-0.680	-0.049	0.730	-0.345	-0.103	0.413	-0.818	-0.068	0.636	-0.474
SUB	-0.003**	0.020	-2.319	-0.001	0.149	-1.442	-0.003**	0.020	-2.334	-0.002	0.130	-1.513
ZSCORE	-0.068***	0.000	-9.097	-0.063***	0.000	-7.532	-0.068***	0.000	-9.068	-0.062***	0.000	-7.495
Constant	-5.898***	0.000	-6.489	-3.211***	0.000	-5.045	-6.038***	0.000	-6.707	-3.617***	0.000	-6.046
Observations	23,086			6,291			23,086			6,291		
COUNTRY FE	YES			YES			YES			YES		
INDUSTRY FE	YES			YES			YES			YES		
YEAR FE	YES			YES			YES			YES		
Pseudo R2	0.448			0.355			0.448			0.356		

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1