

ESG Ratings and Corporate Tax Avoidance

-- An Analysis based on Chinese A-share Listed Companies

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Abstract

This paper empirically analyzes the impact of ESG rating on the degree of corporate tax avoidance by selecting the financial data of Chinese A-share listed companies from 2015-2020 and Shang Dao Rong Green ESG rating index. The results show that there is a significant positive relationship between ESG rating index and the degree of tax avoidance, i.e., the higher the ESG rating of a company, the greater its tax avoidance degree, and the above findings still hold after robustness tests and endogeneity treatment. In addition, the heterogeneity analysis of this paper finds that the positive correlation between ESG rating and tax avoidance is stronger when the company has tight cash flow, is a non-state enterprise or has higher information opacity. This paper develops a study on ESG ratings from the perspective of tax avoidance, which not only helps to explore the influencing factors of corporate tax avoidance, but also helps the theoretical community to have a more comprehensive understanding of the potential effects of corporate ESG ratings on social and economic development.

Keywords

Esg Rating; Corporate Tax Avoidance; Corporate Heterogeneity.

1. Introduction

With the growing maturity and development of global capital markets, more and more investors are focusing on analyzing companies' practices and performance in sustainable development, and ESG ratings are gradually becoming a source of information for investors to obtain information on the effectiveness of companies' sustainable development. According to statistics, the number of Chinese A-share listed companies participating in ESG ratings has reached more than 800 and is growing, which shows that ESG ratings have become an information tool of common concern for all participants in the capital market. However, research on the impact of ESG ratings on company behavior has not received sufficient attention and understanding from the theoretical community.

Corporate tax avoidance, as a common way to regulate profits in daily business management, has been a hot topic of discussion in both practice and academic research. However, as ESG performance has become an important dimension in identifying a company's sustainability, the question of whether the rating information used to demonstrate a company's ESG performance has an impact on the company's tax avoidance behavior has been discussed. However, as ESG performance has become an important dimension for identifying the sustainability of a company, the question of whether the rating information used to show the ESG performance of

a company has an impact on the tax avoidance behavior of the company is worthy of further investigation and has strong practical implications.

This paper examines the relationship between ESG ratings and corporate tax avoidance using financial data of Chinese A-share listed companies from 2015 to 2020 and draws the following main conclusions: (1) There is a significant positive relationship between ESG rating index and tax avoidance. (2) The mechanism of action test shows that the intrinsic motivation of corporate tax avoidance lies in the fact that ESG inputs lead to an increase in corporate costs and thus induce companies to reduce costs through tax avoidance. (3) Further analysis shows that the positive correlation between ESG rating and tax avoidance is stronger when the company has tight cash flow, is a non-state enterprise, or has higher information opacity.

The main contributions of this paper are: on the one hand, the existing literature on the impact of ESG ratings on corporate behavior mainly focuses on corporate finance, corporate investment efficiency, corporate governance, etc. Few scholars have studied from the perspective of tax avoidance, this paper enriches the impact of ESG ratings on corporate behavior and helps the theoretical community to more comprehensively understand the potential effects of corporate ESG ratings on social and economic development. On the other hand, this paper enriches the study of the factors influencing corporate tax avoidance. While the existing literature focuses on the influence of fiscal pressure, tax collection, equity concentration, economic policy or some aspect of E, S and G on the degree of corporate tax avoidance[1], this paper not only helps to explore the influencing factors of corporate tax avoidance, but also helps to deepen the capital market's deeper understanding and attention to ESG ratings.

2. Review of the Literature

Firstly, after combing the existing literature for the effect of ESG ratings of companies, it is found that ESG ratings have a significant effect on behavioral activities such as company operations and finance, while ESG ratings also have a significant effect on the decisions of capital market participants. In addition, some scholars have also started to explore the impact of ESG ratings on firm behavior from more perspectives, such as corporate cash holdings [2], accounting robustness [3], and social responsibility [4]. However, little literature has focused on the impact of ESG ratings on the extent of corporate tax avoidance.

Second, most of the existing literature on corporate tax avoidance has focused on corporate tax avoidance motives and determinants. Regarding the research on the motivation of corporate tax avoidance, on the one hand, motivated by financial interests, it is argued that tax avoidance involves withholding resources from the government and retaining resources within the firm for enhancing the firm's value, while the goal of effective tax planning is to maximize the firm's value [5] point out that tax avoidance can also generate resources and lead to economic benefits. On the other hand, corporate surplus management preferences, financial information quality pressures and investment and financing policies of the firm's operating process can have an impact on firms' tax avoidance motives. Most of the studies on the determinants of corporate tax avoidance have focused on corporate governance, business environment, firm size and business strategy [6], in addition, Gallemore and Labro [7] found that firms with better internal controls and internal information quality tend to pursue more tax avoidance. Existing scholars have also studied the impact of social responsibility on the extent of corporate tax avoidance from the perspective of social responsibility and found through empirical studies that the fulfillment of social responsibilities such as philanthropy by companies exacerbates their tax avoidance. However, few studies have examined the impact of ESG ratings on the extent of corporate tax avoidance from the perspective of ESG ratings.

Throughout the existing literature, the impact of ESG ratings on corporate behavior and activities is significant, but the existing literature mainly focuses on its impact on corporate finance, corporate investment efficiency, and corporate governance, and there is a lack of research focusing on the impact of ESG ratings on the extent of corporate tax avoidance. In addition, studies on the factors influencing corporate tax avoidance are mainly focused on corporate governance, business environment, social responsibility, company size, business strategy, internal control and internal information quality, but few articles have investigated how ESG ratings affect corporate tax avoidance. Further, this paper expands the literature on ESG ratings and corporate tax avoidance based on the depth of research in China's special institutional context.

3. Theoretical Analysis and Research Hypotheses

Company ESG rating is a comprehensive rating of the financial market for the company's internal ESG behavior performance, in the current ESG behavior performance has become an important information for listed companies to disclose in order to improve the social value impact.

On the one hand, empirical and theoretical studies show that a higher ESG rating requires more necessary expenditures for the company. Firstly, from the external environment, a higher ESG rating means that the company has to strictly control the environmental education and training, wastewater discharge, SO₂ emission, CO₂ emission, soot and dust and solid industrial waste emission, and pollutant emission compliance rate, as well as pass the ISO14001 and ISO9001 certification audit; secondly, from the social level, the company needs to formulate strict policies on employee rights protection, Secondly, at the social level, the company needs to establish strict policies on protection of employees' rights and interests, protection of suppliers' rights and interests, safety production, protection of consumers' rights and interests, and invest in relevant management personnel costs and legal maintenance expenses; finally, at the company level, a high ESG rating means that the company pays more attention to corporate governance and invests reasonable expenses to optimize internal governance procedures and management mechanisms. However, when a company's net internal cash flow decreases sharply due to an increase in necessary costs, the company will consider reducing operating costs in order to maintain normal operations, and since tax avoidance can reduce the company's tax bill, increase cash flow and improve the company's short-term performance. Therefore, tax avoidance is a possible way for companies to achieve cost reductions.

On the other hand, the good reputation generated by ESG ratings tends to make financial market regulators relax their oversight. When a company actively achieves social value impact, it creates a favorable public perception of its brand and creates an image of a "good company" among regulators such as the SEC, which increases its recognition to a certain extent, thus inducing the potential risk of tax avoidance being identified and increasing the likelihood of tax avoidance by the company. Such companies are encouraged to use ESG ratings as a poor tool to disguise tax avoidance.

In summary, better ESG ratings induce companies to reduce their operating costs through tax avoidance, and increase the likelihood that tax avoidance will not be identified, which in turn leads to tax avoidance decisions. Accordingly, this paper proposes the following main hypothesis.

Hypothesis H0: When ESG ratings of listed companies are higher, their tax avoidance is higher.

4. Study Design

4.1. Data Sources

The purpose of this paper is to study the influence of ESG ratings on the degree of tax avoidance of listed companies, considering that the ESG ratings of Chinese listed companies in Wind database (Shang Dao Rong Green Rating) have been disclosed since 2015, so this paper takes all A-share listed companies from 2015-2020 as the initial sample for examination, in order to ensure the validity of the sample, the following procedures are carried out Screening: (1) exclude companies in financial industries; (2) exclude ST, PT and *ST companies; (3) exclude samples with missing data; After the above screening and collation process, this study finally obtains 2679 valid sample observations, except for the data of Shang Dao Rong Green ESG rating index and the data of nominal income tax rate of companies from Wind database, all other data are taken from CSMAR database. And after manual calculation and collation, in order to ensure the credibility of the sample, the sample data are checked with the annual reports of A-share listed companies in this paper for sampling work, in addition, in order to mitigate the impact of outliers on the research results, in the empirical analysis this paper Winsorize all continuous variables by 1% each up and down.

4.2. Model Design

To test the effect of ESG ratings on the extent of corporate tax avoidance, this paper sets up the following model to test it empirically by referring to the relevant research practices of Benlemlih and Bitar [7].

$$\begin{aligned} TaxAvoidance_{i,t} = & \beta_0 + \beta_1 ESG_Rating_{i,t} + \beta_2 ROA_{i,t} + \beta_3 LEV_{i,t} + \beta_4 SOE_{i,t} + \beta_5 PPE_{i,t} + \beta_6 INTAN_{i,t} \\ & + \beta_7 SIZE_{i,t} + \beta_8 GROWTH_{i,t} + \beta_9 AGE_{i,t} + \beta_{10} OCF_{i,t} + \beta_{11} FIRST_{i,t} + \beta_{12} DUAL_{i,t} + \beta_{13} BIG4_{i,t} + \sum Indcd \\ & + \sum Year + \varepsilon \end{aligned} \quad (1)$$

TaxAvoidance is the degree of corporate tax avoidance, measured by TRD, and ESG_Rating is the combined environmental, social and corporate governance performance rating of A-share listed companies.

4.3. Variable Setting

(1) Explained variable (TaxAvoidance): The measure of the degree of corporate tax avoidance. There are various ways to measure the degree of corporate tax avoidance in the existing literature, and most academics currently use the effective tax rate or effective tax rate method to measure the degree of corporate tax avoidance [8], when the lower the effective tax rate of a company indicates the higher the degree of tax avoidance. However, this method is not in line with the tax collection environment in China, as the tax policies implemented in China are relatively complex, and A-share listed companies generally enjoy different degrees of tax incentives, while the nominal tax rate varies, so such indicators are likely to cause horizontal incomparability among companies, and it is difficult to measure the subjective tax avoidance of companies. In this paper, we use the difference between nominal and cash income tax rates (TRD) to measure the degree of tax avoidance, and the larger the TRD value is, the higher the level of tax avoidance of the company.

(2) Explanatory Variable (ESG_Rating): Business Road Green ESG rating. Environmental, social, and corporate governance (ESG) is used to assess the performance of companies in terms of sustainable development. With the development and promotion of the concept of socially responsible investment, many ESG rating systems have emerged internationally, and they differ in evaluation criteria, reference indicators, and coverage, such as Shang Dao Rong Green, Social Investment Alliance, Harvest, Ding Li, Ming Sheng Index, and China Securities Index, etc. In this

paper, with reference to the existing literature on ESG rating in China, the article selects the Shang Dao Rong Green rating, which has a wide range of application in China, and sets discrete variables according to the rating. The discrete variables are set according to the distribution; where A+ is 10, A is 9, and so on, and D is 1.

(3) Control variables: In this paper, the following control variables are set in the model with reference to the established literature: ROA (earnings profitability), LEV (financial leverage), SOE (nature of ownership), PPE (fixed asset ratio), INTAN (intangible asset ratio), SIZE (company size), GROWTH (growth), AGE (years on the market), OCF (cash flow), FIRST (first largest shareholder ownership ratio), DUAL (dual role), BIG4 (audit oversight). The specific calculations are shown in Table 1. In addition, this paper also controls for year fixed effects (Year) and industry fixed effects (IndustryCode).

Table 1. List of variable definitions and calculations

Variable Type	Variable Name	Variable symbol	Variable definition
Explained variables	Extent of corporate tax avoidance	TRD	Nominal income tax rate - (income tax expense - deferred income tax expense) / (profit before tax - deferred income tax expense / statutory tax rate)
Explanatory variables	ESG rating	ESG_Rating	Business Road Rong Green ESG Rating Metrics
Control variables	Profitability	ROA	Net profit/average total assets
	financial leverage	LEV	Total liabilities/total average assets
	Nature of property rights	SOE	1 if a state-owned enterprise, 0 otherwise
	Fixed assets ratio	PPE	Net fixed assets/total average assets
	Intangible assets ratio	INTAN	Net intangible assets/total average assets
	Company Size	SIZE	Natural logarithm of average total assets
	growth	GROWTH	Growth rate of operating income
	Number of years on the market	AGE	Years on market plus 1 to take the natural logarithm
	cash flow	OCF	Net cash flow from operations/total average assets
	Shareholding ratio of the first largest shareholder	FIRST	Number of shares held by the largest shareholder/total share capital
	dual employment	DUAL	The value is 1 if the chairman and the managing director are the same person, otherwise it is 0
	Audit oversight	BIG4	1 if the annual report audit is performed by a "Big 4" accounting firm, 0 otherwise

Source: Compiled from this article

5. Empirical Results and Analysis

5.1. Descriptive Statistical Analysis

Table 2 reports the results of descriptive statistics of the variables. As can be seen, (1) the mean and standard deviation of the TRD for the degree of tax avoidance among Chinese A-share listed

companies are 0.020 and 0.006, respectively, which overall specify that some Chinese listed companies may have more serious tax avoidance practices. (2) The mean and median of Shang Dao Rong Green ESG rating indicators are 5.868 and 6.000, indicating that the ESG ratings of listed companies are all at a medium level. (3) Among the statistical results of other variables, the mean value of ROA is 0.047, and its relatively low value indicates that the profitability of listed companies in China needs to be improved; the values of PPE and INTAN confirm the tendency of listed companies in China to emphasize investment in fixed assets but not in intangible assets; the mean value of GROWTH is 0.123, which is at a relatively high level, but there are also about 1 /2 companies whose growth rate does not exceed 1%; the mean value of SOE is 0.501, which indicates that almost half of the sample is owned by state-owned enterprises and half by non-state-owned enterprises; the mean value of the shareholding ratio of the first largest shareholder is 37.648%, which indicates that the shareholding is relatively concentrated, in addition, the 25% and 75% quartiles of each variable indicate that listed companies show strong heterogeneity among each other in terms of AGE, OCF and LEV, etc. The mean value of the variables is 3748% which indicates the relative concentration of equity.

Table 2. Descriptive statistical analysis of variables

variable	N	mean	sd	max	p25	p50	p75
TRD	2679	0.020	0.006	0.059	0.015	0.025	0.025
ESG_Rating	2679	5.868	0.986	8.000	5.000	6.000	6.000
SIZE	2679	23.994	1.193	26.243	23.095	23.835	24.817
LEV	2679	0.524	0.204	1.016	0.378	0.530	0.671
ROA	2679	0.047	0.068	0.218	0.017	0.040	0.078
PPE	2679	0.215	0.179	0.720	0.077	0.161	0.320
INTAN	2679	0.053	0.061	0.357	0.019	0.036	0.062
OCF	2679	0.069	0.066	0.261	0.028	0.064	0.105
SOE	2679	0.501	0.500	1.000	0.000	1.000	1.000
GROWTH	2679	0.123	0.331	3.030	-0.026	0.083	0.213
BIG4	2679	0.207	0.405	1.000	0.000	0.000	0.000
DUAL	2679	0.239	0.426	1.000	0.000	0.000	0.000
First	2679	37.648	16.297	72.840	24.690	36.570	50.140
AGE	2679	14.130	7.117	27.000	8.000	14.000	20.000

Source: Compiled from this article

5.2. Relevance Analysis

This paper analyzes the correlation of the main variables and the results show that ESG rating is significantly and positively correlated with the degree of corporate tax avoidance at the 1% level. To some extent, it supports the main hypothesis of this paper and provides basic information for the empirical test below.

5.3. Analysis of Regression Results

5.3.1. Basic Analysis

Panel A of Table 3 presents the results of the basic regression of ESG ratings on the extent of corporate tax avoidance. In particular, column (1) controls for industry and year fixed effects only, and column (2) adds the relevant control variables as regression results for model (1), which is also the main regression. The results show that there is a significant positive relationship between ESG ratings and the degree of corporate tax avoidance when controlling for firm characteristics and external factors, which is consistent with the results of the correlation analysis. This shows that when the necessary cost of ESG input increases for Chinese

A-share listed companies, in order to hedge the total cost of company operations and maintain normal business operations will induce companies to reduce their operating costs through tax avoidance, and the main hypothesis of this paper is verified.

Table 3. Main effects and robustness tests

variable	Panel A: Basic analysis		Panel B: Robustness Tests			
	TRD	TRD	Mean_ETR	BTD	TRD	TRD
	(1)	(2)	(1)	(2)	(3)	(4)
ESG_Rating	0.302*** (0.099)	0.573 *** (0.105)	2.693 ** (1.315)		0.823 *** (0.270)	0.436 ** (0.195)
HzRating				0.083 ** (0.034)		
SIZE	uncontrolled	0.800 *** (0.139)	3.236 ** (1.649)	0.143 *** (0.048)	0.786 ** (0.322)	0.506 ** (0.239)
LEV	uncontrolled	-0.973 (0.669)	-3.998 (4.191)	0.502 (0.696)	-0.755 (1.496)	-0.582 (1.453)
ROA	uncontrolled	-4.904 *** (1.875)	0.330 (11.437)	122.719 *** (4.493)	-2.219 (3.979)	-6.675 * (3.890)
PPE	uncontrolled	-2.909 *** (0.783)	-13.902 *** (5.091)	0.660 (0.483)	-2.914 (1.771)	-2.787 * (1.480)
INTAN	uncontrolled	-1.085 (1.863)	-35.848 *** (12.600)	0.292 (0.792)	-2.691 (4.190)	-2.726 (4.138)
OCF	uncontrolled	-0.111 (1.785)	8.839 (20.271)	-1.983 (2.032)	0.313 (5.265)	-1.159 (3.607)
SOE	uncontrolled	-0.201 (0.238)	-7.173 *** (1.736)	0.138 (0.098)	0.074 (0.528)	-0.043 (0.459)
GROWTH	uncontrolled	0.393 (0.316)	-4.704 (3.894)	-0.716 ** (0.325)	-0.533 (1.016)	0.275 (0.717)
BIG4	uncontrolled	1.233 *** (0.226)	1.824 (2.181)	0.037 (0.068)	1.879 *** (0.538)	1.243 *** (0.475)
DUAL	uncontrolled	-0.231 (0.226)	-5.799 (3.644)	-0.048 (0.122)	0.145 (0.609)	0.407 (0.442)
First	uncontrolled	0.004 (0.007)	-0.034 (0.055)	-0.001 (0.002)	-0.008 (0.015)	0.002 (0.013)
AGE	uncontrolled	0.104 *** (0.015)	0.305 (0.190)	0.022 *** (0.005)	0.118 *** (0.031)	0.099 *** (0.026)
constant term (math.)	21.804 *** (1.128)	1.415 (3.440)	20.104 (62.394)	-4.087 *** (1.237)	1.904 (7.889)	4.611 (6.458)
Year fixed effects	control	control	control	control	control	control
Industry fixed effects	control	control	control	control	control	control
N	2679	2679	3055	2657	640	744
R ²	0.346	0.393	0.049	0.933	0.373	0.388

Note: Values in parentheses are T-statistics; ***, ** and * represent significant at the 1%, 5% and 10% levels, respectively

Source: Compiled from this article

5.3.2. Robustness Tests

The first is to change the measure of the main variable. One, a separate replacement is made for the explanatory variables. To ensure the robustness of the previous findings in terms of variable settings, this paper performs variable substitution for the measure of tax avoidance by using the five-year rolling average of the difference between the nominal and effective income tax rates to measure the extent of corporate tax avoidance [8]. The results of the substitution robustness are shown in column (1) of Panel B in Table 3, and the significant positive relationship between ESG rating and the degree of corporate tax avoidance continues to hold. Second, the paper resets both the explanatory and explanatory variables. This paper adopts the accounting-tax difference to measure the degree of corporate tax avoidance, and chooses the ESG rating of China Securities as the explanatory variable of the study, and the test results are shown in column (2) of Panel B in Table 3, and we can see that the results of variable substitution more robustly prove the main hypothesis of this paper.

Second, regressions are grouped by year. The results are shown in columns (3)-(4) of Panel B in Table 3. The results show that ESG ratings are still positively correlated with the degree of corporate tax avoidance. However, from the comparison, we know that Chinese companies' tax policies are given strong preferential incentives under the epidemic, and although ESG rating is still positively related to the degree of tax avoidance, the marginal effect is significantly lower relative to the pre-epidemic period, indicating that companies' incentive to reduce operating costs through tax avoidance channels is weakened.

5.4. Endogeneity Test

The above benchmark regression results confirm that ESG ratings are positively related to the degree of corporate tax avoidance, but the study in this paper may have potential endogeneity problems due to reverse causality issues or omission of important control variables. Therefore, the estimation results are subject to some error.

Table 4. Endogeneity test

variable	ESG_Rating	TRD
	(1)	(2)
ESG_Rating		1.038 *** (0.225)
ESG_Rating-Lag two perious	0.625 *** (0.021)	
Other control variables	control	control
Industry fixed effects	control	control
Year fixed effects	control	control
constant term (math.)	4.619 *** (0.601)	-23.133 *** (4.406)
N	1652	1348
R ²	0.537	0.156

Note: Values in parentheses are T-statistics; ***, ** and * represent significant at the 1%, 5% and 10% levels, respectively

Source: Compiled from this article

To mitigate the potential endogeneity problem, this paper uses two-stage least squares (2SLS) with a two-lagged indicator of Business Way Rongreen ESG rating as an instrumental variable,

and columns (1)-(2) of Table 4 report the regression results for the first and second stages. The results show that the positive relationship between ESG ratings and the degree of corporate tax avoidance still holds after accounting for endogeneity.

5.5. Heterogeneity Analysis

The previous study answered the question of "the relationship between ESG ratings and corporate tax avoidance", and the following study will examine the effect of higher ESG ratings on tax avoidance among Chinese listed companies in three different scenarios.

5.5.1. Corporate Net Cash Flow

In this paper, the net cash flows of companies are grouped by annual means and the main regression model is repeated, and the regression results are shown in columns (1) and (2) in Table 5, which indicate that the marginal effect of ESG rating on the degree of corporate tax avoidance is significantly higher when the company has fewer net cash flows in the scenario. It further indicates that when the scenario of less internal net cash flow of the company, the company increases its cost expenditure to obtain a higher ESG rating, which at that time will intensify the positive relationship between ESG rating and the degree of tax avoidance of the company.

5.5.2. Nature of Property Rights

The results of this paper are shown in columns (3) and (4) of Table 5, which show that the positive correlation between ESG rating and tax avoidance is stronger when the company is a non-state company. Based on the theoretical analysis, non-state companies are more likely to face financial shortage due to lack of capital supply, therefore, non-state companies will increase their costs to obtain higher ESG rating to the extent that it is not enough to maintain normal operation, and then the company will make tax avoidance decision to reduce operating costs.

5.5.3. Level of Information Asymmetry

Table 5. Analysis of heterogeneity

variable	TRD					
	(1)	(2)	(3)	(4)	(5)	(6)
	OCF is less than the mean	OCF is greater than the mean	state-owned business	non-state enterprise	High level of information asymmetry	Weak information asymmetry
ESG_Rating	0.667 *** (0.157)	0.510 *** (0.138)	0.463 *** (0.141)	0.554 *** (0.175)	0.680 *** (0.193)	0.528 *** (0.121)
Other control variables	control	control	control	control	control	control
Industry fixed effects	control	control	control	control	control	control
Year fixed effects	control	control	control	control	control	control
constant term (math.)	-1.477 (5.013)	1.039 (4.959)	-4.251 (5.189)	12.264 ** (4.947)	4.027 (6.565)	2.799 (3.945)
N	1495	1184	1343	1336	943	1736
R ²	0.361	0.488	0.397	0.401	0.462	0.405

Note: Values in parentheses are T-statistics; ***, ** and * represent significant at the 1%, 5% and 10% levels, respectively

Source: Compiled from this article

A higher degree of information asymmetry provides a favorable external environment for firms to implement tax avoidance. The results are shown in columns (5)-(6) of Table 5. The empirical evidence shows that the positive correlation between ESG rating and the degree of tax avoidance is stronger when the degree of information opacity is higher. Further analysis shows that when information asymmetry is high, it creates favorable conditions for corporate tax avoidance, which increases the likelihood of corporate tax avoidance masking and then reduces the potential risk of being identified.

6. Conclusion

This paper is based on the fact that the effect of ESG rating has become an emerging and important hot spot in the current academic field and the relationship between ESG rating and the degree of corporate tax avoidance in the context of China's special tax system will have strong practical significance. The main findings of this paper are as follows: (1) There is a significant positive relationship between ESG rating and tax avoidance, which may be due to the fact that ESG input leads to the increase of company cost and thus induces companies to reduce cost through tax avoidance. (2) Further analysis reveals that the positive correlation between ESG rating and tax avoidance is stronger when the company has tight cash flow, is a non-state enterprise, or has a high degree of information opacity. This suggests that both internal financial constraints and the favorable environment created externally increase the likelihood of corporate tax avoidance disguise. The research in this paper both enriches relevant studies on the impact of ESG ratings on corporate behavior and digs deeper into the determinants of corporate tax avoidance, while contributing to a more comprehensive theoretical understanding of the potential effects of corporate ESG ratings on social and economic development.

7. Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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Appendix

Table 6. List of definitions of E, S and G variables

Variable Name	Method of accounting	Variable definition	
E	E = summary score for each item/theoretical optimal score (27 points)	Annual Reports of Listed Companies	1 point for disclosure of relevant information, 0 points otherwise
		Social responsibility report	
		Environmental reports	
		Environmental Education and Training	
		Implementation of the "three simultaneous" regime	
		Sudden environmental accidents	1 point for a sudden major environmental pollution incident, 0 points otherwise
		Total wastewater discharge	0 points for no description, 1 point for general description, 2 points for quantitative description
		SO2 emissions	
		CO2 emissions	
		Soot and dust emissions	
		Industrial solid waste generation	
		Cleaner production implementation	
		Solid waste utilization and disposal	
		Exhaust emission reduction	
		Wastewater abatement	
Pollutant emission compliance rate	1 point for meeting pollutant discharge standards, 0 points otherwise		

		ISO14001 certification	1 point for passing the audit, 0 points otherwise
		ISO9001 certification	
S	Principal component analysis method, the first major principal component was selected	Shareholder Rights Protection Policy	Disclosure assigns a value of 1, otherwise 0
		Creditor rights protection policy	
		Employee rights protection policy	
		Supplier Rights Protection Policy	
		Safe Production Policy	
		Consumer Rights Protection Policy	
G	Principal component analysis, extracting eigenvalues greater than 1 of the top three principal components, calculate each principal component Score. The variance contribution of each principal component was The contribution rates were used as weights and a weighted average was summed.	Shareholding of the largest shareholder	Shareholding of the first largest shareholder
		Concentration of shareholding	Ratio of the shareholding of the first largest shareholder to the second largest shareholder
		Number of shareholder meetings	Number of annual general meetings held by the company
		Board size	Number of board members
		checks and balances on shareholding	Ratio of the sum of the shareholding of the second to tenth largest shareholders to the shareholding of the first largest shareholder
		dual employment	Whether the chairman and CEO are both, yes takes the value of 1, otherwise 0
		Audit opinion on financial statements	1 for standard unqualified audit opinion and 0 for other audit opinion

Source: Compiled from this article