

Relaxation of Short-Selling Constraints and Innovation Investments of Energy Industry in China

Wenzhen Mai and Nik Intan Norhan Binti Abdul Hamid

ABSTRACT

The purpose of this research is to determine the effect of short selling restrictions on the corporate innovation investments of China's publicly traded energy businesses. According to external governance theory, it is predicted that deregulation of short selling serves as a monitoring role for energy businesses' innovation investments, which are particularly vulnerable to energy efficiency issues. Between 2010 and 2018, a multiple linear regression is undertaken on a panel data set of Chinese 64-listed energy companies. According to descriptive data, the average innovation investment of Chinese energy businesses is 2.24%, indicating a low level of innovation in the energy sector. The regression findings demonstrate that easing short selling limitations may benefit energy businesses' innovative activity. The outcomes of this study indicate that financial officials should explore further loosening short selling restrictions, which might benefit sectors of the energy business that are highly dependent on technological innovation practices and performance.

Keywords: Energy industry, innovation investments, short-selling deregulation.

Published Online: December 29, 2022

ISSN: 2736-5506

DOI :10.24018/ejenergy.2022.2.5.93

W. Mai *

Universiti Teknologi Malaysia, Johor Bahru, 81310, Malaysia.

(e-mail: wenzhen@graduate.utm.my)

N. I. N. Binti Abdul Hamid

Universiti Teknologi Malaysia, Johor Bahru, 81310, Malaysia.

**Corresponding Author*

I. INTRODUCTION

The energy sector has established a vital role in China's national economic and social development. Energy is a critical component of economic development and national security. Besides the depletion of conventional fossil fuels and the discovery of their flaws, an increasing number of nations are propelling the growth of alternative energy sources. China places a premium on energy development and has established several preferential policies, including the annual awarding of different fiscal subsidies and financial availability to energy industries and fostering power company innovation.

Corporate innovation, particularly in the energy sector, has grown in importance in recent years, attracting considerable attention and study effort from academic scholars across a range of disciplines, including finance, economics, accounting, marketing, and management. This has been particularly true over the past decade, owing to the presence of high-quality patent and citations statistics that accurately reflect a government or a company innovation output. However, it is uncertain to what degree financial markets and institutions influence the origin, process, characteristics, and implications of corporate technology innovation. The purpose of this research is to determine how short-selling deregulation has an effect on the level of innovation investment made by publicly traded energy businesses in China.

Although short selling has been permitted in developed markets for many years, China's regulatory authorities have reduced its limitations on stock short selling since March 2010. Economic studies require an assessment of the negative

implications of short selling. According to the research, short sellers are skilled investors who can anticipate stock prices movement, identify illegal behaviors of companies, avert financial disaster, and improve firm value [1]-[3].

Prior research has proven that the short selling affect the corporate behaviors by deterring and preventing corporate managers from conducting myopic decisions [4]. The external governance effect of short-selling is also observed by considering the firm value creation in the firms with low corporate governance level [5], [6]. The US reference demonstrates short-selling deregulation is beneficial to innovation performance disclosure which represent a company's potential advantages in industrial competition [7]. However, lacking empirical evidence between short-selling and innovation related topics in China motivate authors to conduct the research of this paper.

In this research, we overcome the issue of model misspecification by using a multiple linear model with panel data from tourist businesses listed in China from 2010 to 2018 and analyze whether short selling legalization will have an effect on innovation investment decisions. This work demonstrates theoretical and practical contributions in particular. Theoretically, this article examines the function of short selling in monitoring corporate innovation. On the assumption that corporate leaders would embrace appropriate innovation strategies in order to fight against and dissuade short sellers, energy businesses will volunteer to adopt and enhance their innovation performance when short selling threats are accessible. These results contribute to the creation of a more robust theoretical framework for the interaction between short selling and corporate investment in the development of innovation.

II. LITERATURE REVIEW

It is essential to understand the critical aspects affecting corporate innovation contribution and to determine if short selling might improve innovation performance. According to studies, a company's financial capital is a significant element in determining the degree of its innovative performance. Reference [8] systematically review top-tier journals from 2009 to 2017, and find that venture capitals (VC), Initial Public Offering (IPO), merger and acquisition (M&A) and incentives plans of management can improve technology innovation.

According to external governance theory, short selling practices raise the cost of managers pursuing private gain, which might benefit from limiting their unethical behaviors and moral hazard. To ward against short-selling assaults, corporate executives often strive to boost innovation in order to illustrate the company's long-term sustainability objectives [7].

When considering the monitoring role of short sellers on innovation performance, [9] presented US empirical results under Regulation SHO and stated that an increased threat of short selling could significantly improve innovation quality, efficiency, and originality. The deregulation of short-selling improves patent citations and innovation output of Russell 3000 index firms. Similarly, [10] provides evidence about short-selling ban lifting can help improve innovation performance in both quality and quantity in China. Lowering firms' information asymmetry and improving the efficiency of managerial contract are the rationales behind this mechanism. However, their research did not pay attention to innovation inputs such as research and development (R&D) investment.

Innovation investment is regarded as an efficient strategy for energy companies to improve firm value by sending healthy signals to stakeholders or remedying internal problems of companies. There is no consensus about external capital market forces, such as short selling activity, that will have impact on managers' decision about innovation operations. As long as the companies are attacked by short sellers who are considered as sophisticated investors and have private negative information about companies, managers will fight back and deter the short sellers by disclosing beneficial information in order to increase the stock price and reduce profits of short sellers [11]. Innovation activities show that the company has more than sufficient cash flow for its business and has the capability to care about future development, which is a proper message and good image sent to public by redirecting their attention when the attacks of short sellers reflect negative withheld information of the companies [12]. The research of [13] confirmed the positive relationship between short selling intensity and innovation activities, especially when companies suffer problems of low information transparency, low profitability, low internal control and suspected to be caught by regulatory authorities, which means managers indeed employed innovation activities as an instant defense and opportunistic behavior over the adverse effect of short selling.

Developing energy resource is one of the win-win measures in response to climate changes and energy security. In order to promote technical innovation in the energy industry, the capital market is a major source for funding

energy companies [14]. The various ownership structure may affect internal and external corporate governance for energy companies. Reference [15] study the relationship between government and energy companies. The stronger the connection to the government, the weaker of the innovation capacity of energy companies, because energy companies often employ those with political backgrounds as members of the board of directors and board of supervisors. It is interesting to observe that short-selling mechanism can act as another side of supervisor to balance the power of the politically connected shareholders.

In general, this study is inclined to hypothesize that short selling may help listed energy businesses in China engage more in innovation by increasing their research and development contributions, corporate governance, and minimizing managerial myopia. As a result, the following hypotheses are examined:

H1: There is a positive relationship between the short selling deregulation and innovation investment of listed energy companies in China.

III. METHODOLOGY

A. Data and Sample Sources

The sample for this article is drawn from 64 Chinese publicly traded energy firms from 2010 to 2018. Financial data and expenditures in innovation are sourced from the China Stock Market and Accounting Research Database (CSMAR). The information collected for the short-selling designated list is sourced from the Shanghai and Shenzhen Stock Exchange's website.

Suggested by the references in short-selling studies [16], this study excludes ST* businesses, businesses that were formerly shortable but have since become non-shortable, and businesses with missing relevant information. This article winsorises data at the 1% and 99 percent confidence levels in order to minimize the impacts of outliers. Following the above steps, we acquire a preliminary sample of 389 firm-year observations, including 39 firms on the shortable list and 25 firms not on the shortable list.

B. Measurements of Variables and Model

This paper attempts to examine the effect of short selling deregulation. Following [16], the measurements of deregulation of short selling include three variables, namely, SHORT, TREAT and SHORT*TREAT. SHORT is the variable of short dummy, which is regarded as 1 if the stock is permitted to short during the sample period, and 0 otherwise. TREAT is a time dummy which equals 1 if the stock can be shortable by the end of current fiscal year, and 0 otherwise. SHORT*TREAT is the interactive item for DID model which ensures that the firm value of a firm capture all of its activities over an entire fiscal year either before or after the exogenous shock.

For proxying companies' innovation investments (INNO), this paper adopts R&D investment divided by total sales to capture the contribution of companies on innovation activities.

This article employs different control variables to elucidate the basics of energy companies. Firm size (SIZE) is estimated as a natural logarithm of the market cap, firm growth

(GROWTH) is measured as the market to book margin, leverage (LEV) is assessed as total liability divided by total asset, firm value (ROA) is calculated as net income divided by average total assets. Table I summarizes the variables' measurements.

TABLE I: SUMMARY OF VARIABLES

Variables	Measurement	Sources
Independent variables		
Deregulation of short selling (SHORT)	A dummy variable (0,1), equals to 1 if the firm is shortable, and 0 otherwise	Shanghai and Shenzhen Stock exchange
Time factor of short selling (TREAT)	A dummy variable (0,1), equals to 1 for the years after firm is shortable, and 0 otherwise.	Shanghai and Shenzhen Stock exchange
Dependent variables		
Innovation investments (INNO)	R&D investment divided by total sales	CSMAR Database
Control Variables		
Firm size (SIZE)	Natural logarithm of the market capitalization	CSMAR Database
Firm growth (GROWTH)	Market to book ratio	CSMAR Database
Leverage (LEV)	Total liability divided by total assets	CSMAR Database
Firm value (ROA)	Net income divided by average total assets	CSMAR Database
Year effect		
Industry effect		

To test Hypothesis 1, this article examines if deregulation of short selling has a beneficial effect on innovation investments by adopting the following model 1:

$$INNO = a0 + a1SHORT * TREAT + a2controls + \varepsilon$$

IV. RESULTS AND DISCUSSIONS

The descriptive statistics of this research are presented in Table II. With total samples of 389 firm-year observations, the mean value of innovation expenditure ratio is 2.24%, indicating the low contribution on innovation activities of energy companies in China. Its standard deviation is 2.86% presenting that the difference of innovation inputs among energy companies is not large. The mean value of firm size, sales growth, leverage ratio and profitability of energy companies in China are 23.059, 2.9%, 47.34% and 3.62% respectively.

TABLE II: DESCRIPTIVE STATISTICS

Variables	Samples	Mean	SD	Max	Min
SHORT*TREAT	389	0.4627	0.4993	1.0000	0.0000
INNO	389	0.0224	0.0286	0.2039	0.0000
SIZE	389	23.0587	1.3565	25.9957	19.9963
GROWTH	389	0.0290	0.0230	0.2158	0.0081
LEV	389	0.4734	0.1794	0.8548	0.0618
ROA	389	0.0362	0.0475	0.1708	-0.1027

Table III presents correlation analysis of all variables in our study. The overall correlation short-selling ban lifting (SHORT*TREAT) and innovation expenditure ratio of listed energy companies (INNO) is only 0.1458 but significant within 1% confidence level, indicating the moving direction of short-selling deregulation and innovation inputs is positive. Despite firm size (SIZE) is positive correlated to innovation inputs, all other variables have negative correlation with innovation inputs of energy companies.

TABLE III: CORRELATION ANALYSIS

	SHORT* TREAT	INNO	SIZE	GROWTH	LEV	ROA
SHORT* TREAT	1					
INNO	0.1458 ***	1				
SIZE	0.5687 ***	-	1			
GROWTH	-0.2766 ***	0.2155 ***	-	1		
LEV	0.2144 ***	-	0.5425 ***	-0.1621 ***	1	
ROA	0.0166 **	-	0.0754 ***	0.2686 ***	-	1

Note: *, **, ***Denote significance at the 10%, the 5%, and the 1%, respectively.

Table IV demonstrates the results of multiple linear regression of this research which estimates the impact of relaxation of short-selling constraints (SHORT*TREAT) on innovation expenditures of energy companies. We control the set of control variables in the energy companies throughout the analysis. Model 1 described in Part Three is designed to investigate the impact of short-selling on innovation investments. The regression examines the effect of the main independent variable, that is, relaxation of short-selling ban (SHORT*TREAT). The coefficient of SHORT*TREAT is positive (0.0086) and significant ($p < 1\%$). This result supports our hypothesis that short-selling deregulation can increase innovation investments of listed energy firms in China. The result of this test indicates that the availability of potential short selling activities after ban lifting can act as motivator which requires corporate managers in the energy firms to invest more on innovation activities.

TABLE IV: REGRESSION RESULT

INNO		
Variables	Coefficient	Probability
Intercept	0.1893***	0.000
SHORT* TREAT	0.0086***	0.003
SIZE	-0.0061***	0.000
GROWTH	0.1797***	0.002
LEV	-0.0659***	0.000
Adj R-squared	0.3560	
F-statistics	43.90	
N	389	

Note: *, **, ***Denote significance at the 10%, the 5%, and the 1%, respectively.

V. CONCLUSIONS

Investment in innovation is critical for energy firms to achieve long-term reproductive success and collaborative responsible development of social and economic progress, especially for the energy industry, which demands a high degree of technological innovation. The majority of research on innovation and short-selling, however, is performed in developed market economies, most notably the United States and Europe. As a result, emerging countries still have a limited understanding of energy corporations' social responsibility and sustainable development. Additionally, a few experts questioned whether capital market mechanisms may have a beneficial effect on firms' innovation contributions. As a result, this article fills a need by examining whether deregulation of short selling might boost innovation inputs in the Chinese energy market. The

empirical findings of this research support the notion that when specified energy firms are included on specified lists for short selling deregulation, their innovation investment increases. The consequence of this research is that financial officials should explore further loosening short-selling restrictions in China, which would promote technological advancement and other participants in the energy business.

To conduct further research, it is necessary to examine the link between short selling deregulation and energy company innovation using a variety of moderating variables, including international competition environments and product market competitions. Additionally, the innovation metrics will be rigorously studied to establish which drivers of innovation are most influenced by the short selling mechanism. Finally, though this research focuses only on energy businesses listed in China, additional leading Chinese energy businesses that are listed in the United States and Hong Kong but not included in this research's scope. It is critical to consider if the link between short selling and innovation is similarly relevant for Chinese energy companies listed on international exchanges.

CONFLICT OF INTEREST

Authors declare that they do not have any conflict of interest.

REFERENCES

- [1] Massa M, Zhang B, Zhang H. The invisible hand of short selling: Does short selling discipline earnings management? *The Review of Financial Studies*. 2015; 28(6): 1701-1736.
- [2] Brockman P, Luo J, Xu L. The impact of short-selling pressure on corporate employee relations. *Journal of Corporate Finance*. 2020: 64.
- [3] Mai W, Hamid NINBA. *Understanding the Effect of Short Selling Mechanism on Market Value of Pharmaceutical Industry in China Under Covid-19*. in Basic & Clinical Pharmacology& Toxicology. 2020.
- [4] Massa M, Wu F, Zhang B, Zhang H. Saving long-term investment from short-termism: The surprising role of short selling. 2015.
- [5] Mai W, Hamid NINBA. The moderating effect of family business ownership on the relationship between short-selling mechanism and firm value for listed companies in China. *Journal of Risk and Financial Management*. 2021; 14(6): 236.
- [6] Mai W, Hamid NINBA. Short-selling and financial performance of SMEs in China: the mediating role of CSR performance. *International Journal of Financial Studies*. 2021; 9(2): 22.
- [7] He J, Tian X. Do short sellers exacerbate or mitigate managerial myopia? Evidence from patenting activities. 2016.
- [8] He J, Tian X. Finance and corporate innovation: A survey. *Asia-Pacific Journal of Financial Studies*. 2018; 47(2): 165-212.
- [9] He J, Tian X. *SHO time for innovation: The real effects of short sellers*. Kelley School of Business Research Paper. 2015.
- [10] Li C, Xu H, Wang L, Zhou P. Short-selling and corporate innovation: Evidence from the Chinese market. *China Journal of Accounting Studies*. 2019; 7(3): 293-316.
- [11] Hou D, Meng Q, Zhang K, Chan KC. Motives for corporate philanthropy propensity: Does short selling matter?. *International Review of Economics & Finance*. 2019; 63: 24-36.
- [12] Wu GZ, You DM. Margin trading, short selling and corporate green innovation. arXiv [Preprint] 2021. Available from: <https://arxiv.org/abs/2107.11255>
- [13] Liu, Y. and G. Ahuja. Does External Governance Hinder or Improve Firm Innovation? Evidence from the Short Selling Pressure. Academy of Management Proceedings. 2021.
- [14] Wang Q, Hang Y, Sun L, Zhao Z. Two-stage innovation efficiency of new energy enterprises in China: A non-radial DEA approach. *Technological Forecasting and Social Change*. 2016; 112: 254-61.
- [15] Qu J, Cao J, Wang X, Tang J, Bukenya JO. Political connections, government subsidies and technical innovation of wind energy companies in China. *Sustainability*. 2017; 9(10): 1812.
- [16] Mai W, Hamid NINBA. Short-selling deregulation and corporate social responsibility of tourism industry in China. *E3S Web Conferences*. 2021; 251: 3032.