Board Gender Diversity, Audit Fees and Auditor Choice

Abstract

Using a sample of U.S. firms spanning 2001-2011, we examine whether female directors (female audit committee members) affect audit quality in terms of audit effort and auditor choice. After correcting for endogeneity and other board, firm and industry characteristics, we find that firms with gender-diverse boards pay higher audit fees and are more likely to choose specialist auditors compared to their peers. Our findings suggest that boards with female directors are likely to demand higher audit quality, *ceteris paribus.*

Keywords: Audit Fees, Corporate Governance, Gender Diversity, Audit Quality

1. Introduction

In this paper, we find evidence consistent with gender-diverse boards of U.S. corporations engaging higher quality auditors and demanding more effort from them. We consider gender diversity on corporate boards as being equivalent to female board participation because women constitute less than 14% of board directors and there are no all-female boards. In this study, approximately 30% (59%) of the firms have all-male boards (audit committees) which constitute a relatively large proportion and only 50% (13.4%) of female boards (audit committee) have more than one female member. In view of this gender distribution, we use "gender diversity" to signify the presence of one or more female directors on the board. Our motivation to examine this issue arises from a significant increase in regulatory and academic interest about the role of gender diversity in improving corporate governance throughout the world.[1] For example, there is a spate of legislative changes in Europe where Norway has legislated 40% female board representation with penalties for non-compliance and Spain and Sweden require female board representation of 40% and 25% respectively by 2015 (Burke and Vinnicombe [2008]).[2,3] Proponents of board reform in the UK and elsewhere have called for more female directors to be appointed to boards as part of improving corporate governance (Higgs [2003]; Tyson [2003]). In the U.S., there is a voluntary increase in the presence and proportion of female directors on corporate boards over the last two decades (Catalyst Group [2004]).

[1] This is a departure from the earlier "social equality" argument that was advanced for including women in management positions and corporate boards. Improvement of corporate governance is an issue of importance to investors and results in a business case for gender diversity. This change of perspective explains the expansion of research interest from purely social and organizational research to the accounting and finance areas.

[2]The trend in increasing the gender diversity of corporate boards has also been helped by the disclosure rules adopted in 2003 by the Securities and Exchange Commission concerning director nomination (Cohn [2006]).

[3] Bill S-238, a bill to bring about gender parity in Canadian corporate boards was introduced in the Canadian parliament on June 4, 2009 by Senator Hon. Hervieux-Payette based on a law on parity in force in Quebec in Canada. France has also introduced legislation that requires 50% female directors in public listed companies by 2015.

Not surprisingly, this trend has fuelled practitioner and academic interest about the effects of board gender diversity on governance, transparency and performance in the Finance and Accounting areas. In the Finance area, Adams and Ferreira [2009], for example, show that gender-diverse boards exhibit better attendance and that the female directors are more likely to serve as members of the audit committee. In the Accounting area, Srinidhi et al. [2011] show that board gender diversity translates to higher earnings quality and Gul et al. [2011] show that board diversity results in richer information environment.

However, the above studies do not delve into how gender-diverse boards achieve higher earnings quality and richer information environment than all-male boards in similar firms. What decisions and actions do they take that are different from those made by all-male boards? Srinidhi et al. [2011] and Gul et al. [2011] suggest that female directors improve the information environment through more intensive oversight than their male counterparts but do not provide any direct empirical evidence of increased monitoring. In order to make their oversight more intense, directors need to intervene in the operating and reporting decisions of managers. While advising managers (passive information exchange) could conceivably help them in improving their operating decisions, it is not likely to improve reporting.[4]

Improvements in reporting require some form of intervention in the reporting process. Arguably, the most effective intervention in the reporting process is engaging high quality independent auditors and inducing them to devote more effort to auditing. In turn, these auditors can exert pressure on managers to pay more attention to reporting and reduce the scope for opportunistic reporting.

Higher quality audit is shown to improve reporting quality in diverse contexts. For example, Carcello et al. [2002] show that the board can effectively demand and make the auditors exert

[4] Reporting quality is often weak because of managerial inattention or/and because managerial incentives to hide information. Neither of these causes can be rectified by advising. Improvement in reporting quality requires the managers to be under pressure to report accurately.

higher effort in order to protect the directors' reputation capital, avoid legal liability and promote shareholder interest. Fan and Wong [2005] and Srinidhi et al. [2014] show that auditors can improve reporting quality and reassure minority shareholders in family-controlled firms. Gul [2006] shows that auditors can improve reporting in politically connected firms and thereby protect the investors. Therefore, we posit that gender-diverse boards are likely to use external auditing as the primary mechanism to improve reporting quality.

We build on prior literature to develop the relation between gender-diversified boards and audit quality. Studies in Sociology, Psychology and Finance show that boards with female directors discuss more difficult and unpalatable issues than all-male boards (McInerney-Lacombe et al. [2008], Huse and Solberg [2006]) and avoid groupthink (Adams et al. [2010]). Meaningful discussion of tough and contentious issues requires reliable and detailed objective information. Moreover, because female directors often bring perspectives to the board meetings that are different from those of male directors, board decisions require reconciliation of disparate issues.[5] Such a resolution demands more objectivity and credibility in the supporting information. Generation and dissemination of reliable information is rendered possible by its verification and certification by higher quality auditors. As prior studies such as Gul at al. [2011] and Srinidhi et al. [2011] have shown, gender-diverse boards (audit committees) improve the earnings quality and information environment. Gender-diverse boards are likely to achieve those results by engaging specialist auditors and incentivizing them to exert higher effort than they otherwise would. In particular, audit committees enhance audit quality by overseeing the preparation of the company's financial statements and the conduct of the audit and by appointing external auditors

[5] Potentially, different perspectives could lead to irreconcilable differences in opinion in the absence of objective evidence. Further, these opinions could cause the board to be divisive and dysfunctional. However, there is no evidence that gender-diverse boards are divisive or dysfunctional. By implication, the differences in perspective in gender-diverse boards are resolved by collecting more objective evidence.

(PWC [2012]). We focus only on these two measures of audit quality because they are the direct outcomes of board and the audit committee decisions.[6]

Using a sample of US firms from 2001 to 2011, we find evidence consistent with boards (audit committees) with female directors demanding more audit effort and higher quality audit assurance by engaging industry-specialist auditors, *ceteris paribus.*[7] Further, we find that the demand for higher audit quality increases when there is a greater proportion of female directors (audit committee members) on the board (audit committee).

As part of our analysis, we address several issues to ascertain that gender diversity drives our results. The first issue is one of endogeneity wherein the firm characteristics might relate to both board gender diversity and higher audit quality. We address this concern by matching each gender-diverse-board firms with an all-male-board firm that has a similar propensity for appointing female directors.[8] We find that audit fees are approximately 5% (10%) higher for gender diverse boards (audit committees). These firms have 21% or higher likelihood of hiring audit specialists. Our results also confirm that female participation in both the board and audit committee is incremental to each other, at least for audit fees. For our investigation of the effect

[6] Other measures of audit quality such as restatements and going concern qualifications are consequences of auditing. Gender diverse boards could affect these consequences in opposing ways. Although higher audit quality could decrease restatements and increase going concern qualifications *ceteris paribus*, their direct monitoring of managers could improve pre-audit reporting quality, thereby further decreasing restatements but also decreasing going concern qualifications. Therefore, we expect a decrease in the restatements but cannot *ex-ante* predict the effect on ongoing concern qualifications. Abbott et al. [2012] provide evidence of negative relation between board gender diversity and the likelihood of restatements. Chapple et al. [2012] provide evidence of a negative relation between board gender diversity and the likelihood of going concern qualifications. Because of these confounding effects, we focus on auditor choice and audit fees.

[7] Consistent with the literature, we measure audit effort by the audit fees, after controlling for other known factors that affect audit fees. This measurement is justified in a competitive audit market that cannot sustain monopoly rent in the pricing (Healy and Palepu [2003]). This proxy is further validated by audit fee models (Craswell and Francis [1999]; Frankel et al. [2002]; Ashbaugh et al. [2003]) that typically include several variables that are more likely to affect audit effort rather than rent. The engagement of industry-specialist auditors reduces the opportunity for managers to make self-serving accounting accrual estimates. Consistent with the literature, we therefore attribute higher audit quality to industry-specialist auditors. Correspondingly, the boards (and the audit committees) that engage industry-specialist auditors have better oversight over managers.

[8] We also do the reverse matching – matching firms with all-male boards (audit committees) with firms that have gender-diverse boards (audit committees) that have the same propensity to be all-male. The results are similar. We discuss this in greater detail in Footnote 19. We discuss our choice of propensity score matching procedure to address endogeneity in Section 3.1.

of the proportion of female directors on boards (audit committees), we also use a propensity score matched pair design. We compare firms with high female board proportion (top quartile) with firms that have low female board proportion (bottom quartile)[9]. In addition, we estimate full models where we include all the covariates driving both gender diversity and audit choice/fees variables as determinants of the propensity score and compare the t-statistics (z-statistics for auditor choice model) of the difference in means between matched treatment and control groups. We also conduct a change analysis wherein we examine the effect of changed female participation on the board (audit committee) in period (t-1) on subsequent audit fee change in period t.

A related second issue is that firms with boards that are independent and strong enough to restrain CEO power are likely to choose higher quality auditors and at the same time, might also happen to be the firms whose boards are characterized by higher gender diversity. We use board governance and CEO power as control variables in both the first and second stage regressions to mitigate this concern. The third issue is that our results might be attributable to the ethnic diversity of the board and not particularly to gender diversity. We show that our results hold after we control for ethnic diversity on boards. The fourth issue is that the results might be attributable more to superior financial expertise of the directors on the board rather than to the board's gender diversity. We find that female audit committee members have, on average, lower financial expertise than their male counterparts (Table 2, Panel C).[10] We control for financial expertise on the boards in the audit fee regression to resolve this concern. Another issue is that

[9] We delete observations with all male boards.

[10] Based on Hillman et al. [2002], although female directors hold more doctorates than male directors but almost 100% of directors – both male and female – have university degrees, which suggests that the difference in educational levels between female and male directors may not have a material effect. Further, female directors are more likely to contribute to the board in the capacity of "Community Influentials" by bringing in different environmental perspectives (Hillman et al. [2002] rather than as business experts or technical specialists (More on this in the section on the conceptual framework in Section 2). The role of Community Influentials is not much dependent on expertise. Taken together, these pieces of evidence suggest that the difference in education between female and male directors is not likely to result in differential monitoring by gender-diverse and all-male boards.

the results might not be driven by the gender diversity *per se* but by the differences between male and female directors in age or tenure or exposure to other boards on which the director serves. We control for differences in age, tenure and the number of directorships in an additional test. Finally, a lone woman on the board might merely serve as a token without much influence on board deliberations (Kramer et al.[2006]; Erkut et al. [2008]; Branson [2006]; Bourez [2005]). We address this issue in an additional test by limiting gender-diverse boards (audit committees) to those that have at least two women. Our results are robust to all these additional tests.

This paper contributes to our understanding about how gender-diverse boards improve earnings quality and information environment by using external auditing as the mechanism for monitoring the reporting process. Previous literature in this area has focused either on the inputs provided by a gender-diverse board (Adams and Ferreira [2009]) or on the consequences such as earnings quality and informativeness (Srinidhi et al. [2011]; Gul et al. [2011]), but not on the process by which female directors affect these changes. This study is the first one to document that gender diversity *in fact* increases monitoring. More generally, this paper contributes to the growing literature on the linkages between board governance, financial reporting and audit processes (e.g., Beasley [1996]; Carcello et al. [2002]; Bedard and Johnstone [2004]). It highlights that prior studies on the linkage between board characteristics and financial reporting could have benefited by explicitly considering the role of female directors. Ours is also one of the first studies in this area to use archival evidence to show the effect of board gender diversity in contrast to prior studies that have typically relied on survey and interview methodologies (Bilimoria [2000]).

The rest of the paper is organized as follows. In the next section, we present our conceptual framework and the relevant background literature on gender differences and outline the

hypotheses. In section 3 we discuss the research design. The fourth section provides the empirical analysis and results. The fifth section concludes the paper.

2. Background and Hypotheses

2.1. CONCEPTUAL FRAMEWORK ON DIVERSITY AND GOVERNANCE

Diversity among the board members is a core feature of corporate governance. For example, consider the differences between the incentives of executive and independent directors. While the executive directors (who are more informed about the firm) could well have incentives for opportunistic reporting, such reporting increases the risk to the reputation of independent directors, which, in turn incentivizes them to restrain opportunistic reporting by executives.[11] Diversity in board expertise induces greater demand for audit (Carcello et al. [2002]). Similarly, diversity in age, gender, ethnicity and experience among board members could reduce groupthink and bring to the board different perspectives on issues facing the firm. One plausible explanation for the positive effect of the diversity in the perspectives among directors is that it gives rise to greater mutual skepticism.[12]

Discussions in gender-diverse boards are likely to encompass more diverse perspectives than in all-male boards. When faced with similar situations, female directors perceive risks and opportunities differently from male directors. Prior research in various contexts including auditing and forecasting shows that men and women respond differently when faced with similar situations. Second, compared to men, women show less tolerance to opportunism in their decision making (Ambrose and Schminke [1999]; Schminke and Ambrose [1997]; Robinson et

[11] The diversity in the incentives between independent and executive directors arises because executives have incentives to present the firm's performance in the best light but the independent directors have incentives to preserve and/enhance their own reputation and reduce the likelihood of investor lawsuits.

[12] Mutual skepticism beyond a critical level could cause disruptive fights and result in a dysfunctional board. It is an empirical question as to whether diversity helps or hurts the functioning of the board.

al. [2000]; Thorne et al. [2003]; Bernardi and Arnold [1997]; Krishnan and Parsons [2008]), and place less emphasis on expediency, self-interest, and common practice (Arlow [1991]). Kumar [2010] shows that female equity analysts exhibit superior forecasting ability compared to their male counterparts. Thorne et al. [2003] show that female auditors resolve moral issues in auditing by applying more prescriptive reasoning than male auditors. All these studies suggest that gender-diverse boards are more likely than all-male boards to engage in deeper discussions on a wider spectrum of perspectives.

Hillman et al. [2000] identify three value-adding roles for outside directors: *Business Experts,* who are typically active or retired executives in other firms, bring expertise in internal decision making, *Support Specialists* provide specific expertise (such as financial expertise), and *Community Influentials* possess knowledge about the firm's environment beyond competitors and suppliers. Using 1993 data about Fortune 1000 firms, Hillman et al. [2002] show that female directors (above 50%) act overwhelmingly in the role of Community Influentials compared to white male directors (5%). When a board is faced with these diverse perspectives, the directors feel a greater need to support their positions with objective evidence that is verified preferably by third party auditors to be effective.

Furthermore, female directors do not belong to the "old-boy network" (Adams et al. [2010]) and are more likely to challenge the opinions of other directors, champion the discussion of tough issues and seek objective evidence to justify their positions (McInerney-Lacombe et al. [2008]). Female directors are also more likely to be sensitive to their minority status and identify more intensely with their monitoring responsibility to prove their worth.[13] These traits further increase the demand for monitoring, which is consistent with the female directors self-selecting

[13] In a slightly different context, Hillman et al. [2008] show that directors with multiple identities (such as director, CEO, shareholder, and organizational and stakeholder identities) behave differently. They argue that an independent director, whose level of identification with the organization is higher (lower multiple identities), will also increase her or his monitoring intensity.

into monitoring roles in audit and governance committees (Adams and Ferreira [2009]). These factors support the hypothesis that the board's gender-diversity results in greater demand for audit quality. [14]

2.2. BOARD-BASED GOVERNANCE AND AUDITING

Board structure can be seen as an important control mechanism that is deployed to restrain managerial opportunism (see Fama and Jensen [1983]). By structure, we refer to the board characteristics that can be observed by external parties (Larcker et al. [2007]). Recent accounting research examines the consequences of the structural characteristics of boards and shows that firms with independent and expert boards are associated with more disclosures, lower earnings management and lower audit risks (Dechow et al. [1996]; Xie et al. [2003]; Gul and Leung [2004]; Bedard and Johnstone [2004]). Further, independent boards and audit committees better monitor the managers and thereby improve both firm performance and the quality of their reporting (Morck et al. [1988]; Byrd and Hickman [1992]; Brickley et al. [1994]; Yermack [1996]; Core et al. [1999]; Klein [2002a], [2002b]; Gompers et al. [2003]; Carcello et al. [2006]; Larcker et al. [2007]). In a similar vein, firms with gender-diverse boards exhibit better earnings quality (Srinidhi et al. [2011]), make more public disclosures and facilitate more private information collection by sophisticated investors (Gul et al. [2011]).

These studies show that the board structure affects reporting and information environments of firms. They speculate but do not provide evidence on the mechanism employed by the boards to achieve these results. One of the means available to the boards to improve the accuracy and

[14] For example, Fuller and Jensen [2003] recommend that the board's ability to exercise its oversight function can be enhanced if the board has its own budget to hire independent experts, lawyers and consultants; meets privately with key managers to gather critical information and takes control of its own composition rather than depend on the CEO. In essence, these authors imply that in addition to the separation of rights over which the current debate is focused, two more factors affect the effectiveness of the board: the ability of the boards to independently collect relevant information and a philosophical shift from one of compliance and review to one of "insatiable curiosity".

reliability of financial statements is in the choice of high quality external auditors and in negotiating more intensive audits with them.[15] In this sense, auditors aid the board in their monitoring role in the firm (Watts and Zimmerman [1986]). Not surprisingly recent research has focused on how the boards of directors, particularly the audit committees, monitor the managers through auditor choice and audit fees.

The current literature has identified the linkages between the board's monitoring incentives and auditing (Carcello et al. [2002]). First, independent directors demand higher audit quality to protect their reputation capital (Fama and Jensen [1983]; Gilson [1990]). Second, they demand higher audit effort to avoid legal liability (Gilson [1990]; Sahlman [1990]). Finally, they promote shareholder interests by demanding audits of higher quality than what the auditors are obligated to provide. Using audit fee data obtained from a survey of 258 controllers of Fortune 1000 firms for the fiscal year ended between April 1992 and March 1993 and information on board characteristics from the proxy statements filed immediately before the financial statement date for those 258 firms, Carcello et al. [2002] show that board independence, diligence and exposure (outside directorships) are positively associated with audit fees.[16] This evidence supports the board's (audit committee's) use of external auditing as the oversight mechanism to protect their interests. Likewise, we expect gender-diverse boards to demand higher audit quality to facilitate the monitoring of managers.

[15] We recognize that there are other mechanisms that are available to the board to improve financial statements and monitor the management – through better internal audits, recruiting managers with greater integrity etc. The existence of alternative mechanisms does not necessarily diminish the role of external auditors. An important difference between the mechanism of using external auditors and other mechanisms is that (independent) external auditors are not beholden to the management. Internal auditors, accountants who design and comply with internal control systems and operating managers are likely to be more influenced in their monitoring role by the top executives than external auditors.

[16] In the absence of additional demand from the board, auditors will provide an audit that complies with the standards and will optimize the expected net auditor benefit in the long run computed as the expected present value of future normal audit fees less the expected costs arising from potential litigation and reputation effects. The board requires additional assurance over this auditor-optimal level of effort, in order *to protect the board reputation, to reduce board exposure to litigation and to provide higher level of assurance to investors than auditors normally will.* The more effective the board is, the better able they will be to make this additional demand on the auditors.

We note that from the production function viewpoint of auditing (Simunic [1980]), effective boards reduce the audit risk by improving the pre-audit financial reporting quality, which should, *ceteris paribus*, decrease the demand for audit effort. This argument predicts a negative association between strong boards and audit effort. Empirical evidence to date does not support the negative association. One reason is that as Knechel and Willekens [2006] point out, the production function viewpoint assumes a constant demand for assurance that does not consider the incentives of directors to protect their own individual interests. Alternatively, even if there is reduced audit risk in firms with strong boards, that effect is more than compensated by the demand for higher audit effort by the strong boards resulting in a higher net demand for audit effort.

2.3. CURRENT EVIDENCE ON GENDER DIVERSITY AND BOARD EFFECTIVENESS

A growing academic literature suggests that female directors are associated with stronger board monitoring, higher profitability and greater competitive advantage (Adams and Ferreira [2009]; Burke and Mattis [2000]; Rosener [2003]). Conference Board of Canada conducted a study in 2002 that shows strong links between female directors on the board and good governance credentials. Using data from 797 Fortune 1000 companies for 1999, Carter et al. [2003] find positive association between women on corporate boards and firm value. They argue that female directors increase firm value by improving board independence (Carter et al. [2003]: p.37) and protecting shareholder interests. Another stream of literature suggests that women are more sensitive to ethical issues than men in decision making (Cohen et al. [1998]; Bernardi and Arnold [1997]; Bruns and Merchant [1990]). An implication of this stream of literature is that the boards with female directors may demand higher audit effort and choose high quality specialist auditors in order to protect the firms' reputation capital (Fama and Jensen [1983]; Gilson [1990]) and avoid legal liability (Gilson [1990]; Sahlman [1990]) especially in situations characterized

by ethical dilemma. A third stream of literature in management and psychology suggests that female directors are more averse to risk and complexity (Brooks and Zank [2005]; Jianakoplos and Bernasek [1998]; Barber and Odean [2001]) which make them demand higher levels of monitoring to protect the firms' reputation capital (Gilson [1990]).[17] Together, these streams of literature suggest that female directors on the board, particularly on the audit committee, are likely to increase board monitoring.

Based on the above evidence, we expect boards with female directors to engage higher quality auditors and demand higher audit effort. Consistent with current literature, we use audit fees as a proxy for audit effort (Gul and Tsui [1998]; Carcello et al. [2002]) and city-level specialist auditors based on industry-market leadership as a proxy for higher quality auditor (Li et al. [2010]; Lim and Tan [2008]; Ferguson et al. [2006]).

Formally, we state the following hypothesis.

Hypothesis: The presence of female directors (female audit committee members) is positively associated with higher audit fees and with the choice of specialist auditors after controlling for endogeneity and other board-governance characteristics.

In our investigation of this hypothesis, endogeneity arises because the treatment variable – the presence or proportion of female directors in the board (audit committee) – is not exogenous. It is a choice made by the firm and is therefore an endogenous variable. Further, other firm characteristics, structural board variables and director characteristics also affect the demand for audit quality. These variables must be controlled for.

[17] We note that ethical levels and risk aversion are personal characteristics that are shown to be, on average, higher for women. Loss of a firm's reputation directly affects the personal reputation of its directors who are held accountable for corporate misdeeds by investors and regulators alike. However, potential legal losses increase the risk of default and bankruptcy in addition to increasing the variability of the return distribution for investors. Default or bankruptcy of the firm translates to a risk of personal reputation loss for its directors. Female directors strive to avoid these personal reputation losses by employing specialist auditors and goading them into putting higher effort in the audit process.

3. Research Design

3.1. MODELS FOR TESTING THE HYPOTHESIS

3.1.1. The Model for the Effect of Gender Diversity on Audit Fee

We use the following audit fee model on the propensity score matched sample[18] that matches each gender diverse board (audit committee) with an all-male board (all-male audit committee) to test our audit fee hypothesis.

$$LAF = d_0 + d_1 GD + d_2 CGboard + d_3 CEOpower + d_4 Segnum + d_5 Foreign + d_6 Loss + d_7 ROA + d_8 Recint + d_9 Invint + d_{10} Size + d_{11} Lev + d_{12} Util + d_{13} DirAge(AcDirAge) + d_{14} DirTenure(AcDirTen) + d_{15} Directorships(AcDirectorships) + d_{16} LaudTen + d_{17} YE + \sum_j c_j YR_j + \sum_k c_k IND_k + \varepsilon \quad (1)$$

The variables in the above pooled cross-sectional regression estimation are defined for each firm-year as follows. The variable *LAF* is the natural logarithm of the audit fee. *GD* is the indicator variable denoting either the presence of at least one female director on the board (*FDir*) or the presence of at least one female director on the audit committee (*FAud*). The control variables include *CGboard* and *CEOpower* to control for board governance. Based on Carcello et al. [2002], we expect *CGboard* to have a positive coefficient. Given that the power of the board is diluted by a strong CEO, we expect *CEOpower* to have a negative coefficient. Powerful CEOs could stave off external scrutiny to manage disclosures and financial statements. If the CEO has a strong influence on the board, it could impair the ability of the board to independently demand higher audit effort and engage specialist auditors. Audit effort is higher for firms with higher *Segnum*, the number of business segments, and *Foreign*, the proportion of sales from foreign operations. *Loss,* an indicator variable set equal to 1 if the firm has suffered a loss in any of the preceding three years or else, set equal to 0. We expect its relation with audit fees to be positive

[18] The propensity-matching procedure is described in section 3.2.

as loss making firms present higher audit risk. The litigation and reputation risks faced by the auditor of a loss-making firm are both higher which results in higher audit effort. By the same token, the profitability of the firm, *ROA*, reduces those risks and we expect a smaller audit effort in more profitable firms. *Recint* and *Invint*, are the accounts receivable and inventory accounts respectively scaled by total assets and are expected to be positively associated with audit effort because their verification often requires physical verification (for inventory) and substantive tests (customer confirmation for accounts receivable). *Size* is the natural logarithm of the total assets in millions of dollars. Based on the earlier audit fee models, we expect *Size* to be positively associated with *LAF*. Audit risk is also measured by *Lev* (total debt over market value of equity and total debt) and we expect the variable to be positively associated with audit fee. *Util*, is an indicator variable for utility firms. We expect utility firms to have lower audit effort because they are mostly regulated and therefore, undergo scrutiny by another independent source. *YE* is the indicator variable for firms with fiscal years ending December 31 and is expected to be positively associated with audit fees because this is the busy season for auditors in the U.S.. We also control for auditor tenure (*LaudTen*). There are two arguments on how audit tenure could affect audit fees. On one hand, auditors with longer tenure may tend to extract higher fees in order to recover the losses from low-balling. On the other hand, auditors with longer experience about the client can design more efficient audit procedures and thus enjoy cost savings. *YR* is the indicator variables for years that control for systematic differences in audit fees during different years in the pooled cross-sectional model. We also conduct Fama-Macbeth analysis (without the *Years* variables) to ensure that the results in the pooled regression are consistent over the years (See also Skoulakis [2008] for the desirability of combining pooled regression with Fama-Macbeth analysis as a test of robustness). We include *DirAge* and *DirTenure* as control variables[19] since newer and younger directors are likely to demand more information and

[19] We thank one of the reviewers for this suggestion.

correspondingly greater audit effort. We also include outside directorships since prior studies suggest that outside directorships may provide higher monitoring and contribute to the demand for higher audit effort. Finally, we include industry indicator variables to allow for differences in audit procedures in different industries.

3.1.2. The Model for Auditor Choice

For our examination of the effect of the presence of female directors (audit committee members) on the probability of choosing specialist auditors, we estimate the following Logit model on the propensity score matched sample that matches each gender diverse board (audit committee) with an all-male board (all-male audit committee).

$$\Pr(Specialist=1) = d_0 + d_1 GD + d_2 CGboard + d_3 CEOpower + d_4 Size + d_5 Lev + d_6 ROA + d_7 DirAge(AcDirAge) + d_8 DirTenure(AcDirTen) + d_9 Directorships(AcDirectorships) + \sum_j d_j YR_j + \sum_k d_k IND_k + \varepsilon_{it} \quad (2)$$

Following Fan and Wong [2005], we control for the scale and scope of the audit measured by the natural logarithm of the firm's assets (*Size*) and audit risk captured by two variables, the firm's financial leverage (*Lev*) and its return on assets (*ROA*). As in the case of the audit fee model, we include *CGboard, CEOpower, DirAge, DirTenure and Directorships* as control variables.

3.1.3. Proportion of female directors audit fees and auditor choice

The previous analysis focused on the presence of female directors (audit committee members) on the board (audit committee), based on the rationale that the gender-diverse boards (audit committees) demand higher audit quality. In this section, we focus on the effects of the *degree* of gender diversity in a sample that is comprised of firms whose boards have at least one female director (audit committee member). We measure the degree of gender diversity in the board by

the proportion of female directors on the board (*FDirprop*), and in the audit committee by the proportion of female audit committee members on the board (*FAudprop*) and the proportion of female audit committee members on the audit committee (*FACprop*). In order to test the effects of the degree of gender diversity, we construct indicator variables *FDirp*, *FAudp* and *FACp* from the above proportions respectively that compare the top and bottom quartiles of each proportion. The second and third quartiles are excluded from these tests.

We use propensity matching to test the effects of the proportions of female directors (*FDirp*, *FAudp* and *FACp*) on audit fees and auditor choice. Specifically, we match gender-diverse firms with high degree of gender diversity (top quartile of the proportion) with firms that have low degree of gender diversity (bottom quartile of the proportion). [20] [21]

3.2. CONTROL FOR ENDOGENEITY – PROPENSITY SCORE MATCHING

In our analysis of the comparative audit quality between gender-diverse and all male boards (audit committees), we correct for endogeneity by using the propensity score matched pair design (Rosenbaum and Rubin [1983]). Endogeneity might be caused by several factors such as reverse causality, simultaneity, omitted variables, selection bias and measurement error. The endogeneity problem that we face in this study is mainly one of selection bias because firms that engage female directors could be systematically different from those that have all-male boards. To the extent that the characteristics of firms that engage gender-diverse boards also might lead to higher audit quality, firms that are more likely to demand higher audit quality might self-select into the sample of gender-diverse firms. The research method we use must control for this self-selection. One way of doing it is to consider matched firms that have the same propensity to engage female directors, out of which one has a gender diverse board and the other one does not.

[20] We have also tested other cutoffs (tercile and median) and find consistent results.
[21] We thank an anonymous reviewerfor this suggestion.

Because these two firms are similar in the characteristics that determine board gender diversity, differences in audit quality between them could be attributed to the difference between gender-diverse and all-male boards. The advantage of a matching procedure over other methods of controlling for endogeneity is that it does not rely on a clear source of identification of exogenous variables (Roberts and Whited [2012], p.67). However, as Roberts and Whited [2012] point out, propensity score matching requires a propensity score model that is based on observable firm characteristics. Hillman et al. [2002] provide such a model that identifies the observable determinants of female directorship in firms.[22]

The propensity matching procedure consists of the following steps. First, we estimate a Logistic propensity score model, which estimates the probability that a firm will have a gender-diverse board conditional on the observable firm and industry characteristics consistent with the female-director determinant model developed by Hillman et al. [2002]. Second, we form matched pairs identify pairing that result with the smallest propensity score differences. In particular, we identify a firm with non-gender-diverse board whose propensity score is as close

[22] If the firm characteristics that determine gender-diversity are not observable (say, if it is based on the innate beliefs or abilities of managers), and the unobservable characteristics also affect audit quality, a propensity matching approach might not be the most appropriate, unless one assumes that the unobserved variables affect audit quality through the observed variables. Unobserved variables could be firm-specific and time-invariant or they could be both firm and time-variant. Firm fixed-effects and change models control for selection on time-invariant firm-specific unobservable variables. We have performed both analyses and get consistent results (the Change model results are given in Table 4 Panel E). Time variant unobservable variables can be controlled by the instrumental variable (IV) approach where the IV is correlated with the treatment variable (board gender diversity) but not with the error term in the second stage regression of the dependent variables (audit fees and auditor choice) (See Larcker and Rusticus [2010]; Roberts and Whited [2012]) or the Heckman [1976] procedure where the selection bias is corrected by the inverse mills ratio computed from a prediction model whose variables should, in theory, not be directly related to the dependent variables (Lennox et al. [2012]). However, the identification of good instrument variables is a problem and if such variables can be identified, they can be used as part of the propensity score model. Armstrong et al. [2010] show that the propensity score model provides a more robust estimate of the treatment effect than alternative regression approaches, except when the underlying structural model cannot be fully specified because of unobservable variables or because of unknown functional form. Moreover, we believe that the Hillman et al. [2002]'s prediction model is a reliable model of predicting board gender diversity. Therefore, we use the propensity matching approach as the primary means to address the endogeneity issue in this study.

to the focal gender-diverse board in question.[23] Third, we remove dissimilar matched pairs if the difference in the propensity scores (probabilities) is greater than 0.001.

The model used to develop the propensity scores is similar to that used by Hillman et al. [2007].[24] Product diversification increases the need for board independence (Boone et al. [2007]), and growth, R&D, and stock volatility affect the demand for board monitoring (Linck et al. [2008]).[25] Cheng [2008] shows an association between large boards and lower variability in corporate performance. Therefore, we include variables that measure sales growth, stock volatility, and diversification in the propensity score model. In addition, based on Adams and Ferreira [2009] and Campbell and M ńguez-Vera [2008], we include several performance variables, such as accounting performance (ROA), Tobin's Q, and market returns. We include the age of the firm to control for potential alternative explanations for female representation, such as inertia (Hillman et al. [2002]) and *Size* because larger firms face greater pressure to conform to societal expectations (DiMaggio and Powell [1985]). We also include the percentage of women employed in the industry (Hillman et al. [2002]) because firms in that industry might follow the industry norms for board structuring.[26] To mitigate the confounding effects resulting from other directors' characteristics, we include director's age and tenure. Finally, we include the average number of outside directorships held by directors to proxy for the demand for additional

[23] We note that because there are more gender-diverse boards in our sample, matching for every gender-diverse board requires that the matched non-gender diverse firms be repeated in several cases. Similarly, because there are more all-male audit committees, matching for every gender-diverse audit committee requires us to discard some all-male audit committees. We repeat the tests with *reverse matching* in additional tests. In addition, we also conduct analysis with *full models* where we pool all the covariates driving both the treatment (GD) and outcome (auditor fees/choice) as determinants of propensity score and conducting t-tests/z-tests of differences in means between matched treatment and control groups to estimate the treatment effects. We report this in Section 4.3. For each treatment variable (*FDir, FAud, FDirp, FAudp* and *FACp*), we use independent matching procedures aiming to isolate the effect of treatment from other characteristics.

[24] We use the Logit model for reporting our results. However, our tests using the Probit model yield similar results.

[25] Although R&D has been shown to affect the demand for board-monitoring, only firms with material R&D expenses disclose them and this is a relatively small subset. Including this variable will reduce our sample considerably and therefore we decided to exclude it from our analysis.

[26] We use Bureau of Labor Statistics (BLS) data to obtain the percentage of women employees in the two-digit SIC industry category.

networking. We control for board governance using two indexes: a governance index based on the governance variables identified by Larcker et al. [2007] and an index of CEO power.

The notations and definitions of all the variables used are summarized in Exhibit 1.

Insert Exhibit 1 here

In our prediction models, we measure organizational size (*Size*) by the natural logarithm of total assets. Firm age (*FirmAge*) is measured by the number of years that the firm reported assets on Compustat from 1977 onwards. Sales growth (*SalesGrth*) is the year-to-year percentage change in sales over a three-year period ending in the current year. Consistent with Hillman et al. [2007], we measure diversification (*DT*) using the entropy measure[27] of Palepu [1985] and total risk (*TotRisk*) by the standard deviation of daily stock returns over the fiscal year standardized to a mean of 0 and standard deviation of 1 over all the firms. Tobin's Q is computed as: (the book value of assets - the book value of equity + the market value of equity) scaled by the book value of assets. The firm's accounting and market performances are measured respectively by return on assets (*ROA*), and stock return (*Ret*) over the fiscal year. Other control variables include the value-weighted market return measured over the fiscal year (*Vwretd*), the percentage of female employees in the two-digit SIC industry category (*IndFpct*), the average director age (*DirAge*) and the average director tenure (*DirTen*). The number of external links is measured by the average number of outside directorships (*Directorships*) held by directors of the firm.

Larcker et al. [2007] identify seven categories of corporate governance. Out of these, we focus on two that are of interest in controlling the relevant board variables: board governance

[27]The entropy measure given in Appendix 2 of Palepu [1985] is $\sum_{i=1} P_i \, ln(1/P_i)$ where P_i is the share of the ith industry segment in the total sales of the firm. Consistent with Palepu [1985], we define industry segments as the four-digit SIC industry categories in which the firms operate.

and the percentage of shareholding by inside directors and executives.[28] In addition, we include an indicator variable for Big-4 auditors because it is known that the Big-4 auditors provide a differentiated quality of audit at a premium price. Our board governance index, *CGboard*, is the principal component of thirteen variables identified by Larcker et al. [2007]. These variables include board independence, affiliated director proportion, old directors, board diligence in terms of the meetings, audit committee and board sizes and variables on busy directors who serve on four or more other boards. The descriptions of these variables and their component loadings are given in Exhibit 1. We use the principal component as well as the individual governance variables separately in different regressions. In addition to *CGboard,* we use another variable, *CEOpower*, to control for the influence that the CEO has on the board. *CEOpower* is computed as an average of three indicator variables: (i) indicator variable for the same person holding the positions of CEO and the chairman of the board – based on prior literature that suggests that combining the duties of CEO and chairman could impair the ability of the board to exercise oversight (Finkelstein and D'Aveni [1994]; Millstein [1992]); (ii) indicator variable if the founder of the firm also serves as the CEO and (iii) an indicator variable for when the CEO is the only insider in the board. The last two variables are based on the analysis of governance in Dechow et al. [1996].[29] Year and industry dummies are included. The Logit model for computing the propensity score is

$$\Pr[GD_{it}=1] = c_0 + c_1 ROA + c_2 Size + c_3 FirmAge + c_4 SalesGrth + c_5 DT + c_6 TotRisk + c_7 Q + c_8 Ret + c_9 Vwretd + c_{10} IndFpct + c_{11} CGboard + c_{12} CEOpower + c_{13} DirAge(AcDirAge) + c_{14} DirTenure(AcDirTen) + c_{15} Directorships(AcDirectorships) + \sum_j c_j YR_j + \sum_k c_k IND_k + \varepsilon_{it} \quad (3)$$

[28] The other categories include stock ownership by institutions, activist holders, debt and preferred stock holdings, compensation mix variables and anti-takeover devices. It is unlikely that the last four categories might reflect female board participation. Including institutional ownership is not directly associated with female board participation but including it as a variable significantly reduces the sample size.

[29] Admittedly, equal weight for the three variables is somewhat arbitrary. However, using the three variables separately does not change our results.

In the above equation, the subscript i denotes the firm; the subscript t denotes the year (2001-2011); *GD* is set equal to 1 if there is at least one female director (audit committee member) on the board of firm i in year t, and 0 otherwise.

We complement the propensity score matched pair design with a change specification model in which we regress the changes in audit fees with changes in GD as an alternative control for endogeneity. We describe these models in the section on empirical analysis.

4. Empirical Analysis and Results

4.1. THE SAMPLE

Our sample is taken from the Corporate Library database for the period 2001-2011. Table 1 gives the sample selection details.

Insert Table 1 here

Firms for which both the gender of the directors and other corporate board characteristics (required for *CGboard* and *CEOpower* variables) are available from Corporate Library are first selected. Out of these, the firms for which the audit fee data is available from the Audit Analytics database are retained in the sample. Further, the audit fee model requires financial data. After eliminating the firms for which the financial information is not available, we are left with 9,416 firm-years for our analysis.

Out of these firms, we have 2,762 firms with no female director (*FDir* = 0) to be matched with 6,654 firms with one or more female directors (*FDir* = 1). The larger number of firms with gender-diverse boards results in some of the all-male boards in the sample to be duplicated in matching. We find the closest propensity score match for each one of the firms with female director and then eliminate the pair if the difference in their propensity scores is greater than

0.001. The elimination of dissimilar pairs leaves us with 2,898 propensity score matched pairs for a total of 5,796 observations. For the propensity score matching for female audit committee members, there are 4,009 firms with female audit committee members (*FAud* = 1) that are matched with firms without female audit committee members (*FAud* = 0). To be consistent with the procedure we have followed for *FDir*, we match a firm without female audit committee member with those that have at least one audit committee member. Unlike the case of gender-diverse boards, this matching results in the elimination of some of the all-male audit committees. After removal of dissimilar pairs (propensity scores differing by more than .001), this procedure results in 1,502 propensity score matched pairs for a total of 3,004 observations.

Table 2 (Panel A) gives the descriptive statistics of the total sample of 9,416 firms as well as the two sub-samples, with and without female directors (N=2,762 with no female directors and N = 6,654 with at least one female director). The p-values for t-tests of the difference between means of the two sub-samples are shown in the last column. The average audit fee is significantly higher in the sub-sample with female directors than in the sub-sample without them. Panel B compares the boards with female directors with all-male boards that are propensity-matched. The average audit fee is also higher for the sub-sample with female directors, consistent with our expectation.

Insert Table 2 here

Panel C contrasts the characteristics of female and male directors. The financial expertise of female directors and audit committee members is similar to their male counterparts, which suggests that it is not the additional financial expertise of female audit committee members that is driving the demand for higher audit quality. Female directors and audit committee members are, on average, younger than their male counterparts. The average tenure of male directors (audit committee members) is materially higher than that of female directors (audit committee

members). However, the average number of outside directorships held by the female directors (1.74) is marginally higher than those held by the male directors (1.69). This statistic suggests that female directors seem to have a better exposure to other firms than male directors. Consistent with our expectation, both Pearson and Spearman correlations (not tabulated) show that *LAF* is positively correlated with all female directorship (*GD*) variables.[30] Further, all the female directorship variables are positively correlated with corporate governance, performance and size variables. Consistent with Carcello et al. [2002], *CGboard* is also positively correlated with audit fees.

4.2. LOGIT MODEL (PROPENSITY SCORE) RESULTS

Table 3 provides the results of the Logit model (Model 1) that estimates the probability of female director (female audit committee member) presence.

Insert Table 3 here

Both the models for *FDir* and *FAud* are explain female participation in the board and audit committee at a 1% significance level (the areas under the ROC are 0.8120 and 0.7651 respectively). Consistent with Hillman et al. [2007], FirmAge and Size are positively related to having at least one *FDir* or *FAud*. Similar to their results, ROA, total risk and Tobin's Q are not significant. We conduct separate analyses for these two dimensions as these two models offer similar but not identical signs of coefficients in several of the explanatory variables.

4.3. AUDIT FEE ANALYSIS RESULTS

Panel A of Table 4 gives the regression results for *GD* variables (*FDir* and *FAud*) on the propensity score matched samples. The data is analyzed using two-dimensional clustering by firms and years and the cluster-robust corrected t-statistics are presented. Consistent with

[30] The correlations are not tabulated in the paper in the interest of brevity. They are available from authors on request.

Carcello et al. [2002][31], *CGboard* is positive and significant. *CEOpower* is not significant. The rest of the variables are consistent with our predicted signs. The number of segments reflects the extensiveness and complexity of audit and shows a positive coefficient. Loss making firms present higher audit risk and therefore, are positively associated with audit fee. The receivables and inventory increase the need for substantive tests and consistent with prior studies and our expectations, show positive and significant coefficients. *Size* is a measure of the extensiveness and complexity of audit and is strongly positively associated with audit fee. Utilities are regulated and exhibit lower risk for auditors and therefore, show negative coefficients. The coefficients of *DirAge* and *Directorships* are positive but insignificant while the coefficient of *DirTenure* is negative and significant.

In both regressions, *GD* variables are positive and significant, supporting our hypothesis that female director (female audit committee member) presence results in a higher demand for audit and is reflected in higher audit fees[32].

Insert Table 4 here

These results hold for reverse propensity matching regressions (untabulated) where each firm with *FDir* (*FAud*) = 0 is matched with a firm with *FDir* (*FAud*) = 1. The results also hold in full model matching regressions and reverse matching regressions (untabulated) where all the covariates that determine *GD* and Audit Fee are used for propensity matching and the t-statistic

[31] We use the audit fee model in Ashbaugh et al. [2003] as an alternative audit fee model and introduce *FDir* as a treatment variable. The model uses variables including Big5, natural log of market value of equity and market to book ratio to proxy for audit complexity; merger and financing to capture the demand for additional audit and consulting services. Leverage, ROA, sum of accounts receivables and inventory, negative ROA and special items are proxy for audit risk. Market to book ratio, ROA, and NEGATIVE_ROA are also proxy for firm performance. We find that *FDir* is positive and significant (not tabulated). We use 0.001 caliper distance to form the propensity-matched samples and also obtain consistent results after trying different caliper distances (between 0.0005-0.005).

[32] In a separate test, we use the total fee paid to the auditors (sum of audit and non-audit fee) as the dependent variable to account for possible transfer of fees between audit and non-audit fees (Simunic [1984]). The results are unchanged when total fees are used instead of audit fees in the analysis. We also control for *SOX 404* opinions. The results for *GD* variables remain positive and significant.

for the difference in means of *LAF* is found to be significant where the *LAF* for *FDir* (*FAud*) = 1 is higher than the *LAF* for *FDir* (*FAud*) = 0.[33]

Our sample period of 2001-2011 includes the enactment of the Sarbanes-Oxley Act which severely restricted non-audit service provision by the auditors (Sec. 202) and therefore, in all likelihood affected audit fees across the board. Panel B gives the results for the periods 2001-2002 (pre-SOX) and 2003-2011 (post SOX) in separate regressions. Untabulated results for *GD* variables are positive but not significant in the pre-SOX period but are significant in the post-SOX period. These results are consistent with the argument that the attention of the board towards audit effort was bolstered by the passage of the Sarbanes-Oxley Act and the gender diversity on the board contributed to the increased audit effort after the passage of SOX. [34]

Panels B to D provide the analyses undertaken to address specific issues. We note that higher audit fee in gender-diverse boards could arise either because they engage specialist auditors who charge higher fees or/and they demand higher audit effort which entails higher audit fee. We estimate the second stage regressions after controlling for specialist premium (by using a dummy variable for specialist auditor). Panel C shows the results of these regressions. We find that the results for *GD* hold after controlling for specialist premium. The implication of this result is that the increase in audit fee reflects an increase in audit effort after allowing for the fact that gender-diverse boards and audit committees are more likely to engage specialist auditors.

Panel D shows the results after controlling for financial expertise (for the period 2004-2011 for which the financial expert data is available) and ethnic diversity. The results continue to hold in both cases. Panel E gives the results for the lagged change analysis in which the dependent variable is the change in the audit fees between the years t and t-1 and the treatment variable is

[33] The results of these analyses – the reverse matching reduced model; the full model matching regression and reverse matching regression are not tabulated in the paper in the interest of brevity but are available on request from the authors.

[34] The lack of significance of the results in the pre-SOX period could also be due to small sample size.

the change in *GD* between years t-2 and t-1. All the other control variables are also change variables with a lag. In the change analysis, change in *GD* shows a significant effect in the change of audit fees in the following year for both *FDir* and *FAud*. The change model can be viewed as a way to control for omitted variables.

4.4. AUDITOR CHOICE RESULTS

Table 5 gives the results of Model (3) on the effect of female directorship on the choice of city-level specialist auditors using the propensity-matched sample. The city level specialist auditor is defined as the auditor who is the industry market leader in the city where the client is headquartered. We follow the same method (audit fees) of identifying specialist auditors as Francis et al. [2005] and Fung et al. [2012]. We first compute each Big N audit firm's share in each two-digit industry group in each city before applying the sample selection criteria. The auditor with the largest share is designated the industry specialist. [35] We do not include observations with less than two clients by city-industry cluster in any MSAs. The results indicate that *GD* is positive and significant for both *FDir* and *FAud*, implying that gender diverse boards (audit committees) are more likely to engage higher quality specialist auditors than similar all-male boards (audit committees).

Insert Table 5 here

4.5. DEGREE OF GENDER DIVERSITY IN FIRMS WITH GENDER-DIVERSE BOARDS

[35] We have also used three additional alternative definitions of specialist auditors: (i) following Reichelt and Wang [2010], we additionally require specialist auditors have a market share of at least 10% greater than its closest competitor in the city; (ii) require specialist auditors to have a market share of 50% or higher in an industry based on the two-digit SIC category in the city audit market; (iii) following Minutti-Meza [2013], we require the specialist auditor to have the highest market share (total assets) in the given industry and year at the city level. We find consistent and significant results in all the eight cases (four for board directors and four for audit committee members). The results using the alternative definitions are not reported in the interest of brevity but are available upon request from the authors.

We run logistic models to determine the propensity that a firm with gender-diverse board (audit committee) has a low (bottom quartile) or high (top quartile) proportion of female directors (audit committee members). We use the same variables as in Model 1 (similar to Table 3).[36]

Table 6 provides the results for the degree of gender diversity on boards (audit committees). Panel A of Table 6 shows strong positive associations between all three predicted proportions and audit fees. Panel B gives the results of Model (3) on auditor choice. In all cases, the coefficients of predicted GD are positive and significant[37] which support the hypothesis that firms with more female directors (audit committee members) are more likely to choose specialist auditors.

Insert Table 6 here

4.6. ADDITIONAL TESTS

The incremental effect of gender diversity in the audit-committee:

We construct a joint model to examine whether having female directors on the audit committee is incremental to having female directors only on the board. We include both the variables *FAud* and *FDir_not FAud* (*FDir_not FAud* is a variable where female directors do not participate in the audit committee) in the audit fee and auditor choice models. The results (not

[36] We run six logistic regressions to determine the probability of a firm being placed in the bottom or the top quartile of the proportion of female directors or audit committee members. Three of the regressions are based on the samples for gender-diverse boards (audit committees) for audit fees. The other three are based on samples for gender diverse boards (audit committees) for auditor choice. The latter are smaller samples because of the exclusion of firms whose city locations do not match the US Census Bureau MSA codes. We do not report these first stage results in the interest of brevity. All the models are significant. We use a caliper distance of 0.001 to form the propensity-matched samples.

[37] We note that the sample sizes drop to 286 and 268 when we examine the effect of the proportion of female audit committee members (*FAudp* and *FACp*). As indicated, the drop in sample size is due first in the sample being restricted to gender-diverse audit committees and then to the exclusion of the firms without matching MSA codes. We complement these results by using the proportions as continuous variables (without propensity matching) and find consistent results.

tabulated) show that both variables are positively and significantly associated with the audit fee but only *FAud* is positively and significantly associated with specialist auditor choice.

Insert Table 7 here *Controlling for differences in age, tenure and outside directorships between male and female directors*:

The inclusion of the directors' average age, tenure and directorships in the analysis does not directly address the question of systematic differences in these variables between male and female directors. In this analysis, we run the audit fee and the auditor choice models with three additional control variables: the difference in the average age between male and female directors on the board (audit committee); the difference in the average tenure between male and female directors on the board (audit committee); and the difference in the average number of outside directorships between male and female directors on the board (audit committee). The results for *GD* remain significant and positive after controlling for these variables for both the audit fee and the auditor choice models.

Female Chairman of the Board (Audit Committee):

We examine the effect on both the audit fees and auditor choice when a woman holds the position of the chairman of the board (audit committee). We find significant results for both audit fee and auditor choice when a woman is the chairman of the board. The results are consistent but not significant when the position of audit committee chairman is held by a woman. In view of the small sample sizes we consider these results to be, at best, exploratory.

Female nonexecutive directors:

We conducted both the audit fee and the auditor choice tests for the presence and proportion of female nonexecutive directors. The results are similar to those for female director presence

and proportion. This consistency in results is not surprising because about 87% of female directors on boards are non-executive independent directors.

Control for Tokenism:

There is some evidence that a lone woman on the board often serves as a token and is not taken seriously (Kramer et al. [2006]; Erkut et al. [2008]; Branson [2006]; Bourez [2005]). We examine the effect of two or more women on the board or the audit committee. We define the variable *FDir2* (*FAud2*) equals 1 when there are two or more female directors (audit committee members) and 0 when there are no female directors. For the purpose of this test, the observations with only one female director (audit committee member) are excluded from this analysis.[38] Untabulated results also show that the presence of two or more directors/audit committee members on the board (*GD2)* is significant and positive.

Alternative specialist variable specifications:

To examine whether the results are sensitive to the specification of the specialist variable, we try alternative measures based on the definitions in Reichelt and Wang [2010] and Minutti-Meza [2013]. Our main findings are still robust to the measures based on audit fees defined in Reichelt and Wang [2010] and based on total assets defined in Minutti-Meza [2013].

First time audits:

[38] Out of the 70% (41%) of the sample with female participation, more than 47% (77%) of the boards have only one female director (audit committee member).

Based on Carcello et al. [2002], we argue that the board (audit committee) can negotiate with the auditor and demand higher effort than would otherwise be exerted. The scope of the negotiation is much higher during the first year of audit when lowballing is a primary concern. We find that the results of the effect of gender diversity on audit fee holds for the first time audits.

Full sample versus propensity matching score tests

We conducted non-matched sample tests and compared the results with our matched sample. Untabulated results show that the tested variables for the non-matched samples are economically and statistically significant in the unmatched samples. For instance, the coefficients (t-values) of *FDir* and *FAud* in the audit fee regression are 0.0603 (3.84) and 01.2457 (3.86) respectively. For city specialist results, the coefficients (Chi-squared statistics) of *FDir* and *FAud* are 0.7803 (4.46) and 0.8238 (4.87) respectively.

5. Concluding Remarks

This paper examines the effect of gender diversity in the board of directors on audit fees and auditor choice. Based on prior evidence on the positive effect of female directors on earnings quality and information embedded in stock prices, and the literature on the use of auditing as a mechanism to affect these changes, we surmised that female directors are likely to move the board towards engaging high quality auditors and demanding higher audit effort from them. We find support for the hypothesis that firms with gender-diverse boards (audit committees) choose industry-specialist auditors and demand higher audit effort from them, after controlling for self-selection bias and other variables that are known to affect audit fees or auditor choice as the case may be.

This paper adds to the literature in the area of gender diversity that has increasingly been recognized as one of societal importance by regulators. It is positioned within a set of studies that examine the effect of gender diversity on different important variables of consequence such as performance, earnings quality, informativeness, disclosure and the cost of capital.

The specific contribution of this paper is that it tests whether gender diversity *in fact* increases monitoring. The earlier literature conjectured that by increasing board attendance and number of meetings and by becoming members of monitoring committees such as the audit committee, female directors likely improved the monitoring function of the board and thereby improved earnings quality and informativeness. However, the prior literature is silent on the specific actions taken by gender-diverse boards - *the mechanism* - to improve the monitoring of the managers and increase the oversight over their actions. By showing that they demand higher audit effort and choose higher quality auditors, this paper confirms that auditing is used as the mechanism to affect these changes and validates the conjectures of the earlier work.

We note that our results are valid for US firms and cannot be generalized to firms in other countries that might have different legal, institutional, structural or cultural attributes. Second, as is the case with similar studies, there may be exogenous firm-level variables correlated with female directorships and with audit fees. Although we have considered a number of such variables in the two-stage procedure, we cannot completely rule out the possibility of our results being affected by omitted variables.

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EXHIBIT 1

Notation and definitions of variables

I. Gender diversity variables

GD	*FDir* or *FAud* or *FAC*
FDir	1 if there is at least 1 female director on board, 0 otherwise
FAud	1 if there is at least 1 female director on the audit committee, 0 otherwise
FDirprop	Proportion of female directors on board
FAudprop	Proportion of female audit committee members on the board
FACprop	Proportion of female audit committee members on the audit committee
FDirp	1 if the proportion of female directors on board is in the top quartile; 0 if it is in the bottom quartile
FAudp	1 if the proportion of female audit committee members on the board is in the top quartile; 0 if it is in the bottom quartile
FACp	1 if the proportion of female audit committee members on the audit committee is in the top quartile; 0 if it is in the bottom quartile
ChgAC	1 if there is change in the composition of audit committee, 0 otherwise

II. Audit fee and auditor choice variables

LAF	the natural log of audit fee
Specialist	indicator variable for city-specific industry leaders where clients are headquartered

III. Control variables in the first stage: Determinants of female director presence

ROA	return on assets defined as net income before extraordinary items divided by average total assets
Size	natural log of total assets
FirmAge	the number of years for which total assets was reported in Compustat since 1977
SalesGrth	year-to-year percentage change in sales over preceding 3 years
DT	total diversification, Palepu (1985) computed as $\sum_{i=1} P_i \, ln(1/P_i)$ where P_i is the share of the i^{th} industry segment in the total sales of the firm. Consistent with Palepu (1985), we define industry segments as four-digit SIC industry categories in which the firm operates.
TotRisk	standard deviation in daily returns over a company's fiscal year (standardized to a mean of 0 and a standard deviation of 1)
Q	*Tobin's Q,* the book value of assets minus the book value of equity, plus the market value of equity, scaled by the book value of assets
Ret	the annual return measured over the fiscal year
Vwretd	the value weighted market return measured over the fiscal year
IndFpct	the percentage of employees who were women in each two-digit SIC industry category
CGboard[a]	First principal component of board characteristics variables
CEOpower	(CEO = chairman dummy + CEO = founder dummy +CEO = only insider dummy)/3
Directorships	average number of outside directorships held by directors
DirAge	average directors' age in a firm
DirTenure	average directors' tenure in a firm
AcDirAge	average age of directors' in the audit committee
AcDirTen	average tenure of directors' in the audit committee
AcDirectorships	average number of outside directorships held by directors in the audit committee

IV. Control variables in the second stage

CGboard[a]	First principal component of board characteristics variables

CEOpower	(CEO = chairman dummy + CEO = founder dummy +CEO = only insider dummy)/3
Segnum	the number of business segments
Foreign	the sales from foreign operations derived by the total sales
Loss	1 if the firm reports a net loss, 0 otherwise
ROA	return on assets defined as net income before extraordinary items divided by average total assets
Recint	accounts receivable divided by total assets
Invint	inventory divided by total assets
Size	natural log of average total assets
Lev	total debt divided by market value of equity plus total debt
Util	1if the firm is an utility, 0 otherwise
Directorships	average number of outside directorships held by directors
DirAge	average directors' age in a firm
DirTenure	average directors' tenure in a firm
AcDirAge	average age of directors' in the audit committee
AcDirTen	average tenure of directors' in the audit committee
AcDirectorships	average number of outside directorships held by directors in the audit committee
YE	1 if fiscal year end is December 31, 0 otherwise
Laudten	natural log of auditor tenure

V. Additional variables

SOX	1 if fiscal year <= 2002, 0 otherwise
FinExppct	proportion of financial experts on board
DirEthn	1 if there is a non-Caucasian director on the board, 0 if the board is full of Caucasian directors.
FDir2	1 if there are at least 2 female directors on board, 0 if there is no female director
FAud2	1 if there are at least 2 female directors on the audit committee, 0 if there is none
GD2	*FDir2* or *FAud2*

[a] *CGboard* is determined using principal component analysis by the following factors:

Inddirpct	proportion of independent directors on the board (these directors have no material connection to the company other than board seats)
Affdirpct	1 minus proportion of affiliated directors (Directors outside related: Mostly, these directors or their primary employers have a financial relationship with the company, or he/she is a former employee of the company. These outside directors are not independent.)
Insiderspct	percentage of outstanding shares held by insiders
Oldavgdirten	average number of years the directorship who are older than 70 has been active
OlddirNoshrpct	proportion of directors who are older than 70 with no shareholding in the firm
Bdmtgs	board Meetings, number of full board meetings
Dirattendpct	proportion of directors attended over 75% of meetings
Numtotaldir	number of board directors
NumACdir	number of directors on audit committee
Binddirpct	busy outsiders, proportion of independent directors who serve on four or more other boards
Baffdirpct	busy affiliated, proportion of affiliated directors who serve on four or more other boards
Binsdirpct	busy insiders, proportion of insider directors who serve on four or more other boards
Big 4/5	1 if firms audited by Big 4/5, 0 otherwise

Factors	Component Loading	Standard Error
Inddirpct	0.5419	0.1493
Affdirpct	0.4270	0.1252
Insiderspct	-0.3676	0.1936
Oldavgdirten	-0.0809	8.6760
OlddirNoshrpct	-0.0907	0.2376
Bdmtgs	0.1502	4.4723
Dirattendpct	0.0436	0.0393
Numtotaldir	0.3626	5.6191
NumACdir	0.3763	2.0529
Binddirpct	0.0083	0.1012
Baffdirpct	-0.2254	0.0325
Binsdirpct	-0.1200	0.0287
Big 4/5	0.1063	0.3234

TABLE 1

The Sample

This table reports the statistics about sample selection for the sample years 2001-2011

	Match Samples (*FDir*=1 with *FDir*=0)	Firm-years
Firms with available director gender in Corporate Library Database		25,201
Firms both in Corporate Library and with audit fee from Audit Analytics		25,050
Less:		
Financial sector (SIC 6000-6999)		(4,844)
Corporate governance data not available		(7,988)
Missing total risk and financial data		(2,802)
Firms used in calculating propensity score matching		9,405
Firms used in the audit fee model*	5,782	
Unmatched city (MSA) codes	(3,194)	
Firms used in the auditor choice model**	2,588	

*The number of firms used in the audit fees model when matching *FAud*=1 with *FAud*=0 is 2,970.
** The number of firms used in the auditor choice model when matching *FAud*=1 with *FAud*=0 is 1,360.

TABLE 2

Descriptive statistics and characteristics of female and male directors – Matched Sample

Panel A: In this panel, we report the descriptive sample statistics for the matched sample (*FDir*=1 match with *FDir*=0). All the variables have been defined in Exhibit 1. For dummy variables that take the value of 1 for firms with female directors on the board and 0 for firms with no female directors.

Panel A: Descriptive statistics

	No female director on the board (N=2,891)			At least one female director on		
Variable	Mean	Median	Std Dev	Mean	Median	
LAF	14.0622	14.0228	0.8980	14.1254	14.1178	
AuditFees (in millions)	1.9260	1.2304	2.1637	2.1668	1.3530	
FAud	0.0000	0.0000	0.0000	0.5264	1.0000	
FDirprop	0.0000	0.0000	0.0000	0.1230	0.1111	
FAudprop	0.0000	0.0000	0.0000	0.0900	0.0769	
FACprop	0.0000	0.0000	0.0000	0.1429	0.1400	
ROA	0.0081	0.0418	0.1489	0.0198	0.0433	
Size	6.9047	6.7538	1.2898	6.9004	6.8015	
FirmAge	33.7321	24.0000	32.7040	38.7366	30.0000	3
SaleGrth	0.0278	-0.0015	0.1713	0.0215	0.0006	
DT	0.3631	0.0000	0.4451	0.4058	0.1558	
TotRisk	0.0326	0.0289	0.0155	0.0318	0.0280	
Q	1.8165	1.4683	1.1675	1.8246	1.4954	
Ret	0.1346	0.0796	0.5322	0.1354	0.0838	
Vwretd	0.0742	0.1186	0.2157	0.0720	0.1186	
IndFpct	0.3784	0.4004	0.1550	0.3630	0.3528	
CGboard	-0.11118	0.0505	1.2824	-0.0547	0.1317	
CEOpower	0.1738	0.0000	0.2227	0.1705	0.0000	
DirAge	60.6058	60.7692	3.7902	60.8501	61.034	
DirTenure	8.8799	8.1333	4.0101	9.3020	8.8333	
Directorships	1.3669	1.2000	0.6166	1.3684	1.2500	
Segnum	6.5299	5.0000	4.7353	7.3419	6.0000	
Foreign	0.0264	0.0000	0.0915	0.0576	0.0000	
Loss	0.4152	0.0000	0.4929	0.4026	0.0000	
Recint	0.1397	0.1249	0.1143	0.1479	0.1354	
Invint	0.1277	0.1002	0.1307	0.1310	0.1149	
Lev	0.2264	0.1721	0.2261	0.1935	0.1325	
Util	0.0452	0.0000	0.2100	0.0043	0.0000	
YE	0.6610	1.0000	0.4735	0.6266	1.0000	

LaudTen	2.6708	2.7081	0.6267	2.8148	2.9444
Specialist[a]	0.4236	0.0000	0.4944	0.4973	0.0000
Finexppct[b]	0.0550	0.0000	0.0879	0.0516	0.0000
DirEthn[c]	0.9855	1.0000	0.1197	0.9883	1.0000
AcDirAge	61.056	61.360	4.4900	61.987	62.090
AcDirTen	7.7989	7.2500	3.7058	8.1471	7.6667
AcDirectorships	1.5811	1.3333	0.8362	1.6225	1.3750

[a] Number of *FDir*=1& =0 is 1,312.
[b] Number of *FDir*=1& =0 is 2,590.
[c]Number of *FDir*=1& =0 is 1,279.

Panel B: In this panel, we report the descriptive sample statistics for the matched sample (*FAudr*=1 match with *FAud*=0). All the variables have been defined in Exhibit 1. For dummy variables that take the value of 1 for firms with female directors on the board and 0 for firms with no female directors.

Panel B: Descriptive statistics

	No female director in the audit committee (N=1,294)			At least one female director in t (N=1,294)		
Variable	Mean	Median	Std Dev	Mean	Median	
LAF	13.9675	13.9820	0.8683	14.0591	14.1430	
AuditFees (in millions)	1.8434	1.1810	2.1408	2.0681	1.3875	
FDir	0.0000	0.0000	0.0000	1.000	1.0000	
FDirprop	0.0000	0.0000	0.0000	0.1230	0.1111	
FAudprop	0.0000	0.0000	0.0000	0.0900	0.0769	
FACprop	0.0000	0.0000	0.0000	0.1429	0.1400	
ROA	0.0140	0.0406	0.1493	0.0175	0.0429	
Size	6.7906	6.8122	1.2922	6.7906	6.8512	
FirmAge	32.0960	25.0000	29.9102	32.4187	27.0000	2
SaleGrth	0.0220	0.0005	0.1526	0.0298	0.0026	
DT	0.3370	0.0000	0.4358	0.3342	0.0563	
TotRisk	0.0329	0.0289	0.0160	0.0328	0.0285	
Q	1.8706	1.4662	1.2160	1.8483	1.5240	
Ret	0.1367	0.0808	0.5262	0.1717	0.0761	
Vwretd	0.0929	0.1300	0.1996	0.1000	0.1186	
IndFpct	0.3558	0.4004	0.1501	0.3638	0.3528	
CGboard	-0.0603	-0.0138	1.3158	-0.0792	0.0056	

CEOpower	0.1847	0.0000	0.2305	0.1768	0.0000
DirAge	60.387	61.000	3.9496	60.968	61.087
DirTenure	8.7586	8.4444	3.8040	8.6448	8.6154
Directorships	1.3026	1.2000	0.0168	1.4149	1.2500
Segnum	6.2864	5.0000	4.7143	6.4848	6.0000
Foreign	0.0300	0.0000	0.1092	0.0512	0.0000
Loss	0.3917	0.0000	0.4882	0.4225	0.0000
Recint	0.1481	0.1232	0.1112	0.1452	0.1308
Invint	0.1200	0.0915	0.1220	0.1178	0.1037
Lev	0.2096	0.1721	0.2116	0.1760	0.1398
Util	0.0452	0.0000	0.2100	0.0043	0.0000
YE	0.6502	1.0000	0.4771	0.6396	1.0000
LaudTen	2.6708	2.7081	0.6267	2.8148	2.8909
Specialist[a]	0.4236	0.0000	0.4944	0.4973	0.0000
Finexppct[b]	0.0550	0.0000	0.0879	0.0516	0.0000
DirEthn[c]	0.9855	1.0000	0.1197	0.9883	1.0000
AcDirAge	61.056	61.360	4.4900	61.987	62.090
AcDirTen	7.7989	7.2500	3.7058	8.1471	7.6667
AcDirectorships	1.5811	1.3333	0.8362	1.6225	1.3750

[a] Number of *FDir*=1& =0 is 1,312.
[b] Number of *FDir*=1& =0 is 2,590.
[c] Number of *FDir*=1& =0 is 1,279. **TABLE 2 –** *Continued*

Panel C: In this panel, we report some characteristics of all directors in the first column, female directors in the second column and the male directors in the third column. The characteristics include financial expertise, age, tenure and the averages of number of directorships held by the directors belonging to each category using the full sample. The variables have been defined in Exhibit 1.

Characteristics of female and male directors

	All directors	Female directors Characteristics	Male directors Characteristics
Financial expertise of directors	0.0595 (N=7840)	0.0609 (N=5677)	0.0600 (N=7840)
Financial expertise of audit committee members	0.2046 (N=7840)	0.1461 (N=1891)	0.2113 (N=4934)
Age of directors	61.0178 (N=9405)	56.4043 (N=6654)	61.4898 (N=9405)
Age of AC member	61.8729 (N=9405)	56.9039 (N=4009)*	61.2287 (N=9405)

Tenure of directors	9.0701 (N=9405)	7.1397 (N=6654)	9.7910 (N=9405)
Tenure of AC member	8.3975 (N=9405)	6.9026 (N=4009)*	10.0294 (N=9405)
Average number of directorships	1.6980 (N=9405)	1.7425 (N=6023)	1.6939 (N=9405)
Average number of AC directorships	1.7517 (N=9405)	1.7998 (N=4009)*	1.7387 (N=9405)

* The number represents the female audit committee members' characteristics. Due to data availability, there are only 4,009 observations.

TABLE 3

Logit model for female directorship on the board (First stage)

This table reports the results of the Logit model for the presence of female directors (*FDir*) and the presence of female audit committee member (*FAud*) on the board of directors. The variables used in the models given here are defined in Exhibit 1. The logit model is used to estimate the propensity (probability) for firms to include a female director on the board (female director on the audit committee).

$$\Pr[GD_{it}=1] = c_0 + c_1 ROA + c_2 Size + c_3 FirmAge + c_4 SalesGrth + c_5 DT + c_6 TotRisk + c_7 Q + c_8 Ret + c_9 Vwretd + c_{10} IndFpct + c_{11} CGboard + c_{12} CEOpower + c_{13} DirAge(AcDirAge) + c_{14} DirTenure(AcDirTen) + c_{15} Directorships(AcDirectorships) + \sum_j c_j YR_j + \sum_k c_k IND_k + \varepsilon_{it}$$

GD =	Pred Sign	*FDir*	*FAud*
Intercept	?	-1.1838	0.9842
		(-0.58)	(0.88)
ROA	?	-0.0421	0.1974
		(-0.15)	(0.60)
Size	+	0.4969***	0.3157***
		(9.13)	(7.21)
FirmAge	+	0.0104***	0.0064***
		(4.49)	(3.77)
SaleGrth	+	0.4757	0.4215*
		(1.37)	(1.69)
DT	-	0.0451	0.2580**
		(0.55)	(2.00)
TotRisk	-	0.1945	1.5247
		(0.07)	(0.46)
Q	+	-0.0265	-0.0037
		(-0.95)	(-0.07)
Ret	+	-0.1907***	-0.1181*
		(-2.83)	(-1.82)
Vwretd	+	0.4751	0.1791
		(1.44)	(0.72)
IndFpct	+	0.2639	0.5320
		(0.64)	(0.72)
CGboard	?	0.3485***	0.3119***
		(8.70)	(8.41)
CEOpower	?	-0.4443	-0.1564
		(-1..03)	(-0.73)
DirAge/AcDirAge	?	-0.0453***	-0.0788***
		(-3.34)	(-6.22)
DirTenure/AcDirTen	?	-0.0329	-0.0263*
		(-1.09)	(-1.85)
Directorships(AcDirectorships	?	0.1340	-0.0566
		(0.88)	(-0.44)
Years		Included	Included
Industries		Included	Included
Pseudo R Sq		0.3421	0.2034
LR Statistic		2535.5242	2074.2688
p-value		<.0001	<.0001
N		9,405	9,405

*** Statistically significant at the <1% level (2-tailed);** Statistically significant at the <5% level (2-tailed)

*Statistically significant at the <10% level (2-tailed). Z-statistics are calculated based on clustered standard errors. All variables are defined in Exhibit 1.

TABLE 4

Effect of female directorships on audit fees (Propensity score-matched sample)

Panel A: This table reports the propensity score matched regression results. The model used in this panel is

$$LAF = d_0 + d_1 GD + d_2 CGboard + d_3 CEOpower + d_4 Segnum + d_5 Foreign + d_6 Loss + d_7 ROA + d_8 Recint + d_9 Invint + d_{10} Size + d_{11} Lev + d_{12} Util + d_{13} DirAge(AcDirAge) + d_{14} DirTenure(AcDirTen) + d_{15} Directorships(AcDirectorships) + d_{16} LaudTen + d_{17} YE + \sum_j d_j YR_j + \sum_k d_k IND_k + \varepsilon$$

	Pred Sign	Match *FDir*=1 with *FDir*=0	Match *FAud*=1 with *FAud*=0
Intercept		10.3485***	10.0322***
		(36.28)	(37.69)
GD	?	0.0539**	0.0956***
		(2.36)	(3.27)
CGboard	+	0.0276***	0.0357***
		(2.95)	(3.04)
CEOpower	-	0.0633	0.1265
		(1.11)	(1.53)
Segnum	+	0.0205***	0.0257***
		(7.03)	(8.07)
Foreign	+	-0.1593	-0.3349*
		(-0.74)	(-2.45)
Loss	+	0.1077***	0.1020***
		(4.20)	(2.79)
ROA	-	-0.1344	-0.1745*
		(-1.11)	(-1.65)
Recint	+	1.1167***	1.2059***
		(8.11)	(5.86)
Invint	+	0.5443***	0.2508
		(3.91)	(1.40)
Size	+	0.5151***	0.4943***
		(44.86)	(28.15)
Lev	+	0.0262	0.1439*
		(0.40)	(1.73)
Util	-	-0.4829***	-0.2368**
		(-2.70)	(-2.05)
DirAge/ AcDirAge	?	-0.0019	0.0076
		(-0.49)	(0.22)
DirTenure/ AcDirTen	?	-0.0241***	-0.0152***
		(-6.14)	(-3.30)
Directorships/ AcDirectorships	?	0.0078	0.0525**
		(0.29)	(2.25)
LaudTen	?	0.0506**	0.0155
		(2.34)	(0.68)
YE	+	0.0367	0.0136
		(1.32)	(0.41)

Industries	Included	Included
Years	Included	Included
ADJRSQ	0.7338	0.7152
Fvalue	144.01	137.56
ProbF	0.0000	0.0000
N	5,782	2,970

*** Statistically significant at the <1% level (2-tailed); ** Statistically significant at the <5% level (2-tailed);
* Statistically significant at the <10% level (2-tailed). The t-values (in parentheses) are based on robust standard errors adjusted for clustering by firm and year. Caliper distance is 0.001 for all the models. All variables are defined in Exhibit 1.

TABLE 4 -*Continued*

Panel B: This panel provides the results after controlling for city specialist (*Specialist*) using the *LAF* model given in Panel A.

	Match *FDir*=1 with *FDir*=0	Match *FAud*=1 with *FAud*=0
Intercept	10.2989***	11.5297***
	(33.84)	(21.78)
GD	0.0737***	0.0529***
	(2.81)	(3.72)
Specialist	0.0661**	0.0924**
	(2.48)	(2.05)
Controls	Included	Included
Industries	Included	Included
Years	Included	Included
ADJRSQ	0.7183	0.7355
N	2,574	1,268
FValue	87.75	72.28
ProbF	0.0000	0.0000

*** Statistically significant at the <1% level (2-tailed); ** Statistically significant at the <5% level (2-tailed)
*Statistically significant at the <10% level (2-tailed). The t-values (in parentheses) are based on robust standard errors adjusted for clustering by firm and year. Caliper distance used in the models is 0.001. All variables are defined in Exhibit 1.

Panel C: This panel gives the analysis after controlling for financial expertise and ethnic diversity using the *LAF* model as in Panel A. For the analysis controlling for financial expertise, the financial expertise data is available only from 2004 onwards. Therefore, the analysis is carried out over the period (2004-2011).

	Financial Expertise			Ethnic Diversity	
	Match FDir=1 with FDir=0	Match FAud=1 with FAud=0		Match FDir=1 with FDir=0	Match FAud=1 with FAud=0
Intercept	10.1268***	10.1715***	Intercept	9.5272***	10.3175***
	(55.08)	(47.74)		(41.12)	(33.30)
FDir	0.0307**		*FDir*	0.0561***	
	(2.21)			(2.87)	
FAud		0.0716***	*FAud*		0.1246***
		(3.15)			(4.16)
Finexppct	0.1004	0.1707	*DirEthn*	0.0568	-0.1578
	(0.81)	(0.98)		(0.92)	(-1.15)
Controls	Included	Included	Controls	Included	Included
Years	Included	Included	Years	Included	Included
Industries	Included	Included	Industries	Included	Included
ADJRSQ	0.7182	0.7095	ADJRSQ	0.7621	0.7252
N	5,142	2,568	N	2,506	1,268
FValue	212.91	102.10	FValue	126.33	62.11
ProbF	0.0000	0.0000	ProbF	0.0000	0.0000

*** Statistically significant at the <1% level (2-tailed); ** Statistically significant at the <5% level (2-tailed)
*Statistically significant at the <10% level (2-tailed). The t-values (in parentheses) are based on robust standard errors adjusted for clustering by firm. All variables are defined in Exhibit 1.

TABLE 4 -*Continued*

Panel D: This panel provides the results for the change *LAF* model below:

$$\Delta LAF_t = d_0 + d_1\Delta GD_{t-1} + d_2\Delta CGboard_{t-1} + d_3\Delta CEOpower_{t-1} + d_4\Delta Segnum_{t-1} + d_5\Delta Foreign_{t-1} + d_6\Delta Loss_{t-1} + d_7\Delta ROA_{t-1} + d_8\Delta Recint_{t-1} + d_9\Delta Invint_{t-1} + d_{10}\Delta Size_{t-1} + d_{11}\Delta Lev_{t-1} + d_{12}\Delta DirAge(AcDirAge)_{t-1} + d_{13}\Delta DirTenure(AcDirTen)_{t-1} + d_{14}\Delta Directorships(AcDirectorships)_{t-1} + d_{15}\Delta LaudTen_{t-1} + \varepsilon$$

The dependent variable is the change in *LAF* from t-1 to t. The change variables on the right-hand side are changes from t-2 to t-1. Because of the lag, the period *t* is over the interval 2002-2011. *ChgAC* is defined as 1 if there are any changes to the composition of the audit committee.

	FDir	*FAud*
Intercept	0.0078***	0.0032*
	(5.14)	(1.81)
ΔGD_{t-1}	0.0059***	0.0183*
	(3.15)	(1.88)
ChgAC		-0.0053**
		(-2.00)
Controls	Included	Included
ADJRSQ	0.0477	0.1221
N	1,617	516
FValue	6.26	4.10
ProbF	0.0000	0.0000

*** Statistically significant at the <1% level (2-tailed); ** Statistically significant at the <5% level (2-tailed) *Statistically significant at the <10% level (2-tailed). T statistics are given in parentheses. All variables are defined in Exhibit 1.

TABLE 5

Logit model for board gender diversity and auditor choice (Propensity-matched sample)

This table provides the analysis of gender diversity and the choice of specialist auditors. It provides the results for sample partitions with and without the presence of female directors in the first column and female audit committee members in the next column. The sample size drops because of the missing values of the city-specific leading auditor. Firms whose city locations on Compustat that do not match the US Census Bureau MSA codes following Francis et al. [2005] have been removed from the original sample.

The model is

$$\Pr(Specialist = 1) = d_0 + d_1 GD + d_2 CGboard + d_3 CEOpower + d_4 Size + d_5 Lev + d_6 ROA + d_7 DirAge$$

$$(AcDirAge) + d_8 DirTenure(AcDirTen) + d_9 Directorships(AcDirectorships) + \sum_j d_j YR_j + \sum_k d_k IND_k + \varepsilon_{it}$$

	Pred. sign	*Match FDir* = 1 with *FDir* =0	*Match FAud* = 1 with *FAud*=0
Intercept	?	-4.4615***	-3.4124*
		(22.18)	(3.37)
GD	?	0.2191**	0.3483**
		(3.95)	(4.72)
CGboard	+	0.0759**	0.1834*
		(4.17)	(3.55)
CEOpower	?	-0.1172	0.3139
		(0.28)	(0.64)
Size	+	0.2373***	0.1393***
		(32.56)	(7.91)
Lev	+	-0.2305	0.4059
		(0.76)	(0.56)
ROA	+	-0.7738**	-0.1352
		(5.43)	(0.05)
DirAge/AcDirAge	?	0.0365**	0.0020
		(5.58)	(0.92)
DirTenure/ AcDirTen	?	0.0292*	0.0169
		(3.67)	(0.51)
Directorships/ AcDirectorships	?	0.1259	0.1256
		(1.48)	(0.99)
Industries		Included	Included
Years		Included	Included
Pseudo RSq		0.1387	0.1678
LR Statistic		274.1860	296.5839
p-value		0.0000	0.0000
N		2,588	1,360

*** Statistically significant at the <1% level (2-tailed); ** Statistically significant at the <5% level (2-tailed)

*Statistically significant at the <10% level (2-tailed). Chi-squared statistics are provided in parentheses. Caliper distance is 0.001 for all models. All variables are defined in Exhibit 1. The full sample in Table 3 is used in the determination of the matching pairs. We have also rerun the prediction model using the reduced sample and the results are generally consistent.

Table 6

Effect of the degree of gender diversity on audit fee (Propensity score matched sample)

Panel A: This table reports the propensity score matching regression results. Firms with high proportions (top quartile) are matched with firms with low proportions (bottom quartile)[a] The model used in this panel is

$$LAF = d_0 + d_1 GD + d_2 CGboard + d_3 CEOpower + d_4 Segnum + d_5 Foreign + d_6 Loss + d_7 ROA + d_8 Recint + d_9 Invint + d_{10} Size + d_{11} Lev + d_{12} Util + d_{13} DirAge(AcDirAge) + d_{14} DirTenure(AcDirTen) + d_{15} Directorships(AcDirectorships) + d_{16} LaudTen + d_{17} YE + \sum_j d_j YR_j + \sum_k d_k IND_k + \varepsilon$$

	Pred sign	Match *FDirp*=1 with *FDirp*=0	Match *FAudp*=1 with *FAudp*=0	Match *FACp*=1 with *FACp*=0
Intercept	?	10.5248***	9.3958***	11.5062***
		(25.82)	(10.39)	(21.56)
GD	?	0.0658**	0.2002**	0.1840***
		(2.16)	(2.16)	(3.23)
CGboard	+	0.0322***	0.0768*	0.0214
		(2.79)	(1.85)	(0.98)
CEOPower	-	0.1005	-0.2455	0.2887*
		(1.25)	(-1.09)	(1.66)
Segnum	+	0.0208***	-0.0034	0.0140**
		(5.78)	(-0.24)	(2.54)
Foreign	+	0.1154	2.9091**	-0.2703
		(0.42)	(2.09)	(-1.22)
Loss	+	0.0743**	0.1902	0.1908***
		(2.24)	(1.28)	(3.06)
ROA	-	-0.0873	-1.4964***	-0.5688***
		(-0.71)	(-4.16)	(-2.89)
Recint	+	1.4844***	1.6895***	1.5197***
		(6.60)	(5.90)	(3.28)
Invint	+	-0.2650	0.8048	0.1174
		(1.29)	(0.95)	(0.36)
Size	+	0.4886***	0.6790***	0.5421***
		(34.86)	(11.66)	(19.53)
Lev	+	0.1377	0.0700	-0.0030
		(1.56)	(0.20)	(-0.20)
Util	-	-0.4729***	-0.3953	-0.2345
		(-2.73)	(-1.28)	(-1.42)
DirAge/AcDirAge	?	-0.0032	-0.0100	-0.0271***
		(-0.61)	(-0.62)	(-3.15)
DirTenure/AcDirTen	?	-0.0151**	0.0059	0.0243**
		(-2.41)	(0.24)	(2.27)
Directorships/AcDirectorships	?	0.0482	-0.0693	0.0091
		(1.21)	(-0.50)	(0.21)
Laudten	?	0.0115	-0.0588	-0.0564
		(0.33)	(-0.52)	(-0.84)

YE	+	0.1617***	-0.0790	0.0825
		(4.80)	(-0.53)	(1.17)
Industries		Included	Included	Included
Years		Included	Included	Included
ADJRSQ		0.7736	0.7983	0.8787
Fvalue		64.95	60.83	46.05
ProbF		0.0000	0.0000	0.0000
N		986	562	548

[a] The second and the third quartile are deleted for this test.

*** Statistically significant at the <1% level (2-tailed); ** Statistically significant at the <5% level (2-tailed);

*Statistically significant at the <10% level (2-tailed). Caliper distance is 0.001 for all the models. The t-values (in parentheses) are based on robust standard errors adjusted for clustering by firm. All variables are defined in Exhibit 1.

Note: The proportion of female AC members on the BOD (the proportion of females on Audit Committee) is economically more significant than the proportion of females on BOD. In terms of statistical significance, they are similar.

Table 6 - *Continued*

Effect of female directorship proportions on auditor choice (Propensity score matched sample)

Panel B: This table reports the propensity score matching regression results. Firms with high proportions (top quartile) are matched with firms with low proportions (bottom quartile).[a] The model used in this panel is

$$\Pr(Specialist=1) = d_0 + d_1 GD + d_2 CGboard + d_3 CEOpower + d_4 Size + d_5 Lev + d_6 ROA + d_7 DirAge(AcDirAge) + d_8 DirTenure(AcDirTen) + d_9 Directorships(AcDirectorships) + \sum_j d_j YR_j + \sum_k d_k IND_k + \varepsilon_{it}$$

	Pred. sign	*FDirp* = 1 match with *FDirp*=0	*FAudp* = 1 match with *FAudp*=0	*FACp* = 1 match with *FACp*=0
Intercept	?	0.1372	-9.3096	-11.7914***
		(0.95)	(2.55)	(8.60)
GD	?	0.3921**	0.8193**	0.8739**
		(3.77)	(3.89)	(3.91)
CGboard	+	0.1976**	-0.2402	0.2145
		(5.05)	(0.99)	(0.62)
CEOpower	?	-0.0840	0.5609	-2.5758*
		(0.02)	(0.14)	(3.65)
Size	+	0.1106*	0.3733*	0.3634**
		(3.25)	(3.16)	(3.81)
Lev	+	-0.5555	3.3122**	1.8036
		(-0.82)	(4.25)	(1.45)
ROA	+	-0.5572	1.9121	-0.1542
		(0.39)	(0.68)	(0.51)
DirAge/AcDirAge	?	-0.0416	0.0820	0.1021
		(0.95)	(0.75)	(2.30)
DirTenure/ AcDirTen	?	0.0367	-0.0171	0.1235
		(0.99)	(0.03)	(2.21)
Directorships/AcDirectorships	?	0.9909	0.3221	1.079**
		(1.63)	(0.40)	(4.67)
Industries		Included	Included	Included
Years		Included	Included	Included
Pseudo R Sq		0.2459	0.3672	0.5309
LR Statistic		105.7563	60.6644	125.3904
p-value		0.0000	0.0002	0.0000
N		492	258	220

[a] The second and the third quartile are deleted for this test.

*** Statistically significant at the <1% level (2-tailed); ** Statistically significant at the <5% level (2-tailed); *Statistically significant at the <10% level (2-tailed) Chi-squared statistics are provided in parentheses. Caliper distance is 0.001 for all the models. All variables are defined in Exhibit 1.

TABLE 7

Effect of having female board members on the audit committee is incremental to not having female members on the audit committee in audit fee model

Panel A: This table reports the propensity score matching regression results. The model used in this panel is

$$LAF = d_0 + d_1 FAud + d_2 FDir\_noFAud + d_3 CGboard + d_4 CEOpower + d_5 Segnum + d_6 Foreign + d_7 Loss + d_8 ROA + d_9 Recint + d_{10} Invint + d_{11} Size + d_{12} eLev + d_{13} Util + d_{14} DirAge + d_{15} DirTenure + d_{16} Directorships + d_{17} LaudTen + d_{18} YE + \sum_j d_j YR_j + \sum_k d_k IND_k + \varepsilon_{it}$$

	Pred sign	
Intercept	?	10.3076***
		(54.62)
FAud	?	0.0482**
		(2.121)
FDir_noFAud	?	0.0329***
		(2.81)
CGboard	+	0.0345***
		(5.71)
CEOpower	-	0.0833**
		(2.17)
Segnum	+	0.0205***
		(12.63)
Foreign	+	0.1254
		(0.09)
Loss	+	0.1312***
		(8.77)
ROA	-	-0.1692***
		(-3.32)
Recint	+	0.9602***
		(10.48)
Invint	+	0.4896***
		(5.85)
Size	+	0.5027***
		(68.51)
Lev	+	0.0580
		(1.46)
Util	-	-0.1885
		(-1.35)
DirAge	?	0.025
		(0.96)
DirTenure	?	-0.0264
		(-0.50)
Directorships	?	0.0092
		(0.07)
LaudTen	?	0.0413**
		(2.39)
YE	+	0.0024
		(0.16)

Years	Included
Industries	Included
ADJRSQ	0.7215
Fvalue	207.62
ProbF	0.0000
N	2,944

*** Statistically significant at the <1% level (2-tailed); ** Statistically significant at the <5% level (2-tailed); *Statistically significant at the <10% level (2-tailed). The t-values (in parentheses) are based on robust standard errors adjusted for clustering by firm and year. *FDir_noFAud* =1 if the female director is not an audit committee member and 0 otherwise. Caliper distance is 0.001 for the model. All other variables are defined in Exhibit 1.

TABLE 7 - *Continued*

Effect of having female board member(s) on the audit committee is incremental to not having female members on the audit committee in audit specialist choice model.

Panel B: This table reports the propensity score matching regression results. The model used in this panel is

$$\Pr(Specialist=1) = d_0 + d_1 FAud + d_2 FDir\_noFAud + d_3 CGboard + d_4 CEOpower + d_5 Size + d_6 Lev + d_7 ROA + d_8 DirAge + d_9 DirTenure + d_{10} Directorships + \sum_j d_j YR_j + \sum_k d_k IND_k + \varepsilon_{it}$$

	Pred sign	
Intercept	?	-5.3100
		(11.77)
FAud	?	0.4331**
		(5.23)
FDir_noFAud	?	-0.0401
		(0.72)
CGboard	+	0.0545
		(1.33)
CEOpower	-	0.2387
		(0.67)
Size	+	0.3258***
		(13.44)
Lev	+	-0.1325
		(0.14)
ROA	-	-0.1426
		(0.88)
DirAge	?	-0.0146
		(0.50)
DirTenure	?	0.0314
		(2.29)
Directorships	?	0.2680*
		(3.61)
Years		Included
Industries		Included
Pseudo R Sq		0.2536
LR Statistic		120.048
p-value		0.0000
N		1,272

*** Statistically significant at the <1% level (2-tailed); ** Statistically significant at the <5% level (2-tailed); *Statistically significant at the <10% level (2-tailed). *FDir_noFAud* =1 if the female director is not an audit committee member and 0 otherwise. Chi-squared statistics are provided in parentheses. Caliper distance is 0.001 for the model. All other variables are defined in Exhibit 1.