



An Empirical Study on the Relationship Between Corporate Investment Preferences and Impulsive Carbon Emissions Behavior

WenTao Liu and Fang Zou(✉)

Business Travel College, Sichuan Agricultural University, Dujiangyan, Chengdu, China
fangzou@sicau.edu.cn

Abstract. Based on the panel data of a-share heavily polluting industrial listed companies from 2015 to 2019, this study focuses on the impact of corporate investment preference on impulsive behavior of carbon emissions, and empirically tests the moderating effect of executive overconfidence on the relationship between the two. The investment preference of enterprises is divided into fixed assets investment preference and the influence of executives' overconfidence on carbon emission impulse behavior in the production process is discussed. The results show that fixed asset investment preference is positively correlated with impulsive behavior of carbon emission. The positive relationship between fixed asset investment preference and carbon emission impulse behavior was weakened after the addition of executives' overconfidence as a moderating variable.

Keywords: Carbon impulse · Enterprise investment preference · Fixed asset investment preferences · Overconfidence

1 Introduction

In recent years, carbon emission has become a global environmental problem. Exploring how to meet the growing energy demand while minimizing the carbon emissions accompanying economic development and industrialization has become a focus issue [1]. Industrialization is an important tool to promote economic growth, but it may also lead to a large amount of carbon dioxide and other polluting gases. Therefore, in order to cope with the climate change caused by increasing carbon emissions, carbon emission reduction is gradually taken seriously. China is in the plight of industrial transformation and upgrading and deterioration of environmental pollution, as the main source of industrial carbon emissions generated, especially in the industrial structure and polluting industries energy scale blindly adopt high input, high consumption, with resources and environment at the expense of extensive development model, carbon reach peak before too radical to release more carbon emissions [2]. In 2021, experts said that in order to recover the economy under the impact of the epidemic, some localities have an obvious impulse to expand traditional steel, cement, coal power and other energy-intensive production capacity. Some experts put forward that carbon peak is not "peak climbing",

more not "rush peak". How to seize the new economic growth point of industrial enterprises, to avoid excessive energy consumption, excessive release of carbon emissions impulse phenomenon, this has to be solved urgently. There are very few relevant literatures on carbon emissions of enterprises. The carbon emissions of relevant enterprises are all based on the description of the phenomenon itself, and the impulsive behavior of carbon emissions of enterprises is seldom studied through the behavior or theory behind the phenomenon.

Therefore, can investment preference of industrial firms influence carbon emission impulse behavior? Does executive overconfidence have an impact on the effect of investment preference on corporate carbon emissions? This paper will discuss these outstanding issues in depth.

2 Theoretical Analysis and Hypothesis Formulation

2.1 Carbon Emissions Impulse

Impulse is a personality characteristic, which refers to the psychological phenomenon of hasty and improper behavior, strong feelings and weak rational control. It can be manifested in behavior or ideology [3]. Impulsive sexual behavior is always a manifestation of losing the will to supervise one's own actions, which should be fought [4]. Through the definition of impulsiveness and related literature analysis, this study defines carbon emission impulsiveness, that is, enterprises pursue immediate profit opportunities, and choose high-energy and high-carbon emission fixed asset projects with strong investment profitability in the production and operation investment decisions, which leads to the carbon emission exceeding the emission levels of enterprises over the years, showing the aggressive behavior of unreasonable emissions. This phenomenon is called carbon emission impulsiveness.

2.2 Corporate Investment Preferences and Carbon Impulses

Enterprise'S investment preference refers to the investment method or behavior that enterprises are relatively willing to choose among all available investment behaviors and ways [5]. The most important financial decision of an enterprise is capital investment, which generally refers to the investment in fixed assets and R&D within the enterprise. However, when enterprises are faced with internal environmental pressure, they are more likely to cope with the performance decline by expanding the scale of fixed assets [6]. This study mainly analyzes the influence of heavy polluting industrial enterprises' fixed assets investment preference on carbon emission impulse behavior.

Rui Wang, Zhongying Qi (2020) analyzed that fixed asset investment preferences directly affect energy consumption through purchasing and upgrading equipment on the one hand, and indirectly affect carbon emissions through expanding production scale on the other. Gheorghe H. Popescu Affiliation (2019) evaluated the effects of fixed assets, energy use, and domestic material consumption on changing the economic paradigm of inland Romania from an economic perspective, and confirmed that fixed asset inputs increase energy consumption and domestic material consumption. With

the increase of fixed assets with high energy consumption, the economic scale keeps expanding and a large amount of energy is consumed at the same time [7]. In terms of the scientific and technological level, industrial structure and emission coefficient remain unchanged, the expansion of economic activities will undoubtedly lead to the increase of carbon emissions. According to the analysis of existing literature, fixed asset investment in heavily polluting industrial enterprises increases energy consumption and thus generates more carbon emissions [8]. Therefore, this paper believes that fixed asset investment preference will greatly increase carbon emission impulsive behavior. The above analysis leads to the hypothesis that.

H1: Corporate fixed asset investment preferences are positively associated with carbon impulses.

2.3 Moderating Effect of Overconfidence of Executives

With the development of behavioral finance, the academic research on managers' psychological deviation is deepening. Especially in the aspect of overconfidence, Hayward (2018) believes that more confident executives will have greater emotional and cognitive flexibility and give up fixed asset investment with low returns and short profits, so as to reduce excessive carbon emissions and create a good image of low carbon awareness for the enterprise. As the most powerful person in enterprise operation, the cognitive characteristics of senior executives are bound to affect various decisions and behaviors of enterprises [9]. Control enterprises or enterprise key position, it is derived from its own influence of overconfidence psychology, will make its show "control illusion" overconfidence, believe oneself can control the process of project investment and risk control, encourage enterprises to grasp the investment opportunities [10], inhibition of enterprises in investment in fixed assets for excessive energy consumption, Inhibition of fixed asset investment preference has positive effect on carbon emission impulse. Based on this, this paper puts forward the hypothesis:

H2: Executive overconfidence has a negative moderating effect on the relationship between fixed asset investment preferences and corporate carbon emissions impulses.

3 Study Design

3.1 Sample Selection and Data Sources

In this paper, China's heavily polluting industrial enterprises from 2015 to 2019 were selected as the primary sample. The original data of carbon emissions come from China Statistical Yearbook, China Environmental Yearbook and the statistical yearbook of the database of the National Bureau of Statistics. The relevant enterprise data mainly comes from Guotai'an Securities Research Database (CSMAR). The samples are processed as follows: (1) ST, *ST and PT companies are excluded; (2) Eliminate financial and insurance companies; (3) Eliminate samples with missing data.

3.2 Variable Setting

3.2.1 Explained Variable

Carbon emission impulse (CI): carbon emission impulse variable. As for the measurement of this index, this paper draws lessons from Chen Xiaobei's (2021) measurement method of carbon emissions. When the annual carbon emissions of an enterprise exceed the five-year average carbon emissions of the enterprise, it is 1, otherwise it is 0.

3.2.2 Explanatory Variables

Enterprise Investment Preference (PE): a variable of fixed asset investment preference. With reference to Wang Ran (2019), it is measured by relative investment in fixed assets (the ratio of net change of fixed assets to business income of enterprises).

3.2.3 Moderating Variables

Overconfidence of executives (Ovcon): Using the practice of Tian Xi et al. (2019) for reference, the overconfidence of executives is measured by relative salary index, namely: overconfidence of executives = total salary of top 3 executives/total salary of all executives.

3.2.4 Control Variables

Referring to the related research of Chen Xueting, Liu Yuanyuan and Chen Xiaobei (2021), this paper selects enterprise leverAge (Lev), environmental investment (Eip), enterprise Size (Size), ownership concentration (CR1), Cashflow ratio (Cashflow), enterprise age (Age) and return on assets (Roa) as control variables.

3.3 Empirical Model

To examine the impact of investment preferences on the impulse to emit carbon at the firm level, the following research model was set up to test hypothesis 1.

$$Impulsiveness_{i,t} = \alpha_0 + \alpha_1 Ln(PE)_{i,t} + \alpha_2 Control + \varepsilon_{i,t} \tag{1}$$

To test hypothesis 2, the following research model was set up.

$$Impulsiveness_{i,t} = \alpha_0 + \alpha_1 Ln(PE)_{i,t} + \alpha_2 Ln(PE)_{i,t} * Ovcon_{i,t} + \alpha_3 Control + \varepsilon_{i,t} \tag{2}$$

4 Analysis of the Empirical Results

4.1 Descriptive Analysis

As can be seen from Table 1, the average value of carbon emission impulse (CI) is 0.252, indicating that 25.2% of sample enterprises have the impulse of carbon emission.

Table 1. Results of descriptive analysis

variable	N	Mean	p50	sd	min	max
CI	2805	0.252	0	0.434	0	1
PE	2805	0.505	0.422	0.359	0	3.746
Ovcon	2805	0.597	0.568	0.177	0	1
CR1	2805	23.138	0.651	29.44	0.0140	95.25
Size	2805	22.555	22.34	1.475	0	27.10
Roa	2805	0.032	0.0300	0.0760	-0.987	0.945
Cashflow	2805	0.077	0.0680	0.408	-7.588	16.89
Lev	2805	0.247	0.159	0.225	0	2.290
Age	2805	18.835	19	5.529	5	43
Epi	2805	4.904	0	7.128	0	19.58

The average value of fixed asset investment preference ($\ln(\text{PE})$) is 0.505, the minimum value and the maximum value are 0 and 3.746, respectively, which indicates that the overall investment level of the sample enterprises is low and there are great differences among enterprises. The average overconfidence of executives is 0.597, which indicates that more than half of the executives in the sample enterprises have overconfidence.

4.2 Correlation Analysis

From the correlation analysis, the correlation coefficient between fixed asset investment preference ($\ln(\text{PE})$) and carbon impulse (CI) is 0.077, which is significantly positive at 1% level, i.e. the greater the fixed asset investment preference, the greater the carbon impulse, tentatively testing hypothesis H1. Equity concentration (CR1), corporate leverage (Lev) and carbon impulse are significantly negatively correlated at 1% level. The relationship between corporate size and age and carbon impulse is positive at the 1% level, while the relationship between return on assets and carbon impulse is negative at the 10% level, and there is no relationship between executive overconfidence (Ovcon), cashflow ratio and environmental investment and carbon impulse. The above analyses are all preliminary inferences and further regression analyses will follow (Table 2).

4.3 Analysis of Main Regression Effects

Table 3 presents the results of the main regression of fixed asset investment preference ($\ln(\text{PE})$) and carbon emission impulse (CI). As shown in the figure, before the inclusion of the control variables, fixed asset investment preference ($\ln(\text{PE})$) is significantly positively correlated with carbon impulse (CI) at the 1% level, and after the introduction of the control variables, fixed asset investment preference ($\ln(\text{PE})$) remains positively correlated with carbon impulse (CI) at the 5% level of significance. In other words, the greater the preference for investment in fixed assets ($\ln(\text{PE})$), the greater the impulse to emit carbon (CI), and hypothesis H1 is tested.

Table 2. Results of correlation analysis

	CI	PE	Ovcon	CR1	Size	Roa	Cashflow	Lev	Age	Epi
CI	1									
PE	0.077***	1								
Ovcon	-0.022	-0.109***	1							
CR1	-0.252***	0.019	-0.016	1						
Size	0.088***	0.299***	-0.192***	0.029	1					
Roa	-0.034*	-0.173***	0.023	-0.005	-0.002	1				
Cashflow	-0.007	-0.088***	-0.013	0.066***	-0.029	0.422***	1			
Lev	-0.195***	0.020	-0.010	0.700***	0.075***	-0.073***	0.019	1		
Age	0.174***	0.069***	-0.054***	-0.069***	0.132***	-0.051***	-0.023	-0.022	1	
Epi	-0.019	0.028	-0.107***	-0.005	0.132***	-0.004	0.004	-0.020	-0.009	1

Table 3. Main regression results

	CI	CI
PE	0.464***	0.310**
CR1		-0.022***
Size		0.121**
Roa		-1.340**
Cashflow		0.193**
Lev		-0.346
Age		0.065***
Epi		-0.011
N	2805	2805

4.4 Analysis of Moderating Effects

In terms of the moderating effect results, after the inclusion of the interaction effect, fixed asset investment preference (Ln(PE)) remains positively related to carbon impulse (CI) at the 10% level of significance. The cross product of Ln(PE) and OVCON is negatively correlated with CI at the 1% level, indicating that OVCON negatively moderates the relationship between Ln(PE) and CI, i.e. when executives are overconfident, it will inhibit The positive effect of fixed asset investment preference (Ln(PE)) on carbon impulse (CI) is suppressed when executives are overconfident. Hypothesis H2 is tested (Table 4).

Table 4. Results of moderation effects

	CI
PE	0.689*
interact	-2.142***
CR1	-0.024***
Size	0.103*
Roa	-1.766***
Cashflow	0.185**
Lev	-0.459
Age	0.075***
Epi	-0.007
N	2754

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

5 Conclusion

Based on the data from 2015 to 2019, this paper selects the heavily polluting industrial listed companies in Shanghai and Shenzhen A-shares as the research object to study the relationship between corporate investment preference and corporate carbon emission impulse, and the influence of executives' overconfidence on the relationship between them. Through research, the following conclusions are drawn: there is a significant positive correlation between corporate fixed asset investment preference and corporate carbon emission impulse behavior, and the higher the fixed asset investment preference is, the more obvious the carbon emission impulse behavior will be. This may be because the investment preference of fixed assets affects the scale of industrial development of enterprises. With the continuous expansion of the scale, the energy consumption will be more, which will lead enterprises to release more carbon emissions, thus aggravating the carbon emission impulse behavior. Therefore, the stronger the investment preference of fixed assets, the more the carbon emission impulse behavior of enterprises will appear. The overconfidence of executives influences the fixed assets investment preference and carbon emission impulse behavior of enterprises through moderating effect, that is, overconfidence plays a significant negative moderating role on the fixed assets investment preference affecting carbon emission impulse behavior of enterprises. It shows that executives' overconfidence will reduce the positive impact of fixed assets investment preference on carbon emission impulse behavior, which may be because executives' overconfidence comes from their management experience and can bring forward-looking development strategies to enterprises. Therefore, the higher the overconfidence of executives, the less obvious it is that fixed assets investment preference enhances carbon emission impulse behavior of enterprises. This will help heavily polluting industrial enterprises to formulate effective carbon emission control measures,

reduce carbon emission impulse behavior, and provide empirical evidence for enterprises to achieve reasonable and effective carbon emission.

References

1. Adams, S., Adedoyin, F., Olaniran, E., & Bekun, F. V. (2020). Energy consumption, economic policy uncertainty and carbon emissions; causality evidence from resource rich economies. *Economic Analysis and Policy*, 68, 179-190.
2. Brunzel, J. (2021). Overconfidence and narcissism among the upper echelons: a systematic literature review. *Management Review Quarterly*, 71(3), 585-623.
3. Cheng Jing, Tao Yitao. The impact of income tax rate preference on enterprises' investment preference[J]. *Statistics and Decision Making*,2020,36(22):143-147.
4. Cho, M., & Keltner, D. (2020). Power, approach, and inhibition: Empirical advances of a theory. *Current Opinion in Psychology*, 33, 196-200.
5. Chen Ximing, Huang Wei, Sun Yan. Financial market risk, corporate financialization and the efficiency of corporate fixed asset investment[J]. *Business Research*,2021(03):65-72.
6. Chen Z, Zhang X, Chen F. Do carbon emission trading schemes stimulate green innovation in enterprises? Evidence from China[J]. *Technological Forecasting and Social Change*, 2021, 168: 120744.
7. Fan Xiaomin, Chen Weihong, You Jiaying. Investment preferences of state-owned venture capital and their policy effects[J]. *Economic Management*,2021,43(01):35-53.
8. Li Yanxi, Wu Guotong. A review and critique of research on the economic consequences of managers' irrational behavior[J]. *Modern Management Science*,2019(05):100-102.
9. Laibson, D. (1997). Golden eggs and hyperbolic discounting. *The Quarterly Journal of Economics*, 112(2), 443-478.
10. Li, J., & Li, S. (2020). Energy investment, economic growth and carbon emissions in China-Empirical analysis based on spatial Durbin model, 111425.
11. Lei Guangyong, Cao Yali, Qi Yunfei . Risk capital, institutional efficiency and firms' investment preferences[J]. *Accounting Research*,2017(08):48-54+94.
12. Rubinstein, A. (2003). "Economics and psychology"? The case of hyperbolic discounting. *International Economic Review*, 44(4), 1207-1216.
13. Sun Yan, Wang Hongyu, Yu Yingxin. Fund manager competence effect, overconfidence and fund performance[J]. *Economic and Management Review*,2018,34(03):132-142.
14. Sun, H., Yao, S., & Zhai, M. (2021). Enterprise Low-Carbon Behavior, Financial Performance and Economic Transformation--Data from Listed Companies in China. . In *E3S Web of Conferences* (Vol. 275, p. 02004). EDP Sciences.
15. Wang Deng, Yu Bo, Huang Yi. Performance decline, development cycle and firms' investment choices - micro evidence based on listed Chinese manufacturing firms[J]. *Journal of Nanjing Audit University*,2019,16(05):65-73.
16. Wang B., Du M. Zhe. The win-win situation of marginal abatement cost and industrial economy under low carbon technology[J]. *Southern Economy*,2015(02):17-36.
17. Yu, J., Shi, X., Guo, D., & Yang, L. (2021). Economic policy uncertainty (EPU) and firm carbon emissions: evidence using a China provincial EPU index. *Energy Economics*, 94, 105071.
18. Zhao, X., Ma, X., Chen, B., Shang, Y., & Song, M. (2022). Challenges toward carbon neutrality in China: Strategies and countermeasures. *Resources, Conservation and Recycling*, 176, 105959.
19. Zheng, Z. L., Gao, X., & Ruan, X. L. (2019). Does economic financialization lead to the alienation of enterprise investment behavior? Evidence from China. *Physica A: Statistical Mechanics and Its Applications*, 536, 120858.

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

