"The relationship between female workforce participation and corporate bond credit ratings"

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THE RELATIONSHIP BETWEEN FEMALE WORKFORCE PARTICIPATION AND CORPORATE BOND CREDIT RATINGS

Abstract

The topic of gender diversity in the workforce has received an increasing amount of attention and even resulted in developing a new term, sheconomy, which describes an economy in which women are the main economic players. This study examines the relationship between female workforce participation and corporate bond credit ratings. Using an ordered logit regression model and a sample of listed companies on the Korea Exchange, the results show that the higher the number and proportion of women in the workforce (based on female directors and female employees), the higher the credit rating. However, for chaebol companies, where female directors' positive role is limited by chaebol owners, a negative (–) moderating effect is observed in the relationship between female workforce participation and credit ratings. Besides, female directors who are members of the owner's family and were appointed as a means of succession negatively affect a company's value. The findings contribute to accounting and finance research on the relationship between governance and credit ratings in terms of gender diversity. Policy implications regarding the recent system changes in Korea, including introducing a gender quota system, can be derived from the study.

Keywords	credit ratings, gender diversity, chaebol, female workforce, gender quota system
JEL Classification	G30, G38, M41

INTRODUCTION

This study examines the impact of female workforce participation on corporate bond credit ratings in Korea. Good corporate governance positively affects credit ratings and mitigates information asymmetry (Sengupta, 1998; Bhojraj & Sengupta, 2003; Ashbaugh-Skaife et al., 2006). In particular, female executives are well-placed to represent independent opinions and perspectives and thus can stand for activism and gender diversity (Heminway, 2007; Barua et al., 2010; Srinidhi et al., 2011; Francis et al., 2014). Female directors show a positive commitment to organizational goals and enhance corporate reputation and value by forming a transparent and efficient corporate culture (Hillman & Dalziel, 2003; Adams & Ferreira, 2009). At the operational level, female employees can represent diverse perspectives in decision-making and positively impact corporate performance. Besides, considering the recent expansion of female workforce protection policies in Korea, it is expected that positive external effects will accrue to companies that employ women.

On the other hand, female directors' positive effect may be weakened in chaebol companies, a corporate governance structure unique to Korea. In chaebol companies, the owner's family strongly influences the companies' overall management activities within the group, including evaluating the professional managers of the group's affiliates and making compensation and promotion-related decisions.

Simultaneously, the appointment of female directors at chaebol companies is typically driven by the owner's family. Therefore, these appointments may be based on family relationships and succession, rather than objective ability.

This study contributes to accounting and finance research on the relationship between governance and credit ratings, focusing on gender diversity. This evidence may encourage those outside the company (e.g., participants in the capital markets) to positively view companies with a large proportion of females in their workforce when making investment decisions. With the caveat, a different view of female directors' role must be applied for chaebol companies. The findings also provide a positive basis for companies to design an effective organization (i.e., management structure) by utilizing a female workforce at both the executive and operational levels.

1. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

This section reviews the literature concerning the female workforce's role as a corporate governance and chaebol companies, which is a corporate governance structure unique to Korea. The first sub-section gives an overview of the effect of female workforce participation as a corporate governance measure on corporate value and reputation. The second sub-section reviews the literature on chaebol companies' unique human resources systems and performance.

Carter et al. (2003), Erhardt et al. (2003), and Hillman and Dalziel (2003) report that female directors improve corporate transparency and increase corporate value. Based on biological characteristics, such as conservatism (risk aversion, low overconfidence) and morality (ethics, regulatory compliance), female board members have been observed to faithfully perform the role of monitoring to improve the reliability (usefulness) of accounting information (Heminway, 2007; Barua et al., 2010; Gul et al., 2011; Srinidhi et al., 2011; Francis et al., 2014). Moreover, female directors show a strong commitment to organizational goals and, ultimately, enhance corporate reputation and value by forming a transparent and efficient corporate culture (Hillman & Dalziel, 2003; Adams & Ferreira, 2009). Thus, if a female director can improve a company's accounting transparency and the credibility of its financial statements, which can enhance corporate value, capital market participants are likely to estimate a reduced risk premium for the company. Wilson

and Altanlar (2009) supported the tendency that female directors' presence reduced UK firms' insolvency risk. As such, credit rating agencies are expected to recognize female directors' presence, which signifies the independence, activism, and gender diversity of the board, as a positive factor in terms of risk management. Overall, this can be expected to lead to a decrease in capital procurement costs.

Furthermore, gender diversity and flexibility in decision-making can positively impact the organizational culture of a company, not only at the executive level but also at the operational level. Companies with a high proportion of female employees can embrace various perspectives for decision-making at the operational level and form a flexible corporate culture. First, female employees can be valuable as human resources and positively impact corporate value by creating synergy among staff through organizational diversity. In other words, female employees who tend to represent various perspectives and solutions in decision-making processes can enrich the existing male-dominated corporate organization. This can lead to the development of superior management strategies.

Besides, as the perception of female social advancement changes and the government implements more policies to encourage female employment, female employees at a company can affect corporate performance or long-term growth potential through external factors. The differences unique to female employees and the synergies they can create within an organization are conceivable. Compulsory government (national and local) policies like the "gender equality employment quota," "mandatory parental

leave," "tax support for companies that rehire women with career gaps," and an "increase in the proportion of public investments for companies with a high proportion of female directors" were introduced because they create a favorable environment for women in the workforce both socially and economically. The support for these policies is likely to be viewed positively in capital markets, and therefore, credit rating agencies are expected to recognize female employees' presence as a positive factor in credit ratings. Based on these discussions, the following Hypothesis 1 is proposed: => add.

H1: *The number of female directors and employees in the workforce positively affects the corporate bond credit rating.*

H1a: *The higher the number (or proportion) of female directors, the higher the corporate bond credit rating.*

H1b: *The higher the number (or proportion) of female employees, the higher the corporate bond credit rating.*

A chaebol, a corporate governance structure unique to Korea, is a group of two or more companies that are directly controlled by the same person (the chairperson or his/her family members), either alone or through relatives, through non-profit corporations and affiliates. The chaebol is an organic collective in which the independent company is legally bound by equity investments, the aforementioned key controlling shareholder, internal markets, common management methods, and corporate culture. Chaebols have a unique management method in which relatives, particularly the chairperson, have a strong influence whereby they lead management decisions on a company-wide basis. Thus, in chaebol companies, female directors' positive influence based on their unique characteristics (independence, activism, gender diversity) may be weakened. This is because female directors' role may be limited in a corporate culture where it is possible for the chairperson, or de facto director, to have an unlimited exercise of power (Article 401-2 of the Commercial Act).

Besides, chaebols have a unique human resources system where the directors of the affiliates are managed at the group headquarters level. A chaebol has a professional performance assessment organization that regularly assesses affiliate directors' performance and makes decisions regarding compensation levels and positions (including transfers and promotions) (Chang & Shin, 2006; Park et al., 2010). The chairperson and his/her family have virtually unlimited decision-making authority and lead personnel management, including appointment, assessment, and compensation. Therefore, it is also highly likely that a female director is a family member of a controlling shareholder with cash flow rights at a chaebol enterprise. In this case, female directors who are family members may not make active efforts to acquire and maintain their positions (Schulze et al., 2003), which is a circumstance that is known to have a negative impact on corporate value (Villalonga & Amit, 2006; Fahlenbrach, 2009). This analysis supports the formulation of Hypothesis 2 as follows:

H2: *The positive relationship between female directors and corporate bond credit ratings is expected to be weaker at chaebol companies.*

2. METHODOLOGY

2.1. Model

Model 1 was developed to test *H1*. A regression equation was designed with the credit rating score as the dependent variable and factors affecting credit ratings as the independent variables. Many prior studies using credit ratings as a dependent variable employ the ordered logit model (Ashbaugh-Skaife et al., 2006). Thus, the same was applied in this study. Besides, if all variables are set to the same point in time *t*, a lag is used between the independent and dependent variables to avoid endogeneity problems between the dependent variable and the independent and control variables.

The credit rating (grade), which is the dependent variable, is measured by scoring the domestic credit rating agencies' ratings. Points are given at equal intervals in decreasing order of 1 point for each step from the highest AAA rating score of 20 to the lowest D rating of 1 point. Thus, the highest value for the credit rating variable is 20, and the lowest is 1.

The female workforce, which is the independent variable of interest in this study, comprises female directors and female employees. The variables related to female directors consist of a dummy variable, FD_D, which is 1 if the company has female directors and 0 otherwise, FD_N, which indicates the number of female directors, and FD_R, which is the ratio of female directors among all directors. Variables related to female employees consist of FE_N, which is the natural logarithm of the number of female employees, FE_R, which represents the ratio of female employees among all employees, and FE_AR, which is the ratio of female employees compared to the average in the same industry (based on the standard industrial classification).

The financial and non-financial factors that are expected to affect credit ratings are also included in the model as control variables. These include the size of the company (SIZE), sales growth rate (GROW), net profit margin (ROA), and debt-to-equity ratio (LEV), which represent the company's financial characteristics (Pinches & Mingo, 1973; Kaplan & Urwits, 1979). Generally, company's size represents the company's potential capability to have a strong market position, the net asset margin reflects performance, and the debt ratio indicates the risk of default. Therefore, size and profitability are expected to have a positive (+) effect on credit ratings, whereas the debt ratio is anticipated to have a negative (–) effect. Further control variables include systemic risk (BETA), which is measured using a market beta coefficient (Bhojraj & Sengupta, 2003; Francis et al., 2008), and foreign investor equity (FOR), which controls for the corporate governance structure impact of foreign investors. The ratio of outside directors (ODR) and dummy variables for the scale of auditors (BIG4), MKT (affiliated market), industry (IND), and year (YD) are also added as further control variables.

Model 1

$$GRADE_{i,t+1} = \beta_1 FW_{i,t} + \beta_2 SIZE_{i,t} +$$
$$+ \beta_3 GROW_{i,t} + \beta_4 ROA_{i,t} + \beta_5 LEV_{i,t} +$$
$$+ \beta_6 BETA_{i,t} + \beta_7 FOR_{i,t} + \beta_8 ODR_{i,t} +$$
$$+ \beta_9 BIG4_{i,t} + \beta_{10} MKT_{i,t} + \beta_{11} AGE_{i,t} +$$
$$+ IND + YR + \varepsilon_{i,t},$$

where GRADE = Credit rating score (AAA 20 points – D 1 point);

FD (Female Director) = Female directors:

- FD_D = 1, if there are female directors, 0 if not;

- FD_N = Number of female directors;

- FD_R = Ratio of female directors among all directors;

FE (Female Employee) = Female employees:

- FE_N = Natural logarithm of the number of female employees;

- FE_R = Ratio of female employees among all employees;

- FE_AR = Ratio of female employees compared to the average in the same industry;

SIZE = Company size (natural logarithm of total assets); GROW = Sales growth rate; ROA = Return on assets; LEV = Debt ratio; BETA = Systemic market risk; FOR = Foreign investor equity ratio; ODR = Ratio of outside directors; BIG4 = 1, if the company is audited by a BIG4 audit firm, 0 if not; MKT = 1, if it belongs to the securities market, 0 if not; AGE = Age of the company; IND = Industry dummy; YR = Year dummy.

Model 2 is used to test H2 regarding chaebols' moderating effect in the relationship between female directors and corporate credit ratings. In the regression equation that determines credit rating score (GRADE), CH (chaebol status) and its interaction with FD (female directors) are added as independent variables to examine the moderating effect of the chaebol structure in the relationship between female directors and credit ratings. In other words, if the regression coefficient β_3 for FD·CH, which represents chaebol companies with female directors, is negative (–), it suggests the positive effect of female directors on corporate credit ratings is weakened at chaebol companies.

Model 2

$$\grave{u}\grave{u}\grave{u}\grave{u}_{\ i,t+1} = \beta_1 \quad_{i,t} + \beta_2 \quad_{i,t} +$$
$$+\beta_3\left(FD_{i,t} \cdot CH_{i,t}\right) + \beta_4 SIZE_{i,t} +$$
$$+\beta_5 GROW_{i,t} + \beta_6 ROA_{i,t} + \beta_7 LEV_{i,t}$$
$$+\beta_8 BETA_{i,t} + \beta_9 FOR_{i,t} + \beta_{10} ODR_{i,t} +$$
$$+\beta_{\grave{u}\grave{u}\grave{u}\grave{u}} BIG4_{i\ t} + \beta \quad MKT_{i\ t} + \beta \quad AGE_{i\ t} +$$
$$+IND + YR + \varepsilon_{i,t},$$

where CH = 1, if the company belongs to a chaebol, 0 if not; $FD \cdot CH$ = The interaction between female directors and chaebol status.

The chaebol variable data, which represent a corporate governance structure unique to Korea, are compiled based on Fair Trade Commission (FTC) data. The FTC (http://ftc.go.kr/) publishes the financial statements and stakes of affiliates belonging to large enterprise groups at the end of each business year. The chaebol variable (CH) is defined for each sample year as a dummy variable indicating whether the FTC designates an enterprise as a chaebol in the "large enterprise group" data.

2.2. Sampling and data collection

This study's sample is domestic listed companies (*KOSPI* + *KOSDAQ*) with financial information and data regarding their female workforce available between 2014 and 2018. In November 2013, the Financial Supervisory Service established a mandatory standard requiring the addition of director gender information to the director status table presented in regular disclosures.[1] This was implemented following the recommendations from the Organization for Economic Cooperation and Development (OECD) to increase female directors' proportion at listed companies. Therefore, this study uses observations from 2014 to 2018, when disclosure of director gender was mandatory.

After removing several observations due to missing variable information and companies where financial and non-financial data were not available, the final sample includes 1,076 enterprise-years.

Meanwhile, to minimize the effect of extreme variable values on the analysis results, the main variables with extreme values were winsorized at the top and bottom 1%. The data on directors and employees were extracted through TS-2000. Major financial and credit data were acquired from DataGuide Pro of the Fn-Guide, and other additional data were hand-collected through business reports obtained from DART.

3. RESULTS AND DISCUSSION

3.1. Review of the relationship between female workforce participation and credit ratings

The results of testing *H1* on the relationship between female workforce participation (based on female directors and female employees) and credit rating evaluations are presented in Tables 1 and 2. First, female directors' effect on corporate bond credit ratings, shown in Table 1, can be summarized as follows. The coefficients for female directors (*FD_D*, *FD_N*, *FD_R*), which are the variables of interest for testing the hypothesis, are significantly positive (+), with values of 0.552, 0.123, and 3.824, respectively. If there is a female director, a higher number of female directors, or a higher ratio of female directors, the credit rating is higher. These results support *H1a*, which argues that female directors' presence is positively related to credit rating evaluations.

Table 2 presents the results of testing *H1b*, which examines the between female employees' presence and the evaluation of corporate bond credit ratings. The coefficients for female employees (*FE_N*, *FE_R*, *FE_AR*), the variables of interest in this study are significantly positive (+), with values of 0.184, 1.464, and 1.324, respectively. This means the higher the number of female employees, the higher the ratio of female employees among all employees, and the higher the ratio of female employees compared to the average in the same industry, the higher the credit rating. These results support *H1b*, which argues that female employees' presence is positively related to credit rating evaluations.

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1   Article 9-1-1 (Status of Executives) of the Financial Supervisory Service's Standards for Preparation of Corporate Disclosure Form. Implemented November 29, 2013.

Table 1. Effect of female directors on corporate bond credit ratings (*H1a*)

Variable	Predicted direction	FD_D Coef. (z-value)	FD_N Coef. (z-value)	FD_R Coef. (z-value)
FD	+	**0.552** **(3.657)***	**0.123** **(2.672)***	**3.824** **(2.552)**
SIZE	+	0.869 (11.783)***	0.876 (11.827)***	0.901 (12.223)***
GROW	?	0.055 (0.359)	0.060 (0.390)	0.058 (0.377)
ROA	+	5.126 (8.476)***	5.125 (8.451)***	5.095 (8.411)***
LEV	−	−0.016 (−5.174)***	−0.016 (−5.219)***	−0.016 (−5.206)***
BETA	−	−0.814 (−6.030)***	−0.800 (−5.911)***	−0.814 (−6.019)***
FOR	+	5.679 (8.052)***	5.703 (7.967)***	5.852 (8.345)***
ODR	+	3.198 (4.370)***	3.248 (4.391)***	2.864 (3.912)***
BIG4	+	2.324 (9.441)***	2.271 (9.226)***	2.297 (9.332)***
MKT	+	0.824 (3.248)***	0.844 (3.320)***	0.861 (3.391)***
AGE	?	−0.249 (−2.321)**	−0.259 (−2.403)**	−0.270 (−2.530)**
IND & *YR*		Included		
Pseudo R^2		60.28	60.06	60.15
No. of obs.		1,076		

$$GRADE_{i,t+1} = \beta_1 FD_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 GROW_{i,t} + \beta_4 ROA_{i,t} + \beta_5 LEV_{i,t} + \beta_6 BETA_{i,t}$$
$$+ \beta_7 FOR_{i,t} + \beta_8 ODR_{i,t} + \beta_9 BIG4_{i,t} + \beta_{10} MKT_{i,t} + \beta_{11} AGE_{i,t} + IND + YR + \varepsilon_{i,t},$$

Note: *, **, and *** denote significance at 10%, 5%, and 1% levels, respectively.

Table 2. Effect of female employees on corporate credit ratings (*H1b*)

Variable	Predicted direction	FE_N Coef. (z-value)	FE_R Coef. (z-value)	FE_AR Coef. (z-value)
FE	**+**	**0.184** **(4.209)***	**1.464** **(2.947)***	**1.324** **(1.769)***
SIZE	+	0.816 (10.637)***	0.928 (12.431)***	0.881 (11.915)***
GROW	?	0.061 (0.402)	0.052 (0.339)	0.057 (0.370)
ROA	+	5.067 (8.381)***	5.083 (8.399)***	5.119 (8.435)***
LEV	−	-0.016 (−5.219)***	−0.016 (−5.204)***	−0.016 (−5.245)***
BETA	−	−0.795 (−5.894)***	−0.778 (−5.751)***	−0.816 (−6.018)***
FOR	+	5.424 (7.540)***	5.716 (8.108)***	6.158 (8.730)***
ODR	+	3.502 (4.734)***	2.815 (3.852)***	2.894 (3.951)***
BIG4	+	2.196 (8.917)***	2.200 (8.922)***	2.279 (9.247)***
MKT	+	0.863 (3.405)***	0.831 (3.273)***	0.838 (3.295)***
AGE	?	−0.268 (−2.520)**	−0.269 (−2.525)**	−0.297 (−2.792)***
IND & *YR*		Included		
Pseudo R^2		60.32	60.23	60.00
No. of obs.		1,076		

$$GRADE_{i,t+1} = \beta_1 FE_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 GROW_{i,t} + \beta_4 ROA_{i,t} + \beta_5 LEV_{i,t} + \beta_6 BETA_{i,t}$$
$$+ \beta_7 FOR_{i,t} + \beta_8 ODR_{i,t} + \beta_9 BIG4_{i,t} + \beta_{10} MKT_{i,t} + \beta_{11} AGE_{i,t} + IND + YR + \varepsilon_{i,t},$$

Note: *, **, and *** denote significance at 10%, 5%, and 1% levels, respectively.

Table 3. Additional review of the effect of female employees on corporate credit ratings

Variable	Predicted direction	Ratio of full-time female employees to full-time male employees	Ratio of salaries of female employees to salaries of male employees
		Coef. (z-value)	Coef. (z-value)
FW	+	**1.105** **(2.255)****	**0.391** **(2.195)****
SIZE	+	1.015 (14.891)***	1.034 (14.684)***
GROW	?	0.067 (0.442)	0.090 (0.584)
ROA	+	4.924 (8.126)***	4.903 (8.013)***
LEV	−	−0.017 (−5.339)***	−0.016 (−5.295)***
BETA	−	−0.756 (−5.595)***	−0.736 (−5.354)***
FOR	+	6.214 (8.880)***	6.054 (8.414)***
ODR	+	2.893 (3.936)***	3.125 (4.125)***
BIG4	+	2.389 (9.920)***	2.309 (9.452)***
MKT	+	0.868 (3.411)***	0.906 (3.467)***
AGE	?	−0.272 (−2.563)**	−0.257 (−2.364)**
IND & YR		Included	
Pseudo R²		60.21	60.33
No. of obs.		1,076	

$$GRADE_{i,t+1} = \beta_1 FE_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 GROW_{i,t} + \beta_4 ROA_{i,t} + \beta_5 LEV_{i,t} + \beta_6 BETA_{i,t}$$
$$+ \beta_7 FOR_{i,t} + \beta_8 ODR_{i,t} + \beta_9 BIG4_{i,t} + \beta_{10} MKT_{i,t} + \beta_{11} AGE_{i,t} + IND + YR + \varepsilon_{i,t},$$

Note: *, **, and *** denote significance at 10%, 5%, and 1% levels, respectively.

Further analysis of *H1b* was carried out using the ratio of full-time female employees to full-time male employees and the ratio of salaries of female employees to salaries of male employees. The results of the analysis are presented in Table 3. It can be seen that the higher the ratio of females to males in terms of the number of full-time employees and salaries, the higher the corporate bond credit rating. This is qualitatively equivalent to the previous test results of *H1b* and thus further supports the finding that female employees' presence is positively related to credit rating scores.

3.2. Review of the moderating effects of chaebol enterprises on the relationship between female directors and credit ratings

Table 4 shows the results of the review of the moderating effects of chaebol enterprises on the relationship between female directors and credit ratings. First, the coefficient for *CH* is signif-

icantly positive (+), which suggests that chaebol enterprises have higher credit ratings than those that are not chaebols. As stated above, chaebol enterprises are organic aggregates where legally independent entities are bound by equity investments and share the same controlling shareholders, internal markets, common management methods, and corporate culture. This means they can be relatively economically flexible because their mutual compensation can be shared among affiliates. In other words, chaebol enterprises, which are formed as a group, can share resources through large-scale internal markets and enjoy coinsurance benefits through varying competitiveness (La Porta et al., 1999; Khanna & Yafeh, 2005). It is to be expected that these characteristics are reflected in their credit ratings. Next, the coefficient for *FD·CH* is significantly negative (−). This result supports Hypothesis 2, which shows that the strength of the positive relationship between female directors' presence and corporate bond credit ratings is weaker at chaebol companies.

Table 4. Moderating effect of chaebol enterprises in the relationship between female directors and credit ratings (*H2*)

Variable	Predicted direction	FD_D	FD_N	FD_R
		Coef. (z-value)	Coef. (z-value)	Coef. (z-value)
FD	+	0.986 (3.794)***	0.275 (3.167)***	3.023 (1.874)*
CH	+	0.927 (3.863)***	0.881 (3.954)***	0.615 (2.829)***
FD·CH	**−**	**−0.724 (−2.131)****	**−0.268 (−2.346)****	**−0.611 (−1.788)***
SIZE	+	0.869 (11.780)***	0.878 (11.846)***	0.928 (12.571)***
GROW	?	0.031 (0.204)	0.037 (0.243)	0.056 (0.370)
ROA	+	5.106 (8.467)***	5.086 (8.412)***	5.044 (8.390)***
LEV	−	−0.016 (−5.254)	−0.016 (−5.273)***	−0.017 (−5.391)***
BETA	−	−0.814 (−6.059)	−0.805 (−5.975)***	−0.794 (−5.915)
FOR	+	5.802 (8.218)***	5.724 (8.023)***	5.987 (8.538)***
ODR	+	3.034 (4.152)***	3.142 (4.272)***	2.807 (3.855)***
BIG4	+	2.281 (9.323)***	2.228 (9.023)***	2.214 (9.076)***
MKT	+	0.787 (3.113)***	0.808 (3.174)***	0.879 (3.483)***
AGE	?	−0.262 (−2.449)**	−0.262 (−2.432)**	−0.268 (−2.516)**
IND & YR			Included	
Pseudo R²		61.13	60.16	60.77
No. of obs.			1,076	

$$GRADE_{i,t+1} = \beta_1 FD_{i,t} + \beta_2 CH_{i,t} + \beta_3(FD_{i,t} \cdot CH_{i,t}) + \beta_4 SIZE_{i,t} + \beta_5 GROW_{i,t} + \beta_6 ROA_{i,t} + \beta_7 LEV_{i,t}$$
$$+ \beta_8 BETA_{i,t} + \beta_9 FOR_{i,t} + \beta_{10} ODR_{i,t} + \beta_{11} BIG4_{i,t} + \beta_{12} MKT_{i,t} + \beta_{13} AGE_{i,t} + IND + YR + \varepsilon_{i,t},$$

Note: *, **, and *** denote significance at 10%, 5%, and 1% levels, respectively.

The negative (–) moderating effect of chaebol companies on the positive relationship between female directors and credit ratings can be explained in conjunction with the management decision-making process and large enterprise groups' internal labor market. In particular, chaebol owners with unlimited decision-making authority take the initiative on decisions regarding personnel management (appointment, evaluation, compensation, etc.), so non-family female directors may be less influential. Further, at chaebol companies, a woman with a family relationship is likely to be appointed as a director, and in such cases, the appointment may be motivated by family management succession, not for objective ability. It has been observed that directors who have family relationships with the controlling shareholder may not make active efforts to acquire and maintain their positions (Schulze et al., 2003), which can have a negative impact on corporate value (Villalonga & Amit, 2006; Fahlenbrach, 2009).

Therefore, this study examines the difference in credit ratings according to the proportion of female directors with family relationships in the sample of firms with female directors. Looking at Table 5, which presents the differences in credit ratings according to the proportion of female director family relationships in the total sample, it can be seen that the credit rating increases when only some of the female directors have family relationships. This means that within the board of directors, female directors with family relationships can create synergy by sharing various perspectives with other female directors. However, if the percentage of female directors with family relationships is 100% (meaning all of the female directors), this is associated with a significantly lower credit rating. In other words, if all female directors at a company are family members, the positive effects of female directors are limited. In non-chaebol companies, the difference in credit ratings between firms with 100% of female directors having family relationships and firms

Table 5. Differences in credit ratings based on the ratio of family relationships in firms with female directors

Ratio of family members among female directors	Average credit rating score	Grade difference
Total sample	**14.8**	
0% of female directors have a family relationship	15.1	
0% to less than 50% of female directors have a family relationship	16.1	**N/A**
50% to less than 100% of female directors have a family relationship	15.4	
100% of female directors have a family relationship	13.4	
Chaebol	**16.7**	
Less than 100% of female directors have a family relationship	17.0	**Δ1.9*****
100% of female directors have a family relationship	15.1	
Non-chaebol	**12.7**	
Less than 100% of female directors have a family relationship	12.9	**Δ0.9***
100% of female directors have a family relationship	12.0	

Note: *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

with less than 100% female directors having family relationships is 0.9. But it is even more evident for chaebol companies whereby the negative difference in the credit rating is observed to be 1.9 points.

There is a significantly negative (–) moderating effect of family relationships on the relationship between female directors and credit ratings (*FD·FAMILY*) at chaebol companies in the regression analysis. By comparison, while non-chaebol companies' effect was negative (–), it was not significant. The negative (–) moderating effect of family relationships on female directors' relationship and credit ratings only exists at chaebol companies. This means female directors with family relationships weaken female directors' positive effects on chaebol companies' credit ratings. In other words, if a member of a chaebol family is appointed as a female director for succession, it has a negative effect on the enterprise's credit ratings.

Table 6. The moderating effects of family relationships on the relationship between female directors and credit ratings (chaebol vs. non-chaebol)

Variable	Predicted direction	Chaebol		Non-chaebol	
		Coef.	(z-value)	Coef.	(z-value)
FD	+	0.249	2.947**	0.234	1.879*
FAMILY	?	0.431	1.126	0.704	1.363
FD·FAMILY	**?**	**−0.271**	**−1.917***	**−0.164**	**−0.754**
SIZE	+	0.467	5.017***	1.535	13.760***
GROW	?	0.132	0.957	−0.096	−0.277
ROA	+	10.299	6,493***	3.047	4.366***
LEV	−	−0.013	−5.344***	−0.099	−5.405***
BETA	−	−1.093	−6.354***	−0.354	−1.916*
FOR	+	7.075	7.774***	4.502	4.295***
ODR	+	3.357	3.658***	1.427	1.362
BIG4	+	2.977	4.319***	1.493	5.264***
MKT	+	−0.163	−0.351	0.827	2.662***
AGE	?	0.031	0.248	−0.585	−3.664***
IND & YR		Included			
Pseudo R²		50.05		58.16	
No. of obs.		511		565	

$$GRADE_{i,t+1} = \beta_1 FD_{i,t} + \beta_2 FAMILY_{i,t} + \beta_3(FD_{i,t} \cdot FAMILY_{i,t}) + \beta_4 SIZE_{i,t} + \beta_5 GROW_{i,t} + \beta_6 ROA_{i,t}$$
$$+ \beta_7 LEV_{i,t} + \beta_8 BETA_{i,t} + \beta_9 FOR_{i,t} + \beta_{10} ODR_{i,t} + \beta_{11} BIG4_{i,t} + \beta_{12} MKT_{i,t} + \beta_{13} AGE_{i,t} + IND + YR + \varepsilon_{i,t},$$

Note: *, **, and *** denote significance at 10%, 5%, and 1% levels, respectively.

In summary, the results show that the higher the number and proportion of women in the workforce (based on female directors and female employees), the higher the credit rating. However, for chaebol companies, where female directors' positive role is limited by chaebol owners, a negative (–) moderating effect is observed in the relationship between female workforce participation and credit ratings. Besides, female directors who are members of the owner's family and were appointed as a means of succession negatively affect credit ratings.

CONCLUSION

Considering the recent rise in women's social and economic status in Korea and the rapidly changing laws and systems related to women's economic activities, this is the first study to examine the role of the female workforce in the evaluation of corporate bond credit ratings. This study shows that companies with female directors (or with a high ratio of female directors) exhibit higher credit ratings. Meanwhile, it is found that the positive effect of female directors on credit ratings was weakened at chaebol companies, which have a corporate governance structure unique to Korea.

The contributions of this study are as follows. Explaining the relationship between Korean female directors and corporate bond credit ratings and the moderating effect of chaebol companies will provide an opportunity to consider the impact of the gender composition of the workforce among the management risks reflected in the credit rating evaluation. Besides, it provides a positive rationale for the female workforce's use concerning the design of effective organizations (management schemes) within the enterprise. This will allow investors (creditors) in the capital market to take on a positive view of companies with a high proportion of female employees in making investment decisions while also arguing that different views are needed regarding the female directors' role at chaebol companies. Ultimately, it also provides policy implications regarding recent system changes in Korea, such as introducing the gender quota system.

AUTHOR CONTRIBUTIONS

Conceptualization: Yujin Kim.
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Investigation: Yujin Kim, Jiyeun Hong.
Methodology: Yujin Kim.
Project administration: Yujin Kim.
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Software: Yujin Kim, Jiyeun Hong.
Supervision: Yujin Kim.
Validation: Yujin Kim.
Visualization: Yujin Kim.
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