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Market Reactions to the European Carbon Border Adjustment Mechanism: Evidence from Carbon-Intensive Industries in China

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Abstract. The European Union introduces a cross-border carbon policy, the Carbon Border Adjustment Mechanism (CBAM), to prevent carbon leakage. This study aims to investigate the short-term market reaction of Chinese listed firms in industries covered by the EU CBAM to its official enactment on May 17, 2023. This research examines whether investors perceived the CBAM as a risk or an opportunity. Using an event study methodology, we analyze the cumulative abnormal returns (CAR) for a sample of affected firms over a three-day event window surrounding the enactment date. The results reveal a significant positive market reaction, with a cumulative average abnormal return of 0.60%, primarily driven by a strong 0.91% positive return on the enactment day itself. This finding suggests that investors, on aggregate, interpreted the CBAM not as a punitive burden but as a regulatory shock that will enhance the short-term valuation of Chinese exporters.

Keywords: Carbon border adjustment mechanism, Event study, Short-term market reaction

1. Introduction

Climate change represents one of the most severe societal challenges of our time, prompting governments worldwide to implement ambitious environmental policies. A landmark development in this arena is the European Union's Carbon Border Adjustment Mechanism (CBAM), a cross-border carbon pricing policy formally enacted on May 17, 2023, to prevent carbon leakage and make an fair playing field for European firms in carbon-intensive industries. This study investigates the short-term market reaction of Chinese listed firms in sectors covered by the CBAM to its official enactment. One of the main objectives of CBAM is to prevent and curb carbon leakage. The CBAM allows the EU to unilaterally impose a levy on countries that do not meet the carbon emission standards set by the EU. The CBAM aims to encourage non-EU countries to develop more energy-efficient industries, thus reducing greenhouse gas emissions. China is the largest greenhouse gasses emitter in the world and one of the largest trading partners of the EU. China's exports of iron and steel, aluminum, cement, and fertilizer—key sectors targeted by the CBAM—are significant globally, making its economy particularly exposed to this policy. Understanding how the capital market in China perceives this regulatory shock is therefore critical for both academics and practitioners.

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The academic significance of this research lies in its contribution to the burgeoning literature on the market valuation of carbon pricing policies. While existing studies, such as Shen et al., have examined market reactions during the CBAM's legislative process—finding negative cumulative abnormal returns for Chinese exporters—this paper focuses specifically on events during the legislative process rather than the final enactment event [1]. This distinction is crucial, as market perceptions can shift dramatically between policy uncertainty and policy certainty. Furthermore, the literature presents a dichotomy: some studies highlight the cost burdens and negative valuation effects of environmental regulations, while others, aligned with the Porter Hypothesis, suggest they can serve as a stimulus for green innovation. This study directly engages with this debate in the context of a major, externally imposed cross-border carbon policy.

The empirical result reveals a significant positive market reaction, with a cumulative average abnormal return of 0.60% over a three-day window. This finding challenges the predominant risk-based narrative and supports the innovation-driven view. This shed a new light on how external carbon-related regulations from a key trading partner can be interpreted as a positive external shock for value creation in an emerging market context.

2. Literature review and hypothesis development

2.1. Literature review

Extant studies have explored the relationship between carbon pricing schemes and firm value. Research on the European Emissions Trading System (EU ETS) began to emerge in the early 2000s, following its establishment as the world's first carbon cap-and-trade mechanism. Based on data from EU firms covered in the EU ETS, Clarkson et al. suggested that it was a firm's carbon allocation shortfalls that were negatively associated with its firm value rather than its carbon allowance. Plus, for firms with better carbon performance, the negative relationship between firm value and carbon allocation shortfalls was mitigated [2]. For countries outside the EU, the Australian government once planed to introduce a national Emissions Trading Scheme in March 2008. Chapple et al. investigated the impact of this impending ETS on the market valuation of the Australian Securities Exchange firms by using an event study. Their result showed that the market assesses the most carbon-intensive firms with a market value decrement compared to other firms in the sample [3]. Shen et al. reveal that the announcement of events associated with the EU CBAM negatively affects the stock return of EU export companies and that companies with higher carbon emission intensity have lower stock returns. following the announcement of legislative events of the CBAM [1]. Ma et al. constructed a model for the linkage mechanism among China's carbon emission trading market, energy market, and capital market. They revealed that the dynamic correlation coefficient between China's ETS market and the capital market is negative [4]. Liu et al. investigate the impact of China’s carbon emission trading scheme on the corporate financial performance of A-share listed companies from 2009 to 2018 and find that the enactment of ETS reduces firms’ market value but promotes their total asset-liability ratio [5].

There are other studies that indicate carbon pricing policies positively affect the valuation of firms in carbon-intensive sectors. Oestreich & Tsiakas find that firms granted with free carbon allowances experience higher returns than their peers without free allowances and that the EU ETS boosted the firm value of carbon-intensive German firms by granting free allowances, creating a carbon premium in stock returns [6]. Tang et al. document evidence that China’s carbon emission trading policy improves firms’ market value by promoting firms’ innovative activities and carbon disclosure [7]. Chan et al. find that the initial phases of the EU ETS exhibited limited and uneven

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impacts on firm competitiveness, and no significant effects were observed in the cement or steel sectors, suggesting that early concerns regarding carbon leakage and diminished industrial competitiveness were not empirically substantiated [8]. Wen et al. provide evidence that supports an asymmetric relationship between China's ETS and the stock market. They also argue that the connection between China's ETS and corporate value is not significant [9]. As discussed above, the existing literature has not yet reached a conclusion on the impact of carbon pricing policies on firms' value.

Extant studies have investigated mechanisms by which the carbon pricing policies affect firm value. Veith et al. test the economic consequences of the EU ETS in the electricity generation industry and find that common stock returns are positively associated with carbon allowance price, indicating that these firms can pass their carbon costs to customers [10]. Dewaelheyns et al. investigate how policy-induced carbon risk under the EU ETS affects firm value. They document evidence that highlights carbon risk as a central mechanism influencing firm value and that policy reforms increased regulatory stringency, amplifying future compliance uncertainty and leading to value discounts for under-allocated firms [11]. Empirical evidence from Luo et al. indicates that emission trading enhances firm competitiveness primarily through firm behaviors. They argue that carbon asset trading and energy-saving technologies significantly mediate cost competitiveness, while technology adoption strengthens green competitiveness, implying that deeper participation in ETS mechanisms yields greater competitive advantages for firms [12]. Chen et al. investigate how China's ETS affects firms' investment efficiency and find that China's ETS significantly improves corporate investment efficiency by restraining over-investment rather than alleviating under-investment, and the effect is particularly prominent for firms with strong corporate governance and state-owned enterprises [13]. Chen et al. explore how China's carbon emission trading scheme influences corporate environmental investments. They find that the ETS increases corporate environmental investments by internalizing carbon costs, creating revenue opportunities from selling allowances, and enhancing competitiveness through decarbonization innovation, which in turn improves both environmental and financial performance [14]. Using monthly data from 2010 to 2023 for 139 EU companies, Arlie et al. find a significant negative relationship between carbon allowance returns and stock returns for carbon-intensive companies, suggesting that rising carbon allowance prices significantly reduce stock returns of carbon-intensive firms under the European Union's ETS [15].

Empirical evidence suggests that the impact of carbon pricing policies on firms' financial performance varies markedly across industries, countries, and firm characteristics. Zhang & Liu find that China's ETS significantly reduces financial performance in the nonferrous metal industry but promotes it in the electricity sector, with effects intensifying over time. Firms' carbon abatement investments are valued differently across countries due to varying climate policies [16]. He et al. document evidence that carbon reduction investments reduce firm value in the U.S., enhance value in the U.K., and have no significant effect in Australia, highlighting how national policy stringency shapes investor perceptions of carbon reduction efforts [17]. Shrestha et al. find that firms with high-quality carbon management systems (CMS) experience a weaker negative association between carbon emissions and firm value. CMS adoption signals superior carbon governance, risk mitigation, and efficiency, reducing future regulatory costs and enhancing investor confidence, thereby protecting market value [18]. Niu et al. show that the carbon emission trading system (ETS) has heterogeneous effects across firm characteristics. Non-state-owned enterprises benefit more than state-owned ones due to greater profit orientation and flexibility, while larger firms experience

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significant market value gains, leveraging scale advantages and stronger innovation capacity for low-carbon transformation [19].

2.2. Hypothesis development

The announcement of the CBAM is expected to elicit a negative stock market reaction from affected Chinese firms due to anticipated increases in compliance costs, financial constraints, and restricted learning opportunities. Firstly, the CBAM may increase additional costs of covered products exporting into the EU, potentially reducing sales, profitability, and future cash flows. The CBAM internalizes environmental costs, and exporters should purchase CBAM certificates for the embedded emissions of their products. If the export firms fail to surrender sufficient carbon certificates, significant fines will be imposed on them. The CBAM imposes a direct financial burden by requiring exporters to purchase carbon certificates equivalent to the cost under the EU ETS. Although the cost of one CBAM certificate can be deducted from the carbon cost already paid for the product in the country of origin, given that the average price of EU Allowance (EUAs) in 2023 is 85.32 euros per ton, exporters will spend considerable financial resources to purchase carbon certificates. The CBAM will also incur compliance costs for firms, such as costs for calculating and reporting carbon emissions, and third-party information verification. Companies operating in the affected industries are required to set up an adequate carbon management system and procedures to report carbon emissions. Calculating and reporting the carbon emissions contained in products and the costs of third-party verification will impose additional financial burdens on export firms. These costs will make firms commit resources to nonproductive uses, thus negatively affecting the productivity and competitive advantage of exporters.

Secondly, this new regulatory uncertainty heightens firms' carbon risk, which can exacerbate information asymmetry and lead to stricter financing conditions. Creditors and shareholders may demand a higher risk premium, increasing the cost of capital and constraining investment in profitable projects. Prior evidence suggests that markets rationally price anticipated carbon liabilities before regulation becomes binding. For instance, Chapple et al. document that the Australian market imposed a valuation decrement on carbon-intensive firms in anticipation of the proposed ETS, attributing this penalty to unbooked liabilities arising from future compliance and decarbonization costs, as well as reduced future earnings capacity. Plus, the capital market avoids providing resources to firms that face risk exposure to proposed environmental costs [3]. Investors in the capital market require extra compensation for their exposure to carbon risk that can not be assessed accurately. The affected firms will face financial constraints, such as an inability to borrow, more rigorous loan reviews, and an inability to issue equity.

Finally, a decline in export sales could limit firms' access to advanced EU markets, thereby reducing opportunities to learn from foreign consumers and suppliers, which is a key benefit of international trade. In the short term, these combined pressures—increased costs, heightened financial constraints, and diminished learning effects—are likely to be perceived by investors as detrimental to firm value. Based on the above discussions , I suggest:

H1a: Chinese firms in the affected industries of the EU CBAM experience negative shock returns when the CBAM is officially announced.

Conversely, drawing on Porter's Hypothesis, the EU CBAM could theoretically trigger a positive market reaction by acting as a stimulus for carbon reduction innovation that enhances firm competitiveness. Porter and van der Linde argue that well-designed environmental regulations can facilitate innovation, leading to efficiency gains, better resource utilization, and the development of new, greener technologies that offset compliance costs. The CBAM may signal to investors that

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Chinese exporters have a strong incentive to invest in decarbonization technological innovations, such as modifying carbon-intensive processes, thus improving energy efficiency. Such proactive environmental strategies can lead to a first-mover advantage in the growing global market for sustainable products, potentially opening up new business opportunities and strengthening the firm's long-term competitive position [3]. If investors believe that the regulatory shock of the CBAM will compel management to innovate and fundamentally improve operational efficiency and product offerings, they may reassess the firm's future cash flow potential upwards. Consequently, the announcement of the CBAM could be interpreted as positive news, leading to an increase in firm value and positive abnormal returns in the stock market. The implementation of CBAM may also drive firms, which export covered products to the EU, to improve energy efficiency, use renewable energy, or ameliorate their carbon-intensive manufacturing processes. These activities enable firms to keep foreign markets and maintain green competition of their products. Therefore, I suggest:

H1b: Chinese firms in the affected industries of the EU CBAM experience positive shock returns when the CBAM is officially announced.

3. Research design

3.1. Sample and data

The six sectors covered by CBAM are Hydrogen, Iron and Steel, Cement, Aluminum, Electricity, and Fertilizers. As China does not share a border with the EU, my research excludes the electricity industry. The sample includes the listed firms of China’s A-share market in the above five industries, excluding stocks with Special Treatment (ST). The data of firms’ stock return rates and market index return rates are both derived from publicly available market data.

3.2. Determination of estimation windows

The CBAM entered into force on May 17, 2023, so I chose this day as the event day. The estimation window [-121, -2] lasts 120 trading days, which begins 121 trading days before the event day and ends 2 days before the event day. I select 3-trading-day [-1,+1] as the event window that begins from the day before the enactment of the CBAM and lasts three trading days.

3.3. Measurement of Calculated Abnormal Return (CAR)

This paper uses the market model to estimate the normal returns.

$$R_{it} = \alpha_0 + \alpha_1 R_{mt} + \varepsilon_{it} \tag{1}$$

Here i indicates firms; t indexes trading days. R_{it} represents the stock return of firm i on t-th day, considering cash dividend reinvestment. R_{mt} stands for the market return of the Shanghai and Shenzhen 300 Index.

Abnormal return (AR) for firm i is calculated as follows:

$$AR_{it} = R_{it} - \widehat{\alpha_0} - \widehat{\alpha_1} R_{mt} \tag{2}$$

Here $E(R_{it})$ is the normal return for firm i. Next, calculating the cumulative abnormal return over the event window:

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$$CAR_i[-1,+1] = \sum_{t=-1}^{+1} AR_{it} \quad (3)$$

4. Empirical results

4.1. Overall market reaction

Results of market reaction to the CBAM enactment are presented in Table 1. On the day before the event day, the average abnormal return (AAR) was -0.20% and was significantly negative at the 1% level. This indicates that before the CBAM was published, there might have been a slight negative expectation in the market. On May 17, 2023, that is the event day, the AAR was as high as 0.91% and was highly significant at the 1% level. This was a very strong positive market reaction, indicating that the enactment of the CBAM was interpreted by the market as a piece of positive news, causing the stock price of firms operating in the industries covered by the CBAM to rise significantly on that day. The cumulative average abnormal return (CAAR) starting from the window period rose to 0.71%, which was also at the 1% level. This indicates that the market generated a significant positive cumulative gain. On the day after the enactment, the AAR was -0.11% at the 10% level. This might be a price correction following a strong positive reaction on the event day, and it is a normal adjustment by the market after absorbing the information. The CAAR remained at a relatively high level of 0.60% and maintained a highly significant level at 1%. This indicates that, although there was a value correction the next day, throughout the entire event window period [-1, 1], the market as a whole achieved a significantly positive return. This strongly proves that this event brought a statistically significant and economically considerable positive value effect to the relevant firms, which provides evidence for H1b. The positive market reaction was mainly concentrated on the event day, with slight expected adjustments and value corrections before and after the event, but it did not change the overall positive trend.

Table 1. Market reaction to the CBAM enactment

Event days	AAR	T-statistic	CAAR	T-statistic
-1	-0.0020***	-3.222	-0.0020***	-3.222
0	0.0091***	6.242	0.0071***	4.488
1	-0.0011*	-1.829	0.0060***	3.756

Note: The AAR stands for the average abnormal return, and the CAAR stands for the cumulative average abnormal return. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

4.2. Descriptive analysis

The descriptive analysis is shown in Table 2. On the event day and the day after the event, the average and median values of CAR were very close. This indicates that the distribution of CAR was relatively symmetrical and was not severely distorted by extreme values, enhancing the representativeness of the average value. The standard deviation (SD) on the event day and the day after the event was much larger than that on the day before the event. This suggests that the occurrence of the event significantly increased the heterogeneity of market reactions. Different firms had very different reactions to the event. The distribution range of CAR on the day before the event was narrow (-9.32% to 8.35%), with relatively small fluctuations, which was in line with the market norm before the event did not occur. After the event, the distribution range of CAR expanded, with

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significantly negative and positive values. This suggests the possibility of heterogeneity, that is, different firms had significantly different responses to the policy.

Table 2. Descriptive statistics of CAR

Event days	Obs	Mean	P50	SD	Min	Max
-1	553	-0.0020	-0.0032	0.0146	-0.0932	0.0835
0	553	0.0071	0.0070	0.0372	-0.1091	0.0990
1	553	0.0060	0.0061	0.0378	-0.1261	0.1521

5. Conclusion

This study investigates the short-term market reaction to the official enactment of the European Union's Carbon Border Adjustment Mechanism (CBAM) on May 17, 2023, focusing specifically on Chinese listed firms in the affected industries. This event study analysis reveals a significant positive market reaction to the enactment of the CBAM. The cumulative average abnormal return over the event window was a statistically significant 0.60%, driven primarily by a strong 0.91% positive return on the enactment day itself. This finding suggests that investors, on aggregate, interpreted the CBAM as a stimulus for value creation. This study is not without limitations. The analysis captures only the short-term market reaction; the long-term financial and operational consequences of the CBAM on Chinese firms remain an open empirical question.

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