ISSN 1611-1699 / eISSN 2029-4433

VILNIUS TECH
Vilnius Gediminas Technical University

JOURNAL of BUSINESS ECONOMICS & MANAGEMENT

2024
Volume 25
Issue 3
Pages 590–611

https://doi.org/10.3846/jbem.2024.21609

GREEN FINANCIAL POLICY AND INVESTMENT-FINANCING MATURITY MISMATCH OF ENTERPRISES

Lingxiao ZHANG [1], Ke ZHANG [2]✉, Yuriy BILAN[3]

[1]*Economics and Management School, Wuhan University, Wuhan, China*
[2]*Hubei Academy of Social Science, Wuhan, China*
[3]*Faculty of Social and Economic Relations, Alexander Dubcek University of Trencin, Trencin, Slovakia*

Article History:
- received 3 November 2023
- accepted 2 April 2024

Abstract. Green financial policies play an important role in acceleration of China's green transformation. Existing associated studies mainly focus on the qualitative analysis and descriptive analysis. However, it still lacks empirical studies. To explore the relationship between green finance policies and the investment and financing terms of enterprises, the effects of green financial policies on investment-financing maturity mismatch of A-share companies on Shanghai Stock Exchange and Shenzhen Stock Exchange from 2009 to 2020 were investigated in this study by a difference-in-difference (DID) model. Results demonstrate that green financial policies significantly alleviate short-term loans used as long-term investment in enterprises. Green financial policies inhibit investment-financing maturity mismatch of enterprises by increasing loan availability, lowering financing cost and increasing proportion of long-term loans of enterprises. Such effect is more obvious in enterprises with higher internal control quality and enterprises with more transparent information. Green financial policies can alleviate short-term loans used as long-term investment in non-state-owned enterprises more obviously than state-owned enterprises. Research results provide some references to alleviate debt risks of enterprises. Enterprises are recommended to seek steady development, fulfil social responsibilities and take green low-carbon social actions extensively.

Keywords: investment-financing term, maturity mismatch, green finance policy, debt maturity structure, financing cost, short-term loans.

JEL Classification: D81, G31, L23.

✉Corresponding author. E-mail: ***202001040005@stu.zuel.edu.cn***

1. Introduction

It is a key feature to maintain low-carbon economic development and achieve the goal of high-quality development. As a combination of environmental regulation policy and financial support policy, green financial policies have both constraint effects and incentive effects, and they have become a booster of green economic transformation (Aguilar et al., 2023; Lu et al., 2020; Linnenluecke et al., 2016). It is estimated that China needs 2,000 billion CNY of green investment every year to achieve the goal of ecological civilization construction. However, government can only afford 10%~15% of green investment due to the limited financial budget. Based on new green financial tools like green credit, green bonds and green funds, green financial policies encourage financial institutions to give prior investment to green

Copyright © 2024 The Author(s). Published by Vilnius Gediminas Technical University

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

enterprises and green innovation which have a significant favorable effect on economic development and ecological conservation (Ahmad et al., 2023) through the fluctuation of interest rate, skewed credit and other mechanisms.

The maturity of financing shall be matched with the period of return on investment (ROI). In other words, short-term funds shall be used to support current assets, while long-term funds shall be used as long-term asset financing. This is not only the basic principle for enterprises to make decisions in investment and financing, but also one of development barriers against green enterprises. On the one hand, green projects propose higher investment demands, longer ROI period, lower short-term profitability, and more obvious public benefits compared with traditional projects (Zhu et al., 2020). Additionally, capital markets in developing countries are still facing obstacles, such as imperfect capital market and imbalance between earnings and asymmetric environmental cost/benefits (Greenstone & Jack, 2015). Hence, green projects and green enterprises require remarkable capital investments to low-carbon energy industrial development, and they may face with severe financing constraints as well as investment and financing maturity mismatch (Liu & Bai, 2020; Wang et al., 2019).

The key to alleviate "short-term loans used as long-term investment" in enterprises is to increase long-term debt financing which matches with projects (Zhang & Ye, 2021). In 2015, the government of China issued the Opinions on Implementation of the Third-party Environmental Pollution Control, stipulating that innovative financial service mode should provide long-term debt financing supports to investment projects of green enterprises. Moreover, it was suggested to alleviate green investment-financing maturity mismatch, information asymmetry, lack of products and analysis tools, etc. Then, whether the debt maturity structure of enterprises has been optimized and whether the investment-financing maturity mismatch of enterprises has been alleviated since 2015 after the green financial policies were implemented and the green financial system was established? How do green financial policies influence investment-financing maturity mismatch of enterprises?

In the market of the credit tools, green financial policies play an important role in fund collecting, capital allocation, industry structure optimizing, and economic benefits growing (Zhou et al., 2023; Omran & Yaaqbeh, 2023; Du & Zheng, 2019). Shi and Wang (2023) analyzes corporate finance strategic planning from the perspective of China's habitat environment and green finance. Facing with insufficient long-term funds, China Banking Regulatory Commission also emphasizes on establishing a long-term mechanism of "dare to lend, willing to lend and be able to lend" in order to solve "short-term loans used as long-term investment" of enterprises. In this context, studying the effect of green financial policies in improving "short-term loans used as long-term investment" of enterprises not only is conducive to correct the supplying mismatch in capital markets, but also has theoretical and practical significance to achieve the long-term goal of financial system innovation.

Existing studies concerning green financial policies mainly focus on regional pollution discharge efficiency, green financial credit balance and the improvement of enterprises excessive pollution, but rarely focus on short-term loans used as long-term investment of enterprises. This study attempts to explore whether green financial policies can alleviate investment-financing maturity mismatch of enterprises as well as specific influencing channels. On this basis, the internal mechanism of promoting green transition of enterprises based on optimized allocation of financial resources was explored. Results show that green financial policies alleviate investment-financing maturity mismatch of enterprises. Specifically, enterprises have a lower financing cost and a higher proportion of long-term loans after green financial policies were implemented compared to that before. According to the heterogeneity test, green financial policies achieve better effect in enterprises with higher internal control quality and

enterprises with more transparent information than others. After implementation of the green financial policies, the phenomenon that short-term loans are used as long-term investments of non-state-owned enterprises is mitigated more obviously compared to that before. This study might have following marginal contributions: First, an empirical study on whether and how green financial policies affect investment-financing maturity mismatch of enterprises was carried out by using the multi-phase difference-in-difference (DID) method. Second, a heterogeneity analysis of influences of the green financial policies on investment-financing maturity mismatch of enterprises was carried out from perspectives of internal control quality, information transparency and research & development (R&D) intensity of enterprises.

The remainder of this study is organized as follows. Section 2 introduces literature review. Section 3 is the research design. Section 4 analyzes empirical study results. Section 5 is a discussion. Section 6 summarizes conclusions and enlightenment.

2. Literature review

In the context of industrialized green reform, people pursue sustainable development and improved well-being rather than mere economic development (He et al., 2023). Therefore, central banks and regulatory agencies in developed and developing countries have adopted green financial policies to cope with global climate challenges (Ionescu, 2021; Zhang et al., 2021). In this regard, some scientists stress the importance of appropriate information management as well as scientific research supporting green deal implementation (Olzhebayeva et al., 2023; Štreimikienė et al., 2022). From the policy perspective of green finance reform innovative test zone, Wang et al. (2021) demonstrated that green finance could decrease environmental pollution and facilitate regional green development. This agrees with conclusions of Mamun et al. (2022). As innovative financial tools, green financial policies have the generalized sense and narrowed sense. In the generalized sense, green financial policies provide financial channels for all enterprises and industries which stick to the principle of sustainable development. In the narrowed sense, the green financial policies guide financial institutions to issue green finance tools to prevent environmental risks and build a friendly society. These green finance tools mainly include green investment, green insurance, green securities and green credit (He et al., 2019; Liu et al., 2019). Linnenluecke et al. (2016) found that green financial policies include financial tools, system innovations and mode innovations which serve for energy-saving and environmental-friendly projects. Green financial policies can alleviate investment-financing maturity mismatch of enterprises through the following three micro-mechanisms.

First, green financial policies mitigate debt financing cost issues of enterprises. Based on a comparative study between green enterprises and enterprises with "high energy consumption and high pollution", Lian (2015) found that green financial policies could significantly lower debt financing cost of enterprises. Due to information asymmetry, traditional bankrollers may cause moral hazards, adverse selection and other problems when they involve in relevant projects, thus bringing transaction costs for project subjects. To assure professional information collection and processing, green finance system can successfully disclose the reasonable price, promote effective allocation of capitals and lower transaction cost. Under the implementation of green financial policies, financial resources are given firstly to enterprises and green industries with low-pollution and low-emission. Enterprises conforming to the policy evaluation standards have the higher capital availability and are easy to get financial supports. Niu et al. (2020) found that green credit policy increased financial convenience of green environmental-friendly enterprises by increasing credit supports to green industries.

Lv et al. (2021) pointed out that green financial policies can play the basic role of resource allocation, expand the traditional financial boundaries, optimize capital supply structures, and support green innovation of enterprises by relieving their financing constraints. This policy has numerous evidence of support from entrepreneurs and stakeholders. For instance, there are typical practices for privileged access to funding by social enterprises if they confirm certain criteria (Bilan et al., 2017). The same is about customers' perceptions. In terms of their growing positive attitude toward sustainability principles, the preferences in buying decisions are made for the sake of responsible businesses (Mishchuk et al., 2023; Musova et al., 2021). Therefore, it became typical even for HRM practices (Bhattarai et al., 2023) to gain the advantages arise from stakeholders' recognition. Some scholars believed that there's a premium for enterprises to issue green bonds. For example, it may send a signal to investors about long-term stable return on investment (Baker et al., 2018) or a signal of environmental commitment (Flammer, 2021), thus lowering the financing cost of enterprises. Additionally, financing cost of enterprises can be lowered by issuing green bonds, lowering the transaction cost and providing interest discount (Ma et al., 2020). To sum up, banks or stakeholders are willing to provide financial supports to enterprises with good performances in social responsibility or strong consciousness of environmental responsibility at a low cost (Goss & Roberts, 2011).

Second, green financial policies increase supports to enterprises in term of long-term green credit, green bonds and green funds (Wang et al., 2019). R&D, innovation and subsequent promotion of green technologies often require considerable capital investment, which is difficult to be met by traditional financing channels of enterprises. Moreover, R&D of most new technologies is greatly uncertain. There's a high risk of investment in R&D of technologies and some traditional bankrollers are unwilling to involve in such projects. Volz (2018) pointed out that for transitional economy bodies, the green financial development should focus on "green-oriented" transition of investment, that is, transforming from the mode dominated by high-pollution and high-energy consumption investment to the mode dominated by energy-saving and environmental-friendly investment. Wang et al. (2019) found that green finance development and increasing scale of long-term debts can alleviate maturity mismatch of investment in green enterprises, and increase investment to green enterprises.

Third, green financial policies mitigate debt maturity structure of enterprises. Wu and Yin (2021) proved that green credit policy increased the long-term and short-term debt financing scales, alleviated the debt maturity structure of enterprises without "high energy consumption, high pollution and excessive production capacity", and generated significant "penalty" effect to long-term debt financing scale and debt maturity structure of these enterprises. Green bonds have an advantage of offering additional green financing sources and providing more long-term capitals for green projects. Green bonds can not only be used for construction and operation of green projects, but also pay for long-term and short-term debts like bank loans (Billah et al., 2023). Li and Liu (2020) carried out an empirical test based on green patent ownership data of listed companies and found that green finance promoted green innovation of enterprises by increasing proportion of long-term debts of enterprises. As a new financing tool, green bonds have become one of the optimal financing modes of enterprises' green projects. This not only is beneficial for enterprises to get long-term capitals, but also can optimize debt maturity structure of enterprises (Ning & Wang, 2021).

Based on the above analysis, this study plans to make an empirical test whether implementation of green financial policies can alleviate investment-financing maturity mismatch of enterprises.

3. Methodology

3.1. Model setting

In January, 2015, the government of China proposed Opinions on Implementation of the Third-party Environmental Pollution Control, which stated clearly that financial policy should be preferential to green environmental-friendly projects. In September, 2015, the Overall Plan for Ecological Civilization Structural Reform issued by the government of China explicitly proposed the top-level design of China's green finance system. Hence, the year of 2015 is viewed as a symbol for a new stage of China's green financial policies. This study focuses on A-share listed companies in Shanghai and Shenzhen, using the initiation of the green financial policy in 2015 as the policy impact time point. It investigates the influence of the green financial policy on the short-term debt and long-term utilization of enterprises, both at an overall and mechanistic level.

A generalized DID model is constructed with references to Ning and Wang (2021). On the one hand, the DID model can avoid direct comparison of influences of uncertainty factors except for other difficult-to-recognize factors on short-term loans used as long-term investment before and after the issuing of green financial policies. On the other hand, it can evaluate policy effect effectively and alleviate endogenous problem by using green financial policies as an explanatory variable. For the research theme of this study, the DID model can be set as follows:

$$SFLI_{it} = \alpha_0 + \alpha_1 D_{it} + cX_{it} + \mu_i + \upsilon_t + \varepsilon_{it}, \quad (1)$$

where *SFLI* represents the degree of enterprise short-term loans used as long-term investment. *D* is the DID variable of the product of Green and post. X refers to control variables, including enterprise size, current ratio, growth, inventory turnover ratio, executive compensation, audit quality, and board size. μ_i is the fixed effect of individuals and it is used to control influences of individual heterogeneity which doesn't change with time and is difficult to be observed. υ_t is the fixed effect of time and ε_{it} is a random disturbance term.

3.2. Declaration of major variables

3.2.1. Explained variable

Degree of enterprise "short-term loans used as long-term investment" (SFLI): existing empirical studies have proved the universal behavior of using short-term loans as long-term investment in enterprises. SFLI is measured and used as the explained variable in this empirical study. Referring to Frank and Goyal (2003), Zhong et al. (2016), SFLI is measured according to the following equation: (cash outflow for investment activities like buying and building fixed assets – increment of long-term loans – increment of rights and interests of the current period – operational cash net flow – increment of bonds payable – cash inflow from selling of fixed assets in the current period)/total assets in the beginning of the period.

3.2.2. Explanatory variable

The green financial policy is used as the core explanatory variable of this study and is measured by a dummy variable. The year of 2015 marks that China's green financial policies enter into a new stage, having important significance. With references to Zou (2017), if the policy document is issued during January ~ October, it generates effects in the current year. If the

policy document is issued during November ~ December, it generates effects in the next year. In 2015, the government of China issued green financial policy documents in January and September. Hence, the dummy variable is set 0 before 2015, and 1 after 2015 (including 2015).

According to requirements of classical DID model, the interaction term (D) of Green and Post is used as the core explanatory variable of this study. The green enterprises are defined as enterprises from industries of energy-saving and environmental protection, clean production, clean energy, ecological environment, green updating of infrastructure and green services. We refer to Abbas et al. (2023) did in their study, green enterprises were constructed via content analysis of carbon disclosure items reported in stand-alone ESG reports or firm annual reports. In addition, with references to list companies with energy-saving and environmental-protection concept proposed by Huaxi Securities, a total of 248 green enterprises are finally chosen as the treatment group, while other non-green enterprises are chosen as the control group. According to the method of dummy variable, enterprises which meet the abovementioned range of green enterprises according to main business scope are determined as the treatment group (value = 1) in this study; whereas the rest enterprises are determined as the control group (value = 0).

3.2.3. Mechanism variables

Debt maturity structure of enterprises: proportion of long-term loans in total debts in the beginning of the period.

Debt financing cost: quantitative proportion of debt interest expense in total debts in the beginning of the period.

Increased debt size: including the increased long-term debt size (*Loan_Long*) and short-term debt size (*Loan_Short*). The increased *Loan_Long* = long-term loan – long-term loans in the beginning of the period + matured long-term debts in a year, and it is adjusted by the total debts in the beginning of the period. The increased *Loan_Short* = short-term loan – short-term loans in the beginning of the period, and it is adjusted by the total debts in the beginning of the period.

3.2.4. Control variable

For an objective analysis of influences of green financial policies on investment-financing maturity mismatch of enterprises and to prevent prejudiced estimation results by missing important variables, the enterprise size, solvency, operation capacity, development capacity and corporate governance are controlled with references to existing research results. Specifically, enterprise size is measured as the natural logarithm of total assets. Solvency is measured as the current ratio. Operation capacity is measured by the inventory turnover ratio. Development capacity is measured by the growth rate of main business incomes. Corporate governance is measured by board size, executive compensation and audit quality. Measurements of variables in this study are listed in Table 1.

3.3. Sample selection and data source

To decrease the disturbance of other factors, we examine the period after the financial crisis. Thus, the year of 2009 is chosen as the initial year of sample survey. A-share companies in Shanghai Stock Exchange and Shenzhen Stock Exchange from 2009 to 2020 are chosen as research objects. The sampling period for the empirical study is finally determined from 2010

Table 1. Variable definitions

Variables	Signs	Definition
Maturity mismatch degree	SLFI	(cash outflow for investment activities like building fixed assets – increment of long-term loans – increment of rights and interests of the current period – operational cash net flow – increment of bonds payable – cash inflow from selling of fixed assets in the current period)/total assets in the beginning of the period
Dummy variable of green enterprises	Green	It values 1 for green enterprises; otherwise, it values 0. Industries of green enterprises include energy saving and environmental protection, clean production, clean energy, ecological environment, green updating of infrastructure, green services, etc.
Dummy variable of time	Post	It values 0 before 2016, and 1 after 2016.
Green financial policy	D	Product of Green and post
Debt maturity structure	Loansr	Long-term debts/total debts
Debt financing cost	Cost	Debt interest expense/total debts in the beginning of the period
Increased short-term debt size	Loan Short	short-term loan – short-term loans in the beginning of the period. It is adjusted by the total debts in the beginning of the period.
Increased long-term debt size	Loan long	long-term loan – long-term loans in the beginning of the period + matured long-term debts in a year. It is adjusted by the total debts in the beginning of the period.
Enterprise size	Size	Natural logarithm of total assets of the enterprise
Liquidity ratio	Liq	Current assets/current liabilities
Growth	SG	Growth rate of sales revenues
Audit quality	Big10	It values 1 for top 10 accounting firms in China; otherwise, it values 0.
Operation capacity	SAT	Inventory turnover ratio
Board size	BDS	Number of board members
Executive compensation	Dpay	Natural logarithm of average compensation of the top 3 executives
R&D intensity	RDS	Proportion of R&D expenses in operation revenues

to 2020 with consideration to the necessity of variable lag in calculation of SFLI. To get valid samples and mitigate research effect, the following samples are deleted: (1) enterprises of the financial industry, (2) ST and PT enterprises, (3) Enterprises which have listed for less than 2 years, (4) Enterprises with severe missing of financial data, and (5) Enterprises with obvious abnormal data (e.g. asset-liability ratio higher than 100%). Based on above screening and deletion, a total of 3,548 enterprises are collected and the cumulative sample number is 22,163.

Furthermore, 1% and 99% winsorization are performed to continuous variables to avoid influences of extremums on the study. Only processed data is applied in the follow-up analysis. Annual data on listed firms come from the China Stock Market & Accounting Research (CSMAR). The database includes all listed firms on both the Shanghai and the Shenzhen Stock Exchanges and contains information about firm identifiers and debts. All empirical analyses are completed based on Stata 15.1 software.

3.4. Descriptive statistical analysis

The basic features of major variables are shown in Table 2. The mean of SFLI is 0.09 (>0), indicating that maturity mismatch generally exists in sample enterprises. The maximum and minimum are 1.288 and –0.271, respectively, showing a great difference among sample enterprises in "short-term loans used as long-term investment". The mean of Cost is 0.089. In view of maximum and minimum, the sample enterprises show great differences in debt financing cost and financing capacity. Similarly, the statistical distribution of other variables can be analyzed. The multicollinearity diagnosis results are also presented in Table 2. It is noticed that VIF values of all variables are lower than 10, indicating the absence of serious multicollinearity in variables.

Table 2. Descriptive analysis

	N	Mean	St.Dev	min	max	VIF
SFLI	22163	.090	.226	–.271	1.288	–
D	22163	.057	.232	0	1	1.01
Cost	22163	.089	.122	.001	.793	1.19
Size	22163	22.415	1.288	20.067	26.386	1.57
Liq	22163	2.215	3.37	.03	204.742	1.20
SG	22163	.381	.985	–.671	6.835	1.01
SAT	22163	13.777	51.228	.136	446.124	1.01
Dpay	22163	14.505	.72	12.751	16.545	1.31
Big10	22163	.582	.493	0	1	1.03
BDS	22163	8.669	1.708	5	15	1.09

An independent sample t-test in Table 3 is carried out to compare system differences of samples before and after implementation of the green financial policies. It can be seen from results that most variables have significant differences except solvency. Specifically, the mean of SFLI is 0.116 before the implementation of green financial policies, while 0.076 after, which proves that the degree of "short-term loans used as long-term investment" of enterprises decreases after implementation of the green financial policies. Similarly, the debt financing cost of sample enterprises after implementation of the green financial policies declines significantly compared to that before. In view of control variables, enterprise size increases after implementation of the green financial policies, accompanied with an increasing operation capacity of enterprises and strengthening corporate governance construction.

Table 3. Independent sample t-test

Variable	Pre Policy		After Policy		T test
	Sample	Avg.	Sample	Avg.	
SFLI	8000	0.116	14163	0.076	0.040***
Cost	8000	0.091	14163	0.088	0.003*
Size	8000	22.242	14163	22.513	–0.271***
Liq	8000	2.245	14163	2.198	0.047
SG	8000	0.426	14163	0.355	0.071***

End of Table 3

Variable	Pre Policy		After Policy		T test
	Sample	Avg.	Sample	Avg.	
SAT	8000	12.506	14163	14.494	–1.988***
Dpay	8000	14.204	14163	14.674	–0.471***
Big10	8000	0.538	14163	0.606	–0.068***
BDS	8000	8.967	14163	8.500	0.467***

4. Results analysis

4.1. Baseline results

Before the regression analysis, it is necessary to test the stationarity of the data series to determine whether the unit root of the data series exists and to avoid the problem of "pseudo-regression". In this paper, the SFLI uses the Fisher-ADF test. Results show that all variables reject the null hypothesis of the present unit root, stationary at the 1% significance level.

Although the previous independent sample test has verified that SFLI decreased to some extent after implementation of the green financial policies, it cannot reflect the causal relationship between green financial policies and short-term loans used as long-term investment. Hence, regression analysis is further needed. The regression results of Model (1) are listed in Table 4. Columns (1) and (2) are fixed effect models of individuals. In view of estimation results, the coefficient of D is negative under the 1% significance level no matter whether influences of control variables are considered. Columns (3) and (4) are enterprise-year two-way fixed effect models. Column (4) is the DKSE method proposed by Driscoll and Kraay (1998) and it considers influences of contemporaneous correlation and autocorrelation of sections in short panels on the study. This estimation method is applicable to fixed effect model of non-equilibrium panel. It is noticed that coefficient estimations of Columns (3) and (4) are consistent, except for different t-statistics. This reflects that the DKSE method corrects the standard error of coefficient. According to regression results of Table 4, the phenomenon of "short-term loans used as long-term investment" of enterprises is alleviated after implementation of the green financial policies.

Table 4. Reference regression results

	(1)	(2)	(3)	(4)
	SFLI	SFLI	SFLI	SFLI
D	–0.070***	–0.0695***	–0.018*	–0.018**
	(–6.31)	(–6.24)	(–1.66)	(–1.99)
Size		0.054***	0.113***	0.113***
		(14.68)	(27.42)	(3.86)
Liq		0.004***	0.003***	0.003
		(6.07)	(5.38)	(1.61)
SG		0.042***	0.039***	0.039***
		(21.09)	(20.34)	(10.78)

End of Table 4

	(1)	(2)	(3)	(4)
	SFLI	SFLI	SFLI	SFLI
SAT		–0.000	–0.000	–0.000
		(–0.28)	(–0.26)	(–0.24)
Dpay		–0.076***	–0.014***	–0.014**
		(–17.33)	(–2.99)	(–2.18)
Big10		–0.001	–0.002	–0.002
		(–0.14)	(–0.36)	(–0.31)
BDS		0.009***	–0.000	–0.000
		(5.08)	(–0.28)	(–0.34)
Constant	0.094***	–0.119	–2.104***	–2.104***
	(59.60)	(–1.63)	(–21.93)	(–3.77)
Firm FE	Yes	Yes	Yes	Yes
Year FE	No	No	Yes	Yes
R^2	0.00213	0.0464	0.105	0.105
N	22163	22163	22163	22163

Note: t statistics in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

4.2. Mechanism analysis

According to existing studies, green financial policies can alleviate "short-term loans used as long-term investment" of enterprises by lowering debt financing cost, increasing loan size and proportion of long-term loan of enterprises, and other mechanisms.

For an empirical test of the relevant influencing mechanism, the debt financing cost (*Cost*), debt maturity (*LoanSr*) and increased debt size (*Loan_ALL*) of enterprises are chosen as mechanism variables. The following X-M model is built:

$$Med_{it} = \beta_0 + \beta_1 D_{it} + cX_{it} + \mu_i + \upsilon_t + \varepsilon_{it}, \quad (2)$$

where *Med* refers to mechani sm variables, including debt financing cost, proportion of long-term loans and increased debt size. The increased debt size includes the increased *Loan_Long* and the increased *Loan_Short*.

According to results on Column (1) of Table 5, the coefficient of *D* is negative under the 1% significance level, indicating that the green financial policies has alleviated short-term loans used as long-term investment of enterprises by lowering debt financing cost. The coefficient of *Loan_ALL* in Column (2) is significantly positive, indicating that the green financial policies have increased the debt size of enterprises. According to results of Columns (3) and (4), the green financial policies have increase *Loan_Long* and *Loan_Short*. In particular, the increased *Loan_Long* further elaborates that the green financial policies can alleviate short-term loans used as long-term investment of enterprises by increasing loan sizes. The coefficient of *LoanSr* in Column (5) passes through the 1% significance test, which revealing that the green financial policies alleviate the debt maturity structure of enterprises. To sum up, the green financial policies alleviate maturity mismatch of enterprises by lowering financial cost, increasing loan sizes and improving debt maturity structure.

Table 5. Mechanism test results

	(1)	(2)	(3)	(4)	(5)
	Cost	Loan_ALL	Loan_Long	Loan_Short	LoanSr
D	–0.003***	1.206***	1.037***	0.169***	0.704***
	(–2.62)	(3.21)	(3.18)	(3.33)	(3.20)
Size	0.001	0.236	0.095	0.141**	0.074
	(0.36)	(0.65)	(0.31)	(2.20)	(0.35)
Liq	0.005***	–0.023***	–0.008**	–0.015***	–0.006**
	(6.06)	(–4.38)	(–2.25)	(–4.00)	(–2.51)
SG	0.006***	–0.045	–0.097	0.051***	–0.066
	(8.84)	(–0.38)	(–0.85)	(4.00)	(–0.81)
SAT	0.000	0.001*	0.001*	0.000	0.000*
	(1.35)	(1.96)	(1.86)	(0.43)	(1.80)
Dpay	0.0107***	–0.294*	–0.229	–0.065***	–0.166
	(11.76)	(–1.70)	(–1.39)	(–4.33)	(–1.38)
Big10	0.006***	0.169	0.145	0.024***	0.108
	(6.28)	(1.40)	(1.24)	(2.75)	(1.30)
BDS	–0.000	0.025	0.027	–0.003	0.019
	(–0.14)	(1.15)	(1.25)	(–0.43)	(1.23)
Constant	–0.098	–0.931	1.100	–2.031	0.790
	(–1.49)	(–0.09)	(0.13)	(–1.33)	(0.13)
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
N	22163	22163	22163	22163	22163
R^2	0.0639	0.00162	0.00141	0.00665	0.00141

4.3. Robustness test

4.3.1. Parallel trend test

The DID mode has a premise hypothesis that the treatment group and the control group meet the common trend before issuing of the green financial policies. A parallel trend test of the treatment group and the control group is carried out in this study by using the event research method. The specific model is set as follows:

$$SFLI_{it} = \theta_0 + \varphi_n \sum_{n=1}^{6} Pre_{it} + \rho Current_{it} + \tau_m \sum_{m=1}^{5} Post_{it} + cX_{it} + \mu_i + \upsilon_t + \varepsilon_{it}, \quad (3)$$

where Pre_{it} is the dummy variable of the treatment group from the first to the sixth year before issuing of the green financial policies. $Current_{it}$ is the dummy variable in the year of issuing. $Post_{it}$ is the dummy variable of the treatment group from the first to the fifth year after issuing of the green financial policies. During regression, the previous year of issuing the green financial policies is chosen as the base period. If coefficients of Pre_{it} in Model (3) are not significant in all periods, there's no obvious trend difference between the treatment group and the control group before issuing the green financial policies. The hypothesis of

common trend will be met. Figure 1 is plotted according to coefficients and confidence intervals in order to get an intuitive expression of the parallel trend test results. Two dotted lines represent the 95% confidence interval and the solid line represents the coefficient of interaction term between dummy variable of the treatment group and the dummy variable of the year. It is noticed that variables are all insignificant in different periods before issuing the green financial policies. This manifests that the confidence interval covers 0. In the second year after issuing the green financial policies, the green financial policies show some effect in relieving short-term loans used as long-term investment of enterprises. Such relieving effect shows a rising trend. Based on the above analysis, the treatment group and control group meet the parallel trend hypothesis before implementation of the green financial policies.

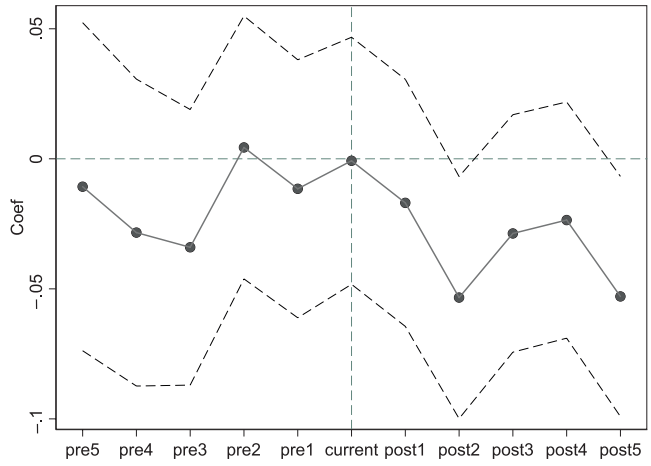

Figure 1. Parallel trend test

4.3.2. Placebo test

Although the two-way fixed effect model is applied in the previous DID analysis, it still may have other unobservable interferences. Hence, a placebo effect regression is built to test whether DID recognition is disturbed by unobservable disturbance factors changing with time. If the policy effect is still gained from the DID model by using "false" occurrence time of the policy, the policy effect in reference regression is not reliable and it may be generated by other unobservable factors rather than the concerned policy. With references to practices of Ning and Wang (2021), the time of issuing green financial policies is moved forward by 2–4 years. Then, the interaction term of the hypothesizes the dummy variable of time and the dummy variable of treatment group is used for placebo test. Results are shown in Table 6. In view of results, the coefficients of D are all not significant although they are negative after changing the year of issuing the green financial policies. This reveals that the phenonmenon of short-term loans used as long-term investment of enterprises is mainly alleviated by the green financial policies rather than by other unobservable system factors.

4.3.3. PSM-DID

There may be some system differences between green enterprises and non-green enterprises, which causes differences of "short-term loans used as long-term investment" of green

Table 6. Placebo test results

	(1)	(2)	(3)
	2year Pre-Policy	3year Pre-Policy	4year Pre-Policy
D	–0.009	0.006	–0.002
	(–0.95)	(0.58)	(–0.23)
size	0.113***	0.112***	0.112***
	(3.86)	(3.86)	(3.86)
liq	0.003	0.003	0.003
	(1.61)	(1.61)	(1.61)
sg	0.0390***	0.0390***	0.0390***
	(10.75)	(10.72)	(10.73)
sat	–0.000	–0.000	–0.000
	(–0.24)	(–0.25)	(–0.24)
dpay	–0.014**	–0.014**	–0.014**
	(–2.18)	(–2.17)	(–2.18)
big10	–0.002	–0.002	–0.002
	(–0.31)	(–0.32)	(–0.32)
bds	–0.000	–0.000	–0.000
	(–0.31)	(–0.30)	(–0.31)
Constant	–2.100***	–2.096***	–2.097***
	(–3.77)	(–3.76)	(–3.77)
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
N	22163	22163	22163
R^2	0.105	0.105	0.105

enterprises before and after issuing of green financial policies. The net averaging effect of the green financial policies in alleviating short-term loans used as long-term investment is gained to eliminate endogenous problems caused by selection bias. Similar control groups are chosen for the treatment group through the propensity score matching (PSM) method in the present study, thus eliminating differences between the treatment group and the control group. In the present study, enterprise size (*Size*), asset-liability ratio (*Lev*), enterprise value (*TQ*), audit quality (*Big10*), board size (*BDS*) and executive compensation (*Dpay*) are chosen as covariates. Besides, the neighbor 1:1 matching with a caliper radius of 0.01 is used. The matching effect of PSM is inspected by a balance test. According to the balance test results in Table 7, the results of the t-test for the means of the covariates for the treatment group and the control group before PSM denies the null hypothesis, thus reflecting the significant difference between the treatment group and the control group. After PSM, *p* values of the difference tests of the means of covariates are all greater than 0.1, indicating the difference between the treatment group and the control group is alleviated obviously. Thus, the propensity score matching process in this paper can better mitigate the sample self-selection bias, and applying the matched samples to carry out the subsequent empirical research is reasonable.

The kernel density curves of pre-PSM and post-PSM are also plotted to get an intuitive expression of the matching effect. It can be seen from Figure 2 that the curves of the treatment group and the control group almost overlap after PSM, indicating the relatively ideal PSM effect.

Table 7. Balance test results

Variable	Unmatched	Mean		%bias	%reduct bias	t-test	
	Matched	Treated	Control			t	p>t
Size	U	22.494	22.407	7.0		2.86	0.004
	M	22.494	22.456	3.1	56.4	0.96	0.339
TQ	U	1.809	2.047	–19.4		–7.74	0.000
	M	1.809	1.808	0.0	99.8	0.01	0.992
Lev	U	0.494	0.446	25.4		10.18	0.000
	M	0.494	0.494	–0.2	99.1	–0.07	0.944
Big10	U	0.549	0.585	–7.1		–3.02	0.003
	M	0.549	0.557	–1.5	78.3	–0.48	0.630
BDS	U	8.496	8.685	–11.5		–4.68	0.000
	M	8.496	8.473	1.5	87.3	0.47	0.641
Dpay	U	14.386	14.516	–19.1		–7.63	0.000
	M	14.386	14.389	–0.4	97.6	–0.14	0.886

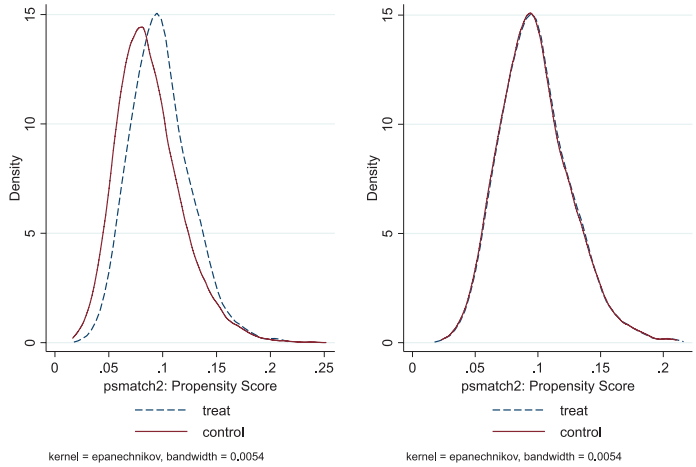

Figure 2. Kernel density curves before and after matching

After a balance test, samples after PSM are chosen for the DID analysis. The results of corresponding regressions are shown in Table 8. Since PSM is sensitive to matching method to some extent, the neighbor 1:2 matching results are also presented for a robustness test. According to the regression results of Table 8, the main conclusion of our study is robust. Enumerate row (1) as a benchmark, the coefficient of green finance policy implementation (D) is still negative, under the siginificance level of 5%. This result suggests that the implementation

of green financial policies optimizing the debt maturity structure of enterprises, matching the investment and financing maturities of enterprises, thus mitigating the degree of SFLI.

Observing the regression coefficients of other control variables, it is found that the coefficient of Size is positive under the 1% significance level, and the coefficient of Liq is positive under the 1% significance level. Above results indicate that the larger size and the more liquid assets of the enterprise, it is prone to fall in a SFLI predicament. In addition, the growth rate of the enterprise enhance the degree of SFLI.

Table 8. PSM-DID estimation results

	(1)	(2)
	k-nearest neighbor match 1:1	k-nearest neighbor match 1:2
D	–0.027**	–0.025**
	(–2.56)	(–2.07)
Size	0.096***	0.103***
	(2.75)	(3.22)
Liq	0.030***	0.025***
	(4.24)	(4.34)
SG	0.043***	0.050***
	(3.57)	(5.99)
SAT	0.000	0.000
	(1.14)	(0.98)
Dpay	–0.009	–0.015
	(–0.49)	(–0.89)
Big10	–0.004	0.000
	(–0.30)	(0.02)
BDS	–0.006	–0.000
	(–1.35)	(–0.03)
Constant	–1.809***	–1.928***
	(–3.11)	(–3.55)
Firm FE	Yes	Yes
Year FE	Yes	Yes
N	3703	5399
R^2	0.118	0.128

4.3.4. Alternative measurements of key variables

To investigate the sensitivity effect of variable measurement modes, the variable measurement is changed as follows: first, (cash outflow for investment activities like building fixed assets – increment of long-term loans – increment of rights and interests of the current period – operational cash net flow – increment of bonds payable – cash inflow from selling of fixed assets in the current period)/total assets is used as the substitution variable of short-term loans used as long-term investment. Second, a DID analysis of company-year two-way fixed effect model is carried out. The corresponding results are reported in Table 9, which shows that both the improving effect and the mechanism of influence of green financial

policies on enterprises' "short-term loans used as long-term investment" remain unchanged. This implies that research conclusions have a low sensitivity to measurement of variables.

Table 9. Robustness test of substitution variables

	(1)	(2)
	SFLI	Cost
D	–0.014**	–0.003**
	(–2.08)	(–2.02)
Size	0.067***	0.001
	(3.78)	(0.29)
Liq	0.00287*	0.005***
	(1.83)	(5.31)
SG	0.000	–0.001
	(0.00)	(–0.51)
SAT	0.000	0.000
	(0.37)	(1.26)
Dpay	0.003	0.011***
	(0.61)	(9.56)
Big10	0.002	0.006***
	(0.53)	(4.05)
BDS	0.002	0.000
	(0.09)	(0.04)
Constant	–1.382***	–0.093
	(–3.94)	(–1.06)
Firm FE	Yes	Yes
Year FE	Yes	Yes
N	22163	22163
R^2	0.0824	0.0603

4.4. Heterogeneity analysis

Internal control quality is a key factor that determines whether an enterprise can get long-term loans (Luo et al., 2021). The higher audit quality implies the higher effectiveness of internal control. This study further investigates heterogeneity characteristic performances of the internal control quality in the mismatch behaviors between green finance and financing term of enterprises. Specifically, enterprises with an audit opinion of "Standard and No Unreserved Opinion" are viewed as the high-audit-quality group. The internal control effectiveness of these enterprises is higher than that of the other enterprises. Other enterprises are viewed as the group of low internal control quality. Sub-sample regression is carried out. Results are shown in Columns (1) and (2) in Table 10. Clearly, the green financial policies can alleviate short-term loans used as long-term investment of enterprises with high internal control effectiveness more obviously.

For the self-need of profit seeking and green requirements of supervisors, financial institutions which have green finance business may take the initiative to search enterprise

information and seek projects with high benefits, low risks and conforming to green requirements.

Heterogeneity characteristic performances of information transparency in the mismatch behaviors between green finance and financing term of enterprises are discussed in the present study. In the contract negotiation stage, banks have insufficient understanding on operation conditions of enterprises due to the serious information asymmetry. Banks often provide enterprises short-term credits rather than long-term credits in order to decrease credit risks (Diamond, 1991; Bonfim et al., 2018; Wang et al., 2020). For post-supervision cost, it can be known from the relational lending theory that banks have to give stronger and more intensive supervision over investment projects of long-term loans compared to short-term loans. After implementation of the green financial policies, enterprises with the higher information transparency can get more long-term loans, thus relieving their investment-financing maturity mismatch more effectively. Analyst tracking is used as the substitution variable of enterprise information transparency and a sub-sample regression is carried out. Results are shown in Columns (3) and (4) of Table 10. It is easy to see that green financial policies can alleviate investment-financing maturity mismatch of enterprises with higher information transparency better than enterprises with lower information transparency.

Furthermore, enterprise samples are divided into state-owned enterprises and non-state-owned enterprises for the sub-sample regression according to properties of controlling shareholders. Results are shown in Columns (5) and (6) of Table 10. Coefficient of D in Column (5) is insignificant and coefficient of D in Column (6) is negative under 1% significance level, thus proving that influences of the green financial policies on short-term loans used as long-term investment of enterprises vary with property rights. Such influences are more obvious in non-state-owned enterprises.

Table 10. Group test results

	(1)	(2)	(3)	(4)	(5)	(6)
	Internal control H	Internal control L	Analys_H	Analys_L	SOE	Non-SOE
D	–0.020**	–0.247	–0.057***	0.009	–0.009	–0.038***
	(–2.40)	(–1.61)	(–4.51)	(1.23)	(–1.38)	(–4.15)
Size	0.121***	–0.011	0.092***	0.153***	0.105***	0.141***
	(4.29)	(–0.46)	(4.29)	(5.39)	(4.84)	(3.98)
Liq	0.003	0.030**	0.003	0.002*	0.013***	0.002
	(1.57)	(2.11)	(1.28)	(1.83)	(4.97)	(1.01)
SG	0.038***	0.00817	0.035***	0.037***	0.041***	0.036***
	(10.48)	(0.95)	(9.17)	(11.54)	(8.54)	(7.25)
SAT	–0.000	–0.001***	0.000	–0.000**	0.000***	–0.000***
	(–0.15)	(–6.86)	(0.09)	(–2.32)	(3.22)	(–3.80)
Dpay	–0.019***	0.025	–0.007	–0.022***	0.004	–0.031***
	(–2.84)	(0.84)	(–0.83)	(–3.20)	(0.42)	(–3.55)
Big10	–0.002	–0.030	–0.006	0.003	–0.004	–0.005
	(–0.28)	(–0.84)	(–1.28)	(0.50)	(–0.74)	(–0.82)

End of Table 10

	(1)	(2)	(3)	(4)	(5)	(6)
	Internal control H	Internal control L	Analys_H	Analys_L	SOE	Non-SOE
BDS	–0.001	–0.014	0.001	–0.003	0.001	0.001
	(–0.64)	(–1.00)	(0.35)	(–1.57)	(0.46)	(0.64)
Constant	–2.191***	0.012	–1.780***	–2.828***	–2.312***	–2.378***
	(–4.08)	(0.03)	(–4.87)	(–4.96)	(–5.02)	(–3.74)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	21581	582	12256	9907	9333	12830
R^2	0.105	0.178	0.0939	0.0997	0.104	0.132

5. Discussions

The empirical results validate the research hypothesis in the theoretical analysis and confirms the scientific preciseness of this study. According to the independent sample t-test, the investment-financing maturity mismatch of enterprises is alleviated after implementation of the green financial policies. Debt financing cost of enterprise samples after implementation of the green financial policies decreases significantly compared to that before.

According to regression results of Table 4, the green financial policies alleviate both investment-financing maturity mismatch of enterprises and "short-term loans used as long-term investment" of enterprises. This is consistent with the conclusion of Ma and Hu (2020). Green finance policies likely boost banks' willingness to provide long-term loans to enterprises by enhancing their capacity to screen, review, and monitor firms' financial and operational information.

It can be seen from regression results of Table 5 that the green financial policies alleviate short-term loans used as long-term investment of enterprises by decreasing their debt financing costs. This is because the green financial system could collect and process information professionally, disclose the reasonable price and promote effective allocation of capitals, thus decreasing transaction costs. Besides, the green financial policies increase new debt size of enterprises. It increases new growth and short-term loan size of enterprises, respectively. In particular, the increased long-term loan size further proves that the green financial policies can alleviate short-term loans used as long-term investment by increasing new loan size of enterprises. Moreover, green financial polices improve the debt maturity structure of enterprises. This finding is the same as that of Wang et al. (2019). The possible reason is that the implementation of green finance policy enables banks to utilize information disclosure, resource tilting, and reassessment of corporate projects to curb the moral hazard of the firms. As a result, the firms' financial ratios become robust, the operational capacity is improved, and the size and share of long-term debt is significantly increased.

Conclusions in Table 10 are new findings of this study. Results show that firstly, the green financial policies alleviate short-term loans used as long-term investment of enterprises with high internal control effectiveness more obviously. Secondly, the green financial policies alleviate short-term loans used as long-term investment of enterprises with higher information transparency more significantly compared to enterprises with a low information transparency.

This conclusion may be attributed to the fact that state-owned enterprises, being mostly in a mature stage, benefit from state capital as an "implicit guarantee". In contrast, private enterprises, although more growth-oriented, face greater uncertainty in growth and profitability. This directly intensifies the issue of private enterprises lacking long-term capital and relying on short-term debt. State-owned enterprises, in comparison to non-state-owned ones, encounter relatively lower external financing constraints. Consequently, the implementation of green finance policies is more visibly effective in alleviating short-term debt used as long-term debt for non-state-owned enterprises. Additionally, small and medium-sized financial institutions catering to private enterprises are proactively adopting green finance policies, thereby alleivating the mismatch between their investment and financing maturities.

6. Conclusions

6.1. Main findings

In the strategic background that green finance drives green low-carbon development, it is necessary to study micro-implementation effect of the green financial policies. Hence, effects of the green financial policies on investment-financing maturity mismatch of enterprises of A-share companies in China and the influencing paths are studied through DID method based on their panel data from 2009–2020. Some major conclusions could be drawn: (1) the investment-financing maturity mismatch of enterprises is alleviated after implementation of the green financial policies. (2) Green financial policies alleviate investment-financing maturity mismatch of enterprises through three major ways, namely, lowering financing cost, increasing debt financing size and improving debt maturity structure. (3) Green financial policies alleviate the investment-financing maturity mismatch of non-state-owned enterprises better than state-owned enterprises. Green financial policies alleviate the investment-financing maturity mismatch of enterprises with higher internal control quality and higher information transparency more obviously than other enterprises.

6.2. Management implications

This study enriches evidences of studies about investment-financing maturity mismatch and proposes the following policy suggestions: (1) provide good green institutional environment for production and management of enterprises, and provide better services for green economic growth. Implementing a series of policy measures like Instructions on Building the Green Financial System is conducive to facilitate coordinated economic and environmental development, encourage and guide financial institutions to invest credit funds to green projects (e.g. energy-saving and environmental protection), and thereby increase the proportion of long-term debts of green enterprises. (2) Increase size and efficiency of direct financing market, especially the equity financing channel. Take the initiative to implement local government's reform of debt management system and decrease "squeezing effect" of government's long-term financing to long-term financing of enterprises. Continue to insist in deepening reform of financial system, develop diversified financing modes of enterprises, and further provide interest subsidy support, aiming to lower financing cost of enterprises and increase availability of credit loans to enterprises. (3) Size and structure of enterprise debt are important premises of fund stability. Therefore, government shall strengthen macroscopic regulation and perfect relevant supervision policies, mitigate debt maturity structure of enterprises together, increase utilization of credit funds, consolidate foundation for enterprise

economic development, strengthen competitive edges of enterprises in middle-term and long-term financing investment, prevent risks caused by short-term loans used as long-term investment of enterprises, and thereby decrease the investment-financing maturity mismatch of enterprises.

6.3. Shortcomings and prospects

This study still has some limitations. Firstly, it shall be more thorough in the empirical study based on a quasi-natural experiment. Secondly, this study determines 2015 as the implementation time of all green financial policies, including green credit, green bonds, green stock index, green development funds, green insurance, and so on. Although this has some references, it ignores the different issuing time of different green financial policies.

Author contributions

Lingxiao Zhang and Yuriy Bilan carried out empirical analysis and wrote the draft of the paper. Ke Zhang collected data and designed the model. All authors have participated in revising of the manuscript.

Disclosure statement

Authors do not have any competing financial, professional, or personal conflict of interests from other parties.

References

Abbas, A., Zhang G., Bilal, & Ye, C. (2023). Firm governance structures, earnings management, and carbon emission disclosures in Chinese high-polluting firms. *Business Ethics, the Environment and Responsibility*, *32*, 1470–1489. https://doi.org/10.1111/beer.12582

Aguilar, P., González, B., & Hurtado, S. (2023). Green policies and transition risk propagation in production networks. *Economic Modelling*, *126*(9), Article 106412. https://doi.org/10.1016/j.econmod.2023.106412

Ahmad, M., Ahmed, Z., Yang, X., & Can, M. (2023). Natural resources depletion, financial risk, and human well-being: What is the role of green innovation and economic globalization? *Social Indicators Research*, *167*(1), 269–288. https://doi.org/10.1007/s11205-023-03106-9

Baker, M., Bergstresser, D., Serafeim, G., & Wurgler, J. (2018). *Financing the response to climate change: The pricing and ownership of US green bonds* (Working paper No. w25194). National Bureau of Economic Research. https://doi.org/10.3386/w25194

Bhattarai, U., Lopatka, A., Devkota, N., Paudel, U. R., & Németh, P. (2023). Influence of green human resource management on employees' behavior through mediation of environmental knowledge of managers. *Journal of International Studies*, *16*(3), 56–77. https://doi.org/10.14254/2071-8330.2023/16-3/3

Bilan, Y., Mishchuk, H., & Pylypchuk, R. (2017). Towards sustainable economic development via social entrepreneurship. *Journal of Security & Sustainability Issues*, *6*(4), 691–702. http://doi.org/10.9770/jssi.2017.6.4(13)

Billah, M., Amar, A. B., & Balli, F. (2023). The extreme return connectedness between Sukuk and green bonds and their determinants and consequences for investors. *Pacific-Basin Finance Journal*, *77*(2), Article 101936. https://doi.org/10.1016/j.pacfin.2023.101936

Bonfim, D., Dai, Q., & Franco, F. (2018). The number of bank relationships and borrowing costs: The role of information asymmetries. *Journal of Empirical Finance*, (46), 191–209. https://doi.org/10.1016/j.jempfin.2017.12.005

Diamond, D. W. (1991). Debt maturity structure and liquidity risk. *The Quarterly Journal of Economics*, *106*(3), 709–737. https://doi.org/10.2307/2937924

Driscoll, J. C., & Kraay, A. C. (1998). Consistent covariance matrix estimation with spatially dependent panel data. *Review of Economics and Statistics*, *80*(4), 549–560. https://doi.org/10.1162/003465398557825

Du, L., & Zheng, L. C. (2019). Effect evaluation of China's green financial policy system: The analysis based on pilot operation data. *Journal of Tsinghua University (Philosophy and Social Sciences)*, *34*(1), 173–182. https://doi.org/10.13613/j.cnki.qhdz.002821

Flammer, C. (2021). Corporate green bonds. *Journal of Financial Economics*, *142*(2), 499–516. https://doi.org/10.1016/j.jfineco.2021.01.010

Frank, M. Z., & Goyal, V. K. (2003). Testing the pecking order theory of capital structure. *Journal of Financial Economics*, *67*(2), 217–248. https://doi.org/10.1016/S0304-405X(02)00252-0

Goss, A., & Roberts, G. S. (2011). The impact of corporate social responsibility on the cost of bank loans. *Journal of Banking & Finance*, *35*(7), 1794–1810. https://doi.org/10.1016/j.jbankfin.2010.12.002

Greenstone, M., & Jack, B. K. (2013). Envirodevonomics: A research agenda for a young field (Working paper No. w19426). National Bureau of Economic Research. https://doi.org/10.3386/w19426

He, W., Fu, J., & Luo, Y. (2023). A study of well-being-based eco-efficiency based on Super-SBM and Tobit Regression Model: The case of China. *Social Indicators Research*, *167*(1), 289–317. https://doi.org/10.1007/s11205-023-03107-8

He, L., Zhang, L., Zhong, Z., Wang, D., & Wang, F. (2019). Green credit, renewable energy investment and green economy development: Empirical analysis based on 150 listed companies of China. *Journal of Cleaner Production*, *208*, 363–372. https://doi.org/10.1016/j.jclepro.2018.10.119

Ionescu, L. (2021). Leveraging green finance for low-carbon energy, sustainable economic development, and climate change mitigation during the COVID-19 pandemic. *Review of Contemporary Philosophy*, *20*, 175–186. https://doi.org/10.22381/RCP20202112

Li, T. Y., & Liu, Y. (2020). The relationship of corporate bond credit spreads with the maturity mismatch between investment and financing. *Financial Regulation Research*, (10), 63–73. https://doi.org/10.13490/j.cnki.frr.2020.10.001

Lian, L. L. (2015). Does green credit influence debt financing cost of business? A comparative study of green businesses and "two high" businesses. *Financial Economics Research*, *9*, 83–93.

Linnenluecke, M. K., Smith, T., & McKnight, B. (2016). Environmental finance: A research agenda for interdisciplinary finance research. *Economic Modelling*, *59*, 124–130. https://doi.org/10.1016/j.econmod.2016.07.010

Liu, X., Wang, E., & Cai, D. (2019). Green credit policy, property rights and debt financing: Quasi-natural experimental evidence from China. *Finance Research Letters*, *29*, 129–135. https://doi.org/10.1016/j.frl.2019.03.014

Liu, Y., & Bai, X. Y. (2020). Does Chinese stock market reward for going green? Based on enterprise sustainable development. *Business and Management Journal*, *42*(01), 155–173.

Lu, J., Ren, L., Zhang, C., Rong, D., Ahmed, R. R., & Streimikis, J. (2020). Modified Carroll's pyramid of corporate social responsibility to enhance organizational performance of SMEs industry. *Journal of Cleaner Production*, *271*, Article 122456. https://doi.org/10.1016/j.jclepro.2020.122456

Luo, H., Jia, X. Y., & Wu, J. F. (2021). Internal control quality and maturity mismatch of enterprises' investment and financing. *International Financial Studies*, (9), 76–85. https://doi.org/10.16475/j.cnki.1006-1029.2021.09.008

Lv, C., Shao, C., & Lee, C. C. (2021). Green technology innovation and financial development: Do environmental regulation and innovation output matter? *Energy Economics*, *98*, Aricle 105237. https://doi.org/10.1016/j.eneco.2021.105237

Ma, Y. M., Hu, C. Y., & Liu, X. (2020). Issuing green bonds and enhancing corporate value: A mediation effect test based on the did model. *Financial Forum*, *25*(09), 29–39. https://doi.org/10.16529/j.cnki.11-4613/f.2020.09.005

Mamun, M. A., Boubaker, S., & Nguyen, D. K. (2022). Green finance and decarbonization: Evidence from around the world. *Finance Research Letters*, *46*(5), Article 102807. https://doi.org/10.1016/j.frl.2022.102807

Mishchuk, H., Czarkowski, J. J., Neverkovets, A., & Lukács, E. (2023). Ensuring sustainable development in light of pandemic "New Normal" Influence. *Sustainability*, *15*(18), Article 13979. https://doi.org/10.3390/su151813979

Musova, Z., Musa, H., & Matiova, V. (2021). Environmentally responsible behaviour of consumers: Evidence from Slovakia. *Economics and Sociology*, *14*(1), 178–198. https://doi.org/10.14254/2071-789X.2021/14-1/12

Ning, J. H., & Wang, M. (2021). Can green bonds alleviate "short-term financing and long-term investment" of enterprises? Empirical evidence from the bond market. *Securities Market Herald*, (09), 48–59.

Niu, H. P., Zhang X. Y., & Zhang P. D. (2020). Institutional change and effect evaluation of green finance policy in China: Evidence from green credit policy. *Management Review*, *8*, 3–12. https://doi.org/10.14120/j.cnki.cn11-5057/f.2020.08.001

Olzhebayeva, G., Buldybayev T., Pavalkis D., Kireyeva, A., & Micekiene, A. (2023). Is there interest in green deal research in Central Asia? *Economics and Sociology*, *16*(3), 302–322. https://doi.org/10.14254/2071-789X.2023/16-3/16

Omran, M. S., & Yaaqbeh, M. N. (2023). Climate change and business accountability, empirical evidence on the roles of environmental strategy and environmental accounting. *Business Ethics, the Environment & Responsibility*, *32*(4), 1592–1608. https://doi.org/10.1111/beer.12591

Shi, B., & Wang, H. (2023). Green finance and improving habitat: Corporate financial strategic planning and risk regulation under the influence of green consumption behavior. *Transformations in Business and Economics*, 22(3a), 576–591.

Štreimikienė, D., Mikalauskienė, A., & Macijauskaitė-Daunaravičienė, U. (2022). Role of information management in implementing the Green Deal in the EU and the US. *Journal of International Studies*, *15*(4), 9–27. https://doi.org/10.14254/2071-8330.2022/15-4/1

Volz, U. (2018). *Fostering green finance for sustainable development in Asia* (ADBI Working Paper, 814). SSRN. https://doi.org/10.2139/ssrn.3198680

Wang, C. W., Chiu, W. C., & King T. H. D. (2020). Debt maturity and the cost of bank loans. *Journal of Banking & Finance*, *112*, Article 105235. https://doi.org/10.1016/j.jbankfin.2017.10.008

Wang, K. S., Sun, X. R., & Wang, F. R. (2019). Development of green finance, debt maturity structure and investment of green enterprise. *Finance Forum*, *24*(7), 9–19. https://doi.org/10.16529/j.cnki.11-4613/f.2019.07.003

Wang, Y. L., Lei, X. D., & Long, R. Y. (2021). Can green credit policy promote the corporate investment efficiency. *China Population, Resources and Environment*, *31*(1), 123–133.

Wu, H. Y., & Yin, D. S. (2021). The reward and penalty effects of the green credit policy on corporate debt financing: An effect evaluation based on a quasi-natural experiment. *Contemporary Finance & Economics*, *02*, 49–62. https://doi.org/10.13676/j.cnki.cn36-1030/f.2021.02.006

Zhang, R., Li, Y., & Liu, Y. (2021a). Green bond issuance and corporate cost of capital. *Pacific-Basin Finance Journal*, *69*(10), Article 101626. https://doi.org/10.1016/j.pacfin.2021.101626

Zhang, X. M., & Ye, Z. W. (2021). Obtaining trust helps? Does social trust mitigate investment with short-term financing? *Foreign Economics & Management*, *43*(1), 44–57. https://doi.org/10.16538/j.cnki.fem.20200816.201

Zhong, K., Cheng, X. K., & Zhang, W. H. (2016). The moderating level of monetary policy and the mystery of short loans used as long investments by enterprises. *Journal of Management World*, (03), 87–98. https://doi.org/10.19744/j.cnki.11-1235/f.2016.03.008

Zhou, X. X., Jia, M. Y., & Zhao, X. (2023). An Empirical study and evolutionary game analysis of green finance promoting enterprise green technology innovation. *China Industrial Economics*, (06), 43–61. https://doi.org/10.19581/j.cnki.ciejournal.2023.06.002

Zhu, J. M., Wang, J. L., Yu, Z. Q., Yang, S. Y., & Wen, Q. X. (2020). Policy effectiveness of green finance: market reaction to the issuance of green bonds in China. *China Public Administration Review*, *2*(2), 21–43.

Zou, J. J. (2017). Green finance policy, policy synergy and industrial pollution intensity: A perspective of policy text analysis. *Financial Theory & Practice*, (12), 71–74.