

# The Relationship of Board Attributes, Corporate Social Responsibility and Corporate Financial Performance in Chinese Technology-Listed Companies

Angela K-F Ma\*, Yinfei Chen, and Yiming Chen

**Abstract**—Chinese companies have paid more attention to corporate social responsibility (CSR) activities in recent years. This paper aimed to provide empirical evidence on the relationship between board attributes and CSR and between CSR and corporate financial performance of Chinese technology-listed companies. The data from 2011 to 2020 was obtained from the database systems of CSMAR, Bloomberg and Wind. A total of 2,726 listed technology companies in China were gathered. The data were analyzed by CSR metrics in the form of ESG scores using OLS regression analysis and fixed effect regression models. The findings report that Board independence is a strong driving force of CSR performance, whereas board gender has a significant negative impact on CSR performance. The correlation between board attendance and CSR performance is insignificant. CEO duality has a negative impact on CSR performance. The results highlight the importance of CSR performance which can promote corporate financial performance. This study fills up the gap in CSR related research in the technology industry and offer more evidence for further research between board diligence and CSR. The study presents feasible suggestions for enterprises in the Chinese technology industry to improve operation and management by providing theoretical and practical implications, to guide regulators and Chinese technology-listed companies in ensuring the sustainable development of the sector.

**Index Terms**—Board attributes, corporate social responsibility (CSR), company financial performance (CFP), environmental, social, and governance factors (ESG)

## I. INTRODUCTION

With the fast development and progress of science and technology, manufacturing, and information intelligence generated by the internet, technologies are constantly evolving and are affecting our lives. As the technology sector has become the backbone of all economic activities around the world, both developed and developing countries are currently strengthening their competitive industrial advantages in economic development and are trying to gain an advantageous position in international competition in the technology sector. Nevertheless, harmful effects of the technology industry, such as the release of greenhouse gas emissions, have been the focus of a variety of stakeholder groups, including environmentalists, shareholders, investors, and regulators. The rate of artificial intelligence is growing on social media, bringing unknown risks to users, and the harm is hard to predict. It is also challenging to access clean,

affordable, and reliable energy globally. Other issues such as pollution and cybersecurity, negatively impact the environment and society. As a result, there is an increasing interest in technology industry's corporate social responsibility (CSR) and its related measures worldwide. An extensive body of research have examined CSR practices indicating that over the past 20 years, CSR reporting and CSR communication have become more common in technology industry (Chu *et al.*, 2020; Gugler and Shi, 2009; Hollindale, 2019; Parsa, 2021; Radu and Smaili, 2021).

The changes that China's economy has undergone over the last decade are sweeping, unprecedented, and essential (Tong *et al.*, 2021; Wu and Hu, 2019). As China is in a period of rapid development, investors are beginning to attach importance to CSR for making investment. Investors are often in a relatively disadvantaged position because it can be challenging for them to grasp complete information about the company and its products. Therefore, CSR has become an important indicator to make it possible for investors to measure the performance of the company for sustainable development. This study attempts to explore i) the potential factors in board attributes that may affect CSR scores, and ii) their influence on CSR metrics, as well as iii) the relationship between CSR metrics and company financial performance (CFP) in the technology industry.

In our study, the first research objective is to explore the underlying factors within board attributes which will affect CSR scores. Since China is in a period of rapid economic and technological development, Chinese companies have paid more attention to CSR activities in recent years. Investors are beginning to attach importance to corporate social responsibility at the same time of making investment decisions. To gain social support from stakeholders, technology companies must engage in responsible corporate practices when taking responsibility for their business and CFP (Dixon, 2014). Our first research objective is to explore the various factors within board attributes which will affect CSR scores by gathering data through the CSMAR, Bloomberg and Wind database.

The second research objective is to examine the relationship among the board attributes, including board independence, board gender ratio, board diligence (tested by independent director attendance rate), and chief executive officer duality on CSR performance. This study applies the agency theory and stakeholder theory to explain the association between enterprises and social parties, leading to the promotion of corporate governance in Chinese technology-listed companies.

The third research objective is to analyze the influence of board attributes on CSR, as well as the relationship between

Manuscript received June 30, 2022; revised August 27, 2022; accepted October 13, 2022.

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CSR and CFP. This study aims to provide empirical evidence on the association between board attributes and CSR engagement, as well as between CSR engagement and corporate performance in the Chinese technology-listed companies. This paper uses ESG scores (consisting of environmental, social, and governance factors) as the basis for CSR judgment, serving as an essential non-financial indicator to measure management capability and risk management.

Previous studies on CSR of Chinese companies mainly focus on the relationship between industry and CSR (Dixon, 2014; Shin, 2014; Tong *et al.*, 2021; Wu and Hu, 2019; Zhao, 2018). Other studies researched CSR attributes from different perspectives such as the board attributes, the executives' attributes, and the external environment (Li *et al.*, 2020). Recent studies researched into the social factors affecting CSR, and consumers' engagement with CSR communication in social media (Chu *et al.*, 2020). This paper intends to provide empirical evidence on the relationship between board attributes and CSR, and also CSR and CFP, of the Chinese technology-listed companies. In view of this, the first research question of this study is:

*RQ1: To explore the underlying factors contributing to board attributes which may affect CSR performance through the use of the ESG scores in Chinese technology-listed companies.*

Review of literature supported that boards of directors formulated company strategies and policies related to CSR and encouraged company members to meet CSR standards (Chu *et al.*, 2020; Prado-Lorenzo and Garcia-Sanchez, 2010). Therefore, it is important to analyze the influence of board attributes on CSR as well as the relationship between CSR and CFP. As CSR can be considered as an important factor contributing to CFP, this leads to the second research question:

*RQ2: What is the relationship between board attributes and CSR, and the relationship between CSR and CFP in Chinese technology-listed companies.*

## II. HYPOTHESIS AND RESEARCH MODEL

This study gathered data for the period from 2011 to 2020 through the database systems of CSMAR, Bloomberg and Wind. The data of a total of 2,726 technology-listed companies in China was analyzed by CSR metrics in the form of ESG scores. There are 3 Models proposed in this study: Model 1 combines the ESG (environment, social, and governance) and board attributes (board independence, board gender ratio, independent director attendance, and CEO duality) of Chinese technology-listed companies.

Model 2 is developed by adding the time fixed effects model into Model 1. By using panel data analysis, the approach of fixed effects model can assess effects that cannot be identified in cross sectional and time series data, since the model controls company characteristics that cannot be observed. Through the approach of time fixed effects, the model controlled the individual heterogeneity (Baltagi, 2021).

Model 3 verifies the relationship between CSR and CFP with Return on Equity (ROE) representing CFP. When comparing companies within the same sector, ROE is particular used to evaluate individual company's

performance against its rivals and the market as a whole, because it can provide useful indicators of which companies operate with more financial efficiency. As ROE can provide investors the information on how well a business manages the money given by shareholders, it quantifies a company's profitability to its investors' equity in a way that the greater the ROE, the more effectively a business's management generates revenue and growth from its equity funding.

As shown in the proposed framework in Figure 1, ROE is a dependent variable, ESG is an independent variable, and other variables are the control variables.

### A. Board Independence

Based on the Agency Theory, external directors are independent of internal directors, and they can effectively supervise shareholders' interests. For this reason, board independence is essential to the operation of the board (Shahbaz *et al.*, 2020). Therefore, the proportion of independent directors is positively related to voluntary disclosure because independent directors are independent to the company's daily business operations, reducing the cost of resource information (Gallego-Álvarez and Pucheta-Martínez, 2020). Accordingly, we propose the first hypothesis:

*H1: There is positive relationship between board independence and CSR performance in Chinese Technology-Listed companies.*

### B. Board Gender

The second board attribute concerns the impact of the board gender on CSR performance. Most scholars have supported that gender balance positively impacts CSR performance (Cheng *et al.*, 2020; Harjoto *et al.*, 2015). However, Hollindale, 2019; Rao and Tilt, 2016 argued that gender equality has limitations in formulating CSR policy. Recent studies McGuinness *et al.*, 2017 showed that the more balanced the gender composition in top management, the stronger the CSR performance, and that companies with female executives as CEOs and deputy CEOs have more robust CSR performance. As female leadership is as important as gender mix in promoting CSR performance, we propose the second hypothesis:

*H2: There is positive relationship between board gender and CSR performance in Chinese Technology-Listed companies.*

### C. Board Diligence

The board meeting can serve as a communication link between executive directors and non-executive directors. Directors' absence from meetings can lead to less supervision of management and lower corporate performance (Wu and Håbek, 2021). Therefore, board attendance implies that directors are concerned about business decisions making processes, including CSR activities ((Li *et al.*, 2020). As board attendance at meetings can promote corporate CSR activities engagement, we propose the third hypothesis:

*H3: There is positive relationship between board diligence and CSR performance in Chinese Technology-Listed companies.*

### D. Chief Executive Officer Duality

Chief executive officer (CEO) duality refers to a situation

in which an employee holds the positions of the board chair and CEO at the same time. As proposed in agency theory, managers' interests may trigger behaviors which affect the disclosure of CSR activities. CEO duality provides a person too much power which may cause managers to re-evaluate CSR activities when they believe they are not valuable. Thus, we propose the fourth hypothesis:

H4: There is negative relationship between CEO duality and CSR performance in Chinese Technology-Listed companies.

E. Corporate Financial Performance

Past empirical studies of scholars believe that CSR performance positively impacts corporate performance, and that social responsibility behaviors within a specific range can increase the profits and values of enterprises. Based on the demonstration of the positive influence of CSR performance, we put forward the fifth hypothesis:

H5: There is positive relationship between CSR performance and CFP in Chinese Technology-Listed companies.

III. METHODOLOGY

Model 1 combines the ESG (environment, social, and governance) and board attributes (board independence, board gender ratio, independent director attendance, and CEO duality) of Chinese technology-listed companies. ESG is a dependent variable, and board attributes are the independent variables. Other corporate characteristics are controlled variables, such as board size (measured by the total assets' natural logarithm), ROE, and free float percentage. In our data analysis, we apply the Ordinary Least Squares (OLS) for estimating the unknown parameters in a linear regression model by a simple formula. The goal is for minimizing the differences between the collected observations in the arbitrary data set and the responses predicted by the linear approximation of the data. Whilst the fixed effect explores the relationship between predictor and outcome variables within the industry. The pooled OLS regression and industry fixed effect in Model 1 is expressed as below:

$$ESG_{i,t} = \beta_0 + \beta_1 BoardIn_{i,t} + \beta_2 BoardGen_{i,t} + \beta_3 BoardAtte_{i,t} + \beta_4 CEO_{i,t} + \beta_5 BoardSize_{i,t} + \beta_6 LnTAssets_{i,t} + \beta_7 Lvr_{i,t} + \beta_8 ROE_{i,t} + \beta_9 FFPer_{i,t} + \epsilon_i$$

Model 2 is developed by adding the time fixed effects model into Model 1. The time fixed effects model helps eliminate omitted variable bias caused by excluding unobserved variables that evolve over time but are constant across the industry. Similar to Model 1, ESG is the dependent variable, and board attributes are the independent variable. Other company characteristics serve as the controlled variables. Model 2 is presented as below:

$$ESG_{i,t} = \beta_1 BoardIn_{i,t} + \beta_2 BoardGen_{i,t} + \beta_3 BoardAtte_{i,t} + \beta_4 CEO_{i,t} + \beta_5 BoardSize_{i,t} + \beta_6 LnTAssets_{i,t} + \beta_7 Lvr_{i,t} + \beta_8 ROE_{i,t} + \beta_9 FFPer_{i,t} + \alpha_i + \lambda_t + \epsilon_{i,t}$$

To verify the relationship between CSR and CFP, ROE is used to represent CFP. ROE is a dependent variable, ESG is an independent variable, and other variables are control variables. The time fixed effects regression in Model 3 is

shown below:

$$ROE_{i,t} = \beta_1 ESG_{i,t} + \beta_2 BoardIn_{i,t} + \beta_3 BoardGen_{i,t} + \beta_4 BoardAtte_{i,t} + \beta_5 CEO_{i,t} + \beta_6 BoardSize_{i,t} + \beta_7 LnTAssets_{i,t} + \beta_8 Lvr_{i,t} + \beta_9 FFPer_{i,t} + \alpha_i + \lambda_t + \epsilon_{i,t}$$

IV. DATA ANALYSIS AND RESULTS

This study applies ROE as an indicator of corporate finance, and the leverage ratio is the total debt divided by the total assets. Between the period from 2011 to 2020, there is a total of 2,726 listed technology companies in China, which are screened and winsorized because of the problem of data disclosure.

Table I presents the descriptive statistics from the statistical data analysis from 2011 to 2020. According to the data disclosed by Chinese technology listed companies, ESG performance and social scores are around 20 points. The median and the maximum and minimum data are compared in the same direction, and the scores belong to the average level. At the same time, the table shows that the ESG score fluctuates highly (21.54 ± 6.6067), between the range 9.917–44.63. From the individual score, the mean of the environmental score is 10.51, the median is 9.302, and the standard deviation is 7.358. The data reveals that corporate governance score in the technology industry is stable. Within the measurement time, the proportion of female executives in companies is not high, some companies have no female executives, and the proportion of companies with the most female executives is only half. The mean is only 13.3%. On the other hand, the average attendance rate at corporate board meetings was extremely high, at 99.9%, with a low of 95.8%. Some companies have only six board members, but the most extensive company has 29 directors.

TABLE I: DESCRIPTIVE STATISTICAL ANALYSIS

Variables	N	Mean	SD	Min	Median	Max
ESG	4843	21.54	6.067	9.917	20.25	44.63
E	4843	10.51	7.358	2.326	9.302	43.41
S	4843	24.39	8.591	7.017	22.81	56.14
G	4843	44.92	5.149	33.93	44.64	58.93
ROE	4843	6.494	15.74	-82.18	6.912	48.69
BoardIndep	4843	0.382	0.074	0.25	0.364	0.615
BoardGen	4843	0.133	0.118	0	0.111	0.5
BoardAtte	4843	0.999	0.005	0.958	1	1
BoardSize	4843	10.59	2.714	6	10	19
CEODuality	4843	0.221	0.415	0	0	1
TotAssetsLn	4843	23.02	1.228	20.07	22.94	26.49
Lvrg	4843	47.24	19.24	6.231	48.6	86.91
ffper	4843	81.61	22.02	14.98	89.86	100

Note. \*\*\*p<0.01, \*\*p<0.05, \*p<0.10. ESG:ESG score, E:Environment score, S:Social score, G:Governance score, TobinQ: proportion of market capitalization that total debt divided by total assets, ROE: Return of equity, BoardIndep: Percentage of independent directors, BoardGen: Percentage of female directors, BoardAtt: Percentage of board meeting attended, BoardSize: Number of directors of the company, CEODuality: CEO part time job, TotAssetsLn: Logarithm of total assets, Lvrg: Corporate leverage, FFPer: Proportion of circulating shares in the company.

Table II presents the correlation coefficient and significance level. Due to a large number of samples, the correlation coefficient is relatively small, but most of the data are significant, indicating a correlation between the data. From 2011 to 2020, ESG index is moderately correlated with the scores of environment, social and government (r=0.893, r=0.776, r=0.578; p<0.01); the correlation between ESG and corporate ROE is low, r=0.028 (p<0.1), the correlation between social indicator and corporate roe is low, r=0.043 (p<0.01), and there has insignificant relationship between

environmental index and governance data and corporate roe. In addition, the correlation with the proportion of female boards was low, and it was negative,  $r=-0.086$  ( $p<0.01$ ); the correlation between ESG and the attendance rate of the

company's board meeting is not significant; And the size of the company's board of directors and the part-time job of CEO are relatively small ( $r=0.056$ ,  $r=0.063$ ;  $p<0.01$ ).

TABLE II: CORRELATION REGRESSION ANALYSIS

Variables	ESG	E	S	G	ROE	BoardIndep	BoardGen	BoardAtte	BoardSize	CEODuality	TotAssetsLn	Lvrg	ffper
ESG	1												
E	0.893***	1											
S	0.776***	0.549***	1										
G	0.578***	0.380***	0.354***	1									
ROE	0.028*	0.021	0.043***	0.019	1								
BoardIndep	0.039***	0.044***	0.029**	-0.018	-0.019	1							
BoardGen	-0.086**	-0.075**	-0.079**	-0.106*	-0.012	0.038**	1						
BoardAtte	-0.001	-0.006	0.005	0.007	-0.031**	-0.019	0.017	1					
BoardSize	0.056***	0.042***	0.051***	0.052***	0.029**	-0.152***	-0.093**	-0.084***	1				
CEODuality	-0.063**	-0.018	-0.069**	-0.119**	0.002	0.113**	0.111***	0.019	-0.159**	1			
TotAssetsLn	0.409***	0.367***	0.282***	0.362***	0.043***	0.012	-0.102**	-0.002	0.175***	-0.077***	1		
Lvrg	0.127***	0.103***	0.069***	0.184***	0.041***	-0.050***	-0.089**	-0.026*	0.121***	-0.096***	0.507***	1	
ffper	0.019	-0.029*	-0.002	0.108***	-0.036**	-0.02	0.01	0.022	-0.004	-0.106***	0.031**	0.136***	1

Notes: \*\*\* $p<0.01$ , \*\* $p<0.05$ , \* $p<0.10$ .

ESG:ESG score, E:Environment score, S:Social score, G:Governance score, TobinQ: proportion of market capitalization that total debt divided by total assets, ROE: Return of equity, BoardIndep: Percentage of independent directors, BoardGen: Percentage of female directors, BoardAtt: Percentage of board meeting attended, BoardSize: Number of directors of the company, CEODuality: CEO part time job, TotAssetsLn: Logarithm of total assets, Lvrg: Corporate leverage, FFPer: Proportion of circulating shares in the company. Corporate leverage, FFPer: Proportion of circulating shares in the company.

TABLE III: MODEL 1&2: ESG ANALYSIS

Variables	ESG	ESG	ESG	E	S	G
BoardIndep	2.5525* *	2.6587* **	3.3812* **	3.5473* **	3.4776* *	0.5309
	-2.45	-2.59	-3.27	-2.76	-2.18	-0.56
BoardGen	-2.4748 ***	-1.7329 ***	-2.565 9***	-2.5198 ***	-4.2167 ***	-2.6598 ***
	(-3.66)	(-2.60)	(-3.79)	(-2.92)	(-4.40)	(-4.52)
BoardAtte	-3.1328	4.516	-4.762 1	-3.857	-8.0096	1.056
	(-0.22)	-0.3	(-0.32)	(-0.27)	(-0.34)	-0.07
CEODuality	-0.5465 ***	-0.6195 ***	-0.617 1***	-0.1315	-0.9477 ***	-0.9057 ***
	(-2.76)	(-3.16)	(-3.15)	(-0.55)	(-3.26)	(-5.32)
BoardSize	-0.0379	-0.0454	-0.034 1	-0.0418	-0.0067	-0.0411
	(-1.27)	(-1.53)	(-1.15)	(-1.15)	(-0.15)	(-1.50)
TotAssetsLn	2.2778* **	2.3352* **	2.1180* **	2.3050* **	2.2423* **	1.3984* **
	-26	-26.63	-24.23	-21.6	-17.05	-18.17
Lvrg	-0.0358 ***	-0.0291 ***	-0.023 4***	-0.0173 ***	-0.0469 ***	-0.005
	(-7.54)	(-5.51)	(-4.43)	(-2.77)	(-6.02)	(-1.06)
ffper	0.0046	0.0045	-0.001 6	-0.0146 ***	-0.0086	0.0204* **
	-1.24	-1.19	(-0.42)	(-3.01)	(-1.56)	-6.47
cons	-26.575 2*	-35.894 8**	-21.67 38	-37.237 4**	-16.797 5	11.0357
	(-1.83)	(-2.38)	(-1.45)	(-2.51)	(-0.71)	-0.76
Industry	no	yes	yes	yes	yes	yes
Year	no	no	yes	yes	yes	yes
N	4843	4843	4843	4843	4843	4843
F	98.091	97.634	83.763	65.089	43.425	64.646
r2_a	0.18	0.2507	0.2609	0.2495	0.1697	0.2127

Notes: Std. error in parentheses; \*\*\* $p<0.01$ , \*\* $p<0.05$ , \* $p<0.10$ .

Table III shows the analysis results of running the pooled OLS regression and the fixed effect regression. Since the  $p$ -values of the  $F$ -statistic are less than 0.01, indicating that the pooled OLS and the fixed effect regression models are significant (Model 1 and 2). Using the pooled OLS model, the ESG score variance is 18%. The results of pooled OLS indicate a statistically significant (positive) correlation between ESG score and board independence ( $\beta_1=2.5525$  with  $p$ -value<0.05), and a statistically significant (negative) correlations between ESG score, board gender ( $\beta_2=-2.4748$  with  $p$ -value<0.01), and CEO duality ( $\beta_4=-0.5465$  with  $p$ -

value<0.01). And there has insignificant links between ESG performance and board attendance. The fixed-effects model proved the previous conclusions gained by pooled OLS with little difference in coefficients:  $\beta_1=2.6587$ ,  $\beta_2=-1.7329$ , and  $\beta_4=-0.6195$  with  $p$ -values < 0.01 for all.

For Model 2, which uses the time fixed effects model, was run for the ESG and its three dimensions. The time fixed effect model indicated the significant (positive) relationship between ESG Score and board independence ( $\beta_1=3.3812$  with  $p$ -value<0.01), and it showed statistically significant (negative) relationships between ESG score and board gender ( $\beta_2=-2.5659$ ), and board duality ( $\beta_4=-0.6171$ ), with  $p$ -values<0.01 for all. Moreover, it indicated the insignificant relationship between ESG score and board attendance since most of the board attendance rate was 99.9% in our sample data. Therefore, hypotheses 1 and 4 are accepted, but hypotheses 2 and 3 are rejected.

Table III indicates the statistically significant relationships between environmental performance and board independence ( $\beta_1=3.5473$ ), and board gender ( $\beta_2=-2.5198$ ), with  $p$ -values<0.01 for all. Similarly, the fixed effects regression analysis indicates the statistically significant relationships between social performance and board independence ( $\beta_1=3.4776$  with  $p$ -value<0.05), board gender ( $\beta_2=-4.2167$  with  $p$ -value<0.01), and CEO duality ( $\beta_4=-0.9477$  with  $p$ -value<0.01). At last, the fixed effects regression analysis demonstrates the statistically significant links between governance score and board gender ( $\beta_2=-2.6598$ ), and CEO duality ( $\beta_4=-0.9057$ ), with  $p$ -values<0.01 for all.

The paper also explored the relationships between corporate financial performance and ESG score with its pillar scores. ROE was used as a proxy for corporate financial performance. The result shows there has a statistically significant (positive) link between ROE and ESG score. This finding supports hypothesis 5.

## V. DISCUSSION AND CONTRIBUTIONS

The results of this study indicate that board diligence are robust drivers of CSR performance, as proxied by the composite ESG scores. As ESG is a relatively new concept in China, this study applied the concept to evaluate CSR in the Chinese technology-listed companies. The results have maintained that ESG has a positive impact to the company financial performance, which support the results of previous studies on China's listed power generation companies and the hospitality and tourism industry (Zhao *et al.*, 2018; Uyar *et al.*, 2020).

Despite board independence is a strong driving force of CSR performance, the findings also show that board gender has a significant negative impact on CSR performance. As regard the relationship between the proportion of female directors and CSR, the findings further suggest that for the Chinese technology-listed industry, increasing the proportion of female board members does not have a positive impact on corporate CSR, but that may be because women are less involved in the decision-making process in the high technology industry in China. It is noteworthy that this finding, regarding the proportion of women in senior management having a negative impact on CSR scores, is contradictory to most other CSR studies. For instance, it is inconsistent with the conclusions drawn by a recent study for the energy industry (Uyar *et al.*, 2021). Therefore, this provides a new research direction to explore whether the impact of the proportion of female directors on CSR is different between emerging market economies and the traditional industries.

In addition, our findings show that there is a negative correlation between board attendance and CSR performance. Moreover, CEO duality has a negative impact on CSR performance. Lastly, CSR performance has a positive impact on CFP. These results fill up the gap in CSR related research particularly in the Chinese technology industry, and provide insights for further research on board attributes, CSR, and CFP. The findings provide insights for companies in the Chinese technology industry to improve their operation and management.

## VI. CONCLUSION

This research gathered data from 2011 to 2020 from the CSMAR, Bloomberg and Wind database, involving a total of 2,726 technology-listed companies in China. We present our contributions by highlighting the following results: First, board independence can be a strong driving force of CSR performance whereas board gender has a significant negative impact on CSR performance. Second, the correlation between board attendance and CSR performance is insignificant. Third, CEO duality has a negative impact on CSR performance, as stated in the hypothesis. Lastly, CSR performance has a significant effect on CFP. These highlights are expected to fill up the gap in CSR related research in the technology-listed companies in China, and to offer more evidence for future research between board diligence and CSR. Technology-listed companies are suggested to pay more attention on the long-term business strategy for expanding enterprise value, instead of focusing only on short-

time financial situations. This study provides theoretical and practical implications, to guide regulators and Chinese technology companies in ensuring the sustainable development of the industrial sector.

## VII. LIMITATIONS AND FUTURE WORK

There are several limitations in this study. First, the industry disclosure rate is still insufficient, leading to certain impact on the findings. As this study focuses on China's technology listed companies from 2011 to 2020, the results may not be applicable to other industries and cannot be applied to the unlisted energy companies. Our research focuses on the characteristics of the company's senior executives and the company's financial situation without considering the influencing factors of the company's macro environment and stakeholder attitudes. For instance, government policy support, media coverage, public response, company publicity, and other factors which may lead to the higher financial performance of the technology industry. Since the technology industry is a rapidly developing market, it is susceptible to the ever-changing market environment and is observed closely by various stakeholders, such as the government, the public, and the media. We hope that through this research, we can attract more public attention to the CSR in Chinese technology-listed companies, the relationship between CSR and board attributes as well as the awareness of the ESG impacts to the future development of the industry.

## CONFLICT OF INTEREST

The authors declare no conflict of interest.

## AUTHOR CONTRIBUTIONS

Yinfei Chen and Yiming Chen: research, data analysis, and writing original draft. Angela K-F Ma: conceptualization, methodology, resources, writing the final draft, review & supervision. All authors approved the final version.

## FUNDING

This project was supported by the Beijing Normal University-Hong Kong Baptist University United International College Research Grants (UICR0500006-21 and A1067).

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