Female audit committee members and their influence on audit fees

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Abstract

We test the relationship between female representation on the audit committee and audit fees for 624 Australian companies in the year 2011. A positive relationship is found, leading to the conclusion that female presence on audit committees influences the quality of the external audit. Further, we find that gender is the significant audit committee characteristic in predicting audit quality and that women on the audit committee strengthen the positive relationship between firm size and audit fees, and between risk and audit fees. Conversely, we find that female representation dampens the positive relationship between complexity and audit fees.

Key words: Audit fees; Gender; Audit committee; Demand-side approach; Supply-side approach

JEL classification: M42, G34

1. Introduction

The structure and effectiveness of the board of directors and its subcommittees is perhaps one of the most recognised forms of corporate governance (De Lacy, 2005; Connelly *et al.*, 2010). In particular, the audit committee, viewed by many as the most important board subcommittee (Kesner, 1988; Klein, 1998; Xie *et al.*, 2003), has wide-ranging authority over the financial

accountability and reporting process. It appoints, compensates and oversees the work and independence of the external auditor. Furthermore, the audit committee reviews the general purpose financial reports, provides oversight of the internal control and risk management processes and pre-approves all auditing and nonauditing services (Klein, 1998; Aldamen, 2010; Australian Institute of Company Directors, 2011). Certain characteristics, such as independence, expertise and accounting education, are critical to the audit committee's effectiveness (Klein, 2002; Abbott *et al.*, 2004; Krishnan, 2005). However, more recently, gender diversity on boards and committees has gained recognition as one of the factors that increases effectiveness. Female directors on boards can have influence over the level of risk aversion, conservatism when making decisions and the monitoring of management (Thiruvadi and Huang, 2011; Gul *et al.*, 2013). In fact, participation of female directors in subcommittees, such as the audit committee, is not merely a gender equality issue, per se, but a governance issue that requires thorough consideration.

Prior literature provides evidence to support the relationship between female representation on boards of directors and firm-specific variables such as value (Carter *et al.*, 2003), stock returns (Campbell and Mínguez-Vera, 2010), earnings management (Arun *et al.*, 2015), earnings quality (Srinidhi *et al.*, 2011), financial restatements (Abbott *et al.*, 2012) and continuous disclosure compliance (Chapple and Truong, 2015). Female directors exercise better monitoring of management (Adams and Ferreira, 2009), and the likelihood of corporate failure is reduced when female directors sit on boards (Burgess and Tharenou, 2002). Firms with female CEOs report more conservative earnings (Ho *et al.*, 2015) and are more conservative in estimating discretionary accruals (Barua *et al.*, 2010; Peni and Vähämaa, 2010).

The relationship between firm performance and board gender diversity has also been studied extensively over the years, and while positive relationships have been found (for example, Erhardt *et al.*, 2003; Hutchinson *et al.*, 2015), results have certainly been mixed. Adams and Ferreira (2009) show that females have better patterns of attendance at board meetings than males and that gender-diverse boards exercise more effort in their monitoring activities; however, they find that women directors have a negative impact on firm performance. In Denmark where female board representation is very low, gender diversity has no impact on firm performance (Rose, 2007). Using U.S. data, Carter *et al.* (2010) also find no evidence to link board gender diversity with financial performance, and Chapple and Humphrey (2014) arrive at a similar result examining board gender diversity in their Australian study. These inconsistent findings leave the question of whether gender diversity at the board level improves organisational performance undecided and, despite a large body of literature, no definitive conclusions have been reached.

However, a recent meta-analysis of 140 studies between 1997 and May 2014, covering 144 independent samples, and representing over 90,000 firms in 35 countries was conducted by Post and Byron (2015). They sought confirmation

that female board members positively affect firm performance. They found a positive relationship between accounting returns and female board representation, and further, that this relationship was greater in countries with stronger stakeholder protection mechanisms. Their findings about the relationship between female board members and market performance, while slight, were positive in countries where greater gender parity exists but negative in countries with low gender parity. Consequently, it seems appropriate to conclude that female board members do enhance company financial performance but not necessarily company stock market performance.

However, little is known about the impact of gender diversity on the audit committee and proxies of external audit outcomes such as audit fees. Prior studies focus on how female directors influence the effectiveness of the audit committee (Carter *et al.*, 2010; Sun *et al.*, 2011; Thiruvadi and Huang, 2011). They also examine the relationship between various aspects of corporate governance and audit fees (Carcello *et al.*, 2002; Larcker and Richardson, 2004; Boo and Sharma, 2008; Griffin *et al.*, 2008; Bliss, 2011; Chan *et al.*, 2013). However, a specific link between female representation on the audit committee and audit fees is largely unexplored. To date, two studies have been identified in which this relationship is directly investigated. Ittonen *et al.* (2010) examine the relationship between audit committee gender diversity and audit fees in S&P 500 firms. They find that committees with more than one female member or with a single female member serving as chair report lower audit fees. These findings are attributed to increased internal monitoring and improved communication on the part of female members, which lowers perceived audit risk and reduces the need for external audit services. In a conference paper, Sultana and Rahman (2016) followed a line of enquiry similar to ours. They found that audit committees with female representation have higher audit fees and higher abnormal audit fees.

We propose a positive relationship between gender diversity on the audit committee and audit fees. Consistent with the demand-side perspective (Abbott *et al.*, 2003; Goodwin-Stewart and Kent, 2006; Turley and Zaman, 2007), we contend that effective committees will require more services from the external auditor. We base our premise on the notion that female audit committee members will seek higher quality audit information, which in turn will require more audit services, thereby increasing audit fees. Furthermore, we propose that female directors on the audit committee moderate the relationships between audit fees and inherent situational factors such firm size, risk and audit complexity. Thus, we expect that when these situational factors are low, the presence of female directors on the audit committee creates a supply-side effect whereby audit fees decrease due to a reduction in audit risk. However, when the inherent situational factors are high, the presence of females on the audit committee will not reduce audit risk adequately and demand-side effects will result in increased fees.

The importance of this topic stretches beyond bridging the gap in the literature to include the consideration of the rising trend in world markets where gender diversity on boards of directors is encouraged and in some instances, expected. Some countries (e.g. Australia, Canada and the United Kingdom) recommend gender diversity as part of corporate governance best practices (ASX Corporate Governance Council, 2010; Ontario Securities Commission, 2013; Financial Reporting Council, 2014). However, other countries (e.g. Belgium, France, India, Italy, Norway and Spain) have enacted a quota system whereby it is mandatory to maintain a certain number of female directors on the board (Kamonjoh, 2014). Given this increased attention, it is imperative to understand the corporate governance implication of gender diversity on boards of directors and their subcommittees. This study not only contributes to the extant literature by examining the thinly researched topic of the relationship between female representation on the audit committee and audit fees, it also offers world markets empirical evidence that will influence the debate on the importance of gender diversity.

We test the relationship between female representation on the audit committee and audit fees for 624 nonfinancial Australian companies in the year 2011. This year is significant in the Australian context due to the Australian Securities Exchange (ASX) Corporate Governance Council (2010) recommendation that corporate boards should establish measurable objectives to become more diverse in terms of gender and to report on the proportion of women employees in the company. It is expected that after 2010 companies subject to these recommendations will make an effort to increase female participation on their boards and audit committees. Thus, our study examines this issue at a critical turning point in the composition of audit committees.

Using OLS regression, we confirm our first proposition by demonstrating a positive relationship between the presence of females on the audit committee and the fees charged by the auditor. This finding provides support for the demand-side argument that female representation on audit committees results in a committee that requires more services from the external auditor, resulting in higher audit fees. Additionally, we use interaction terms to examine our second proposition regarding the moderating role of female audit committee members on the relationship between the three situational characteristics (firm size, firm risk and audit complexity) and audit fees. We find that in the presence of low size and low risk, there is support for the supply-side argument in that fees are lower when there are females on the audit committee. In the presence of high size and high risk, we find support for the demand-side argument in that fees are higher when women serve on the audit committee. However, in examining audit complexity, we find the opposite. Female representation dampens the positive relationship between complexity and audit fees, resulting in higher fees for low complexity audits and lower fees in high complexity audits when women are on the committee.

The remainder of the paper proceeds as follows. Section 2 provides a review of prior literature, presents a theoretical link between female representation on the audit committee and audit fees, and states our hypotheses. Section 3 details the research design. Section 4 describes the results of the analysis. Finally, Section 5 offers a discussion of the results and the conclusion to the paper in which contributions and limitations of our study are described.

2. Literature review, theoretical foundation and hypotheses

The board of directors and subcommittees such as audit committees are chief mechanisms that play an important monitoring role on behalf of shareholders. From an agency theory perspective, corporate governance mechanisms provide independent substantive oversight of management's activities, which should protect shareholder interests. Including female board members on the audit committee not only adds diversity, but also strengthens the monitoring efforts of the board (Adams and Ferreira, 2009). However, institutional theory provides a different view to female representation on boards and subcommittees. According to the theory, firms' concern for their perceived legitimacy prompts their adoption of various policies and procedures that conform to other organisations' actions (Meyer and Rowan, 1977; DiMaggio and Powell, 1983; Cohen *et al.*, 2008; Beasley *et al.*, 2009). Dunn (2012) proposes that rather than focusing on operational improvements, firms that emulate others' practices do so for reasons of survival. They wish to avoid their activities being challenged, and thus create a perception of lower uncertainty and risk, and consequently gain greater access to key resources (Dunn, 2012). Others contend that mimicking behaviour is mostly for ceremonial purposes and some research has questioned whether the very existence of audit committees is largely for ceremonial purposes rather than for effective monitoring of financial reporting (Cohen *et al.*, 2008; Beasley *et al.*, 2009). Whatever the reason, the incidence of females on corporate boards and subcommittees continues its upward trend as companies follow the lead of others and conform to regulatory requirements in increasing gender diversity in corporate governance.

Long before corporate governance principles and recommendations were established, researchers asserted that the scope or extent of an external audit is directly influenced by the audit committee (Kalbers and Fogarty, 1993; Collier and Gregory, 1996; Carcello *et al.*, 2002; Goodwin-Stewart and Kent, 2006). This is a credible notion as the audit committee possesses and exercises powers with regard to supporting and promoting audit quality and in determining the scope and adequacy of the external audit. Audit committees also have rights to obtain information from internal and external auditors and to make recommendations to the board on issues that include the appointment or dismissal of external auditors (Australian Institute of Company Directors, 2011). Thus, the audit committee holds a position of power and influence over the quality of audit demanded from the external auditor. Further, the general belief is that

effective audit committees influence the level of audit coverage and thus audit fees. Given the authority assigned to an audit committee in performing its oversight role of the financial reports, this is reasonable and is supported by research evidence (Carcello *et al.*, 2002; Abbott *et al.*, 2003; Turley and Zaman, 2007; Hay *et al.*, 2008; Beasley *et al.*, 2009).

The study of gender diversity of audit committees in relation to external audit fees is relatively new, and only two studies have been identified that address this topic. In one study, Ittonen *et al.* (2010) find that external audit fees are lower when there are women on the audit committee and suggest this is due to women enhancing the monitoring activities of the audit committee. However, this is inconsistent with the findings of Gul *et al.* (2008) which explores female board members' impact on audit effort. Gul *et al.* (2008) found that audit fees are higher with female board membership and suggest that female membership influences higher demand for audit effort. The Sultana and Rahman (2016) conference paper also found higher audit fees in the presence of female audit committee members but did not explicitly link this to female audit committee members demanding more audit effort.

2.1. Characteristics of female board members

Archival researchers do not generally have access to private information regarding board decision-making, and this makes the dynamics of mixed gender representation in the boardroom difficult to observe and measure. As a result, research has often focused on identifying differences between the characteristics of board members of each gender. A plethora of literature in the psychology and business disciplines examines differences in attitudes, characteristics and decision-making across gender. These studies show that women possess certain qualities that differ from, or are of different levels than, those possessed by men and find this works to the company's benefit in various ways. For example, women's communication capabilities are more effective (Wood *et al.*, 1985) and female directors are more inclined to ask questions that men would not ask (Konrad *et al.*, 2008). Board oversight is improved with female participation (Thomas and Ely, 1996; Srinidhi *et al.*, 2011). This increases board independence which in turn has a positive influence on firm value (Carter *et al.*, 2003).

Females working as a group may provide better solutions to a problem (Wood *et al.*, 1985). Wood *et al.* (1985) conducted a psychology experiment and found that while all male groups generated more solutions to a problem, higher quality solutions were generated by female groups. A positive influence on firm performance is evident when the board consists of a higher percentage of women rather than a single female director (Campbell and Mínguez-Vera, 2008). Konrad *et al.* (2008) determined that two women on a board are better than one because they have a larger impact on the board than a single woman and that three women (the 'magic number') are better than two. They suggest

that, from a group dynamics perspective, a critical mass of three or more females might have a noticeable bearing on boardroom content and dynamics. Furthermore, they found that more varieties of topics are discussed when three or more women are on the board and that this helps the board to focus on longer-term sustainable performance. Joecks *et al.*'s (2013) research of German firms found that it takes a critical mass of three female directors before higher firm performance is achieved. It is noted, however, that Germany has a dualistic corporate governance system and different results might be observed in different corporate governance systems.

Female board presence disrupts groupthink and promotes a slower pace of decision-making (Robinson and Dechant, 1997; Daily *et al.*, 2003; Abbott *et al.*, 2012). Females have a higher quality decision-making capability and are more likely to challenge the conventional decision-making processes because they feel significantly less constrained by the use of rules, regulations and other traditional ways that dominate the typical normative reasoning of male decision-making (Bart and McQueen, 2013). Women also are more likely to engage in participative decision-making (Mano-Negrin and Sheaffer, 2004). Further, female directors are said to be better directors as they are significantly more likely to consider the interests of multiple stakeholders and consistently make fairer decisions when competing interests are at stake (Bart and McQueen, 2013). These practices promote better corporate governance.

Numerous studies have also found that women have a lower preference for risk (e.g. Johnson and Powell, 1994; Powell and Ansic, 1997; Jianakoplos and Bernasek, 1998; Barber and Odean, 2001; Dwyer *et al.*, 2002; Hallahan *et al.*, 2004; Watson and McNaughton, 2007; Thiruvadi and Huang, 2011; Charness and Gneezy, 2012) and make more conservative decisions than men (Powell and Ansic, 1997; Levin *et al.*, 1998; Byrnes *et al.*, 1999; Schubert, 2006; Watson and McNaughton, 2007). Conservatism in risk preferences is likely to lower the potential for bankruptcy. Furthermore, Lord Davies (2011) report on women board members referred to a study by a Leeds University Business School that found that having one female director reduced the chances of bankruptcy by 20 percent, and this was reduced even further if there were two or three females on the board.

It is not surprising that, given the qualities women are likely to bring to the corporate boardroom and their contributions to corporate governance, they are taking part in important subcommittees such as the audit committee. However, despite the important role of this committee and calls for greater diversity in audit committee composition, research in this area is fairly limited. Thiruvadi (2012) finds that gender-diverse audit committees are more likely to display diligence by meeting more often. Attributes associated with women such as a questioning nature, communication skills, commitment to duty, and fair and morally consistent decision-making are essential to effective corporate governance and are likely to increase the effectiveness of an audit committee in implementing board policy and governance. Virtanen's (2012) finding that

female board members take more active roles on the board supports the supposition that females bring the same qualities to their subcommittee positions and influence the extent of internal and external monitoring demanded by the audit committee. Given that women are also more conscientious (Schmitt *et al.*, 2008) and take their responsibilities more seriously (Fondas and Sassalos, 2000), it is plausible that they would also demand more detailed and extensive audits. Consistent with the increased audit fees found to be correlated with female board membership (Gul *et al.*, 2008) and female audit engagement partners (Ittonen and Peni, 2012), it is reasonable to assume that female representation on the audit committee may also lead to increased audit fees.

2.2. Hypotheses

Given the traits demonstrated by women in corporate governance positions, it seems plausible that female presence on the audit committee would increase its effectiveness. This is in line with a Thiruvadi and Huang (2011) study, which suggests a positive link between female presence on the audit committee and audit quality. Female attributes of diligence, independence, conservatism and risk aversion demonstrated in previous studies suggest that women audit committee members would demand a higher level of audit quality and require more detailed work by the external auditor. This increased audit effort would result in higher audit fees than those for companies with all-male audit committees.

We posit that in a gender-diverse audit committee, a higher quality audit will be demanded increasing the level and scope of services required of external auditors and manifesting in higher audit fees. Consistent with the preponderance of the results of studies of audit committee effectiveness, we hypothesise the following:

H1: There is a positive relationship between female presence on the audit committee and audit fees.

Previous literature postulates two approaches to explain the effect of audit committee effectiveness on audit fees: the demand-side and the supply-side arguments. Demand-side arguments contend that more effective audit committees command more external audit effort, driving up audit fees (Carcello *et al.*, 2002; Gul *et al.*, 2008; Zaman *et al.*, 2011). On the other hand, supply-side arguments (Abbott *et al.*, 2003; Stewart and Munro, 2007; Munro and Stewart, 2011) posit that effective audit committees better monitor the financial reporting process and communicate better with the auditors, thereby reducing audit risk. High-risk audits result in higher fees by requiring more audit procedures. When effective audit committees reduce the audit risk, the extent of audit work from the auditor's perspective is reduced, thus lowering audit fees (Krishnan and Visvanathan, 2009).

Studies investigating the impact of audit committee effectiveness on audit fees take one approach or the other, treating the supply-side and demand-side arguments as competing theories and findings exist to support each. Krishnan and Visvanathan (2009) acknowledge that these are complementary rather than competing theories yet they do not approach them as such. We posit that the conflicting findings in the past are a result of not considering the interplay of these two approaches and we propose a unified model of the impact of audit committee effectiveness on audit quality that incorporates both approaches (see Figure 1).

Consistent with the demand-side argument, the model proposes a positive relationship between audit committee effectiveness and audit effort, which in turn is positively related to audit fees. In addition, the model incorporates the supply-side argument by proposing a negative relationship between audit committee effectiveness and audit risk. Audit risk has a direct, positive relationship with audit fees due to risk premiums (Jiang and Son, 2015) and auditor experience (Cahan and Sun, 2014) necessary in risky audits. Risk also impacts audit fees indirectly via a positive relationship with audit effort because risky audits require more effort. Thus, we contend audit fees are driven by both audit effort and degree of audit risk. Furthermore, each of these is influenced by the effectiveness of the committee.

While an effective committee may reduce the control risk component of audit risk, the inherent risk component is unaffected and remains. Inherent risk is a result of situational factors such as firm size and firm risk, as well as audit complexity, which are specific to the organisation and its business environment. The inherent risk for each organisation is different, and in some situations, an effective committee may mitigate the risk sufficiently to effect lower audit fees even in the face of increased audit effort. However, in other situations, the risk may be so great that even a high degree of audit committee effectiveness may not counteract the necessity for extensive and expensive audit procedures.

Several conditions contribute to the level of inherent risk, and subsequently, the external audit work required. The seminal study by Simunic (1980) shows
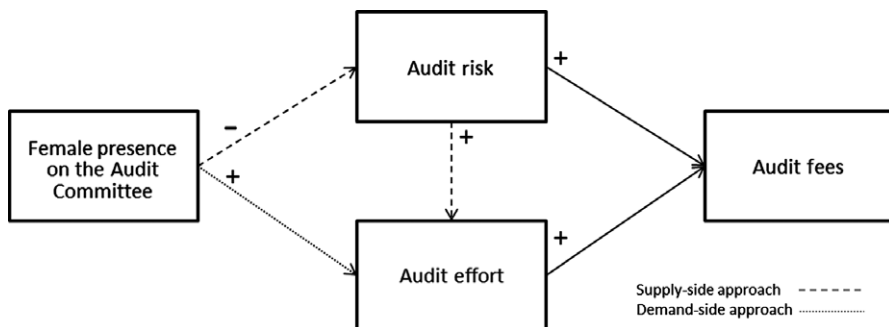

Figure 1 Unified model of supply-side and demand-side theories of audit committee effectiveness.

that firm size and risk, as well as audit complexity are primary factors that explain audit fees. Later studies by Francis and Simon (1987) and Simon and Francis (1988) further support the importance of those factors. The underlying argument is that as firm size increases so does the number of transactions that need to be audited. Furthermore, companies that are risky stand to undergo bankruptcy, which might subject the auditor to reputational damage or litigation. This will encourage the audit firm to conduct more thorough investigations to protect themselves from this possibility. A similar argument is also made for firms that maintain complex operations. Those firms will most likely require extensive reporting and record keeping. As a result, the auditor will need to allocate additional time and resources to examine those records (Ittonen *et al.*, 2010; Loukil, 2014). In each of these cases, we propose that inherent risk will be high, increasing overall audit risk.

We propose that in a mixed gender audit committee, a higher quality audit will be demanded in these high-risk situations increasing the level and the scope of services required of external auditors and will manifest in higher audit fees (demand-side argument). Simultaneously, greater monitoring of managerial behaviour will occur when females are present on the audit committee; this will reduce control risk (supply-side argument). However, we contend that the reduction in control risk will not be sufficient to mitigate the increase in audit risk created by the higher inherent risk. Thus, we expect that when inherent risk is high, fees will be higher when there are females on the audit committee than for all-male audit committees.

On the other hand, while we expect committees with female members to demand more audit effort than all-male committees, when inherent risk factors are low, we expect audit committees with females to request fewer procedures than they do in high-risk situations. In addition, female presence on the committee will effect increased monitoring and better communication with the auditors, resulting in decreased control risk. The combination of decreased control risk with already low inherent risk will result in audit risk low enough to mitigate the demand for additional procedures. Thus, we expect that when inherent risk is low, fees will be lower when there are females on the audit committee than for all-male audit committees. Therefore, we hypothesise:

H2: Female presence on the audit committee will strengthen the positive relationship between inherent risk factors and audit fees.

3. Research design

3.1. Sample selection

The initial sample includes all companies with audit committees listed on the Australian Securities Exchange in the year 2011. The year 2011 has a special

significance as it was the first year companies were expected to report the diversity of their boards of directors including female representation on the board and subcommittees (ASX Corporate Governance Council, 2010). After excluding companies from the financial sector and companies with missing information, the final sample comprises 624 companies. The data used in the study come primarily from notes in the annual reports, while other information is obtained from Thomson Reuter's BoardRoom, SandP's Capital IQ and Morningstar's FinAnalysis databases.

3.2. Measurement of variables

Consistent with prior studies, the dependent variable, audit fees, is measured as the natural log of fees paid to auditors (Carcello *et al.*, 2002; Loukil, 2014). We use the variable *AUD_FEES* to designate audit fees. The independent variable female representation on the audit committee, represented by *FEM_CODE*, is a dichotomous variable that indicates whether females are present on the audit committee or not (Ittonen *et al.*, 2010; Abbott *et al.*, 2012). In line with previous studies, variables for characteristics related to audit committee effectiveness are included. These are independence, experience and education (Abbott *et al.*, 2003; Vafeas and Waegelein, 2007; Ittonen *et al.*, 2010). Audit committee independence, *AC_INDP*, is measured as the proportion of audit committee members that are independent and nonexecutive. Audit committee experience, *AC_EXP*, is operationalised as the proportion of audit committee members that have board experience. Audit committee education, *AC_EDU*, is measured as the proportion of audit committee members with an accounting or finance degree or who have an accounting-related professional certification (e.g. CPA, CMA or CFA).

We also include variables representing the firm's situational audit risk factors: firm size, firm risk and audit complexity (Simunic, 1980; Carcello *et al.*, 2002; Kane and Velury, 2004; Lee and Mande, 2005; Loukil, 2014). Firm size, *SIZE*, is measured as the natural log of total assets. Leverage, *LEV*, is the proxy for firm risk which is measured as total debt divided by total assets. Complexity, *INVREC*, is measured as total inventory and receivables divided by total assets.

Finally, we control for four additional firm-specific characteristics: the type of auditor, firm performance, liquidity and industry. The variable *BIG4* is used to proxy the type of auditor. It equals one if the auditor is a Big Four accounting firm and zero otherwise. Performance, *ROA*, is measured as the return on assets which is earnings before interest and tax divided by total assets. Liquidity, *CR*, is represented by the current ratio which is measured as total current assets divided by total current liabilities. Industry is controlled for using industry fixed effects. This is conducted by the use of $K-1$ industry dummy variables.

3.3. Method

The study uses univariate, bivariate and multivariate analyses to test the hypotheses presented in the previous section. Univariate analysis is carried out through ANOVA to test whether the means of the variables are different for companies that have female representation on the audit committee relative to those that do not. Additionally, we conduct ANOVA on all variables to determine whether differences exist based on the presence of firm size, risk and audit complexity. Bivariate analysis is carried out in the form of Pearson's correlation analysis. Multivariate analysis is conducted via the estimation of the following OLS regression model:

$$
\begin{aligned}
AUD\_FEES = \beta_0 &+ \beta_1 FEM\_CODE_i + \beta_2 AC\_INDP_i + \beta_3 AC\_EXP_i \\
&+ \beta_4 AC\_EDU_i + \beta_5 SIZE_i + \beta_6 LEV_i + \beta_7 INVREC_i \\
&+ \beta_8 BIG4_i + \beta_9 ROA_i + \beta_{10} CR + Industry\ fixed\ effects + \varepsilon_i.
\end{aligned}
$$

$$(1)$$

where AUD_FEES_i = Natural log of audit fees for firm i. FEM_CODE_i = One if at least one audit committee member is female and zero otherwise for firm i. AC_INDP_i = Proportion of audit committee members that are independent and nonexecutive for firm i. AC_EXP_i = Proportion of audit committee members that have board experience for firm i. AC_EDU_i = Proportion of audit committee members with a finance or accounting degree (or have CPA, CMA or CFA) for firm i. $SIZE_i$ = Natural log of total assets for firm i. LEV_i = Total debt to total assets for firm i. $INVREC_i$ = Inventory and receivables divided by total assets for firm i. $BIG4_i$ = One if the auditor for firm i is a Big Four auditor and zero otherwise. ROA_i = Earnings before interest and tax divided by total assets for firm i. CR_i = Total current assets divided by total current liabilities for firm i. *Industry fixed effects* = $K - 1$ industry dummy variables.

In line with prior studies, we expect that factors such as firm size, firm risk and audit complexity play an important role in determining audit fees (Simunic, 1980; Carcello *et al.*, 2002; Kane and Velury, 2004; Lee and Mande, 2005; Loukil, 2014). Two methods are used to examine the impact of these factors.

The first method is to split the sample into three pairs of subsets based on the median values of the three inherent risk factors mentioned above. The sample is split into small and large-sized companies; low- and high-risk companies; and low and high complexity audits. The model is then estimated for each subset separately, and the results are examined to identify differences in the subset pairs.

The second method is to introduce interaction terms to the model. The first interaction term, *SIZE_INTR*, is *FEM_CODE* multiplied by *SIZE*. This

interaction term is used only when testing the impact of female committee representation in the presence of company size. The second interaction term, *RISK_INTR*, is *FEM_CODE* multiplied by *RISK*. This interaction term is used only when testing the impact of female committee representation in the presence of company risk. The third interaction term, *INVREC_INTR*, is *FEM_CODE* multiplied by *INVREC*. This interaction term is used only when testing the impact of female committee representation in the presence of complexity.

4. Results

4.1. Descriptive statistics

The descriptive statistics for all the companies in the sample are reported in Panel A, Table 1. The mean for audit fees is 5.031, and the standard deviation is 0.514. Approximately fifteen percent (15.4 percent) of the companies have at least one female member on the audit committee. These results indicate that female representation is fairly modest and that the vast majority of companies do not have female board members on the audit committee. Reported next are the variables representative of characteristics related to the effectiveness of the audit committee. The mean proportion of independent audit committee members is 58.6 percent; the mean proportion of members with board experience is 47.0 percent; however, the mean proportion of members with accounting educational credentials is only 25.9 percent. These percentages indicate that the composition of audit committees varies across the three effectiveness proxies. The mean natural log of total assets, which represents company size, is 7.816. The risk variable suggests that, on average, 40 percent of assets are financed through debt. On average, receivables and inventory represent 18 percent of total assets and almost 50 percent of all companies have a Big Four auditor. Average performance, measured by return on assets, is -29.2 percent. Finally, the mean for the liquidity variable shows that current assets are more than six times greater than current liabilities.

Panel B, Table 1, shows the descriptive statistics for companies that have females on the audit committee ($n = 96$). The overall results suggest that these companies have certain characteristics that distinguish them from other companies. The mean for audit fees is 5.439, and the standard deviation is 0.615. The mean proportion of independent audit committee members for these companies is 61.8 percent, while the mean proportion of members with board experience is 52.4 percent. The mean proportion of members with accounting educational credentials is 24.1 percent. The mean for company size, risk, complexity, having a Big Four auditor, profitability and liquidity is 8.150, 0.352, 0.291, 0.720, -0.0006 and 4.947, respectively. However, the statistical significance in these differences requires the use of ANOVA analysis.

Table 1
Descriptive statistics

	N	Mean	Median	SD	Minimum	Maximum
Panel A: All companies						
AUD_FEES	624	5.031	4.941	0.514	2.732	7.158
FEM_CODE	624	0.154	N.A.	N.A.	N.A.	N.A.
AC_INDP	624	0.586	0.667	0.392	0.000	1.000
AC_EXP	624	0.470	0.500	0.351	0.000	1.000
AC_EDU	624	0.259	0.250	0.282	0.000	1.000
SIZE	624	7.816	7.722	0.974	4.263	11.071
LEV	624	0.400	0.267	0.906	0.007	10.000
INVREC	624	0.179	0.086	0.489	0.000	11.462
BIG4	624	0.494	N.A.	N.A.	N.A.	N.A.
ROA	624	−0.292	−0.030	1.899	−35.718	0.969
CR	624	6.689	2.215	13.968	0.000	226.060
Panel B: Female representation on audit committees						
AUD_FEES	96	5.439	5.412	0.615	4.228	7.158
AC_INDP	96	0.618	0.667	0.387	0.000	1.000
AC_EXP	96	0.524	0.500	0.323	0.000	1.000
AC_EDU	96	0.241	0.200	0.273	0.000	1.000
SIZE	96	8.510	8.526	1.077	6.065	11.071
LEV	96	0.352	0.368	0.228	0.009	0.899
INVREC	96	0.291	0.102	1.166	0.000	11.462
BIG4	96	0.720	N.A.	N.A.	N.A.	N.A.
ROA	96	−0.006	0.054	0.222	−1.196	0.578
CR	96	4.947	1.790	7.842	0.160	49.140

AUD_FEES = Natural log of audit fees, *FEM_CODE* = 1 if one audit committee member is female and zero otherwise, *AC_INDP* = Proportion of audit committee members that are independent and nonexecutive, *AC_EXP* = Proportion of audit committee members that have board experience, *AC_EDU* = Proportion of audit committee members with a finance or accounting degree (or have CPA, CMA or CFA), *SIZE* = Natural log of total assets, *LEV* = Total debt to total assets, *INVREC* = Total inventory and receivables divided by total assets, *BIG4* = One if the auditor is a Big Four and zero otherwise, *ROA* = Earnings before interest and tax divided by total assets, *CR* = Total current assets divided by total current liabilities.

Recall that 96 (15.4 percent) companies from our sample of 624 have female audit committee representation. Table 2 provides more detailed information. When gender diversity is present on the audit committee, the number of female audit committee members ranges from one to four. While only one company (1 percent) in the sample has four female audit committee members, two companies (2 percent) have three females, thirteen (14 percent) have two females, and the overwhelming majority (80 companies or 83 percent) have only one female member.

Table 2
Demographics of audit committees with female members

	Female members	Number of firms	% of Females
Committee composition			
One female	80	96	83
Two females	13	96	14
Three females	2	96	2
Four females	1	96	1
Situational factors			
Large size	69	312	22
Small size	27	312	9
High risk	59	312	19
Low risk	37	312	12
High complexity	53	312	17
Low complexity	43	312	14
Industry			
Energy	11	92	12
Materials	20	224	9
Industrial	14	97	14
Consumer Discretionary	19	71	27
Consumer staples	5	16	31
Health care	13	52	25
Information Technology	4	40	10
Telecom	3	14	21
Utilities	7	18	39

Table 2 also provides a breakdown of female representation based on situational factors. The majority of females represented on the audit committee are found in large, high-risk and high complex companies. In terms of company size, 22 percent of large size companies have females on the audit committee as opposed to only 9 percent for small size companies. For risk, these percentages are 19 and 12 percent, respectively. As for complexity, companies with females on the audit committee represent 17 and 14 percent of high and low complexity companies, respectively.

The largest number of companies with females on the audit committee is found in the Materials industry ($n = 20$). However, as the Materials industry is the largest amongst all other industries, the percentage of female representation in this industry relative to other industries is in fact the lowest (9 percent). On the other hand, seven of 18 companies in the Utilities industry have females on the audit committee, thus making it the industry with most female presentation (39 percent).

4.2. ANOVA results

ANOVA is used to assess variations in the means for the variables based on the presence or absence of female members on audit committees. However, there is an issue of unequal sample sizes as the number of audit committees that

Table 3
Brown-Forsythe ANOVA for variables in the presence of female audit committee members

FEM_CODE

Variable	Factor	Mean	SD	ANOVA F
AUD_FEES	No female	4.957	0.456	**53.457*****
	Female	5.439	0.615	
	All	5.031	0.514	
AC_INDP	No female	0.581	0.394	0.765
	Female	0.618	0.387	
	All	0.586	0.392	
AC_EXP	No female	0.460	0.355	3.151
	Female	0.524	0.323	
	All	0.470	0.351	
AC_EDU	No female	0.263	0.284	0.496
	Female	0.241	0.273	
	All	0.259	0.282	
SIZE	No female	7.689	0.899	**49.485*****
	Female	8.510	1.077	
	All	7.816	0.974	
LEV	No female	0.409	0.980	1.358
	Female	0.352	0.228	
	All	0.400	0.906	
INVREC	No female	0.158	0.188	1.238
	Female	0.291	1.166	
	All	0.179	0.489	
BIG4	No female	0.453	0.498	**27.255*****
	Female	0.719	0.452	
	All	0.494	0.500	
ROA	No female	−0.344	2.059	**13.338*****
	Female	−0.006	0.222	
	All	−0.292	1.899	
CR	No female	7.006	14.795	**4.019****
	Female	4.947	7.842	
	All	6.689	13.968	

This table presents Brown-Forsythe ANOVA due to the unequal groups of female and nonfemale audit committee members (96 with females and 528 with no females). Additionally, this test is used due to the lack of homogeneity of variances between the groups of female and nonfemale audit committee members. Refer to Table 1 for definitions of variables. ***, **Significant at 1, 5 percent, two-tailed, respectively (presented in bold).

have female members is much fewer than the number of audit committees that do not. As a result, we use Brown-Forsythe ANOVA to address this concern. The results reported in Table 3 suggest that there is a significant difference in the means for *AUD_FEES* across the two subsets ($p < 0.01$). This indicates that audit fees are higher for companies that have female representation on the audit committee relative to other companies. ANOVA results also show that the means for *SIZE*, *BIG4* and *ROA* are significantly different for companies that have female audit committee members versus committees that do not ($p < 0.01$). This shows that firms with females on the audit committee tend to be larger, to have a Big Four auditor and to be more profitable than firms with all-male audit committees. Additionally, the results in Table 3 show that there is a significant difference in the means for *CR* ($p < 0.05$). This indicates that firms with females on the audit committee tend to be more liquid than companies without female audit committee members.

ANOVA is also conducted to assess differences in variable means in the presence of company size, company risk and audit complexity as shown in Table 4. Sample sizes are equal in this analysis as the total sample is split at the median. The results demonstrate that there are significant differences in means for *AUD_FEES, FEM_CODE, AC_INDP, BIG4, ROA* and *CR* ($p < 0.01$) based on firm size. Audit fees are significantly higher for larger companies. Furthermore, larger companies are more likely to have female audit committee members, independent audit committee members, a Big Four auditor, higher profitability and less liquidity. Table 4 also presents ANOVA results for company risk. The results indicate that significant differences exist for means of *AUD_FEES, AC_INDP, SIZE, INVREC, BIG4* and *CR* ($p < 0.01$) as well as *FEM_CODE* and *AC_EDU* ($p < 0.05$). These findings suggest that higher audit fees are paid by companies that have greater risk relative to other companies. Furthermore, female presence on the audit committee, higher levels of independence and education on the audit committee, larger size, higher audit complexity, having a Big Four auditor and less liquidity are found in riskier companies relative to other companies.

A similar ANOVA is conducted to assess the differences in the variable means in the presence of audit complexity. The ANOVA results for the means of high versus low complexity firms are presented in Table 4. These results indicate that the means for *AUD_FEES, SIZE, LEV, BIG4* and *CR* are significantly different based on the complexity of the audit as measured by *INVREC* ($p < 0.01$). This suggests that audit fees are higher for more complex audits relative to other audits. Furthermore, firms with more complexity are larger, have higher risk and tend to retain a Big Four auditor. However, the mean liquidity is much lower for high complexity firms versus low complexity firms.

Table 4
ANOVA for variables for different-sized companies, level of risk and complexity

Firm size					Risk					INVREC				
Variable	Factor	Mean	SD	ANOVA F	Variable	Factor	Mean	SD	ANOVA F	Variable	Factor	Mean	SD	ANOVA F
AUD_FEES	Small	4.712	0.297	392.02***	AUD_FEES	Low	4.802	0.378	154.73***	AUD_FEES	Low	4.857	0.460	80.280***
	Large	5.350	0.486			High	5.260	0.530			High	5.205	0.507	
	All	5.031	0.514			All	5.031	0.514			All	5.031	0.514	
FEM_CODE	Small	0.087	0.282	22.427***	FEM_CODE	Low	0.119	0.324	5.996**	FEM_CODE	Low	0.138	0.345	1.230
	Large	0.221	0.416			High	0.189	0.392			High	0.170	0.376	
	All	0.154	0.361			All	0.154	0.361			All	0.154	0.361	
AC_INDP	Small	0.515	0.398	21.547***	AC_INDP	Low	0.540	0.396	8.880***	AC_INDP	Low	0.576	0.397	0.412
	Large	0.658	0.374			High	0.633	0.384			High	0.596	0.388	
	All	0.586	0.392			All	0.586	0.392			All	0.586	0.392	
AC_EXP	Small	0.451	0.359	1.862	AC_EXP	Low	0.463	0.357	0.269	AC_EXP	Low	0.485	0.337	1.127
	Large	0.489	0.342			High	0.477	0.344			High	0.455	0.364	
	All	0.470	0.351			All	0.470	0.351			All	0.470	0.351	
AC_EDU	Small	0.248	0.294	0.952	*AC_EDU	Low	0.227	0.265	8.022**	AC_EDU	Low	0.248	0.286	0.986
	Large	0.270	0.270			High	0.291	0.295			High	0.27	0.278	
	All	0.259	0.282			All	0.259	0.282			All	0.259	0.282	
SIZE					SIZE	Low	7.499	0.736	73.489***	SIZE	Low	7.702	0.952	8.630***
						High	8.132	1.076			High	7.929	0.984	
						All	7.816	0.974			All	7.816	0.974	
LEV	Small	0.423	1.260	0.408	LEV	Low				LEV	Low	0.284	0.805	10.411***
	Large	0.377	0.240			High					High	0.516	0.985	
	All	0.400	0.906			All					All	0.400	0.906	
INVREC	Small	0.184	0.672	0.084	INVREC	Low	0.120	0.657	9.020***	INVREC	Low			
	Large	0.173	0.168			High	0.237	0.202			High			
	All	0.179	0.489			All	0.179	0.489			All			

(continued)

Table 4 (continued)

	Firm size						Risk						INVREC				
					ANOVA							ANOVA						ANOVA
Variable	Factor	Mean	SD		F		Variable	Factor	Mean	SD		F		Variable	Factor	Mean	SD		F
BIG4	Small	0.260	0.439		174.48***		BIG4	Low	0.410	0.493		16.398***		BIG4	Low	0.423	0.495		12.624***
	Large	0.728	0.446					High	0.570	0.495					High	0.564	0.497		
	All	0.494	0.500					All	0.490	0.500					All	0.494	0.500		
ROA	Small	−0.622	2.644		19.386***		ROA	Low	−0.242	0.761		0.424		ROA	Low	−0.260	0.838		0.175
	Large	0.038	0.138					High	−0.341	2.577					High	−0.324	2.554		
	All	−0.292	1.899					All	−0.292	1.899					All	−0.292	1.899		
CR	Small	8.292	12.026		8.315***		CR	Low	11.781	18.36		95.514***		CR	Low	10.17	18.370		41.265***
	Large	5.086	15.525					High	1.597	1.311					High	3.208	5.389		
	All	6.689	13.968					All	6.689	13.968					All	6.689	13.968		

This table presents ANOVA for the variables under three different situational factors. Refer to Table 1 for definitions of variables.
***, **Significant at 1, 5 percent, two-tailed, respectively (presented in bold).

Table 5
Correlation analysis

	FEM_CODE	AC_INDP	AC_EXP	AC_EDU	SIZE	LEV	INVREC	BIG4	ROA	CR
FEM_CODE	1.000									
AC_INDP	0.035	1.000								
AC_EXP	0.066	**-0.176*****	1.000							
AC_EDU	-0.027	-0.032	**0.386*****	1.000						
SIZE	**0.304*****	**0.216*****	0.045	0.036	1.000					
LEV	-0.023	-0.017	0.056	0.036	**-0.147*****	1.000				
INVREC	**0.098****	0.037	0.010	0.075	-0.023	0.043	1.000			
BIG4	**0.192*****	**0.157*****	0.027	-0.038	**0.516*****	-0.008	-0.016	1.000		
ROA	0.064	0.030	-0.030	0.022	**0.335*****	**-0.603*****	-0.024	**0.105*****	1.000	
CR	-0.053	-0.021	-0.030	**-0.102****	**-0.124*****	**-0.155*****	0.005	**-0.098****	0.010	1.000

***, **Significant at 1, 5 percent, two-tailed, respectively (presented in bold). Refer to Table 1 for definitions of variables.

4.3. Correlation analysis results

The correlation results are reported in Table 5. The presence of females on the audit committee is positively correlated with firm size ($p < 0.01$), complexity ($p < 0.05$) and having a Big Four auditor ($p < 0.01$). There is a negative correlation between audit committee independence and expertise on the audit committee ($p < 0.01$). However, expertise on the audit committee and accounting education of audit committee members are positively correlated ($p < 0.01$). Company size is negatively correlated to risk ($p < 0.01$) and liquidity ($p < 0.01$), while it is positively correlated to having a Big Four auditor ($p < 0.01$) and profitability ($p < 0.01$). Risk is negatively correlated to profitability ($p < 0.01$) and liquidity ($p < 0.01$). Although the correlation coefficients are relatively small, thus dismissing concerns for multicollinearity, collinearity diagnostics in the form of Variance inflation factors (VIF) is undertaken before conducting the regression analysis.

4.4. Regression results

OLS regression is used to examine the impact of female representation on the audit committee on the amount of audit fees paid. The VIF results indicate that there is no multicollinearity in the data. Results of the regression analysis are presented in Models 1 through 4 in Table 6. Model 1 shows the regression results without the industry fixed effects while Model 2 includes the eight industry variables. Models 3 and 4 replace the variable *FEM_CODE* with *FEM_NUM* (number of females on the audit committee) as a robustness test to the main variable. However, Model 3 excludes the industry variables while Model 4 includes them.

The results in Model 1 explain approximately 69 percent of the variance in audit fees. As expected, the analysis shows that the presence of a female on the audit committee is associated with higher audit fees ($p < 0.01$). This is consistent with prior studies that adopt a demand-side perspective to the relationship between audit fees and audit committee characteristics (Abbott et al., 2003; Goodwin-Stewart and Kent, 2006; Turley and Zaman, 2007; Zaman et al., 2011). However, our findings are in conflict with Ittonen et al. (2010) who find a negative relationship between audit fees and females on the audit committee. The three other variables related to audit committee effectiveness did not demonstrate significant relationships at the 0.05 level. However, company size (*SIZE*), company risk (*LEV*), audit complexity (*INVREC*) and engaging a Big Four auditor (*BIG4*) are positively related to audit fees ($p < 0.01$). Liquidity (*CR*) is the only significant control variable that is negatively related to audit fees ($p < 0.01$). The results in Model 2, which include industry fixed effects, echo the results reported in Model 1. Although the explanatory power of the model increased to almost 72 percent, the statistical significance for the coefficient of audit independence (*AC_INDP*) and

Table 6
The relationship between audit fees and female directors on the audit committee

Variables	Model 1	Model 2	Model 3	Model 4
FEM_CODE	**0.094*** (3.968)	**0.074*** (3.215)		
FEM_NUM			**0.087*** (3.696)	**0.063*** (2.761)
AC_INDP	**0.043* (1.862)	0.035 (1.550)	**0.044* (1.873)	0.035 (1.551)
AC_EXP	0.001 (0.018)	−0.013 (−0.547)	−0.001 (−0.034)	−0.013 (−0.561)
AC_EDU	−0.023 (−0.946)	−0.017 (−0.704)	−0.025 (−1.034)	−0.018 (−0.777)
SIZE	**0.609*** (20.987)	**0.621*** (21.792)	**0.615*** (21.401)	**0.627*** (22.202)
LEV	**0.162*** (5.683)	**0.127*** (4.534)	**0.162*** (5.680)	**0.127*** (4.539)
INVREC	**0.070*** (3.095)	**0.039* (1.756)	**0.072*** (3.193)	**0.041* (1.854)
BIG4	**0.254*** (9.687)	**0.236*** (9.288)	**0.252*** (9.583)	**0.235*** (9.224)
ROA	0.006 (0.204)	−0.014 (−0.484)	0.005 (0.186)	−0.014 (−0.501)
CR	**−0.089*** (−3.864)	**−0.048** (−2.130)	**−0.088*** (−3.865)	**−0.048** (−2.133)
Energy		**−0.176*** (−3.212)		**−0.174*** (−3.177)
Materials		**−0.268*** (−3.747)		**−0.267*** (−3.726)
Industrial		**−0.091* (−1.651)		**−0.094* (−1.690)
Consumer Discretionary		−0.068 (−1.370)		−0.066 (−1.338)
Consumer Staples		−0.028 (−0.919)		−0.027 (−0.888)
Health care		−0.032 (−0.713)		−0.032 (−0.698)
Information Tech		−0.18 (−0.446)		−0.017 (−0.419)
Utilities		0.048 (1.504)		−0.047 (−1.449)
Adjusted R^2	**0.692**	**0.719**	**0.691**	**0.717**
N	624	624	624	624

Model 1 presents regression results for the relationship between audit fees and female directors on the audit committee. Model 2 includes industry fixed effects. The t-values are given in parenthesis below each estimate. Variance inflation factors (VIF) do not suggest multicollinearity. Refer to Table 1 for definitions of variables. ***, **,*Significant at 1, 5 percent, two-tailed, respectively (presented in bold).

Table 7
The relationship between audit fees and female directors on the audit committee for different-sized companies

Variables	Size		
	Small	Large	Interaction
FEM_CODE	0.056 (1.160)	**0.228***** (5.048)	**−0.699***** (−3.925)
SIZE			**0.566***** (18.458)
SIZE_INTR			**0.797***** (4.374)
AC_INDP	0.043 (0.885)	**0.079*** (1.731)	0.028 (1.278)
AC_EXP	−0.046 (−0.894)	0.054 (1.095)	−0.009 (−0.370)
AC_EDU	−0.019 (−0.371)	−0.020 (−0.411)	−0.021 (−0.906)
LEV	**0.176***** (2.800)	**0.227***** (4.460)	**0.120***** (4.363)
INVREC	0.076 (1.484)	**0.094*** (1.810)	**0.052**** (2.335)
BIG4	**0.337***** (6.937)	**0.409***** (9.097)	**0.238***** (9.539)
ROA	**0.190***** (3.104)	0.063 (1.400)	−0.002 (−0.062)
CR	−0.059 (−1.159)	−0.051 (−1.112)	**−0.046**** (−2.065)
Energy	**−0.270**** (−2.214)	−0.151 (−1.355)	**−0.144***** (−2.642)
Materials	**−0.378**** (−2.334)	**−0.297**** (−2.127)	**−0.224***** (−3.153)
Industrial	−0.069 (−0.682)	**−0.233*** (−1.838)	−0.055 (−0.998)
Consumer Discretionary	0.043 (0.437)	**−0.203*** (−1.855)	−0.038 (−0.775)
Consumer Staples	−0.086 (−1.547)	−0.087 (−1.203)	−0.025 (−0.825)
Health care	0.001 (0.011)	−0.129 (−1.620)	−0.006 (−0.128)
Information Tech	0.009 (0.084)	**−0.117*** (−1.707)	0.001 (0.035)
Utilities	**−0.134**** (−1.976)	−0.048 (−0.707)	−0.046 (−1.465)
N	312	312	624
Adj. R^2	0.326	0.435	0.727

The *t*-values are given in parenthesis below each estimate. Refer to Table 1 for definitions of variables. ***, **Significant at 1, 5 percent, two-tailed, respectively (presented in bold).

complexity (*INVREC*) dropped drastically. It is important to note that, all other things being equal, *AUD_FEES* are lower for firms in the energy and materials sectors than in the reference industry sector ($p < 0.01$). The results reported under Models 3 and 4 mirror those reported under Models 1 and 2. This suggests that there is no difference between the two proxies for female representatives on the audit committee. As a result, the remaining analysis is conducted with the original variable, *FEM_CODE*.

The relationship between audit fees and female representation is also examined by modelling the interaction of female audit committee participation with company size, risk and audit complexity. Table 7 presents the results of investigating the interplay of female presence on the audit committee and firm size. The first approach is to split the sample into small *SIZE* and large *SIZE* subsets based on the value being below and above the median of *SIZE*. The results show that there is no relationship between female representation on the audit committee and audit fees for small firms. Additionally, none of the other audit committee effectiveness variables have a significant relationship with

audit fees for small firms. However, company risk, engaging a Big Four auditor and profitability are positively related to audit fees ($p < 0.01$). For large firms, female representation on the audit committee is positively related to audit fees ($p < 0.01$). However, the only two other control variables that are related to audit fees at a significance level of 0.05 or less are firm risk and use of a Big Four auditor. The adjusted R^2 values of 0.326 and 0.435 for the small and large company samples, respectively, indicate the model does not explain much of the variance when applied to the subsamples. This is not unexpected as the most important predictor, *SIZE*, is not included in the model for this analysis.

The second approach is to assess the relationship between audit fees and female representation on the audit committee using interaction terms. It is clear from Table 7 that the model accounts for over 72 percent of the variance when applied to the entire sample and an interaction term calculated as the product of *SIZE* and *FEM_CODE* is included in the model. The interaction term is positive and significant ($p < 0.01$) indicating that female presence on the audit committee strengthens the positive relationship between firm size and audit fees. To better understand this interaction, Figure 2 presents a visualisation of the relationship by plotting the interaction using points one standard deviation above and below the mean. The figure demonstrates that in smaller firms, fees are lower when there are women on the audit committee but in large firms the opposite occurs.

The same procedures are used to examine how female audit committee membership interacts with risk. As shown in Table 8 for both low and high *LEV* firms, female participation on the audit committee is significantly
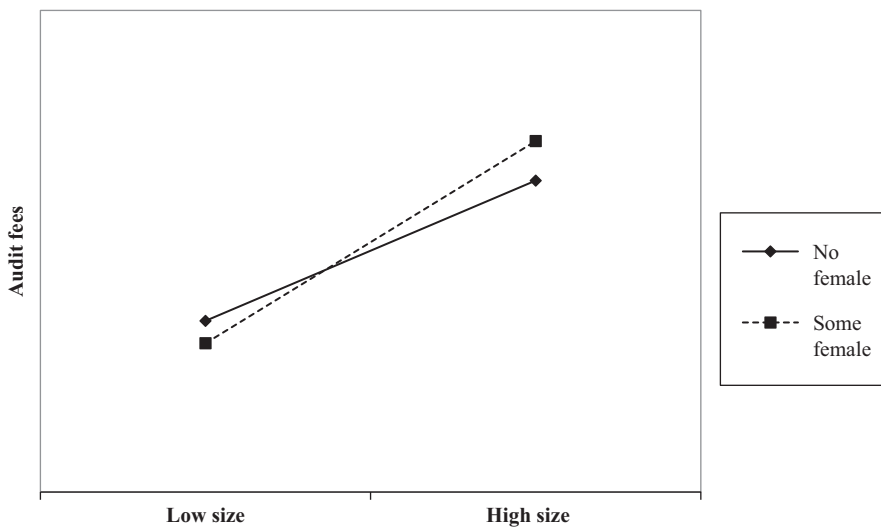

Figure 2 Interaction effect of female representation on the audit committee with firm size in determining audit fees.

Table 8
The relationship between audit fees and female directors on the audit committee in the presence of company risk

Variables	Risk		
	Low risk	High risk	Interaction
FEM_CODE	**0.076**** (1.993)	**0.072**** (2.026)	−0.001 (−0.012)
LEV			**0.122***** (4.364)
LEV_INTR			**0.098**** (2.426)
AC_INDP	0.034 (0.898)	0.017 (0.515)	0.034 (1.535)
AC_EXP	−0.015 (−0.372)	0.005 (0.135)	−0.012 (−0.499)
AC_EDU	**−0.067*** (−1.711)	−0.010 (−0.272)	−0.020 (−0.863)
SIZE	**0.548***** (12.762)	**0.646***** (13.903)	**0.606***** (20.932)
INVREC	0.053 (1.295)	**0.107***** (3.040)	**0.048**** (2.113)
BIG4	**0.280***** (6.825)	**0.282***** (7.232)	**0.237***** (9.379)
ROA	**−0.108***** (−2.639)	**−0.094***** (−2.699)	−0.013 (−0.447)
CR	−0.059 (−1.575)	−0.011 (−0.352)	**−0.045**** (−2.014)
Energy	**0.513*** (1.948)	**−0.118**** (−2.131)	**−0.163***** (−2.972)
Materials	**0.602*** (1.838)	**−0.230***** (−3.285)	**−0.253***** (−3.542)
Industrial	**0.310****(2.046)	**−0.142*** (−1.945)	−0.085 (−1.534)
Consumer Discretionary	**0.418***** (2.675)	**−0.124*** (−1.904)	−0.064 (−1.286)
Consumer Staples	**0.137*** (1.869)	−0.055 (−1.262)	−0.029 (−0.938)
Health care	**0.515***** (2.708)	−0.066 (−1.268)	−0.026 (−0.588)
Information Tech	**0.421***** (2.689)	−0.028 (−0.548)	−0.012 (−0.290)
Utilities	0.160 (1.623)	−0.026 (−0.585)	**−0.056*** (−1.740)
N	312	312	624
Adj. R^2	0.587	0.701	0.721

The *t*-values are given in parenthesis below each estimate. Refer to Table 1 for definitions of variables. ***, **Significant at 1, 5 percent, two-tailed, respectively (presented in bold).

related to audit fees ($p < 0.05$). For the low *LEV* subsample, audit committee education is the only audit committee characteristic that is significantly related to audit fees ($p < 0.10$), and it is negative. However, none of the audit committee effectiveness variables are related to audit fees for the high *LEV* subsample. In terms of firm characteristics, size, use of a Big Four auditor and profitability are significant predictors for both subsamples ($p < 0.01$). However, complexity is only a significant factor for high *LEV* firms ($p < 0.01$).

Table 8 further indicates that the model accounts for over 72 percent of the variance when the entire sample is examined using an interaction term calculated as the product of *LEV* and *FEM_*Code. The interaction term is positive and significant ($p < 0.05$) which suggests that the presence of females on the audit committee strengthens the positive relationship between company risk and audit fees. Examination of the interaction plot (see Figure 3) shows that when risk is low, female presence on the audit committee results in lower
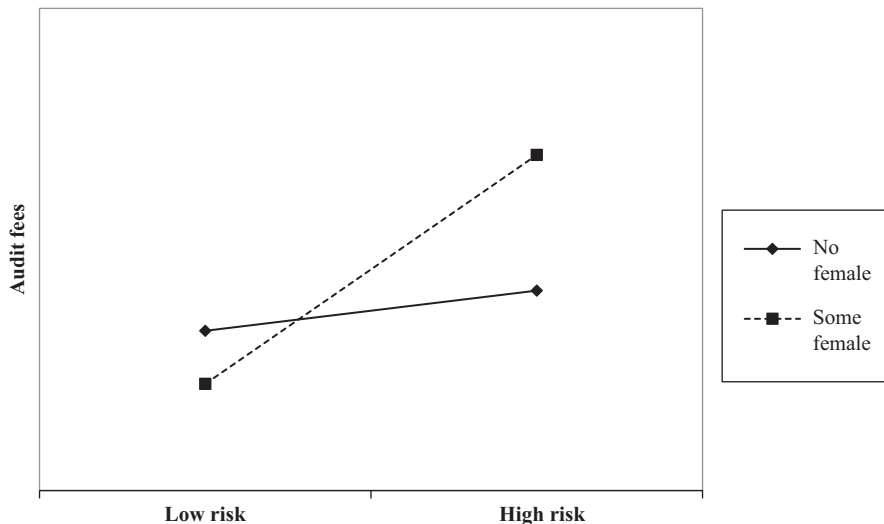
Figure 3 Interaction effect of female representation on the audit committee with audit risk in determining audit fees.

fees; however, when risk is high and females are present on the committee, fees are higher.

Finally, Table 9 presents the results of the regression model in the presence of complexity. For low *INVREC* firms, audit fees is positively related to female presence on the audit committee ($p < 0.05$). Audit committee independence, firm size, firm risk and having a Big Four auditor are also significantly related to audit fees ($p < 0.01$), while profitability is negatively related at the 0.05 significance level. The adjusted R^2 for the low *INVREC* subsample is 0.660. Results of the regression on the high *INVREC* subsample indicate that the presence of females on the committee is again positive and significantly related to audit fees ($p < 0.10$). However, while firm size, risk and engaging a Big Four audit firm are significant predictors ($p < 0.01$), audit committee independence is not. The adjusted R^2 for the high *INVREC* subsample is 0.768.

Table 9 reports the results of regression analysis on the full sample using an interaction term in the model that is the product of *INVREC* and *FEM_CODE*. This results in an adjusted R^2 of 0.729 and demonstrates that the interaction term is significant and negatively related to audit fees ($p < 0.01$). This suggests that female representation on the audit committee dampens the positive relationship between audit complexity and audit fees. Examination of the interaction plot (see Figure 4) shows almost no change in audit fees between low and high complexity when there are no females on the audit committee. However, when females are on the committee, fees are higher in low complexity situations than they are in high complexity situations.

Table 9

The relationship between audit fees and female directors on the audit committee in the presence of audit complexity

| Variables | Complexity | | |
	Low INVREC	High INVREC	Interaction
FEM_CODE	**0.086**** (2.436)	**0.057*** (1.821)	**0.122***** (4.967)
INVREC			**0.357***** (5.220)
INVREC_INTR			**−0.340***** (−4.905)
AC_INDP	**0.121***** (3.381)	−0.013 (−0.463)	0.033 (1.489)
AC_EXP	0.015 (0.410)	−0.032 (−0.977)	−0.005 (−0.235)
AC_EDU	−0.053 (−1.480)	0.015 (0.467)	−0.014 (−0.622)
SIZE	**0.553***** (12.583)	**0.769***** (18.710)	**0.627***** (22.414)
LEV	**0.114***** (3.244)	**0.181***** (3.808)	**0.126***** (4.582)
BIG4	**0.254***** (6.639)	**0.196***** (5.786)	**0.234***** (9.386)
ROA	**−0.081**** (−2.200)	0.008 (0.169)	−0.007 (−0.232)
CR	−0.034 (−0.992)	−0.031 (−0.991)	−0.034 (−1.509)
Energy	−0.192 (−1.101)	−0.069 (−1.455)	**−0.144***** (−2.667)
Materials	−0.308 (−1.468)	**−0.129**** (−2.032)	**−0.223***** (−3.149)
Industrial	−0.107 (−1.096)	−0.072 (−1.079)	**−0.099*** (−1.820)
Consumer Discretionary	−0.047 (−0.436)	−0.053 (−0.910)	−0.075 (−1.531)
Consumer Staples	0.001 (0.025)	−0.051 (−1.247)	−0.032 (−1.046)
Health care	−0.054 (−0.483)	0.014 (0.274)	−0.020 (−0.457)
Information Tech	−0.054 (−0.730)	0.026 (0.517)	−0.016 (−0.393)
Utilities	−0.002 (−0.025)	−0.030 (−0.954)	−0.027 (−0.837)
N	312	312	624
Adj. R^2	0.660	0.768	0.729

The *t*-values are given in parenthesis below each estimate. Refer to Table 1 for definitions of variables. ***, **Significant at the 1, 5 percent, two-tailed, respectively (presented in bold).

5. Discussion and conclusion

The results of the study provide solid support for the importance of gender diversity on the audit committee. The examination of female representation on the audit committee and audit fees shows a positive relationship which supports the demand-side argument for audit effort. This is to say that audit committees with female members require more services from the external auditor, thus incurring higher audit fees. However, the interaction of female presence on the committee with factors that create audit risk provides critical findings that explain gender diversity and audit fees. In the presence of low size and low risk, we find support for the supply-side argument in that fees are lower when there are women on the audit committee. This supports our proposition that the impact of females on the monitoring process sufficiently reduces risk to outweigh demands for increased audit effort. On the other hand, in the presence of high size and high risk, we find support for the demand-side argument in that fees are higher when women are on the audit committee. In these situations, the
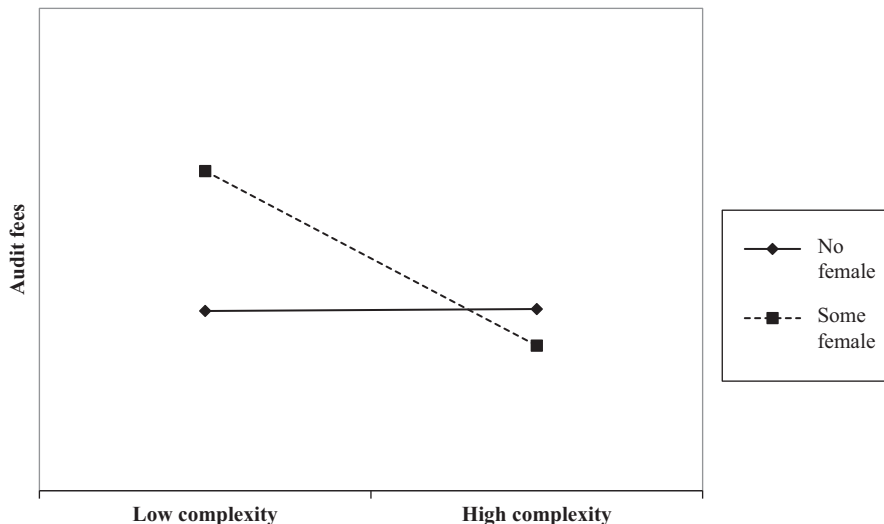
Figure 4 Interaction effect of female representation on the audit committee with complexity in determining audit fees.

necessity of additional effort demanded by the circumstances outweighs the improved monitoring effected by women on the audit committee.

However, in examining audit complexity, we find the opposite. In situations where there is audit complexity, female representation dampens the positive relationship between complexity and audit fees. Consistent with the demand-side argument, in low complexity situations, audit fees are higher when there are women on the audit committee than when there are none. However, in the presence of high audit complexity, audit fees are lower when a female member is on the audit committee than when there are no females. This negative interaction is an intriguing difference from the interaction effects found for size and risk. We suggest that this may demonstrate the female demand for more external audit effort in the low complexity situation and that high complexity is better managed by increased monitoring activity than are size and risk; however, we recognise that further research is required to unravel this perplexity.

We acknowledge that our findings and implications for the present study are subject to several limitations and these provide opportunities for further research. Firstly, our sample comprises ASX firms; thus, our empirical analysis is limited to publicly-traded Australian firms. Our findings are not necessarily generalisable to firms outside of Australia. Secondly, our study was confined to the year 2011 which was selected because it was the first year corporate governance regulations required ASX companies to report on their diversity policies (ASX Corporate governance Council, 2010). Studying a later period may yield different results. Given that early adopters of board and subcommittee diversity policies may have been motivated to do so by reasons other

than consideration of females' expertise and qualities, an extended research period may be useful. This would determine how female representation on the audit committee affects audit fees over time and perhaps also determine whether appointments are merit-based or are largely tokenism based on adhering to corporate governance regulations. Thirdly, our factors for audit risk followed Simunic (1980) and were based on three elements of inherent risk: firm size, firm risk and audit complexity. Alternate proxies for their measurement are possible and may yield different results.

Despite these limitations, this study makes several important contributions. Firstly, it provides a counterpoint to the Ittonen *et al.* (2010) study by demonstrating contradictory results. This establishes the need for more intensive study to better understand how such divergent findings are possible. Secondly, this study proposes a conceptual model that integrates the two opposing approaches of explaining audit committee effectiveness on audit fees and has used this model to explain the impact of female representation on the audit committee. By incorporating both supply-side and demand-side approaches, we provide a parsimonious yet inclusive framework for future research into these contradictory findings. Thirdly, we provide empirical evidence to support the proposition that female representation is a significant factor in impacting audit fees but that the impact is different depending on situational factors inherent to the firm and the audit. Each of these contributions has important ramifications not only for the academic understanding of this phenomenon but also for practitioners and policymakers. Given the differential impact of women in governance roles, there may be situations which do not benefit from their influence. However, there may be situations in which female presence is not only important but crucial to effective governance.

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