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Audit Committee Networks and Audit Fees: A European Analysis

Ruth García-Cobo[1] | César Zarza Herranz[2] | Félix J. López Iturriaga[1]

[1]University of Valladolid, Valladolid, Spain | [2]University of Alcalá, Madrid, Spain

Correspondence: Ruth García-Cobo (ruth.garcia.cobo@uva.es)

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ABSTRACT

This study investigates the association between audit committee member networks and audit fees in a sample of 225 publicly traded firms from eight European countries between 2005 and 2020. Using social network analysis, we find that director interconnections—established through overlapping board memberships—are associated with audit fees. Our findings reveal an extensive, yet fragmented director network, where higher centrality positions correlate with increased audit fees. This suggests that director connections strengthen the demand for audit effort, leading to higher audit fees. Furthermore, we show that director centrality moderates the positive relationship between firm complexity, financial risk, and board independence with audit fees.

1 | Introduction

This paper extends a recent approach such as the social network analysis (SNA) to examine audit committees (ACs). While the pioneering literature focused on audit quality and restatements, we examine how connections among AC members—through overlapping roles in other committees or boards—relate to audit fees (AF) (Omer et al. 2019). SNA studies structures and information flows from interactions among individuals and organisations. It emphasises the importance of connections among AC directors as channels for sharing information, resources, and practices. Directors serving on multiple boards exchange knowledge, expand networks, and influence each other. These interactions can improve decision-making and oversight but also carry risks, such as spreading inefficient practices, increasing workload, or group-thinking, which may compromise directors' effectiveness.

The relationship with external auditors and determining AF are key decisions for ACs. Although AF are a construct of audit quality, it remains unclear as to whether higher fees mean better quality. This study integrates social network theory and AF determinants in an effort to reconcile these differing views.

We analyze 6899 directors from 225 publicly listed firms across eight major European countries (Germany, Belgium, Spain, France, the Netherlands, Italy, Portugal, and the United Kingdom) between 2005 and 2020. Our study reveals extensive yet fragmented networks among board members formed through shared board memberships, including one large main group and several smaller clusters. Consistent with the theoretical framework, the findings show that director connections significantly impact AF. Specifically, directors' central positions within these networks correlate with higher AF, indicating that more connected directors tend to be associated with increased audit effort.

We make four key contributions. First, we utilise the advanced methodology of SNA to study AF. While prior research has mainly focused on financial and corporate governance factors of audited firms and external auditors, this study incorporates the professional connections of AC members as an additional explanatory factor. Second, we apply SNA specifically to ACs, thereby addressing a research gap since most SNA studies concentrate on boards of directors in general, with few works exploring AC social networks (Omer et al. 2019). Third, we extend the use of centrality measures beyond interlocks by including eigenvector, closeness, and betweenness centrality, which capture not only the number of direct connections but also the quality, access to information, and intermediary roles within the network. Fourth, we use a unique, comprehensive international database, thus contrasting with many studies that focus on single countries. This larger scope under a common European auditing legal framework provides valuable academic evidence to better understand AF determinants across multiple countries.

The manuscript comprises five main sections and two technical appendices. Section 1 introduces the study; Section 2 reviews its theoretical foundations; Section 3 describes the methodological framework – sample, variables, and procedures – with Section 3.2 devoted to SNA; Section 4 reports descriptive and explanatory results; and Section 5 concludes with a synthesis of results and suggestions for future research.

2 | Theoretical Foundations and Hypothesis

2.1 | Audit Committee Characteristics and Audit Fees

AF are generally considered an indicator of audit quality (Goodwin-Stewait and Kent 2006), although empirical evidence remains inconclusive. Eshleman and Guo (2013) indicate that AF are positively related to audit quality, whereas Cohen et al. (2013), Ettredge et al. (2014) and Krauß et al. (2015) find a negative relationship. Other studies identify complex or non-existent links between fees and quality (Alhababsah and Yekini 2021; Asthana and Boone 2012; Choi et al. 2010). To clarify this ambiguity, we conceptualise AF primarily as a measure of audit effort and rigour, capturing the intensity of procedures required by auditors in response to client complexity and risk, rather than as a direct indicator of quality.

AF can be viewed from both the client and the auditor perspective. From the client side, factors such as size, complexity, risk, and leverage are positively associated with AF, whereas profitability exhibits a negative relationship. From the auditor's perspective, higher auditor quality correlates with increased fees, while longer auditor tenure is linked to lower fees (Daemi Gah 2020; Hay 2013; Hay et al. 2006). These dual perspectives underscore the multifaceted determinants of determining AF.

Beyond traditional determinants of AF, recent studies have explored their relationship with corporate governance mechanisms, particularly the AC and its members (Kalia et al. 2023; Nerantzidis et al. 2023). The AC of audited companies plays a crucial role in determining AF, as it reviews the auditor's fees and submits the most appropriate proposals to the board based on a quality-price assessment. Prior research has examined the effect of AC existence (Goodwin-Stewait and Kent 2006; Knechel and Willekens 2006), the experience and tenure of its members (Abbott et al. 2003; Azizkhani et al. 2023), their expertise (Alhababsah and Yekini 2021; Ghafran and O'Sullivan 2017), female representation (Aldamen et al. 2018; Ittonen et al. 2010), and committee activities (Yatim et al. 2006) on AF.

Complementary research has enriched the study of AF by examining broader governance and audit-quality dimensions. Ferdous et al. (2024) show that CEO age and dominance materially affect audit pricing. Hossain et al. (2017) investigate how the proportion of senior auditors on the audit team influences fees, while Hossain et al. (2016) demonstrate that economic dependencies from director interlocks can impair auditor independence and indirectly alter fee determination. Frino et al. (2023) underscore the impact of information asymmetry and find that firms in high-asymmetry environments incur higher AF due to increased audit effort and risk. Despite these advances, a notable gap remains concerning the role of directors' social networks in auditing, including AF (Fernández Méndez et al. 2015; Kalelkar 2017). Our study addresses that gap by integrating social network analysis to evaluate how AC members' interconnections shape AF.

Signalling theory posits that attributes such as professional reputation, certifications, and inter-organisational connections serve as indicators of otherwise unobservable quality. Within this framework, observable characteristics of AC members—particularly their network positions—convey credible signals about the strength of internal controls and the firm's transparency. High network centrality conveys reliable information to external auditors and investors regarding a member's experience, commitment, and reputation, thereby reinforcing confidence in internal oversight. Furthermore, well-reputed members are incentivised to demand superior audit quality to protect their own reputation.

Several studies corroborate the signalling function of ACs in enhancing market credibility regarding internal control and audit quality. Elmashtawy et al. (2024) demonstrate that an effective AC signals robust control systems and yields higher audit quality, with this effect amplified under joint audit structure. Appuhami (2018) finds that AC composition reduces perceived risk among investors, acting as a credibility-enhancing signal. Bédard et al. (2008) argue that an independent and expert AC mitigates information asymmetries during initial public offerings, while Dragomir and Dumitru (2023) show that AC quality is positively associated with integrated reporting quality, where independence signals greater transparency and enhances report credibility. Mkumbuzi (2015) highlights that AC financial expertise generates positive signals that strengthen corporate reputation, and Vafeas (2005) observes that shareholding by AC members conveys a commitment to report quality. Signalling theory thus suggests that market participants and auditors interpret a central, high-quality AC as requiring more rigorous audits to safeguard its reputation, a demand reflected in higher AF. This framework underpins our hypothesis that AC centrality not only influences audit effort but also serves as a credible signal driving external auditors' pricing decision.

The relationship between AC characteristics and AF can be framed through demand and supply theory. From the client's perspective, a robust AC demands more comprehensive external audit procedures to secure high quality, even at the expense of higher fees. Conversely, from the auditor's perspective, an effective AC enhances the quality of financial information and communication, thereby reducing audit risk—a critical factor in audit planning—and potentially lowering AF (Aldamen et al. 2018).

2.2 | Directors' Social Networks

Directors add value not only through their expertise but also by connecting firms to diverse information sources. Their social networks enhance reputation and credibility and go beyond merely facilitating information flow. When committee members occupy central positions in the network, it reassures auditors of their skills and commitment, thereby narrowing information gaps and strengthening trust in the firm's oversight.

Director connections exist both formally and informally (Marra 2021). Given the difficulty in objectively measuring informal ties, research has concentrated on formal relationships through concurrent board memberships (Renneboog and Zhao 2020; Zhao 2022). This approach emphasizes that directors actively use their network positions to influence governance practices and corporate outcomes, effectively signalling their oversight capabilities and commitment to external auditors rather than passively receiving information.

This emerging research stream, originating in corporate finance, has recently extended into accounting and financial reporting (Almaqoushi and Powell 2021; Bianchi et al. 2023). Evidence suggests that auditors with broader social networks deliver higher-quality audits (Pittman et al. 2019), and that firms with well-connected ACs are less prone to financial misstatement and exhibit greater firm value (Omer et al. 2014, 2019). Director networks facilitate not only information exchange but also the diffusion of practices and behaviours. For instance, earnings management tends to spread among companies sharing directors with firms that engage in such practices, while it is less prevalent among firms linked to those that avoid manipulation (Chiu et al. 2013). Conversely, high board centrality can intensify internal conflicts and defensive behaviour, as evidenced by poorer post-merger performance in China (Tao et al. 2019). Directors occupying central network positions also display increased dissent voting, illustrating how excessive cohesion may lead to catastrophic decisions—highlighted by groupthink phenomena in Enron and WorldCom, characterised by illusions of unanimity, self-censorship, and conformity pressure (Canet 2016; Zhang et al. 2024). These findings underscore that while centrality within AC networks offers access to resources and information, it also generates conformity pressures and group biases that can elevate fraud risk.

The way in which board members perform their supervisory role directly influences how external auditors approach their work. Aghazadeh et al. (2023) demonstrate that AC behaviour directly influences auditors' critical judgements and procedures. In this framework, greater AC centrality can increase demands for rigorous audits whilst also affecting auditors' risk perceptions. However, excessive centrality may create groupthink, strain members' capacity to oversee effectively, or compromise independence due to time constraints. Moreover, Ying et al. (2023) highlight that social pressure and partner expectations can shape auditors' professional scepticism, reinforcing the idea that the network structure within the AC plays a key role in the dynamics of external auditing.

In accordance with the dual perspective of AF (client-auditor perspective), two alternative hypotheses can be proposed regarding the relationship between AC connections and AF. On the one hand, there could be a negative relationship, since better-connected directors might negotiate lower fees due to their enhanced market knowledge derived from their contacts (Ittonen et al. 2019). Simultaneous memberships on different AC and boards would facilitate the exchange of experiences among directors, potentially leading to lower fees for audited companies. Conversely, this enhanced knowledge of the audit environment could result in higher demands and greater effort required from the audit firm, thereby increasing the fees for the services provided (Ghafran and O'Sullivan 2017). Consequently, we propose the main hypothesis of this study in a dual form:

Hypothesis 1a. *A more central position in the network of directors is negatively related to the audit fees paid by the audited firm.*

Hypothesis 1b. *A more central position in the network of directors is positively related to the audit fees paid by the audited firm.*

3 | Empirical Analysis

3.1 | Sample and Data Sources

Our dataset covers 225 non-financial firms from eight major European indices—Germany's DAX 30, Belgium's BEL20, Spain's IBEX35, France's CAC40, the Netherlands' AEX, Italy's FTSE MIB, Portugal's PSI20, and the UK's FTSE 100—over 2005–2020. We included all listed firms but excluded financial firms due to their unique regulations, following standard practices, resulting in the final sample used in this study.

The sample composition is justified for several reasons. First, these countries have been central to European economic integration and the harmonisation of accounting and auditing regulations, exemplified by Regulation 537/2014—pioneered by Germany, France, and Italy and subsequently adopted by others. Additionally, including Spain and Portugal ensures representation of southern Europe's regulatory environment. Although the UK exited the European Union post-2016, it remained an EU member throughout the study period and has historically influenced corporate governance and auditing practices. Its inclusion captures the impact of advanced governance frameworks and facilitates comparability across diverse European jurisdictions.

Second, this country selection captures diverse cultural, legal, and regulatory frameworks that affect financial oversight and AF negotiations. It includes the Anglo-American common law model via the UK and various continental civil law traditions through Germany, France, Italy, Spain, and others (La Porta et al. 1997, 1998). This heterogeneity enables the examination of how differing legal systems and accounting standards shape AF determination and corporate governance practices across Europe.

Third, the selected countries represent Europe's largest and most advanced economies, collectively contributing a substantial share of regional GDP. Germany, France, Italy, and Spain rank among Europe's top five economies, while Belgium and the Netherlands serve as important financial and logistical centres with extensive corporate linkages. Our sample is also dictated by data availability, thereby ensuring homogeneous and reliable information for publicly traded firms listed on major indices such as the FTSE 100, DAX 30, CAC 40, and IBEX 35. These stock markets offer robust data on AF, governance structures, and financial performance, thus facilitating empirical analysis. Additionally, these countries have been the focus of numerous academic studies and regulatory attention, enabling comparisons with prior research and contributing to current debates on governance and audit quality in Europe. Geographic and cultural proximity promotes network formation by lowering logistical and communication costs and facilitating face-to-face interactions that are essential for trust and learning. Historical ties further embed confidence and contact networks, easing market entry and reinforcing collaborative governance and oversight practices across neighbouring countries.

Regulation (EU) 537/2014 (European Union 2014a) and Directive 2014/56/EU (European Union 2014b) introduced measures to strengthen auditor independence and audit transparency, redesigning AF negotiations. Key provisions include restrictions on providing both audit and non-audit services and mandatory rotation of the statutory auditor. The AC plays a central role, being tasked with auditor selection, independence assessments, and audit supervision. Additionally, firms must publicly disclose auditor tenure and total fees. These regulatory changes enhance the AC's oversight responsibilities and increase visibility into auditor practices, thereby influencing the determinants and negotiations of AF.

The reform of the EU Statutory Audit Market has multifaceted impacts on AF. First, the prohibition of non-audit services (NAS) removes a revenue stream that auditors once used to offset lower AF, thereby reducing commercial flexibility and potentially driving AF increases, especially where NAS previously deepened client knowledge (Castillo-Merino et al. 2020). With only audit services negotiable, fee discussions are exclusively on the audit's inherent value. Second, mandatory auditor rotation generates mixed fee effects. Initially, onboarding new auditors incurs learning costs and increases fees. Over time, rotation encourages competitive tendering, as auditors compete for contracts, which can drive fees down (Cameran et al. 2015). These provisions enhance transparency and also redesign the economic incentives and negotiation dynamics underlying AF determination.

Mandatory disclosure of auditor tenure and fees introduces public and market scrutiny, aligning AF with engagement complexity, risk, and effort. This transparency constrains abnormally low or high pricing Dunn et al. (2021). The AC's active oversight—especially when members have long-running sector and market expertise—further adjusts fees to reflect fair service value, thus preventing excesses that could impair audit quality (Carcello et al. 2002). Structural factors—notably audit firm size– also shape negotiations; in competitive markets, larger firms, particularly the Big Four, influence capacity and brand to offer lower fees to retain or attract clients (Simunic 1980). Collectively, Regulation (EU) 537/2014 and Directive 2014/56/EU have improved transparency and competition in the audit market by restricting non-audit services and mandating auditor rotation. While these reforms may have increased truthful audit costs by eliminating fee-balancing flexibility, they promote a closer link between fees and expected audit quality. This effect is most pronounced when technically proficient, engaged ACs exert robust supervisory roles, driving negotiations toward fees that mirror the underlying audit effort and that safeguard both auditor independence and client assurance.

We integrate two sets of data. First, we identify each board of directors and the AC member for the 225 companies across the 16-year period. This process involved consulting corporate annual reports, company websites, and national securities regulators, often requiring multilingual source review and reconciliation of variant name spellings and non-Latin scripts. After standardisation, as the same individual could be referenced differently depending on the firm or year, we matched 6899 unique directors, of whom 2688 served on an AC at least once.

Second, we compiled firm-level financial and governance variables—including AF, balance-sheet and income-statement items, among others—from *Refinitiv Eikon, Bloomberg*, and *NRG Metrics*. Panel A of Table 1 summarises country composition;[1] the UK contributes the largest share with 77 firms and over 12,000 firm-year observations, whereas smaller markets like Portugal account for 16 firms and about 3000 observations. Overall, AC members constitute nearly 39% of all directors, indicating substantial role overlap.

As shown in Panels I and II of Panel B in Table 1,[2] the total number of directors and AC members increases over the study period, as does the number of firms analysed. When normalising the number of directors by the number of firms, we observe a negative coefficient, indicating a trend toward simplifying board structure. In contrast, the coefficient for AC members is positive, highlighting the increasing importance of the AC in corporate governance and the significance of social networks.

3.2 | Methodology

A social network comprises relationships and interactions within a human group, typically represented as a graph with nodes (actors) connected by links. In our study, the reference population includes all board members from 225 companies across eight European countries. Following established literature, we consider two directors to be connected if they serve on the same board in the same year, thus forming a director network (Intintoli et al. 2018). This network translates to firm level, where companies are linked if they share at least one director in a given year (Omer et al. 2019).

Our analysis employs two interconnected network structures: a director network where nodes represent AC members and centrality measures are calculated, and a company network where nodes represent firms. Centrality measures from AC members in the director network are aggregated (using mean values) and transferred to the company network. Since our research focuses specifically on ACs, only centrality measures of AC members

TABLE 1 | Sample distribution.

Panel A: General sample distribution

Distribution of firms, observations, directors, and audit committee members by country.

	Germany	Belgium	Spain	France	The Netherlands	Italy	Portugal	United Kingdom	Total
Firms	25	14	26	35	17	28	16	77	225
Observations	8240	2713	4826	7210	2466	6123	3010	12,309	46,897
Directors	1247	403	757	1116	421	1108	524	1844	6899
AC members	348	159	315	436	172	355	144	902	2688

Panel B: Sample by years

Distribution of firms, observations, directors, and audit committee members by country

Panel I: All datasets

	Different directors	AC members	Firms	Total number of directors	Directors/firm	AC members/firm
2005	2098	601	163	2370	12.87	3.69
2006	2291	688	186	2621	12.32	3.70
2007	2416	741	197	2791	12.26	3.76
2008	2618	797	209	3060	12.53	3.81
2009	2642	818	212	3111	12.46	3.86
2010	2685	833	218	3142	12.32	3.82
2011	2761	864	223	3234	12.38	3.87
2012	2780	875	224	3238	12.41	3.91
2013	2819	926	230	3287	12.26	4.03
2014	2843	949	228	3293	12.47	4.16
2015	2555	886	223	2856	11.46	3.97
2016	2570	904	221	2866	11.63	4.09
2017	2533	880	221	2824	11.46	3.98
2018	2479	887	219	2758	11.32	4.05
2019	2466	886	216	2732	11.42	4.10
2020	2513	890	217	2796	11.58	4.10

Panel II: Largest network

	Different directors	AC members	Firms	Total number of directors	Directors/firm	AC members/firm
2005	1722	496	127	1977	13.56	3.91
2006	1980	592	154	2307	12.86	3.84
2007	2105	634	166	2477	12.68	3.82
2008	2213	670	171	2648	12.94	3.92
2009	2235	692	175	2695	12.77	3.95
2010	2148	682	170	2581	12.64	4.01
2011	2146	677	168	2592	12.77	4.03
2012	2196	692	174	2628	12.62	3.98

(Continues)

Panel II: Largest network

	Different directors	AC members	Firms	Total number of directors	Directors/firm	AC members/firm
2013	2276	753	182	2725	12.51	4.14
2014	2244	756	178	2651	12.61	4.25
2015	1866	665	162	2143	11.52	4.10
2016	1938	696	165	2210	11.75	4.22
2017	1980	708	173	2251	11.45	4.09
2018	1874	675	166	2128	11.29	4.07
2019	1856	688	165	2101	11.25	4.17
2020	1900	692	163	2157	11.66	4.25

are incorporated into firm-level analyses. Notably, if a director serves on an AC in any firm, their centrality measure transfers to all companies where they hold board positions, regardless of AC membership status at those firms.

Previous research on board interlocks focuses on direct director overlaps across boards, offering an incomplete picture of network influence. SNA provides more comprehensive centrality metrics that capture both position and connection quality within networks (Intintoli et al. 2018). Centrality is multidimensional, encompassing four key components: degree, eigenvector, closeness, and betweenness centrality (Bonacich 1972, 1987; Freeman 1977, 1978).

While avoiding excessive technical detail (which is provided in Appendix A), it is pertinent to briefly outline the significance of each metric. Degree centrality measures immediate influence by counting direct connections. Eigenvector centrality assesses long-term influence, weighting connections based on their own centrality scores and incorporating indirect network effects. Closeness centrality calculates the average shortest path from one node to all the others, reflecting information flow efficiency. Betweenness centrality identifies nodes that frequently serve as intermediaries on the shortest paths between other actors.

Given centrality's multidimensional nature, we construct a composite measure using principal component analysis (PCA), following established literature on director connectedness and firm outcomes (Intintoli et al. 2018; Omer et al. 2014, 2019). The factor loadings of degree centrality, eigenvector centrality, closeness centrality, and betweenness centrality are 0.60, 0.45, 0.45, and 0.47, respectively. The first factor exhibits an eigenvalue of 2.24 and explains 56% of total variance.

We calculate centrality measures at the director level for all network members, then transfer these to the firm level. Following (Omer et al. 2019), centrality measures are standardised by subtracting the mean and dividing by the standard deviation, obtaining variables with zero mean and unit standard deviation. Since our research focuses on ACs, only centrality measures of AC members are transferred from the director network to the company network, using mean values for each firm's AC members.[3]

Table 2 illustrates this process with six firms and their board compositions, indicating AC membership status. Figure 1 illustrates the director network showing interconnections among board members, while Figure 2 presents the corresponding company network. This dual-network approach captures how individual director connections aggregate to firm-level network positions.

We calculated four centrality measures for each director using UCINET VI, software (Section I of Panel B, Table 2), then standardised these measures (Section II of Panel B, Table 2). To aggregate measures at the firm level, we used mean values of all AC members (Panel C of Table 2). For instance, Firm 1's AC comprises two directors (A and B), with no other board members serving on other ACs. Thus, Firm 1's degree centrality equals 0.993 – the mean of Director A's centrality (0.128) and Director B's centrality (1.858). Conversely, Firm 2 has AC members R and F, plus director H, who, whilst not on Firm 2's AC, serves on Firm 4's AC. Consequently, Firm 2's degree centrality reflects the mean of three directors: R (−0.448), F (−0.448), and H (2.435).

Following established practice (Omer et al. 2019), we employ PCA to create a composite connectedness measure as mentioned before. We retain only the first principal component because it explains 55.9% of total variance—a substantial proportion for multidimensional empirical data. Additionally, the first component exhibits the largest eigenvalue (2.239), exceeding the standard threshold of one. Its consistent factor loadings across measures confirm that it reflects general network position rather than favouring specific centrality aspects. Using a single component simplifies interpretation and aligns with prior research, where a single dimension of connectedness is often used to capture the structural relationships within networks.

3.3 | Variables and Models

Following established AF literature (Abbott et al. 2003; Carcello et al. 2002), we define our dependent variable (AF) as the natural logarithm of AF paid by firms to external auditors for audit services, excluding non-audit services. Our explanatory variables include director connection metrics together with other factors that may influence AF, thus mitigating

TABLE 2 | Centrality example.

Panel A: Director composition across firms

Firm 1	Firm 2	Firm 3	Firm 4	Firm 5	Firm 6
Director A (AC)	Director R (AC)	Director J (AC)	Director H (AC)	Director L (AC)	Director P (AC)
Director B (AC)	Director F (AC)	Director K (AC)	Director M (AC)	Director O (AC)	Director B (AC)
Director C	Director H	Director S	Director N	Director H	Director K
Director D	Director I		Director Ñ		Director M
Director E					

Panel B: Director network centrality measures

	Section I: Baseline measures					
Id	Degree	Closeness	Eigenvector	Betweenness	AC	Firm
A	0.235	0.377	0.431	0	Yes	Firm 1
B	0.411	0.531	0.649	0.382	Yes	Firm 1 and 6
C	0.235	0.377	0.431	0		Firm 1
D	0.235	0.377	0.431	0		Firm 1
E	0.235	0.377	0.431	0		Firm 1
F	0.176	0.369	0.141	0	Yes	Firm 2
H	0.470	0.531	0.353	0.485	Yes	Firm 2, 4 and 5
I	0.176	0.369	0.141	0		Firm 2
J	0.117	0.346	0.106	0	Yes	Firm 3
K	0.294	0.5	0.374	0.220	Yes	Firm 3 and 6
L	0.117	0.361	0.100	0	Yes	Firm 5
M	0.352	0.607	0.486	0.529	Yes	Firm 4 and 6
N	0.176	0.459	0.239	0		Firm 4
O	0.117	0.361	0.100	0	Yes	Firm 5
P	0.176	0.472	0.335	0	Yes	Firm 6
R	0.176	0.369	0.141	0	Yes	Firm 2
S	0.117	0.346	0.106	0		Firm 3
Ñ	0.1764	0.459	0.239	0		Firm 4

Section II: Standardised centrality measures

Id	Degree	Closeness	Eigenvector	Betweenness	AC	Firm
A	0.128	−0.566	0.843	−0.492	Yes	Firm 1
B	1.858	1.394	2.148	1.604	Yes	Firm 1 and 6
C	0.128	−0.566	0.843	−0.493		Firm 1
D	0.128	−0.566	0.843	−0.493		Firm 1
E	0.128	−0.566	0.843	−0.493		Firm 1
F	−0.448	−0.671	−0.901	−0.493	Yes	Firm 2
H	2.435	1.394	0.372	2.169	Yes, yes, no	Firm 2, 4 and 5
I	−0.448	−0.671	−0.901	−0.493		Firm 2
J	−1.025	−0.960	−1.108	−0.493	Yes	Firm 3

(Continues)

Section II: Standardised centrality measures						
Id	**Degree**	**Closeness**	**Eigenvector**	**Betweenness**	**AC**	**Firm**
K	0.704	0.995	0.496	0.717	Yes, no	Firm 3 and 6
L	−1.025	−0.771	−1.143	−0.493	Yes	Firm 5
M	1.281	2.363	1.172	2.410	Yes	Firm 4 and 6
N	−0.448	0.477	−0.309	−0.493		Firm 4
O	−1.025	−0.771	−1.143	−0.493	Yes	Firm 5
P	−0.448	0.640	0.263	−0.493	Yes	Firm 6
R	−0.448	−0.671	−0.901	−0.493	Yes	Firm 2
S	−1.025	−0.960	−1.108	−0.493		Firm 3
Ñ	−0.448	0.477	−0.309	−0.493		Firm 4

Panel C: Company network centrality measures

	Degree average	Closeness average	Eigenvector average	Betweenness average
Firm 1	0.993	0.414	1.496	0.555
Firm 2	0.512	0.017	−0.476	0.394
Firm 3	−0.160	0.017	−0.305	0.112
Firm 4	1.858	1.879	0.772	2.289
Firm 5	0.128	−0.049	−0.638	0.394
Firm 6	0.849	1.348	1.020	1.059

Note: Panel B—Centrality measures of the network of directors, as exemplified in Panel A. Section I provides the baseline metrics, and Section II reports the standardised measures. See Appendix A for the definitions of measures. Panel C—Firm-level centrality measures of the network of directors, as exemplified in Table 2. See Appendix A for the definitions of measures.

potential bias. Consistent with the dual perspective mentioned before (Section 2.1), these factors are categorised into client-associated and auditor-associated characteristics (Hay et al. 2006; Simunic 1980).

Among the client-related variables, we control for company size (SIZE), measured as the natural logarithm of total assets (Abbott et al. 2003). We also capture client complexity (EXP), proxied by the exports-to-assets ratio (Carcello et al. 2002), which is expected to positively relate to audit efforts given the needs of larger, more complex firms. Client audit risk is measured by the accounts receivable-to-assets ratio (RECEI), which should correlate positively with AF because riskier clients demand more scrutiny (Gul et al. 2008). Profitability (ROA) serves as another audit risk indicator, since weaker performance heightens auditor risk and may increase fees. Finally, we control for bankruptcy risk via the leverage ratio (LEV), defined as total debt over total assets (Ivanova and Prencipe 2023).

Given our focus on corporate governance issues, we control for board size (B_SIZE) (Fernández Méndez et al. 2015), proportion of independent directors (B_INDEP) (Yatim et al. 2006), and proportion of female directors (B_FEM) (Gul et al. 2008) to reflect board diversity. We also include the number of board meetings (B_MEET) (Goodwin-Stewait and Kent 2006), audit committee size (AC_SIZE) in order to examine oversight, and audit committee meetings (AC_MEET) (Zaman et al. 2011), capturing committee composition, activity, and frequency. Regarding external audit, a binary variable (BIG4) indicates engagement of a Big Four auditor and is expected to be positively associated with AF (Firoozi and Magnan 2022).

We control for the institutional environment using the World Bank's Rule of Law indicator (RLAW), which reflects the quality of the legal framework, the enforcement of contracts, and the overall effectiveness of governance institutions (Abraham et al. 2025).

We winsorized the variables at the 1st and 99th percentiles to mitigate the abnormal influence of extreme values. We include year and industry fixed effects to enhance robustness (Intintoli et al. 2018; Omer et al. 2019). Year fixed effects adjust for time-specific factors affecting all firms, such as macroeconomic or regulatory changes. Industry fixed effects address unobserved sector differences, acknowledging that audit practices vary due to industry regulations, reporting standards, and risk profiles. We employ cluster-robust standard errors clustered by year to account for error dependence (Gow et al. 2010; Ittonen et al. 2010).

The model to be estimated can therefore be represented by the following equation, where i represents the industry, t denotes the time period, η_i is the fixed-effects term for each industry,

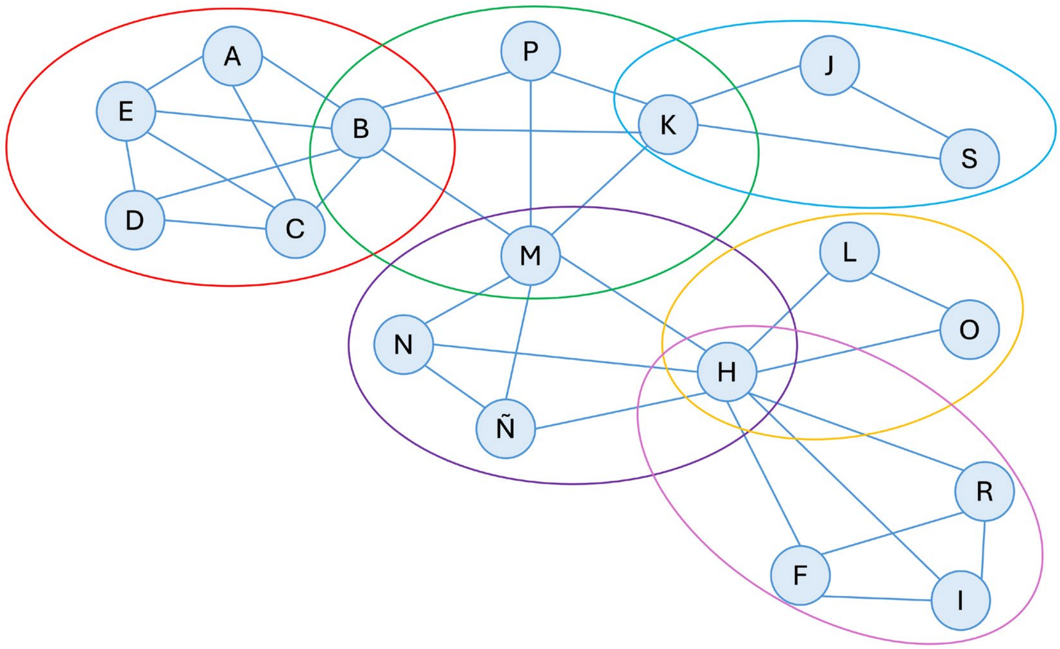

FIGURE 1 | Director network. Directors are represented by blue bubbles labelled with capital letters. Each coloured circle clusters together directors belonging to the same firm, visually highlighting interconnections and shared memberships across companies. *Source:* Own elaboration.

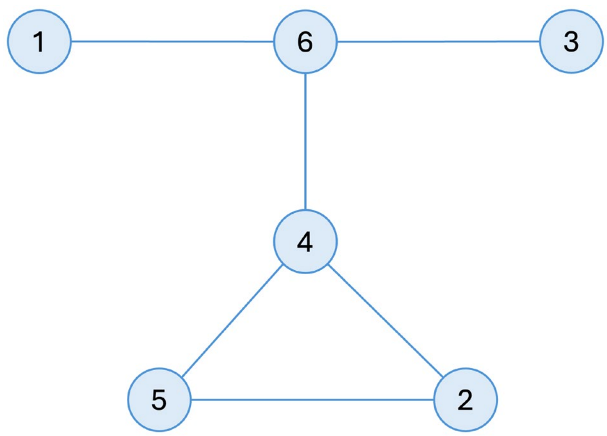

FIGURE 2 | Company network. Firms are represented by labelled bubbles with numbers. Each numbered bubble corresponds to a different firm. *Source:* Own elaboration.

γ_t is the fixed-effect term for each year, and $\varepsilon_{i,t}$ is the random error term. We apply the panel data methodology.

$$\begin{aligned} \mathrm{AF}_{it} = {} & \beta_0 + \beta_1 \mathrm{Centrality}_{it} + \beta_2 \mathrm{SIZE}_{it} + \beta_3 \mathrm{EXP}_{it} + \beta_4 \mathrm{RECEI}_{it} \\ & + \beta_5 \mathrm{ROA}_{it} + \beta_6 \mathrm{LEV}_{it} + \beta_7 \mathrm{B\_SIZE}_{it} + \beta_8 \mathrm{B}_{\mathrm{INDEP}_{it}} \\ & + \beta_9 \mathrm{B}_{\mathrm{FEM}it} + \beta_{10} \mathrm{B}_{\mathrm{MEET}it} + \beta_{11} \mathrm{AC}_{\mathrm{SIZE}it} + \beta_{12} \mathrm{AC}_{\mathrm{MEET}it} \\ & + \beta_{13} \mathrm{BIG4}_{it} + \beta_{14} \mathrm{RLAW}_{it} + \eta_i + \gamma_t + \varepsilon_{it} \end{aligned} \tag{1}$$

4 | Results

4.1 | Descriptive Analysis

The main network—constructed based on directors' overlapping board memberships—encompasses 85% of sample firms, while smaller, isolated networks exist in parallel.[4] Despite its fragmentation, its dominant component spans between 131 and 189 companies depending on the year. Figure 3 illustrates the largest network in 2015, where nodes represent firms, and ties illustrate their relationships, established through shared board members.

Table 3 reports descriptive statistics for the main variables. The mean log of AF is 15.409, which is consistent with (Sun et al. 2022). Exports account for 64% of sales, indicating substantial EU cross-border trade. Boards average 14 members, with 20% being female and 60% being independent directors. ACs have four members and meet six times per year, with boards meeting seven times annually. Most firms use a Big Four auditor. Financially, the average return on assets (ROA) is 12.1%, and the leverage ratio is 29%, reflecting moderate financial risk.

Table 4 shows the correlation matrix for key variables. AF correlates strongly with firm size (0.764), as larger firms generally face higher fees. AF also has a moderate positive relationship with board size (B_SIZE) at 0.303. Board size and AC committee size correlate at 0.397, consistent with (Ferdous et al. 2024), indicating that firms with larger boards often have larger ACs. AC meetings and board meetings exhibit a strong correlation of 0.693, reflecting synchronised governance schedules. The correlation between board size and firm size (SIZE) aligns with (Kalelkar 2017). Most correlations remain below 0.4, thus mitigating multicollinearity concerns.

Panel II of Table 4 presents the correlation matrix of centrality measures and the dependent variable (AF). AF exhibits moderate positive correlations with DEG, EIGEN, CLOS, and BET, indicating that firms with more centrally positioned AC members tend to incur higher fees. This supports the notion that well-connected committees may demand more rigorous or extensive audits. Additionally, the PCA effectively integrates these measures, reinforcing its role as a comprehensive metric of network centrality.

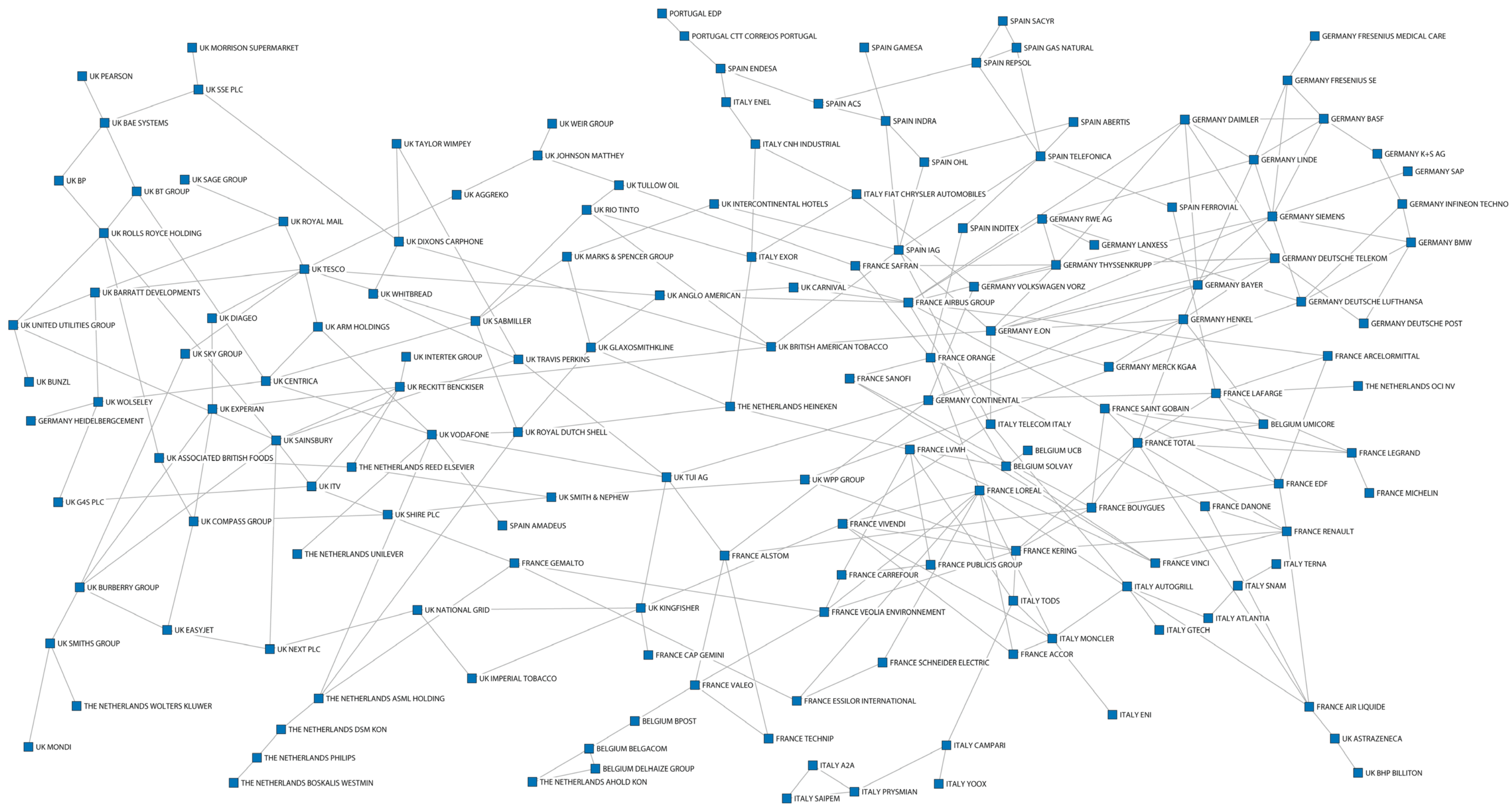

FIGURE 3 | Example of network in 2015. Nodes represent firms, and ties illustrate their relationships, established through shared board members. *Source:* Own elaboration using UCINET VI.

TABLE 3 | Descriptive statistics.

Variable	Obs	Mean	SD	Q1	Q3
DEG	2655	0.263	0.952	−0.393	0.676
EIGEN	2655	−0.057	0.858	−0.341	−0.173
CLOS	2655	0.049	1.032	−0.372	0.606
BET	2655	0.513	0.908	−0.057	0.771
PCA	2655	0	1.497	−0.968	0.575
AF	3138	15.409	1.338	14.473	16.402
SIZE	3313	16.424	1.347	15.466	17.387
EXP	2974	0.643	0.273	0.488	0.859
RECEI	3311	0.143	0.094	0.079	0.187
ROA	3305	0.121	0.073	0.078	0.154
LEVERAGE	3274	0.299	0.159	0.188	0.410
B_SIZE	3381	13.692	4.996	10	16
B_INDEP	3074	0.594	0.201	0.460	0.730
B_FEM	3155	0.198	0.137	0.091	0.300
B_MEET	3039	7.44	3.647	5	9
AC_SIZE	3381	4.296	1.348	3	5
AC_MEET	3011	6.199	3.095	4	7
BIG 4	3369	0.918	0.274	—	—
RLAW	3381	1.378	0.433	1.154	1.697
MASC	3381	53.899	16.309	43	66
IND	3381	72.851	16.747	67	89
PDI	3381	47.590	13.336	35	63
UAI	3381	65.109	24.106	35	86
LTO	3381	30.377	7.2364	25	38

Note: Mean, standard deviation, first and third quartiles of the main variables. See Appendix B for the definition of the variables.

4.2 | Regression Analysis

Table 5 reports the estimates of Equation (1), showing that AF are positively and significantly related to all centrality measures: degree (DEG), eigenvector (EIGEN), closeness (CLOS), betweenness (BET), and the composite PCA metric. A higher degree centrality (DEG) coefficient implies that AC members with more direct connections are linked to greater AF, likely reflecting their emphasis on audit quality. The significance of eigenvector centrality (EIGEN) indicates that connection quality—not just quantity—drives AF. Closeness centrality (CLOS) underscores how faster access to network resources prompts auditors to exert more effort, thereby increasing fees. Betweenness centrality (BET) suggests that AC members serving as bridges within the board network improve information flow, thus reinforcing demands for rigorous audits. The PCA's significance confirms the aggregate effect of AC connectivity on AF. Overall, these findings imply that more connected ACs proactively seek thorough audits, potentially as a strategy to mitigate risk.

The estimates of the control variables align with prior research. Client size (SIZE) and complexity (EXP) positively relate to AF, indicating that larger, more complex firms necessitate greater audit effort and higher fees (Ittonen et al. 2010). Audit risk, which is proxied by the accounts receivable ratio (RECEI), also increases AF, as riskier clients require additional audit work (Goodwin-Stewait and Kent 2006). Leverage (LEV) exhibits a positive, significant effect on AF, suggesting that higher debt levels elevate audit effort due to greater financial risk, creditor monitoring, and reporting complexity. Finally, the positive coefficient for BIG4 confirms that Big Four auditors command higher fees, reflecting their reputation for superior audit quality (Harjoto et al. 2015).

The positive coefficient for board independence (B_INDEP) indicates that greater independence leads to more detailed audit demands, reflecting a commitment to financial transparency (Knechel and Willekens 2006; Yatim et al. 2006). Likewise, the proportion of female directors (B_FEM) is positively and significantly associated with AF, supporting the notion that greater board diversity contributes to a more rigorous audit approach (Gul et al. 2008). The explanatory power of our models, as shown by the R^2 values, aligns with prior research (Azizkhani et al. 2023; Frino et al. 2023; Garcia-Blandon et al. 2023; He et al. 2017). Overall, these findings confirm a significant positive relationship between AF and the connectivity of AC members.

We investigate whether the relationship between AF and AC centrality varies across firm types by interacting centrality measures with proxies for complexity, financial risk, and governance. We use exports (EXP) to capture complexity, leverage (LEV) for financial risk, and board independence (B_INDEP) for governance strength. For each, we create dummies HIGHEXP, HIGHLEV, and HIGHINDEP, set to 1 if EXP, LEV, or B_INDEP are at or above the median, and 0 otherwise. These interactions were selected for their significance in the prior analysis and to capture key dimensions that influence audit demands, allowing for a comprehensive analysis of interaction effects.

Table 6 shows the estimation results relating exports and centrality measures to AF. The findings confirm a clear, consistent positive association between all centrality metrics and export levels with AF, and align with previous results. Notably, the interaction terms between HIGHEXP (firms with above-median export levels) and each centrality measure display negative and significant coefficients. This implies that, although firm complexity—represented by exports—generally leads to higher AF, the effect becomes less pronounced when AC members are highly connected. In export-oriented firms, well-connected AC members may help to facilitate the audit, perhaps due to their expertise or the confidence they instill in external auditors, thus reducing perceived complexity and required audit effort. This points to a dual dynamic; while greater network connectivity among AC members typically increases rigour and fees, in highly internationalised firms, it actually reduces auditors' concerns and moderates audit costs. The robustness of this finding across all centrality measures further strengthens the validity of these results.

Table 7 presents results from the interaction of centrality measures and leverage (LEV) with AF. Centrality metrics and LEV have positive, significant direct relationships with AF, similar to previous findings. However, columns 1, 2, and 5 show that most interactions

TABLE 4 | Correlation matrix.

Panel I: Correlation matrix of main variables

Pairwise coefficients of correlation among the main variables

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
(1) AF																		
(2) SIZE	0.764***																	
(3) EXP	0.231***	0.131***																
(4) RECEI	0.040**	−0.148***	0.101***															
(5) ROA	−0.172***	−0.240***	−0.045**	0.014														
(6) LEVERAGE	−0.079***	0.045**	−0.137***	−0.200***	−0.112***													
(7) B_SIZE	0.303***	0.402***	0.022	0.057***	−0.093***	0.027												
(8) B_INDEP	0.233***	0.159***	0.229***	0.007	−0.005	−0.124***	−0.170***											
(9) B_FEMALE	0.125***	0.156***	0.075***	−0.027	−0.057***	−0.046**	−0.096***	0.249***										
(10) B_MEET	−0.040**	0.077***	−0.047**	0.003	−0.208***	0.232***	0.027	−0.047**	0.161***									
(11) AC_SIZE	0.186**	0.200***	0.005	−0.003	−0.010	−0.043**	0.397***	0.012	0.064***	−0.023								
(12) AC_MEET	0.039**	0.165***	−0.048**	−0.012	−0.143***	0.184***	0.142***	−0.044**	−0.015	0.693***	−0.026							
(13) BIG4	0.031*	−0.007	0.047**	−0.028	0.005	0.028	0.004	0.073***	−0.006	−0.132***	−0.053***	−0.071***						
(14) MAS	0.062***	0.083***	0.009	−0.100***	0.112***	−0.099***	0.141***	−0.008	−0.012	−0.151***	0.233***	−0.079***	−0.038**					
(15) IND	0.200***	0.063***	0.140***	−0.061***	0.149***	−0.201***	−0.226***	0.348***	0.147***	−0.348***	0.051***	−0.380***	0.033*	0.514***				
(16) UAI	−0.102	0.019	−0.092***	0.099***	−0.181***	0.116***	0.250***	−0.373***	−0.058***	0.295***	−0.040**	0.316***	−0.114***	−0.483***	−0.810***			
(17) LTO	0.164***	0.102***	0.121***	0.098***	−0.085***	−0.104***	0.119***	0.150***	0.124***	−0.051***	−0.070***	−0.086***	−0.090***	−0.415***	0.057***	0.333***		
(18) PDI	−0.049***	0.019	−0.086***	0.076***	−0.169***	0.063***	0.043***	−0.371***	0.017	0.237***	−0.108***	0.221***	−0.140***	−0.486***	−0.595***	0.891	0.351***	
(19) RLAW	0.180***	0.059***	0.030	−0.006	0.110***	−0.165***	−0.122***	0.274***	0.049***	−0.430***	−0.017	−0.501***	0.204***	−0.065***	0.414***	−0.565	−0.014	−0.477***

Panel II: Correlation matrix of network centrality measures

Correlation coefficients among audit fees (AF) and centrality measures

Variables	(1)	(2)	(3)	(4)	(5)	(6)
(1) AF	1.000					
(2) DEG	0.375***	1.000				
(3) EIGEN	0.210***	0.654***	1.000			
(4) CLOS	0.340***	0.446***	0.195***	1.000		
(5) BET	0.221***	0.519***	0.170***	0.437***	1.000	
(6) PCA	0.385***	0.901***	0.680***	0.681***	0.710***	1.000

Note: See Appendix B for the definition of the variables. ***, **, and * for 1%, 5% and 10% significance level.

TABLE 5 | Audit committee centrality and audit fees.

	(1)	(2)	(3)	(4)	(5)
DEG	0.119***				
	(0.0258)				
EIGEN		0.0418*			
		(0.0220)			
CLOS			0.0947***		
			(0.0269)		
BET				0.0457***	
				(0.0147)	
PCA					0.0684***
					(0.0152)
SIZE	0.685***	0.702***	0.684***	0.695***	0.684***
	(0.0111)	(0.00923)	(0.0145)	(0.0107)	(0.0121)
EXP	0.635***	0.640***	0.618***	0.620***	0.630***
	(0.0423)	(0.0428)	(0.0417)	(0.0421)	(0.0415)
RECEI	1.759***	1.741***	1.811***	1.805***	1.796***
	(0.208)	(0.208)	(0.196)	(0.197)	(0.198)
ROA	−0.318*	−0.278	−0.350*	−0.310	−0.323*
	(0.180)	(0.181)	(0.179)	(0.178)	(0.177)
LEV	0.315***	0.258***	0.315***	0.291***	0.329***
	(0.0468)	(0.0436)	(0.0595)	(0.0468)	(0.0504)
B_SIZE	−0.0283***	−0.0158***	−0.0160***	−0.0124***	−0.0235***
	(0.00416)	(0.00345)	(0.00280)	(0.00266)	(0.00346)
B_INDEP	0.277***	0.250**	0.240***	0.272***	0.249***
	(0.0830)	(0.0875)	(0.0750)	(0.0848)	(0.0802)
B_FEM	0.827***	0.875***	0.776***	0.833***	0.819***
	(0.216)	(0.220)	(0.220)	(0.215)	(0.216)
B_MEET	0.00183	0.000475	0.000831	0.000390	0.00138
	(0.00569)	(0.00564)	(0.00541)	(0.00546)	(0.00557)
AC_SIZE	0.0301**	0.0235*	0.0255**	0.0258**	0.0305**
	(0.0114)	(0.0113)	(0.0108)	(0.0109)	(0.0111)
AC_MEET	−0.00149	−0.00435	−0.000420	−0.00320	−0.000341
	(0.00511)	(0.00484)	(0.00536)	(0.00484)	(0.00521)
BIG 4	0.114**	0.126**	0.137***	0.123**	0.116**
	(0.0436)	(0.0443)	(0.0457)	(0.0445)	(0.0454)
RLAW	0.146***	0.143***	0.159***	0.162***	0.145***
	(0.0357)	(0.0366)	(0.0377)	(0.0354)	(0.0359)
Intercept	3.180***	2.812***	3.071***	2.805***	3.163***
	(0.187)	(0.152)	(0.227)	(0.160)	(0.203)
Observations	2052	2052	2052	2052	2052
R^2	0.663	0.660	0.664	0.660	0.664

Note: Estimated coefficients (*t*-statistics) using the fixed-effects regression of Equation (1). The dependent variable is audit fees (AF) in all the regressions. All the estimations include year and industry fixed effects clustering by year. See Appendix B for the definition of the variables. ***, **, and * for 1%, 5%, and 10% significance level.

TABLE 6 | Cross-sectional analysis of the interaction between audit committee centrality and firm exports in audit fees.

	(1)	(2)	(3)	(4)	(5)
DEG	0.308***				
	(0.0444)				
DEG × HIGHEXP	−0.293***				
	(0.0484)				
EIGEN		0.153***			
		(0.0382)			
EIGEN × HIGHEXP		−0.187***			
		(0.0559)			
CLOS			0.274***		
			(0.0650)		
CLOS × HIGHEXP			−0.267***		
			(0.0753)		
BET				0.217***	
				(0.0448)	
BET × HIGHEXP				−0.251***	
				(0.0554)	
PCA					0.204***
					(0.0310)
PCA × HIGHEXP					−0.208***
					(0.0386)
EXP	0.653***	0.610***	0.611***	0.736***	0.580***
	(0.0451)	(0.0417)	(0.0421)	(0.0517)	(0.0413)
SIZE	0.686***	0.704***	0.686***	0.697***	0.687***
	(0.0107)	(0.00927)	(0.0137)	(0.0101)	(0.0115)
RECEI	1.735***	1.760***	1.803***	1.778***	1.778***
	(0.208)	(0.211)	(0.191)	(0.192)	(0.196)
ROA	−0.270	−0.256	−0.305	−0.286	−0.257
	(0.191)	(0.183)	(0.185)	(0.183)	(0.188)
LEVERAGE	0.329***	0.277***	0.336***	0.301***	0.353***
	(0.0478)	(0.0456)	(0.0673)	(0.0473)	(0.0540)
B_SIZE	−0.0286***	−0.0157***	−0.0171***	−0.0135***	−0.0250***
	(0.00389)	(0.00347)	(0.00290)	(0.00264)	(0.00339)
B_INDEP	0.235**	0.243**	0.199**	0.248**	0.199**
	(0.0860)	(0.0858)	(0.0795)	(0.0858)	(0.0820)
B_FEM	0.829***	0.871***	0.795***	0.826***	0.826***
	(0.214)	(0.221)	(0.219)	(0.215)	(0.213)
B_MEET	0.00293	0.00111	0.00167	0.00167	0.00311
	(0.00524)	(0.00525)	(0.00543)	(0.00516)	(0.00502)
AC_SIZE	0.0289**	0.0226*	0.0254**	0.0283**	0.0303**
	(0.0110)	(0.0112)	(0.0106)	(0.0109)	(0.0110)

(Continues)

TABLE 6 | (Continued)

	(1)	(2)	(3)	(4)	(5)
AC_MEET	−0.00230	−0.00453	−0.00134	−0.00482	−0.00184
	(0.00494)	(0.00483)	(0.00538)	(0.00453)	(0.00499)
BIG 4	0.120**	0.128**	0.149***	0.133**	0.128**
	(0.0467)	(0.0445)	(0.0469)	(0.0461)	(0.0477)
RLAW	0.158***	0.146***	0.157***	0.157***	0.147***
	(0.0344)	(0.0365)	(0.0382)	(0.0356)	(0.0355)
Intercept	3.154***	2.794***	3.068***	2.715***	3.164***
	(0.180)	(0.150)	(0.216)	(0.150)	(0.192)
Observations	2052	2052	2052	2052	2052
R^2	0.666	0.660	0.667	0.663	0.668

Note: Estimated coefficients (*t*-statistics) using the fixed-effects regression of Equation (2). The dependent variable is audit fees (AF) in all the regressions. All the estimations include year and industry fixed–effects clustering by year. See Appendix B for the definition of the variables. ***, **, and * for 1%, 5%, and 10% significance level.

TABLE 7 | Cross-sectional analysis of the interaction between audit committee centrality and firm leverage on audit fees.

	(1)	(2)	(3)	(4)	(5)
DEG	0.171***				
	(0.0231)				
DEG × HIGHLEV	−0.132***				
	(0.0189)				
EIGEN		0.0851***			
		(0.0230)			
EIGEN × HIGHLEV		−0.106***			
		(0.0205)			
CLOS			0.124***		
			(0.0286)		
CLOS × HIGHLEV			−0.0520		
			(0.0342)		
BET				0.0592***	
				(0.0189)	
BET × HIGHLEV				−0.0348	
				(0.0342)	
PCA					0.0937***
					(0.0153)
PCA × HIGHLEV					−0.0607***
					(0.0149)
LEV	0.415***	0.244***	0.337***	0.344***	0.336***
	(0.0479)	(0.0444)	(0.0566)	(0.0829)	(0.0509)
SIZE	0.687***	0.703***	0.681***	0.694***	0.683***
	(0.0115)	(0.00918)	(0.0143)	(0.0102)	(0.0123)
EXP	0.655***	0.656***	0.625***	0.624***	0.648***
	(0.0437)	(0.0432)	(0.0422)	(0.0426)	(0.0424)

(Continues)

TABLE 7 | (Continued)

	(1)	(2)	(3)	(4)	(5)
RECEI	1.760***	1.742***	1.813***	1.806***	1.794***
	(0.202)	(0.208)	(0.193)	(0.196)	(0.195)
ROA	−0.295	−0.265	−0.346*	−0.302	−0.306
	(0.181)	(0.184)	(0.180)	(0.179)	(0.178)
B_SIZE	−0.0278***	−0.0158***	−0.0163***	−0.0124***	−0.0232***
	(0.00414)	(0.00346)	(0.00280)	(0.00261)	(0.00342)
B_INDEP	0.287***	0.255**	0.245***	0.275***	0.259***
	(0.0785)	(0.0875)	(0.0734)	(0.0819)	(0.0764)
B_FEM	0.848***	0.866***	0.781***	0.844***	0.840***
	(0.211)	(0.221)	(0.220)	(0.208)	(0.215)
B_MEET	0.00309	0.00158	0.00122	0.000588	0.00243
	(0.00557)	(0.00511)	(0.00559)	(0.00552)	(0.00550)
AC_SIZE	0.0287**	0.0202	0.0259**	0.0261**	0.0289**
	(0.0114)	(0.0116)	(0.0109)	(0.0109)	(0.0112)
AC_MEET	−0.00225	−0.00452	−0.000263	−0.00345	−0.000545
	(0.00536)	(0.00468)	(0.00539)	(0.00497)	(0.00542)
BIG 4	0.109**	0.124**	0.137***	0.118**	0.109**
	(0.0420)	(0.0438)	(0.0447)	(0.0432)	(0.0425)
RLAW	0.130***	0.149***	0.158***	0.159***	0.142***
	(0.0359)	(0.0362)	(0.0378)	(0.0353)	(0.0354)
Intercept	3.114***	2.789***	3.091***	2.805***	3.152***
	(0.183)	(0.148)	(0.219)	(0.156)	(0.197)
Observations	2052	2052	2052	2052	2052
R^2	0.666	0.661	0.665	0.661	0.665

Note: Estimated coefficients (*t*-statistics) using the fixed-effects regression of Equation (1). The dependent variable is audit fees (AF) in all the regressions. All the estimations include year and industry fixed effects clustering by year. See Appendix B for the definition of the variables. ***, **, and * for 1%, 5%, and 10% significance level.

between centrality and HIGHLEV (a dummy for above-median financial leverage) yield negative coefficients. This means that although high LEV and AC centrality both individually increase AF, their interaction actually moderates this increase. Central ACs in highly leveraged firms appear especially adept at managing the additional risks and complexities, thereby reducing the need for greater audit effort. This creates a dual dynamic: firms with higher leverage face greater financial scrutiny and increased audit costs, but the presence of highly connected ACs strengthens risk management and internal controls, neutralising some of this pressure. Consequently, auditors perceive such firms as possessing stronger governance mechanisms, thus lessening their expected workload and moderating AF. This nuanced interplay is consistently observed across multiple centrality measures, supporting the robustness of these findings.

Table 8 provides analogous results by analysing interactions between AC centrality and board independence (HIGHINDEP), operationalised as a median-based dummy. Both centrality measures and B_INDEP display positive, significant coefficients, confirming their direct relationship with AF. However, in columns 1, 2, 4, and 5, most interactions between centrality and HIGHINDEP are negatively correlated with AF, indicating that more central ACs help balance the increased AF that is typically associated with greater board independence. This suggests that well-connected AC members enhance governance and access to key information, which reduces the perceived need for extensive audit procedures in firms with independent boards, ultimately lowering expected audit workload and costs.

4.3 | Robustness Test

As an additional analysis, we assess whether country-specific factors—using Hofstede's cultural dimensions (individualism, masculinity, uncertainty avoidance, long-term orientation, and power distance) (Hofstede 1980)—influence our results. Table 9 shows how centrality measure coefficients remain stable in both direction and magnitude, despite these cultural factors.

Following previous literature, we conducted an analysis using abnormal AF (ABAF), calculated as residuals from the baseline model explaining AF. The regression results reported in Tables 10–13 show positive and significant coefficients for each centrality measure and the composite index, indicating that centrality affects not only audit effort but also the portion of fees

TABLE 8 | Cross-sectional analysis of the interaction between audit committee centrality and board independence on audit fees.

	(1)	(2)	(3)	(4)	(5)
DEG	0.156***				
	(0.0295)				
DEG × HIGHINDEP	−0.0769***				
	(0.0252)				
EIGEN		0.0798***			
		(0.0235)			
EIGEN × HIGHINDEP		−0.0811***			
		(0.0224)			
CLOS			0.117***		
			(0.0348)		
CLOS × HIGHINDEP			−0.0581		
			(0.0376)		
BET				0.0699***	
				(0.0140)	
BET × HIGHINDEP				−0.0482**	
				(0.0197)	
PCA					0.0971***
					(0.0169)
PCA × HIGHINDEP					−0.0598***
					(0.0170)
B_INDEP	0.337***	0.252**	0.259***	0.325***	0.271***
	(0.0940)	(0.0859)	(0.0810)	(0.0875)	(0.0833)
SIZE	0.686***	0.702***	0.685***	0.697***	0.685***
	(0.0109)	(0.00937)	(0.0145)	(0.0112)	(0.0124)
EXP	0.623***	0.632***	0.609***	0.618***	0.614***
	(0.0455)	(0.0427)	(0.0448)	(0.0422)	(0.0452)
RECEI	1.762***	1.742***	1.828***	1.808***	1.809***
	(0.204)	(0.209)	(0.193)	(0.196)	(0.195)
ROA	−0.316*	−0.289	−0.336*	−0.298	−0.313*
	(0.173)	(0.178)	(0.176)	(0.177)	(0.170)
LEVERAGE	0.311***	0.264***	0.311***	0.292***	0.327***
	(0.0454)	(0.0444)	(0.0607)	(0.0458)	(0.0499)
B_SIZE	−0.0288***	−0.0157***	−0.0164***	−0.0130***	−0.0239***
	(0.00403)	(0.00347)	(0.00271)	(0.00270)	(0.00335)
B_FEM	0.822***	0.866***	0.767***	0.829***	0.808***
	(0.212)	(0.219)	(0.220)	(0.214)	(0.213)
B_MEET	0.00239	0.000952	0.000434	0.00127	0.00209
	(0.00544)	(0.00525)	(0.00523)	(0.00552)	(0.00521)
AC_SIZE	0.0297**	0.0229*	0.0255**	0.0261**	0.0300**
	(0.0113)	(0.0111)	(0.0108)	(0.0108)	(0.0110)

(Continues)

TABLE 8 | (Continued)

	(1)	(2)	(3)	(4)	(5)
AC_MEET	−0.00190	−0.00508	−0.000522	−0.00362	−0.000893
	(0.00485)	(0.00460)	(0.00517)	(0.00490)	(0.00488)
BIG 4	0.114**	0.128***	0.140***	0.125**	0.120**
	(0.0426)	(0.0434)	(0.0461)	(0.0441)	(0.0448)
RLAW	0.141***	0.135***	0.153***	0.163***	0.137***
	(0.0369)	(0.0381)	(0.0398)	(0.0352)	(0.0377)
Intercept	3.149***	2.830***	3.049***	2.743***	3.152***
	(0.185)	(0.153)	(0.228)	(0.174)	(0.205)
Observations	2052	2052	2052	2052	2052
R^2	0.664	0.661	0.665	0.661	0.665

Note: Estimated coefficients (*t*-statistics) using the fixed-effects regression of Equation (1). The dependent variable is audit fees (AF) in all the regressions. All the estimations include year and industry-fixed effects and clustering by year. See Appendix B for the definition of the variables. ***, **, and * for 1%, 5%, and 10% significance level.

TABLE 9 | Baseline model with culture variables.

	(1)	(2)	(3)	(4)	(5)
DEG	0.137***				
	(0.0262)				
EIGEN		0.0866***			
		(0.0268)			
CLOS			0.0725***		
			(0.0245)		
BET				0.0355**	
				(0.0164)	
PCA					0.0679***
					(0.0147)
SIZE	0.665***	0.682***	0.673***	0.679***	0.667***
	(0.0113)	(0.0103)	(0.0129)	(0.0112)	(0.0124)
EXP	0.597***	0.614***	0.592***	0.593***	0.597***
	(0.0384)	(0.0382)	(0.0383)	(0.0387)	(0.0384)
RECEI	1.804***	1.755***	1.839***	1.819***	1.830***
	(0.202)	(0.199)	(0.191)	(0.191)	(0.193)
ROA	−0.201	−0.132	−0.244	−0.190	−0.208
	(0.186)	(0.186)	(0.183)	(0.184)	(0.182)
LEV	0.341***	0.296***	0.314***	0.316***	0.352***
	(0.0565)	(0.0530)	(0.0629)	(0.0593)	(0.0617)
B_SIZE	−0.0165***	−0.00608	−0.00366	−0.00133	−0.0106**
	(0.00475)	(0.00390)	(0.00380)	(0.00368)	(0.00442)
B_INDEP	0.296***	0.253***	0.237***	0.274***	0.258***
	(0.0802)	(0.0849)	(0.0752)	(0.0830)	(0.0782)

(Continues)

TABLE 9 | (Continued)

	(1)	(2)	(3)	(4)	(5)
B_FEM	0.454*	0.493**	0.484**	0.485**	0.463*
	(0.227)	(0.222)	(0.227)	(0.224)	(0.224)
B_MEET	−0.00336	−0.00470	−0.00332	−0.00380	−0.00342
	(0.00571)	(0.00586)	(0.00548)	(0.00559)	(0.00564)
AC_SIZE	0.0371***	0.0317***	0.0289**	0.0307**	0.0360***
	(0.0109)	(0.0107)	(0.0104)	(0.0106)	(0.0107)
AC_MEET	0.00676	0.00594	0.00547	0.00500	0.00792
	(0.00599)	(0.00572)	(0.00564)	(0.00545)	(0.00591)
BIG 4	0.193***	0.206***	0.205***	0.204***	0.192***
	(0.0354)	(0.0386)	(0.0415)	(0.0382)	(0.0404)
MASC	0.00121	0.00217	0.00232	0.00335**	0.00200
	(0.00146)	(0.00152)	(0.00136)	(0.00136)	(0.00139)
INDIV	−0.0136**	−0.0151**	−0.0154**	−0.0165**	−0.0146**
	(0.00540)	(0.00581)	(0.00560)	(0.00572)	(0.00564)
UAI	−0.0253***	−0.0266***	−0.0245***	−0.0254***	−0.0249***
	(0.00485)	(0.00534)	(0.00543)	(0.00553)	(0.00537)
LTO	0.0196***	0.0218***	0.0208***	0.0232***	0.0206***
	(0.00430)	(0.00454)	(0.00469)	(0.00470)	(0.00461)
PDI	0.0273***	0.0293***	0.0247***	0.0267***	0.0266***
	(0.00385)	(0.00405)	(0.00437)	(0.00429)	(0.00415)
Intercept	4.151***	3.785***	3.990***	3.703***	4.058***
	(0.368)	(0.461)	(0.405)	(0.461)	(0.395)
Observations	2052	2052	2052	2052	2052
R^2	0.676	0.675	0.675	0.673	0.677

Note: Estimated coefficients (*t*-statistics) using the fixed-effects regression of Equation (1). The dependent variable is audit fees (AF) in all the regressions. All the estimations include year and industry-fixed effects and clustering by year. See Appendix B for the definition of the variables. ***, **, and * for 1%, 5%, and 10% significance level.

TABLE 10 | Audit committee centrality and abnormal audit fees.

	(1)	(2)	(3)	(4)	(5)
DEG	0.119***				
	(0.0258)				
EIGEN		0.0418*			
		(0.0220)			
CLOS			0.0947***		
			(0.0269)		
BET				0.0457***	
				(0.0147)	

(Continues)

TABLE 10 | (Continued)

	(1)	(2)	(3)	(4)	(5)
PCA					0.0684***
					(0.0152)
SIZE	−0.0339***	−0.0163*	−0.0350**	−0.0233**	−0.0347**
	(0.0111)	(0.00923)	(0.0145)	(0.0107)	(0.0121)
EXP	0.0643	0.0686	0.0473	0.0493	0.0589
	(0.0423)	(0.0428)	(0.0417)	(0.0421)	(0.0415)
RECEI	0.194	0.175	0.245	0.239	0.231
	(0.208)	(0.208)	(0.196)	(0.197)	(0.198)
ROA	0.100	0.140	0.0683	0.109	0.0952
	(0.180)	(0.181)	(0.179)	(0.178)	(0.177)
LEV	0.0710	0.0146	0.0709	0.0473	0.0848
	(0.0468)	(0.0436)	(0.0595)	(0.0468)	(0.0504)
B_SIZE	−0.0149***	−0.00233	−0.00258	0.00102	−0.0100**
	(0.00416)	(0.00345)	(0.00280)	(0.00266)	(0.00346)
B_INDEP	−0.140	−0.167*	−0.177**	−0.145	−0.168*
	(0.0830)	(0.0875)	(0.0750)	(0.0848)	(0.0802)
B_FEM	−0.214	−0.167	−0.265	−0.209	−0.223
	(0.216)	(0.220)	(0.220)	(0.215)	(0.216)
B_MEET	0.00533	0.00398	0.00433	0.00389	0.00489
	(0.00569)	(0.00564)	(0.00541)	(0.00546)	(0.00557)
AC_SIZE	0.00135	−0.00522	−0.00329	−0.00293	0.00176
	(0.0114)	(0.0113)	(0.0108)	(0.0109)	(0.0111)
AC_MEET	0.0129**	0.01000*	0.0139**	0.0111**	0.0140**
	(0.00511)	(0.00484)	(0.00536)	(0.00484)	(0.00521)
BIG 4	0.0531	0.0655	0.0763	0.0617	0.0551
	(0.0436)	(0.0443)	(0.0457)	(0.0445)	(0.0454)
RLAW	0.146***	0.143***	0.159***	0.162***	0.145***
	(0.0357)	(0.0366)	(0.0377)	(0.0354)	(0.0359)
Intercept	0.429**	0.0604	0.320	0.0539	0.411*
	(0.187)	(0.152)	(0.227)	(0.160)	(0.203)
Observations	2052	2052	2052	2052	2052
R^2	0.024	0.016	0.030	0.018	0.028

Note: Estimated coefficients (*t*-statistics) using the fixed-effects regression of Equation (1). The dependent variable is abnormal audit fees (ABAF) in all the regressions. All the estimations include year and industry-fixed effects and clustering by year. See Appendix B for the definition of the variables. ***, **, and * for 1%, 5%, and 10% significance level.

not explained by observable factors. Models incorporating firm complexity, client financial risk, and governance yield similar findings, reinforcing the influence of network centrality on both regular and abnormal audit fees.

To address endogeneity and causality concerns, we performed an additional analysis lagging centrality variables by 1 year, as shown in Table 14. This approach examines whether the relationship between AC members' centrality and AF remains robust against reverse causality. By using lagged centrality measures, we reduce the risk that the association results from simultaneity between network structure and AF. The results confirm the consistency of our main findings.

We also employed propensity score matching (PSM) as an additional robustness check. Table 15 shows how the results are

TABLE 11 | Cross-sectional analysis of the interaction between audit committee and firm exports in abnormal audit fees.

	(1)	(2)	(3)	(4)	(5)
DEG	0.308***				
	(0.0444)				
DEG × HIGHEXP	−0.293***				
	(0.0484)				
EIGEN		0.153***			
		(0.0382)			
EIGEN × HIGHEXP		−0.187***			
		(0.0559)			
CLOS			0.274***		
			(0.0650)		
CLOS × HIGHEXP			−0.267***		
			(0.0753)		
BET				0.217***	
				(0.0448)	
BET × HIGHEXP				−0.251***	
				(0.0554)	
PCA					0.204***
					(0.0310)
PCA × HIGHEXP					−0.208***
					(0.0386)
EXP	0.0823*	0.0389	0.0395	0.165***	0.00896
	(0.0451)	(0.0417)	(0.0421)	(0.0517)	(0.0413)
SIZE	−0.0326***	−0.0149	−0.0331**	−0.0214*	−0.0313**
	(0.0107)	(0.00927)	(0.0137)	(0.0101)	(0.0115)
RECEI	0.169	0.194	0.237	0.212	0.212
	(0.208)	(0.211)	(0.191)	(0.192)	(0.196)
ROA	0.148	0.163	0.113	0.133	0.161
	(0.191)	(0.183)	(0.185)	(0.183)	(0.188)
LEVERAGE	0.0850*	0.0333	0.0921	0.0576	0.109*
	(0.0478)	(0.0456)	(0.0673)	(0.0473)	(0.0540)
B_SIZE	−0.0151***	−0.00219	−0.00365	−4.35e-05	−0.0115***
	(0.00389)	(0.00347)	(0.00290)	(0.00264)	(0.00339)
B_INDEP	−0.182*	−0.174*	−0.218**	−0.169*	−0.218**
	(0.0860)	(0.0858)	(0.0795)	(0.0858)	(0.0820)
B_FEM	−0.213	−0.171	−0.247	−0.215	−0.215
	(0.214)	(0.221)	(0.219)	(0.215)	(0.213)
B_MEET	0.00644	0.00461	0.00517	0.00517	0.00661
	(0.00524)	(0.00525)	(0.00543)	(0.00516)	(0.00502)

(Continues)

TABLE 11 | (Continued)

	(1)	(2)	(3)	(4)	(5)
AC_SIZE	8.57e-05	−0.00620	−0.00337	−0.000453	0.00152
	(0.0110)	(0.0112)	(0.0106)	(0.0109)	(0.0110)
AC_MEET	0.0120**	0.00982*	0.0130**	0.00953*	0.0125**
	(0.00494)	(0.00483)	(0.00538)	(0.00453)	(0.00499)
BIG 4	0.0593	0.0674	0.0880*	0.0719	0.0673
	(0.0467)	(0.0445)	(0.0469)	(0.0461)	(0.0477)
RLAW	0.158***	0.146***	0.157***	0.157***	0.147***
	(0.0344)	(0.0365)	(0.0382)	(0.0356)	(0.0355)
INTERCEPT	0.403**	0.0428	0.316	−0.0359	0.413**
	(0.180)	(0.150)	(0.216)	(0.150)	(0.192)
Observations	2052	2052	2052	2052	2052
R^2	0.033	0.018	0.038	0.025	0.039

Note: Estimated coefficients (*t*-statistics) using the fixed-effects regression of Equation (1). The dependent variable is abnormal audit fees (ABAF) in all the regressions. All the estimations include year and industry-fixed effects clustering by year. See Appendix B for the definition of the variables. ***, **, and * for 1%, 5%, and 10% significance level.

TABLE 12 | Cross-sectional analysis of the interaction between audit committee and firm leverage in abnormal audit fees.

	(1)	(2)	(3)	(4)	(5)
DEG	0.171***				
	(0.0231)				
DEG × HIGHLEV	−0.132***				
	(0.0189)				
EIGEN		0.0851***			
		(0.0230)			
EIGEN × HIGHLEV		−0.106***			
		(0.0205)			
CLOS			0.124***		
			(0.0286)		
CLOS × HIGHLEV			−0.0520		
			(0.0342)		
BET				0.0592***	
				(0.0189)	
BET × HIGHLEV				−0.0348	
				(0.0342)	
PCA					0.0937***
					(0.0153)
PCA × HIGHLEV					−0.0607***
					(0.0149)
LEV	0.171***	−6.49e-05	0.0931	0.101	0.0920*
	(0.0479)	(0.0444)	(0.0566)	(0.0829)	(0.0509)

(Continues)

TABLE 12 | (Continued)

	(1)	(2)	(3)	(4)	(5)
SIZE	−0.0320**	−0.0156	−0.0375**	−0.0243**	−0.0354**
	(0.0115)	(0.00918)	(0.0143)	(0.0102)	(0.0123)
EXP	0.0844*	0.0853*	0.0541	0.0529	0.0768*
	(0.0437)	(0.0432)	(0.0422)	(0.0426)	(0.0424)
RECEI	0.194	0.177	0.247	0.240	0.228
	(0.202)	(0.208)	(0.193)	(0.196)	(0.195)
ROA	0.123	0.154	0.0724	0.116	0.113
	(0.181)	(0.184)	(0.180)	(0.179)	(0.178)
B_SIZE	−0.0144***	−0.00229	−0.00279	0.00107	−0.00972**
	(0.00414)	(0.00346)	(0.00280)	(0.00261)	(0.00342)
B_INDEP	−0.131	−0.162*	−0.172**	−0.142	−0.158*
	(0.0785)	(0.0875)	(0.0734)	(0.0819)	(0.0764)
B_FEM	−0.194	−0.175	−0.261	−0.197	−0.202
	(0.211)	(0.221)	(0.220)	(0.208)	(0.215)
B_MEET	0.00660	0.00508	0.00472	0.00409	0.00593
	(0.00557)	(0.00511)	(0.00559)	(0.00552)	(0.00550)
AC_SIZE	−0.000117	−0.00860	−0.00284	−0.00271	0.000108
	(0.0114)	(0.0116)	(0.0109)	(0.0109)	(0.0112)
AC_MEET	0.0121**	0.00983*	0.0141**	0.0109**	0.0138**
	(0.00536)	(0.00468)	(0.00539)	(0.00497)	(0.00542)
BIG 4	0.0485	0.0630	0.0761	0.0575	0.0475
	(0.0420)	(0.0438)	(0.0447)	(0.0432)	(0.0425)
RLAW	0.130***	0.149***	0.158***	0.159***	0.142***
	(0.0359)	(0.0362)	(0.0378)	(0.0353)	(0.0354)
Intercept	0.363*	0.0383	0.340	0.0539	0.401*
	(0.183)	(0.148)	(0.219)	(0.156)	(0.197)
Observations	2052	2052	2052	2052	2052
R^2	0.033	0.020	0.031	0.019	0.032

Note: Estimated coefficients (*t*-statistics) using the fixed-effects regression of Equation (1). The dependent variable is abnormal audit fees (ABAF) in all the regressions. All the estimations include year and industry-fixed effects clustering by year. See Appendix B for the definition of the variables. ***, **, and * for 1%, 5%, and 10% significance level.

TABLE 13 | Cross-sectional analysis of the interaction between audit committee and board independence in abnormal audit fees.

	(1)	(2)	(3)	(4)	(5)
DEG	0.156***				
	(0.0295)				
DEG × HIGHINDEP	−0.0769***				
	(0.0252)				
EIGEN		0.0798***			
		(0.0235)			
EIGEN × HIGHINDEP		−0.0811***			
		(0.0224)			

(Continues)

TABLE 13 | (Continued)

	(1)	(2)	(3)	(4)	(5)
CLOS			0.117***		
			(0.0348)		
CLOS × HIGHINDEP			−0.0581		
			(0.0376)		
BET				0.0699***	
				(0.0140)	
BET × HIGHINDEP				−0.0482**	
				(0.0197)	
PCA					0.0971***
					(0.0169)
PCA × HIGHINDEP					−0.0598***
					(0.0170)
B_INDEP	−0.0802	−0.165*	−0.158*	−0.0922	−0.147*
	(0.0940)	(0.0859)	(0.0810)	(0.0875)	(0.0833)
SIZE	−0.0331***	−0.0164*	−0.0332**	−0.0215*	−0.0336**
	(0.0109)	(0.00937)	(0.0145)	(0.0112)	(0.0124)
EXP	0.0516	0.0607	0.0384	0.0465	0.0425
	(0.0455)	(0.0427)	(0.0448)	(0.0422)	(0.0452)
RECEI	0.196	0.176	0.262	0.242	0.243
	(0.204)	(0.209)	(0.193)	(0.196)	(0.195)
ROA	0.102	0.130	0.0823	0.121	0.105
	(0.173)	(0.178)	(0.176)	(0.177)	(0.170)
LEVERAGE	0.0670	0.0201	0.0675	0.0485	0.0836
	(0.0454)	(0.0444)	(0.0607)	(0.0458)	(0.0499)
B_SIZE	−0.0153***	−0.00220	−0.00289	0.000516	−0.0104***
	(0.00403)	(0.00347)	(0.00271)	(0.00270)	(0.00335)
B_FEM	−0.219	−0.176	−0.274	−0.213	−0.234
	(0.212)	(0.219)	(0.220)	(0.214)	(0.213)
B_MEET	0.00590	0.00446	0.00394	0.00477	0.00560
	(0.00544)	(0.00525)	(0.00523)	(0.00552)	(0.00521)
AC_SIZE	0.000960	−0.00590	−0.00328	−0.00269	0.00124
	(0.0113)	(0.0111)	(0.0108)	(0.0108)	(0.0110)
AC_MEET	0.0124**	0.00927*	0.0138**	0.0107**	0.0135**
	(0.00485)	(0.00460)	(0.00517)	(0.00490)	(0.00488)
BIG 4	0.0534	0.0671	0.0794	0.0638	0.0591
	(0.0426)	(0.0434)	(0.0461)	(0.0441)	(0.0448)
RLAW	0.141***	0.135***	0.153***	0.163***	0.137***
	(0.0369)	(0.0381)	(0.0398)	(0.0352)	(0.0377)
Intercept	0.398**	0.0786	0.297	−0.00841	0.401*
	(0.185)	(0.153)	(0.228)	(0.174)	(0.205)
Observations	2052	2052	2052	2052	2052
R^2	0.027	0.019	0.031	0.020	0.032

Note: Estimated coefficients (*t*-statistics) using the fixed-effects regression of Equation (1). The dependent variable is abnormal audit fees (ABAF) in all the regressions. All the estimations include year and industry-fixed effects clustering by year. See Appendix B for the definition of the variables. ***, **, and * for 1%, 5%, and 10% significance level.

TABLE 14 | Audit committee lagged centrality and audit fees.

	(1)	(2)	(3)	(4)	(5)
DEG_{t-1}	0.092***				
	(0.024)				
$EIGEN_{t-1}$		0.050**			
		(0.020)			
$CLOS_{t-1}$			0.106***		
			(0.017)		
BET_{t-1}				0.045***	
				(0.016)	
PCA_{t-1}					0.066***
					(0.013)
SIZE	0.696***	0.710***	0.691***	0.705***	0.691***
	(0.015)	(0.014)	(0.015)	(0.014)	(0.015)
EXP	0.619***	0.627***	0.605***	0.605***	0.616***
	(0.060)	(0.060)	(0.060)	(0.060)	(0.060)
RECEI	1.682***	1.669***	1.758***	1.740***	1.721***
	(0.174)	(0.175)	(0.173)	(0.175)	(0.173)
ROA	−0.216	−0.198	−0.281	−0.214	−0.234
	(0.230)	(0.230)	(0.229)	(0.230)	(0.229)
LEV	0.297***	0.263**	0.321***	0.290**	0.325***
	(0.113)	(0.112)	(0.112)	(0.113)	(0.112)
B_SIZE	−0.025***	−0.018***	−0.018***	−0.014***	−0.024***
	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)
B_INDEP	0.339***	0.314***	0.308***	0.341***	0.314***
	(0.082)	(0.083)	(0.082)	(0.082)	(0.082)
B_FEM	0.842***	0.890***	0.780***	0.851***	0.825***
	(0.162)	(0.162)	(0.161)	(0.162)	(0.161)
B_MEET	0.001	−0.000	0.001	−0.000	0.001
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
AC_SIZE	0.027**	0.022*	0.026**	0.025**	0.028**
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
AC_MEET	−0.008	−0.009	−0.007	−0.010	−0.006
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
BIG 4	0.161***	0.168***	0.189***	0.172***	0.159***
	(0.059)	(0.059)	(0.058)	(0.059)	(0.059)
Intercept	3.135***	2.870***	3.129***	2.839***	3.210***
	(0.268)	(0.254)	(0.255)	(0.251)	(0.263)
Observations	1993	1993	1993	1993	1993
R^2	0.656	0.655	0.660	0.655	0.659

Note: Estimated coefficients (*t*-statistics) using the fixed-effects regression of Equation (1). The dependent variable is audit fees (AF) in all the regressions. The variables of network centrality have been lagged 1 year. All the estimations include year and industry-fixed effects clustering by year. See Appendix B for the definition of the variables. ***, **, and * for 1%, 5%, and 10% significance level.

TABLE 15 | Audit committee centrality and audit fees with PSM.

	(1)	(2)	(3)	(4)	(5)
DEG	0.119**				
	(0.052)				
EIGEN		0.068			
		(0.080)			
CLOS			0.188***		
			(0.056)		
BET				0.112**	
				(0.047)	
PCA					0.176***
					(0.048)
SIZE	0.692***	0.701***	0.687***	0.698***	0.687***
	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)
EXP	0.625***	0.628***	0.618***	0.614***	0.613***
	(0.156)	(0.157)	(0.154)	(0.156)	(0.153)
RECEI	1.809***	1.749***	1.804***	1.791***	1.817***
	(0.505)	(0.511)	(0.508)	(0.506)	(0.509)
ROA	−0.307	−0.294	−0.363	−0.320	−0.346
	(0.464)	(0.465)	(0.459)	(0.464)	(0.462)
LEVERAGE	0.287	0.263	0.308	0.289	0.312
	(0.262)	(0.261)	(0.256)	(0.258)	(0.259)
B_SIZE	−0.018*	−0.013	−0.015*	−0.013	−0.019**
	(0.009)	(0.009)	(0.008)	(0.008)	(0.009)
B_INDEP	0.280	0.267	0.241	0.270	0.271
	(0.183)	(0.185)	(0.179)	(0.181)	(0.181)
B_FEM	0.839**	0.855**	0.774**	0.838**	0.823**
	(0.345)	(0.351)	(0.342)	(0.345)	(0.341)
B_MEET	0.000	0.000	0.001	−0.000	0.001
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
AC_SIZE	0.026	0.022	0.023	0.024	0.027
	(0.023)	(0.023)	(0.022)	(0.022)	(0.023)
AC_MEET	−0.003	−0.004	−0.002	−0.003	−0.002
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
BIG4	0.128	0.128	0.136	0.125	0.125
	(0.104)	(0.105)	(0.102)	(0.104)	(0.103)
RLAW	0.168*	0.150	0.153	0.151	0.158
	(0.091)	(0.091)	(0.091)	(0.090)	(0.091)
Intercept	2.876***	2.765***	2.938***	2.776***	2.956***
	(0.519)	(0.520)	(0.518)	(0.513)	(0.514)

(Continues)

TABLE 15 | (Continued)

	(1)	(2)	(3)	(4)	(5)
Observations	2052	2052	2052	2052	2052
R^2	0.661	0.659	0.663	0.661	0.664

Note: Estimated coefficients (*t*-statistics) using the fixed-effects regression of Equation (1) and PSM. The dependent variable is audit fees (AF) in all the regressions. All the estimations include year and industry-fixed effects and clustering by year. See Appendix B for the definition of the variables. ***, **, and * for 1%, 5%, and 10% significance level.

consistent with previous analyses, confirming the positive and statistically significant effects of degree, closeness, betweenness, and the composite centrality measure on AF, reinforcing the reliability of our main findings.

5 | Conclusion

This study examines the impact of AC social networks on AF in Europe, using SNA and data from 225 publicly traded firms across eight countries between 2005 and 2020. By considering interlocking directorates and AC-level social ties, it goes beyond traditional AF determinants and provides further insights into governance and auditing connections.

This study extends current SNA in accounting and auditing by addressing a research gap and by emphasising the role of AC networks within corporate governance. As Europe harmonises auditing standards, understanding these networks is fundamental. The multi-country sample provided herein enriches the analysis by reflecting diverse regulatory, legal, and cultural influences.

The study finds that AC member centrality in European director networks is positively related to AF, indicating that more connected ACs demand greater audit effort. These findings support the idea that networks effectively facilitate the sharing of information, best practices, and resources, thereby raising auditors' expectations and, consistent with prior evidence, potentially enhancing audit quality. Moreover, AC connections not only directly affect AF but also moderate the impact of firm complexity, financial risk, and board independence on AF. Through their knowledge or the signals they convey to external auditors, well-connected ACs appear to reduce the audit effort required for more complex or riskier firms and for more independent boards of directors, highlighting the key role they play in shaping audit demands and outcomes. While our analysis does not directly measure audit quality as a mediating mechanism, the higher AF associated with more central AC members may reflect, among other factors, improved audit quality standards that such well-connected ACs help establish through their information-sharing networks.

In this regard, the measures on transparency and rotation introduced in European auditing regulation may have contributed to raising awareness of AC connections, thereby allowing AF to be aligned more accurately with firm complexity and market conditions. These findings also reveal governance trade-offs; while AC centrality improves audit quality, concentrating expertise in a small group of directors poses risks. Overlapping directorships can enhance knowledge sharing but may encourage groupthink and weaken independent oversight. Regulators might develop guidelines to balance the advantages of expertise with independence concerns, and firms could use centrality metrics as indicators of governance quality to manage these risks effectively.

This study does evidence certain limitations that suggest directions for future research. One issue is that it relies on publicly available data from listed firms and excludes smaller or private companies. Furthermore, its temporal scope ends in 2020, such that it may fail to reflect recent economic changes. Additionally, the focus on UK and continental European firms limits generalizability and indicates that future studies could expand to include Nordic and Eastern European countries for a broader perspective.

Although our main findings are robust, some alternative explanations deserve attention. Financial statement comparability could influence variable relationships, since greater comparability enhances transparency and reduces information asymmetry, thus affecting AF (Chen and Gong 2019; Sun et al. 2022), and future research could include comparability metrics or cross-entity similarity measures. Additionally, interlocking relationships between AC members and external auditors may impact AF (Tao et al. 2019; Xiang and Lin 2024). Another line of research is examining the role of audit quality and the extent to which more central ACs are associated with higher-quality audits. Moreover, in order to deepen understanding, subsequent studies might incorporate indicators of such interlocks, like the number of shared AC memberships among client firms using the same audit firm.

This study's focus on formal network connections overlooks informal director interactions, representing a key limitation. Future research could explore both formal and informal networks and their effects on audit practices. Expanding to non-European contexts and industries such as financial services that face unique regulations may provide further insights. Longitudinal studies incorporating directors' personal attributes such as experience, specialisation, and background may influence AC networks outcomes. Additionally, while this study centres on AF, future work could examine other important accounting and auditing areas, such as financial reporting quality and auditor selection.

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Data Availability Statement

Research data are not shared.

Endnotes

[1] The total number may not necessarily equal the sum of all the columns because some companies are listed in multiple countries and some directors may serve on the board of companies in different countries simultaneously.

[2] As will be explained later, the connections among AC members result in a fragmented network, of which we consider only the largest component.

[3] To test the robustness of our results, we also constructed a network using the connections of all directors, regardless of whether they are members of the AC or not. The results are essentially the same and are not reported so as to avoid redundancy.

[4] Following Omer et al. (2019), we focused on this largest network that includes most of the firms.

References

Abbott, L. J., S. Parker, G. F. Peters, and K. Raghunandan. 2003. "The Association Between Audit Committee Characteristics and Audit Fees." *Auditing: A Journal of Practice & Theory* 22: 17–32. https://doi.org/10.2308/aud.2003.22.2.17.

Abraham, N., E. Amir, and M. Ghitti. 2025. "Audit Fees and Corruption: An International Analysis of Audit Rates and Audit Hours." SSRN 5106607.

Aghazadeh, S., Y. J. Kang, and M. Peytcheva. 2023. "Auditors' Scepticism in Response to Audit Committee Oversight Behaviour." *Accounting and Finance* 63: 2013–2034. https://doi.org/10.1111/acfi.12944.

Aldamen, H., J. Hollindale, and J. L. Ziegelmayer. 2018. "Female Audit Committee Members and Their Influence on Audit Fees." *Accounting and Finance* 58: 57–89. https://doi.org/10.1111/acfi.12248.

Alhababsah, S., and S. Yekini. 2021. "Audit Committee and Audit Quality: An Empirical Analysis Considering Industry Expertise, Legal Expertise and Gender Diversity." *Journal of International Accounting, Auditing and Taxation* 42: 100377. https://doi.org/10.1016/j.intaccaudtax.2021.100377.

Almaqoushi, W., and R. Powell. 2021. "Audit Committee Quality Indices, Reporting Quality and Firm Value." *Journal of Business Finance and Accounting* 48: 185–229. https://doi.org/10.1111/jbfa.12478.

Appuhami, R. 2018. "The Signalling Role of Audit Committee Characteristics and the Cost of Equity Capital: Australian Evidence." *Pacific Accounting Review* 30: 387–406. https://doi.org/10.1108/PAR-12-2016-0120.

Asthana, S. C., and J. P. Boone. 2012. "Abnormal Audit Fee and Audit Quality." *Auditing: A Journal of Practice & Theory* 31: 1–22. https://doi.org/10.2308/ajpt-10294.

Azizkhani, M., S. Hossain, and M. Nguyen. 2023. "Effects of Audit Committee Chair Characteristics on Auditor Choice, Audit Fee and Audit Quality." *Accounting and Finance* 63: 3675–3707. https://doi.org/10.1111/acfi.13058.

Bédard, J., D. Coulombe, and L. Courteau. 2008. "Audit Committee, Underpricing of IPOs, and Accuracy of Management Earnings Forecasts." *Corporate Governance: An International Review* 16: 519–535. https://doi.org/10.1111/j.1467-8683.2008.00708.x.

Bianchi, P. A., M. Causholli, M. Minutti-Meza, and V. Sulcaj. 2023. "Social Networks Analysis in Accounting and Finance." *Contemporary Accounting Research* 40: 577–623. https://doi.org/10.1111/1911-3846.12826.

Bonacich, P. 1972. "Factoring and Weighting Approaches to Status Scores and Clique Identification." *Journal of Mathematical Sociology* 2: 113–120. https://doi.org/10.1080/0022250X.1972.9989806.

Bonacich, P. 1987. "Power and Centrality: A Family of Measures." *American Journal of Sociology* 92: 1170–1182. https://doi.org/10.1086/228631.

Cameran, M., J. R. Francis, A. Marra, and A. Pettinicchio. 2015. "Are There Adverse Consequences of Mandatory Auditor Rotation? Evidence From the Italian Experience." *Auditing: A Journal of Practice & Theory* 34: 1–24. https://doi.org/10.2308/ajpt-50663.

Canet, A. 2016. "Groupthink in the Boardroom – The Good, the Bad and the Ugly." SSRN 2839855.

Carcello, J. V., D. R. Hermanson, T. L. Neal, and R. A. Riley. 2002. "Board Characteristics and Audit Fees." *Contemporary Accounting Research* 19: 365–384. https://doi.org/10.1506/CHWK-GMQ0-MLKE-K03V.

Castillo-Merino, D., J. Garcia-Blandon, and M. Martinez-Blasco. 2020. "Auditor Independence, Current and Future NAS Fees and Audit Quality: Were European Regulators Right?" *European Accounting Review* 29: 233–262. https://doi.org/10.1080/09638180.2019.1577151.

Chen, A., and J. J. Gong. 2019. "Accounting Comparability, Financial Reporting Quality, and the Pricing of Accruals." *Advances in Accounting* 45: 100415. https://doi.org/10.1016/J.ADIAC.2019.03.003.

Chiu, P.-C., S. H. Teoh, and F. Tian. 2013. "Board Interlocks and Earnings Management Contagion." *Accounting Review* 88: 915–944. https://doi.org/10.2308/accr-50369.

Choi, J. H., J. B. Kim, and Y. Zang. 2010. "Do Abnormally High Audit Fees Impair Audit Quality?" *Auditing: A Journal of Practice & Theory* 29: 115–140. https://doi.org/10.2308/aud.2010.29.2.115.

Cohen, J., G. Krishnamoorthy, and A. Wright. 2013. "The Effect of Audit Committee Industry Expertise on Monitoring the Financial Reporting Process." *Accounting Review* 89: 243–273. https://doi.org/10.2139/ssrn.1567453.

Daemi Gah, A. 2020. "A Meta-Analysis of Audit Fees Determinants: Evidence From an Emerging Market." *Iranian Journal of Accounting, Auditing and Finance* 4: 1–17. https://doi.org/10.22067/ijaaf.2020.39255.

Dragomir, V. D., and M. Dumitru. 2023. "Does Corporate Governance Improve Integrated Reporting Quality? A Meta-Analytical Investigation." *Meditari Accountancy Research* 31: 1846–1885. https://doi.org/10.1108/MEDAR-03-2022-1618.

Dunn, R. T., N. G. Lundstrom, and M. S. Wilkins. 2021. "The Impact of Mandatory Auditor Tenure Disclosures on Ratification Voting, Auditor Dismissal, and Audit Pricing." *Contemporary Accounting Research* 38: 2871–2917. https://doi.org/10.1111/1911-3846.12708.

Elmashtawy, A., M. H. Che Haat, S. Ismail, and F. A. Almaqtari. 2024. "Audit Committee Effectiveness and Audit Quality: The Moderating Effect of Joint Audit." *Arab Gulf Journal of Scientific Research* 42: 512–533. https://doi.org/10.1108/AGJSR-09-2022-0202.

Eshleman, J. D., and P. Guo. 2013. "Abnormal Audit Fees and Audit Quality: The Importance of Considering Managerial Incentives in Tests of Earnings Management." *Auditing: A Journal of Practice & Theory* 33: 117–138.

Ettredge, M., E. E. Fuerherm, and C. Li. 2014. "Fee Pressure and Audit Quality." *Accounting, Organizations and Society* 399: 247–263.

European Union. 2014a. "Regulation (EU) No 537/2014 of the European Parliament and of the Council of 16 April 2014 on Specific Requirements Regarding Statutory Audit of Public-Interest Entities."

European Union. 2014b. "Directive 2014/56/EU of the European Parliament and of the Council of 16 April 2014 Amending Directive

2006/43/EC on Statutory Audits of Annual Accounts and Consolidated Accounts."

Ferdous, L. T., S. Bose, S. Shams, and M. Azizkhani. 2024. "Does CEO Age Matter in Auditor Choice and Audit Pricing? The Role of CEO Dominance." *Journal of Accounting Literature*. https://doi.org/10.1108/JAL-09-2023-0169.

Fernández Méndez, C., S. Pathan, and R. Arrondo García. 2015. "Monitoring Capabilities of Busy and Overlap Directors: Evidence From Australia." *Pacific-Basin Finance Journal* 35: 444–469. https://doi.org/10.1016/j.pacfin.2015.05.006.

Firoozi, M., and M. Magnan. 2022. "Audit Committee Members' Proximity to Corporate Headquarters and Audit Fees." *Managerial Auditing Journal* 37: 1062–1090. https://doi.org/10.1108/MAJ-05-2020-2684.

Freeman, L. C. 1977. "A Set of Measures of Centrality Based on Betweenness." *Sociometry* 40: 35–41. https://doi.org/10.2307/3033543.

Freeman, L. C. 1978. "Centrality in Social Networks Conceptual Clarification." *Social Networks* 1: 215–239. https://doi.org/10.1016/0378-8733(78)90021-7.

Frino, A., R. Palumbo, and P. Rosati. 2023. "Does Information Asymmetry Predict Audit Fees?" *Accounting and Finance* 63: 2597–2619. https://doi.org/10.1111/acfi.12985.

Garcia-Blandon, J., J. M. Argilés-Bosch, D. Ravenda, and D. Castillo-Merino. 2023. "Women Leading the Audit Process and Audit Fees: A European Study." *European Research on Management and Business Economics* 29: 100206. https://doi.org/10.1016/j.iedeen.2022.100206.

Ghafran, C., and N. O'Sullivan. 2017. "The Impact of Audit Committee Expertise on Audit Quality: Evidence From UK Audit Fees." *British Accounting Review* 49: 578–593. https://doi.org/10.1016/j.bar.2017.09.008.

Goodwin-Stewait, J., and P. Kent. 2006. "Relation Between External Audit Fees, Audit Committee Characteristics and Internal Audit." *Accounting and Finance* 46: 387–404. https://doi.org/10.1111/j.1467-629X.2006.00174.x.

Gow, I. D., G. Ormazabal, and D. J. Taylor. 2010. "Correcting for Cross-Sectional and Time-Series Dependence in Accounting Research." *Accounting Review* 85: 483–512. https://doi.org/10.2308/accr.2010.85.2.483.

Gul, F. A., B. Srinidhi, and J. S. L. Tsui. 2008. "Board Diversity and the Demand for Higher Audit Effort." *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.1359450.

Harjoto, M. A., I. Laksmana, and R. Lee. 2015. "The Impact of Demographic Characteristics of CEOs and Directors on Audit Fees and Audit Delay." *Managerial Auditing Journal* 30: 963–997. https://doi.org/10.1108/MAJ-01-2015-1147.

Hay, D. C. 2013. "Further Evidence From Meta-Analysis of Audit Fee Research." *International Journal of Auditing* 17: 162–176. https://doi.org/10.1111/j.1099-1123.2012.00462.x.

Hay, D. C., W. R. Knechel, and N. Wong. 2006. "Audit Fees: A Meta-Analysis of the Effect of Supply and Demand Attributes." *Contemporary Accounting Research* 23: 141–191. https://doi.org/10.1111/j.1524-4733.2006.00093.x.

He, X., J. A. Pittman, O. M. Rui, and D. Wu. 2017. "Do Social Ties Between External Auditors and Audit Committee Members Affect Audit Quality?" *Accounting Review* 92: 61–87. https://doi.org/10.2308/accr-51696.

Hofstede, G. 1980. *Culture's Consequences: International Differences in Work-Related Values*. Sage.

Hossain, S., G. S. Monroe, M. Wilson, and C. Jubb. 2016. "The Effect of Networked Clients' Economic Importance on Audit Quality." *Auditing: A Journal of Practice & Theory* 35: 79–103. https://doi.org/10.2308/ajpt-51451.

Hossain, S., K. Yazawa, and G. S. Monroe. 2017. "The Relationship Between Audit Team Composition, Audit Fees, and Quality." *Auditing: A Journal of Practice & Theory* 36: 115–135. https://doi.org/10.2308/ajpt-51682.

Intintoli, V. J., K. M. Kahle, and W. Zhao. 2018. "Director Connectedness: Monitoring Efficacy and Career Prospects." *Journal of Financial and Quantitative Analysis* 53: 65–108. https://doi.org/10.1017/S0022109018000017.

Ittonen, K., J. Miettinen, and S. Vähämaa. 2010. "Does Female Representation on Audit Committees Affect Audit Fees?" *Quarterly Journal of Finance and Accounting* 49: 113–139.

Ittonen, K., E. R. Myllymäki, and P. C. Tronnes. 2019. "Banks' Audit Committees, Audit Firm Alumni and Fees Paid to Audit Firm." *Managerial Auditing Journal* 34: 783–807. https://doi.org/10.1108/MAJ-01-2018-1766.

Ivanova, M. N., and A. Prencipe. 2023. "The Effects of Board Interlocks With an Allegedly Fraudulent Company on Audit Fees." *Journal of Accounting, Auditing and Finance* 38: 271–301. https://doi.org/10.1177/0148558X20971947.

Kalelkar, R. 2017. "Effect of Audit and Compensation Committee Membership Overlap on Audit Fees." *Asian Review of Accounting* 25: 34–57. https://doi.org/10.1108/ARA-12-2014-0128.

Kalia, D., D. Basu, and S. Kundu. 2023. "Board Characteristics and Demand for Audit Quality: A Meta-Analysis." *Asian Review of Accounting* 31: 153–175. https://doi.org/10.1108/ARA-05-2022-0121.

Knechel, W. R., and M. Willekens. 2006. "The Role of Risk Management and Governance in Determining Audit Demand." *Journal of Business Finance and Accounting* 33: 1344–1367. https://doi.org/10.1111/j.1468-5957.2006.01238.x.

Krauß, P., P. Pronobis, and H. Zülch. 2015. "Abnormal Audit Fees and Audit Quality: Initial Evidence From the German Audit Market." *Journal of Business Economics* 85: 45–84.

La Porta, R., F. Lopez-De-Silanes, A. Shleifer, and R. W. Vishny. 1997. "Legal Determinants of External Finance." *Journal of Finance* 52: 1131–1150. https://doi.org/10.1111/j.1540-6261.1997.tb02727.x.

La Porta, R., F. Lopez-de-Silanes, A. Shleifer, and R. W. Vishny. 1998. "Law and Finance." *Journal of Political Economy* 106: 1113–1155. https://doi.org/10.1086/250042.

Marra, A. 2021. "All That Glitters is Not Gold! Independent Directors' Attributes and Earnings Quality: Beyond Formal Independence." *Corporate Governance: An International Review* 29, no. 6: 567–592. https://doi.org/10.1111/corg.12380.

Mkumbuzi, W. P. 2015. "Corporate Governance and Intangibles Disclosure as Determinants of Corporate Reputation." *Asian Social Science* 11: 192–208. https://doi.org/10.5539/ass.v11n23p192.

Nerantzidis, M., A. Koutoupis, G. Drogalas, C. Vadasi, and D. Mitskinis. 2023. "Impact of the Audit Committee on Audit Fees: A Review and Future Research Agenda." *Cogent Business & Management* 10. https://doi.org/10.1080/23311975.2023.2238976.

Omer, T. C., M. K. Shelley, and F. M. Tice. 2014. "Do Well-Connected Directors Affect Firm Value?" *Journal of Applied Finance* 2. https://doi.org/10.2139/ssrn.2167354.

Omer, T. C., M. K. Shelley, and F. M. Tice. 2019. "Do Director Networks Matter for Financial Reporting Quality? Evidence From Audit Committee Connectedness and Restatements." *Management Science* 66: 3361–3388. https://doi.org/10.1287/mnsc.2019.3331.

Pittman, J. A., B. Qi, and G. Zhang. 2019. "The Importance of Social Capital to Individual Auditors." *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3365474.

Renneboog, L., and Y. Zhao. 2020. "Director Networks, Turnover, and Appointments." *European Financial Management* 26, no. 1: 44–76. https://doi.org/10.1111/eufm.12213.

Simunic, D. A. 1980. “The Pricing of Audit Services: Theory and Evidence.” *Journal of Accounting Research* 18: 161. https://doi.org/10.2307/2490397.

Sun, J., L. Li, and B. Qi. 2022. “Financial Statement Comparability and Audit Pricing.” *Accounting and Finance* 62: 4631–4661. https://doi.org/10.1111/acfi.12970.

Tao, Q., H. Li, Q. Wu, T. Zhang, and Y. Zhu. 2019. “The Dark Side of Board Network Centrality: Evidence From Merger Performance.” *Journal of Business Research* 104: 215–232. https://doi.org/10.1016/j.jbusres.2019.07.019.

Vafeas, N. 2005. “Audit Committees, Boards, and the Quality of Reported Earnings.” *Contemporary Accounting Research* 22: 1093–1122. https://doi.org/10.1506/1QYN-2RFQ-FKYX-XP84.

Xiang, R., and R. Lin. 2024. “Audit Committee-Auditor Interlocking and Audit Fees: Evidence From China.” *Applied Economics* 56: 7669–7685. https://doi.org/10.1080/00036846.2023.2288046.

Yatim, P., P. Kent, and P. Clarkson. 2006. “Governance Structures, Ethnicity, and Audit Fees of Malaysian Listed Firms.” *Managerial Auditing Journal* 21: 757–782. https://doi.org/10.1108/02686900610680530.

Ying, S. X., C. Patel, and A. L. Dela Cruz. 2023. “The Influence of Partners' Known Preferences on Auditors' Sceptical Judgements: The Moderating Role of Perceived Social Influence Pressure.” *Accounting and Finance* 63: 3193–3215. https://doi.org/10.1111/acfi.13030.

Zaman, M., M. Hudaib, and R. Haniffa. 2011. “Corporate Governance Quality, Audit Fees and Non-Audit Services Fees.” *Journal of Business Finance and Accounting* 38: 165–197. https://doi.org/10.1111/j.1468-5957.2010.02224.x.

Zhang, H., Z. Liu, and W. Zhong. 2024. “Network Centrality and Dissent Voting by Directors on Boards.” *Management and Organization Review* 20: 60–84. https://doi.org/10.1017/mor.2023.29.

Zhao, H. 2022. “Network Connections Within Committees and Board Governance Effectiveness.” *Corporate Governance: An International Review* 30, no. 4: 421–441. https://doi.org/10.1111/corg.12409.

Appendix A

Centrality Measures

Centrality is a concept that inherently involves multiple dimensions, requiring several components for a comprehensive measurement. The four network centrality measures applied in this study are widely recognised in research and were initially defined by Bonacich (1972, 1987) and Freeman (1977, 1978).

Degree centrality measures immediate influence by indicating the number of direct connections (degree) each node has. It reflects the popularity and engagement level of nodes within the network. Like the concept of interlock, nodes with higher degree centrality are presumed to exert greater local influence due to enhanced access to distributed information or resources. To standardise for varying network size annually, this measure is normalised by dividing by the total number of nodes minus one:

$$C_{\mathrm{D}} = \frac{\left|N\left(V_i\right)\right|}{|V| - 1},$$

where $N(V_i)$ is the number of nodes connected with a given node and v is the total number of nodes.

Eigenvector centrality measures the centrality of a node based on its first-degree connections. It complements degree centrality by considering the indirect effects of these connections. This measure operates on the premise that not all nodes in a network hold equal importance, highlighting how significant the direct links of a node are, thereby including indirect connections. By accounting for connections beyond immediate neighbours, eigenvector centrality offers insights into long-term influence. Its calculation takes into consideration the varying size of the network each year.

$$C_{\mathrm{E}}\,(u) = \frac{1}{\lambda} \sum\nolimits_{V=1}^{|V|} \omega_{u.v} C_{\mathrm{E}}(U),$$

where λ is constant; C_{E} is the eigen vector; ω is the matrix of the net.

Betweenness centrality quantifies the probability of information or resources passing through a particular node. It measures how frequently a node lies on the shortest path between other nodes, i.e., its bridging capacity with highly connected nodes. To adjust for varying network sizes, values are normalised by the maximum value of the same component:

$$C_{\mathrm{B}}(v) = \sum_{s.v.t \in V}^{s \neq v \neq t} \frac{\rho_{st}(V)}{\rho_{st}},$$

where ρ_{st} is the number of the shortest paths between s and t; $\rho_{st}(V)$ is the number of the shortest paths from s to t passing through node v.

Closeness centrality is the average shortest path length from one node to all others, indicating the speed of information transmission to or from that node. Nodes with higher closeness centrality are less distant from other nodes in the network. The distances between unconnected nodes are assigned a zero value:

$$C_{\mathrm{C}}\left(V_i\right) = \frac{|V| - 1}{\sum_{V_j \in V} \mathrm{distance}\left(V_i . V_j\right)},$$

where $\mathrm{distance}\left(V_i . V_j\right)$ is the shortest distance between V_i and V_j.

Appendix B

List of Variables and Description

	Variable	Definition
DEG_t	Degree centrality	Number of direct connections[a]
$EIGEN_t$	Eigenvector centrality	First-degree connections (direct ties)[a]
BET_t	Betweenness centrality	Bridge node between others[a]
$CLOS_t$	Closeness centrality	Average shortest path length from one node to all others[a]
PCA_t	Principal component analysis	Composite measure of centrality[b]
AF_t	Audit fees	Logarithm of audit fees (EUR)
$SIZE_t$	Firm size	Logarithm of total assets (EUR)
EXP_t	Foreign sales	Foreign sales/total sales
$RECEI_t$	Receivables	Receivable/total assets

(Continues)

	Variable	Definition
ROA_t	ROA	EBITDA/total assets
$LEVERAGE_t$	Leverage	Total liabilities/total assets
B_SIZE_t	Board size	Number of directors
B_INDEP_t	Board independence	Proportion of independent directors in the board
B_FEM_t	Board female	Proportion of female directors in the board
B_MEET_t	Board meetings	Number of board meetings
AC_SIZE_t	Audit committee size	Number of members in AC
AC_MEET_t	Audit committee meetings	Number of AC meetings
$AC\_MEET_t^2$	Square of audit committee meetings	Square of number of AC meetings
BIG 4_t	BIG 4	1 if the firm is audited by a Big 4, and 0 otherwise
$RLAW_t$	Rule of law	World Bank rule of law index
MASC	Masculinity	Hofstede's index
INDIV	Individualism	Hofstede's index
UAI	Uncertainty avoidance	Hofstede's index
LTO	Long-term orientation	Hofstede's index
PDI	Power distance	Hofstede's index
$HIGHEXP_t$	Higher exporting firms	1 if exports are higher than the median value, and 0 otherwise
$HIGHLEV_t$	More leveraged firms	1 if financial leverage is higher than the median value, and 0 otherwise
$HIGHINDEP_t$	More independent boards of directors	1 if board independence is higher than the median value, and 0 otherwise

[a]See Appendix A for further detail.
[b]See Section 3.2 for further detail.