Audit committee expertise in large European firms*

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Purpose: this paper studies how audit committee member expertise is related to certain features of the committee and to the audit process.

Design/methodology/approach: based on information from 2,477 directors from 296 firms in eight European countries between 2005 and 2014, we measure average audit committee expertise using a continuous variable, which combines education-based and experience-based expertise. Different measures of the audit process are then regressed against this as well as other control variables.

Findings: average committee expertise has increased in recent years. Education-based and experience-based expertise seem to be complementary. Results also show that committees with greater expertise meet more frequently, have fewer directors with full-time dedication, and pay lower audit fees. There is no link to changes in the external firm audit, which may be due to mandatory auditor rotation.

Originality/value: the paper provides a comprehensive metric of audit committee expertise that includes directors' academic background, professional experience and qualifications. In addition, this study expands current knowledge concerning whether and how committee expertise affects the audit process.

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Keywords: corporate governance, audit committee, financial and accounting expertise, audit committee activity, audit fees.

1. Introduction

Audit committees have been at the core of both recent academic research and financial market authority attention (Martinov-Bennie *et al.* 2015). One aim of policymakers has been to create revitalised audit committees, which has led to a new and more stringent legal framework for auditing (Ghafran & O'Sullivan 2013). One key point of the new legal framework is audit committee composition in terms of independence and member expertise.

In the United States, the Sarbanes–Oxley Act (SOX) of 2002 requires every public company's audit committee to be composed of independent directors, with at least one member possessing financial expert qualifications, either through education or experience. In Europe, a number of laws, guides, and recommendations[1] have been enacted with an objective analogous to that of SOX. Directive 2014/56/EU of the European Parliament (and the transpositions into each member state's laws) attempts to reinforce the independence and technical competence of audit committees by requiring a majority of committee members to be independent and at least one member to be competent in auditing and/or accounting. Similarly, EU Recommendation 2005/162/EC mandates that audit committee members should, collectively, have a recent and relevant background as well as experience in finance and accounting for listed companies appropriate to the company's activities. This regulatory concern is even more pertinent in such an important industry as the financial sector, in which specific guidelines on the independence and necessary expertise of directors have been issued by the European Central Bank (2018) and the European Banking Authority (2018).

Both audit committee independence and competence have a longstanding tradition in auditing research (Zaman *et al.* 2011; Alderman & Jollineau 2019). The literature shows that more independent audit committees, as well as those with greater expertise, are more likely to choose a *Big Four* external auditor (Chen & Zhou 2007), pay higher audit fees (Muniandy 2007; Gul & Goodwin 2010; Ghafran & O'Sullivan 2017), reduce the likelihood of fraud (Lary & Taylor 2012), and improve the quality of financial statements (Ika & Mohd Ghazali 2012; Habib & Bhuiyan 2016). Other studies find that audit committees which have greater expertise

[1] Recommendation 2005/162/CE, Directive 2014/56/EU, Green paper on audit policy, Regulation 537/2014, and Recommendation 2014/208/UE, together with several national codes of good governance.

are associated to more accurate analyst earnings forecasts (Abernathy *et al.* 2013), reduce aggressive earnings management (Bedard *et al.* 2004; Sharma & Kuang 2014), increase accruals quality (Dhaliwal *et al.* 2010), and exhibit lower management expectations in an effort to avoid negative earnings surprises (Liu *et al.* 2014).

Although both independence and expertise seem to have similar effects, the concept of independence is subject to less discussion whereas the notion of expertise is not without controversy (Bédard & Gendron 2010).[2] In the list of requirements regarding statutory audit of public-interest entities, Regulation 537/2014 of the European Parliament defines an expert as a natural person who has specific expertise in financial markets, financial reporting, auditing, or other fields relevant to inspection, including practising statutory auditors. Thus, at least in the European framework, the notion of expertise is quite wide and can be gained in a variety of ways such as through academic degrees, professional experience in the private sector, service in the public administration or capital markets authorities, and so on. In addition, another important element related to expertise is how it can be measured. The difficulty inherent in identifying and quantifying expertise has led most of the research to operationalize expertise as a dichotomous variable; for example, in terms of whether at least one audit committee member has some specific knowledge, without considering the full knowledge of all committee members (Bilal *et al.* 2018).

Jointly based on the agency theory and resource dependence theory, the present paper focuses on this multifaceted notion of expertise and explores how the qualifications of audit committee members as experts affects the audit function. This approach stems from the new audit framework. Since both committee independence and expertise have become almost mandatory, the focus of research has shifted. Whereas early studies examined the impact of audit committee features, more recent literature has examined whether and how committee composition and expertise is related to other elements of corporate governance. We join this stream of literature and analyse the corporate governance motivations underlying audit committee qualifications. More specifically, the paper examines certain characteristics of the audit committee and the audit process which may be affected by audit committee member expertise.

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[2] One example of such criticism is the definition of expertise provided by SOX. This definition initially came in for so much criticism as a result of being too restrictive that one year later the Securities and Exchange Commission (2003) amended the ways in which expertise could be gained.

The paper makes a threefold contribution. First, a more precise measurement of the level of audit committee expertise is provided, including the experience and qualifications of each member, quantifying the level of expertise in committees of European listed companies as a whole. To date, most studies which have explored board expertise have used dichotomous variables indicating whether at least one member is a financial/accounting expert or similar (Xie *et al.* 2003; Abbott *et al.* 2004; Bedard *et al.* 2004; Carcello *et al.* 2006; Badolato *et al.* 2014). This paper, however, examines the overall level of audit committee expertise through a continuous variable that measures the different skills or background (i.e., academic background, specialized financial or accounting knowledge, general economic knowledge, previous experience as auditor, experience as CEO, and international experience) of all the directors. Second, given the different ways in which audit expertise may be gained (namely, by both educational as well as professional experience), we show that both types are complementary and should be jointly fostered. By way of a third contribution, the paper looks at what effects audit committee expertise has on the audit process, exploring the relationship between committee expertise as a whole and the committee's activity, its members' dedication, external auditor rotation, and audit fees.

The sample includes 296 companies listed in the main stock indexes of France, Germany, Italy, Spain, Belgium, the Netherlands, Portugal, and the United Kingdom for the 2005-2014 period. Results point to an improvement in committee expertise over this period. Findings show that committees displaying greater expertise are more active in terms of meetings, that their directors have less dedication (in terms of fewer directors with full-time dedication and with more outside directorships), and that they pay lower audit fees. However, no relationship is found with external audit firm rotation, which might be related to mandatory auditor rotation. Taken together, these results support the view that committee expertise is complementary to other characteristics of good corporate governance and also that it enhances the audit process (Magrane 2010; Eulerich 2017).

The remainder of the paper is organized as follows. Section 2 provides the literature review and hypothesis development. Section 3 describes the data collection process, the sample, and the research method. Section 4 discusses the results of the empirical analysis. Section 5 summarizes the study's main contributions.

2. Theoretical background

Recent reforms of the audit legal framework in many European countries have substantially altered the requirements concerning audit committee expertise. The EU Recommendation 2005/162/EC and the Directive 2014/56/EU mandate that directors who belong to the audit committee should possess expertise, and their dedication to the committee has to be enough to develop their functions. The underlying idea is that the board of directors (and the board committees) are a cornerstone of firms' decision making.

Directors are supposed to bring three types of input: ability to monitor managers, strategical guidance, and critical resources (van Ees *et al.* 2009; Adams *et al.* 2010). Since the monitoring ability of audit committee members seems to dominate, a large stream of literature tends to adopt an agency approach (Sánchez Ballesta & García Meca 2005; Sarens & Abdolmohammadi 2011; Ghafran & Yasmin 2018; Zalata *et al.* 2018). The separation between ownership and management raises the demand for control mechanisms to mitigate the agency costs associated with asymmetric information (Piot 2004). From an agency perspective, stakeholders (mainly shareholders) engage the audit committee to oversee managers and to protect shareholders' interests (Puat Nelson & Devi 2013). The existing literature agrees that the monitoring function of directors increases audit committee effectiveness and improves the quality of the financial information about the firm (DeZoort *et al.* 2002; Fajembola *et al.* 2018; Norziaton & Hafizah 2019).

In order to gain a better knowledge of directors' influence it is necessary to consider the specific resources they bring. The resource dependence theory proposes a theoretical framework to understand the role of directors in the audit committee (Dalziel *et al.* 2011). In accordance with this theory, directors with human and social capital may be able to provide firms with such information, resources and experience, thereby ensuring the development of the audit committee's functions and improving its effectiveness (Dhaliwal *et al.* 2010). Thus, directors' specific expertise is crucial vis-à-vis understanding what contribution they make to firms (Kassinis & Vafeas 2002; Kor & Misangyi 2008). In fact, as explained by Puat Nelson and Devi (2013), audit committees provide expertise and experience so that firms can gain a competitive advantage, especially in financial reporting quality.

Under both the agency and the resource dependence theoretical lens, the question arises as to what impact director expertise has on the audit process. Indeed, little is known about such

implications. This paper reviews the theoretical foundations for four issues related to the audit process: committee activity, director dedication, audit firm rotation, and audit fees.

The frequency of audit committee meetings[3] is an important indicator of a committee's effectiveness and affects certain issues that are relevant to users of financial information. Frequent meetings can enable the committee to perform better the duty of managerial oversight and the provision of resources. In fact, Bedard *et al.* (2004) report that the level of income-increasing abnormal accruals is negatively related to the frequency of audit committee meetings. Beasley *et al.* (2000) show that, in some industries, firms involved in instances of fraud held fewer audit committee meetings. Alzahrani and Aljaaidi (2015), Stewart and Munro (2007), and Fajembola *et al.* (2018) show that holding meetings more frequently can improve risk management and enhance financial stability.

Despite the relevance of the frequency of audit committee meetings, the literature says little about the underlying determinants of meeting frequency (Sharma *et al.* 2009; Al-Najjar 2011; Khelil *et al.* 2016; Prihartantiningtyas & Juliarto 2016). Intuitively, directors' qualifications affect their availability for committee meetings since said qualifications are related to their effectiveness (Chou *et al.* 2013). Greco (2011) finds that Italian audit committees which are more independent meet more frequently. Abbott *et al.* (2004), Goodwin-Stewart and Kent (2006), Hoitash *et al.* (2009), and Hosseinniakani (2014) report that the most active audit committees are the most efficient. Sharma *et al.* (2009) find that directors with greater expertise attend U.S. audit committee meetings more often when the risk of financial misreporting is higher. Similarly, Maraghni and Nekhili (2014) find that directors' individual competence in France (i.e., educational level and experience gained in other committees) enhances diligence through the number of audit committee meetings. However, Yin *et al.* (2012) fail to find any evidence in China of an association between the frequency of committee meetings and the proportion of directors who are accounting experts. Given the parallelism between audit committee independence and expertise, and the literature findings concerning the relation between the qualifications of audit committee members and committees' activity, our first hypothesis posits a positive relation between audit committee expertise and committee activity.

H1: Audit committee activity is positively related to committee member expertise.

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[3] This study only deals with formal committee meetings. Zaman and Sarens (2013) and Qamhan *et al.* (2018), and Oussii *et al.* (2019) study informal meetings.

Directors' dedication can also prove to be influential with regard to certain issues that are relevant to users of financial information. On the one hand, multiple-directorships and part-time dedication could be a signal of directors' abilities and connections. On the other hand, belonging to too many boards might harm directors' dedication and negatively affect their work. Prior research has not yet reached any concluding evidence in this regard. While Yang and Krishnan (2005) and Dhaliwal *et al.* (2010) find that multiple directorships reduce earnings management, Garven (2015) and Sun *et al.* (2014) report just the opposite. Baccouche and Omri (2014) find that audit committee members accumulating several outside directorships leads to a higher degree of earnings management in French firms. In contrast, De Vlaminck and Sarens (2015) report a positive association between the proportion of audit committee members holding more than three directorships and financial statement quality in Belgium firms.

In their study on the multiple directorships of audit committee members, Sharma and Iselin (2012) report no significant relation between the percentage of audit committee members serving on at least three other boards and the percentage of members with financial or accounting expertise. Alternatively, Tanyi and Smith (2015) report that higher busyness of audit committee experts relates to other non-audit committee experts. This result is consistent with the fact that financial experts in the audit committee hold significantly more directorships in other firms than non-experts do (Iyer *et al.* 2013; Jaafar *et al.* 2016). Because the legal framework attaches so much importance to the expertise of audit committee members, directors who have a background in auditing, financial reporting, financial markets, and similar fields have become key actors. However, the availability of directors with such profiles is not unlimited. Furthermore, given the increasing demand for committee members who can boast such expertise, directors with accounting or financial skills may find professional opportunities by serving on several boards. The following hypothesis concerning the dedication of experts in the audit committee is thus formulated:

> H2: The dedication of audit committee directors is negatively related to member expertise.

One of the most important decisions taken by the audit committee concerns the selection of external audit firms. Although whether or not external auditor rotation improves audit quality remains a controversial issue (Ruiz Barbadillo *et al.* 2009; Casterella & Johnston 2013), the change in the external auditor is a key topic in the political agenda. Recently, European regulation EU 537/2014 on the specific requirements regarding statutory audit of public-interest entities dramatically changed the legal framework. From 2016, the regulation places a ten-year

limit of audit firm tenure for listed firms in the European Union. Regardless of the debate surrounding the relation between audit quality and audit tenure, European authorities implicitly support audit firm independence by mandatory rotation.

Nevertheless, the question of whether more highly qualified audit committees are more prone to switch audit firms is still an unexplored issue. Krishnan and Ye (2005) find that the financial expertise of audit committees is positively associated with the likelihood of firms seeking ratification on auditor selection from shareholders. In the aftermath of the Arthur Andersen scandal, audit committees with greater financial expertise dismissed this audit firm (Chen & Zhou 2007). Albring *et al.* (2014) find that broad financial expertise on the audit committee is related to the switch decision from permissible auditor-provided tax services. In this vein, we analyse whether audit committee member qualifications support the notion of auditor rotation as an enhancer of audit quality. Consequently, the third hypothesis reads as follows:

H3: Audit firm rotation is positively related to audit committee member expertise.

This study also examines the relation between audit committee expertise and audit fees. Higher audit fees are supposed to increase audit testing and to lead to higher audit quality (Goodwin-Stewart & Kent 2006). Nevertheless, the existing literature shows varied results concerning whether or not higher fees actually increase audit quality. While Eshleman and Guo (2013) find a positive relationship between (abnormal) audit fees and audit quality, the results of Ettredge *et al.* (2014) and Krauß *et al.* (2015) indicate that such audit fees are negatively associated with audit quality.

As far as the relationship between audit fees and committee member expertise is concerned, two different theoretical explanations can be posited. On the one hand, the relation can be negative because more qualified directors, when fulfilling their duties, might negotiate more affordable fees and perhaps collaborate to a greater extent with the audit firm. Krishnan and Visvanathan (2009) and Farooq *et al.* (2018) provide empirical support for a negative relation between audit pricing and accounting financial expertise. This result may suggest that a better qualified audit committee leads to more reliable financial reporting and less external auditor efforts, which results in lower audit fees. Another possible explanation is that of Ittonen *et al.* (2019), whose results suggest that audit firms might consider other firms using their former employees as audit committee members so as to be easier to audit, thus requiring relatively less effort from the auditors.

On the other hand, audit committee expertise may mean higher quality standards and a greater effort by the audit firm. Furthermore, better corporate governance through an expert audit committee may complement external auditors when monitoring management. In this case, directors' qualifications may imply higher audit fees. Consistent with this second approach, and despite the legal difference for audit fees with Europe during our sample period, Abbott *et al.* (2003), Vafeas and Waegelein (2007) and Ghafran and O'Sullivan (2017) report that audit committee expertise is positively associated with audit fees in U.S. and UK firms. Thus, audit committee expertise is likely to affect audit fees of European firms, although the direction of influence, whether positive or negative, is an empirical question. Consequently, the final hypothesis is stated in a dual manner:

H4a: Audit fees are positively related to audit committee member expertise.

H4b: Audit fees are negatively related to audit committee member expertise.

3. Empirical design

3.1. Sample

The initial sample was made up of all 310 listed firms included in the most representative stock exchange indexes in France, Germany, Italy, Spain, Belgium, the Netherlands, Portugal, and the United Kingdom in December 2014.[4] A similar selection procedure was followed by Böhm *et al.* (2016) and covers the vast majority of financially significant European companies. After dropping cross-listed firms in several markets, the sample is short-listed to 296 firms.[5] The curricula vitae for all audit committee members of these companies between 2005 and 2014 are then identified and compiled. The year 2005 was chosen because this was when the IFRS and Recommendation 2005/162/EC on good governance requirements in companies' boards of directors came into effect in Europe. Following this, information is compiled from 2,350 firm-year audit committees and 2,477 different directors.

This information is hand-collected from firms' annual reports and, where necessary, by looking at other public sources such as *Bloomberg Business Week* and the official websites of

[4] These indexes are the IBEX-35 (35 Spanish firms), DAX (30 German firms), CAC-40 (40 French firms), FTSE MIB (40 Italian firms), FTSE-100 (100 U.K. firms), BEL-20 (20 Belgian firms), AEX (25 Dutch firms), and PSI-20 (20 Portuguese firms).

[5] For cross-listed firms, the country of the parent firm has been considered.

other companies where these directors served. The audit report was also reviewed to identify issues related to the audit firm such as the name of the firm, audit fees, and so on. Director-level information is completed with firm-level financial information from the Bloomberg database.

The final sample was built by aggregating the information on audit committee members. To ensure data reliability, for a given firm to be included in a given year, comprehensive information must be available for all audit committee members in that year. Due to mergers, acquisitions, and delisting and because not all curricula vitae provide the required data, the number of firm-year audit committees with available information is reduced to 2,350 committees, which means a coverage of 79.4% of the 2,960 all firm-year audit committees. The sample breakdown can be expressed as follows:

A	Composition of the stock indices	310
B	Repeated firms in stock indices	14
C=A-B	Total firms	296
D	Period (2005-2014)	10
E= C x D	Original firm-year sample	2,960
F	Incomplete information firm-year	-610
G= E - F	Final firm-year sample	2,350

To assess the comprehensiveness of the sample, it was compared with the samples of other studies addressing audit committee expertise, such as the 2,484 firm-year observations in Abernathy *et al.* (2013), the 203 firms in Albring *et al.* (2014), the 217 firms in Bajra and Čadež (2018), the 3,451 firm-year observations in Bedard *et al.* (2004), the 702 directors in DeFond *et al.* (2005), the 246 firm-year observations in Ahmed Haji and Anifowose (2016), the 370 firm-year observations in Qamhan *et al.* (2018), the 770 firm-year observations in Dhaliwal *et al.* (2010), the 3,590 firm-year observations in Erkens and Bonner (2013), the 3,218 audit committee members in Krishnan and Lee (2009), the 633 firm-year observations in Krishnan and Visvanathan (2008), the 423 firm-year observations in Kusnadi *et al.* (2016), the 612 firm-year observations in Ittonen *et al.* (2018), and the 98 firms in Sun *et al.* (2012). Table 1 reports the distribution of the audit committees of our sample by country and year.

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Two difficulties were encountered when quantifying the expertise and qualifications of audit committee members. First, each country's laws and codes of good practices impose

different requirements (Böhm *et al.* 2013). Given the international scope of the present research and the focus on the EU level legal framework, the different national criteria were harmonized in order to assess expertise. Table 2 provides a synopsis of these criteria.

<<TABLE 2 ABOUT HERE>

Second, the concept of qualification entails multiple dimensions. Early research identifies audit committee expertise with directors who have a corporate or investment banking background (Xie *et al.* 2003), who serve on other audit committees (Karamanou & Vafeas 2005), or who hold multiple directorships (Baccouche *et al.* 2013). Several studies subsequent to the SOX measured the expertise of audit committee members more precisely. Bedard *et al.* (2004) differentiate expertise by type, such as financial expertise and governance expertise. In a similar vein, Albring *et al.* (2014), DeFond *et al.* (2005), and Zhang *et al.* (2007) separate financial expertise into accounting and non-accounting expertise. Krishnan and Visvanathan (2008), Hoitash *et al.* (2009), Sun *et al.* (2012), Dhaliwal *et al.* (2010), and Abernathy *et al.* (2013) go one step further by categorizing nonfinancial expertise in addition to financial accounting and non-accounting expertise.

3.2. Variables

The literature provides no universally comprehensive metric of financial expertise. Furthermore, many of the previously used metrics are dichotomous variables that measure whether a director is an expert or whether the audit committee includes at least one expert (Salleh & Stewart 2012; Alzeban 2015; Hassan *et al.* 2017).[6] To the best of our knowledge, this is the first study to go one step further by proposing a continuous metric of director expertise[7].

Our metric of expertise is a sophistication of other metrics such as Wang *et al.* (2017), who assign to each director an education index that ranges from one (if the highest level of education is elementary school) to six (if the highest level is a PhD). Our measure is more stringent with regard to the level of studies since we include only higher levels of education (post-secondary, post-graduate, or courses taken at prestigious business schools), but is more

[6] Audit committee expertise has occasionally been measured through a continuous variable such as the proportion of directors with financial expertise (Ahmed Haji 2015).

[7] It is worth mentioning Lin (2018), who use incentive-based compensation as a measure of audit committee quality.

comprehensive, since we capture director knowledge gained through international experience, CEO experience or audit and accounting experience (Dhaliwal *et al.* 2010; Habbash *et al.* 2013).

This measure is based on eight characteristics: (i) a post-secondary degree in corporate business or related fields; (ii) post-graduate studies in corporate business or related fields; (iii) post-graduate studies at a prestigious business school;[8] (iv) experience as a CEO; (v) experience as an auditor or consultant; (vi) international professional experience; (vii) understanding of accounting principles gained as a controller, chief financial officer, chief accounting officer, etc.; and (viii) knowledge of economics acquired through professional experience in economics, finance, or investment banking, or through a university degree in economics.

In order to build a more detailed measure of expertise, a review is first carried out of the experience and knowledge described in all the audit committee members' *curricula vitae*. Screening of these files provided eight root-causes or dimensions as the most important characteristics: "University education", "Master or PhD", "Prestigious and internationally renowned studies", "CEO experience", "Auditor or consultant experience", "International experience", "Accounting knowledge" and "Economic knowledge". Subsequently, each *curriculum vitae* was assessed to check which dimensions a given director fulfilled. We thus define eight dummy sub-variables that equal one if a given dimension was fulfilled, and zero otherwise. In order to obtain a director's individual qualification, all the dummy sub-variables were aggregated, with the result that this qualification is an integer number from zero to eight. This work is even more complex due to the internationality of our data set, given that curricula vitae are written in German, Spanish, French, English, Italian, or Portuguese. The appendix provides more information on the technicalities of the definition.

For each audit committee and year, the QUALIF variable was computed as the average value of the qualification of all committee members. Five variables were defined concerning the structure or functioning of the audit committee: size (COMSIZE), activity (ACTIV), dedication (DEDIC), multiple directorships of committee members (DIRECTORSHIPS), and internationalization (INTERNAT). COMSIZE is the number of directors on the committee,

[8] The category of prestigious business schools is based on the Forbes magazine in 2015: INSEAD, London Business School, IESE, IE Business School, IMD, SDA Bocconi, Cranfield, Saïd, Warwick, Lancaster University, and SP Jain.

ACTIV is the number of meetings held by the committee each year, DEDIC is the proportion of members with full-time dedication to the committee (i.e., with no other duty in another large European firm), DIRECTORSHIPS is the average number of outside boards on which the directors of a given committee sit in the same year, and INTERNAT is the proportion of foreign members[9].

Two variables related to the external audit are defined: the rotation of the audit firm (ROTAT) and the fees for the independent audit report (FEE). ROTAT is a dummy variable that equals 1 when the audit committee decides to change the audit firm in a given year, and zero otherwise. FEE is the amount of audit fees relative to total assets.

In order to enhance the comparability of our results with analogous research (Liu *et al.* 2014) and to avoid some omission bias, there is control for firm size, financial leverage, profitability, litigation risk, and company complexity. ASSETS is defined as the log of total assets, LEV as the debt-to-total assets ratio, and ROA as the return on assets (i.e., earnings before interests and taxes relative to total assets). As for auditor litigation risk, Carcello and Palmrose (1994), Krishnan and Krishnan (1997), and Stice (1991) show that such a risk is affected by the client firm size, the variability of firms' returns, receivables, and inventory, among others[10]. The variability of a firm's returns (VARIAB) is operationalized using the variance of residuals obtained from regressing daily firm stock returns against a market index for a six-month period[11]. The underlying reason is that the higher the variability of a firm's returns, the higher the probability of large decreases and increases in stock price, and the greater the perceived benefit of legal action against the auditor. RECEIV is the ratio of accounts receivable to total assets, and INVENT is the ratio of inventory to total assets ratio. The complexity of the firm has been measured using two variables: the number of segments (DIVISIONS) and a Herfindahl-Hirschman index of concentration taking into account the five

[9] There is no control for committee independence given that European laws require audit committees to be made up of non-executive and independent directors.

[10] The aforementioned authors consider that the receivables and inventory accounts represent an important part of the firm's financial statements, and that there is a high risk for the auditor in this valuation. They also consider that companies which have very variable returns will have a higher probability of losses and, therefore, of legal action against the auditor.

[11] The underlying reason, as explained by Stice (1991), is that the higher the variability of a firm's returns, the higher the probability of large decreases and increases in stock price, and the greater the perceived benefit of legal action against the auditor.

main segments (HH5)[12]. In analogous research, it is usual to control for the size of the external audit firm. Given the overwhelming majority of firms audited by the *Big Four* audit firms,[13] an alternative control variable (AUDITOR) is used that equals one when the auditee firm provides full information (identity of the external auditor, contract tenure, fees, etc.) about the audit firm, and zero otherwise.

Table 3 reports the descriptive statistics (mean, standard deviation, and quartiles) of the variables.

<<INSERT TABLE 3 ABOUT HERE>>

Table 4 reports the correlation matrix among the variables. The literature generally considers multicollinearity to be a problem if the correlation between the independent variables is higher than 0.7 (Cooper & Schindler 2003). Although the correlation coefficients are, in general, below 0.7, the variance inflation factor is computed to test the lack of multicollinearity in the estimates. VIF values are all found to be below 3. Given that a lack of multicollinearity is broadly accepted when VIF values are below 5 (Studenmund 1997), multicollinearity was not deemed to be an issue with the estimates.

<<INSERT TABLE 4 ABOUT HERE>>

3.3. Method

A test of means comparisons was first performed in order to check whether differences exist between two groups of firms: in other words, firms whose audit committees have above-average expertise and firms whose audit committees have below-average expertise. The combination of time series with cross-sectional data thus allows a panel data set to be formed. The panel data methodology enhances control of the so-called constant and unobservable heterogeneity introduced by the firms' fixed-effects term. One of the key points of the panel data procedure is this fixed-effects term or, in other words, the identification of certain specific features of each firm which remain invariant over time. Consequently, Tables 7-13 report the Hausman test, which is used to test the null hypothesis of lack of correlation between the

[12] Additional analyses (not tabulated) have been run with a similar index based on the three main segments. Broadly speaking, the results remain unaffected.

[13] Only four firms in the present sample were audited by an external audit firm other than the *Big Four*.

independent variables and the fixed effects term and, thus, the choice between the within-groups or the between-groups estimate (Baltagi 2013).

The dependent variables are ACTIV, DEDIC, ROTAT, and FEES. Because ROTAT is a dummy variable (the decision to change the audit firm), a logit panel data regression is used when the dependent variable is ROTAT.[14] The model can be expressed as:

$$COMACT_{it}, DEDIC_{it}, ROTAT_{it}, FEES_{it}, = \beta_0 + \beta_1 QUALIF + \beta_2 LEV + \beta_3 ROA + \beta_4 LOGACT + \beta_5 VARIAB + \beta_6 RECEIV + \beta_7 DIVISIONS + \varepsilon_{it}$$

All estimates include dummy variables to control for time, industry, and country fixed effects. For industry effects, the one-digit level SIC is used. For each estimate, given the constraints imposed by the availability of data of the control variables, a parsimonious model is run: a baseline model is initially tested, to which a different control variable is then added in each column.

4. Results

4.1. Descriptive Analysis

Given the relevance of our measure of expertise, Figure 1 shows the evolution of expertise (QUALIF) throughout the period studied. A sustained increasing trend can be seen between 2005 and 2014 (from 4.641 to 4.975), such that audit committees in European listed firms have gained expertise over this period. Table 5 reports the values for the start and the end of the period for each country. The countries with the highest expertise in the audit committee are the Netherlands and Italy. All the countries apart from Germany have improved considerably in terms of audit committee expertise, with the largest improvements taking place in France and the Netherlands. This positive trend is in line with the aim of the new European regulation and may suggest how the largest (and likely the most visible) European listed firms have responded to the new legal framework.

Average audit committee size is just over four people, not far from the 3.5 people in Chinese committees (Yin *et al.* 2012) or 3.6 in Malaysian firms (Ahmed Haji 2015). Audit committees

[14] French firms have been dropped from the estimate of the switch of auditors since these firms are required by law to have two audit firms.

meet around six times a year, consistent with the 4.6 times reported by Greco (2011) for Italian firms, and meet far more often than in emerging markets (Khlif & Samaha 2016). Slightly less than three out of four members have full-time dedication and, on average, directors belong to almost three outside boards. These figures are consistent with similar figures reported for U.S. firms (Iyer *et al.* 2013).

<<INSERT TABLE 5 ABOUT HERE>>

Table 6 reports the results of the test of means comparison. The sample was split into two groups according to the mean value of QUALIF: firms whose audit committee has above-average expertise and firms whose audit committee has below-average expertise. Results show significant differences between the two subgroups in terms of the committee's features and the audit function. Most of these differences are consistent with our hypotheses and suggest the need for further analyses.

<<INSERT TABLE 6 ABOUT HERE>>

Table 6 shows that firms with more highly qualified audit committees also differ in terms of the audit function: the audit committee meets significantly more often and has fewer full-time members. These firms also change the audit firm more often and pay audit firms more. Firms with more qualified committees are also larger. Although not conclusive, these results are in line with our hypotheses.

4.2. Explanatory Analysis

Table 7 reports the estimates concerning the implications of audit committee expertise vis-à-vis the committee's activity (H1). The baseline results in column 1 support the idea of a positive relation between expertise and the number of audit committee meetings, given the positive and significant coefficient of the variable QUALIF. In other words, committees who have greater expertise meet more often. Columns 2-4 introduce the additional control variables. A parsimonious model is run because of the decrease in the number of observations due to the lack of available information. In all cases, the positive relationship holds between audit committee qualifications (QUALIF) and the number of committee meetings. It seems that more highly qualified audit committee members meet more often, which might be seen as evidence of their commitment. Given the supervisory role which directors play, by meeting more often the committee members seem be evidencing their alignment with shareholder interest in order

to ensure the quality of financial information. From a resource based perspective, this result can be seen as the members trying to bring more valuable resources in the form of more frequent scrutiny.

As for other factors, company size is positively related to committee activity, consistent with Yin *et al.* (2012), Al-Najjar (2011), and Greco (2011). The degree of internationality in the committee has a negative relationship, which could be due to the difficulties involved in gathering an international group of directors. The committees of firms who have more volatile stock returns, *i.e.*, one of the proxies of litigation risk, meet more often, which is consistent with the relevance of the financial information issued by the firm to capital markets. The lack of significance of other explanatory variables, such as leverage or financial performance, is in line with previous research (Sharma *et al.* 2009; Al-Najjar 2011; Greco 2011; Yin *et al.* 2012).

The F-statistics and the R-squared coefficient support the explanatory power of the model. This table also reports the variance inflation factor to test the lack of multicollinearity in the estimates. As previously noted, multicollinearity is not a problem in the estimates.

<<INSERT TABLE 7 ABOUT HERE>>

Table 8 reports the results for H2 concerning the relationship between audit committee expertise and committee member dedication. Dedication is operationalized with two variables: the proportion of members with full-time dedication to the committee (DEDIC) and the average number of outside directorships (DIRECTORSHIPS). The results for each variable are shown in columns 1-4 and 5-8, respectively. As hypothesized, the significant coefficient of QUALIF suggests that the most qualified committee experts display less dedication both in terms of less full-time dedication in the firm (columns 1-4) and in terms of more engagements in other firms (5-8). This result may be a consequence of a higher number of directorships among expert directors and the increased demand for such expertise due to recent legal changes (Jaafar *et al.* 2016). The negative relationship between expertise and dedication raises certain concerns that should be addressed by the law. The aim of the new audit legal framework in terms of improving the dedication of audit related agents is clear. In this vein, Recommendation 2005/162/CE states that directors should limit the number of their other professional commitments, particularly directorships held in other companies, in order to ensure they can perform their duties properly. Nevertheless, our results indicate that new legal efforts must be made to ensure that committee member qualification and dedication do not conflict but, rather, converge.

The coefficients of the control variables imply that dedication is negatively related to the firm's size and performance, but positively related to the internationality of the committee. As they did previously, the F-statistics and the R-squared coefficient support the explanatory power of the model. The choice between the within-groups or the generalized least squares estimate is based on the Hausman test.

<<INSERT TABLE 8 ABOUT HERE>>

The effect of committee expertise on certain issues related to external audit is now explored. More specifically, whether committee expertise influences the rotation of the audit firm is now examined (H3). Since the decision to switch the audit firm is a dichotomous variable, Table 9 reports the logit estimates of the model. In no case does the expertise of the audit committee (QUALIF) have any significant relationship with the rotation of the external audit firm (ROTAT), thus rejecting the third hypothesis. To understand the lack of significance of expertise, we need to bear in mind the recent legal changes that have made auditor rotation mandatory and we must also take into account the policies implemented by various European countries regarding this rotation. Although our sample covers the period 2005-2014, prior to the coming into force of Directive 2014/56/EU, in which mandatory auditor rotation was established, large listed firms used to change the external audit firm as proof of independence and good governance. In addition, before said Directive, Italy already complied with mandatory rotation, France had established co-audit firms, and Portugal had included audit rotation on a "comply or explain" rule. Consequently, this lack of relationship could be due to mandatory rotation having been implemented among the most visible firms before the legal mandate was enacted, and to the different legal situations in the various countries at the time.

Indeed, the control variables suggest that the change of external auditor is more frequent among large firms (ASSETS), firms with superior performance (ROA), and among firms with more volatile stock returns (VARIAB), which proxies litigation costs. Despite the lack of significance of the main explanatory variable, the predicting power of the model is highly acceptable since it correctly classifies over 95% of the observations.

<<INSERT TABLE 9 ABOUT HERE>>

As regards audit fees (FEES), Table 10 shows a negative relation between committee expertise (QUALIF) and fees (FEES), in line with hypothesis H4. There are several possible explanations for this result. First, audit committees with more expertise can negotiate more

affordable audit fees. A complementary explanation is that the expertise of audit committee members improves the internal audit process in such a way that it makes the job of the external audit firms less time-consuming. It should be remembered that one of the items considered in the measure of director expertise is experience as an auditor or consultant, which is consistent with these two possible explanations. The negative relation with the size of the committee may be seen as a possible confirmation of this. Whatever the reason, our result suggests that, in line with Krishnan and Visvanathan (2009), audit pricing reflects audit committee effectiveness. Our result deviates from Lin (2018), which may be due to the different metric. Whereas said author proxies audit committee quality with incentive-based compensation, the present study uses the average expertise of the committee. Another difference is the measure of fees, since Lin uses abnormal audit fees.

<<INSERT TABLE 10 ABOUT HERE>>

4.3. Additional Analyses

Our measure of qualification is a continuous variable. Since it is questionable whether a director/committee with, say, an index value of 6 is exactly twice as qualified as a director/committee with an index value of 3, we defined a dummy variable (HIGHQUALIF) that equals one if the variable QUALIF is above the median value. We ran new estimates that are reported in Table 11. For brevity, we only ran the most complete models with all the control variables[15]. The results corroborate previous findings. The HIGHQUALIF variable is positively related to the activity of the committee and negatively related to the dedication of committee members and to audit fees. These results are those expected in hypotheses H1, H2, and H4b. In contrast, more qualified audit committees do not seem to have any statistically significant relationship with the change in the external audit firm.

In a similar vein, we defined the ORDER variable. This variable is the position of each firm-year observation in the qualification ranking of all the committees. It ranges from 1 (the firm-year committee with the lowest qualification) to 2,350 (the most qualified committee in a given year). We then ran similar estimates, whose results are reported in Table 12. Once again, the results support those previously reported: more qualified committees are positively related to the number of meetings and negatively related to the proportion of full-time members and

[15] The results for simpler models are available from the authors upon request.

audit fees (H1, H2, and H4b). We do not find any significant relationship with the decision to change the external audit firm.

Member and audit committee expertise can be gained both through education and experience. In fact, our measure of qualification aggregates the two characteristics. We now wonder whether both sources of expertise are complementary or substitutive. Thus, we define two sub-dimensions of qualification: education-based qualification (EDUCQUALIF) and experience-based qualification (EXPQUALIF). Education-based qualification is the aggregation of the first three components of expertise, whereas the experience-based metric is the aggregation of the last five components of expertise. Accordingly, EDUCQUALIF ranges from 0 to 3, and EXPQUALIF ranges from 0 to 5. Figure 2 shows the evolution of each dimension of expertise. Both components increase slightly during the period, although the increasing trend is more noticeable in the experience-based metric. This may be explained by the fact that education-based expertise only increases with the incorporation of new members who have a better educational background, whereas experience-based expertise increases every year in itself through the work of the director.

In Table 13, we report the estimates of the explanatory analysis using both variables. The results lead to interesting inferences regarding how to gain expertise. For brevity, we only report the results of the most complete model. In column 1, we study the relationship with the number of audit committee meetings. Whereas the education-based dimension has no significant effect, experience-based expertise has a positive relationship, consistent with hypothesis H1. It could be understood as a sign that both types of expertise are not redundant, but bring different views and implications to audit committees. Similarly, in column 4, we study the relationship of both kinds of expertise with audit fees. In this case, while the experience-based component has no significant effect, education-based expertise displays a negative relationship, as stated in hypothesis H4b. It might also suggest that both kinds of expertise play different roles in the board. Thus, to some extent, there seem to be reasons for considering that education and professional experience are two complementary sources of expertise that enrich committee member qualification.

As far as committee member dedication is concerned, both education-based and experience-based expertise seem to play a similar role, since they exhibit a negative relationship, in accordance with hypothesis H2 (column 2 of Table 13). Given the lack of

support for our hypothesis H3 in the baseline estimates, it comes as no surprise that neither type of expertise has a significant relationship with the change of audit firm (column 3).

As robustness checks, we ran some analyses replacing the control variables: litigation risk is controlled for with the proportion of inventories on total assets (INVENT), and company complexity is controlled for with the Herfindahl index (HH5). In all cases, estimates confirm the baseline findings. The results of these analyses are not tabulated but are available from the authors upon request.

5. Conclusion

Audit committees have become a key element in the corporate governance landscape. Consistent with this process, an international wave of legal changes has reinforced the role of the audit committee. These legal improvements seek both to safeguard the independence of the directors and to ensure their ability (i.e., expertise) to provide reliable financial information. Whereas the concept of independence is less subject to debate, measures of expertise prove more controversial.

The European regulator indicated in Recommendation 2005/162/EC that *there is one issue which usually raises particular concern, namely the need for particular competence in the audit committee where some specific knowledge is deemed to be indispensable*. Subsequently, Directive 2014/56/EU confirmed the importance of strengthening the technical competence of audit committees by requiring at least one of their members to be competent in auditing and/or accounting. In addition, it ratified the recommendation concerning board of director responsibility to determine the desired composition of the audit committee and to evaluate it periodically.

This study focuses on the multifaceted notion of expertise and explores some consequences of audit committee member qualifications. More specifically, the relation between audit committee member expertise and said committee's activity and the external audit function is examined. A new and comprehensive metric of expertise is proposed, which includes directors' academic background, professional experience, international experience, and financial knowledge. Personal information on 2,477 directors and corporate information for 296 firms from eight European countries between 2005 and 2014 is subject to thorough processing. Based on this information, a continuous variable is computed to measure the audit committee's average expertise.

Data show a positive trend among large European firms towards more expert audit committees in recent years. Committees with more expertise are found to be more active in terms of meetings, with their directors evidencing less dedication (in terms of fewer directors with full-time dedication and more outside directorships), and lower audit fees being paid. However, no relationship with the change of external audit firm is found. This is likely due to mandatory auditor rotation in certain countries during the period studied. We also split our measure into two components: education-based expertise and experience-based expertise. Our results suggest that both ways of gaining expertise are complementary and bring different competences and skills to the audit committee. Taken together, these results support the view that committee expertise is complementary to other characteristics of good corporate governance and improves the audit process.

Results bear out the importance of the audit committee in corporate governance, and have implications both for firms and for policymakers alike. For the former, the results suggest that the board of directors (and, in particular, nomination committees) should adopt a broad view of the skill matrix of audit committee members, and consider the complementarities among them. For the latter, the pivotal role of the audit committee is confirmed, as is the need to pay further attention to directors' expertise by defining the different competences that must be taken into account and the possible ways in which such expertise may be gained. This implication is especially important in the European environment since, unlike the authorities in the USA[16], the European Commission has not yet specified how audit expertise may be gained.

Certain limitations are apparent in this research which, at the same time, point to several directions for future inquiry. Endogeneity is a frequent concern in the research on corporate governance. However, our research is not affected as much by endogeneity since external legal changes and rules are considered. Nonetheless, future studies that explicitly address endogeneity should confirm the insights presented herein. Future research may also explore the internal dynamics of audit committees. By using individual-level information, future studies

[16] According to SOX and its subsequent revision by the Securities and Exchange Commission (2003), an expert is a person who, through education and experience as a public accountant, auditor, principal financial officer, controller, or principal accounting officer of an issuer, or from a position which involves performing similar functions, has (i) an understanding of generally accepted accounting principles and financial statements; (ii) experience in preparing or auditing financial statements of generally comparable issuers and the application of such principles in connection with accounting for estimates, accruals, and reserves; (iii) experience with internal accounting controls; and (iv) an understanding of audit committee functions.

may shed some light on the types of expertise and the interplay inside the committee among directors who have different backgrounds.

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Appendix: Technical Note

The process of preparing the expertise measure started with the hand collection of the curricula vitae of all the audit committee directors. The information available in the annual reports and the companies' websites was used.

Big data techniques were used to obtain background, experience, and expertise from these directors' curriculum vitae. The information contained in the curriculum vitae was included in a single text and cut into separate words. All of the coincidences were grouped in order to form a ranking of which words were repeated most often throughout the curricula vitae.

The ranking was analysed to identify words associated with qualifications. For example, the words "universität", "university", "master", "PhD", "professor", and so on are related to the "university studies" component. For the "accounting expertise" attribute, the words "accounting", "revisore contabile", "auditor", "Deloitte", "PWC", and so on are identified. "Chief executive officer", "CEO", "directeur general", "Geschäftsführer", and so on are identified for the "CEO expertise" dimension. For the "economic expertise" attribute, the associated words include "economics," "CFA", "Wirtschaft", and so on. For "audit experience", the associated words are "auditor", "vérificateur comptable", "CPA", "Ernst & Young", "KPMG", and so on. Over 600 topics related to academic degrees and work experience are identified herein.

These academic degrees and work experience areas were mapped to each individual director's curriculum vitae, and classified into eight characteristics: (i) a post-secondary degree in corporate business or related fields; (ii) post-graduate studies in corporate business or related fields; (iii) post-graduate studies at a prestigious business school[17]; (iv) experience as a CEO; (v) experience as an auditor or consultant; (vi) international professional experience; (vii) understanding of accounting principles gained as a controller, chief financial officer, chief accounting officer, etc.; and (viii) knowledge of economics acquired through professional experience in economics, finance, or investment banking, or through a university degree in economics. A director obtains a score of 1 for each one of these characteristics if his/her curriculum vitae contained the topics related to this characteristic at least once, and 0 otherwise.

[17] The category of prestigious business schools is based on the Forbes magazine in 2015: INSEAD, London Business School, IESE, IE Business School, IMD, SDA Bocconi, Cranfield, Saïd, Warwick, Lancaster University, and SP Jain.

Consistency tests were carried out to ensure, for example, that a director who reported post-graduate studies would also be considered to have a post-secondary degree even though he/she did not report it.

In addition, each director's curriculum vitae is examined in order to obtain the number of outside directorships held in a given year and to examine their current international position in the board.

Table 1. Sample (number of audit committees) distribution by country and year

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Germany	22	23	26	26	26	29	30	30	29	30	271
Belgium	7	7	6	5	5	5	6	5	4	3	53
Spain	22	26	23	24	28	29	32	30	31	31	276
France	24	28	32	34	34	35	37	37	38	37	336
Netherlands	16	17	16	17	19	19	18	18	20	20	180
Italy	21	23	26	29	29	30	32	32	35	35	292
Portugal	6	10	13	13	14	15	16	12	14	17	130
UK	61	71	76	84	84	83	86	88	88	91	812
Total	179	205	218	232	239	245	257	252	259	264	2,350

Table 2. Expertise requirements by country

Country	Qualification	Source
Germany	Knowledge and experience in accounting and auditing.	Stock Corporation Act
Belgium	Knowledge in accounting, auditing and finance.	Belgian Code on Corporate Governance
Spain	Knowledge and experience in accounting, auditing or risk management	Good Governance Code of Listed Companies
France	Competence in accounting or finance	Corporate Governance Code of Listed Corporations
Netherlands	Financial expertise	Dutch Corporate Governance Code
Italy	Auditor, accounting professor or member of an Italian professional college	Codice Civile
Portugal	Knowledge suited to the duties in hand	Còdigo de Governo das Sociedades
UK	Recent and relevant finance experience	UK Corporate Governance Code
European Union	Technical knowledge in accounting and/or auditing. Education and relevant and pertinent background in finance and accounting.	Commission Recommendation 2005/162/CE

Note: this table reports how the required expertise of audit committee members is defined in each country and in the European Union.

Table 3. Descriptive statistics

	Obs.	Mean	Std. Dev.	Q25	Median	Q75
QUALIF	2,350	4.792	1.209	4.035	5.071	5.580
COMSIZE	2,487	4.207	1.171	3	4	5
ACTIV	1,845	6.041	3.071	4	5	7
DEDIC	2,487	0.722	0.242	0.6	0.75	1
DIRECTORSHIPS	2,487	2.811	2.666	0	2	4
ROTAT	1,724	0.039	0.193	0	0	0
FEE	1,142	0.264	0.231	0.075	0.194	0.402
ASSETS	2,448	4.287	0.758	3.748	4.197	4.722
LEV	2,448	0.673	0.186	0.544	0.675	0.814
ROA	2,435	0.053	0.049	0.015	0.044	0.075
INTERNAT	2,382	0.274	0.305	0	0.2	0.5
VARIAB	1,577	0.008	0.076	0.0001	0.0002	0.0005
RECEIV	1,407	0.107	0.084	0.048	0.089	0.149
INVENT	1,249	0.088	0.108	0.018	0.065	0.122
DIVISIONS	1,360	5.711	2.090	4	6	7
HH5	1,236	0.474	0.205	0.306	0.416	0.593

Note: this table provides the mean, standard deviation, and quartiles of the variables. QUALIF is the average qualification of committee members; COMSIZE is the number of directors on the committee; ACTIV is the number of meetings held by the committee each year, DEDIC is the proportion of committee members with full-time dedication to the committee; DIRECTORSHIPS is the average number of outside directorships of audit committee members; ROTAT is a dummy variable that equals 1 when the audit committee decides to change the audit firm in a given year, and zero otherwise; FEE is the amount of audit fees relative to total assets; ASSETS is the log of total assets; LEV is the debt-to-total assets ratio; ROA is the return on assets; VARIAB is the variance of residuals of the daily firm stock returns regression; RECEIV is the ratio of accounts receivable to total assets; INVENT is the ratio of inventory to total assets ratio; DIVISIONS is the number of segments of the firm; and HH5 is the Herfindahl-Hirschman index of concentration among the five main segments.

Table 4. Correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
QUALIF	0.033	0.030	–0.128***	0.134***	0.023	0.066**	0.110***	0.123	0.026***
COMSIZE (1)		0.050**	–0.008	0.283***	–0.007	–0.067**	0.261***	0.128***	–0.088***
ACTIV (2)			0.118***	–0.114***	0.079***	–0.171***	0.349***	0.258***	–0.228***
DEDIC (3)				–0.863***	0.006	0.022	–0.168***	0.033	–0.038
DIRECTORSHIP(4)					–0.005	–0.057*	0.268***	0.008	–0.010
ROTAT (5)						–0.035	0.008	0.018	0.030
FEES(6)							–0.486***	–0.225***	0.214***
ASSETS (7)								0.534***	–0.451***
LEV (8)									–0.512***

Note: this table provides the correlation coefficients. QUALIF is the average qualification of committee members; COMSIZE is the number of directors on the committee; ACTIV is the number of meetings held by the committee each year; DEDIC is the proportion of committee members with full-time dedication to the committee; DIRECTORSHIPS is the average number of outside directorships of audit committee members; ROTAT is a dummy variable that equals 1 when the audit committee decides to change the audit firm in a given year, and zero otherwise; and FEE is the amount of audit fees relative to total assets; ASSETS is the log of total assets; LEV is the debt-to-total assets ratio; and ROA is the return on assets.

$^{***}p$-value < 0.01. $^{**}p < 0.05$. $^{*}p < 0.10$.

Table 5. Evolution of expertise across countries

	2005	2014	Variation
Germany	4.465	4.427	-0.86%
Belgium	4.189	4.567	9.00%
Spain	4.273	4.607	7.80%
France	4.474	5.105	14.10%
Netherlands	4.829	5.423	12.30%
Italy	5.130	5.356	4.40%
Portugal	3.984	4.114	3.27%
UK	4.801	5.159	7.45%
Sample	**4.641**	**4.975**	**7.21%**

Note: this table provides the average QUALIF value for each country at the start and end of the study period.

Table 6. Test of means comparison

	Less expertise	Greater expertise	*t*-test
COMSIZE	4.16	4.33	–3.573***
ACTIV	5.86	6.14	–1.964**
DIRECTORSHIP	2.64	3.18	–4.863***
DEDIC	0.74	0.69	5.042***
ROTAT	0.03	0.05	–2.010**
FEE	0.29	0.35	–3.013***
ASSETS	4.26	4.35	–2.858***
LEV	0.68	0.67	0.100
ROA	4.56	4.64	–0.385
INTERNAT	0.20	0.33	-10.61***
VARIAB	0.007	0.010	-0.967
RECEIV	0.122	0.099	5.800***
INVENT	0.089	0.087	0.493
DIVISIONS	5.515	5.801	-3.005***
HH5	0.487	0.469	1.934**

Note: this table provides the means of each group and the t-test for the means comparison. The sample is divided according to the average QUALIF (average expertise of committee members). COMSIZE is the number of directors on the committee; ACTIV is the number of meetings held by the committee each year, DEDIC is the proportion of committee members with full-time dedication to the committee; DIRECTORSHIPS is the average number of outside directorships of audit committee members; ROTAT is a dummy variable that equals 1 when the audit committee decides to change the audit firm in a given year, and zero otherwise; and FEE is the amount of audit fees relative to total assets; ASSETS is the log of total assets; LEV is the debt-to-total assets ratio; ROA is the return on assets. INTERNAT is the proportion of foreign directors in the committee; VARIAB is the variance of residuals of the daily firm stock returns regression; RECEIV is the ratio of accounts receivable to total assets; INVENT is the ratio of inventory to total assets ratio; DIVISIONS is the number of segments of the firm; and HH5 is the Herfindahl-Hirschman index of concentration among the five main segments.
$^{***}p$-value < 0.01. $^{**}p < 0.05$. $^{*}p < 0.10$.

Table 7. Effects on audit committee activity

	(1)	(2)	(3)	(4)
QUALIF	0.103**	0.127**	0.102**	0.114*
	(2.084)	(2.547)	(2.002)	(1.935)
ASSETS	0.902***	0.882***	0.777***	0.678***
	(5.082)	(4.807)	(3.716)	(2.976)
LEV	0.548	0.532	0.303	0.477
	(0.994)	(0.958)	(0.519)	(0.731)
ROA	0.013	0.014	0.011	0.013
	(1.070)	(1.141)	(0.882)	(0.907)
COMSIZE	0.029	0.057	0.027	0.075
	(0.563)	(1.121)	(0.499)	(1.181)
INTERNAT	-0.405	-0.660**	-0.415	-0.605**
	(-1.556)	(-2.474)	(-1.557)	(-1.979)
AUDITOR	0.069	0.020	-0.005	0.054
	(0.496)	(0.143)	(-0.037)	(0.315)
VARIAB		26.203***	15.680*	15.147
		(3.330)	(1.811)	(1.552)
RECEIV			0.981	1.196
			(0.910)	(1.025)
DIVISIONS				0.049
				(1.425)
Observations	1,533	1,412	1,209	997
Hausman test	4.37	7.74	13.05	6.52
R^2	0.393	0.397	0.360	0.3546
F-stat	273.9***	257.8***	212.9***	207.1***
VIF	1.42	1.42	1.41	1.52

Note: this table provides the estimated coefficients (t-statistics) by the generalized least squares panel data method. The dependent variable is the number of meetings held by the committee each year (ACTIV). QUALIF is the average qualification of committee members, ASSETS is the log of total assets; LEV is the debt-to-total assets ratio; ROA is the return on assets; COMSIZE is committee size; INTERNAT is the proportion of foreign directors in the committee; AUDITOR is a dummy variable that equals one when the auditee firm provides full information on the external audit firm; VARIAB is the variance of residuals of the daily firm stock returns regression; RECEIV is the ratio of accounts receivable to total assets; and DIVISIONS is the number of segments of the firm. All the estimates include year, industry, and country-dummy variables.
***p-value < 0.01. **p < 0.05. *p < 0.10.

Table 8. Effects on committee member dedication

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
QUALIF	-0.040***	-0.041***	-0.042***	-0.046***	0.091***	0.065**	0.080***	0.106***
	(-7.641)	(-7.387)	(-7.066)	(-7.079)	(3.604)	(2.432)	(2.743)	(3.370)
ASSETS	-0.070***	-0.069	-0.064***	0.059	0.375***	0.347***	0.395***	0.345***
	(-4.773)	(-0.091)	(-3.305)	(0.852)	(5.538)	(4.766)	(4.487)	(3.631)
LEV	0.077	0.065	0.077	0.074	-0.489**	-0.340	-0.230	-0.053
	(1.499)	(1.180)	(1.288)	(1.155)	(-1.998)	(-1.313)	(-0.816)	(-0.175)
ROA	-0.004***	-0.004***	-0.004**	-0.004***	0.006	0.008	0.010	0.007
	(-2.801)	(-2.735)	(-2.468)	(-2.716)	(0.925)	(1.252)	(1.356)	(0.909)
COMSIZE	0.003	-0.001	-0.002	-0.004	0.091***	0.114***	0.137***	0.142***
	(0.518)	(-0.261)	(-0.365)	(-0.582)	(3.583)	(4.279)	(4.619)	(4.391)
INTERNAT	0.102***	0.114***	0.111***	0.122***	-0.042	-0.001	-0.003	-0.036
	(3.775)	(3.861)	(3.571)	(3.586)	(-0.324)	(-0.005)	(-0.018)	(-0.221)
AUDITOR	0.017	0.015	0.013	0.020	-0.216***	-0.165**	-0.250***	-0.230**
	(1.146)	(0.966)	(0.766)	(1.091)	(-2.975)	(-2.208)	(-3.019)	(-2.517)
VARIAB		0.013	0.001	-0.003		-0.219	-0.266	-0.230
		(0.242)	(0.019)	(-0.051)		(-0.806)	(-0.902)	(-0.793)
RECEIV			0.021	0.403**			0.002	-0.503
			(0.191)	(2.513)			(0.003)	(-0.940)
DIVISIONS				-0.004				0.015
				(-1.119)				(0.842)
Observations	2,068	1,888	1,621	1,359	2,068	1,888	1,621	1,359
Hausman test	22.29	31.29*	11.83	196.14***	27.48	40.09**	38.15**	52.55***
R^2	0.158	0.154	0.146	0.171	0.206	0.197	0.196	0.228
F-stat	208.9***	187.1***	160.0***	148.1***	200.3***	174.1***	162.6***	154.2***
VIF	1.31	1.27	1.22	1.23	1.31	1.27	1.22	1.23

Note: this table provides the estimated coefficients (t-statistics) by the within-groups or generalized least squares panel data method depending on the Hausman test. The dependent variable is the proportion of committee members with full-time dedication to the committee (DEDIC) in columns 1-4, and the number of outside directorships (DIRECTORSHIPS) in columns 5-8. QUALIF is the average qualification of committee members, ASSETS is the log of total assets; LEV is the debt-to-total assets ratio; ROA is the return on assets; COMSIZE is committee size; INTERNAT is the proportion of foreign directors in the committee; AUDITOR is a dummy variable that equals one when the auditee firm provides full information on the external audit firm; VARIAB is the variance of residuals of the daily firm stock returns regression; RECEIV is the ratio of accounts receivable to total assets; and DIVISIONS is the number of segments of the firm. All the estimates include year, industry, and country-dummy variables. $^{***}p$-value < 0.01. $^{**}p < 0.05$. $^{*}p < 0.10$.

Table 9. Effects on external auditor rotation

	(1)	(2)	(3)	(4)
QUALIF	0.002	-0.003	-0.004	0.000
	(0.397)	(-0.537)	(-0.652)	(0.033)
ASSETS	0.009	0.016**	0.027**	0.027**
	(1.079)	(2.602)	(2.453)	(2.143)
LEV	0.016	0.012	0.019	-0.015
	(0.435)	(0.307)	(0.467)	(-0.322)
ROA	0.003**	0.003*	0.003**	0.003*
	(2.171)	(1.863)	(2.213)	(1.730)
COMSIZE	0.003	0.003	0.008	0.008
	(0.556)	(0.565)	(1.463)	(1.188)
INTERNAT	-0.033	-0.012	-0.035	-0.037
	(-1.346)	(-0.449)	(-1.252)	(-1.121)
AUDITOR		0.071	0.108	0.111
		(0.911)	(1.305)	(1.305)
VARIAB			8.244**	8.244**
			(2.449)	(2.350)
RECEIV				0.001
				(0.343)
Observations	1,397	1,257	1,047	876
Hausman test	4.96	7.38	5.64	3.46
% correct classification	95.53%	95.63%	95.87%	95.46%
Wald test	65.67***	63.69***	69.19***	54.19***
VIF	1.42	1.42	1.41	1.52

Note: this table provides the estimated coefficients (t-statistics) by the logit panel data method. The dependent variable is the change of the external audit firm (ROTAT). QUALIF is the average qualification of committee members, ASSETS is the log of total assets; LEV is the debt-to-total assets ratio; ROA is the return on assets; COMSIZE is committee size; INTERNAT is the proportion of foreign directors in the committee; AUDITOR is a dummy variable that equals one when the auditee firm provides full information on the external audit firm; VARIAB is the variance of residuals of the daily firm stock returns regression; RECEIV is the ratio of accounts receivable to total assets; and DIVISIONS is the number of segments of the firm. All the estimates include year, industry, and country-dummy variables. The Wald test is a test of joint significance of the estimated coefficients. $^{***}p$-value < 0.01. $^{**}p < 0.05$. $^{*}p < 0.10$.

Table 10. Effects on audit fees

	(1)	(2)	(3)	(4)
QUALIF	-0.009**	-0.008*	-0.009*	-0.012**
	(-2.101)	(-1.817)	(-1.818)	(-2.251)
ASSETS	-0.199***	-0.201***	-0.199***	-0.169***
	(-5.701)	(-5.759)	(-4.413)	(-3.435)
LEV	-0.008	-0.036	-0.043	0.024
	(-0.129)	(-0.572)	(-0.611)	(0.315)
ROA	-0.001	-0.001*	-0.002*	-0.000
	(-1.243)	(-1.647)	(-1.717)	(-0.171)
COMSIZE	-0.014***	-0.015***	-0.017***	-0.006
	(-3.149)	(-3.157)	(-3.240)	(-1.046)
INTERNAT	-0.009	0.002	-0.006	0.002
	(-0.359)	(0.064)	(-0.217)	(0.059)
AUDITOR	-0.035*	-0.036*	-0.043**	-0.035
	(-1.836)	(-1.819)	(-2.027)	(-1.435)
VARIAB		-0.024	-0.029	-0.030
		(-0.528)	(-0.566)	(-0.642)
RECEIV			0.121	-0.406
			(0.568)	(-1.505)
DIVISIONS				-0.001
				(-0.134)
Observations	904	851	728	551
Hausman test	19.15	16.77	23.01	21.07
R^2	0.233	0.238	0.179	0.111
F-stat	3.72***	3.82***	3.38***	1.57**
VIF	1.31	1.27	1.22	1.23

Note: this table provides the estimated coefficients (t-statistics) by the generalized least squares panel data method. The dependent variable is audit fees deflated by total assets (FEES). QUALIF is the average qualification of committee members, ASSETS is the log of total assets; LEV is the debt-to-total assets ratio; ROA is the return on assets; COMSIZE is committee size; INTERNAT is the proportion of foreign directors in the committee; AUDITOR is a dummy variable that equals one when the auditee firm provides full information on the external audit firm; VARIAB is the variance of residuals of the daily firm stock returns regression; RECEIV is the ratio of accounts receivable to total assets; and DIVISIONS is the number of segments of the firm. All the estimates include year, industry, and country-dummy variables.
*** p-value < 0.01. ** $p < 0.05$. * $p < 0.10$.

Table 11. Qualification measured with a dummy variable

	(1) ACTIV	(2) DEDIC	(3) ROTAT	(4) FEE
HIGHQUALIF	0.282**	-0.055***	0.002	-0.022**
	(2.357)	(-3.986)	(0.113)	(-1.977)
ASSETS	0.650***	-0.058***	0.027**	-0.171***
	(2.839)	(-2.856)	(2.133)	(-3.470)
LEV	0.509	0.073	-0.015	0.020
	(0.778)	(1.133)	(-0.321)	(0.261)
ROA	0.013	-0.005***	0.003*	-0.000
	(0.888)	(-2.824)	(1.717)	(-0.129)
COMSIZE	0.074	-0.003	0.008	-0.006
	(1.170)	(-0.443)	(1.186)	(-1.005)
INTERNAT	-0.606**	0.084**	-0.038	-0.000
	(-1.997)	(2.469)	(-1.164)	(-0.002)
AUDITOR	0.063	0.014		-0.038
	(0.372)	(0.758)		(-1.565)
VARIAB	-0.606	-0.000	0.111	-0.032
	(-1.186)	(-0.005)	(1.302)	(-0.664)
RECEIV	1.080	0.195*	-0.013	-0.362
	(0.922)	(1.711)	(-0.182)	(-1.339)
DIVISIONS	0.048	-0.004	0.001	-0.001
	(1.418)	(-1.190)	(0.343)	(-0.323)
Observations	997	1,359	876	551
Hausman test	33.41*	2.48	11.26	40.29**
R^2	0.351	0.160		0.120
VIF	2.79	1.94	2.17	2.89
F-stat	205.5***	113.3***		1.52*
% correct classification			95.46%	
Wald test			54.20***	

Note: this table provides the estimated coefficients (t-statistics) by the generalized least squares panel data method. The dependent variable is the number of meetings held by the committee each year (ACTIV) in column 1, the proportion of committee members with fume dedication to the committee (DEDIC) in column 2, the change of the external audit firm (ROTAT) in column 3, and the audit fees deflated by total assets (FEES) in column 4. HIGHQUALIF is a dummy variable that equals 1 if QUALIF (committee member qualification) is above the median value, ASSETS is the log of total assets; LEV is the debt-to-total assets ratio; ROA is the return on assets; COMSIZE is committee size; INTERNAT is the proportion of foreign directors in the committee; AUDITOR is a dummy variable that equals one when the auditee firm provides full information on the external audit firm; VARIAB is the variance of residuals of the daily firm stock returns regression; RECEIV is the ratio of accounts receivable to total assets; and DIVISIONS is the number of segments of the firm. All the estimates include year, industry, and country-dummy variables.
*** p-value < 0.01. ** $p < 0.05$. * $p < 0.10$.

Table 12. Qualification measured with an order variable

	(1) ACTIV	(2) DEDIC	(3) ROTAT	(4) FEE
ORDER	0.222**	-0.072***	0.001	-0.024***
	(2.186)	(-6.412)	(0.023)	(-2.645)
ASSETS	0.669***	-0.059***	0.027**	-0.171***
	(2.931)	(-2.854)	(2.143)	(-3.491)
LEV	0.485	0.075	-0.015	0.018
	(0.743)	(1.161)	(-0.321)	(0.236)
ROA	0.012	-0.004***	0.003*	-0.000
	(0.847)	(-2.610)	(1.728)	(-0.149)
COMSIZE	0.077	-0.005	0.008	-0.007
	(1.222)	(-0.726)	(1.189)	(-1.073)
INTERNAT	-0.629**	0.118***	-0.037	0.006
	(-2.051)	(3.435)	(-1.122)	(0.185)
AUDITOR	0.057	0.018		-0.035
	(0.338)	(0.953)		(-1.478)
VARIAB	-0.604	-0.002	0.111	-0.031
	(-1.181)	(-0.037)	(1.305)	(-0.655)
RECEIV	1.194	0.169	-0.014	-0.405
	(1.022)	(1.484)	(-0.188)	(-1.505)
DIVISIONS	0.049	-0.004	0.001	-0.000
	(1.427)	(-1.103)	(0.343)	(-0.117)
Observations	997	1,359	876	551
Hausman test	51.2***	57.9***	11.1	19.8
VIF	2.80	1.94	2.17	2.90
R^2	0.354	0.169		0.112
% correct classification			95.46%	
F-stat	206.97***	138.65***		1.66**
Wald test			54.19***	

Note: this table provides the estimated coefficients (t-statistics) by the panel data method. The dependent variable is the number of meetings held by the committee each year (ACTIV) in column 1, the proportion of committee members with fume dedication to the committee (DEDIC) in column 2, the change of the external audit firm (ROTAT) in column 3, and the audit fees deflated by total assets (FEES) in column 4. ORDER is the position of each firm-year observation in the ranking of qualification of all the committees, ASSETS is the log of total assets; LEV is the debt-to-total assets ratio; ROA is the return on assets; COMSIZE is committee size; INTERNAT is the proportion of foreign directors in the committee; AUDITOR is a dummy variable that equals one when the auditee firm provides full information on the external audit firm; VARIAB is the variance of residuals of the daily firm stock returns regression; RECEIV is the ratio of accounts receivable to total assets; and DIVISIONS is the number of segments of the firm. All the estimates include year, industry, and country-dummy variables.
$^{***}p$-value < 0.01. $^{**}p < 0.05$. $^{*}p < 0.10$.

Table 13. Education-based and experience-based expertise

	(1) ACTIV	(2) DEDIC	(3) ROTAT	(4) FEE
EDUCQUALIF	-0.117	-0.043**	-0.526	-0.036**
	(-0.725)	(-2.393)	(-0.791)	(-1.991)
EXPQUALIF	0.278***	-0.071***	0.275	-0.006
	(2.601)	(-5.972)	(0.598)	(-0.560)
ASSETS	0.660***	-0.059***	0.904**	-0.176***
	(2.895)	(-2.860)	(2.351)	(-3.563)
LEV	0.439	0.074	-0.660	0.013
	(0.673)	(1.160)	(-0.419)	(0.164)
ROA	0.012	-0.004***	0.080*	-0.000
	(0.811)	(-2.632)	(1.686)	(-0.198)
COMSIZE	0.080	-0.004	0.216	-0.007
	(1.272)	(-0.674)	(1.233)	(-1.150)
INTERNAT	-0.750**	0.137***	-1.670	-0.006
	(-2.369)	(3.907)	(-1.314)	(-0.173)
VARIAB	-0.604	-0.003	8.227**	-0.030
	(-1.180)	(-0.056)	(2.305)	(-0.629)
RECEIV	1.132	0.174	0.141	-0.428
	(0.970)	(1.529)	(0.056)	(-1.581)
DIVISIONS	0.051	-0.004	0.034	-0.000
	(1.498)	(-1.091)	(0.347)	(-0.074)
AUDITOR	0.054	0.019		-0.036
	(0.315)	(1.028)		(-1.489)
Observations	1,209	1,359	876	551
Hausman test	116.0***	44.58***	12.20	28.06
VIF	2.18	1.97	2.20	2.89
R^2	0.356	0.155		0.312
F-stat	20.6***	2.81***		100.5***
Wald test			54.22***	
% correct classification			95.46%	

Note: this table provides the estimated coefficients (t-statistics) by the panel data method. The dependent variable is the number of meetings held by the committee each year (ACTIV) in column 1, the proportion of committee members with full dedication to the committee (DEDIC) in column 2, the change of the external audit firm (ROTAT) in column 3, and the audit fees deflated by total assets (FEES) in column 4. EDUCQUALIF is the average education-based qualification of committee member, EXPQUALIF is the average experience-based qualification of committee members, ASSETS is the log of total assets; LEV is the debt-to-total assets ratio; ROA is the return on assets; COMSIZE is committee size; INTERNAT is the proportion of foreign directors in the committee; AUDITOR is a dummy variable that equals one when the auditee firm provides full information on the external audit firm; VARIAB is the variance of residuals of the daily firm stock returns regression; RECEIV is the ratio of accounts receivable to total assets; and DIVISIONS is the number of segments of the firm. All the estimates include year, industry, and country-dummy variables. $^{***}p$-value < 0.01. $^{**}p < 0.05$. $^{*}p < 0.10$.

Figure 1. Average value of the expertise measure for each year

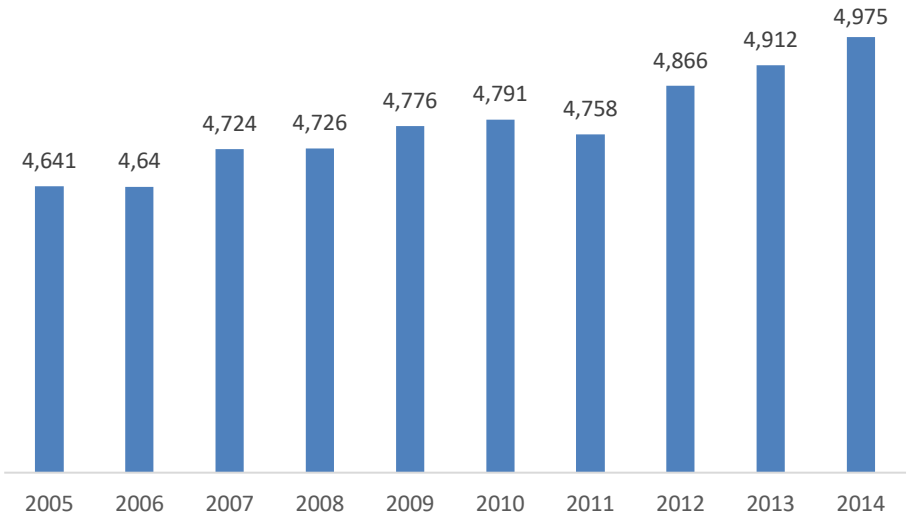

Figure 2. Average value of the education-based and experience-based expertise measure for each year