

On the fast track: The benefits of ESG performance on the commercial credit financing

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Abstract

Under the strategy of sustainability, whether a company can increase its financing capacity by improving environmental, social, and governance (ESG) performance is vital to promoting its high-quality development. Based on China's A-share listed companies from 2009 to 2021, this study empirically examines the impact of corporate ESG performance on commercial credit financing (CCF). Following the research results, a company with better ESG performance is more likely to get CCF support from suppliers. Further analysis of the impact mechanisms shows that ESG performance can effectively reduce environmental, social, and governance risks by promoting green innovation, improving social reputation, and reducing operational risks, thereby improving the CCF of enterprises. Our work expands and enriches the theory of informal financing of enterprises, integrated with the more comprehensive assessment criteria for sustainable development.

1. Introduction

In recent years, the COVID-19 epidemic has occurred repeatedly, geopolitical events have aroused frequently, and global asset prices have fluctuated violently. The complex and severe external environment has brought considerable challenges to the stability of the capital market. The report of the 20th National Congress of the CCP emphasized that accelerating green and low-carbon transformation and improving sustainable development capabilities are of great significance to encouraging the construction of eco-friendly civilization and accelerating economic transformation and upgrading. In 2021, the United Nations Climate Summit (COP26) proposed action initiatives for global carbon emission reduction and sustainable environmental development. Implementing the concept of green development, reducing corporate environmental pollution (Environmental, E), fulfilling corporate social responsibility (Social, S), and improving corporate governance capabilities (Governance, G) have increasingly become the direction advocated by the international community.

The social responsibility requirements caused by sustainable development are reshaping the business philosophy of enterprises. As Friedman (2007) states, firms are only responsible for pursuing profit, while any other social responsibility required erodes market economies. Many supporters of this view regard the maximization of shareholder interests as the standard (Bénabou and Tirole, 2010). However, as social issues related to sustainability, like climate change and infectious diseases, have emerged increasingly prominent, and national-level responses frequently encounter political resistance, the above-mentioned views face many controversies (Hart and Zingales, 2017). Because coping with such major social issues not only depends on the coordination of international organizations but also requires companies to consider E, S, and G in investment decisions. It is done by practicing the ESG concept and seeking solutions to social issues at the corporate level (Reeder and Colantonio, 2013). According to a Global Sustainable Investment Alliance (GSIA) report, global ESG investment has increased by 15% in the past two years, and the asset management scale has reached 35.3 trillion US dollars. ESG investment is expected to exceed 53 trillion US dollars in 2025, accounting for over one-third of the world's total assets. As ESG investments have grown globally, ESG strategies have become business mainstream.

China's economy cannot achieve high-quality development without the strong support of enterprises, and the operation of enterprises cannot do without the support of funds. Financing is a global problem affecting enterprises' sustainable operation, which is also a crucial element that causes inefficient investment. There is still a transition period in China's economy. Banks and firms in China experience information asymmetry owing to the imperfect financial market, resulting in the issue of 'credit rationing.' Enterprises that need to borrow cannot obtain bank loans smoothly, even if they bear high-interest rates. In this case, the informal financing channel provided by CCF with suppliers as the main creditors becomes a substitute financing approach for bank loans (Stiglitz and Weiss, 1981). CCF allows enterprises to delay the payment of the purchase price of goods and services or to obtain payment from the purchaser in advance. It is equivalent to the partners of the enterprise transferring their funds' liquidity and realizing the redistribution of financial resources to a certain extent. It is also a meaningful way to ease corporate financing constraints. At the same time, commercial credit is also an essential means to reduce transaction costs, convey product quality, stabilize customer relationships, and maintain market share, which exerts a prominent role in elevating enterprise growth (Fabbri and Menichini, 2010). In China, the sum of accounts payable, bills payable and accounts received in advance account for 15.6%^[1] of the total assets. It shows that commercial credit has a position that cannot be underestimated in the financing methods of listed companies in China.

There is evidence that corporate ESG performance will affect corporate risk management, especially credit risk management (Li et al., 2022a). In essence, ESG is a kind of management and control of non-financial risks of enterprises, which eliminates or reasonably reduces the possible or existing dangers in all aspects of the enterprise's operation to a controllable range. Because of this, ESG is also born with another higher-level ability-opportunity recognition. For example, reducing risks can help companies minimize risk losses, and identifying opportunities can help companies create new profit points. It manifests the company's sustainable profitability and can enhance the capital market's confidence in corporate investment. Accordingly, both corporate ESG and CCF are critical elements influencing sustainability. However, what is the relationship between the two? As of now, neither domestic nor foreign scholars have thoroughly investigated how corporate ESG affects CCF. Therefore, it is of unquestionable value to carry out research on the impact of ESG on CCF.

This study analyzes the impact and paths of corporate ESG performance on CCF based on information asymmetry theory, signaling theory, and other theories. The process involves the construction of theoretical models and the analysis of empirical data. Some potential marginal contributions to this research are as follows:

First, we explore the relationship between ESG performance and CCF, which enriches the related research in the field of ESG. Our work theoretically expands the competitive advantage factors that drive the level of commercial credit and enriches the theory of informal financing of enterprises. Moreover, it is a valuable supplement to ESG literature.

Second, it expands the specific path through which ESG performance affects corporate business credit. Several facets of environmental, social, and corporate governance are considered in the analysis of ESG performance on the impact path and mechanism of CCF in this article, which is highly integrated with the evaluation criteria of sustainable development, which is more comprehensive.

Finally, this paper has certain advantages regarding data usage and instrumental variables. In related studies that use ESG as an explanatory variable, overcoming variables' endogeneity is critical (Gillan et al., 2021). We construct the product of the dummy variable of the carbon emissions trading pilot and the company's ESG performance in the policy year as an instrumental variable and verify its effectiveness. This paper uses carbon emissions trading policy shocks as the source of ESG shocks, which may inspire subsequent ESG research on dealing with endogenous issues.

The rest of this paper is structured as follows: Section 2 discusses the theoretical analysis. Section 3 is the research design, including data source, econometric model setting, and variable construction. Section 4 analyzes empirical results and tests robustness. Section 5 further analyzes the specific impact paths and mechanisms, and Section 6 concludes and suggests.

[1] The data is shown in the descriptive statistics of Table 2

2. Theoretical Analysis And Hypotheses

2.1 Corporate ESG performance and CCF

For the past few years, the ESG performance of enterprises has always attracted concern, and all stakeholders are always concerned about the performance of ESG. Suppliers are eager to obtain relevant information to evaluate enterprises' future benefits and potential risks and decide whether to offer business credit. Li et al. (2022a) found that ESG plays an essential and active role in credit risk management. Enterprises with satisfactory ESG performance have a lower risk of default, which may indicate lower financing costs, and are more competitive with companies with lower ESG ratings. Therefore, the company's ESG performance will affect suppliers' decision-making and behavior.

Firstly, a company's disclosures are the leading resource for investors to figure out its growth under the information asymmetry theory. Aside from financial information, non-financial information industries, including corporate governance, environment, and social responsibility, have attracted more and more attention from investors. The research of Raimo et al. (2021) confirmed this point. In enterprises with high transparency of information dissemination, ESG disclosure can mitigate the financing cost of enterprises by reducing information asymmetry. As a provider of commercial credit, suppliers are at a disadvantage in obtaining information. In addition to the financial information publicly disclosed by enterprises, the ESG performance of enterprises, as a sort of non-financial information, is one of the critical criteria for suppliers to judge the risks and performance of enterprises. High-quality ESG information promotes improving the information transparency between enterprises and suppliers, enhancing their trust relationship and increasing CCF.

Secondly, based on the signaling theory, by improving ESG performance, companies can send positive signals to investors, suppliers, and other stakeholders to establish a good reputation and corporate image. Reputation can attract social resources for a company from all angles while preventing or mitigating adverse events from causing harm (Zavyalova et al., 2012). For example, in business crises, companies may be unable to uphold their corporate governance or undertake environmental responsibilities, even if they wish to. As a result, suppliers will be more likely to provide CCF for enterprises with a fine reputation.

Finally, forming a buyer's market will also affect corporate credit financing. Fabbri and Menichini (2010) proposed that if the buyer is in a strong position in the market supply and demand relationship, it may promote the scale of commercial credit. Specifically, large-scale, reputable buyer companies with less financing pressure are naturally in an advantageous position in the transaction, and they can obtain low-cost working capital through commercial credit. Considering buyer's market theory, companies with good ESG performance have strong core competitiveness (Mendiratta et al., 2021), and the concentration of suppliers is low. Therefore, buyer companies are less dependent on suppliers, so they naturally have more substantial bargaining power, have an advantage in transactions, and are more easily obtain commercial credit. Suppliers are also more likely to extend business credit to reputable buyers to maintain customer sources and promote sales. Therefore, we hypothesize:

H1: CCF acquisition increase with better ESG performance.

2.2 ESG performance and CCF: Mechanisms of impact

From an environmental risk perspective, given the increasingly popular concept of green development, ESG rating increasingly impacts enterprises' green innovation behavior (Tan and Zhu, 2022). First, based on the high-level theory, managers' cognition as a vital force of the organization determines the corporate development strategy. Therefore, the disclosure and performance of enterprise ESG may increase the environmental awareness of managers. According to Zhang et al. (2015), ecological awareness can promote companies' innovation strategies by integrating green ideas into daily management activities. Second, with the formulation and implementation of green financial policies in recent years, the environmental performance of companies is of great significance for obtaining green credit and reducing environmental regulation. A good ESG performance will help improve the government's credit rating for companies, enabling companies to obtain green funds. The unique green funds encourage enterprises to carry out green innovation, reduce environmental risks, improve the quality of information disclosure, and realize a virtuous development cycle. In addition, enterprise environmental protection investment is crucial to enhancing ESG evaluation. Whether for establishing its market competitive advantage or for considering and balancing improving its social reputation, enterprises are motivated to increase environmental protection expenditure and promote green innovation.

Accordingly, enterprises can increase their green image through green innovation (Chen, 2008) to obtain more benefits and resources, such as greater market share and financial performance, and improve their

core competitiveness. Pelozo and Shang (2011) believed green innovation could strengthen stakeholder relationships and alleviate conflicts. Therefore, as an essential stakeholder of an enterprise, the supplier adjusts its business credit relationship with the enterprise according to its market competitiveness and future expectations. When an enterprise shows good green innovation performance, it will reduce the financing constraints of local governments and macro environmental protection policies on enterprises and reduce environmental protection expenditure, thus effectively reducing environmental risks. This "risk change" conveys the concept of sustainable development and market competitiveness to suppliers and stabilizes suppliers' expectations for the future of enterprise development. In short, ESG is conducive to improving the green innovation ability of enterprises, increasing the ability to resist environmental risks, and enhancing suppliers' confidence in the future development of enterprises. Therefore, we hypothesize:

H2: ESG performance can improve corporate green innovation behavior, effectively reduce corporate environmental risks, and promote CCF

Whether it is to improve its green image or disclose information about social responsibility, it will increase the public's recognition of the value of enterprises and enhance its social reputation. Social reputation is an intangible asset that positively influences coping with social risks. Scholars who agree with the concept of enterprise resources believe that social reputation is a competitive advantage. Yang et al. (2019) pointed out that whether a supplier is willing to provide business credit to customers mainly depends on mutual trust and reputation. Reputation refers to the comprehensive evaluation of the public on the subject. It relates to the sign that an enterprise can fulfill its commitment to customers and other stakeholders formed in public due to its long-term honest and law-abiding operation. The ESG performance of enterprises transmits relevant information on the environment, social governance, and corporate governance. It releases positive signals, which is not only conducive to improving corporate reputation, limiting social reputation risks, and maintaining legitimacy (Karwowski and Raulinajtys-Grzybek, 2021) but also conducive to identifying and judging the risks and opportunities faced by enterprises by stakeholders such as suppliers (Broadstock et al., 2021). A study by McDonnell and King (2013) shows that when enterprises face reputation risk, they have to increase social appeal activities to alleviate negative media reports and constantly change their management strategies as the threat of social reputation risk rises. Accordingly, ESG performance reflects enterprises actively catering to stakeholders' preferences for value, reducing the trust gap between investors and suppliers and thus obtaining the convenience of credit from suppliers. Therefore, we hypothesize:

H3: Enterprise ESG performance can improve its reputation, effectively reduce social reputation risk, and then promote CCF

From the perspective of governance risk, the extent to which suppliers provide CCF for enterprises is mainly based on the enterprise's low operational risk and good debt repayment ability (Matias Gama and Susana, 2012). Governance risks arise from management structures, employee relations, related employee compensation, taxation, and legal compliance (Karwowski et al., 2021). Existing studies have shown that ESG performance will affect companies' identification of potential threats to product and

technology, litigation, and financial risks. It encourages companies to establish risk response frameworks to promote corporate resilience and coping capabilities to protect stakeholders, reputation, and benefits of value creation activities. Therefore, improving corporate governance capabilities can reduce governance risks, improve operational stability, and enhance corporate performance capabilities. Since upstream suppliers and trading partners provide commercial credit to enterprises, they bear the risk of default caused by downstream customers due to poor management or even bankruptcy. The trading partners of enterprises will also adjust their commercial credit policies according to the "risk changes" of enterprises. In addition, a study by Greenlaw et al. (2008) shows that firms with poor governance tend to hold less cash reserves, and management prefers using funds for acquisitions and capital expenditures. In times of economic turmoil, these companies cannot often resist risks, and their operating conditions are full of unknowns. According to market segmentation theory, enterprises with better governance capabilities rely less on bank credit financing and turn to CCF with lower financing costs (Nguyen et al., 2015). Therefore, better ESG performance improves financial transparency and information disclosure and alleviates information asymmetry with trading partners. Suppliers are also more willing to provide commercial credit to enterprises with stable operating conditions and strong solvency. Therefore, we hypothesize:

H4: Enterprise ESG performance reduces its operational risks, mitigates corporate governance risk effectively, and promotes CCF.

3. Research Design

3.1 Samples and data sources

The initial research samples consist of A-share listed companies on the Shenzhen and Shanghai Stock Exchanges between 2009 and 2021. The samples are cleaned with the following standards: (i) Delete financial and ST companies. (ii) Delete companies with owner's equity less than 0. (iii) Enterprises with missing relevant data are deleted. (iv) Winsorize all continuous variables' 1% and 99% quantiles. The data in this article mainly includes three categories: ESG data, which derives from the database of WIND. The second is the company's financial data from the CSMAR and WIND databases. Finally, other data are taken from the CNRDS database. Match the above data, and finally get 32323 samples.

3.2 Empirical model

In order to test H1, this paper constructs a fixed effect model as follows:

$$CCF_{ijt} = \beta_0 + \beta_1 ESG_{it} + \beta_2 Ctrl_{it} + \delta_i + \delta_t + \delta_j + \epsilon_{ijt}$$

1

Where i, j, and t represent firm, industry, and year respectively. Explained variable CCF_{ijt} represents the level of commercial credit financing obtained by the enterprise, ESG_{it} is the core explanatory variable, representing the comprehensive ESG performance of the enterprise in the current year. $Ctrl_{it}$ represents

all control variables; δ_i , δ_j and δ_t represent the individual-fixed, industry-fixed and time-fixed effects of enterprises, respectively. And ϵ_{ijt} represents the disturbance term of the model.

3.3 Index construction

3.3.1 Dependent variable

There are currently three methods used in academic circles to assess corporate CCF: first, use the ratio of commercial credit financial data to total assets to measure the intensity of use (Liu et al., 2022; Lu and Yang, 2011); Second, use the natural logarithm of commercial credit financial data to measure the scale of use (Carter and McNulty, 2005); Third, use the proportion of supplier loans in total financing to measure the debt ratio (Crocchi et al., 2021). Among them, the academic community frequently uses the first method, and our study also adopts this idea. Specifically, using the ratio of the sum of accounts payable, notes payable, and advance receipts to the total assets.

3.3.2 Independent variable

ESG performance (ESG) is constructed based on the Huazheng ESG evaluation system, which consists of 14 themes and 26 key indicators. This indicator also refers to the mainstream international ESG evaluation system and adjusts it according to the characteristics of the Chinese market. It has the features of high update frequency (quarterly update), comprehensive coverage, and high data availability. Huazheng ESG Rating is based on index scores, and all listed companies are rated into nine grades, ranging from C to AAA, from low to high. Referring to Li et al. (2022b), the benchmarking analysis assigns a value from 1 to 9 for companies' ESG ratings from low to high, and the larger the value, the better the ESG performance.

3.3.3 Control variables

To control the potential impact of corporate CCF, we also included the following variables: leverage ratio (Lev), return on assets (ROA), corporate growth (Growth), corporate Size (Size), return on equity (ROE), equity nature (Eqn), high-quality audit (Big4), Separation of equity (Sep), the concentration of ownership (Top1), and age of establishment (Age). For the convenience of reading, all variable definitions are listed in Table.

Table 1
Variable definitions

Variable	Statistic	Definition
Commercial credit financing	CCF	(Advance receipts + Notes Payable + Accounts Payable) / Total Assets
ESG performance	ESG	Huazheng ESG evaluation system, with a score of 1 ~ 9
Leverage	Lev	Ratio of total liabilities to total assets
Return on assets	ROA	Ratio of net profit to total assets
Corporate growth	Growth	Business revenue growth rate
Enterprise size	Size	Natural logarithm of total assets
Return on equity	ROE	Ratio of net profit to net assets
Equity nature	Eqn	Take 1 if it is state-owned, otherwise 0
High-quality audit	Big4	Take 1 if the big four firms audit it, otherwise 0
Separation of equity	Sep	The difference between the actual controller's control and ownership
Concentration of ownership	Top1	The shareholding ratio of the largest shareholder
Listing age	Age	Difference between reporting period year and listing year

4. Empirical Results

4.1 Descriptive statistics

Table 2 presents descriptive statistics for the main variables in our research. It depicts that the size of the corporate CCF maximum is 0.537, the mean value is 0.156, and the standard deviation is 0.115. The mean is larger than the median and shows a right-skewed distribution phenomenon, which indicates that a small number of the samples of firms received more credit financing from the suppliers. It suggests that the size of the corporate acquiring credit financing is quite different between different firms, and there is a significant difference between samples. The max, min, and mean values of ESG performance are 8, 1, and 4.115, respectively, illustrating that ESG performance also has significant differences among different listed firms.

Table 2
Descriptive Statistics

Variable	N	Mean	SD	Min	P50	Max
CCF	32,323	0.156	0.115	0.000	0.127	0.537
ESG	32,323	4.115	1.100	1.000	4.000	8.000
Lev	32,323	0.422	0.210	0.050	0.413	0.967
ROA	32,323	0.039	0.064	-0.323	0.039	0.204
Growth	32,323	0.406	1.104	-0.731	0.137	7.987
Size	32,323	22.114	1.301	19.522	21.927	26.164
ROE	32,323	0.070	0.133	-0.694	0.077	0.388
Soe	32,323	0.372	0.483	0.000	0.000	1.000
Cash	32,323	0.047	0.071	-0.182	0.046	0.246
Big4	32,323	0.059	0.235	0.000	0.000	1.000
Sep	32,323	4.654	7.391	0.000	0.000	28.526
Top1	32,323	34.967	14.769	8.730	32.940	74.820
Age	32,323	2.854	0.355	1.609	2.890	3.497

4.2 Main results

Table 3 represents the results of an examination in which corporate ESG performance affects corporate CCF. Where, column (1) is the regression result of corporate ESG performance versus CCF under the addition of control variables. The correlation between ESG performance and CCF is 0.006, significant at 1%. Based on column (1), column (2) provides the estimated result of adding firm-fixed, industry-fixed, and time-fixed effects. After controlling the fixed effects, the regression coefficient of ESG and CCF is 0.001, which is significant at 1%. It follows that ESG performance drives enterprises to obtain more CCF, i.e., enterprises with good ESG performance will receive commercial credit from upstream suppliers, research hypothesis H1 proofs.

Table 3
ESG performance and CCF

	(1)	(2)
	CCF	CCF
ESG	0.006 ^{***}	0.001 ^{***}
	(0.001)	(0.000)
Lev	0.323 ^{***}	0.230 ^{***}
	(0.003)	(0.003)
ROA	-0.231 ^{***}	-0.103 ^{***}
	(0.022)	(0.014)
Growth	0.001	0.001 ^{***}
	(0.000)	(0.000)
Size	-0.009 ^{***}	-0.003 ^{***}
	(0.001)	(0.001)
ROE	0.202 ^{***}	0.079 ^{***}
	(0.010)	(0.006)
Soe	-0.002	0.010 ^{***}
	(0.001)	(0.002)
Cash	0.021 ^{**}	0.125 ^{***}
	(0.008)	(0.006)
Big4	-0.014 ^{***}	-0.008 ^{***}
	(0.002)	(0.003)
Sep	0.000 ^{***}	0.000 ^{***}
	(0.000)	(0.000)
Top1	0.000 ^{***}	-0.000
	(0.000)	(0.000)

Notes: Robust criteria errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Clustering at the enterprise level

	(1)	(2)
Age	-0.019 ^{***}	0.003
	(0.002)	(0.005)
Firm	No	Yes
Industry	No	Yes
Year	No	Yes
_cons	0.230 ^{***}	0.078 ^{***}
	(0.011)	(0.024)
<i>N</i>	32323	32323
<i>R</i> ²	0.303	0.216
Notes: Robust criteria errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Clustering at the enterprise level		

4.3 Robust test

4.3.1 Endogeneity test

Considering model setting may miss other factors affecting the explanatory variables, resulting in residual terms related to the explanatory variables, causing endogeneity problems. We used the instrumental variable (IV) method for testing. In 2013 and 2014, the country set up a pilot of carbon emission rights transactions[2]. It developed a carbon emission rights transaction system such as quality management, data verification, and complaint processing. The pilot policy of carbon emission rights transaction will impact corporate ESG but not CCF. Satisfying the exogenous nature of instrumental variables. From this, this paper constructs the product of the dummy variable of the pilot of carbon emission transactions and the firm's ESG performance in the policy year as an instrumental variable, namely: $RE_{i,t} = Reform * ESG_{i,2014}$. Where $ESG_{i,2014}$ denotes the ESG performance of firms in 2014. $RE_{i,t}$, as an exclusive instrumental variable, measures the difference in carbon emission transaction pilot policies between the pilot and non-pilot areas.

In addition, drawing on Zhou et al. (2022), the ESG annual mean (ESG_mean) of other firms in the same industry in the same year is selected as the instrumental variable. ESG_mean was correlated with the ESG performance of individual firms and satisfied the correlation requirement, and was unaffected by the behavior of an individual firm, meeting the exogeneity requirement. The selection of this instrumental variable is therefore theoretically feasible. Sum up, the following models are constructed for examination in this paper:

$$ESG_{ijt} = \beta_0 + \beta_1 IV_{it} + \beta_2 Controls_{it} + \delta_i + \delta_t + \delta_j + \epsilon_{ijt}$$

2

$$TC_{ijt} = \beta_0 + \beta_1 ESG_{it} + \beta_2 Controls_{it} + \delta_i + \delta_t + \delta_j + \delta_p + \epsilon_{ijt}$$

3

Models (2) and (3) estimate the first-stage and second-stage equations. IV_{it} denotes instrumental variables, which are $RE_{i,t}$ and ESG_mean, respectively. Panel A and panel B of Table 4 report the estimation results for IVs, respectively. According to the regression results of the first-stage, $RE_{i,t}$, ESG_mean with ESG is significantly positive at 1%. The p-value of LM test is 0.000, indicating that instrumental variables are significantly related to endogenous explanatory variables. Test values of F statistic are 34.21 and 38.53, respectively, far above the empirical value of 10, ruling out weak instrumental variables. After solving the endogenous problem, from the regression results of the second stage, the effect of ESG on corporate CCF remains significantly positive. The above results show that instrumental variable selection is effective and that the regression results meet our expectations. After controlling for the endogeneity problem, the research conclusions of this paper still hold.

Table 4
IVs estimation

	Panel A		Panel B	
	(1)	(2)	(3)	(4)
	ESG	CCF	ESG	CCF
ESG		0.111**		0.015***
		(0.050)		(0.005)
RE	0.061***			
	(0.024)			
ESG_mean			0.683***	
			(0.049)	
Controls	Yes	Yes	Yes	Yes
Firm	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
LM statistic (P value)	0.000***		0.000***	
Cragg-Donald Wald F statistic	34.21***		38.53***	
_cons	0.387	0.029	-2.151***	0.072***
	(0.347)	(0.050)	(0.393)	(0.024)
<i>N</i>		32323	32323	32323
<i>R</i> ²		0.052	0.083	0.058
				0.352
Notes: Robust criteria errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Clustering at the enterprise level				

4.3.2 PSM test

Although applying the instrumental variable method helps address the endogeneity issue, it cannot overcome the problem of sample bias. For example, firms with better operating conditions, larger size and better growth might have better repayment ability, easier access to the supplier's trust and hence more credit financing, which would possibly have the problem of self-selection of samples. To deal with this problem, this paper adopts the PSM method for robustness testing. Referring to the practices of Chen et

al. (2018), first, the samples are divided into two groups according to the high and low ESG performance of annual and industry firms. Second, a high ESG performance value takes the value of 1 and is set as the experimental group. If not, take 0 and put it as the control group. Third, to control for variable selection as a covariate, there was a 1:1 nearest neighbor matching by year placed back. Finally, the regression test was re-tested based on the paired samples.

Figure 1 shows that most of the samples in the treatment and control groups are in the common range of values. And Fig. 2 demonstrates that the standardized mean difference (%bias) of all covariates after matching is less than 5% and significantly smaller than the %bias before matching, indicating no systematic deviation in the values of covariates between the two groups. Finally, column (1) of Table 5 shows the regression result after matching. The result indicates that after removing the sample bias factor, the regression results are still robust.

4.3.3 Replace the independent variable

Although the ESG score used in this paper comprehensively assesses the status of a firm concerning the environment, society, and governance, it does not give specific scores for E, S, and G. In terms of E, environmental protection investment (EPI) is selected as a proxy variable, which is defined as: (corporate environmental expenditure / total assets) * 100. Regarding S, social responsibility (CSR) is selected as a proxy variable, and the data comes from the comprehensive scoring report of Hexun[3]. Finally, in terms of G, drawing on the practices of Xue et al. (2022), we use principal component analysis to construct a comprehensive indicator (Gov) of corporate governance from multiple aspects of decision-making, incentives, and supervision. The regression results are shown in columns (2)-(4) of Table 5. After replacing the explanatory variables, the regression coefficients of E, S, and G for corporate CCF are all significantly positive, consistent with the regression results of Table 2.

4.3.4 Replacing the model

Considering that the distribution of enterprise CCF indicator has obvious right-side truncated characteristics ($CCF \geq 0$), this paper replaces the SLS-FE model in the benchmark regression with the following Tobit model suitable for the right-side truncated distribution. Aiming to overcome the estimation of the interference caused by method selection bias to the core conclusions. The model established is as follows:

$$TC_{ijt} = \max(0, \beta_0 + \beta_1 ESG_{it} + \beta_2 Ctrl_{it} + \epsilon_{ijt})$$

4

Among them, the definition of each variable is consistent with the model (1). After replacing the Tobit model, the regression coefficient of ESG is still significantly positive at 1%, which result is listed in column (5) of Table 5. It demonstrates that model selection bias will not interfere with the main conclusions of this paper.

4.3.5 Exclusion of the interference of the environmental policy

Since 2015, China has promulgated and implemented the Environmental Protection Act (EPA) to preserve the environment while promoting ecological development. But the law mainly targets highly polluted, energy-consuming, heavy pollution enterprises. Therefore, the EPA may interfere with the CCF behavior of heavily polluted companies and bias the conclusions of this paper. Further, based on the industry classification criteria in the 2012 version of the SFC, we identified 20 heavy pollution industries[4] and eliminated them from the total samples. Suppose the conclusion of the main text can still be established after excluding the interference of EPA. In that case, it indicates that ESG performance can still promote corporate CCF after excluding the interference of the EPA. Furthermore, the ESG is still significant at the 1% level after excluding the sample of heavy pollution industries in column (6). It indicates that the regression results are robust, as the coefficient value (0.01) is the same as that of the total samples, which proves that industry and policy shocks do not bias the CCF impact of the ESG.

Table 5
Robustness test

	PSM	Replace the independent variable			Tobit	Exclude the EPA
	(1)	(2)	(3)	(4)	(5)	(6)
	CCF	CCF	CCF	CCF	CCF	CCF
ESG_dum	0.003**					
	(0.001)					
ESG					0.006***	0.001***
					(0.001)	(0.001)
Epi		0.008**				
		(0.003)				
CSR			0.006*			
			(0.003)			
Gov				0.004***		
				(0.001)		
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm	Yes	Yes	Yes	Yes	No	Yes
Industry	Yes	Yes	Yes	Yes	No	Yes
Year	Yes	Yes	Yes	Yes	No	Yes
_cons	0.166***	7.428***	0.074***	0.235***	0.229***	0.079***
	(0.037)	(0.629)	(0.026)	(0.013)	(0.011)	(0.030)
N	15426	32323	28412	27223	32323	21828
R ²	0.231	0.185	0.216	0.317		0.240
Notes: Robust criteria errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Clustering at the enterprise level						

[2] From 2013 to 2014, the pilot areas during the period were Beijing, Tianjin, Shanghai, Chongqing, Hubei Province, and Guangdong Province

[3] URL: <https://www.hexun.com>

[4] These industry codes are: B06, B07, B08, B09, B10, B11, C15, C17, C18, C19, C22, C25, C26, C27, C28, C29, C30, C31, C32, D44

5. Further Analysis

In this part, we examine the mechanisms by which green innovation, social reputation, and operational risks affect CCF from the perspectives of environmental, social, and governance risks, respectively. Based on this, we adopted the approach of Preacher and Kelley (2011); Wen and Ye (2014) approach, and further, construct the mediating effects model of formula (5) and formula (6) below to examine the mediating mechanisms between enterprise ESG performance and CCF:

$$M_{i,t} = \beta_0 + \beta_1 ESG_{it} + \beta_2 Ctrl_{it} + \delta_i + \delta_j + \delta_t + \epsilon_{ijt}$$

5

$$TC_{ijt} = \beta_0 + \beta_1 ESG_{it} + \beta_2 M_{i,t} + \beta_3 Ctrl_{it} + \delta_i + \delta_t + \delta_j + \epsilon_{ijt}$$

6

In models (5) and (6), $M_{i,t}$ represents the mediating variables of firms, i.e., green innovation, social reputation, and operational risk. The definitions of the remaining variables remained consistent with model (1). For mediating effect, the stepwise test has low test power. It means that the coefficient product is significant, but conclusions may be drawn that are not significant (Fritz and MacKinnon, 2007). Yet the bootstrap method has high statistical power as an alternative to the Sobel method for directly testing the product of coefficients. Therefore, the coefficient cross-product is directly tested using the bootstrap test method, and its significance is further confirmed via the intermediary effect. Table 5 reports the results of a bootstrap test (random sampling 500 times).

5.1 Analysis of the mediating mechanism of green innovation

Measuring the green innovation level of firms is usually considered from two aspects, green innovation input, and output. But green innovation input is harder to separate from firm R & D input. Therefore, drawing on the practices of Hu et al. (2021), we use the number of enterprise green patent applications to evaluate green innovation. Precisely, it is calculated using a logarithmic value of the firm's annual number of green patent applications plus one.

The estimated results are displayed in columns (1) and (2) of Table 6. It has been found that corporate ESG performance is associated with green innovation ($\beta_1 > 0$, $p < 0.01$), with green innovation positively affecting corporate CCF ($\beta_2 > 0$, $p < 0.01$). In the bootstrap test, there is no 0 in the confidence interval, indicating a partial mediation effect of green innovations. H2 is supported.

5.2 Analysis of the mediating mechanism of social reputation

Social reputation is a direct manifestation of the social risk faced by a firm, so the positive or negative reports of the media can reflect the level of corporate social reputation for a certain period. Therefore, as a medium for delivering ESG messages, media coverage can help stakeholders such as vendors identify opportunities and risks facing businesses more quickly and accurately. Based on this, this paper uses media reporting-related data to construct a corporate-level social credibility index. Drawing on the research of Rupley et al. (2012), using the number of negative, neutral, and positive reports obtained from the CNRDS, the Janis-Fadner (*J-F*) coefficient was constructed to reflect the corporate social reputation, as shown in formula (8).

$$J - F = \begin{cases} \frac{p^2 - pn}{s^2} if p > n \\ \frac{pn - n^2}{s^2} if p < n \\ 0 if p = n \end{cases}$$

8

Where *n* and *p* represent the number of negative and positive media reports, respectively, and *s* represents the sum of the two types of reports. The *J-F* coefficient takes values ranging from - 1 to 1. The closer the *J-F* coefficient is to 1, the better the firm's social reputation.

Columns (3) and (4) of Table 6 report the result of the mediation effect test on social reputation. The result shows that company ESG performance promotes a significant increase in social reputation ($\beta_1 = 0.0031, p < 0.01$). Additionally, the effect of social reputation on the size of CCF of firms remains significantly positive ($\beta_2 = 0.003, p < 0.01$). The confidence interval of the bootstrap test results does not contain 0, verifying the existence of a mediating effect of social reputation. That is, corporate ESG performance will reduce social reputation risk by improving social reputation, which in turn facilitates CCF, and hypothesis H3 is validated.

5.3 Analysis of the mediating mechanism of operational risk

The operating risk of a firm is associated with operational robustness and its profitability status, so higher operational risk means that the firm's future cash stream uncertainty increases (Faccio et al., 2011). The volatility of corporate surplus is most widely applied to assess a firm's operational risk due to, among other things, the high volatility of the Chinese stock market. Referring to the research of John et al. (2008), first, adjust the annual Roa of the enterprise using the industry average, then use the rolling calculation method to calculate the industry-adjusted standard deviation, and finally get Enterprise operational risk level (GRisk). The specific calculation formula is as follows:

$$Roa_Adj_{i,t} = \frac{EBIT_{i,t}}{Assets_{i,t}} - \frac{1}{X} \sum_{j=1}^X \frac{EBIT_{i,t}}{Assets_{i,t}}$$

9

$$GRisk_{i,t} = \sqrt{\frac{1}{T-1} \sum_{t=1}^T (Roa_{Adj_{i,t}} - \frac{1}{T} \sum_{t=1}^T Roa_{Adj_{i,t}})^2} \quad |T = 3$$

10

Where, Grisk represents the degree of enterprise operating risk, with a higher value indicating more volatility in earnings and greater risk-taking.

Columns (5) and (6) of Table 6 report the test result of the mediating effect of operational risk. In column(5), Grisk and ESG are negatively correlated, which implies that companies with superior ESG performance dramatically lower operational risk. Specifically, it improves the company's earnings management and corporate governance capabilities. Column (6) shows that ESG is still significantly positively correlated with CCF after controlling for the GRisk. The value of β_2 is -0.05, indicating that the lower the operating risk of the enterprise, the greater the access to CCF. The bootstrap test results demonstrate that operational risk acts as a partial mediating effect between corporate ESG performance and the improvement of CCF; that is, corporate ESG performance will promote the acquisition of CCF by reducing operational risk. Hypothesis H4 is verified.

Table 6
Test of Mediating and Moderating Effects

	(1)	(2)	(3)	(4)	(5)	(6)
	Greln	TC	J-F	TC	Risk	TC
ESG	0.022 ^{***}	0.001 [*]	0.031 ^{***}	0.001 ^{***}	-0.005 ^{***}	0.001 ^{**}
	(0.003)	(0.000)	(0.003)	(0.000)	(0.000)	(0.000)
Greln		0.002 ^{**}				
		(0.001)				
J-F				0.003 ^{***}		
				(0.001)		
Risk						-0.050 ^{***}
						(0.010)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firms	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes
Bootstrap test	[.0002, .0004]		[.0003, .0005]		[.0006, .0009]	
	(P = 0.000)		(P = 0.000)		(P = 0.000)	
_cons	-1.822 ^{***}	0.102 ^{***}	-0.396 ^{**}	0.076 ^{***}	0.356 ^{***}	0.104 ^{***}
	(0.196)	(0.026)	(0.176)	(0.025)	(0.015)	(0.025)
N	28536	28536	28923	28923	31814	31814
R ²	0.068	0.215	0.093	0.222	0.145	0.219
Notes: Robust criteria errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Clustering at the enterprise level						

6. Conclusions And Recommendations

With the rapid spread and development of ESG investment concepts and investment scales worldwide, ESG strategies have become the mainstream trend of business operations and an important measure to promote industrial transformation and upgrading and realize green development. For China's economy to develop at a high quality, it is imperative to explore the impact of ESG performance on corporate CCF. We

use the data of listed companies from 2009 to 2021 to discuss it and come to the following conclusions: firstly, ESG performance promotes the acquisition of corporate CCF. Secondly, ESG performance can significantly improve corporate green innovation and social reputation, reduce operational risks, and improve CCF by reducing environmental, social, and governance risks.

According to the research conclusion of our research, the following inspirations are mainly obtained:

First, it is necessary to improve ESG assessment systems in all countries, especially developing countries. The research conclusions reveal that good ESG performance can alleviate information asymmetry, enhance the investment confidence of stakeholders, and help companies solve financing difficulties. Moreover, it is conducive to fulfilling high-quality economic growth and promoting the coordination and unification of economic, social, and ecological benefits.

Second, the ESG development concept should be actively implemented by businesses, which should also enhance their ESG performance. Positive ESG performance of businesses can effectively contribute to the competitiveness of green innovation, improve enterprises' social reputation and anti-risk ability, and then promote enterprises to obtain more CCF. Therefore, enterprises should fully integrate ESG into corporate culture construction and implement ESG concepts into product research, social responsibility, and operation management.

Third, upstream suppliers should consider corporate ESG performance when making investment decisions. Not only financial information, but suppliers should also pay attention to non-financial information, such as E, S, and G, and evaluate the enterprise's opportunities and challenges in multiple aspects. At the same time, partners' adjustment of commercial credit scale according to the company's ESG performance will also guide the healthy development of listed companies.

Lastly, regulating authorities and the government should set up good surroundings for corporate ESG building. For example, the issuance of relatively uniform and complete ESG disclosure guidelines for listed companies will help increase the cost of false information disclosure by enterprises, thus improving the scope of ESG disclosure and the quality of ESG performance. In addition, information intermediaries should play a full role in information transmission and market supervision. The mechanism analysis shows that ESG performance can attract media reports, transmit more internal information about enterprises, improve information asymmetry, help enterprises establish a good image, and promote commercial credit support.

Declarations

Authorship contribution statement

Yujie Huang: Conceptualization; Investigation; Resources; Visualization; Roles/Writing - original draft; Writing - review & editing.

Fuping Bai: Conceptualization; Supervision; Funding acquisition; Project administration; Roles/Writing - original draft; Writing - review & editing.

Mengting Shang: Formal analysis; Data Curation; Methodology; Resources; Software; Validation; Writing - review & editing.

Mahmood Ahmad: Resources; Supervision; Writing - review & editing

Declaration of Competing Interest

We declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Data availability

Data will be made available on request.

Ethical Approval

Not applicable

Consent to Participate

Not applicable.

Consent to Publish

All authors of the article consent to publish.

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Figures

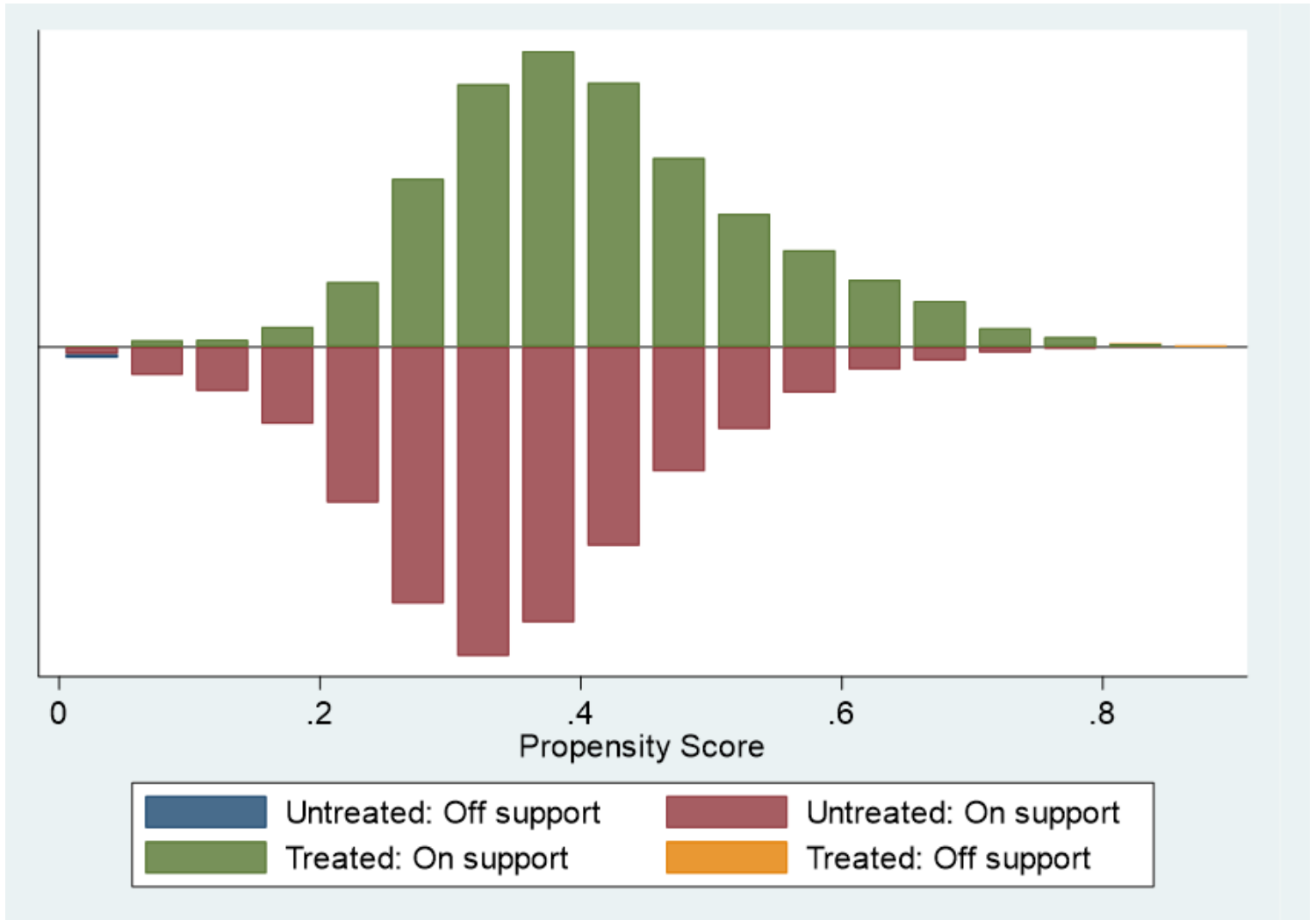


Figure 1

Propensity Score.

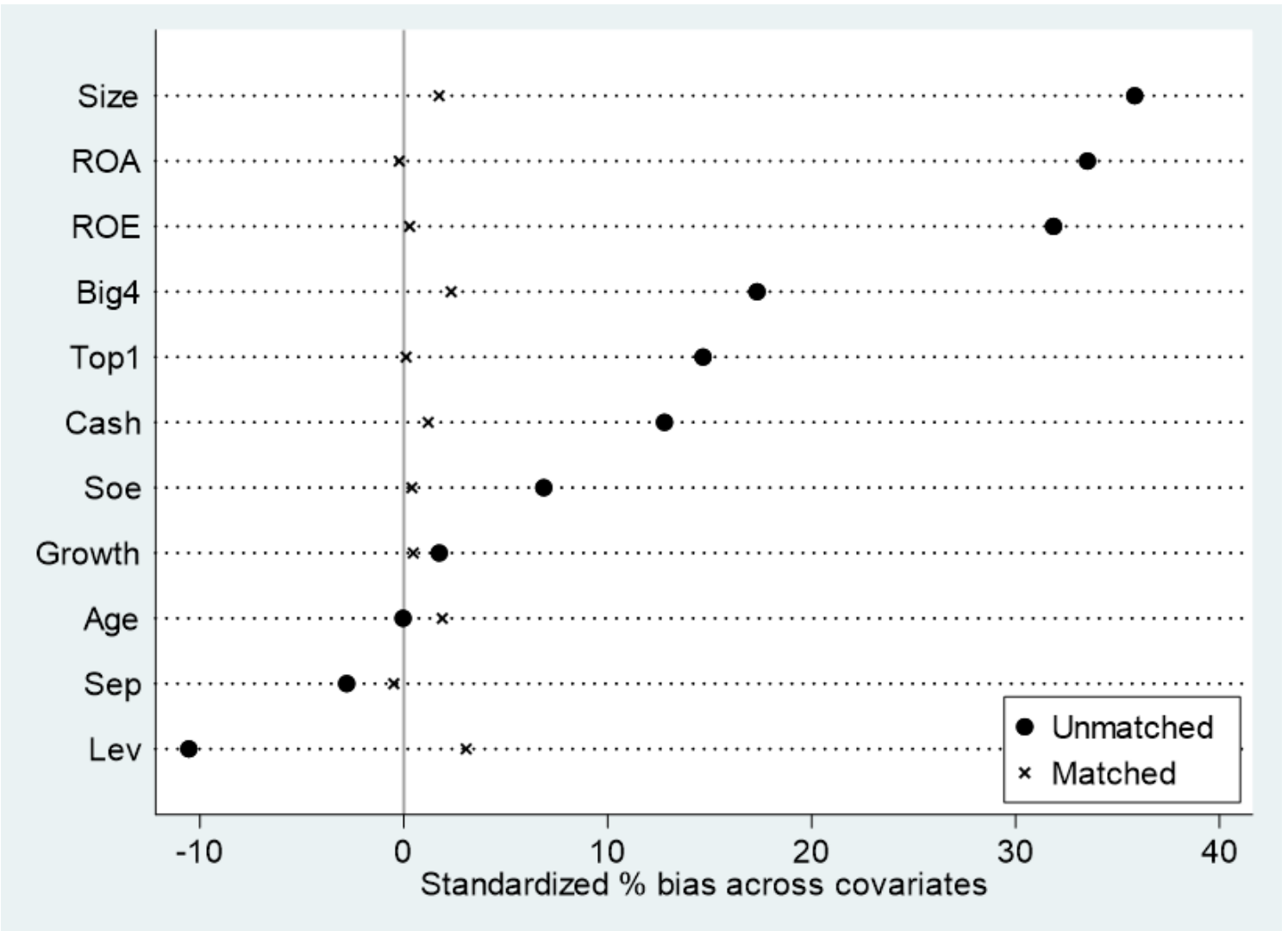


Figure 2

Balance test of PSM.