

Audit committee social networks and audit opinion: a European analysis

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Abstract

Purpose – This study investigates how audit committee members' positions in interorganizational social networks affect external auditors' judgments and the resulting audit opinion.

Design/methodology/approach – Drawing on signalling theory, directors' network centrality is conceptualized as a visible indicator of otherwise unobservable governance quality and access to specialized resources. Using data for 6,899 directors serving on the audit committees of 230 non-financial firms listed in eight European countries over 2005–2020, centrality measures (degree, eigenvector, betweenness and closeness) are computed for audit committee members and aggregated at the firm–year level. Logistic, probit, ordered logit and ordered probit models are then estimated to examine the association between these measures and the likelihood and severity of audit qualifications.

Findings – Results reveal that higher network centrality is systematically associated with a greater probability of unqualified opinions and less severe qualifications, particularly for degree and eigenvector centrality, as well as composite indices; this effect is stronger among low-leverage firms. These effects hold robustly across model specifications, placebo tests and lagged centrality measures.

Originality/value – By extending social network analysis to audit opinions in a multi-country European context, our findings demonstrate that audit committee connectivity serves as a governance signal incorporated by auditors, with novel implications for oversight effectiveness.

Keywords Audit committee, Social network analysis, Eigenvector centrality, Audit opinion, Corporate governance

Paper type Research article

1. Introduction

Recent literature has underscored the relevance of the audit committee (AC) in overseeing financial statements, prompting numerous studies on its composition and functioning (Alcaide-Ruiz and Bravo-Urquiza, 2022; Azizkhani *et al.*, 2023; García Benau *et al.*, 2003). One especially pertinent yet underexplored aspect is the connectivity of AC members, who often serve on similar committees in different firms, thereby forming interorganizational social networks. To our knowledge, no prior study has systematically examined how AC members' social network centrality influences external auditors' opinions. These networks act as channels for disseminating information, resources and practices, and can significantly influence decision-making and external auditors' perceptions of the audit process quality (Wang *et al.*, 2021).

JEL Classification — M42, G34

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In this context, AC connectivity may directly affect the audit opinion issued (Omer *et al.*, 2019). This is particularly important given that audit opinions serve as critical signals of financial reporting quality to investors and regulators. Resources and knowledge acquired through these networks can enhance financial oversight and the obtaining of more favourable audit opinions (He *et al.*, 2017; Omer *et al.*, 2019). Moreover, constant interaction between the AC and external auditors – through communication about the audit plan, results, detected deficiencies and other relevant matters – reinforces the importance of auditors' perceptions regarding directors' experience and centrality (Abbott *et al.*, 2004; Archambeault *et al.*, 2008).

To examine this relationship, we analyse a sample of 6,899 directors from 230 publicly traded firms across eight European countries (Germany, Belgium, Spain, France, Netherlands, Italy, Portugal and the United Kingdom) over the period 2005–2020. We use widely used centrality metrics in social network analysis (SNA) (degree, eigenvector, closeness and betweenness) for AC members, and aggregate them at the firm level. Logistic, ordered-logit, probit and ordered-probit regressions reveal that higher centrality significantly increases the likelihood of receiving a clean (unqualified) audit opinion. These findings are robust to different control variables, fixed effects, placebo tests and alternative model specifications.

To properly assess the relevance of our research, it is important to consider the pivotal role that ACs play within the European framework for statutory audit. ACs have become a cornerstone of the EU's corporate governance and audit architecture, particularly following the reforms introduced by Directive 2014/56/EU and Regulation (EU) 537/2014. They are entrusted with safeguarding auditor independence, a core objective of the EU audit reform. Against this backdrop, our international (and Europe-focused) examination of connectivity among ACs is highly relevant for evaluating the effectiveness of the European audit framework. In line with this relevance, our contribution is threefold. First, we extend the application of SNA within the specific context of audit opinion research, addressing a gap in the literature where AC social network effects remain underexplored. This focus also responds to recent review evidence showing that audit opinion research has expanded considerably, while still leaving scope for new determinants and research settings, particularly those connected to governance structures and emerging analytical perspectives (Nurhidayah *et al.*, 2024). While prior studies examined director networks in various governance contexts, research specifically focusing on AC member connectivity and its impact on external audit opinions remains limited (He *et al.*, 2017; Omer *et al.*, 2019). Our study advances this literature by examining how AC social networks influence audit quality through the lens of external auditor perceptions and decisions. Second, we employ SNA within the specific context of audit opinion. Although SNA has been utilized in accounting research, to the best of our knowledge, no study has yet applied these advance metrics to the context of audit opinions. Third, we expand the geographical scope of AC research by conducting our analysis using an international sample of principal European stock market indices, moving beyond the predominantly US-focused studies that characterized this research area.

This article is structured as follows: after this introduction, Section 2 presents the foundations of the study and the theoretical framework. Section 3 details the methodology, sample, variables and SNA approach. Section 4 reports the results of the empirical analysis. Section 5 concludes with main findings and suggestions for future research.

2. Theoretical foundations and hypotheses

2.1 Theoretical framework

This study adopts a multidimensional theoretical framework that draws on three complementary, and at times contrasting, perspectives: resource dependence theory – rooted in organizational and sociological research – together with agency theory and signalling theory, both grounded in economics. These theories offer complementary but sometimes contrasting predictions, because they highlight both beneficial and harmful channels through which connectivity and centrality can influence the type of opinion issued by external auditors.

Taken together, each theory addresses a distinct mechanism through which AC centrality may operate: resource dependence theory explains how central AC members access external resources; agency theory addresses whether this same centrality strengthens or instead weakens managerial monitoring; and signalling theory explains how external auditors interpret AC centrality as an observable proxy for governance quality. Because these mechanisms operate in parallel rather than in isolation, they jointly generate the complementary, and at times opposing, predictions that motivate our dual hypotheses (H1a/H1b), developed in Section 2.5.

Resource dependence theory (Pfeffer and Salancik, 1978) views the AC as a bridge between the firm and its external environment. From this perspective, highly central AC members are valuable because they bring information about auditing standards, regulatory changes and internal control practices from other firms and boards. This access to external resources can strengthen oversight and support a cleaner (unqualified) audit opinion. At the same time, the same networks can also transmit arguable practices: if central directors operate in environments where aggressive accounting or earnings management are tolerated, they may import and spread these practices, increasing the risk of a qualified opinion.

Building on this resource-based logic, agency theory shifts the focus from external resource access to internal monitoring incentives, emphasizing the AC's role in monitoring managers and protecting shareholders (Jensen and Meckling, 1976). On the positive side, a director who is central in corporate networks has more reputational risk across multiple firms and therefore stronger incentives to monitor carefully. This is consistent with Omer *et al.* (2019), who show that firms with better-connected AC are less likely to misstate their financial statements, and that AC connectedness moderates the negative effect of board interlocks on misreporting firms. However, very dense and repeated connections among the same directors may reduce effective monitoring. Frequent interactions can create familiarity and groupthink, which weaken professional scepticism and may make a qualified or adverse opinion more likely.

Complementing both perspectives, signalling theory turns to how external stakeholders, particularly auditors, interpret observable AC characteristics as signals of underlying governance quality (Spence, 1973). A central AC can be seen by the external auditor as a signal that the firm is embedded in a network of reputable companies and good governance practices, which may lead auditors to perceive lower risk and to issue a clean opinion. Yet signals can be misleading. Centrality may also reflect networks where personal loyalties dominate. In such cases, centrality can work as a protective shield that helps resist stricter scrutiny, making a qualified audit opinion more probable instead of less. This dual reading is consistent with Ivanova and Prencipe (2023), who show that board interlocks with an allegedly fraudulent company lead external auditors to charge higher audit fees, indicating that auditors interpret directors' network connections as informative signals, whether reassuring or alarming, of client-level governance risk.

2.2 Audit committee characteristics and audit opinion

The AC's primary function is to ensure integrity and transparency in financial reporting by evaluating both the audit plan and the external auditor's findings and recommendations. Building on the theoretical lenses introduced in Section 2.1, the following review moves from broad meta-analytic evidence to attribute-specific findings on AC composition.

Given the extent of empirical research on this topic, Habib *et al.* (2021) meta-analyse the literature and report that AC size is generally negatively associated with the probability of restatements, while the impact of independence shows more mixed results, and meeting frequency barely shows consistent evidence of impact on restatements. These findings confirm the complexity of the link between AC characteristics and audit opinion, highlighting the importance of simultaneously considering multiple dimensions of composition and conduct.

Regarding independence specifically, several studies converge on this attribute as a key monitoring mechanism. [Pucheta-Martínez and De Fuentes \(2007\)](#) find that independence of AC directors reduces the probability of a qualified opinion, and [Dimitropoulos \(2025\)](#) demonstrates that higher AC independence is consistently associated with a lower likelihood of receiving a qualified audit opinion. Furthermore, this independence may act as a boundary condition for managerial influence: [Golmohammadi Shuraki and Pourheidari \(2026\)](#) find that while CEO narcissism is linked to an increased probability of qualified audit opinions, AC independence mitigates this effect, suggesting that an independent committee serves as an effective constraint against managerial behavioural biases.

Turning to the AC's activity and expertise, meeting frequency and the accounting or financial expertise of its members are also critical variables for report quality. [Abbott et al. \(2004\)](#) document a negative relationship between AC diligence (independence and number of meetings) and the occurrence of financial restatements. [Archambeault et al. \(2008\)](#) show that firms with high-quality ACs face a significantly lower probability of experiencing adverse restatements. In the European context specifically, [Bajra and Čadež \(2018\)](#) find that, following the mandatory adoption of ACs under the 8th EU Company Law Directive, it is the AC's monitoring effectiveness and the competencies of its members, rather than the mere existence of the committee, that are positively associated with financial reporting quality. Similarly, [Lary and Taylor \(2012\)](#) find that both independence and financial experience of committee members are significantly associated with lower incidence and severity of financial restatements, while [Bédard et al. \(2004\)](#) conclude that such experience has significant positive effects on report quality measures. Relatedly, [Fernández Méndez et al. \(2015\)](#) show that overlap between AC and compensation committee members decreases the probability of a qualified opinion, presumably due to better knowledge flow and internal coordination, while overload from participation in three or more boards is associated with a higher incidence of qualified opinions due to possible supervision deficits, in line with the busyness argument ([Sharma and Iselin, 2012](#); [Wan-Hussin et al., 2021](#)).

Beyond these core attributes, a further stream of the literature has explored additional dimensions of AC composition. [Pucheta-Martínez et al. \(2016\)](#) show that a higher percentage of women on the AC reduces the probability of qualified opinions due to errors or lack of information, and [Oradi and Izadi \(2020\)](#) find that the mere presence of at least one woman, especially if she is independent or a financial expert, reduces the incidence of restatements. Relatedly, [Ittonen et al. \(2010\)](#) find that AC with greater female representation are associated with lower audit fees, consistent with auditors perceiving such committees as more conscientious and as posing lower audit risk. [Vafeas \(2005\)](#) notes that shareholding participation of AC members sends signals of commitment to report quality. Complementarily, [Pucheta-Martínez and García-Meca \(2014\)](#) examine how the presence of institutional investor representatives as directors on the AC improves financial information quality, reducing the probability that the firm receives qualified audit reports.

Consistent with resource dependence theory's emphasis on AC networks as a channel for knowledge and organizational legitimacy, [He et al. \(2017\)](#) demonstrate that social connections between AC members and external auditors influence the probability of a qualified opinion, while [Gao and Huang \(2018\)](#) find that committees with an odd structure have a lower probability of restatements, suggesting benefits in coordination and deliberation.

Several other studies support the role of the AC as a signalling mechanism that conveys credibility to the market regarding internal control and audit quality. [Elmashtawy et al. \(2024\)](#) demonstrate that an effective AC signals strong internal control systems and higher audit quality; [Appuhami \(2018\)](#) shows that AC characteristics reduce perceived risk among investors; and [Bédard et al. \(2008\)](#) argue that the establishment of an independent and expert AC functions as a mechanism to minimize information asymmetries during the initial public offering (IPO) process. [Dragomir and Dumitru \(2023\)](#) find that AC quality is positively associated with the quality of integrated reporting, while [Mkumbuzi \(2015\)](#) emphasizes that an AC with financial expertise emits positive signals that enhance corporate reputation. [Biedma](#)

López *et al.* (2011) show that firms view the AC as a complementary mechanism to the work performed by the external auditor. Beyond general effectiveness, specific human capital attributes also signal quality to auditors: Liu and Huang (2025) find that executives' IT background is associated with a higher likelihood of unqualified audit opinions, supporting the notion that visible expertise acts as a positive signal of reporting quality to external auditors. Furthermore, the communication channel between the AC and external auditors is crucial; Kim *et al.* (2025) demonstrate that such communication is instrumental in reducing audit opinion shopping, which highlights the AC's role in ensuring auditor neutrality.

While this literature has considerably advanced our understanding of how AC composition shapes audit outcomes, it treats the committee largely as a self-contained unit, leaving open how AC members' external connections across firms, captured by the concept of social capital, might similarly influence audit opinion.

2.3 Director networks

Social capital typically refers to the cooperative norms and the density of social networks of a given human group (Huang *et al.*, 2021). It thus relies on the potential for information transmission within individuals' networks, as well as on the dependency links created through these trust-based relationships. In the AC context, this social capital can facilitate the exchange of information about accounting practices, auditing standards and internal control mechanisms between different organizations (Bianchi *et al.*, 2023; Kacanski and Lusher, 2017). We propose to address the social capital of ACs by analysing the formal connections among their members.

The presence of directors who simultaneously hold seats on multiple boards or committees can serve as indicators of prestige and experience. Directors with overlap can improve AC monitoring capacity by contributing specialized knowledge and best practices learned in other organizations. Fernández Méndez *et al.* (2015, 2017) find that directors with overlap improve monitoring capacity, and are associated with lower audit fees and a lower probability of receiving a qualified audit opinion. Similarly, Habib and Bhuiyan (2016) report a positive relationship between member overlap and improvement in financial information quality, especially when such directors possess shareholding participation, which reinforces the signal of commitment to transparency. 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.

However, there exists an alternative perspective suggesting that excess obligations can reduce active committee vigilance. Sharma and Iselin (2012) document that, in the post-Sarbanes-Oxley Act (SOX) environment, there is a significant positive association between the multiple directorships held by independent AC members and the incidence of financial misstatements. The busyness theory suggests that directors with multiple commitments may be too busy to effectively monitor the firm. Post-SOX studies have consistently found that the presence of AC directors with multiple directorships is associated with lower quality in financial reporting (Marek *et al.*, 2024; Sharma and Iselin, 2012; Wan-Hussin *et al.*, 2021).

Research on social links between key actors further reveals complex effects on audit quality. Bruynseels and Cardinaels (2014) examine "friendship ties" between the CEO and AC members, concluding that such relationships cause lower contracting of audit services and increased earnings management. Moreover, external auditors are less inclined to issue going-concern opinions or report internal control weaknesses when friendly ties exist, revealing the independence cost that excessive familiarity between parties can generate. Hossain *et al.* (2016) use a relational approach to analyse networks of interconnected clients. They measured how the audit partner's dependence on fees from network-linked firms affects audit process quality. They find that, with greater economic dependence, there is a lower probability of issuing a qualified report for going-concern doubt and an increase in absolute discretionary accruals.

Research on social links between external auditors and AC members reveals complex effects on audit quality. [He et al. \(2017\)](#) examine whether social links between external auditors and AC members affect audit outcomes. Although these links can facilitate information transfer and help auditors alleviate management pressure to ignore correction of detected errors, close interpersonal relationships can undermine auditor monitoring of the financial reporting process. Consequently, social links between external auditors and AC members detriment audit quality. Similarly, firms with such ties exhibit a higher incidence of ex-post detected accounting irregularities and receive lower market valuation. The study also highlights that audit fees are marginally higher when social connections exist, although without reflecting actual additional audit effort, pointing to possible reciprocities within the network.

Organizational psychology literature suggests that social links can inhibit critical questioning among AC members. [Loewenstein \(1996\)](#) argues that concern for short-term consequences and reciprocity dynamics make members avoid challenging each other when affective or professional closeness exists, weakening the oversight function. Using network analysis, [Omer et al. \(2019\)](#) examine multiple connectivity dimensions and found that, after controlling for operational performance and corporate governance characteristics, firms with well-connected ACs are less likely to adopt reporting practices that reduce financial reporting quality. Collectively, this evidence shows that AC social networks act as channels for resources and reputation, but can also erode independence and monitoring effectiveness. The key is balancing connectivity benefits, access to information and legitimacy, with safeguards that prevent over-commitment and conflicts of interest.

2.4 Audit committee member centrality

Previous research on director networks has focused mainly on board interlocks, where different directors overlap on the same board. This measure remains incomplete, as it only considers direct connections. SNA, in contrast, offers centrality metrics that are more comprehensive for quantifying each actor's position and the quality of their links ([Intintoli et al., 2018](#); [Omer et al., 2019](#)). Building on this literature, the present study focuses on the network centrality of AC members within the broader director network.

Centrality is a multidimensional construct; therefore, we consider four complementary metrics that capture distinct dimensions: degree centrality, eigenvector centrality, closeness centrality and betweenness centrality ([Intintoli et al., 2018](#)). Degree centrality reflects the number of direct connections a director maintains with other boards, indicating immediate access to contacts and information. Eigenvector centrality incorporates the importance of those contacts, assigning higher scores to directors connected to other well-connected actors and thus capturing reputational reach and influence. Betweenness centrality measures the extent to which a director lies on the shortest paths between other nodes, indicating a brokerage role in connecting otherwise distant firms. Closeness centrality reflects how quickly a director can reach all other nodes in the network, capturing efficiency in accessing dispersed information and resources.

In the context of ACs, these centrality dimensions represent distinct influence over the audit process ([Fernández Méndez et al., 2015, 2017](#); [Habib and Bhuiyan, 2016](#); [He et al., 2017](#); [Omer et al., 2019](#)). Since these measures are only partial approaches to the multidimensional nature of centrality, prior work often employs composite scores to summarize overall position in the network ([Chiou et al., 2025](#); [Intintoli et al., 2018](#); [Omer et al., 2019](#)). Consistent with this approach, the present study uses both a principal component analysis (PCA)-based factor and an N-score index that combine different centrality indicators into a more comprehensive measure of AC member centrality.

2.5 Hypotheses

The three theories discussed above suggest that AC centrality has ambivalent effects on the audit opinion. On the one hand, if the resource dependence, positive agency and positive

signalling channels dominate, highly central AC members improve access to information, strengthen reputation-based incentives and send a credible signal of stronger internal control systems and higher reporting quality. In that case, centrality should reduce perceived audit risk and be associated with a higher probability of receiving a clean (unqualified) opinion from external auditors.

On the other hand, if the diffusion of weak practices, busyness and misleading signalling channels dominate, centrality may undermine effective monitoring. Networks can spread permissive attitudes towards earnings management, create groupthink and reciprocity, and allow well-connected directors to coordinate and resist stricter audit decisions. Under this view, greater AC centrality should increase the likelihood of receiving a qualified audit opinion.

Because these positive and negative mechanisms coexist, the net effect of AC centrality on the audit opinion is an empirical question. To capture this theoretical ambiguity, we formulate a dual hypothesis:

H1a. Network centrality of AC members increases the likelihood that the firm receives a qualified audit opinion from external auditors.

H1b. Network centrality of AC members decreases the likelihood that the firm receives a qualified audit opinion from external auditors.

Because centrality is inherently multidimensional as seen in [Section 2.4](#), we do not restrict the test of [H1a/H1b](#) to the composite indexes. Instead, these dual expectations are examined uniformly across all six centrality measures, the four centrality metrics (degree, eigenvector, betweenness and closeness) and the two composite indexes (PCA-based factor and N-score), using identical model specifications. This approach allows us to assess whether the hypothesized effect is a general property of AC member centrality or is instead concentrated in specific dimensions, with the composite indexes serving as a summary robustness check rather than the sole basis for hypothesis testing.

3. Empirical analysis

3.1 Sample and data sources

Our database comprises 230 non-financial firms listed on the main stock market indices of 8 major European countries (Germany DAX 30, Belgium BEL20, Spain IBEX35, France CAC40, Netherlands AEX, Italy FTSE MIB, Portugal PSI20 and United Kingdom FTSE 100) during the period 2005–2020. From an initial sample of 310 firms (all the firms included in the referenced indices), we excluded 66 banks and other financial institutions. We also removed cross-listed firms operating in multiple markets – assigning each to the country of the parent firm – and eliminated 14 firms lacking enough information. After these refinements, the final sample consists of 230 firms. These stock markets offer robust data on governance structures and financial performance, facilitating empirical analysis. Additionally, these countries have been the focus of some prior studies and regulatory attention, allowing comparisons with previous research and contributing to current debates on governance and financial information quality in Europe. The geographical scope balances major economies (Germany, France, the United Kingdom) with smaller markets (Belgium, Portugal), enabling cross-country comparisons while controlling for institutional heterogeneity via country-fixed effects in robustness tests. Financial firms are excluded due to their distinct regulatory environment and accounting standards (IFRS 9, banking-specific disclosures), following standard practice in corporate governance research ([Habib et al., 2021](#); [Pucheta-Martínez and De Fuentes, 2007](#)) (see [Table 1](#)).

We integrate two data sets. First, we identify each board of directors and AC member for the 230 firms throughout the sixteen-year period. This required manual collection and consultation of corporate reports, firm websites and the websites of securities market

Table 1. Sample

	Germany	Belgium	Spain	France	The Netherlands	Italy	Portugal	UK	Total
Firms studied	25	14	26	35	17	28	16	77	230
Observations	8,240	2,713	4,826	7,210	2,466	6,123	3,010	12,309	46,897
Directors	1,247	403	757	1,116	421	1,108	524	1,844	6,899
AC members	348	159	315	436	172	355	144	902	2,688
Source(s): Own elaboration									

supervisory authorities in each country. We then standardize director names, as the same individual might be referenced differently depending on the firm or year. Through this process, we identify 6,899 directors, of which 2,688 served on an AC at some point. The resulting panel is unbalanced, as firms enter and exit the panel due to changes in index membership, network disconnection from the main component and data availability [1]. Additionally, we collect information on balance sheets, income statements and other firm-level characteristics potentially related to audit opinion. This data was obtained from three data providers widely used in academia: *Compustat*, *Refinitiv Eikon* and *Bloomberg* [2].

3.2 Methodology

Social networks represent structured configurations of relationships and interactions among individuals within defined groups. In network analysis, these structures are conceptualized as graphs comprising nodes (actors) interconnected through paths or links. For the purposes of this investigation, the reference population encompasses board members from 230 corporations across eight countries. Consistent with established literature, two board members are considered connected when they serve on the same board during the same period, thereby establishing a director network (Intintoli *et al.*, 2018; Omer *et al.*, 2019). This network configuration subsequently translates to the firm level, where two firms are considered linked if they share at least one director within the same year.

Our analytical framework incorporates both a director network, where nodes represent AC members, and a firm network, where nodes denote firms. We compute centrality measures at the director level for each network member, considering all board members, using UCINET VI software (Bianchi *et al.*, 2023; Borgatti *et al.*, 2002; Jamaludin and Hashim, 2017; Kacanski and Lusher, 2017; Taha Kandil, 2025; Uyar *et al.*, 2020). To transfer directors' centrality to the firm level within the company network, we first standardize each centrality measure by subtracting its mean and dividing by its standard deviation, so that the resulting variables have a mean of zero and a standard deviation of one (Omer *et al.*, 2019). Given that our research specifically focuses on the AC, only the centrality measures of AC members within the director network are transferred to the firm network, using the mean value of each AC member's standardized centrality measure at the firm-year level.

Previous research has focused mainly on board interlocks, where different directors overlap on the same board. This measure remains incomplete, as it only considers direct connections. SNA, in contrast, offers centrality metrics that are more comprehensive for quantifying each actor's position and the quality of their links (Intintoli *et al.*, 2018). Centrality is a multidimensional construct; therefore, we consider four complementary metrics that capture distinct dimensions: degree centrality, eigenvector centrality, closeness centrality and betweenness centrality (Intintoli *et al.*, 2018).

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 standardize for varying network size annually, this measure is normalized by dividing by the total number of nodes minus one:

$C_D = \frac{|N(V_i)|}{|V|-1}$ 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.

$\zeta_E(u) = \frac{1}{\lambda} \sum_{v=1}^{|V|} \omega_{u,v} \zeta_E(v)$, where λ is constant; ζ_E eigen vector; ω matrix of the net.

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:

$$\zeta_c(V_i) = \frac{|V|-1}{\sum_{V_j \in V} \text{distance}(V_i, V_j)}, \text{ where } \text{distance}(V_i, V_j) \text{ is the shortest distance between } V_i \text{ and } V_j$$

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 normalized by the maximum value of the same component:

$$C_B(v) = \sum_{s \neq v \neq t} \frac{\rho_{st}(v)}{\rho_{st}(V)} \text{ where } \rho_{st} \text{ is the number of the shortest paths between } s \text{ y } t; \rho_{st}(V) \text{ is the number of the shortest paths from } s \text{ to } t \text{ passing through the node } v$$

Since these measures are only partial approaches to the multidimensional nature of centrality, it is common to use a composite score (Chiou *et al.*, 2025). We employ a composite metric based on PCA. This composite metric captures the underlying factors of the four-centrality metrics and has been previously used in the literature on director connectivity and its impact on firm value, restatements and career prospects (Intintoli *et al.*, 2018; Omer *et al.*, 2019). The factor loadings of degree centrality, eigenvector centrality and betweenness centrality are 0.6708, 0.5643 and 0.4812, respectively [3]. We also find that the first factor has an eigenvalue of 1.92 and explains 64% of total variance.

To complement the PCA approach, we also develop a supplementary composite index that combines all four centrality measures (degree, betweenness, eigenvector and closeness). This index is constructed by first converting each centrality measure to z-scores, standardizing them to a mean of zero and a standard deviation of one, and then averaging the standardized values (Chiou *et al.*, 2025). The resulting composite score, denoted as N-Score, is calculated as follows:

$$N - \text{Score} = \frac{\text{Degree} + \text{Eigenvector} + \text{Betweenness} + \text{Closeness}}{4}$$

3.3 Variables and models

External audit opinions in the European Union are governed by a harmonized regulatory framework arising from Directive 2006/43/EC and its subsequent amendment, Directive 2014/56/EU. In addition, Regulation (EU) No 537/2014 establishes specific provisions for public interest entities. According to Directive 2006/43/EC, statutory auditors and audit firms must perform their work “in accordance with international auditing standards adopted by the Commission,” understood as ISAs (International Standards on Auditing) issued by the International Auditing and Assurance Standards Board of IFAC International Federation of Accountants. Although these instruments entered into force on June 16, 2014, Member States had until June 17, 2016, to transpose and fully apply ISAs, making them mandatory at the European level.

The European model contemplates four types of audit opinion, according to ISA-ES 700 and 705:

- (1) Unmodified opinion (clean opinion): when financial statements present faithfully, in all material respects, the entity’s situation.
- (2) Qualified opinion: indicates that, except for certain specific aspects, financial statements follow applicable accounting principles.
- (3) Adverse opinion: indicates that financial statements do not comply, as a whole, with the regulatory framework.

Compustat offers the following classification:

- (1) Unqualified – presented fairly
- (2) Unqualified – with additional language
- (3) Qualified – fairly but concern
- (4) Adverse opinion
- (5) No opinion

The category “Unqualified – with additional language” includes those unmodified opinions that incorporate emphasis paragraphs or paragraphs about other matters, in accordance with ISA-ES 706. This distinction is relevant for identifying nuances in auditor communication. In our study, we use logit regression, so we create a dummy variable *CLEAN*, which equals 0 if the opinion is unqualified presented fairly (category 1), and 1 if the opinion falls into categories 2, 3, 4 and/or 5.

To isolate the effect of network centrality on audit opinion issuance, we incorporate a set of control variables that capture firm financial characteristics, corporate governance and audit firm particularities. All continuous variables were winsorized at the 1st and 99th percentiles to mitigate the impact of extreme values. To reduce the risk that our results are driven by macroeconomic or regulatory conditions instead of by AC centrality, we explicitly control for time and industry effects (Omer *et al.*, 2019). Macroeconomic cycles, crisis years and major regulatory changes can influence both the structure of director networks and the way external auditors issue opinions. For example, during recessions, boards may restructure and auditors may become more conservative at the same time. In addition, some industries face specific regulations and business risks that affect both the connectivity of directors and the underlying audit risk. Year fixed effects capture all shocks that are common to firms in a given year, while industry fixed effects capture time-invariant differences across sectors. As a result, our estimates use variation in AC centrality across firms that operate in the same industry and year, after removing the common macroeconomic and sectoral components. We employ cluster-robust standard errors clustered by firm to account for error dependence (Gow *et al.*, 2010; Ittonen *et al.*, 2010).

Following prior literature, we control for various firm-level characteristics to enhance the comparability of our findings (Fernández Méndez *et al.*, 2015; Gaganis and Pasiouras, 2007; He *et al.*, 2017; Ireland, 2003; Karjalainen *et al.*, 2018; Omer *et al.*, 2019; Pham, 2022; Ruiz-Barbadillo *et al.*, 2024; Simões and Carvalho, 2024). Firm size, measured as the natural logarithm of total assets (*SIZE*), acts as a proxy for resource access and operational complexity. Leverage (*LEV*), calculated as the ratio of total debt to total assets, is also included as higher financial leverage implies superior default risk and, consequently, a higher probability of receiving qualified opinions. Audit risk is addressed through the ratio of accounts receivable to total assets (*RECEI*), given that a higher balance of receivables increases the probability of inaccurate estimates and, therefore, of qualifications in the audit opinion. Similarly, profitability, measured through return on assets or ROA (net income over total assets), is incorporated because firms with lower profitability tend to present more volatile financial results and, therefore, higher audit risk. We also capture client complexity through the exports-to-assets ratio (*EXP*), as firms with significant international operations face increased operational complexities that elevate audit risk and the likelihood of qualified opinions. We also include a loss indicator (*LOSS*), coded as 1 if the firm reported negative net income in the current year and 0 otherwise, as companies experiencing losses are associated with heightened financial distress and audit risk, thus increasing the probability of receiving qualified audit opinions. Similarly, we control for losses in the previous year (*LOSS_{t-1}*), given that prior negative performance provides important historical context for auditors’ current risk assessments and opinion decisions.

Regarding corporate governance structures, we incorporate several control variables reflecting different dimensions of board and AC effectiveness. Audit committee size (AC_SIZE), defined as the number of members, serves as an indicator of the supervisory capacity of the audit function (Ali *et al.*, 2017; Oradi and Izadi, 2020). The frequency of audit committee meetings (AC_MEET) during the fiscal year constitutes an important indicator of active governance vigilance (Ali *et al.*, 2017), reflecting the dedication and involvement of committee members in the audit process. These two variables are jointly employed as proxies for AC effectiveness. Additionally, we include the frequency of board meetings (B_MEET), which captures the intensity of strategic oversight and serves as a diligence indicator for organizational governance (Fernández Méndez *et al.*, 2015; Oradi and Izadi, 2020; Pham, 2022). Finally, board independence (B_INDEP), operationalized as the proportion of independent directors serving on the board, is employed as a proxy for governance objectivity and the mitigation of potential conflicts of interest in board decision-making processes (Farinha and Viana, 2009; Omer *et al.*, 2019; Pucheta-Martínez and De Fuentes, 2007).

Regarding external audit characteristics, we include an indicator variable that takes value 1 if the audit firm belongs to the so-called Big 4 and 0 otherwise, given that higher-prestige audit firms tend to exert superior audit pressure (He *et al.*, 2017; Rabea Baatwah, 2016). Similarly, we control for audit fees, defined as the logarithm of total amount paid in the previous fiscal year, which serves as a proxy for the intensity and scope of audit work performed. In the same way, we control for the previous audit opinion $CLEAN_{i,t-1}$ (Ireland, 2003; Karjalainen *et al.*, 2018); auditors often consider the previous year's audit opinion and financial performance when forming current period judgments, as prior opinions signal ongoing operational challenges that may affect the firm's ability to continue as a going concern. The variable REST_LINKS takes a value of one if the firm maintains direct connections to organizations that have restated their financial statements within the current or preceding two-year period (Chiu *et al.*, 2013). Additionally, LINKS_TOTAL captures the aggregate number of board interlocks maintained by the firm (Dharwadkar *et al.*, 2024; Intintoli *et al.*, 2018; Omer *et al.*, 2019; Pittman *et al.*, 2019). Finally, 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). In the Appendix we provide a list of the variables along with their description.

To examine the relationship between AC network centrality and audit opinion issuance, we employ logistic regression as our primary empirical approach. Our baseline specification takes the following form:

$$\begin{aligned}
 CLEAN = & \alpha + \beta_1 CENTRALITY_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 LEV_{i,t} + \beta_4 ROA_{i,t} + \beta_5 EXP_{i,t} \\
 & + \beta_6 RECEI_{i,t} + \beta_7 LOSS_{i,t} + \beta_8 LOSS_{i,t-1} + \beta_9 CLEAN_{i,t-1} + \beta_{10} AC_SIZE_{i,t} \\
 & + \beta_{11} AC_MEET_{i,t} + \beta_{12} B_MEET_{i,t} + \beta_{13} B_INDEP_{i,t} + \beta_{14} BIG4_{i,t} + \beta_{15} AF_{i,t-1} \\
 & + \beta_{16} R.LAW_{i,t} + \beta_{18} REST_LINKS_{i,t} + \beta_{19} LINKS_TOTAL_{i,t} + YEAR \\
 & + INDUSTRY + \varepsilon_{i,t}
 \end{aligned}
 \tag{1}$$

To ensure the robustness of our findings, we implement several alternative econometric approaches. First, we estimate probit models as an alternative to the baseline logit specification, acknowledging that both methods typically yield similar results but provide complementary evidence on the stability of our findings.

Additionally, we employ ordered logit and ordered probit models to capture the ordinal nature of audit opinions more precisely. For these specifications, we construct an ordered

dependent variable (OPINION_CAT) that distinguishes between unqualified opinions, qualified opinions with explanatory paragraphs and adverse or disclaimer opinions. The ordered models allow us to examine whether network centrality affects not only the probability of receiving a clean opinion but also the severity of audit qualifications.

4. Results

4.1 Descriptive analysis

Table 2 presents the distribution of our variables of interest. We can see that most of the firms received unqualified opinions (CLEAN equals 1 or OPINION_CAT equals 1). Among the firms with qualified audit reports, there is a clear trend to some additional comment (category 2), followed, but very distantly, by categories 5 and 3. It is observed that no firm has an adverse opinion (category 4).

Table 3 shows the descriptive statistics of study variables. The mean proportion of unqualified opinion is 74%. Financially, the analysed firms have a mean ROA of 5% while the leverage ratio is 63%. ACs have a mean size of around four members; almost 60% of board members are classified as independent. The AC meets on average six times per year, while the board of directors does so seven times, which adapts to regulations and previous works (Ali *et al.*, 2017; Pham, 2022).

Table 4 shows the correlation between variables in our study. The highest correlation coefficients are shown by relationships between the number of board meetings and the number of AC meetings, reflecting synchronized governance schedules. The previous audit fees and the firm size are correlated (0.701); both variables share common information regarding the scale and complexity of the audit engagement, which explains their high correlation. It is reasonable to observe a correlation between network centrality measures (and their composite index) and firm size because larger firms tend to have more extensive and interconnected governance structures, resulting in higher centrality scores. In addition, as companies grow, they often appoint more board and committee members, which increases the potential paths and interactions within the AC network. Since the correlation coefficients among the explanatory variables are sufficiently low, multicollinearity is not a concern in our estimates.

4.2 Explanatory analysis

4.2.1 *Baseline estimates.* Regression analysis testing the proposed model specification (1) was conducted to examine the relationship between AC member centrality and the probability of obtaining an unqualified audit opinion. Empirical evidence presented in Table 5 confirms that centrality increases the likelihood of receiving an unqualified audit opinion for three of four centrality measures (DEG, EIGEN and BET) and for both composite measures (PCA and N-SCORE). This result suggests that popularity, both in the short and long term, and bridge position appears to be more important than speed in accessing the information or resources

Table 2. Distribution of auditor opinion

	1	0
CLEAN	2,342	826
OPINION_CAT		
1	0	2,342
2	724	0
3	5	0
4	0	0
5	97	0

Source(s): Own elaboration

Table 3. Descriptive variables

Variable	Obs	Mean	Std. dev	Q1	Q3
DEG	2,665	0.263	0.929	−0.393	0.676
EIGEN	2,665	0.057	0.851	−0.341	−0.173
BET	2,665	0.513	0.856	−0.057	0.771
CLOS	2,665	0.0493	1.032	−0.372	0.606
PCA	2,665	0.000	1.387	−0.872	0.376
N-SCORE	2,665	0	0.665	−0.396	0.135
OPINION_CAT	3,168	1.354	0.774	1	2
CLEAN	3,168	0.739	0.439	1	1
SIZE	2,908	9.516	1.383	8.502	10.536
LEV	2,908	0.637	0.158	0.532	0.747
ROA	2,902	0.046	0.053	0.015	0.069
EXP	3,087	−0.005	0.119	−0.011	0.002
RECEI	2,908	0.140	0.092	0.077	0.181
LOSS	3,227	0.104	0.305	0	0
LOSS _{<i>t</i>−1}	3,004	0.092	0.288	0	0
CLEAN _{<i>t</i>−1}	2,949	0.737	0.440	1	1
AC_SIZE	3,381	4.296	1.348	3	5
AC_MEET	3,010	6.196	3.091	4	7
B_MEET	3,093	7.302	3.726	5	9
B_INDEP	3,074	0.594	0.201	0.46	0.73
BIG4	3,369	0.918	0.274	1	1
AF _{<i>t</i>−1}	2,922	15.423	1.434	14.459	16.398
R.LAW	3,381	1.378	0.433	1.1538	1.696
REST_LINKS	3,366	2.867	2.209	1	4
LINKS_TOTAL	3,366	4.004	2.692	2	5

Note(s): Mean, standard deviation, minimum and maximum of the main variables

See [Appendix](#) for the definition of the variables

Source(s): Own elaboration

transmitted within the network in order to obtain an unqualified opinion. Thus, with the exception of closeness, these results suggest that more connected directors tend to be associated with “cleaner” audit opinions, that is, with higher quality financial information issued by the firm.

Control variables align with results obtained in previous literature. A larger firm is less likely to obtain an unqualified opinion ([Gaganis and Pasiouras, 2007](#); [Oradi and Izadi, 2020](#)); a possible explanation is that large firms tend to have more complex operations, representing higher risk for the auditor and making it more difficult to obtain an opinion without qualifications. On the contrary, LEV presents a positive and significant coefficient in three out of the six columns, indicating that firms with higher financial leverage have a higher probability of receiving a clean opinion. Although this result is contrary to expectations, it could be interpreted as these firms, being more watched by their creditors, take better care of their financial information quality ([Al-Shattarat, 2024](#)). Since this result deviates from our expectations, we address it in greater detail in the additional analyses section. Board independence is consistently and positively related to the probability of an unqualified opinion, suggesting that independence contributes to more effective oversight and greater commitment to financial information quality ([Farinha and Viana, 2009](#); [Omer et al., 2019](#)). The positive coefficient for BIG4 reinforces the notion that the auditing firm reputation is associated with higher audit quality and, therefore, with a higher probability of a clean opinion ([Fernández Méndez et al., 2015](#)). Receivables shows the expected negative coefficient, as it is expected that a higher level of receivables represents riskier firms, due to increased collection uncertainty and potential overstatement concerns, which is reflected in a lower possibility of

Table 4. Correlation of variables

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) OPINION_CAT	1.000													
(2) CLEAN	-0.770***	1.000												
(3) DEG	0.031	-0.062**	1.000											
(4) EIGEN	-0.065***	0.085***	0.654***	1.000										
(5) CLOS	0.102***	-0.155***	0.446***	0.195***	1.000									
(6) BET	0.010	-0.035	0.519***	0.170***	0.437***	1.000								
(7) PCA	0.026	-0.056*	0.901***	0.680***	0.681***	0.710***	1.000							
(8) N-SCORE	0.000	0.000	0.710***	0.722***	0.426***	0.600***	0.824***	1.000						
(9) SIZE	0.099***	-0.156***	0.459***	0.262***	0.327***	0.220***	0.433***	0.281***	1.000					
(10) LEV	0.017	-0.032	0.075***	0.112***	-0.002	-0.056**	0.047***	0.076***	0.142***	1.000				
(11) ROA	-0.045*	0.058*	-0.107***	-0.095***	0.016	0.020	-0.061***	-0.087***	-0.247***	-0.288***	1.000			
(12) EXP	-0.014	0.015	-0.003	0.063***	-0.002	0.010	0.021	0.043*	0.009	0.055***	-0.007	1.000		
(13) RECEI	0.040*	-0.067***	0.000	0.036	-0.053**	-0.091***	-0.034	0.009	-0.126***	0.223***	0.002	0.012	1.000	
(14) LOSS	0.026	-0.028	0.009	0.021	0.006	-0.015	0.007	-0.003	0.055*	0.101***	-0.516***	0.122***	0.011	1.000
(15) LOSS _{t-1}	0.036	-0.032	0.009	0.003	0.028	-0.016	0.008	0.006	0.032	0.078***	-0.199***	-0.036	0.023	0.229***
(16) CLEAN _{t-1}	-0.460***	0.638***	-0.071***	0.095***	-0.163***	-0.040	-0.062**	-0.007	-0.162***	-0.027	0.076***	0.030	-0.066***	-0.040*
(17) AC_SIZE	0.020	0.001	0.233***	0.173***	0.086***	-0.039*	0.160***	0.058**	0.198***	0.034	-0.020	-0.037*	0.000	0.043**
(18) AC_MEET	0.066***	-0.031	-0.017	-0.067***	-0.117***	-0.087***	-0.090***	-0.056***	0.146***	0.128***	-0.190***	0.019	-0.006	0.114***
(19) BC_MEET	0.064***	-0.026	-0.062***	-0.081***	-0.093***	-0.082***	-0.103***	-0.089***	0.072***	0.177***	-0.201***	0.039*	0.001	0.124***
(20) B_INDEP	-0.115***	0.138***	-0.081***	0.033	0.077***	0.021	0.008	-0.049*	0.172***	-0.049*	0.025	0.007	0.029	0.010
(21) BIG4	-0.106***	0.121***	0.017	0.043*	-0.038*	0.022	0.015	0.051***	0.035	-0.021	0.073***	-0.045*	-0.035	-0.028
(22) AF _{t-1}	0.120***	-0.181***	0.353***	0.189***	0.328***	0.221***	0.366***	0.217***	0.701***	0.082***	-0.140***	0.002	0.023	0.041*
(23) R_LAW	-0.179***	0.125***	0.055***	0.148***	0.132***	0.099***	0.139***	0.110***	0.088***	-0.016	0.137***	0.021	0.015	-0.063***
(24) REST_LINKS	0.073***	-0.131***	0.565***	0.301***	0.454***	0.478***	0.608***	0.447***	0.457***	0.024	-0.058***	-0.023	-0.056***	-0.003
(25) LINKS_TOTAL	0.106***	-0.171***	0.645***	0.331***	0.550***	0.594***	0.715***	0.540***	0.473***	0.003	-0.034*	-0.011	-0.050***	0.005
	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)			
(15) LOSS _{t-1}	1.000													
(16) CLEAN _{t-1}	-0.036*	1.000												
(17) AC_SIZE	0.037*	-0.007	1.000											
(18) AC_MEET	0.085***	-0.031	-0.026	1.000										
(19) BC_MEET	0.081***	-0.021	-0.014	0.665***	1.000									
(20) B_INDEP	0.019	0.158***	0.012	-0.050***	-0.040*	1.000								
(21) BIG4	-0.033	0.113***	0.063***	0.008	-0.098***	0.028	1.000							
(22) AF _{t-1}	0.046*	-0.177***	0.184***	0.030	-0.058***	0.234***	0.047**	1.000						
(23) R_LAW	-0.053***	0.125***	-0.017	-0.503***	-0.384***	0.274***	0.004	0.165***	1.000					
(24) REST_LINKS	0.015	-0.142***	0.245***	-0.076***	-0.096***	0.076***	0.054***	0.396***	0.090***	1.000				
(25) LINKS_TOTAL	0.008	-0.185***	0.239***	-0.110***	-0.166***	0.086***	0.094***	0.446***	0.129***	0.844***	1.000			

Table 5. Logit model

	DEG	EIGEN	BET	CLOS	PCA	N-SCORE
CENTRALITY	0.371** (0.163)	0.429** (0.182)	0.190* (0.114)	−0.0545 (0.0656)	0.216** (0.0933)	0.424** (0.193)
SIZE	−0.435*** (0.140)	−0.405*** (0.137)	−0.355** (0.139)	−0.357*** (0.137)	−0.410*** (0.140)	−0.380*** (0.139)
LEV	1.382* (0.833)	1.229 (0.824)	1.404* (0.833)	1.384* (0.828)	1.312 (0.834)	1.179 (0.833)
ROA	−2.591 (2.348)	−2.404 (2.309)	−2.810 (2.327)	−2.601 (2.318)	−2.875 (2.339)	−2.607 (2.330)
EXP	0.201 (0.569)	0.0929 (0.574)	0.198 (0.549)	0.233 (0.561)	0.141 (0.568)	0.116 (0.565)
RECEI	−2.941** (1.228)	−2.820** (1.259)	−2.742** (1.268)	−2.795** (1.255)	−2.802** (1.261)	−2.822** (1.272)
LOSS	−0.341 (0.321)	−0.334 (0.327)	−0.363 (0.318)	−0.359 (0.318)	−0.352 (0.322)	−0.326 (0.321)
LOSS _{<i>t</i>−1}	−0.142 (0.296)	−0.142 (0.293)	−0.142 (0.287)	−0.129 (0.290)	−0.174 (0.296)	−0.175 (0.295)
CLEAN _{<i>t</i>−1}	3.055*** (0.221)	3.002*** (0.221)	3.061*** (0.224)	3.061*** (0.225)	3.053*** (0.223)	3.034*** (0.223)
AC_SIZE	0.0417 (0.0615)	0.0425 (0.0616)	0.0899 (0.0621)	0.0622 (0.0611)	0.0681 (0.0614)	0.0769 (0.0615)
AC_MEET	−0.00332 (0.0536)	−0.000498 (0.0527)	0.00622 (0.0508)	0.00316 (0.0517)	0.00336 (0.0520)	0.00283 (0.0517)
B_MEET	−0.00543 (0.0350)	−0.00778 (0.0353)	−0.0144 (0.0340)	−0.0148 (0.0345)	−0.00893 (0.0341)	−0.0109 (0.0344)
B_INDEP	1.988*** (0.516)	1.729*** (0.489)	1.758*** (0.477)	1.737*** (0.484)	1.835*** (0.489)	1.858*** (0.484)
BIG4	1.478*** (0.381)	1.466*** (0.366)	1.482*** (0.376)	1.484*** (0.372)	1.485*** (0.378)	1.437*** (0.372)
AF _{<i>t</i>−1}	−0.0928 (0.131)	−0.0807 (0.125)	−0.0845 (0.126)	−0.0772 (0.124)	−0.0905 (0.129)	−0.0743 (0.127)
RLAW	0.315 (0.234)	0.263 (0.236)	0.361 (0.228)	0.342 (0.230)	0.312 (0.230)	0.311 (0.229)
REST_LINKS	−0.0104 (0.0747)	−0.0183 (0.0734)	−0.00167 (0.0751)	−0.00748 (0.0737)	−0.00519 (0.0745)	−0.00673 (0.0748)
LINKS_TOTAL	−0.104 (0.0742)	−0.0587 (0.0641)	−0.0952 (0.0772)	−0.0386 (0.0681)	−0.119 (0.0766)	−0.0994 (0.0706)
Intercept	2.599 (1.848)	2.391 (1.819)	1.164 (1.803)	1.274 (1.770)	2.329 (1.818)	1.850 (1.786)
Observations	1,757	1,757	1,757	1,757	1,757	1,757
Correctly classified (%)	88.33	88.56	88.22	88.10	88.33	88.39
Pseudo R ²	0.4747	0.4760	0.4724	0.4712	0.4742	0.4747

Note(s): Estimated coefficients (std. errors) using the logit regression of [equation \(1\)](#). The dependent variable is CLEAN in all the regressions. The first row indicates the centrality measure used. All the estimations include year and industry-fixed effects and clustering by firm. See [Appendix I](#) for the definition of the variables. ***, **, * for 1%, 5% and 10% significance level

obtaining an unqualified opinion ([He et al., 2017](#)). The previous audit opinion demonstrates a positive and consistent relationship with the current audit opinion. This result is consistent with prior research showing that firms with an unqualified opinion tend to continue receiving unqualified opinions in consecutive years, reflecting the persistence of underlying financial reporting quality ([Karjalainen et al., 2018](#)).

Given the nature of the dependent variable, as described in [Table 1](#), we check the robustness of our estimates by conducting an ordered logit analysis, whose results are reported in [Table 6](#). Importantly, the dependent variable in the ordered logit models (OPINION_CAT) is coded

Table 6. Ordered logit model

Variables	DEG	EIGEN	BET	CLOS	PCA	N-SCORE
CENTRALITY	−0.309** (0.136)	−0.366** (0.161)	−0.151* (0.0861)	0.0981 (0.118)	−0.169** (0.0849)	−0.347* (0.185)
SIZE	0.344*** (0.115)	0.321*** (0.112)	0.279** (0.112)	0.281** (0.112)	0.320*** (0.114)	0.302*** (0.112)
LEV	−1.187* (0.699)	−1.087 (0.686)	−1.219* (0.709)	−1.206* (0.685)	−1.181* (0.702)	−1.104 (0.696)
ROA	2.497 (2.113)	2.287 (2.088)	2.587 (2.122)	2.515 (2.091)	2.548 (2.121)	2.348 (2.125)
EXP	−0.273 (0.480)	−0.213 (0.480)	−0.268 (0.467)	−0.308 (0.477)	−0.235 (0.478)	−0.222 (0.471)
RECEI	2.067** (0.948)	1.980** (0.965)	1.975** (0.970)	1.982** (0.954)	2.007** (0.972)	2.064** (0.988)
LOSS	0.356 (0.285)	0.357 (0.288)	0.369 (0.286)	0.381 (0.286)	0.361 (0.287)	0.343 (0.288)
LOSS _{t−1}	0.124 (0.249)	0.116 (0.244)	0.123 (0.243)	0.110 (0.240)	0.127 (0.246)	0.123 (0.243)
CLEAN _{t−1}	−2.894*** (0.217)	−2.846*** (0.216)	−2.897*** (0.219)	−2.899*** (0.219)	−2.884*** (0.218)	−2.863*** (0.217)
AC_SIZE	−0.00340 (0.0475)	−0.00514 (0.0474)	−0.0374 (0.0481)	−0.0156 (0.0475)	−0.0219 (0.0477)	−0.0307 (0.0481)
AC_MEET	0.0113 (0.0489)	0.0102 (0.0479)	0.00538 (0.0473)	0.00801 (0.0473)	0.00683 (0.0480)	0.00889 (0.0476)
B_MEET	0.0284 (0.0293)	0.0284 (0.0294)	0.0339 (0.0287)	0.0331 (0.0289)	0.0309 (0.0289)	0.0318 (0.0289)
B_INDEP	−1.624*** (0.456)	−1.403*** (0.448)	−1.415*** (0.439)	−1.406*** (0.439)	−1.475*** (0.445)	−1.487*** (0.445)
BIG4	−1.037*** (0.273)	−1.042*** (0.267)	−1.058*** (0.272)	−1.033*** (0.272)	−1.064*** (0.272)	−1.038*** (0.264)
AF _{t−1}	0.0634 (0.106)	0.0537 (0.104)	0.0531 (0.105)	0.0429 (0.104)	0.0624 (0.105)	0.0453 (0.105)
RLAW	−0.533** (0.230)	−0.485** (0.232)	−0.557** (0.224)	−0.553** (0.224)	−0.528** (0.227)	−0.528** (0.225)
REST_LINKS	0.00248 (0.0639)	0.00701 (0.0629)	−0.00344 (0.0635)	0.00115 (0.0629)	−0.000619 (0.0634)	0.00172 (0.0634)
LINKS_TOTAL	0.0914 (0.0613)	0.0550 (0.0542)	0.0826 (0.0627)	0.0261 (0.0588)	0.100 (0.0631)	0.0885 (0.0607)
Observations	1,798	1,798	1,798	1,798	1,798	1,798
Wald χ^2	1309.04		1303.89	1299.73	1290.32	1291.68
Pseudo R2	0.3929	0.3938	0.3913	0.3908	0.3923	0.3926

Note(s): Estimated coefficients (std. errors) using the logit regression of [equation \(1\)](#). The dependent variable is OPINION_CAT in all the regressions. The first row indicates the centrality measure used. All the estimations include year and industry-fixed effects and clustering by firm. See [Appendix I](#) for the definition of the variables. ***, **, * for 1%, 5% and 10% significance level

such that higher values represent more severe audit qualifications, whereas in the binary logit models (CLEAN) higher values represent the absence of qualifications. Consequently, the signs of the coefficients in [Table 6](#) are reversed compared to [Table 5](#), despite carrying the same economic interpretation: negative coefficients on centrality measures in the ordered logit indicate that higher centrality is associated with moving towards less severe opinions (lower values of OPINION_CAT), which is consistent with the positive relationship between centrality and the probability of a clean opinion found in the logit models. Overall, the estimates broadly are in line with the findings previously reported. As reported in [Table 6](#), the empirical evidence reveals that centrality measures maintain their predicted direction and statistical significance in the ordered logit framework.

The statistical significance of degree centrality, which captures the importance of direct influence, is associated with an increased likelihood of receiving a less severe audit opinion. Eigenvector centrality, reflecting long-term influence and emphasizing the importance of the quality of connections rather than merely their quantity, also increases the likelihood of obtaining a less severe audit opinion. Furthermore, the significance of the composite indices (PCA and N-SCORE), which capture the multidimensional nature of network centrality through PCA and standardized averaging methodologies, consistently demonstrate statistical significance in predicting the likelihood of receiving less severe audit opinions.

Collectively, the centrality results from the ordered logit analysis confirm that AC members occupying more central positions within director networks are systematically associated with a reduced likelihood of qualifications and the severity gradient across opinion categories. The robustness of these findings across both logistic and ordered logit specifications provides evidence that AC member positioning within interorganizational networks constitutes a meaningful governance mechanism influencing audit opinion issuance and, by extension, external auditors' assessments of financial reporting quality. Ultimately, these results reinforce the notion that ACs composed of more centrally positioned members tend to perform their functions more effectively, resulting in higher-quality financial information disclosed by the firm.

Control variables show notable consistency with main model results. Firm size continues to be negatively associated with the probability of receiving a clean opinion, suggesting that the complexity inherent to large organizations continues to represent a challenge for obtaining unqualified opinions. Leverage maintains its positive and significant effect, indicating that more leveraged firms, probably due to being under greater creditor scrutiny, present better financial reporting practices. Similarly, AC independence and the presence of a Big4 audit firm continue to be positively associated with the quality of the opinion issued. Receivables relative to total assets demonstrate the expected negative coefficient, consistent with audit risk theory, as higher levels of receivables represent firms with increased collection uncertainty, valuation complexity and greater potential for overstatement concerns (He *et al.*, 2017). The previous audit opinion has a positive and consistent relationship with the actual audit opinion. This is consistent with prior research; a firm with an unqualified opinion could reflect persistence in following years (Karjalainen *et al.*, 2018). Finally, the RLAW reflects that stronger environmental control and institutional governance frameworks are positively associated with unqualified audit opinions. This relationship underscores that robust legal and regulatory environments enhance financial reporting transparency and audit quality by establishing clear accountability mechanisms and reducing information asymmetries between management and external stakeholders.

To provide greater robustness to the results, additional models were estimated using probit and ordered probit specifications (Tables 7 and 8). Probit models are less general than logit models due to the assumption of normality in the distribution of the error term. In any case, both models provide reliable estimates, and the probit results can be interpreted as a robustness check for those obtained from the logit model.

The results obtained through these alternative distributional assumptions remain consistent with our main findings. Degree centrality and eigenvector centrality continue to demonstrate a significant and robust relationship with unqualified, presented fairly, audit opinion across different model specifications, reinforcing the conclusion that network influence and connection quality constitute the primary mechanisms through which AC social networks affect external auditors' evaluations. In the same way, the closeness centrality measure maintains its lack of statistical significance in these alternative specifications, further confirming that the speed of information access within the network does not meaningfully impact audit opinion outcomes.

As shown in Table 7, the PCA and N-Score composites, which integrate different centrality dimensions, also demonstrate a positive and significant effect on the probability of obtaining a clean opinion in the probit model, reinforcing the importance of adopting a multidimensional perspective on AC members' positions within the social network. Nevertheless, these measures show no statistically significant coefficients in the ordered probit model (Table 8).

Table 7. Audit committee centrality and audit opinion in probit model

	DEG	EIGEN	BET	CLOS	PCA	N-SCORE
CENTRALITY	0.188** (0.0864)	0.198** (0.0891)	0.0898 (0.0575)	−0.0300 (0.0405)	0.218** (0.0870)	0.112** (0.0477)
SIZE	−0.217*** (0.0718)	−0.207*** (0.0710)	−0.179** (0.0721)	−0.181** (0.0712)	−0.192*** (0.0715)	−0.207*** (0.0715)
LEV	0.732* (0.445)	0.676 (0.441)	0.749* (0.446)	0.739* (0.444)	0.635 (0.441)	0.708 (0.443)
ROA	−1.388 (1.286)	−1.316 (1.274)	−1.483 (1.274)	−1.356 (1.270)	−1.378 (1.278)	−1.526 (1.283)
EXP	0.0868 (0.286)	−0.00677 (0.292)	0.0836 (0.281)	0.104 (0.287)	0.0308 (0.286)	0.0485 (0.288)
RECEI	−1.518** (0.653)	−1.478** (0.667)	−1.417** (0.674)	−1.447** (0.670)	−1.461** (0.674)	−1.457** (0.670)
LOSS	−0.184 (0.171)	−0.198 (0.174)	−0.192 (0.170)	−0.190 (0.170)	−0.179 (0.172)	−0.193 (0.172)
LOSS _{t−1}	−0.0942 (0.154)	−0.0934 (0.152)	−0.0942 (0.151)	−0.0844 (0.152)	−0.116 (0.153)	−0.108 (0.154)
CLEAN _{t−1}	1.762*** (0.123)	1.739*** (0.123)	1.766*** (0.124)	1.770*** (0.124)	1.753*** (0.123)	1.761*** (0.123)
AC_SIZE	0.0206 (0.0323)	0.0215 (0.0324)	0.0444 (0.0323)	0.0318 (0.0318)	0.0386 (0.0321)	0.0332 (0.0319)
AC_MEET	−0.00528 (0.0280)	−0.00410 (0.0276)	−0.00119 (0.0270)	−0.00270 (0.0272)	−0.00306 (0.0273)	−0.00237 (0.0274)
B_MEET	−0.00402 (0.0193)	−0.00500 (0.0194)	−0.00734 (0.0191)	−0.00777 (0.0192)	−0.00566 (0.0192)	−0.00502 (0.0190)
B_INDEP	1.073*** (0.278)	0.941*** (0.265)	0.962*** (0.260)	0.947*** (0.261)	1.008*** (0.263)	1.001*** (0.265)
BIG4	0.791*** (0.216)	0.776*** (0.210)	0.792*** (0.215)	0.791*** (0.214)	0.768*** (0.212)	0.796*** (0.215)
AF _{t−1}	−0.0442 (0.0658)	−0.0353 (0.0628)	−0.0393 (0.0636)	−0.0343 (0.0627)	−0.0338 (0.0639)	−0.0430 (0.0647)
RLAW	0.142 (0.123)	0.114 (0.125)	0.163 (0.122)	0.155 (0.122)	0.137 (0.121)	0.139 (0.121)
REST_LINKS	−0.00855 (0.0393)	−0.00840 (0.0391)	−0.00434 (0.0389)	−0.00615 (0.0383)	−0.00523 (0.0393)	−0.00523 (0.0392)
LINKS_TOTAL	−0.0565 (0.0393)	−0.0343 (0.0343)	−0.0494 (0.0395)	−0.0218 (0.0352)	−0.0555 (0.0370)	−0.0650 (0.0405)
Intercept	1.237 (0.990)	1.119 (0.973)	0.506 (0.964)	0.531 (0.949)	0.867 (0.961)	1.117 (0.977)
Observations	1,757	1,757	1,757	1,757	1,757	1,757
R ²	0.4739	0.4749	0.4717	0.4707	0.4741	0.4736
Correctly classified (%)	88.39	88.33	88.16	87.93	88.22	88.28

Note(s): Estimated coefficients (std. errors) using the logit regression of equation (2). The dependent variable is CLEAN in all the regressions. The first row indicates the centrality measure used. All the estimations include year and industry-fixed effects and clustering by firm. See [Appendix I](#) for the definition of the variables. ***, **, * for 1%, 5% and 10% significance level

Control variables present signs and significance levels consistent with previous literature. Firm size and receivables are negatively associated with the probability of a clean opinion, while leverage, board independence, previous-year audit opinion, rule of law and Big 4 auditing maintain positive and significant relationships. Overall, the consistency of results across different statistical models supports the empirical accuracy of the relationship between AC social network centrality and the opinions issued by external auditors, emphasizing the robustness of our findings.

Following previous literature ([Jiang et al., 2019](#)), and with the objective of strengthening the accuracy and credibility of our results, a placebo test was implemented on model 1. This

Table 8. Audit committee centrality and audit opinion in ordered probit model

	DEG	EIGEN	BET	CLOS	PCA	N-SCORE
CENTRALITY	−0.162** (0.0716)	−0.153** (0.0753)	−0.0629 (0.0464)	0.0499 (0.0518)	−0.0725 (0.0443)	−0.119 (0.0946)
SIZE	0.192*** (0.0574)	0.182*** (0.0565)	0.163*** (0.0571)	0.162*** (0.0570)	0.179*** (0.0569)	0.171*** (0.0560)
LEV	−0.729** (0.354)	−0.687** (0.348)	−0.745** (0.359)	−0.753** (0.347)	−0.712** (0.356)	−0.681* (0.352)
ROA	1.090 (1.141)	1.043 (1.135)	1.145 (1.140)	1.046 (1.128)	1.164 (1.139)	1.092 (1.141)
EXP	−0.133 (0.238)	−0.0718 (0.243)	−0.131 (0.237)	−0.150 (0.241)	−0.110 (0.241)	−0.108 (0.239)
RECEI	1.229** (0.510)	1.190** (0.518)	1.174** (0.522)	1.193** (0.517)	1.185** (0.520)	1.193** (0.524)
LOSS	0.180 (0.147)	0.191 (0.148)	0.187 (0.147)	0.189 (0.147)	0.187 (0.147)	0.180 (0.147)
LOSS _{t−1}	0.0799 (0.135)	0.0800 (0.133)	0.0816 (0.132)	0.0646 (0.131)	0.0902 (0.135)	0.0936 (0.133)
CLEAN _{t−1}	−1.583*** (0.124)	−1.565*** (0.124)	−1.588*** (0.125)	−1.587*** (0.124)	−1.584*** (0.125)	−1.580*** (0.126)
AC_SIZE	−0.00558 (0.0249)	−0.00746 (0.0249)	−0.0221 (0.0248)	−0.0129 (0.0248)	−0.0152 (0.0247)	−0.0184 (0.0249)
AC_MEET	−0.000556 (0.0262)	−0.00151 (0.0258)	−0.00299 (0.0256)	−0.00169 (0.0255)	−0.00261 (0.0257)	−0.00200 (0.0256)
B_MEET	0.0233 (0.0164)	0.0239 (0.0163)	0.0254 (0.0162)	0.0256 (0.0163)	0.0242 (0.0162)	0.0248 (0.0162)
B_INDEP	−0.729*** (0.233)	−0.612*** (0.228)	−0.621*** (0.225)	−0.613*** (0.224)	−0.649*** (0.226)	−0.644*** (0.226)
BIG4	−0.541*** (0.161)	−0.535*** (0.160)	−0.548*** (0.162)	−0.539*** (0.163)	−0.548*** (0.160)	−0.536*** (0.157)
AF _{t−1}	0.00465 (0.0521)	−0.00252 (0.0509)	−0.00154 (0.0513)	−0.00649 (0.0510)	0.00205 (0.0515)	−0.00481 (0.0511)
RLAW	−0.344*** (0.121)	−0.322*** (0.123)	−0.353*** (0.121)	−0.354*** (0.121)	−0.339*** (0.121)	−0.339*** (0.120)
REST_LINKS	0.00406 (0.0355)	0.00403 (0.0352)	0.000956 (0.0350)	0.00338 (0.0345)	0.00133 (0.0352)	0.00173 (0.0352)
LINKS_TOTAL	0.0491 (0.0323)	0.0286 (0.0294)	0.0393 (0.0323)	0.0135 (0.0300)	0.0483 (0.0328)	0.0393 (0.0315)
Observations	1,798	1,798	1,798	1,798	1,798	1,798
Pseudo R2	0.3752	0.3752	0.3732	0.3732	0.3740	0.3737

Note(s): Estimated coefficients (std. errors) using the logit regression of equation (3). The dependent variable is OPINION_CAT in all the regressions. The first row indicates the centrality measure used. All the estimations include year and industry-fixed effects and clustering by firm. See [Appendix I](#) for the definition of the variables. ***, **, * for 1%, 5% and 10% significance level

procedure was applied individually to each of the centrality variables (degree, eigenvector, betweenness and closeness), as well as both composite measures. The use of this placebo test allows ruling out that observed effects are attributable to chance, thus reinforcing the validity of conclusions about the relationship between centrality in AC member social networks and the opinion issued by external auditors. We underline that none of the placebo variables presented a significant association with the probability of receiving a clean opinion, supporting the causal validity of results obtained with real centrality variables [4]. Furthermore, to address potential endogeneity and causality concerns, we have incorporated an additional analysis in which centrality variables are lagged by one year. This approach, reflected in the [Appendix II](#) ([Tables 13-15](#)), allows us to examine whether the observed relationships between AC members' centrality and audit opinion remain robust against potential reverse causality in both

models, logit and ordered logit. By lagging the centrality variables, we mitigate the risk that the identified relationship is merely the result of simultaneity between network structure and audit opinion. The results obtained confirm the consistency of our main findings. Furthermore, we address endogeneity through Two-Stage Residual Inclusion (2SRI), applied to all six centrality measures. The results confirm the presence of endogeneity for five of the six measures, as indicated by a significant first-stage residual in the second-stage equation, and the main centrality coefficients remain significant and correctly signed after this correction. The exception is closeness centrality, for which 2SRI likewise yields no significant effect [5].

4.2.2 Additional analyses. Our baseline estimates indicate that financial leverage is positively associated with the probability of receiving a clean opinion. This finding deviates from the conventional audit risk perspective. Higher leverage signals greater financial distress and default risk, which should increase the likelihood of qualified opinions (Carcello and Neal, 2003). This unexpected positive relationship deserves deeper empirical investigation.

We propose that leverage may function as a moderator of the AC centrality and audit opinion relationship, and that the observed positive effect may mask heterogeneous effects across leverage levels. High-leverage firms are under scrutiny from creditor and debt holders, while low-leverage firms enjoy greater financial flexibility and autonomy. This distinction in external oversight intensity suggests two competing mechanisms.

First, in firms with low financial leverage, creditor monitoring and external stakeholder pressure are attenuated. AC operate in an environment where audit risk is inherently lower and external oversight mechanism are weaker. Under these conditions, the internal governance function of AC social network may become more salient. Well-connected ACs can exercise oversight more effectively and increase the likelihood of obtaining an unqualified audit opinion, as internal networks substitute for weak external monitoring.

Second, highly leveraged firms operate under intense scrutiny that actively monitor financial performance and compliance. Under conditions of high external oversight, the contribution of AC networks may be lower. External scrutiny may substitute for the AC mechanism benefits; alternatively, the operational complexity and audit risk inherent to leveraged firms may dominate auditors' perception. In either case, AC centrality effects should be weaker or absent in high-leverage firms.

To further investigate this relationship and examine whether the influence of AC social networks varies according to financial leverage, we conduct split-sample regression analyses (Islam *et al.*, 2023). Specifically, we divide the sample on the mean value of LEV and compare the resulting estimates. Table 9 shows the results. Network centrality measures demonstrate consistently positive and statistically significant coefficients for the low-leverage subsample across all specifications (except, as in previous analysis, closeness centrality), while these effects are not significant in the high-leverage group. This differential effect could be due to the fact that companies with reduced debt levels face diminished creditor scrutiny and exhibit lower inherent risk profiles, thereby creating an organizational environment where informal networks among AC members can play a more pronounced role in safeguarding audit quality. In contrast, highly leveraged firms operate under intensive monitoring by external stakeholders, particularly creditors and debt holders, which may effectively substitute for the governance function traditionally provided by internal social networks.

More generally, these heterogeneous effects suggest that the governance value of AC social networks could be conditional on the firm's external monitoring environment. When external oversight mechanisms are weak, as with firms with low financial leverage, internal networks become more valuable for information sharing, coordination and quality assurance. However, when external monitoring is intense, as occurs with high leverage due to creditor vigilance, the marginal contribution of internal social networks diminishes. This finding implies that the role of AC connectivity is not uniform but rather contingent on the institutional and stakeholder context in which the firm operates. The results remain similar for the logit and probit specifications and in the ordered and non-ordered models (Tables 10 – 12).

Table 9. Audit committee centrality and audit opinion in logit model by leverage

Split by	Low LEV DEG	High LEV DEG	Low LEV EIGEN	High LEV EIGEN	Low LEV BET	High LEV BET	Low LEV CLOS	High LEV CLOS	Low LEV PCA	High LEV PCA	Low LEV N-SCORE	High LEV N-SCORE
CENTRALITY	0.707** (0.353)	0.232 (0.181)	1.136* (0.599)	0.346* (0.208)	0.537** (0.219)	-0.217 (0.155)	0.103 (0.112)	-0.0938 (0.0972)	0.515** (0.219)	0.0600 (0.0950)	1.182*** (0.451)	0.0707 (0.168)
SIZE	-0.129 (0.192)	-0.786*** (0.213)	-0.0894 (0.182)	-0.765*** (0.216)	0.0483 (0.182)	-0.725*** (0.215)	-0.0258 (0.182)	-0.696*** (0.214)	-0.0854 (0.185)	-0.742*** (0.214)	-0.0165 (0.180)	-0.726*** (0.217)
LEV	0.555 (1.700)	-0.627 (1.760)	0.328 (1.655)	-0.746 (1.745)	0.616 (1.762)	-0.586 (1.753)	0.201 (1.653)	-0.385 (1.790)	0.381 (1.722)	-0.719 (1.744)	0.235 (1.730)	-0.706 (1.746)
ROA	-5.583** (2.690)	1.001 (3.566)	-5.771** (2.574)	1.242 (3.532)	-5.173* (2.745)	1.409 (3.471)	-5.518** (2.609)	1.130 (3.504)	-5.709** (2.711)	0.722 (3.507)	-5.828** (2.684)	0.796 (3.514)
EXP	1.322 (0.860)	-0.00963 (0.719)	1.089 (0.797)	-0.120 (0.734)	1.034 (0.781)	0.0887 (0.752)	1.080 (0.819)	0.0602 (0.729)	1.252 (0.851)	0.0125 (0.722)	1.002 (0.723)	0.0277 (0.715)
RECEI	-0.598 (1.861)	-4.404*** (1.397)	-0.198 (1.842)	-4.350*** (1.392)	0.996 (1.922)	-4.587*** (1.396)	0.803 (1.853)	-4.427*** (1.413)	-0.136 (1.787)	-4.457*** (1.408)	0.386 (1.810)	-4.462*** (1.410)
LOSS	-1.091** (0.556)	0.0885 (0.392)	-1.041* (0.569)	0.0678 (0.402)	-1.005* (0.538)	0.0748 (0.392)	-1.027* (0.541)	0.0677 (0.391)	-1.066* (0.549)	0.0612 (0.391)	-1.016* (0.559)	0.0642 (0.391)
LOSS _{t-1}	3.179*** (0.357)	2.728*** (0.291)	3.091*** (0.361)	2.678*** (0.292)	3.163*** (0.363)	2.785*** (0.296)	3.186*** (0.365)	2.739*** (0.291)	3.209*** (0.361)	2.741*** (0.294)	3.139*** (0.365)	2.743*** (0.293)
AC_SIZE	-0.123 (0.103)	0.0152 (0.0809)	-0.102 (0.108)	0.0165 (0.0800)	-0.0513 (0.103)	-0.0122 (0.0868)	-0.0913 (0.108)	0.0237 (0.0799)	-0.0854 (0.103)	0.0335 (0.0813)	-0.0408 (0.104)	0.0336 (0.0826)
AC_MEET	0.0264 (0.0873)	-0.0106 (0.0625)	0.0320 (0.0911)	-0.0133 (0.0608)	0.0290 (0.0832)	-0.00950 (0.0604)	0.0379 (0.0879)	-0.00980 (0.0600)	0.0224 (0.0853)	-0.00806 (0.0608)	0.0373 (0.0859)	-0.00917 (0.0605)
B_MEET	-0.114* (0.0593)	0.0245 (0.0471)	-0.116* (0.0622)	0.0245 (0.0476)	-0.124** (0.0573)	0.0290 (0.0453)	-0.146** (0.0609)	0.0243 (0.0460)	-0.104* (0.0570)	0.0232 (0.0463)	-0.106* (0.0592)	0.0232 (0.0460)
B_INDEP	3.008*** (0.838)	2.117*** (0.702)	2.376*** (0.679)	1.890*** (0.731)	2.124*** (0.650)	2.147*** (0.700)	2.165*** (0.676)	2.106*** (0.699)	2.562*** (0.702)	2.133*** (0.699)	2.502*** (0.675)	2.147*** (0.699)
BIG4	-13.74*** (0.678)	2.647*** (0.494)	-13.33*** (0.624)	2.545*** (0.489)	-14.64*** (0.724)	2.652*** (0.515)	-14.02*** (0.641)	2.543*** (0.503)	-14.65*** (0.693)	2.623*** (0.499)	-14.02*** (0.700)	2.602*** (0.496)
AF _{t-1}	-0.259 (0.165)	0.0724 (0.187)	-0.268* (0.160)	0.0868 (0.183)	-0.261 (0.168)	0.0821 (0.185)	-0.242 (0.162)	0.0807 (0.183)	-0.261 (0.166)	0.0739 (0.184)	-0.259 (0.167)	0.0785 (0.184)

(continued)

Table 9. Continued

Split by	Low LEV DEG	High LEV DEG	Low LEV EIGEN	High LEV EIGEN	Low LEV BET	High LEV BET	Low LEV CLOS	High LEV CLOS	Low LEV PCA	High LEV PCA	Low LEV N-SCORE	High LEV N-SCORE
RLAW	0.617* (0.359)	−0.0782 (0.345)	0.534 (0.346)	−0.146 (0.355)	0.612* (0.345)	−0.0433 (0.358)	0.554 (0.347)	−0.00110 (0.348)	0.651* (0.356)	−0.0472 (0.347)	0.689* (0.358)	−0.0409 (0.349)
REST_LINKS	−0.108 (0.129)	0.0526 (0.0973)	−0.141 (0.127)	0.0397 (0.0936)	−0.116 (0.128)	0.0581 (0.0926)	−0.107 (0.126)	0.0563 (0.0955)	−0.115 (0.127)	0.0621 (0.0969)	−0.139 (0.131)	0.0629 (0.0967)
LINKS_	−0.0808 (0.162)	−0.138 (0.0905)	0.0423 (0.117)	−0.115 (0.0819)	−0.0934 (0.148)	−0.0587 (0.0926)	0.0104 (0.123)	−0.0893 (0.0886)	−0.126 (0.164)	−0.129 (0.0909)	−0.0759 (0.140)	−0.119 (0.0876)
TOTAL	17.02*** (1.840)	4.907 (3.050)	16.96*** (1.931)	4.919 (3.051)	16.25*** (1.913)	3.945 (3.010)	16.40*** (1.756)	3.301 (3.016)	17.84*** (1.863)	4.318 (3.008)	16.58*** (1.877)	4.027 (2.985)
Intercept	826	891	826	891	826	891	826	891	826	891	826	891
Observations	1196.08	362.69	1341.43	397.56	1195.74	347.36	343.75	343.75	350.95	350.95	1118.86	349.52
Wald χ^2	0.5498	0.4787	0.5470	0.4823	0.5497	0.4789	0.5410	0.4780	0.5526	0.4775	0.5558	0.4774
Pseudo R^2												

Note(s): Estimated coefficients (std. errors) using the logit regression of equation (2). The dependent variable is CLEAN in all the regressions. The first row indicates the centrality measure used. All the estimations include year and industry-fixed effects and clustering by firm. See [Appendix I](#) for the definition of the variables. ***, **, * for 1%, 5% and 10% significance level

Table 10. Audit committee centrality and audit opinion in ordered logit model by leverage

Split by	Low LEV DEG	High LEV DEG	Low LEV EIGEN	High LEV EIGEN	Low LEV BET	High LEV BET	Low LEV CLOS	High LEV CLOS	Low LEV PCA	High LEV PCA	Low LEV N-SCORE	High LEV N-SCORE
CENTRALITY	-0.570** (0.244)	-0.269 (0.183)	-0.790** (0.312)	-0.371* (0.196)	-0.407*** (0.132)	0.0848 (0.139)	-0.139 (0.106)	0.199 (0.128)	-0.432*** (0.146)	-0.0766 (0.125)	-0.891*** (0.296)	-0.0884 (0.270)
SIZE	0.133 (0.167)	0.616*** (0.168)	0.0781 (0.157)	0.600*** (0.165)	-0.0101 (0.159)	0.544*** (0.165)	0.0568 (0.157)	0.515*** (0.169)	0.0821 (0.162)	0.568*** (0.172)	0.0498 (0.154)	0.550*** (0.169)
LEV	-1.187 (1.644)	0.166 (1.788)	-1.032 (1.629)	0.282 (1.768)	-1.288 (1.769)	0.255 (1.759)	-0.947 (1.625)	0.0944 (1.663)	-1.123 (1.723)	0.214 (1.788)	-0.994 (1.741)	0.231 (1.780)
ROA	4.673** (2.259)	-0.823 (3.697)	4.406** (2.186)	-0.942 (3.657)	4.106* (2.339)	-0.813 (3.567)	4.624** (2.240)	-0.955 (3.581)	4.398* (2.317)	-0.537 (3.619)	4.402* (2.348)	-0.625 (3.634)
EXP	-1.217** (0.605)	0.0166 (0.718)	-1.069* (0.577)	0.0522 (0.724)	-1.041* (0.563)	-0.0499 (0.718)	-1.104* (0.604)	-0.0571 (0.724)	-1.155* (0.603)	-0.00331 (0.711)	-1.013* (0.535)	-0.0193 (0.702)
RECEI	0.690 (1.532)	2.711** (1.087)	0.509 (1.505)	2.734** (1.086)	-0.139 (1.607)	2.830** (1.116)	-0.198 (1.570)	2.733** (1.120)	0.344 (1.536)	2.773** (1.104)	0.409 (1.550)	2.792** (1.114)
LOSS	0.883** (0.432)	-0.00734 (0.435)	0.887** (0.437)	0.00734 (0.442)	0.843* (0.431)	0.00829 (0.437)	0.892** (0.427)	0.00507 (0.436)	0.851** (0.434)	0.0174 (0.436)	0.815* (0.443)	0.0114 (0.437)
LOSS _{t-1}	-3.060*** (0.348)	-2.546*** (0.286)	-3.003*** (0.355)	-2.495*** (0.282)	-3.045*** (0.357)	-2.571*** (0.286)	-3.088*** (0.359)	-2.559*** (0.285)	-3.083*** (0.356)	-2.546*** (0.290)	-3.013*** (0.357)	-2.548*** (0.291)
AC_SIZE	0.150* (0.0872)	-0.0550 (0.0681)	0.132 (0.0899)	-0.0605 (0.0666)	0.104 (0.0866)	-0.0477 (0.0766)	0.124 (0.0901)	-0.0527 (0.0656)	0.129 (0.0860)	-0.0727 (0.0690)	0.0953 (0.0863)	-0.0717 (0.0721)
AC_MEET	-0.00347 (0.0859)	0.0276 (0.0547)	-0.00761 (0.0877)	0.0290 (0.0524)	-0.00510 (0.0858)	0.0250 (0.0525)	-0.0131 (0.0864)	0.0292 (0.0522)	-0.00255 (0.0856)	0.0240 (0.0529)	-0.00737 (0.0875)	0.0253 (0.0525)
B_MEET	0.130*** (0.0497)	0.000834 (0.0381)	0.126** (0.0513)	0.000402 (0.0384)	0.137*** (0.0503)	-0.000964 (0.0366)	0.144*** (0.0502)	-0.00174 (0.0375)	0.127*** (0.0488)	0.00251 (0.0374)	0.126** (0.0515)	0.00235 (0.0374)
B_INDEP	-1.831** (0.748)	-1.271* (0.666)	-1.389** (0.660)	-1.064 (0.693)	-1.168* (0.669)	-1.293* (0.671)	-1.225* (0.660)	-1.276* (0.666)	-1.463** (0.705)	-1.270* (0.678)	-1.382** (0.686)	-1.298* (0.668)
BIG4	0.591 (0.742)	-1.623*** (0.399)	0.503 (0.731)	-1.590*** (0.389)	0.471 (0.738)	-1.596*** (0.402)	0.436 (0.702)	-1.524*** (0.396)	0.595 (0.723)	-1.616*** (0.402)	0.577 (0.739)	-1.595*** (0.393)
AF _{t-1}	0.164 (0.136)	-0.0804 (0.141)	0.182 (0.134)	-0.0970 (0.140)	0.160 (0.144)	-0.0917 (0.142)	0.167 (0.136)	-0.109 (0.142)	0.171 (0.140)	-0.0828 (0.140)	0.152 (0.138)	-0.0908 (0.141)

(continued)

Table 10. Continued

Split by	Low LEV DEG	High LEV DEG	Low LEV EIGEN	High LEV EIGEN	Low LEV BET	High LEV BET	Low LEV CLOS	High LEV CLOS	Low LEV PCA	High LEV PCA	Low LEV N-SCORE	High LEV N-SCORE
RLAW	−0.861** (0.343)	−0.153 (0.316)	−0.778** (0.334)	−0.0979 (0.326)	−0.836** (0.334)	−0.196 (0.328)	−0.819** (0.333)	−0.233 (0.321)	−0.859** (0.339)	−0.177 (0.316)	−0.901*** (0.337)	−0.183 (0.320)
REST_LINKS	0.0680 (0.0961)	0.00959 (0.0912)	0.0829 (0.0933)	0.0205 (0.0883)	0.0733 (0.0974)	−0.000770 (0.0912)	0.0590 (0.0935)	0.00520 (0.0916)	0.0723 (0.0956)	0.00161 (0.0918)	0.0842 (0.0963)	2.33e-05 (0.0922)
LINKS_	0.0873 (0.113)	0.0868 (0.0729)	−0.000199 (0.0898)	0.0597 (0.0701)	0.0980 (0.105)	0.0358 (0.0785)	0.0243 (0.0911)	0.0138 (0.0749)	0.131 (0.112)	0.0786 (0.0752)	0.0975 (0.105)	0.0664 (0.0757)
TOTAL												
Observations	863	935	863	935	863	935	863	935	863	935	863	935
Pseudo R ²	0.4510	0.3935	0.4484	0.3969	0.4510	0.3918	0.4449	0.3946	0.4539	0.3920	0.4548	0.3917

Note(s): Estimated coefficients (std. errors) using the logit regression of equation (3). The dependent variable is OPINION_CAT in all the regressions. The first row indicates the centrality measure used. All the estimations include year and industry-fixed effects and clustering by firm. See [Appendix I](#) for the definition of the variables. ***, **, * for 1%, 5% and 10% significance level

Table 11. Audit committee centrality and audit opinion in probit model by leverage

Split by	Low LEV DEG	High LEV DEG	Low LEV EIGEN	High LEV EIGEN	Low LEV BET	High LEV BET	Low LEV CLOS	High LEV CLOS	Low LEV PCA	High LEV PCA	Low LEV N-SCORE	High LEV N-SCORE
CENTRALITY	0.356** (0.179)	0.120 (0.0986)	0.581** (0.261)	0.167* (0.0907)	0.257** (0.110)	-0.119 (0.0797)	0.0412 (0.0703)	-0.0457 (0.0549)	0.247** (0.108)	0.0403 (0.0519)	0.535** (0.213)	0.0536 (0.0918)
SIZE	-0.102 (0.0957)	-0.399*** (0.111)	-0.0742 (0.0874)	-0.398*** (0.114)	-0.0155 (0.0900)	-0.372*** (0.114)	-0.0438 (0.0897)	-0.356*** (0.113)	-0.0776 (0.0915)	-0.382*** (0.112)	-0.0458 (0.0877)	-0.372*** (0.114)
LEV	0.252 (0.892)	-0.488 (0.922)	0.0972 (0.857)	-0.509 (0.919)	0.303 (0.921)	-0.416 (0.934)	0.0503 (0.863)	-0.385 (0.933)	0.209 (0.897)	-0.521 (0.917)	0.0603 (0.888)	-0.522 (0.918)
ROA	-3.074* (1.609)	0.454 (1.829)	-3.179** (1.566)	0.538 (1.818)	-2.879* (1.641)	0.727 (1.798)	-3.048* (1.579)	0.548 (1.794)	-3.107* (1.624)	0.322 (1.814)	-3.064* (1.617)	0.384 (1.812)
EXP	0.683 (0.449)	-0.0228 (0.385)	0.579 (0.416)	-0.120 (0.391)	0.542 (0.413)	0.0339 (0.405)	0.561 (0.426)	0.0109 (0.388)	0.628 (0.441)	-0.0200 (0.386)	0.530 (0.390)	-0.0113 (0.381)
RECEI	-0.350 (1.077)	-2.216*** (0.784)	-0.146 (1.047)	-2.188*** (0.781)	0.476 (1.085)	-2.296*** (0.788)	0.392 (1.053)	-2.231*** (0.795)	-0.0774 (1.031)	-2.238*** (0.793)	0.166 (1.029)	-2.242*** (0.795)
LOSS	-0.594* (0.311)	0.0702 (0.207)	-0.601* (0.319)	0.0391 (0.211)	-0.577* (0.309)	0.0708 (0.207)	-0.588* (0.302)	0.0693 (0.205)	-0.587* (0.311)	0.0574 (0.207)	-0.587* (0.321)	0.0630 (0.206)
LOSS _{t-1}	1.804*** (0.199)	1.581*** (0.159)	1.762*** (0.200)	1.555*** (0.161)	1.789*** (0.202)	1.614*** (0.161)	1.810*** (0.203)	1.590*** (0.159)	1.809*** (0.201)	1.587*** (0.160)	1.777*** (0.201)	1.588*** (0.159)
AC_SIZE	-0.0523 (0.0549)	0.00466 (0.0422)	-0.0455 (0.0569)	0.00488 (0.0412)	-0.0208 (0.0547)	-0.00820 (0.0434)	-0.0402 (0.0568)	0.0109 (0.0413)	-0.0356 (0.0546)	0.0148 (0.0414)	-0.0145 (0.0553)	0.0155 (0.0422)
AC_MEET	0.0114 (0.0448)	-0.0121 (0.0344)	0.0107 (0.0458)	-0.0128 (0.0339)	0.0136 (0.0442)	-0.0120 (0.0333)	0.0151 (0.0448)	-0.0117 (0.0332)	0.00982 (0.0447)	-0.0101 (0.0336)	0.0146 (0.0449)	-0.0110 (0.0336)
B_MEET	-0.0569* (0.0313)	0.0140 (0.0256)	-0.0559* (0.0328)	0.0139 (0.0259)	-0.0599* (0.0312)	0.0168 (0.0249)	-0.0706** (0.0321)	0.0139 (0.0252)	-0.0521* (0.0308)	0.0131 (0.0254)	-0.0520 (0.0322)	0.0131 (0.0253)
B_INDEP	1.492*** (0.422)	1.073*** (0.379)	1.233*** (0.345)	0.967** (0.391)	1.047*** (0.340)	1.078*** (0.381)	1.085*** (0.349)	1.068*** (0.380)	1.256*** (0.358)	1.073*** (0.378)	1.218*** (0.347)	1.082*** (0.379)
BIG4	-4.181*** (0.260)	1.447*** (0.296)	-4.105*** (0.236)	1.395*** (0.293)	-4.162*** (0.319)	1.452*** (0.307)	-4.061*** (0.241)	1.397*** (0.301)	-4.125*** (0.269)	1.437*** (0.299)	-4.197*** (0.299)	1.422*** (0.297)
AF _{t-1}	-0.0958 (0.0827)	0.0383 (0.0971)	-0.104 (0.0812)	0.0488 (0.0950)	-0.0947 (0.0835)	0.0464 (0.0957)	-0.0895 (0.0813)	0.0427 (0.0952)	-0.0947 (0.0830)	0.0387 (0.0959)	-0.0879 (0.0842)	0.0420 (0.0957)

(continued)

Table 11. Continued

Split by	Low LEV DEG	High LEV DEG	Low LEV EIGEN	High LEV EIGEN	Low LEV BET	High LEV BET	Low LEV CLOS	High LEV CLOS	Low LEV PCA	High LEV PCA	Low LEV N-SCORE	High LEV N-SCORE
RLAW	0.307 (0.189)	−0.0550 (0.184)	0.265 (0.183)	−0.0963 (0.193)	0.297 (0.184)	−0.0446 (0.192)	0.277 (0.184)	−0.0203 (0.188)	0.309* (0.186)	−0.0418 (0.187)	0.322* (0.187)	−0.0397 (0.188)
REST_LINKS	−0.0648 (0.0689)	0.0231 (0.0511)	−0.0773 (0.0679)	0.0228 (0.0515)	−0.0652 (0.0688)	0.0261 (0.0497)	−0.0627 (0.0665)	0.0255 (0.0506)	−0.0672 (0.0697)	0.0284 (0.0511)	−0.0715 (0.0708)	0.0286 (0.0510)
LINKS_	−0.0336 (0.0803)	−0.0731 (0.0495)	0.0217 (0.0624)	−0.0634 (0.0458)	−0.0416 (0.0756)	−0.0294 (0.0497)	0.0107 (0.0631)	−0.0473 (0.0478)	−0.0557 (0.0815)	−0.0712 (0.0503)	−0.0350 (0.0705)	−0.0651 (0.0475)
TOTAL	5.564*** (1.008)	2.626 (1.606)	5.699*** (1.048)	2.638* (1.602)	4.745*** (1.052)	2.075 (1.582)	5.001*** (0.952)	1.829 (1.584)	5.441*** (1.032)	2.373 (1.589)	5.168*** (1.042)	2.195 (1.573)
Intercept	826	891	826	891	826	891	826	891	826	891	826	891
Observations	1883.34	456.45	489.80	489.80	449.96	2204.97	432.57	1595.96	445.29	445.29	443.63	443.63
Wald χ^2	0.5453	0.4784	0.5436	0.4819	0.5446	0.4788	0.5372	0.4776	0.5469	0.4775	0.5490	0.4774
Pseudo R^2												

Note(s): Estimated coefficients (std. errors) using the logit regression of equation (2). The dependent variable is CLEAN in all the regressions. The first row indicates the centrality measure used. All the estimations include year and industry-fixed effects and clustering by firm. See [Appendix I](#) for the definition of the variables. ***, **, * for 1%, 5% and 10% significance level

Table 12. Audit committee centrality and audit opinion in ordered probit model by leverage

Split by	Low LEV DEG	High LEV DEG	Low LEV EIGEN	High LEV EIGEN	Low LEV BET	High LEV BET	Low LEV CLOS	High LEV CLOS	Low LEV PCA	High LEV PCA	Low LEV N-SCORE	High LEV N-SCORE
CENTRALITY	-0.292** (0.133)	-0.162* (0.0956)	-0.372** (0.157)	-0.167* (0.0875)	-0.198*** (0.0708)	0.0666 (0.0699)	-0.0485 (0.0651)	0.0875 (0.0652)	-0.204** (0.0795)	-0.0302 (0.0640)	-0.384** (0.159)	-0.00591 (0.124)
SIZE	0.104 (0.0853)	0.346*** (0.0809)	0.0713 (0.0790)	0.341*** (0.0822)	0.0360 (0.0818)	0.309*** (0.0815)	0.0605 (0.0806)	0.294*** (0.0840)	0.0797 (0.0825)	0.316*** (0.0825)	0.0622 (0.0785)	0.308*** (0.0822)
LEV	-0.633 (0.827)	0.104 (0.893)	-0.488 (0.814)	0.139 (0.896)	-0.670 (0.865)	0.108 (0.898)	-0.470 (0.817)	-0.0348 (0.858)	-0.638 (0.849)	0.145 (0.881)	-0.508 (0.851)	0.123 (0.865)
ROA	2.303* (1.290)	-0.326 (1.855)	2.270* (1.258)	-0.347 (1.832)	2.051 (1.318)	-0.449 (1.801)	2.330* (1.285)	-0.530 (1.812)	2.195* (1.309)	-0.198 (1.816)	2.147* (1.304)	-0.261 (1.821)
EXP	-0.614* (0.329)	-0.0556 (0.339)	-0.544* (0.314)	0.0162 (0.347)	-0.525* (0.313)	-0.0947 (0.347)	-0.551* (0.327)	-0.0901 (0.347)	-0.573* (0.328)	-0.0651 (0.342)	-0.518* (0.301)	-0.0805 (0.337)
RECEI	0.791 (0.818)	1.383** (0.610)	0.673 (0.800)	1.387** (0.611)	0.334 (0.846)	1.440** (0.636)	0.336 (0.825)	1.413** (0.638)	0.628 (0.813)	1.416** (0.628)	0.568 (0.812)	1.426** (0.637)
LOSS	0.518** (0.259)	-0.0192 (0.209)	0.541** (0.264)	0.00300 (0.212)	0.517** (0.262)	-0.0178 (0.209)	0.543** (0.253)	-0.0258 (0.208)	0.512** (0.260)	-0.00726 (0.208)	0.514* (0.273)	-0.0118 (0.208)
LOSS _{t-1}	-1.653*** (0.192)	-1.407*** (0.166)	-1.625*** (0.193)	-1.382*** (0.166)	-1.649*** (0.196)	-1.432*** (0.165)	-1.666*** (0.197)	-1.411*** (0.163)	-1.658*** (0.196)	-1.417*** (0.168)	-1.632*** (0.194)	-1.422*** (0.168)
AC_SIZE	0.0763* (0.0455)	-0.0361 (0.0361)	0.0722 (0.0470)	-0.0404 (0.0354)	0.0552 (0.0448)	-0.0308 (0.0385)	0.0679 (0.0470)	-0.0380 (0.0351)	0.0676 (0.0450)	-0.0464 (0.0358)	0.0517 (0.0450)	-0.0443 (0.0371)
AC_MEET	-0.0157 (0.0404)	0.0154 (0.0313)	-0.0171 (0.0408)	0.0155 (0.0305)	-0.0174 (0.0305)	0.0144 (0.0302)	-0.0191 (0.0403)	0.0167 (0.0301)	-0.0154 (0.0405)	0.0134 (0.0302)	-0.0188 (0.0410)	0.0138 (0.0302)
B_MEET	0.0744*** (0.0261)	0.00387 (0.0211)	0.0732*** (0.0267)	0.00406 (0.0211)	0.0768*** (0.0261)	0.00252 (0.0202)	0.0804*** (0.0259)	0.00333 (0.0208)	0.0721*** (0.0255)	0.00467 (0.0206)	0.0727*** (0.0267)	0.00424 (0.0206)
B_INDEP	-0.878** (0.385)	-0.491 (0.313)	-0.679** (0.341)	-0.387 (0.328)	-0.548 (0.341)	-0.484 (0.320)	-0.584* (0.341)	-0.471 (0.319)	-0.688* (0.356)	-0.482 (0.320)	-0.658* (0.347)	-0.490 (0.319)
BIG4	0.438 (0.414)	-0.868*** (0.215)	0.382 (0.406)	-0.843*** (0.213)	0.358 (0.409)	-0.849*** (0.219)	0.355 (0.397)	-0.830*** (0.218)	0.427 (0.402)	-0.856*** (0.218)	0.403 (0.413)	-0.851*** (0.215)
AF _{t-1}	0.0224 (0.0773)	-0.0565 (0.0709)	0.0324 (0.0761)	-0.0687 (0.0698)	0.0182 (0.0793)	-0.0669 (0.0699)	0.0233 (0.0757)	-0.0701 (0.0707)	0.0223 (0.0785)	-0.0601 (0.0705)	0.0147 (0.0781)	-0.0626 (0.0702)

(continued)

Table 12. Continued

Split by	Low LEV DEG	High LEV DEG	Low LEV EIGEN	High LEV EIGEN	Low LEV BET	High LEV BET	Low LEV CLOS	High LEV CLOS	Low LEV PCA	High LEV PCA	Low LEV N-SCORE	High LEV N-SCORE
RLAW	−0.472** (0.184)	−0.184 (0.170)	−0.434** (0.180)	−0.156 (0.176)	−0.451** (0.182)	−0.202 (0.176)	−0.444** (0.179)	−0.226 (0.175)	−0.461** (0.183)	−0.201 (0.171)	−0.475*** (0.183)	−0.209 (0.174)
REST_LINKS	0.0307 (0.0585)	0.0151 (0.0494)	0.0385 (0.0577)	0.0149 (0.0498)	0.0315 (0.0591)	0.00890 (0.0491)	0.0287 (0.0564)	0.0130 (0.0493)	0.0318 (0.0595)	0.00837 (0.0494)	0.0356 (0.0602)	0.00794 (0.0493)
LINKS_	0.0495 (0.0599)	0.0403 (0.0394)	0.00507 (0.0502)	0.0228 (0.0391)	0.0537 (0.0552)	0.00361 (0.0414)	0.0130 (0.0494)	−0.000357 (0.0403)	0.0685 (0.0585)	0.0295 (0.0415)	0.0478 (0.0529)	0.0205 (0.0409)
TOTAL												
Observations	863	935	863	935	863	935	863	935	863	935	863	935
Pseudo R2	0.4283	0.3785	0.4255	0.3805	0.4279	0.3765	0.4223	0.3784	0.4298	0.3762	0.4295	0.3759

Note(s): Estimated coefficients (std. errors) using the logit regression of equation (3). The dependent variable is OPINION_CAT in all the regressions. The first row indicates the centrality measure used. All the estimations include year and industry-fixed effects and clustering by firm. See [Appendix I](#) for the definition of the variables. ***, **, * for 1%, 5% and 10% significance level

5. Conclusion

This study examines the relationship between AC network centrality and audit opinion quality in a sample of 230 European non-financial publicly traded firms from 8 countries during 2005–2020. Using SNA methodology, we find that greater centrality of AC members is associated with a higher probability of receiving clean audit opinions from external auditors. Our results support the hypothesis that network centrality reduces the probability of qualified audit opinions. This finding is consistent across different model specifications and centrality measures, with degree, eigenvector and betweenness centrality as well as the composite measures showing the most robust relationships. In turn, our results suggest that AC directors holding more central positions within the network may have access to various resources – such as shared knowledge, best practices and prestige – that enhance the effectiveness of financial oversight and lead to fewer concerns among the audit firm.

While prior research has shown that AC connectivity is associated with financial reporting outcomes such as restatements (He *et al.*, 2017; Omer *et al.*, 2019), our study offers several original contributions. First, rather than relying on a single binary measure of director interlock or connectedness, we operationalize AC social capital through six distinct centrality metrics, four dimensional (degree, eigenvector, betweenness, closeness) and two composite indexes (PCA-based factor and N-score), allowing us to identify which specific network positions drive the relationship with audit opinion. Second, we extend this literature to audit opinion, the direct output of the external audit process, rather than to restatements, which are typically detected independently of the original audit engagement. Third, our international sample of 230 firms across 8 European countries extends this evidence beyond the predominantly US-based literature.

From a theoretical perspective, these findings extend resource dependence theory by showing that centrality provides access to critical knowledge and practices, while signalling theory explains why auditors interpret such centrality as evidence of stronger internal controls. Our results also extend agency theory by showing that central directors face heightened reputational incentives across multiple firms that enhance monitoring effectiveness.

From a practical perspective, our findings offer guidance for three groups of stakeholders. For firms and boards, network characteristics of AC candidates should be considered as a complementary criterion, alongside independence, expertise and diligence, when evaluating and selecting AC members. For regulators, while current frameworks such as Directive 2013/36/EU and national laws in Ireland and Spain focus on limiting the total number of directorships an individual may hold, our results suggest that fine-grained SNA-based measures may offer a more precise means of assessing directors' connectivity and its governance implications. For external auditors, AC network centrality can be incorporated into audit risk assessments as a structural predictor of reporting quality, complementing traditional client-risk indicators.

Our research is not without limitations, such as its focus on publicly traded firms and the overrepresentation of British companies in our sample. Although our sample is representative – capturing the most important firms in each capital market – future research could explore the networking effect by examining all listed firms, or even a broad sample of unlisted firms, within individual countries. A further limitation concerns the construction of the network: although cross-listed firms were not excluded but consolidated under the country of their parent listing, our centrality measures cannot capture ties to directors who also sit on boards outside the eight countries covered by our sample, an inherent limitation common to SNA studies. Another avenue for research is the consideration of informal relationships among AC members. The literature typically focuses on formal ties established through shared board or committee memberships, but connections among directors may also arise from other professional, educational or social relationships. The interaction between directors' networks and other corporate governance mechanisms is also a promising area of study. Future research could analyse the extent to which social networks complement or substitute (if at all) other internal or external governance mechanisms, such as ownership structure or analyst following.

In addition, alternative measures of audit quality could be used, such as restatements or more advanced metrics based on the content of audit reports. Finally, although we have taken steps to mitigate endogeneity concerns, endogeneity may still be present and therefore represents a limitation of this study. Future research could employ alternative methods to address endogeneity more rigorously.

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Notes

1. In any case, the econometric properties of balanced and unbalanced panels are very similar, and most standard panel estimators (as ours) can be applied to both.
2. <https://eikon.refinitiv.com/>, <https://nrgmetrics.com/>
3. The results of the PCA are not tabulated but available from the authors on request.
4. For the sake of brevity, we report only the placebo tests from the logit analysis in the [appendix](#). All other tests are available from the authors upon request.
5. For the sake of brevity, these results are not tabulated; they are available from the authors upon request.

Supplementary material

The supplementary material for this article can be found online.

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