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Original Paper

Does Trade Pressure Undermine Corporate Green Transformation? Evidence from Anti-Dumping Investigation in China

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Abstract

This study explores the impact of anti-dumping investigations on the environmental expenditure and green transformation of Chinese exporting firms. Drawing on a comprehensive panel dataset of listed firms from 2000 to 2016—merged with firm-level customs trade records and anti-dumping data from the World Bank Global Antidumping Database—a difference-in-differences (DID) framework is utilized to identify the causal effects of anti-dumping trade shocks. The findings reveal that anti-dumping investigations significantly reduce firms' environmental expenditure and weaken corporate social responsibility (CSR), suggesting that institutional trade pressure crowds out sustainability commitments. While regional environmental regulation exerts a buffering effect, mitigating the adverse impact, the environmental policy stringency of export destinations does not demonstrate a significant moderating role. Further analysis shows that anti-dumping pressure also hinders firms' broader green transformation, indicating long-term ecological setbacks beyond immediate financial disruption. By examining firm-level responses to external trade pressure, this study contributes new evidence on the ecological consequences of protectionism and emphasizes the importance of supportive regulatory environments for sustaining corporate green strategies. The results offer practical implications for aligning trade resilience with environmental objectives in the context of global sustainability transitions.

Keywords

Anti-dumping Investigation, Environmental Expenditure, Green Transformation, Corporate Social Responsibility, Environmental Regulation

1. Introduction

In the context of growing global trade frictions and rising environmental standards, China has become the most frequent target of anti-dumping investigations worldwide. As China's export sector continues to shift toward capital-intensive and high-value-added industries, it faces increasingly complex trade disputes—notably anti-dumping actions initiated by major economies such as India, the United States,

Brazil, and the European Union. These investigations often involve substantial tariffs and are frequently justified under the guise of "eco-dumping," introducing not only economic costs but also implicit pressures related to environmental and social responsibilities.

Against this backdrop, a crucial question emerges: Does external trade pressure, in the form of anti-dumping investigations, undermine firms' green transition efforts and commitment to sustainable development? The green transformation of enterprises—including CSR performance and environmental investment—has become a critical strategic priority in response to heightened regulatory oversight and global value chain expectations. However, the extent to which trade protectionism influences firms' environmental behavior remains underexplored. Do anti-dumping investigations, as institutional shocks, discourage corporate investment in environmental responsibility? Alternatively, do they stimulate firms to adopt green practices to retain global legitimacy?

While some studies have examined the economic and innovation-related consequences of anti-dumping (Ao, 2025; Konings & Vandenbussche, 2008; Miyagiwa & Ohno, 2007; Wang et al., 2014), relatively little is known about their environmental implications. A notable exception is Banerjee et al. (2022), who find that in response to trade restrictions on Chinese products, Indian exporters increase CSR investments to signal legitimacy to stakeholders. However, little is known about how Chinese firms themselves adjust their environmental behavior under direct anti-dumping pressure. This gap is particularly important given the rising demand for sustainable trade practices and the emergence of "green barriers" in global commerce.

Two contrasting theoretical perspectives offer explanations. On the one hand, the resource constraint hypothesis posits that anti-dumping investigations impose financial and operational burdens—such as tariffs, disrupted exports, and reputational uncertainty—that crowd out long-term investments in environmental governance. On the other hand, a strategic adaptation perspective suggests that firms may increase green investment or CSR engagement to differentiate themselves in competitive international markets and maintain legitimacy with stakeholders that prioritize environmental performance (Fernández-Kranz & Santaló, 2010; Klein & Dawar, 2004). These diverging views warrant empirical testing within the institutional context of China's outward-facing firms.

This study investigates whether and how anti-dumping investigations affect the environmental behavior and green transformation of Chinese listed exporters. The study constructs a firm-year panel from 2000 to 2016 by matching firm-level CSR and environmental investment data with anti-dumping shocks recorded in the Global Antidumping Database (GAD) and Chinese customs trade records. Employing a difference-in-differences (DID) framework, the impact of anti-dumping exposure on both environmental expenditure and CSR performance is examined, along with key moderating roles of regional environmental regulation and the environmental policy intensity of export markets.

The results suggest that external trade shocks can disrupt firms' green agendas. First, the finding shows that anti-dumping exposure significantly reduces environmental investment, indicating that firms may deprioritize long-term sustainability initiatives under trade-induced institutional stress. Second,

alternative measures of CSR performance confirm a consistent negative impact, suggesting a broad weakening of green commitment. Moreover, regional environmental regulation appears to buffer this adverse effect—firms in stricter regulatory regions display greater resilience. In contrast, the stringency of environmental policy in export destinations does not show significant moderating power. Finally, evidence indicates that anti-dumping investigations weaken firms' broader green transformation processes, highlighting long-term environmental costs of trade protectionism.

This paper contributes to the literature in two ways. First, it expands the understanding of the environmental consequences of trade protection by connecting international trade shocks with domestic green transformation behavior. Second, it introduces institutional and policy conditions—such as local regulation and export market norms—that shape firms' green responses to external pressures. The study emphasizes the need for integrated trade and environmental governance frameworks to avoid sustainability setbacks in the face of growing trade frictions.

2. Literature Review and Research Hypotheses

A substantial body of literature has examined the causes and consequences of anti-dumping investigations against Chinese exports. From an ecological perspective, Liu et al. (2014) observe a positive correlation between carbon-intensive industries and the frequency of anti-dumping investigations, suggesting that carbon-intensive sectors are more vulnerable to trade remedies and environmental characteristics play a role in triggering trade sanctions. These findings have inspired a growing literature emphasizing the role of environmental regulation and ecological accountability in trade disputes.

Some literature also explores their economic consequences at the firm level. A growing number of studies suggest that anti-dumping actions tighten firms' financing constraints, thereby discouraging investment in R&D and innovation (Cao et al., 2021; Li et al., 2020; Shen et al., 2021). More recently, scholars have turned their attention to how external shocks and institutional uncertainty shape corporate behavior. Despite this theoretical development, limited empirical evidence exists on how trade-related institutional shocks—particularly anti-dumping investigations—affect corporate green development.

From a theoretical standpoint, two competing mechanisms may drive such responses. On one hand, the resource constraint hypothesis argues that trade sanctions weaken firms' profitability, cash flow, and financing capacity, thereby crowding out discretionary green expenditures (Apaydin et al., 2021). Anti-dumping investigations represent a major exogenous shock to firms engaged in international trade. Under such pressure, firms may experience both cash flow volatility and a decline in short-term financing ability. Firms facing anti-dumping investigations may choose to suspend or scale down their green engagement to preserve liquidity and operational continuity. Therefore, firms tend to prioritize operational survival over socially responsible engagement, and are more likely to reduce green efforts as a resource-preservation strategy, as the following hypothesis:

H1a: Anti-dumping investigations may inhibit corporate environmental investment.

On the other hand, green investment can also be a strategic tool for risk management, enabling firms to restore reputation and mitigate the adverse effects of regulatory pressure (Baron, 2001; McWilliams & Siegel, 2001). Firms especially those in emerging markets may enhance CSR as a way to stand out, signal credibility, and secure access to high-standard markets, particularly in regions with strong stakeholder preferences for sustainability (Banerjee et al., 2022). By increasing environmental investments or adopting more transparent social policies, firms may attempt to counter accusations of environmental dumping or unfair competition—often the basis of anti-dumping claims (Chi & Wang, 2019). In this way, anti-dumping investigations could trigger proactive environmental behavior to mitigate regulatory or market backlash. This duality in theoretical perspectives forms the basis for two competing hypotheses regarding firms' behavioral responses to anti-dumping investigations. Accordingly, a competing hypothesis is formulated:

H1b: Anti-dumping investigations may enhance corporate environmental performance.

These competing views raise an important empirical question: Does anti-dumping pressure inhibit or stimulate green behavior among targeted firms? This study contributes to the literature by focusing on Chinese firms directly subject to anti-dumping investigations and testing which mechanism plays a more dominant role in shaping their responses.

3. Model Specification

3.1 Dependent Variable: Corporate Environmental Investment

The dependent variable in this study is the corporate environmental expenditures ($envinv_{it}$) of firm i in year t rom the CSMAR database's disclosure records in corporate social responsibility reports. Moreover, green transformation encompasses not only environmental investment but also a broader shift in firm' development strategies toward sustainable and low-carbon models. It has been increasingly viewed as a critical pathway for achieving both economic and ecological objectives (Amore et al., 2019; Dugoua & Dumas, 2021). To measure green transformation, this research adopts a text-based approach inspired by (Loughran & McDonald, 2011; Zhou et al., 2022). By extracting and counting the frequency of these keywords from annual reports, this study constructs a continuous measure of firm-level green transformation efforts ($transgreen_{it}$).

3.2 Key Independent Variables

(1) Anti-Dumping Indicator

The anti-dumping data used in this study is drawn from the Global Anti-Dumping Database (GAD) compiled by the World Bank (Bown, 2010; Bown & Crowley, 2014). This database records anti-dumping cases initiated by countries around the world, including product codes, target countries, investigation dates, and imposed measures. To construct the treatment indicator, the research identifies whether firm i, which exports product h to country c, was subject to an anti-dumping investigation. If yes, the variable AD_{hci} is set to 1, indicating that firm i is in the treatment group. Following (Gao & Bao, 2020; Lu et al., 2013), the study defines the control group as firms that export the same HS4-level products to the same

destination country but are not involved in any anti-dumping cases during the sample period.

This matching strategy at the export country-product level allows me to compare firms with similar export characteristics while isolating the impact of anti-dumping investigations. Firm-level export data is obtained from the Chinese Customs Trade Database, which provides detailed transaction-level information on product codes, export destinations, trade volume, and value.

(2) Post-Investigation Time Dummy

The study constructs a post-treatment time indicator variable $Post_{hct}$, which equals 1 for years following the initiation of an anti-dumping investigation targeting product *h* exported to country *c*, and 0 otherwise. If the specific investigation date is unavailable, the research infers it based on the announcement of the preliminary or final determination. For firms subject to multiple anti-dumping investigations by the same country over time, the earliest investigation year is used as the treatment start point, and the dummy remains 1 for all subsequent years.

3.3 Data Sources and Sample

The data used in this study are drawn from multiple authoritative sources. Information on anti-dumping investigations comes from the Global Anti-Dumping Database (GAD) compiled by the World Bank, which includes detailed records of anti-dumping cases initiated by importing countries, such as the targeted product codes, origin countries, initiation dates, and imposed measures. Firm-level export data are obtained from the Chinese Customs Trade Database from 2000 to 2016, which provides transaction-level information on exporting firms, product classifications, export destinations, trade volumes, and trade values. The financial and disclosure data are from the CSMAR (China Stock Market and Accounting Research) database. It also includes a set of firm-level control variables to account for potential confounding factors. Specifically, these variables including asset size, profitability, leverage, revenue growth, and financing constraint measures, are controlled and also sourced from CSMAR.

The final sample covers 1,430 listed firms. For the sample of listed exporting firms in the study, the interaction term *AD*Post* has a mean value of 0.05, indicating that approximately 5.2% of the firm-year observations in the sample fall into the treatment group, firms that were subject to anti-dumping investigations in the post-treatment period.

Table 1. Variable Definitions

Variable Name	Symbol	Definition
Anti-Dumping Treatment	AD_{hci}	Equals 1 if firm *i* exports product *h* to country *c* and the product is subject to an anti-dumping case; 0 otherwise.
Post-Investigation Period	$Post_{hct}$	Equals 1 for year *t* and all subsequent years after country *c* initiates an anti-dumping investigation on product *h*; 0 otherwise.

Corporate environmental expenditure	$envinv_{it}$	Corporate environmental expenditure of firm *i* in year *t*.
Return on Assets	ROA	Net income divided by total assets.
Leverage Ratio	Lev	Total liabilities divided by total assets.
Firm Age	age	Natural logarithm of the number of years since firm establishment.
Revenue Growth	growINC	Annual growth rate of main business revenue.
Environmental Regulation Intensity	envreg	Regional pollution control cost per unit of industrial output, scaled by the share of industrial value-added in GDP.

3.4 Model Specification

To examine the impact of anti-dumping investigations on Chinese firms' green performance, a difference-in-differences (DID) empirical strategy is adopted. A DID design using variation along both the export destination–product dimension and the time dimension, is constructed. Specifically, for a given destination country *c* and product *h*, firms exporting product *h* to country *c* that are subject to an anti-dumping investigation constitute the treatment group, while other firms exporting comparable products (within the same HS4 industry) to the same destination but not subject to an anti-dumping case form the control group. The treatment timing is defined by the year in which country *c* initiates an anti-dumping investigation on product *h*; all years after that are coded as the post-treatment period.

The baseline regression model is specified as follows:

$$envinv_{it} = \alpha_0 + \alpha_1 AD_{hci} + \alpha_2 AD_{hci} * Post_{hct} + \beta_1 X_{it} + \varepsilon_{it}$$

Where $envinv_{it}$ is the environmental expenditure of firm *i* in year *t*; AD_{hci} is a treatment indicator equal to 1 if firm *i* exports product *h* to country *c* and that product is subject to an anti-dumping investigation; $Post_{hct}$ is a time dummy equal to 1 for years after the anti-dumping investigation on product *h* by country *c*, and 0 otherwise; $AD_{hci} * Post_{hct}$ is the DID interation term of interest; X_{it} is a vector of firm-level control variables. The coefficient of interest is α_2, which captures the average treatment effect of anti-dumping investigations on green development. A significantly negative α_2 would indicate that anti-dumping pressure suppresses environmental engagement among targeted firms.

4. Results

4.1 Baseline Regression Results

Table 2 presents the baseline DID regression results. Across all four model specifications, the coefficient on the interaction term *AD*Post* is negative and statistically significant at the 5% level, indicating that environmental expenditures decline following the initiation of anti-dumping cases. In Column (1), firm and year fixed effects are included, and Column (2) adds industry fixed effects, with the coefficient statistically significant. Column (3) further controls for export destination fixed effects, and Column (4) presents the fully specified baseline model, which additionally includes firm-level control variables. The

coefficient on *AD*Post* remains negative at -18.79 ($p<0.05$), indicating that anti-dumping investigations lead to a reduction in firms' environmental investments.

These findings lend strong support to H1a, which posits that external institutional pressure, specifically in the form of trade sanctions, imposes financial and strategic constraints that suppress green engagement. This result is consistent with the resource constraint mechanism, wherein firms reduce discretionary spending such as environmental investment in order to preserve financial flexibility during periods of external stress.

Table 2. Baseline DID Regression: The Impact of Anti-dumping Investigations on Environmental Expenditure

	(1)	(2)	(3)	(4)
	envinv	envinv	envinv	envinv
AD*Post	-17.502**	-17.243**	-18.117**	-18.790**
	(-2.25)	(-2.22)	(-2.38)	(-2.44)
AD	17.685**	17.587**	18.581**	19.093**
	(2.27)	(2.27)	(2.48)	(2.54)
Controls	No	No	No	Yes
Firm	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Industry	No	Yes	Yes	Yes
Country	No	No	Yes	Yes
N	28242	28242	28242	28242
adj. R-sq	0.733	0.735	0.737	0.750

Note. Coefficients marked *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. This convention applies to all subsequent regression tables unless otherwise stated.

Given that environmental expenditure is a specific dimension of corporate social performance, to ensure the robustness of findings, this research re-estimates the baseline model using an alternative measure. According to Banerjee et al. (2022), CSR performance can be disaggregated into three major categories: charitable donations, community-related expenditures, and environmental spending. Among them, environmental investment represents a firm's tangible commitment to sustainability and ecological responsibility.

The CSR score (csr_{it}) of firm i in year t is constructed using the index method widely adopted in prior literature of Bu et al. (2021). Table 3 presents the regression results. Across all four model specifications, the coefficient on the interaction term AD*Post is negative and statistically significant at the 10% level. These results confirm that the negative effect of anti-dumping investigations on CSR performance,

confirming that the negative effect of anti-dumping investigations on social performance is not driven by a particular measurement approach and that trade pressure.

Table 3. The Impact of Anti-dumping Investigations on CSR Performance

	(1)	(2)	(3)	(4)
	csr	csr	csr	csr
AD*Post	-0.156*	-0.170*	-0.166*	-0.149*
	(-1.81)	(-1.90)	(-1.86)	(-1.68)
AD	0.158*	0.174**	0.174**	0.157*
	(1.95)	(2.06)	(2.05)	(1.89)
Controls	No	No	No	Yes
Firm	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Industry	No	Yes	Yes	Yes
Country	No	No	Yes	Yes
N	64824	64824	64824	64824
adj. R-sq	0.721	0.729	0.730	0.736

Note. Coefficients marked *, *, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

4.2 Moderating Role of Environmental Policies

4.2.1 Regional Environmental Regulation

While the baseline results suggest that anti-dumping investigations suppress corporate environmental performance, firm behavior may be shaped not only by trade-related shocks, but also by the broader institutional environment in which firms operate. In particular, local environmental regulatory regimes may influence how firms respond to external pressures. Prior study has shown that stricter environmental regulations can create pressure effects that incentivize firms to enhance their environmental and social performance through increased investment, disclosure, and innovation (Zhang et al., 2019).

Building on this insight, the study examines whether regional environmental regulation intensity mitigates the negative impact of anti-dumping investigations. Following prior research (Du et al., 2023; Jiang & Zhao, 2019), a region-level environmental regulation index (*Envreg*) is constructed based on pollution control investment per unit of industrial output, adjusted for the industrial share of GDP. This variable serves as a proxy for local regulatory stringency.

Table 4. The Role of Regional Environmental Regulation

	(1)	(2)
	csr	csr
AD*Post	-0.295***	-0.273**
	(-2.64)	(-2.49)
AD*Post*Envreg	16.516**	15.872**
	(2.22)	(2.19)
AD	0.173**	0.156*
	(2.04)	(1.88)
Controls	No	Yes
Firm/Year	Yes	Yes
Industry/Country	Yes	Yes
N	64824	64824
adj. R-sq	0.730	0.736

As shown in Table 4, the interaction term between *AD*Post* and *Envreg* is positive significantly ($p<0.05$), suggesting that environmental regulation acts as a moderating force. Specifically, in regions with higher levels of environmental regulation, the negative effect of anti-dumping investigations is significantly attenuated. This indicates that firms facing both trade pressure and environmental scrutiny are more likely to maintain or even enhance related activities, particularly in areas related to sustainability and compliance.

Notably, while anti-dumping investigations impose financial and strategic constraints, regional environmental policy acts as an institutional buffer, encouraging firms to sustain socially responsible behavior. From a policy perspective, this finding highlights the importance of coordinated regulatory governance, suggesting that domestic environmental institutions can play a proactive role in mitigating the unintended social consequences of international trade sanctions.

4.2.2 Extended Analysis: Export Market Environmental Policies

To further assess the institutional conditions under which anti-dumping affect corporate environmental and social performance, the study extends the analysis to examine whether environmental policy stringency in export destination countries moderates the response of Chinese firms. Specifically, the study includes OECD Environmental Policy Stringency (EPS) Index, a widely used, cross-country comparable metric that captures the degree to which governments impose explicit or implicit costs on environmentally harmful behavior (Kruse et al., 2022). The EPS index is constructed based on 13 types of regulatory instruments, with values ranging from 0 (least stringent) to 6 (most stringent).

Table 5. The Role of Export Market Environmental Policy

	(1)	(2)
	csr	csr
AD*Post	-0.171*	-0.156*
	(-1.94)	(-1.76)
AD*Post*EPS	0.010	0.013
	(0.22)	(0.29)
AD	0.174**	0.157*
	(2.05)	(1.89)
Controls	No	Yes
Firm/Year	Yes	Yes
Industry/Country	Yes	Yes
N	64824	64824
adj. R-sq	0.730	0.736

Table 5 reports the results using the interaction term between *AD*Post* and *EPS*. While the coefficient is positive—suggesting a possible moderating effect—the result is not statistically significant. This indicates that, within the sample period, the environmental policy stringency of export destination countries does not significantly mitigate the negative impact of anti-dumping investigations. There are several plausible explanations for this result. First, due to the structure of the anti-dumping data, exports to individual EU member states are consolidated under the umbrella of "EU," whereas the EPS index reports separate values for each member state. To match the two datasets, the study takes the average EPS score across EU countries, which likely dilutes cross-country variation and weakens the empirical power of the test. Second, unlike domestic environmental regulation—whose enforcement directly shapes firms' resource allocation and compliance behaviors—foreign environmental policies may only exert indirect or delayed influence on exporters. The disciplining effects of destination-country regulation may take time to materialize, as firms gradually adjust through long-term investments in green technology, branding, or upgrading of product lines in response to increasing international expectations. This analysis plays a role in shaping corporate responses to trade policy shocks, and also reinforces the finding that local regulatory environments, rather than external market institutions, appear to be the more immediate and binding source of behavioral adjustment for firms facing anti-dumping actions. These findings underscore the role of multi-level governance structures and demonstrate that firms' strategic responses to trade shocks are conditioned not only by economic pressures but also by the regulatory environments in which they are embedded.

4.3 Anti-Dumping Investigations and Corporate Green Transformation

Green transformation encompasses not only environmental investment but also a broader shift in firm'

development strategies toward sustainable and low-carbon models. It has been increasingly viewed as a critical pathway for achieving both economic and ecological objectives (Amore et al., 2019; Dugoua & Dumas, 2021). The study further investigates whether anti-dumping investigations impede firms' progress in green transformation, thereby examining the ecological consequences of trade-induced regulatory shocks.

To measure green transformation, a text-based approach inspired by (Loughran & McDonald, 2011; Zhou et al., 2022) is adopted. By extracting and counting the frequency of these keywords from annual reports, a continuous measure of firm-level green transformation efforts is constructed. This approach allows us to assess deeper shifts in corporate sustainability orientation. As shown in Table 6, the coefficient on the interaction term *AD*Post* is consistently negative significantly (-0.112, $p<0.05$), even after controlling for firm characteristics and a full set of fixed effects. This suggests that anti-dumping investigations significantly hinder firms' green transformation processes.

Table 6. The Impact of Anti-dumping Investigations on Corporate Green Transformation

	(1)	(2)	(3)
	transgreen	transgreen	transgreen
AD*Post	-0.108**	-0.112**	-0.112**
	(-2.41)	(-2.52)	(-2.50)
AD	0.108**	0.112***	0.113***
	(2.55)	(2.68)	(2.68)
Controls	No	No	Yes
Firm/Year	Yes	Yes	Yes
Industry/Country	No	Yes	Yes
N	61916	61916	61916
adj. R-sq	0.659	0.668	0.670

While some scholars view green transformation as an integral part of corporate social responsibility (Di Giuli & Kostovetsky, 2014), others emphasize its broader and more strategic nature. Regardless of the definitional scope, the results confirm that anti-dumping investigations have detrimental ecological implications. From a theoretical standpoint, this finding complements the resource constraint framework: when firms face institutional shocks that compromise liquidity and increase uncertainty, they tend to deprioritize long-term strategic initiatives, including those related to environmental upgrading.

Importantly, this negative effect challenges the assumption that external regulatory pressure automatically promotes environmental progress. Instead, the findings highlight the conditional nature of green transformation, which requires not only pressure but also supportive internal resources, technological capacity, and enabling policy environments. Absent such conditions, firms under stress

may rationally postpone green transition efforts, reinforcing the notion that survival needs often override sustainability ambitions in the short term.

5. Conclusion

In the era of global sustainability transformation and China's dual carbon goals, understanding how trade-induced institutional shocks affect corporate environmental behavior has become increasingly urgent. This study investigates how anti-dumping investigations—one of the most frequent and politically sensitive trade measures faced by Chinese exporters—affect firms' environmental responsibility and broader green transformation. While CSR is often viewed as a strategic response to external pressure, the findings suggest that in the face of financial constraints and policy uncertainty, such commitments may be undermined.

Empirical results show that anti-dumping investigations significantly reduce environmental expenditure, indicating that trade sanctions not only impose economic burdens but also disrupt firms' long-term sustainability investment. The alternative indicator—CSR performance—also declines significantly following anti-dumping shocks, reinforcing the conclusion that firms may retreat from green commitments under external pressure. These outcomes reflect the salience of the resource constraint mechanism: when firms are exposed to institutional shocks that elevate risk, discretionary environmental efforts are often scaled back.

Further, firms located in regions with stricter domestic environmental regulation exhibit a more muted negative response. Stronger regulatory environments appear to buffer the negative effects of anti-dumping shocks, encouraging sustained environmental engagement despite adverse trade conditions. In contrast, the environmental policy stringency of export destinations does not demonstrate a significant moderating effect, implying that external signals may lack immediate influence on firms' internal sustainability behavior.

Importantly, the analysis reveals that anti-dumping investigations also suppress firms' green transformation, including efforts to realign business models with environmental objectives. These findings extend the impact of trade pressure beyond short-term cost adjustment, showing that it can delay or disrupt long-term ecological upgrading. These findings highlight the need for institutional coordination. While external shocks such as anti-dumping may temporarily hinder these efforts, such investments remain critical for sustaining long-term competitiveness, market legitimacy, and environmental accountability. Companies should recognize that environmental responsibility and green transformation are no longer optional; they represent critical components of competitiveness in a global economy increasingly defined by environmental standards.

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