What Listed Firms with Great ESG Performance Look Like

https://github.com/Ruanancy/872EDA-Final-Project.git

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1 Rationale and Research Questions

ESG is the acronym for Environmental, Social, and (Corporate) Governance. Figure 1 shows ESG criteria and ESG rating system. Back to 1984, Edward Freeman (1984) introduced the stakeholder theory emphasizing that business strategy should not only focus on profit maximization but sustainable long-term growth and multiple stakeholders. In 1990, the first ESG index, the Domini 400 Social Index, was created which we now know today as the MSCI KLD 400 Social Index. In 2006, the United Nations Principles for Responsible Investment (UN PRI) were launched and incorporated ESG concept into sustainability investment practice, focused on asset owners, investment managers, and service providers. They have been increasingly popular and have attracted over 3,000 signatories with more than 100 trillion dollars in assets under management by 2021. Therefore, ESG era is coming.
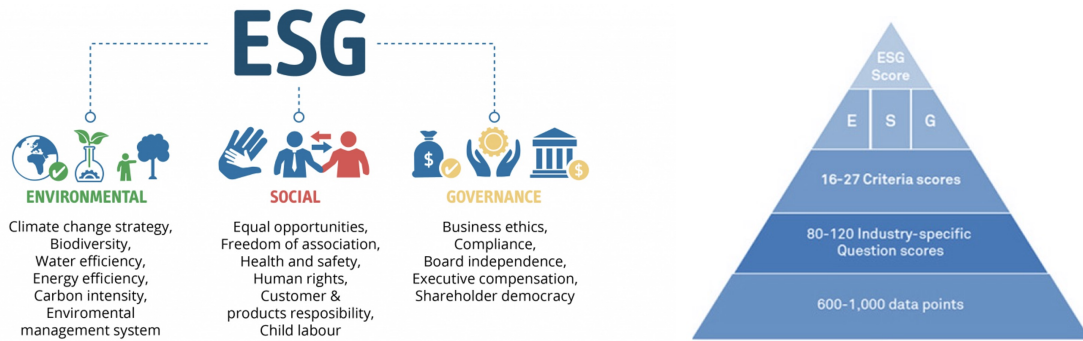

Figure 1: The Concept of ESG and ESG Rating System

Previous studies show that a firm's ESG profile and activities are strongly related to the firm's market, leadership and owner characteristics as well its risk, performance and value (Gillan et al., 2021). Corporate ownership structures, as one of the indicators that describe a company's identity, contribute to institutional oversight and may affect companies' motives in promoting sustainability (Eng and Mak, 2003; Al Amosh & Khatib, 2021). Even in front of the divergence of ESG ratings due to distinctive scope, measurement, and weights (Berg et al., 2019), what listed firms with great ESG performance look like is an interesting question.

This paper investigates the ESG performance of publicly listed firms in China during 2010-2020 and further explores the divergence of ESG ratings, based on data from five prominent ESG rating agencies in China. We finally apply a fixed-effect model to evaluate the association between ESG scores and firm leadership and ownership characteristics.

We choose the following questions to guide our work:

- Are ESG scores from different rating agencies consistent without significant divergences?
- How can these ownership structure factors (ownership concentration, blockholders' ownership, independent board ratio, chairman duality) affect ESG performance?

2 Dataset Information

2.1 Data Retrieval:

For this analysis, we used data collected from Wind database including basic characteristics, and financial statement information of 4912 listed firms during 2010-2021 in China. We also obtained ESG scores from five ESG rating companies from their own databases: Sino-Securities Index ESG, SynTao Green Finance ESG, China Alliance of Social Value Investment (CASVI) ESG, FTSE Russell ESG, and Bloomberg ESG. Table 2 describes the sample size, rating and year ranges of the five ESG indices. We downloaded these two excel files and added them to our project repository. All data and code for this project can be retrieved from the GitHub repository.

Table 1: The Description of ESG Ratings

ESG Index	Sample Size	Rating	Period
Sino-Securities	4065 firms	C, CC, CCC, B, BB, BBB, A, AA, AAA	since 2009
SynTao Green Finance	765 firms	C-, C, C+, B-, B, B+, A-, A, A+	since 2015
CASVI	296 firms	C, CC, CCC, B, BB, BBB, A, AA, AAA	since 2016
FTSE Russell	728 firms	0.3 - 3.9	since 2018
Bloomberg	1122 firms	6.6 - 64.1	since 2010

2.2 Data Wrangling:

We began our analysis by transforming ESG ratings into numerical values. Although two ESG ratings (FTSE Russell and Bloomberg) are numerical values, the other three (Sino-Securities Index, SynTao Green Finance, CASVI) are all rating levels. Thus, we regard these rating levels as nine scores 1-9 from the lowest to the highest, for example, C equals 1, CC equals 2, and so forth. Next, we applied many pipe functions with `pivot_longer` and created a date variable `Year` by using `mutate` to adjust the structure of each data frame for matching. Then, we merged one firm-characteristics dataset from Wind and five ESG rating datasets by `stockcode` (stock ID) and `Year` using `full_join`. Finally, we obtained an unique yearly firm-level panel dataset during 2010-2020.

For further analysis, we created new variables `Top1`, `Top25.Top1`, `IndepBoardRatio`, `ChairisGM` and `StateOwned`. `Top1` equals the shareholding ratio of the largest shareholder of a firm, which can measure the ownership concentration; `Top25to1` equals to the ratio of the sum of shares held by the 2nd, 3rd, 4th, and 5th largest shareholders to that of the 1st largest shareholder of a firm, which can measure the blockholders' power; `IndepBoardRatio` is the ratio of the number of independent board members to the number of total board members, measuring board independence; `ChairisGM` is a binary variable and equals 1 when chairman and general manager (GM) are the same person, and 0 otherwise; `StateOwned` is also a binary variable and equals 1 when a firm is centrally or locally state-owned, and 0 otherwise. In addition, we created several datasets for visualization and statistics.

3   Exploratory Analysis

We conducted an exploratory analysis of our data visually using a heatmap to show differences in ESG performance among the different types of listed firms across years (Figure 2) and summary statistics tables to provide an overview of basic characteristics of listed firms (Tables 2 and 3). The visualization showed that the average ESG score of listed firms was increasing over the past ten years. Moreover, state-owned firms and collective firms in China tend to constantly improve their ESG performance with higher scores, while private firms and foreign firms tend to be associated with decreasing and lower ESG scores during 2010-2020. It is worth mentioning that the average ESG score of foreign listed firms in China decreased significantly in 2015, which might be explained by the withdrawal of foreign capital and 2015 stock market selloff. Details on the variables are available in the excel file on the Github repository.

Table 2: Summary Statistics for Firm-Level Variables

Measure	*Mean*	*SD*	*Max*	*Min*
ESG_bloomberg	22.524	5.730	64.115	9.091
Environmental	10.868	7.081	65.625	0.775
Social	25.431	8.725	77.193	3.509
Goverance	46.194	5.023	84.076	14.286
ROA	6.601	7.294	66.322	-118.172
ROE	8.509	21.463	982.140	-406.450
Top1	39.427	16.202	93.673	3.390
Top25to1	0.553	0.537	3.615	0.004
ChairisGM	0.145	0.352	1.000	0.000
Size	23.297	1.268	28.416	19.541
LEV	50.585	19.540	103.726	0.836
CurrentRatio	1.798	2.365	80.664	0.079
IndepBoardRatio	0.372	0.056	0.800	0.200
StateOwned	0.351	0.477	1.000	0.000

Table 3: Bloomberg ESG Scores by Company Type

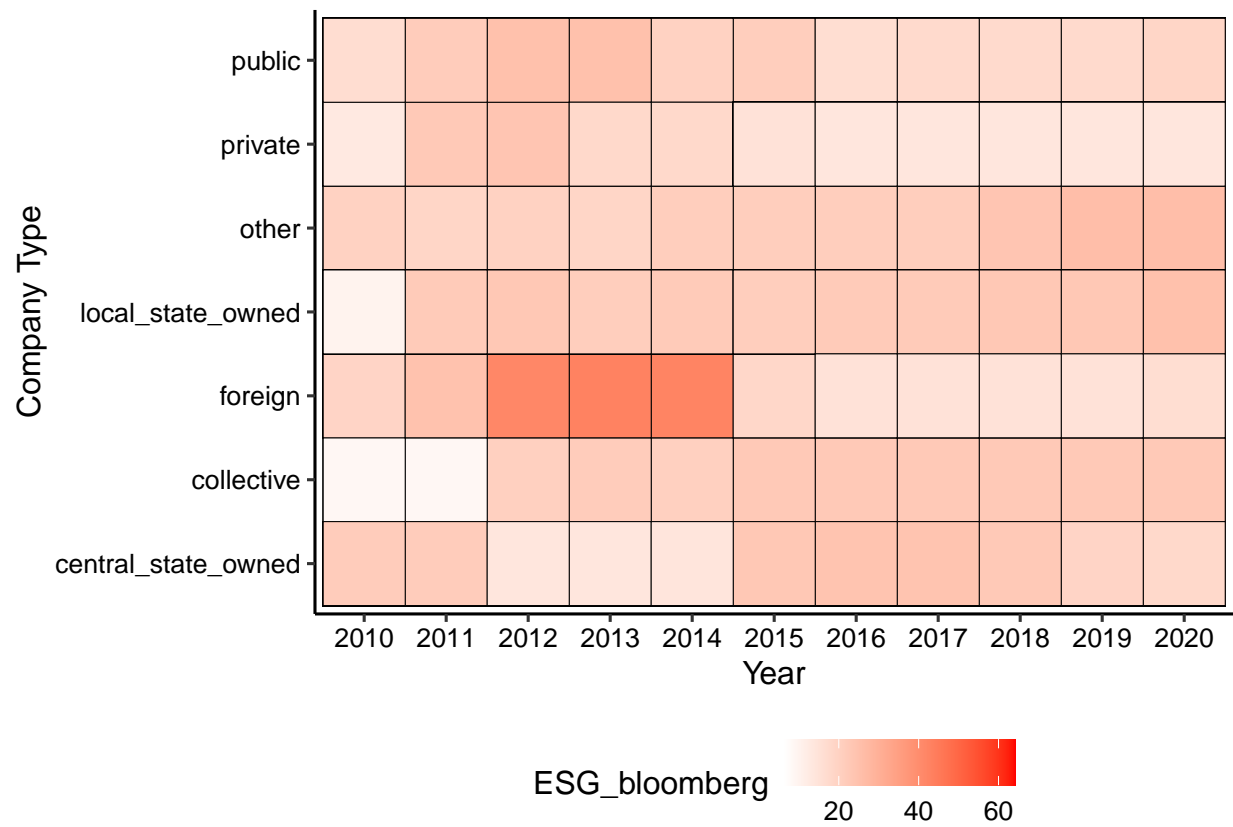| Type	meanESG	minESG	maxESG	sdESG
central_state_owned	22.318	6.612	51.240	6.770
collective	22.051	9.091	35.537	4.739
foreign	20.440	9.091	64.115	8.162
local_state_owned	20.835	7.438	52.066	6.290
other	19.340	11.157	29.752	3.815
private	19.229	7.438	60.744	6.279
public	21.882	8.678	53.719	7.955

Figure 2: Heat Map of ESG Rating of Different Types of Firms Across Years

4 Analysis

4.1 Question 1: Are ESG scores from different rating agencies consistent without significant divergences?

Figure 3 and Table 4 show the correlation between ESG ratings. It is clearly observed that all ESG ratings were positively correlated over the past ten years, while the correlation coefficients were less than 0.60, not as high as we expected.
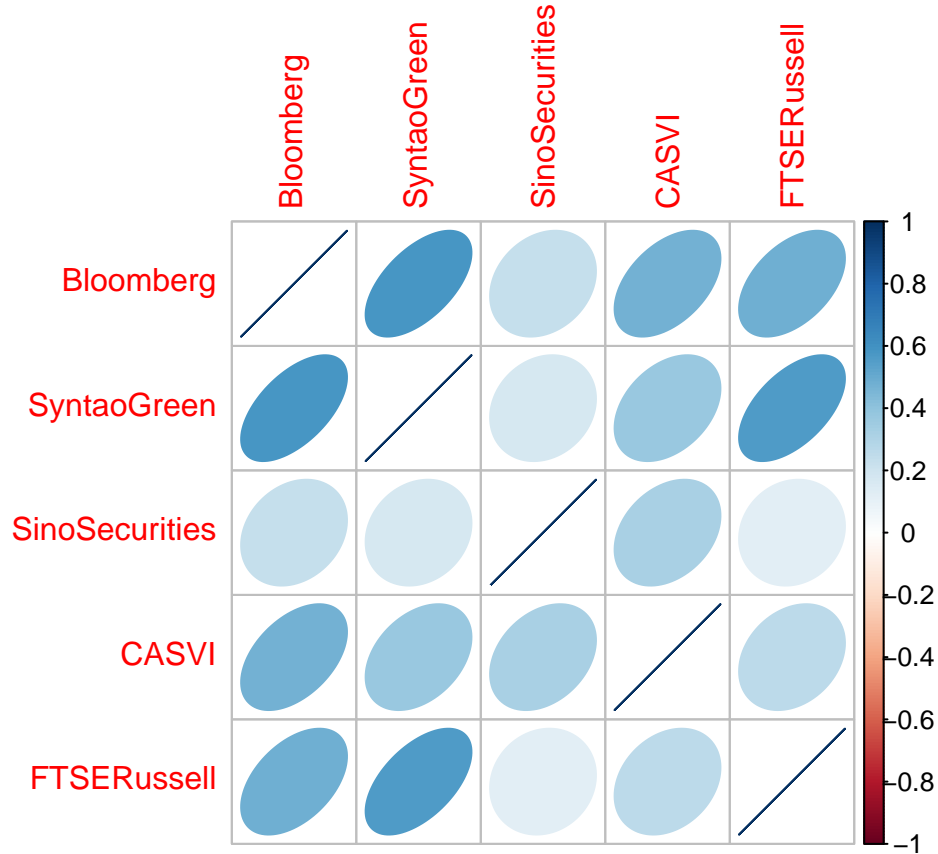
Figure 3: The Correlation Plot for Five ESG Ratings

Table 4: The Correlation Table for ESG Ratings

ESG Index	Bloomberg	SyntaoGreen	SinoSecurities	CASVI	FTSERussell
Bloomberg	1.000	0.585	0.236	0.476	0.480
SyntaoGreen	0.585	1.000	0.178	0.375	0.561
SinoSecurities	0.236	0.178	1.000	0.321	0.122
CASVI	0.476	0.375	0.321	1.000	0.268
FTSERussell	0.480	0.562	0.122	0.268	1.000

Among these five ESG ratings, we should choose a reliable one for further analysis. First of all, although Sino-Securities Index ESG covers most of listed firms in China's stock market, including 4065 out of 4912 listed companies, it has the lowest correlation coefficients (less than 0.35) with other four indices. This means that its ESG rating system is quite different from others. We exclude this one due to its lower reliability. Furthermore, China Alliance of Social Value Investment (CASVI) has a very small sample size, only including 296 listed companies after 2016, so we then exclude this one due to lack of representativeness. Lastly, SynTao Green Finance, FTSE Russell, and Bloomberg ESG indices are all highly positively correlated with darker blue in Figure 3, which means their scope, measurement and weights are consistent without many divergences. Since Bloomberg ESG includes 1122 listed firms during the period of 2010-2020 with fewer missing values and is accurately measured by numerical scores rather than rating levels, we choose Bloomberg ESG as a reliable index to measure ESG performance of listed firms in China for further analysis.

4.2 Question 2: How can these ownership structure and leadership factors (ownership concentration, blockholders' ownership, independent board ratio, chairman duality) affect ESG performance?

Figure 4 provides an overview of the relationship between ESG performance of listed firms and four ownership structure and leadership factors (ownership concentration, blockholders' power, board independence, and chairman duality). Figure 5 also presents a correlation plot to show associations between important variables. However, simply measuring their relationships through correlation coefficients and fitted lines are limited. Instead, we should apply a multiple regression to further measure the effect of these four ownership structure and leadership factors on ESG performance.

The regression equation is listed below.

$$ESG_{it} = Top1_{it} + (Top1_{it})^2 + Top25to1_{it} + IndepBoardRatio_{it} + ChairisGM_{it}$$
$$+Size_{it} + LEV_{it} + CurrentRatio_{it} + \delta_t + \delta_j + \delta_s + \varepsilon_{it}$$

where `Top1` equals the shareholding ratio of the largest shareholder of a firm; `Top25to1` equals to the ratio of the sum of shares held by the 2nd, 3rd, 4th, and 5th largest shareholders to that of the 1st largest shareholder of a firm; `IndepBoardRatio` is the ratio of the number of independent board members to the number of total board members; `ChairisGM` equals 1 when chairman and general manager (GM) are the same person, and 0 otherwise; δ_t, δ_j, and δ_s represent year fixed effect, industry fixed effect, and company type fixed effect; ε_{it} is the unobserved error term.

Table 5 shows the regression result. Column (1) used all data during 2010-2020; Column (2) applied data during 2010-2014; and Column (3) applied data during 2015-2020. By using Bloomberg ESG index for regression, we find that 1) The higher ownership concentration is, the higher ESG performance will be, but the marginal positive effect of ownership concentration is decreasing; 2) The effects of outside blockholders and independent board members
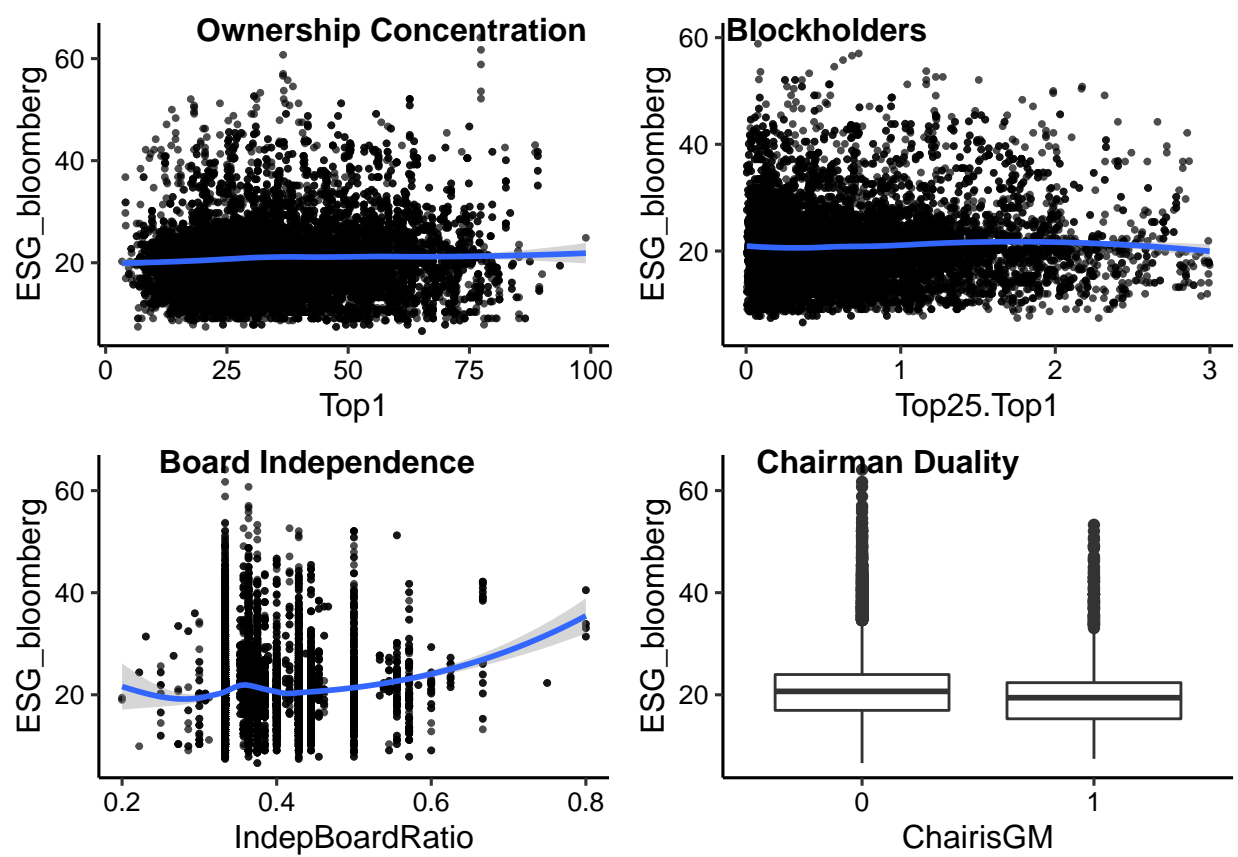
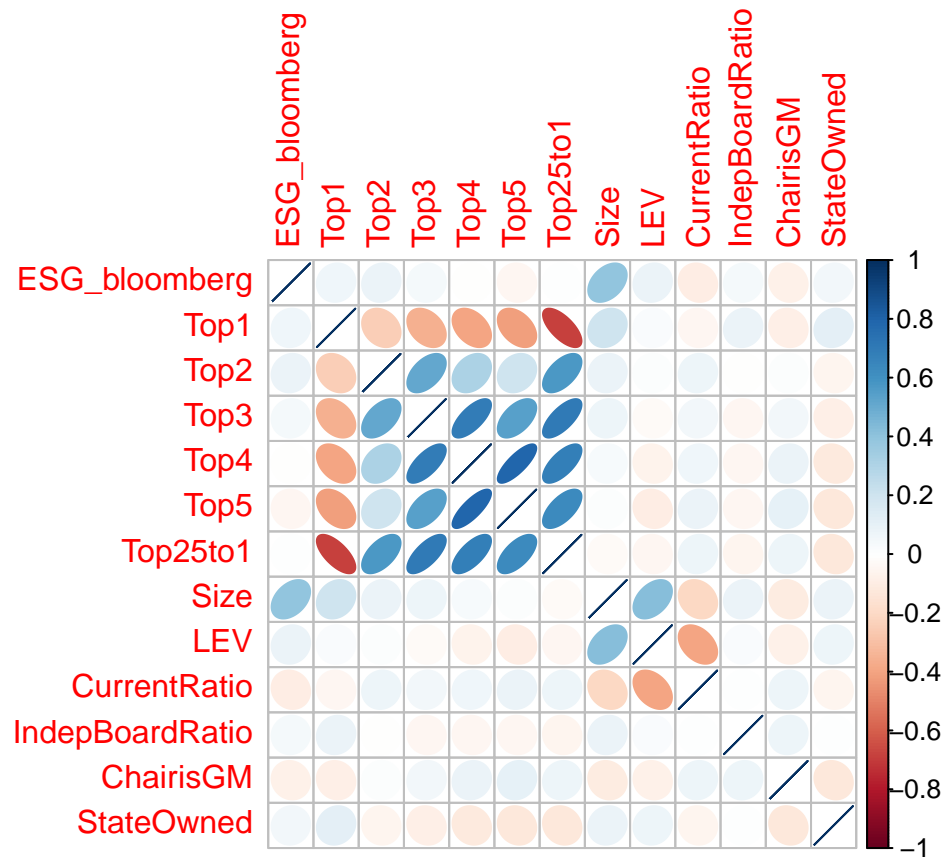Figure 4: Four Ownership Structure and Leadership Factors and ESG Rating

Figure 5: The Correlation Plot for Important Variables

are also significantly positive at a 5% level; 3) Chairman duality is not a good thing and listed firm which chairman and general manager (GM) are the same person tend to have lower ESG scores.

Table 5: Fixed-Effect Model

	Dependent variable:		
	ESG2010-2020	ESG2010-2014	ESG2015-2020
	(1)	(2)	(3)
Top1	0.088***	0.088***	0.085***
	(0.016)	(0.022)	(0.022)
$(\text{Top1})^2$	−0.001***	−0.001***	−0.001***
	(0.0002)	(0.0002)	(0.0002)
Top25to1	0.624***	0.282	0.803***
	(0.136)	(0.204)	(0.183)
Size	1.916***	1.781***	2.044***
	(0.049)	(0.072)	(0.067)
LEV	−0.027***	−0.034***	−0.022***
	(0.003)	(0.004)	(0.005)
CurrentRatio	−0.107***	−0.096***	−0.155***
	(0.017)	(0.018)	(0.034)
IndepBoardRatio	2.494***	4.356***	0.637
	(0.908)	(1.296)	(1.240)
ChairisGM	−0.714***	−0.846***	−0.465***
	(0.139)	(0.217)	(0.180)
ROA2	−0.014*	−0.027**	−0.010
	(0.008)	(0.012)	(0.010)
Constant	−28.437***	−25.763***	−27.595***
	(1.212)	(1.733)	(1.694)
Observations	13,745	5,337	8,408
R^2	0.280	0.255	0.258
Adjusted R^2	0.275	0.243	0.250
Residual Std. Error	5.556 (df = 13649)	5.012 (df = 5249)	5.790 (df = 8317)
F Statistic	55.879*** (df = 95; 13649)	20.664*** (df = 87; 5249)	32.064*** (df = 90; 8317)

Note: *p<0.1; **p<0.05; ***p<0.01

5 Summary and Conclusions

5.1 Increasing Trend

Overall, although the average ESG score of listed firms in China was only 22.524, relatively lower compared to U.S. firms, these listed firms have been working hard on improving ESG performance over the past ten years. Specifically, state-owned firms and collective firms in China tend to constantly improve their ESG performance with higher scores, while private firms and foreign firms tend to be associated with decreasing and lower ESG scores during 2010-2020. Interestingly, the average ESG score of foreign listed firms in China decreased significantly in 2015, which might be explained by the withdrawal of foreign capital and 2015 stock market selloff.

5.2 ESG Divergence and Selection

Globally, different ESG rating agencies have common differences in the ESG ratings of a company. The divergence can be decomposed into contributions of scope, measurement, and weights (Berg et al., 2019). The ESG ratings from five main rating companies in China were all positively correlated, but still had significant divergence. Sino-Securities Index ESG covers 4065 listed companies, but has the lowest correlation coefficients with other four indices. China Alliance of Social Value Investment (CASVI) only includes 296 listed companies after 2016, so the sample size is not large enough to be representative. SynTao Green Finance, FTSE Russell, and Bloomberg ESG indices are all highly positively correlated, but Bloomberg ESG has fewest missing values and is directly measured by numerical scores rather than rating levels. Therefore, we choose Bloomberg ESG as a reliable index to measure ESG performance of listed firms in China for our analysis.

5.3 Ownership Structure and Leadership Factors

Based on our analysis, ownership concentration is beneficial for improving ESG performance to some extent, but the marginal effect is decreasing. This may indicate that the largest shareholder with more shares help stabilize the corporate governance and apply sustainable and consistent strategy, while one person with too much power is more likely to be autarchic, leading a corporate to a wrong direction more easily. The effects of blockholders and independent board members on ESG performance are also significantly positive. This may show that democracy and independence are essential to make rational decisions and avoid corruption. Lastly, chairman duality is not a good choice and listed firm should try to make sure that chairman and general manager are not the same person.

5.4 Future Recommendations

Even in Europe today, only 30% of the largest publicly traded corporations fully disclose their business model's environmental and climate-related implications (CDSB, 2020). It goes

without saying that the topic of ESG is relatively new in the world and the reports like ours concentrating on the identification of factors for construction of ESG policies and strategies would not be as reliable as it will be in 15-20 years, considering the changing politics. That effectively means the research area and data on ESG will improve throughout time and indicators might undergo refreshments and modifications. Additionally it is important to consider the cultural factors that could affect ESG performance of the companies on top of the factors such as corruption nepotism size of the company and others that we have explored to be able to capture the model in a broader way, account for more variabilities and, thus, achieve greater level of R^2. Another issue could be addressed such as the political stability in the country which is actually one of the central tenets of creditworthiness in the business world. As we know it most of the credit lenders and investors are today moving to hunt those companies with higher ESG performance levels and this is one of the greatest priorities for their companies to achieve greater levels of ESG score for attracting more financing opportunities. However, ESG levels are not the most important factors in the are influencing investor decisions and external factors like the value of a local currency could be explored in deeper perspective in order to shed light on the mutual interplay between ESG and creditworthiness to assist those companies as well as the governments in understanding how to regulate their balance of payments to bring about net positive ESG performance levels in the local companies.

6 References

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