



Original research article

## Do environmental regulations undermine energy firm performance? An empirical analysis from China's stock market

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## ABSTRACT

This paper examines the impact of environmental regulations on the stock price of listed fossil based energy companies in China. Based on the event study methodology, we found that environmental regulations have a variety of impacts on the stock prices of China's listed fossil based energy companies. While legislative regulation has negative impacts on the stock prices, both environmental information disclosure (EID) and administrative regulation have positive impacts, and the impacts of market-based regulations (MBR) are firstly positive, then become negative. Further, the negative impacts of legislative regulation and the positive impacts of EID are the greatest. These results suggest that close attention should be paid to EID by policy makers. Moreover, we found that the impacts on firms vary depending on their nationalization level and scale. A surprising finding is that the negative impacts of environmental regulations are greater on listed fossil based energy companies with higher level of EID than on those with lower level of EID, which poses a challenge for policy makers in designing EID policies.

## 1. Introduction

China has resorted to a variety of strategies to fight environmental pollution and carbon emission. According to Xepapadeas [1], the dischargers will choose higher than socially desirable emission levels if by doing so they can increase their profits. Hence, environmental regulations are thought to be important and effective [2]. An efficient environmental policy should balance emission reduction and compliance cost, and thus it can be implemented more easily. However, what kinds of environmental regulations are better to realize such balance? Although the studies of environmental regulations' impacts on enterprises performance have attracted academicians' increasing attention, the specific studies from the perspective of outside investors' perception of energy firms' value lack.

While environmental regulations are generally believed beneficial to the environment, it's controversial to conclude how they affect corporate values. On one extreme, environmental regulations are considered a burden imposed by a government, compromising corporate productivity and competitiveness [63]. This view relies on conventional economic logic that companies have optimized their use and allocation of resources and that any intervention means deviation from such optimal equilibrium. Environmental regulations usually require

companies to engage in nonprofit activities, such as waste disposal, carbon mitigation, or environmental audits [3,4]. Companies that are found to be in noncompliance may have to pay environmental fines or go to court [3–5]. Spending on those nonproductive activities may crowd out a company's potential investment in production expansion or technological innovation [6,7].

At the other extreme, behavioral modifications adopted under the guidance of environmental regulations are unique opportunities to improve a company's financial performance. First, as a regulated company adopts environmentally friendly practices, it may be exposed to unique opportunities to increase revenues. For example, it is usually easier for green enterprises to connect with green consumers and become popular in green markets [8,9]. Moreover, green technologies and innovations developed under the pressure of environmental regulations can be attractive for peer enterprises and create a business opportunity. Several empirical studies have explored the positive link between green practice and profit performance [10–12]. According to the Porter Hypothesis, pollution is a manifestation of economic waste and involves the waste or incomplete use of resources [13]. Thus, reducing pollution can lead to reduction of the costs of raw materials, energy, and services. In addition to operational costs, green companies can save their financing costs, as socially responsible financial institutions have

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developed numerous green mutual funds or green credit programs that charge lower interests on loans to green enterprises [14]. Finally, environmentally regulated companies may shield themselves from certain market risks, which also make them better investment targets. They are less likely to clash with local communities, to engage in environmental disputes with government agencies, or to be the subject of negative news coverage [15–17]. Such risk consideration concerns multinational corporations that face constantly changing environmental standards in quite diversified business environments. It is commonplace for environmental standards to rise with per capita income; more strictly regulated enterprises may more readily adapt to the challenges caused by rising environmental standards than would enterprises that default to lower local standards [18].

As investors recognize the potential influence of environmental regulations on a firm's profits, costs, and risks, they adjust their valuation of the company with the announcement of new regulations. Such strategic re-valuation among investors generally exists in a market, and its consequences will be reflected in the changes of stock prices. Thus, some studies have investigated the relationship between environmental regulation and stock price [19–24]. The empirical results are inconsistent. Some studies found a positive relationship between environmental regulations and stock price. For example, based on event study methodology, Kong et al. [19] found that the carbon emission rights trading scheme (CERTS) in China increased the market values of firms in the environment industry. Using the pooled regression model, Thomas [25] found that environmental regulation had a positive impact on stock price in England. In contrast to these results, other studies have found that environmental regulations have a negative impact on stock price. Using event study methodology, Ramiah et al. [20] found that the announcement of the carbon pollution reduction scheme (CPRS) in Australia had a negative impact on stock price; Gupta and Golder [24] found that environmental information disclosure (EID) led to negative abnormal returns of up to 30% in India.

Some other studies found that the same environmental regulation will have different effects on stock price in different contexts. Yamaguchi [23] stated that EDI has different effects on the stock price of firms depending on their environmental management ranking. Market reaction to corporate environmental performance has a positive effect for the higher frequency of ranking and a negative effect for the lower frequency of ranking. Amato and Amato [22] examined the impact of *Newsweek's* "Greenest Big Companies in America" on stock values for large companies in the U.S. They concluded that there was a positive impact on stock values from favorable environmental recognition but no effect for low-ranked firms.

As a transitional and developing economy, China's environmental regulation and its impact on firms' market value is of special interest [26]. Xu et al. [56,53] investigated the stock market's reaction to disclosure of environmental violations in China. They argued that the negative environmental events of Chinese listed companies have had a weaker impact on the stock market than in other countries. Lyon et al. [26] examined the impact of winning Green Company Awards on shareholder value in China. They found that shareholders of firms in low-pollution industries and firms with primarily private ownership responded more negatively to award announcements, and the peers of winning firms showed higher announcement returns than award winners did.

This study differs from previous analyses in three ways. First, we identify four types of environmental regulations: legislative, administrative, market-based, and EID, and analyzed the impact of these four types of environmental regulations on the stock price of China's energy listed companies. An important finding is that although the environmental regulations have a negative short-term impact on stock price, EID has a positive impact; but as EID rises, its positive effect weakens and eventually becomes negative.

Second, we explore the different effects of environmental regulations on stock price by region, energy type, and firm scale. An

interesting finding is that the medium-scale firms are affected most negatively by environmental regulations. The other findings are as follows: the impact in eastern areas is the strongest and the weakest in the western; the impact on electricity firms is the greatest; on oil and gas firms it is the least.

Third, we investigate the role of ownership in the relations between environmental regulations and the stock price. It is found that as the state share proportion increases, the negative effects of environmental regulations on stock price decrease.

In sum, we intend to answer the following three questions: (1) Do environmental regulations bolster or undermine enterprise performance? This question is important since it is relevant not only to the enthusiasm of policy makers on making environmental regulations, but also to the enterprises' implementation of the regulations. Although many studies have explored this issue, conflict exists in the answers. (2) What kinds of environmental regulations are more desired by enterprises? The answer of this question is important for policy makers to adopt suitable regulation measures. (3) Do environmental regulations have different impacts on the performances of different types of enterprises? The theory of environmental economics tells us distinguished regulations have high efficiency. The answer to the above questions will provide references for the implementation of distinguished environmental regulations in reality.

The remainder of the paper is organized as follows. Section 2 reviews the environmental regulation and describes China's situation. Section 3 discusses the research hypothesis. Section 4 is methodology and data collection. Section 5 presents empirical results and discussions. Section 6 concludes and suggests some policy implications.

## 2. Environmental regulation and China's situation

The world's earliest known environmental regulation can be traced to 1273, when London passed a law to limit smoke dust. Early in the nineteenth century, the United Kingdom established the Conference Committee to study smoke dust. However, environmental problems had been troubling the United Kingdom for years; the fatal London Fog of 1952 led to the promulgation of the *Clean Act Law* of 1956. In 1955, the *Air Pollution Control Law* was enacted in the United States; in 1963, the *Clean Air Act* of the U.S. was signed into law. Moreover, to strengthen environmental regulations, the Environmental Protection Agency (EPA) was established in 1970. The mission of the EPA is to protect and enhance the environment to the fullest extent possible under the law [27]. These environmental regulations encouraged companies to make external environmental costs internalized, and thus promote environmental improvement [28].

In 1978, China embarked on an economic system reform and since then its economy has flourished. However, the accelerated economic growth had been accompanied by a large amount of energy consumption, especially dirty burning coal, producing heavy environmental pollution. China's government quickly realized the importance of environmental protection. At the time of the launch of China's economic reform, the government promulgated the *Environmental Protection Law (Trial)* in 1979. With the exacerbation of poor air quality and environmental degradation, China's government knows that environmental protection is a cornerstone of its commitment to balanced economic growth [29].

In 1992, *China's Ten Strategies for Environmental Protection and Economic Development* was issued, in which the sustainable development strategy was stressed. In 1996, the environmental management system standard, ISO14001, was introduced to promote the investment in the environmental protection of enterprises. Since the beginning of the 21st century, the Chinese government has attached closer importance to environmental protection. In 2005, China's State Council promulgated the *Scientific Approach of Development and Enhancement of Environmental Protection*, in which the development strategy of environmental priority was put forward for the first time. In 2007, the

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