Voluntary Audit Committees, Network Centrality and Accrual Estimation Errors

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Abstract

Drawing on the theoretical foundations of both agency theory and social structure, we study the network of a firm's board members and auditor, defined as monitoring network, and the voluntary adoption of an audit committee as well as determine whether they make inferences on a firm's volatility of accrual estimation errors. We theorise that a central position in the monitoring network enables the exchange of relevant accounting information affecting a firm's decision control and ultimately the quality of accounting accruals. A firm's voluntary adoption of an audit committee has a distinct information intermediary role in this process. We show that auditor connectedness and a firm's network centrality are associated with a firm's volatility of accrual estimation errors. These relations are affected by the voluntarily adoption of an audit committee, and auditor connectedness with the accrual quality is influenced by a firm's network centrality.

Keywords:

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1. Introduction

This study aims to examine how auditor connectedness and a firm's network centrality are related to the volatility of accrual estimation errors (AEEs). Previous research has provided evidence on the incentives to share information and the mechanisms showing how the structural properties of connectivity relate to accrual quality (Chen et al. 2014; Johansen and Petterson 2013). However, the conceptual understanding of agency relationships and the structural properties of connectivity in relation to a firm's accrual quality is fragmented, and empirical evidence on the actor's role and position in the network of a firm's decision control is limited. Thus, we construct a network of a firm's board members and auditors, defined as a monitoring network, and present a conceptual model to investigate how auditor connectedness and a firm's network centrality affect a firm's volatility of AEEs. We examine this issue in the context of voluntary audit committee adoption.

Recent literature has shown that both good and poor accounting practices spread through corporate interlocks between the boards of different firms (Chiu et al. 2013). Bruynseels and Cardinaels (2014) closely examined the role of audit committees in firm oversight and stressed the effect of network type. They argued that friendship ties could be detrimental to the effectiveness of audit committees, whereas interlocking ties through employment and/or education networks do not hamper the quality of audit committee oversight. Consistent with Bruynseels and Cardinaels (2014), Hoitash (2011) concluded that the likelihood of financial restatements is low in firms when interlocking ties include members of the audit committee.

To conduct our analyses, we use a longitudinal sample of Finnish firms that are publicly listed on the Nasdaq OMX Exchange. These data offer a relevant context for examining corporate networks, as Finland represents a country with one of the lowest levels of corruption and the highest levels of corporate governance (Doidge et al. 2007; Kostiander and Ikäheimo, 2012; Transparency International, 2012). Therefore, the network connections in our sample are relatively free from the problems of political connections and corruption (Faccio 2006) and merely represent an information channel of decision control. A feature of our sample is that the networks consist of one component. This feature rules out the potential selection bias related to the choice of firms. However, we cannot rule out the possibility that the interchange of financial reporting information spreads across, for example, friends' networks, which are not included in our study (for more on friends' networks see, for example, Hwang and Kim 2012). Our empirical setting is chosen to render an 'official' network that is legally responsible for giving a true and fair view of a firm's financial statements. Furthermore, the official network can be controlled by regulation, whereas other possible networks, for example, football clubs, family ties and friends' networks, are beyond the direct control of public policy.

Collectively, our results provide evidence that the agency theoretical and network predictors explain a firm's accrual quality. In fact, our findings suggest that the central position of the board members and/or auditors in a network has a significant relationship with the volatility of accounting accruals. Firstly, we find that network centrality is negatively associated with a firm's volatility of AEEs in firms that have, in the early phase, adopted a voluntary audit committee and in firms that have not adopted an audit committee at all. Secondly, auditor connectedness is negatively associated with a firm's volatility of AEEs in firms that have a voluntary audit committee. Thirdly, network centrality influences the relation between auditor connectedness and a firm's accrual quality. The findings support the view that having audit committees in a

central position in the network and having a well-connected auditor communicating with an audit committee indeed enhances the financial reporting process. The results are robust enough to fulfil several alternative specifications.

This study responds to the call for more sophisticated analyses of the connections between corporate governance and the networks of board members (Cohen et al. 2012; Larcker et al. 2007), and the sociological approach of networks in accounting (Daily et al. 2003; Roberts et al. 2005). Firstly, we rely on an extensively studied problem of agency and structure in shaping actors' behaviour (Simmel 1900,1903; Bourdieu 1977, 1990) and contribute to the literature by suggesting a conceptual model that can be used to complement the agency theoretical corporate governance analysis with a network approach. We introduce the construct of a monitoring network to evaluate actors' connections and positions in decision control. Secondly, we provide empirical evidence on the relations among a firm's auditor connectedness, network centrality and volatility of AEEs in the context of voluntarily audit committee adoption. Our findings highlight the importance of actors' network position and the role of audit committees in a firm's decision control. Thirdly, this study responds to the call for research on non-Anglo-American settings (Carcello et al. 2011), presenting evidence from an environment that is relatively free from biases arising from political connections and corruption. Finally, we provide evidence on the incremental role of actors' position in 'official' networks and its associations with accounting accruals that is consistent with the objectives of auditors' communication with an audit committee (Securities Market Association 2015, Recommendation 16).

The findings of this study will contribute to previous accounting literature on the subject, which is mainly focused on agency theoretical designs (Bédard et al. 2004; Klein

2002; Xie et al. 2003), and to the emerging literature on network approaches in accounting (Chiu et al. 2013; Bruynseels and Cardinaels 2014; Hoitash 2011). Aside from the agency conception of the responsibilities of board members and auditors (Roberts et al. 2005; Sorensen and Torfing 2005), we contribute to the lack of knowledge on the liaison between a well-connected auditor and audit committee members in monitoring a firm's accrual quality and propose the construct of a monitoring network to evaluate actors' position in decision control and related public policy.

The remainder of this paper is divided into five sections. Firstly, we review the current understanding of corporate governance in firms and focus our analysis on firms' decision control. We integrate the agency theoretical fundaments and the structure of interlocking networks and then present the construct of a monitoring network that enables an analysis in which actors have several roles in their duties. Secondly, we develop our argument about the interrelations of our variables of interest, state our hypotheses and present our conceptual model. Thirdly, we explain the construction of the network and the measurement of the variables and then present the sample selection procedures and descriptive statistics of our data. Fourthly, we provide the empirical test of the hypotheses and discuss the results. Finally, we summarise and conclude the study.

2. Literature and institutional background

2.1 Corporate governance and decision control

Corporate governance standards highlight the role of committees in ensuring that shareholders are accurately informed. The Statutory Audit Directive (2006/43/EC) makes audit committees a key feature of the corporate governance framework for conducting the oversight role in organisations (European

Commission 2006). Audit committees are required to monitor accounting quality, the effectiveness of a firm's internal audit and control and the statutory audit, including recommending the appointment of the auditor to the board. From the agency theoretical perspective, these actors, namely, audit committee members and an independent auditor, are elected to monitor the financial accounting quality on behalf of the shareholders, and they hold the key position to consider whether the economic substance of the transactions is reflected in the accounting figures.

The discussion on good and poor governance has evoked the notion of the firm-level evolution of corporate governance. Larcker et al. (2007) specified the governance mechanisms and developed the measurement of the various dimensions of governance. Firms may elect to use these elements as supplements or complements to aim at 'good corporate governance.' Armstrong et al. (2010) stated that in the absence of reliable and valid measures of 'good corporate governance', firms are likely to choose the best dimensions of corporate governance for their environment. Shareholders influence and/or control this choice through their composition. However, the agency conflict between the controlling shareholders and the minority interest shareholders becomes severe when their objectives are not aligned. Ashiq et al. (2007) reported that this agency conflict is more severe in family firms.

The segregation of decision management and decision control is fundamental in corporate governance (Coase 1937; Fama and Jensen, 1983; Shleifer and Vishny, 1997). The network approach aims at understanding individual actors' decision control effect on the corporate governance environment. In the current understanding of corporate

governance (Armstrong et al. 2010), firms are likely to choose the best governance practices for their environment. However, accounting standards, as a part of a firm's corporate governance, are constantly changing, and the best practice now may not be valid in the future (Nobes 2005). Therefore, the accounting knowledge of board members and an auditor as well as the network of people working on similar questions, such as the interpretation of accounting standards, are critical for the conveying of relevant accounting information in decision control.

2.2 Monitoring network and social embeddedness

The board members and the auditor are elected to monitor the financial accounting quality on behalf of the shareholders, and they hold the key position to consider whether the economic substance of the transactions is reflected in the accounting figures. The monitoring network by board members and auditors provides an information channel, which affects the quality of the decision control and ultimately financial accounting quality. Our conception of a monitoring network is close to the broader conception of accountability (Roberts et al. 2005), in which actors have several roles in their duties. The monitoring network is influenced by the notion of network governance (Sorensen and Torfing 2005), which enables the horizontal collaboration of interdependent but operationally autonomous (independent) actors[1]. Furthermore, we acknowledge the social psychology literature on shared leadership (Bergman et al. 2012), which suggests that the effective monitoring of a firm can benefit from two or more actors engaging in the leadership. We assume that these actors, namely, board members and auditors, not only monitor a firm's accrual quality but also

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[1] However, the monitoring network by the board members and an auditor is not a legal concept, and therefore it is not related to the legal liability of actors. Obviously, the actors' legal liability is not affected by sharing information per se.

Figure 1
Monitoring the network between the board and an auditor.
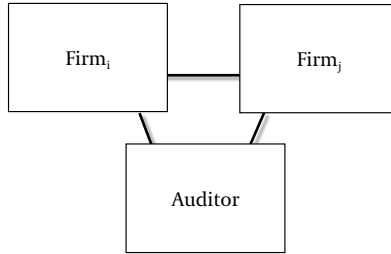
Notes:
This figure shows the connections between firm (F_i) and firm (F_j) and an auditor (A). In a 'closed' triad, auditor A is elected to audit the financial statements of both firms F_i and F_j, and at least one board member of firms F_i and F_j holds a place on both boards.

collaborate and share relevant information within their networks.

Board members and auditors can be connected in many ways. Figure 1 illustrates a triad in which the board members and the auditor are fully connected to each other. At least one board member of firm F_i has been appointed to the board members in firm F_j, and auditor A has been appointed to audit both companies' F_i and F_j.

Granovetter (1985) presented the problem of embeddedness in relation to economic action and social structure. The board members and an auditor are embedded in the social interaction between them and provide a channel for the diffusion of accounting information. The findings of Chiu et al. (2013) reveal evidence on the diffusion of accounting information. However, ultimately, the diffusion process is affected by the position and qualities of the actors, as closely demonstrated by Bruynseels and Cardinaels (2014). Intuitively, audit committees play a crucial role in the diffusion of accounting information, and a well-connected auditor has better possibilities to compare information and share knowledge between organisations. This intuition is even stated in Auditing Standard No. 16 as a requirement of the communication between an audit committee and an auditor, for example, 'auditor's evaluation of the quality of the firm's financial reporting'. As part of investor protection, the Public Company Accounting Oversight Board's (PCAOB[2]) Auditing Standard No. 16 (released in 2012, AS16) deals with independent auditors' communication with the audit committee and highlights the 'effective two-way communication between the auditor and the audit committee throughout the audit to assist in understanding matters relevant to the audit'. However, the literature lacks the construct of a monitoring network as a joint effort of board members and an auditor towards a firm's accounting quality and empirical evidence thereafter.

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[2] Although PCAOB's Auditing Standards are not effective in firms that are headquartered outside the United States, the auditing standards and corporate governance practices tend to diffuse around the globe. This condition is reflected in the Finnish Corporate Governance Code issued by the Securities Market Association in 2015. Recommendation 16 explicitly states that communication with the firm's auditor is a duty of the firm's audit committee.

2.3 Finnish corporate governance within a global context

Scandinavian corporate governance (concerning investor protection) has been classified as distinctly different from Anglo-Saxon practices and from French and German civil law systems (La Porta et al. 1998). In Finland, good corporate governance regulation consists of various factors. Legal regulations and governance recommendations based on the principle of self-regulation have been established. The legal regulations for Finnish corporate governance are primarily included in the Finnish Companies Act, which is closely related to the corresponding laws in the Scandinavian countries of Sweden, Denmark and Norway (Liljeblom and Löflund, 2006).

The Finnish data serve this study well for four specific reasons. Firstly, it represents a country with the lowest level of corruption in the world (Transparency International, 2012). Therefore, Finnish firms operate in an environment with widespread respect for contracts and the rule of law, and the context has been shown to be relatively free from political connections (Faccio 2006). Secondly, all the financial reports of publicly listed Finnish firms have been prepared in accordance with the International Financial Reporting Standards since 2005. Thirdly, only half of the publicly listed companies have voluntarily adopted an audit committee[3]. This situation opens the possibility of studying its implications for decision control. Finally, the Finnish corporate governance system is one of the highest in quality in the world (Doidge et al. 2007; Kostiander et al. 2012). Based on the description of Finland's corporate governance system and financial reporting quality, this study allows a rigorous analysis of the interdependencies of the interlocking connec-

tions and accounting quality in the uncorrupted context of the high-level enforcement of regulations and corporate governance recommendations.

A firm's annual general meeting (AGM) has a central role in corporate governance. For example, the AGM typically nominates the board that hires the chief executive officer (CEO) and appoints the statutory auditor. Moreover, the regulatory body of Finnish corporate governance also includes the Securities Market Act, the Rules of the Helsinki Stock Exchange and the Financial Supervisory Authority (FIN-FSA), which operates in connection with the Bank of Finland (Liljeblom and Löflund, 2006). The Finnish Corporate Governance Code (CG Code) complements the legislation and is in the form of 'Comply or Explain'. Therefore, firms listed on the OMX are bound to follow this code to its full extent. However, firms can deviate from the given recommendation by announcing a deviation from the required explanations.

The first Finnish CG Code was issued in 1997. The first audit committees were nominated in the Finnish listed firms during that year. However, the growing significance and international development of corporate governance practices contributed to the amendment of the recommendations. The second wave of audit committee adoptions were after 2002, when the Sarbanes–Oxley Act (2002) was introduced and the Finnish listed firms were recommended to comply with the updated Finnish CG Code. A detailed corporate governance code for listed companies was issued in December 2003 (OECD, 2004; Securities Market Association, 2015). Although the 2003 recommendation met the high standards internationally, new regulations, together with the European Union (EU)

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[3] The existence of an audit committee is relatively low compared with other countries. For example, in the United Kingdom, almost all the FTSE 350 listed in the Primary Market of the London Stock Exchange had an audit committee after the release of The Code of Best Practice of the Cadbury Committee (1992). In the US context, all US domestic registrants must have an audit committee per the Sarbanes–Oxley Act (2002).

directives and recommendations, created the need to update the code in 2008, 2010 and 2015.

In relation to the board members, the current code states that the board will appoint the members of committees from among its own members (Recommendation 15 in the Finnish Corporate Governance Code 2015). The central features of the Finnish CG Code recommendations are the requirement for independent boards; support for establishing board committees such as audit, nomination and compensation committees; requirement to report on the organisation of the internal control, internal audit and risk management functions of the firm; and various disclosure requirements. Recommendation number 16 states that 'a company shall establish an audit committee if the extent of the firm's business requires that a group with a more compact composition than the board needs to deal with the preparation of the matters pertaining to financial reporting and control. Due to the nature of the matters dealt with by audit committees, the majority of members of the audit committee must be independent of the company and at least one member must be independent of the company and its significant shareholders' (Securities Market Association, 2015).

3. Hypotheses

The management of a firm is responsible for preparing its financial statements. However, the board members and the firm's auditor are at the heart of the approval, certification, assurance and monitoring of the accounting figures. Communication between the board members and the auditor is a crucial determinant of the outcome reflected in the financial accounting figures and eventually the auditor's report. Overall, any reported accounting quality is the product of a negotiation process to a certain extent (Bu et al. 2003).

Firstly, a firm's relationships with its stakeholders raise the question of simulta-

neous independence and interdependence. This problem initiated by Huse (1994) in the context of small firm asks how can this paradox be understood and solved. According to agency theory, a firm's board limits the behaviour of management and assumes that individual decision-makers seeking rational solutions increase their personal wealth. However, this assumption ignores the moral dimension of the actor. The moral dimension deals with trust and interdependence in monitoring the relations among the actors. Our conception of a monitoring network involves the actors having several roles in their duties and enables the horizontal collaboration of interdependent but operationally autonomous (independent) actors. We assume that the actors monitor a firm's accounting quality but also collaborate and share relevant information within their networks. However, we separate information related to a firm's network centrality from information that a well-connected auditor possesses.

We address the implications of monitoring networks on accrual quality by combining the agency theoretical premises and the network notion of the actors. A variety of motivations for managing earnings exist (Dechow and Schrand, 2004). Assuming the rationality of an actor, the typical earnings management incentives aim to meet the expectations of the analyst, issue securities at higher prices or increase the size of earnings-based bonuses (Dechow et al. 1996). Accrual accounting creates an opportunity for earnings management because accruals require managers to make forecasts, estimates and judgments. Per agency theory, management is the one that is best acquainted with the true state of a firm (Jensen and Meckling, 1976). The forecasts, estimates and judgments of management are difficult to challenge because of the information asymmetry between management and other stakeholders. This information asymmetry can be affected by the position of board members and/or the

auditor in the network. The central position is that the network contains many important contacts that facilitate a substantial amount of inter-organisational knowledge transfer. In practice, this means that network members receive comprehensive and well-founded views and analyses related to the business forecast, other estimates and the economy in general. At the firm level, the central position reduces the information asymmetry between the management and the network members, which can influence accrual quality. Consequently, the management will have opportunities to manage earnings that are tied to the level of the firm's board members and the auditor's network position.

Agency theoretical literature offers the 'independence of an actor' as a solution to mitigate the problems of earnings management behaviour and poor contagion effects. A firm's auditor is considered an independent professional, and in many organisations, audit committee members are independent from the firm, whereas other board members may represent the business knowledge of the firm. However, all these actors have interdependencies with the people they work with, and therefore the potential problem of lack of independence can only be mitigated. The institutional mitigating factors, such as governance mechanisms and regulatory oversight, set audit committee members between auditors and management to provide a neutral and well-informed buffer (Johnstone et al. 2001).

DeZoort and Salterio (2001) presented evidence on accounting policy dispute cases among board members, management and an auditor. Interestingly, they found that audit committee members supported the auditor in solving the dispute. Conversely, concurrent experience as a board director and a senior member of management was associated with increased support for management. We argue that the well-informed buffer represented by the voluntary audit committee has

an information intermediary role in this process. Therefore, the opportunities to manage earnings are limited when a well-informed buffer exists between management and the auditor, consistent with DeZoort and Salterio (2001) and Johnstone et al. (2001). However, we limit our argument to only the central firms that have adopted an audit committee, as suggested by Hoitash (2011). In such cases, the information asymmetry between management and the central actors is lower than that between management and the peripheral actors because of the greater possibility of accumulating accounting information.

Our study employs the network notion of an actor's centrality and proposes that the transfer of information will accumulate if an actor has a central position in a network (Freeman 1979; Bonacich 1972). In this case, information asymmetry should be lower and would be reflected in a firm's accrual quality. Therefore, we examine the voluntary audit committees and network centrality and how they are associated with a firm's volatility of AEEs. Accordingly, we state our first hypothesis as follows:

H1. Network centrality in firms that have an audit committee is negatively associated with their volatility of AEEs.

Secondly, we extend our argument to the incremental role of a firm's auditor in the monitoring network. The elaboration of our argument highlights the role of a well-connected auditor in the process of monitoring the accrual quality. In practise, the audit committees' relationship with the auditor facilitates the link between the board members and the auditor. This connection includes regular dialogue, both in and outside of scheduled meetings, annual agendas, formal evaluation and feedback, among others, as suggested by audit regulations (Auditing Standard No. 16). Consequently, firms that have a well-connected auditor and an audit committee en-

able the possibility of inter-organisational communication to interpret accounting standards and to enhance accrual quality. Consistent with the evidence disclosed by DeZoort and Salterio (2001), we expect that audit committee members support the auditor in challenging accounting decisions. Therefore, we combine the agency theoretical rationales and the network notion of auditor connectedness and state our second hypothesis as follows:

H2. Auditor connectedness in firms that have an audit committee is negatively associated with their volatility of AEEs.

In general, the decisions made by actors reflect relevant accounting knowledge and the governance experience they possess. We expect that the earnings management and poor contagion effect exist at the aggregate level.

They are found in the relation between actors' position in the network and accrual quality, but the voluntary audit committees mitigate it.

Thirdly, we consider the auditor's tendency to limit the board's accounting decisions and present the conceptual model of auditor connectedness and a firm's network centrality in relation to accrual quality. The auditor's role in monitoring accrual quality is conditional on the board's decisions. A well-connected firm may benefit from insights from several firms by increasing the firm's knowledge of alternative interpretations of accounting standards. A well-connected auditor may obtain insights from several clients, but doing so may limit the board's possibility to behave opportunistically. When we assume that an auditor and a firm's board members share their views that are reflected in accrual quality, there should

Figure 2
Conceptual model of the monitoring network and the hypotheses.
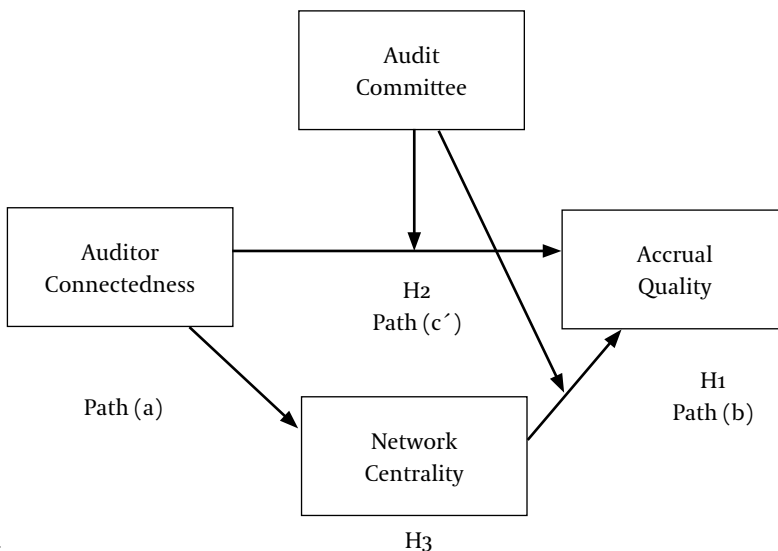
Notes:
This figure shows the interdependencies among auditor connectedness (PORTFOLIO), a firm's network centrality (NSCORE), a voluntary audit committee (AC) and the volatility of a firm's accrual estimation errors (AEE).

be a mechanism or process that underlies the relationship between auditor connectedness and accrual quality through the inclusion of a firm's network centrality. Auditor connectedness can have both direct and indirect effects on accrual quality. Therefore, we state our last hypothesis as follows:

H3. The relation between auditor connectedness and the volatility of AEEs is influenced by a firm's network centrality.

To sum up, we hypothesise that auditor connectedness and a firm's network centrality are related to a firm's accrual quality. We build our argument gradually by investigating the interrelations of our concept of monitoring network and how it affects a firm's decisions on accrual accounting. We present our study's conceptual model as follows.

4. Research design and data

4.1. Network construction and centrality measures

We construct an undirected and un-weighted centrality measure for a board member and an auditor network. The monitoring network is defined as follows: two firms are linked if they share an auditor or at least one board member, and two firms are not linked if they do not share an auditor or a board member. These actors are nominated during the annual general meeting. In technical terms, we create a square adjacency matrix of actors and firms that defines whether they are connected or not.

We model the monitoring network between (A) the board of firm$_i$ and the board of firm$_j$; (B) the auditor of firm$_i$ and the board of firm$_j$ as well as the auditor of firm$_j$ and the board of firm$_i$; and (C) the auditor of firm$_i$ and the auditor of firm$_j$. Therefore, firms can be linked through three different channels (a, b, c). Board members and auditors may

not be linked personally, although they can be linked through firms. Channel (a) is a direct link between board members, whereas channels (b) and (c) have indirect links. For example, information channel (c), in which the firms' auditors are connected, is formed by auditor$_i$ and auditor$_j$ on the condition that board$_i$ is related to board$_j$. The monitoring network provides channel(s) for the information exchanges. Our model builds on that of Larcker et al. (2013) by extending the network to the auditors instead of focusing only on the board members. Appendix I clarifies in detail the calculation of centrality measures in the network and our compound centrality measure NSCORE.

4.2. Audit committees, the auditor and their position in the network

The 8th EU Company Law Directive requires audit committees to include at least one independent member (European Commission 2006). The definition of independence is not precisely provided within the Directive. In general, audit committee members should be free from any relationship that might impair, or might appear to impair, their judgment. The EC Recommendation (European Commission 2005) provides guidance on situations that indicate a potential loss of independence. These situations include, for example, the former directorship of the firm, a material business relationship with the firm, a partner or an employee of a present (or former external) auditor of the firm representing a controlling shareholder and a close family relationship with an executive director. A potential loss of independence may result from an audit committee member holding a cross-directorship or significant links to other directors through involvement in other firms.

Nevertheless, firms adapt their dimensions of corporate governance to their environment and may not find audit committees necessary at all. These firms may not regard

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the work done by audit committees as cru-
cial for their businesses. Interestingly, this
situation raises the question on the role of
audit committees in controlling the financial
accrual quality. Audit committee members
need to be experienced in financial account-
ing and to update their knowledge of current
financial accounting practice regularly (Chen
et al. 2014)[4].

Therefore, for this study, we create a var-
iable for the voluntary adoption of an audit
committee (AC) by making it take the value
of one if a firm had established an audit com-
mittee and zero if it had not. Furthermore,
we create three dummy variables for the fine-
grained dynamics of voluntary audit com-
mittee adoption: a variable for early adop-
tion (EARLY) for a firm that had voluntarily
adopted an audit committee before year 2008
and zero if had not; a variable for late adop-
tion (LATE) for a firm that had voluntarily
adopted an audit committee during the pe-
riod of 2008–2015; and a variable for non-au-
dit committee (NON-AC) for a firm that had
not voluntarily adopted an audit committee
until 2015. These time phases are based on
the regulative development of the Finnish CG
Code recommendations elaborated earlier in
this paper.

As well as, the position of a firm is im-
portant in the analysis of monitoring net-
work, the auditor connectedness needs to
be evaluated, too. A critical aspect of accrual
quality is the two-way communication of the
qualitative aspects of significant account-
ing policies and practices, the assessment of
these aspects, and the conclusions on critical
accounting estimates. The auditor's commu-
nication with the audit committee members
on these matters may directly affect a firm's
accrual quality.

Therefore, we create a variable for the

connectedness of an auditor (PORTFOLIO)
by calculating the number of publicly listed
clients of the auditor. The interaction variable
of a well-connected auditor with the audit
committee members (ACPORTFOLIO) is cre-
ated by multiplying auditor connectedness
(PORTFOLIO) with the voluntary adoption of
an audit committee (AC). We standardise the
values of ACPORTFOLIO at the mean of zero
and standard deviation of one (z-standard-
ised).

4.3. Measurement of accrual quality and control variables

Larcker et al. (2007) employed different ac-
counting quality measures as a dependent
variable explained by corporate governance
indicators. They concluded that the Dechow
and Dichev (2002) model has the best explan-
atory power and that the model is intuitively
solid. The Dechow and Dichev (2002) model
of accounting quality focuses on a firm's ac-
crual quality. We employ the same model to
calculate accrual quality[5] and assume that a
firm's 'normal' accruals are explained within
a three-year cash flow period. In this model,
accrual quality is measured by the standard
deviation of the residual (error) term from
the following model:

$$(1) \quad TAC_{i,t} = \gamma_0 + \gamma_1 CF_{i,t-1} + \gamma_2 CF_{i,t} + \gamma_3 CF_{t+1} + \mu_{i,t}$$

In Equation (1), total accruals (TAC) is the dif-
ference between income before extraordinary
items and operating cash flows (CF) during
period t. Both TAC and CF are scaled by the av-
erage of the total assets. The residual term μ
from the regression reflects the accruals that
are unrelated to cash flow realisations. Our
measure of accrual quality is the standard de-
viation of the absolute value of the error term.
The lower the standard deviation of the error
term is, the higher the accrual quality. We es-

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[4] Cohen et al. (2014) suggested industry expertise to be combined with the required financial experience.
[5] We acknowledge the fact that the most recent literature on accrual quality measurement focuses on the earnings process
and the non-discretionary factors, such as industry and macro-economic conditions (See, e.g., Dichev et al. 2013). Further-
more, a firm's restatements are a proxy for accrual quality, but unfortunately, we do not have them in our setting.

timate Equation (1) by industry. However, our number of firms in the sample is relatively low, and therefore we group the industries into three major industries. For a firm to be eligible in our sample, at least three observations are required.

We include control variables to incorporate the effect of firm size and performance as well as corporate governance indices (Larcker et al. 2007, 2013). The log of the market value of equity is the proxy for firm size (SIZE), return on equity (ROE) is the proxy for accounting-based performance and the logarithmic annual buy-and-hold return (RET) is the proxy for economic performance. Moreover, we include the price-to-book ratio (P/B) to control for growth opportunities of firms, equity ratio (EQUITY) to control a firm's solvency, CEO duality (DUAL) to control whether a firm's CEO acts as chairman of the board and a dummy for firms that have several series of shares (SERIES).

The firm's ownership structure affects the nomination process of board members, and therefore we control for family ownership concentration, which is identified as a determinant of firm performance and accrual quality (Jaggi et al. 2009). We measure family ownership (FAMILY) with a dummy variable, which takes a value of one when the largest shareholder is one controlling family with more than 20% of total votes and zero otherwise. In an institutional setting such as Finland, where Type I agency conflict (conflicts between managers and shareholders) is likely to dominate rather than Type II (conflicts between controlling shareholders and minority shareholders), we expect that family ownership will limit the ability of managers to manipulate earnings, consistent with the conjectures in Ashiq et al. (2007). In general, Type I agency conflicts are more likely to occur in Western countries, whereas Type II agency conflicts are more likely evident in East Asian countries because of their low investor protection and lack of transparency in financial reporting (Fan and Wong 2002).

The expertise of an actor affects accounting information (Bédard et al. 2004; Cohen et al. 2014; Krishnan et al. 2011b; Liu et al. 2014). Intuitively, for the accounting expertise of an actor to influence a firm's accrual quality is reasonable. Liu et al. (2014) found that firm managers are less likely to engage in expectation management when firms include an accounting expert on the audit committee. We control for accounting expertise by including a dummy variable representing whether an actor has experience as a chief financial officer or as an authorised public accountant (ACCEXP). We acknowledge the corporate governance recommendation that the audit committee should have financial expertise. However, we control for the accounting expertise of an actor because we consider accounting education and working experience, rather than a wide range of financial expertise, to mainly affect our variable of interest.

Finally, we control for the audit quality by including an auditor-specific variable to our analysis. We collect the working experience of a firm's auditor (in years), which controls for the auditor-specific characteristics. The auditor's years of experience are suggested as an indicator of audit quality at least by PCAOB, US CAQ, CPAB, ACRA and IOSCO (Federation of European Accountants 2016)[6]. We calculate the audit experience (AUDEXP) from authorisation year (Authorised Public Accountant) to firm-year observation. We employ an auditor-specific variable rather than the more common Big4/non-Big4 variable used widely in previous literature. Over 97% of firms in our sample are audited by

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[6] Public Company Accounting Oversight Board (PCAOB), United States Center for Audit Quality (US CAQ), Canadian Public Accountability Board (CPAB), Accounting and Corporate Regulatory Authority (ACRA), International Organization of Security Commissions (IOSCO).

52

Figure 3
Voluntary audit committee adoptions of Finnish listed firms in 1997–2016.
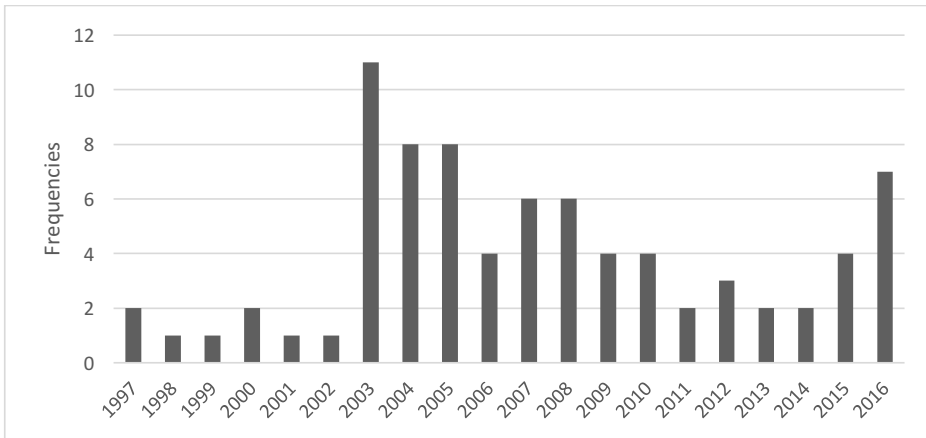
Notes:
This figure shows the voluntary audit committee adoption frequencies of the Finnish listed firms in 1997–2016.

Big4 audit firms, and thus we do not have enough variation.

4.4. Sample selection and descriptive statistics

The data consist of non-financial Finnish (headquarters in Finland) firms listed in Nasdaq OMX Helsinki between 2007 and 2015 (the Main Market). We use also 2006 and 2016 data to calculate our dependent variable. December year-ends[7] are used to ensure that all companies are subject to similar market conditions. Financial firms are excluded[8] because of their different accounting practices; firms that do not have sufficient financial data are also discounted.

We obtain information on firms' boards of directors and auditors from various publicly available sources, primarily from annual reports and the websites of firms[9]. In total, the networks have 592 board members and 74 auditors. The number of firms and the

Table 1
Summary of the sample.

SAMPLE SELECTION OF FINNISH LISTED FIRMS	
	2007–2015
Sample by industry	
Materials and industrials	395
Consumer discretionary and staples	240
Information technology	200
Final Sample	**835**
Companies that have an audit committee (%)	52.3%

Notes:
This table reports a summary of the sample in 2007–2015. The industry breakdown of the sample is in accordance with the Global Industry Classification Standard.

proportion of board members and auditors remain relatively stable within the sample period. The average degree in the network is 4.988, and the network diameter varies between 7 and 8 within those years, indicating

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[7] Most of the firms listed in Nasdaq OMX Helsinki have a financial year that ends in December.

[8] Financial firms were excluded after the calculation of network centralities.

[9] We acknowledge the fact that the actors in the network may have other connections, for example, current and former employment, friends and family relationships. However, these connections are not examined in this study as we examine the network that is controlled by regulations and/or corporate recommendations.

that relatively short steps separate any two firms in the network. The average clustering coefficient varies at 0.323–0.415, which indicates that 32.3%–41.5% of the time two firms that are linked to another firm are also linked to each other. All the firms in our sample are connected to each other by interlocking the board membership and/or the board–auditor relationship.

Table 1 presents the industry breakdown of the sample firms in accordance with the Global Industry Classification Standard (GICS). The number of publicly listed firms is quite stable in this sample period with only a few initial public offerings and de-listings. We group industries into three major industries. Most of the observations are from materials and industrials ranging yearly at 39–46 observations (395 in total). The Finnish context is focused on information technology firms, the proportion of which is almost one-third of the total number of observations (28.7%). Consumer discretionary and staples represent 23.9% of the total amount of observations.

Interestingly, many of the Finnish listed firms have not complied with the recommendation to nominate an audit committee. Many of the firms explain that the magnitude of their business does not require them to adopt an audit committee or that the board members are jointly responsible for the audit committee duties. On average, half of the firms in the sample (52.3%) have adopted an audit committee; this figure grows gradually throughout the sample period.

Panel A in Table 2 presents the pooled descriptive statistics of the firms' accounting and market data. The mean firm size varies at 6 million–230 billion averaging 1,650 million euros. The firms' market return is 0.052 on average, and the financial return on equity is 0.036 on average. The firms' share values (price-to-book) vary from zero to over nine times their valuation compared with their book values. The mean value of equity is

0.450, which reflects the good solvency of the firms.

Panel B of Table 2 shows the descriptive statistics of the centrality measures and controls for the corporate governance characteristics. The NSCORE composed of the centrality measures (DEG, CLO, BET and EIG) ranges from 1 to 5 and has a mean value of 3. The auditor PORTFOLIO has a range of 1–8, and the mean value is 2.937. Interestingly, the level of CEO duality is 0.189, and the mean value of firms having only one series of shares is 0.753. The Finnish Corporate Governance Code recommends that the election of the CEO as chairman of the board should be restricted. However, the combination of these two roles may be justified because of certain special circumstances (Securities Market Association 2015). The mean value of DUAL decreases during the sample period, and it is 0.120 in 2015. The mean value family ownership FAMILY is 0.354, which indicates that approximately one-third of the firms are owned by a controlling family. Similarly, the mean value of ACCEXP is 0.504, which indicates that half of the firms have an accounting expert among the board of directors. The auditor's years of experience AUDEXP has a mean value of 18.311, and the highest number of years of experience is 36.

5. Empirical tests of the hypotheses

We estimate the ordinary least squares regressions on a firm's auditor connectedness and network centrality and the volatility of AEEs. We estimate three specifications for H1 and H2. Group (1) involves firms that have voluntarily adopted an audit committee before 2008 (early adoption); Group (2) includes firms that have voluntarily adopted an audit committee between 2008 and 2015 (late adoption); and Group (3) includes firms that have not voluntarily adopted an audit committee until 2015 (non-adoption). All the regressions are significant ($p < 0.000$) and

Table 2

DESCRIPTIVE STATISTICS OF THE VARIABLES FOR THE SAMPLE IN 2007–2015.

(A) Accounting and market data

		Mean	Std. Dev.	Min	Max
Accrual estimation error	AEE	0.087	0.044	0.008	0.283
Firm size (M€)	SIZE	165,500	3,830	6,048	2300,000
Return on equity	ROE	0.036	0.251	-0.990	0.468
Market return	RET	0.052	0.381	-0.775	4.276
Growth opportunities	P/B	2.188	1.745	0.000	9.530
Solvency	EQUITY	0.450	0.163	-0.100	0.855

(B) Board data

		Mean	Std. Dev.	Min	Max
Degree	DEG	0.015	0.009	0.000	0.061
Closeness	CLO	0.106	0.088	0.000	0.244
Betweenness	BET	0.106	0.090	0.000	0.298
Eigenvector	EIG	0.046	0.061	0.000	0.434
N-Score	NSCORE	3.000	1.040	1.000	5.000
Audit committee	AC	0.523	0.500	0.000	1.000
Auditor portfolio	PORTFOLIO	2.937	1.878	1.000	8.000
Auditor portfolio (AC)	ACPORTFOLIO	0.000	2.268	-1.854	6.145
Early adoption	EARLY	0.293	0.456	0.000	1.000
Late adoption	LATE	0.350	0.478	0.000	1.000
Non-adoption	NON-AC	0.357	0.479	0.000	1.000
CEO duality	DUAL	0.189	0.392	0.000	1.000
Series of shares	SERIES	0.753	0.431	0.000	1.000
Family ownership	FAMILY	0.354	0.189	0.000	1.000
Accounting expertise	ACCEXP	0.504	0.500	0.000	1.000
Audit experience	AUDEXP	18.311	6.196	1.000	36.000

Notes:

Accrual estimation error (AEE) is the standard deviation of the absolute value of estimate error in a Dechow and Dichev (2002) firm-specific accrual model. Market return (RET) is the logarithmic annual buy-and-hold return calculated four months after the fiscal year end. Return on equity (ROE) is calculated as the ratio of ordinary profit to the book value of equity. Firm size (SIZE) is the logarithmic total market value at the end of the fiscal year. Growth opportunities (P/B) are a firm's price-to-book ratio. Solvency (EQUITY) is the amount of equity to total assets in a firm. Degree (DEG) is the number of first-degree links to outside boards. Closeness (CLO) is how easily or quickly a board can reach an outside board through interlocking directorates. Betweenness (BET) is the average proportion of paths between two external boards. Eigenvector (EIG) is a board`s connectedness based on the connectedness of its direct links. All centrality measures are normalised. NSCORE is a compound measure of network centrality (DEG, CLO, BET and EIG). Audit committee (AC) is the dummy variable taking the value of one if a firm has an audit committee and zero otherwise. PORTFOLIO is an auditor's client portfolio of publicly listed firms. ACPORTFOLIO is the compound measure of auditor client portfolio (PORTFOLIO) and audit committee (AC). ACPORTFOLIO is standardized at the mean value of zero and standard deviation of one. EARLY is the dummy variable taking the value of one if a firm has voluntarily nominated an audit committee before year 2008 and zero otherwise. LATE is the dummy variable taking the value of one if a firm has volun-tarily nominated an audit committee during the sample period of 2008–2015 and zero otherwise. NON-AC is the dummy variable taking the value of one if a firm has not nominated an audit committee until 2015 and zero otherwise. CEO duality (DUAL) is the dummy variable taking the value of one if a firm's CEO acts as chairman of the board and zero otherwise. Series of shares (SERIES) is the dummy variable taking the value of one if a firm has only one series of shares and zero otherwise. Family ownership (FAMILY) is the dummy variable taking the value of one if one controlling family owns more than 20% of the total votes of shares and zero otherwise. Accounting expertise (ACCEXP) is the dummy variable taking the value of one if a board member has working experience either as a chief financial officer or an authorised public accountant. Audit experience (AUDEXP) is the number of years the auditor has been working as an authorised public accountant.

Table 3

REGRESSION RESULTS OF NETWORK CENTRALITY AND THE VOLATILITY OF ACCRUAL ESTIMATION ERRORS IN THE GROUPS OF EARLY, LATE AND NON-ADOPTION OF A VOLUNTARY AUDIT COMMITTEE.

AEE	(1) Early adoption Robust			(2) Late adoption Robust			(3) Non-adoption Robust		
	Coef.	SE	t	Coef.	SE	t	Coef.	SE	t
NSCORE	-0.006	0.001	-4.69	-0.002	0.001	-1.20	-0.003	0.001	-2.44
SIZE	-0.008	0.001	-8.35	-0.005	0.001	-3.45	-0.000	0.001	-0.34
ROE	-0.001	0.001	-2.34	-0.015	0.011	-1.36	-0.018	0.006	-2.89
RET	-0.003	0.004	-0.60	0.008	0.004	1.81	0.004	0.003	1.41
P/B	-0.000	0.001	-0.05	-0.000	0.001	-0.17	0.001	0.003	1.11
EQUITY	0.035	0.011	3.07	-0.003	0.010	-0.32	-0.019	0.011	-1.66
DUAL	0.002	0.004	0.53	0.000	0.005	0.05	0.001	0.003	0.20
SERIES	0.015	0.003	5.25	0.035	0.003	9.96	0.008	0.003	2.78
FAMILY	-0.001	0.007	-0.11	-0.055	0.009	-5.93	-0.020	0.007	-2.94
ACCEXP	-0.003	0.002	-1.17	-0.006	0.003	-1.90	0.000	0.003	0.15
AUDEXP	-0.000	0.000	-2.07	-0.002	0.000	-8.32	0.000	0.000	1.48
CONSTANT	0.229	0.022	10.51	0.183	0.026	6.95	0.072	0.028	2.61
F-Value	30.03			16.61			3.98		
Prob > F	0.000			0.000			0.000		
N	248			289			298		
Adj. R²	0.587			0.462			0.211		

Notes:
This table reports the regression results of network centrality and firm characteristics in relation to the volatility of accrual estimation errors for the sample in 2007–2015. We report the results in the groups of early, late and non-adoption of a voluntary audit committee. All regressions include the controls for year effects. T-statistics are based on robust standard errors.

Table 4

REGRESSION RESULTS OF AUDITOR CONNECTEDNESS AND THE VOLATILITY OF ACCRUAL ESTIMATION ERRORS IN THE GROUPS OF EARLY, LATE AND NON-ADOPTION OF A VOLUNTARY AUDIT COMMITTEE.

AEE	(1) Early adoption Robust			(2) Late adoption Robust			(3) Non-adoption Robust		
	Coef.	SE	t	Coef.	SE	t	Coef.	SE	t
PORTFOLIO	-0.001	0.001	-1.69	-0.003	0.001	-3.46	0.001	0.001	1.26
SIZE	-0.008	0.001	-8.08	-0.002	0.001	-2.09	-0.002	0.001	-1.11
ROE	-0.017	0.005	-3.12	-0.045	0.008	-5.80	-0.030	0.008	-3.83
RET	-0.000	0.005	-0.03	0.006	0.007	0.87	0.010	0.005	1.91
P/B	0.000	0.001	0.28	0.001	0.001	0.75	0.001	0.001	0.99
EQUITY	0.042	0.012	3.61	0.005	0.008	0.64	-0.021	0.012	-1.81
DUAL	-0.003	0.004	-0.83	-0.001	0.004	-0.20	0.001	0.003	0.40
SERIES	0.014	0.003	5.00	0.036	0.003	10.54	0.007	0.003	2.60
FAMILY	0.004	0.008	0.58	-0.051	0.009	-5.75	-0.018	0.007	-2.82
ACCEXP	-0.004	0.002	-1.50	-0.005	0.003	-1.81	0.000	0.003	0.10
AUDEXP	-0.000	0.000	-2.02	-0.002	0.000	-8.30	0.000	0.000	1.54
CONSTANT	0.212	0.025	8.61	0.132	0.021	6.33	0.084	0.028	3.02
F-Value	21.42			26.68			3.85		
Prob > F	0.000			0.000			0.000		
N	248			289			298		
Adj. R²	0.546			0.531			0.215		

Notes:
This table reports the regression results of auditor connectivity and firm characteristics in relation to the volatility of accrual estimation errors for the sample in 2007–2015. We report the results in the groups of early, late and non-adoption of a voluntary audit committee. All regressions include the controls for year effects. T-statistics are based on robust standard errors.

Figure 4
Effect of auditor connectedness on the volatility of accrual estimation errors when a firm has/has not established an audit committee.
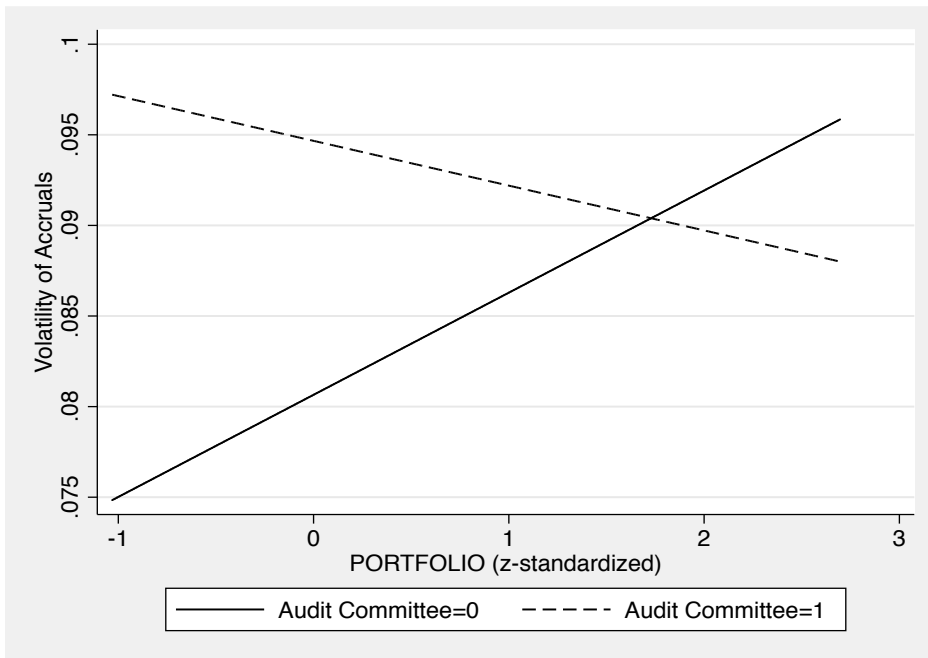
Notes:
The average marginal effect of PORTFOLIO on the volatility of accruals is −0.003 (p < 0.002) when the firm has established an audit committee and 0.002 (p < 0.158) when a firm has not established an audit committee.

have an R^2 of 0.211–0.587. The variance inflation factor (VIF) values are below 2.21 (highest mean is 1.68), which indicate no material multicollinearity problems.

As shown by the covariates in Table 3, the NSCORE is significant and negative in Groups 1 and 3. In Group 2, the NSCORE is negative but insignificant. These results mean that the central position of firms that have early adopted an audit committee or have not adopted an audit committee at all is associated with a low volatility of accruals. Therefore, we find only partial support for H1. We do not find support for H1 for the firms that adopted a voluntary audit committee in a later phase. The accrual quality of firms that later adopted an audit committee is not affected by network centrality. Taken together, we find support for the notion that the centrality affects a firm's accrual quality, but there is no clear interac-

tion effect of the voluntary adoption of an audit committee.

Our second hypothesis proposes that the monitoring of a well-connected auditor and the firm's audit committee incrementally contributes to the firm's accrual quality. Consequently, firms having a well-connected auditor and an audit committee enable inter-organisational monitoring possibilities. We estimate our models by replacing network centrality with a measure of auditor connectedness.

Looking at the covariates in Table 4, PORTFOLIO is significant and has a negative sign in Groups 1 and 2. This finding means that accrual quality is higher in firms that have a well-connected auditor and have adopted an audit committee. Interestingly, PORTFOLIO is insignificant and has a positive sign in Group 3.

Table 5

DIRECT, INDIRECT AND TOTAL EFFECTS OF AUDITOR CONNECTEDNESS AND THE VOLATILITY OF ACCRUAL ESTIMATION ERRORS THROUGH A FIRM'S NETWORK CENTRALITY.

	(1) Path (a) DV=NSCORE			(2) Paths (b) and (c') DV=AEE			(3) Path (c) DV=AEE		
	Coef.	SE	t	Coef.	SE	t	Coef.	SE	t
PORTFOLIO	0.125	0.021	5.90	-0.001	0.001	-1.34	-0.001	0.000	-2.07
NSCORE				-0.003	0.001	-3.44			
AC	-0.191	0.095	-2.00	-0.007	0.001	-3.31	-0.006	0.002	-3.06
SIZE	0.193	0.024	7.95	-0.003	0.001	-6.32	-0.004	0.001	-7.47
ROE	0.021	0.176	0.12	-0.030	0.004	-8.00	-0.030	0.004	-7.96
RET	0.097	0.133	0.73	0.005	0.003	1.76	0.005	0.003	1.66
P/B	0.021	0.023	0.92	0.001	0.000	1.11	0.001	0.001	0.99
EQUITY	0.460	0.255	1.80	0.003	0.005	0.55	0.002	0.005	0.33
DUAL	0.317	0.099	3.22	-0.001	0.002	-0.33	-0.002	0.002	-0.71
SERIES	0.218	0.092	2.38	0.015	0.002	7.61	0.014	0.002	7.31
FAMILY	-0.309	0.213	-1.45	-0.026	0.005	-5.72	-0.025	0.005	-5.52
ACCEXP	0.105	0.076	1.38	-0.004	0.002	-2.56	-0.004	0.002	-2.71
AUDEXP	-0.001	0.006	-0.19	-0.001	0.000	-4.37	-0.001	0.000	-1.23
CONSTANT	48.782	30.848	1.58	1.084	0.660	1.64	0.959	0.663	1.45
F-Value	17.84			27.61			28.45		
Prob > F	0.000			0.000			0.000		
N	835			835			835		
Adj. R^2	0.209			0.310			0.301		

Notes:
This table reports the mediation test of auditor connectedness in relation to the volatility of accrual estimation errors mediated by network centrality for the sample in 2007–2015. All regressions include the controls for year effects. Coefficients are obtained by estimating the process of the Sobel–Goodman mediation test (Sobel, 1982; Goodman, 1960). The significance of the indirect effect is obtained by bootstrapping 5,000 samples using the bootstrap test by Preacher and Hayes (2004).

This outcome suggests that the voluntary adoption of an audit committee interacts with our measure of auditor connectedness. To obtain a proper interpretation of the significant interaction effect, we compute the average marginal effect of PORTFOLIO at different levels of AC (AC=1 and AC=0). This calculation is equivalent to computing simple slopes in linear regression models (Aiken and West, 1991).

Figure 4 depicts the average marginal effect of the auditor's PORTFOLIO on the volatility of accruals. The effect is negative and significant when the firm has an audit committee but positive and insignificant when the firm has no audit committee. This finding suggests that the central position of an auditor does not enhance accrual quality unless the auditor is well connected to the

audit committee members (H2). This finding highlights the importance of the two-way interaction of the well-connected auditor and the audit committee members to achieve a less volatile level of accruals.

Finally, we examine the mediating effect of network centrality on the relation between auditor connectedness and a firm's accrual quality. We employ the Sobel–Goodman mediation test procedure (Sobel 1982; Goodman 1960; Preacher and Hayes 2004) to test H3, which indicates whether network centrality influences auditor connectedness to a firm's accrual quality. We examine whether (1) auditor connectedness significantly affects network centrality (path a), (2) auditor connectedness significantly affects the accrual quality in the absence of network centrality (path c'), (3) network centrality has a significant

unique effect on the accrual quality (path b) and (4) the effect of auditor connectedness on the accrual quality decreases with the addition of network centrality to the model.

As indicated by the covariates in Table 5, in Column 1 PORTFOLIO shows a significant association with NSCORE. Earlier we found that the direct effect of PORTFOLIO on the AEE is significant only when a firm has voluntarily adopted an audit committee. In Column 2 the NSCORE is negative and has a significant unique effect on the AEE. The effect of PORTFOLIO on the AEE decreases with the addition of the NSCORE to the model. We used Preacher and Hayes' (2004) bootstrapped test of mediation to draw 5,000 bootstrapping samples to estimate the indirect effect. As described in Zhao et al. (2010), Preacher and Hayes' test is the most acceptable approach. The direct effect of PORTFOLIO on AEE is −0.619 and the indirect effect is −0.321, thus making the total effect −0.940.[10] However, the direct effect is insignificant and suggests indirect-only mediation. The indirect effect is significant and has a mean value of −0.321, with a 95% confidence interval excluding zero (−0.845 to −0.145). Therefore, we find support for H3. The proportion of total effect is mediated by 34.1%, and the ratio of indirect effect to direct effect is 51.8%.

Our main findings are in accordance with the results of Chiu et al. (2013), who found that financial reporting behaviour spreads through the interlocking parts of a firm's board. Bruynseels and Cardinaels (2014) showed that interlocking networks do not hamper the quality of the audit committee oversight. Our results suggest that the position of the interlocking network members play a role in the group of early audit committee adopters, whereas the late adopters

may benefit from a well-connected auditor. Evidently, well-connected firms adopt an audit committee in the early phase (or not at all) because they are better informed about the benefits they can gain from it. In the later phase, a well-connected auditor may bring insights from other client firms that have already adopted an audit committee and suggest an audit committee as a tool to enhance the accrual accounting process in a firm. Interestingly, a group of firms that have not adopted an audit committee benefits from its connectivity but not from a well-connected auditor. This argument reinforces that of Armstrong et al. (2010) that firms are likely to choose the best dimensions of corporate governance for their environment. For a set of firms, a voluntary audit committee does not fit its environment, although an audit committee is recommended by the CG Code.

Several control variables are introduced to test the robustness of the results. We categorise these controls by firm and governance characteristics. We also test several 'usual suspects'[11] of corporate governance indicators (Finkelstein and Mooney 2003; Huse 2009). Consistent with the findings of both Finkelstein and Mooney (2003) and Larcker et al. (2007), these agency theoretical indicators of corporate governance have little value in explaining accrual quality. Therefore, we report only those commonly used controls, aiming at parsimony in the model.

All the specifications are estimated with firm controls and year dummies. In addition, we re-estimated all specifications controlling the industry effects. All the covariates are qualitatively similar to our main results except that firm size, as a covariate, turns out to be insignificant. However, we find that firm industry is correlated with firm size

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[10] The magnitudes of the effects are multiplied by 1,000 to allow interpretation of the results.

[11] Finkelstein and Mooney (2003) referred to the 'usual suspects' as variables that account for board independence and its effect on monitoring. These variables include, for example, the number of outside board members, director shareholdings, board size and whether the CEO also holds the chair position (CEO duality).

(Spearman correlation -0.274) and that the VIF values of these estimations are over 10. Therefore, we employ firm controls and year dummies without industry controls in all our specifications.

In Tables 3 and 4, SIZE is significant and has a negative sign in most of the specifications, thus suggesting that large firms have less volatility in their accounting accruals. On average, they tend to have larger boards and more knowledge and resources available for preparing financial statements, as reflected in the enhanced accrual quality. We find that ROE is negative and significant, thus suggesting a relationship between a firm's profitability and the volatility of accruals. However, EQUITY is positive and significant for the early adopters. Interestingly, SERIES is significant and has a positive sign. A firm with only one series of shares may indicate the non-existence of a significant block holder and suggest that these firms generally have low accrual quality. Covariate FAMILY is significant and negative in the late adopters and non-adopters, consistent with the majority of family firm studies (Ashiq et al. 2007; Jaggi et al. 2009). Covariate AUDEXP is negative in the early and later adopters of an audit committee in accordance with previous studies on an actor's expertise (Bédard et al. 2004; Cohen et al. 2014; Krishnan et al. 2011b; Liu et al. 2014). Consistent with our results, the coefficients of AC in Table 5 are negative and significant in all specifications. Accordingly, the total effects of SIZE, ROE, SERIES, FAMILY and AC-CEXP are highly significant in relation to AEE.

The research setting involves limitations that are typical in this type of research orientation. Endogeneity occurs when a correlation exists between a variable and the error term or when a variable that is modelled as exogenous is actually endogenous. Potential endogeneity has several sources, including omitted variable bias, reverse causality, measurement error and simultaneity. The risk of omitted variable bias is acknowledged in the development and testing of the empirical model by using several of the 'usual suspects' of corporate governance, for example, series of shares, family ownership and CEO duality. Furthermore, we estimate firm fixed effects to control for any constant unobserved characteristic. However, this econometric technique does not fit into our setting because of the high autocorrelation of the centrality measures (i.e. the fact that centrality changes slowly). Therefore, we do not report these results, although the main results remain unaffected.

Although the voluntary adoption of an audit committee and the related network position are intuitively expected to influence accounting accruals, we cannot rule out the possibility that board members may select their appointment based on firm characteristics, for example, perceived accrual quality. Alternatively, firms with a lower volatility of accruals may select more prominent directors and therefore more reputable auditors.[12] If this is the case, the findings presented above may suffer from the problem of endogeneity. Therefore, we re-estimate our specifications using the lagged values of our independent variables. Interestingly, no major changes occur in the significance or estimates among the variables (unreported). A similar re-estimation is conducted by replacing network centrality with auditor connectedness, and the results follow the same pattern as the main results (unreported). Therefore, we can

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12 We acknowledge alternative explanations that may explain our results. One of these explanations used in the economic literature is reputation risk. Board members and auditors may have incentives to protect their reputation and make sure that the financial reporting provides a true and fair view. Reputational explanation will be more relevant if one argues that more central actors demand for more monitoring to protect their compensation, for example, board member remuneration or audit fees.

rule out a possible reverse causality.

Moreover, the sample is limited to publicly listed firms in Nasdaq OMX Helsinki. In the global context, these firms are considered relatively small, and the inferences drawn from the results may not be transferable to large global firms. Furthermore, the institutional setting is substantially free from political pressures, and studies on other markets may need to control for political connections or other incentives, for example, to hide information. Overall, the limitations of this study open opportunities for future research.

6. Summary and conclusions

Audit committees and an independent auditor occupy positions in which they can assess the major issues of a firm's financial accounts and its accounting. Therefore, their role has been emphasised in corporate governance structures and related research. Within publicly listed companies, the requirements of financial disclosure are enormous, and generally accepted accounting principles may be lost amidst or overwhelmed by rules and interpretations (Nobes 2005). Therefore, to obtain a true and fair view of a firm's financial statement, a necessary condition for an auditor is to have proper accounting knowledge. Conversely, sufficient accounting knowledge is required for the audit committee member or at the board level.

Although many studies have examined the composition and features of audit committees (Boone et al. 2007; DeZoort and Salterio, 2001; Johnstone, et al. 2001), the independence and effectiveness of their members (Duchin et al. 2010; Gendron and Bédard, 2006; Hoitash 2011; Magilke et al. 2009), the expertise of actors (Bédard et al. 2004; Cohen et al. 2014; Krishnan et al. 2011b; Liu et al. 2014) and their effects on accrual quality (Bédard et al. 2004; Bowen et al. 2008; Klein 2002; Krishnan et al. 2011b; Larcker et al. 2007; Xie et al. 2003), only a few studies have

provided evidence on networks that are composed of individual actors. This research gap was investigated in studies highlighting the connections among a CEO, chief financial officer (CFO) and board members (Fracassi and Tate, 2012; Krishnan et al. 2011a), the factual independence of corporate actors (Cohen et al. 2012; Laux 2008) and the implications for accrual quality (Chiu et al. 2013; Hoitash 2011).

This study investigated a corporate setting in which the actors controlling and auditing accounting accruals are required to be independent in a network of interdependencies. Using generally accepted accounting principles, firms record their transactions based on their economic substance, and the board members, audit committees and auditors of firms provide the oversight of the financial reporting process and related decision control. The board members and the auditor are elected to monitor the financial accounting on behalf of the shareholders, and they hold key positions when considering whether the economic substance of the transactions is reflected in the accounting accruals. The construct of a monitoring network is defined as the network of board members and/or a firm's auditor.

We examine whether auditor connectedness and network centrality are associated with a firm's accrual quality. We find interdependencies among auditor connectedness, network centrality and a firm's volatility of accruals, highlighting the role of network predictors of accrual quality and the underlying dimensions of centrality (Bonacich 1972; Freeman 1977; 1979). The importance of actors' role and position in the network is consistent with the finding of Chiu et al. (2013). Whereas Chiu et al. (2013) focused on the importance of the role of individual directors, for example, audit committee member relative to the average director influencing accrual quality, we document the differential role of firm con-

nectivity and a well-connected auditor.

Firstly, we show evidence that network centrality is related to better accrual quality in firms that have voluntarily adopted an audit committee in the early phase. Moreover, we find a similar result for the firms that have not adopted an audit committee at all. The findings suggest that the firms that are supposed to benefit from the adoption of an audit committee (early adopters as they consider it useful when implementation is made possible, and non-adopters as they consider it not necessary at all) will have better accrual quality when their firm is well connected.

Secondly, we found that auditor connectedness is related to accrual quality especially in firms that adopt an audit committee in a later phase. This finding highlights the relevance of auditor connectivity when adopting an audit committee and suggests a well-connected auditor's proactivity to recommend the adoption of an audit committee to a set of firms. Consistent with Chen et al. (2014), the audit committee members meet regularly and challenge the accounting decisions made by management; these decisions are eventually reflected in the financial accounting accruals. The findings indicate that actors, which have objectives that are aligned with those of audit committee members and a firm's auditor in terms of financial reporting (DeZoort and Salterio 2001), contribute to the degree to which actors have input in its assignment, provide social support and share collective goals. Thirdly, the relation between auditor connectedness and accrual quality is influenced by a firm's network centrality.

The network of board members and auditors links actors and organisations, representing a monitoring device for shareholders. The monitoring network produces information channels and facilitates information transfer, thus enhancing the quality of the decision control and ultimately the financial accounting accruals. Owing to the growing number of network studies in the field of accounting, we highlight the crucial decision of which network is examined for which purpose. We suggest the construct of a monitoring network in public policy studies because it defines the network that can be directly influenced by regulation and corporate governance recommendations. In light of our findings, shareholders evidently benefit from the joint effect of network centrality, voluntary adoption of audit committees and communication with a well-connected auditor.

We contribute to the literature on the voluntary adoption of an audit committee, its position in a network and its communication with an independent auditor as well as its influence on a firm's accrual quality. We complement the agency theoretical monitoring responsibility of board members and an auditor with information perspective on interlocking networks that lead to a more pluralistic notion of actors' accountability. These findings challenge the categorical notion of audit committees in controlling financial accounting accruals. They also suggest further research on the actors of the monitoring network of firms in relation to their position in inter-personal and inter-organisational networks as well as on the development of related public policy. However, we lack the understanding of the dynamic interactions of these actors and the related dilemma of actors' simultaneous independence and network dependence, which is the root problem of monitoring and transparent financial reporting.

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APPENDIX I
Calculation of the centrality measures

The topology of board networks has been widely studied, and the position of an actor in a network has received special attention. Freeman (1979) proposed a variety of centrality measures that have distinct traits in the information diffusion process. Firstly, Freeman's (1979) specification of centrality as an *activity* argues that centrality indicates the potential for a higher level of communication activity within the network of board members and auditors. Secondly, Freeman's (1979) specification of network centrality as *independence* contends that the higher value of centrality indicates the possibility for a higher level of independence and/or efficiency within the network of board members and auditors. Independence in these terms means that a firm's board member or auditor is closely related to all the firms in the network, and therefore he or she is only minimally dependent on any single firm's board member or auditor and is not subject to control. Thirdly, Freeman's (1979) specification of centrality as *control* claims that a higher value of centrality indicates the possibility for a higher level of control within the network of board members and auditors. Furthermore, Bonacich (1972) proposed that given that the connectedness of a board or an auditor depends on the connectedness of its direct links, centrality could be interpreted as capturing the notions of *power and prestige*. In other words, a board or auditors may be in a central position in which they are perceived to be prestigious and powerful, and thus they are given a special advantage in obtaining resources, information and favours.

The concept of network centrality is multi-dimensional. In this study, we focus on the four basic dimensions of network centrality that are central to social network studies. These measures are DEGREE centrality, CLOSENESS centrality, BETWEENNESS centrality and EIGENVECTOR centrality (Bonacich 1972; Freeman 1979).

Firstly, the auditor and/or a board member may be a central actor in a network if they possess relatively many channels of communication. The DEGREE centrality enumerates the number of first-degree links to the external board or an external auditor. Letting $\delta(i,j)$ denote an indicator that the auditor or board member in firms i and j shares a director or an auditor, for a given firm i in a network.

$$(1) \quad DEGREE_i \equiv \sum_{j \neq i} \delta(i, j).$$

Freeman's (1979) specification of centrality as an *activity* argues that the higher value of degree centrality indicates the possibility for a higher level of communication activity within the network of board members and auditors.

Secondly, an auditor or a board member may be a central actor in a network if he or she possesses relatively closer connections to external auditors or board members than others, thus making information or resource exchanges quicker and more readily available (Larcker et al. 2013). This concept of connectedness is measured by CLOSENESS centrality, which represents how easily or quickly an auditor or a board member can reach outside boards or auditors through interlocking connections (Freeman, 1977). It is defined as the inverse of the average distance between a board member or auditors and any other board member or an auditor. Letting $\iota(i,j)$ be the number of steps in the shortest path between an auditor or a board member in firm i and the auditor or board member in firm j, (normalized by the size of the network),

$$(2) \quad CLOSENESS_i \equiv \frac{n-1}{\sum_{j \neq i} \iota(i, j).}$$

Freeman's (1979) specification of network centrality as *independence* contends that a higher value of closeness centrality indicates the possibility for a higher level of independence or efficiency within the network of board members and auditors. In these terms, independence means that a firm's board member or auditor is closely related to all the firms in the network, and therefore he or she is only minimally dependent on any single firm's board members or auditor and is not subject to control.

Thirdly, a board or an auditor may be a central actor in a network if he or she lies on relatively more paths between pairs of external boards or auditors, thus making such boards or an auditor vital in connecting companies with each other and a key broker of information or resource exchange (Larcker et al. 2013). BETWEENNESS is defined as the average proportion of paths between two outside boards and/or auditors on which a board member or an auditor lies (Freeman, 1977). Letting $\rho_i(k,j)$ denote the number of shortest paths between an auditor or a board member in firm k and an auditor or a board member in firm j and $\rho(k,j)$ denote the total number of shortest paths between k and j,

$$(3) \quad BETWEENNESS_i \equiv \sum_{j \neq i : i \notin \{k,j\}} \frac{\rho_i(k, j) / \rho(k, j)}{(n-1)(n-2) / 2}$$

One can interpret the distance of the shortest path between two companies to be proportional to the costs of communication or obtaining favours between them. Therefore, we can interpret BETWEENNESS as a measure proportional to the average cost of communicating with or obtaining favours from another firm. In other words, a firm may be in a central position in a network because it is relatively less costly for it to obtain resources or favours from external firms. Furthermore, Freeman's (1979) specification of centrality as *control* claims that the higher value of betweenness centrality indicates the possibility for a higher level of control within a network of board members and auditors.

Finally, we consider a fourth and related notion of a central actor in the network, stemming from Bonacich's (1972) refinement of DEGREE centrality: having more direct connections is more influential when such connections can reach or influence more outside boards or auditors. In other words, a board member or an auditor is a central actor in a network when his or her direct contacts are also in a central position. This concept is measured by the EIGENVALUE centrality of a board member's or an auditor's central position in a network based on the central position of its direct links:

$$(4) \quad \lambda \cdot CENTRALITY_i \equiv \sum_j g_{i,j} \cdot CENTRALITY_j,$$

where λ is the proportionality factor, and $g_{ij} = 1$ if companies i and j are linked. Writing model (4) in vector form, we see that each firm's centrality in the network can be obtained by the EIGENVECTOR of the matrix G.

$$(5) \quad \lambda \cdot EIGENVECTOR = G \cdot EIGENVECTOR$$

As the connectedness of a board or an auditor depends on the connectedness of his or her direct links, EIGENVECTOR centrality can be interpreted as capturing the notions of *power and prestige*. In other words, a board or auditors may be in a central position when they are perceived to be prestigious and powerful, and thus they are given a special advantage in obtaining resources, information and favours.

As larger firms tend to have larger boards (Larcker et al. 2013), the centrality measures may suffer from the size effect. To eliminate this effect, we create ranked versions of the centrality measures using quintiles based on firm size (the log of market value of equity). The highest values of the centrality quintile assume a value of five, whereas the lowest is one. Thereafter, we use size-adjusted centrality measures that diminish their correlation with firm size.

To measure the aggregate network centrality of a firm, we construct NSCORE based on the four dimensions of centrality. We define a network centrality score for each firm by taking the equal-weighted average quintile rank of the centrality measures rounded off to the nearest integer. Therefore, the range of NSCORE is from one to five.

$$(6) \quad NSCORE \equiv Quint \left(\frac{1}{4} \left\{ \begin{array}{l} Quint(DEGREEi) + \ Quint(CLOSENESSi) \\ + \ Quint(BETWEENNESSi) + \ Quint(EIGENVECTORi) \end{array} \right\} \right)$$