

The Impact of Environmental Regulation on Corporate Cross-Regional Investment in China

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ABSTRACT

This study examines how environmental regulation influences corporate cross-regional investment in China. Using panel data from listed companies (2007 – 2023), we find that stricter environmental regulation significantly promotes cross-regional investment, robustly supporting the "Pollution Haven Effect" as firms relocate to avoid high compliance costs. In contrast, no evidence is found for the "Porter Effect" (innovation inducement) in the overall sample. Heterogeneity analysis reveals a clear "avoidance effect" in the strictly regulated East, an "investment absorption effect" in the West, and an insignificant impact in the Central region. We conclude that China's current environmental regulations primarily drive investment relocation rather than green innovation. These findings hold important implications for optimizing environmental policy design and promoting regional coordinated green transformation.

KEYWORDS

Environmental regulation; Corporate cross-regional investment; Avoidance effect

1 Introduction

In recent decades, China's rapid economic expansion has been accompanied by significant energy consumption and environmental pollution, making resource and environmental constraints a critical challenge to sustainable development. Since 2007, as China entered a phase of economic transformation, green development has risen to the level of a national strategy. Consequently, a series of increasingly stringent environmental regulations have been implemented—from pollution discharge fees and total emission controls to carbon trading pilots and the "Dual Carbon" goals. These policies have substantially raised corporate compliance costs, profoundly influencing firms' operational and investment decisions, particularly regarding their geographic location.

Given China's vast territory and significant regional disparities, a critical question arises: how does environmental regulation shape corporate cross-regional investment? Theory suggests two opposing effects. The "Pollution Haven Effect" posits that firms will relocate investments from high-regulation to low-regulation areas to avoid costs. In contrast, the "Porter Hypothesis" argues that regulation can induce innovation, enhancing competitiveness and potentially retaining investment. The dominance of these mechanisms in the Chinese context remains an open empirical question.

This study contributes to the literature by providing systematic evidence on how environmental regulation influences the spatial distribution of firms—a topic less explored compared to its impacts on productivity or trade. For policymakers, understanding this is vital. If regulations simply lead to pollution relocation, it could exacerbate regional imbalances. If they spur innovation, a virtuous cycle of green growth is possible. We analyze data from Chinese listed companies from 2007 to 2023, a period that captures the evolution of China's environmental policies and ensures data reliability. Our findings indicate that, on aggregate, stricter environmental regulation promotes cross-regional investment, strongly supporting the Pollution Haven Effect, while we find no evidence for the Porter Effect. Importantly, we identify significant regional heterogeneity: a pronounced "avoidance effect" in the strictly regulated East, an "investment absorption effect" in the West, and an insignificant impact in the Central region. The rest of the paper is structured as follows: Section II reviews relevant literature and develops our hypothesis. Section III outlines the research design. Section IV presents the empirical results and heterogeneity analysis. Section V concludes with policy implications.

2 Literature review

Corporate cross-regional investment is a key strategic decision for market expansion and resource acquisition, influenced by institutional factors, the economic environment, and internal corporate governance (Qiu Feng et al., 2005). This section reviews the diverse drivers of such investment, focusing subsequently on the specific role of environmental regulation.

2.1 Diverse drivers of corporate cross-regional investment

Existing research identifies multiple drivers of cross-regional investment:

Institutional Factors: Political connections (Xia Lijun et al., 2011), government-business relationships including corruption (Guo Kai, 2016), and major institutional improvements like capital market connectivity (Hong Xiaoyu et al., 2023) and judicial independence (Song Xiaoning et al., 2023) significantly promote cross-regional investment by reducing

barriers.

Economic Environment Factors: Infrastructure development, such as high-speed rail (Ma Guangrong et al., 2020), and digital transformation (Ma Weibiao et al., 2023; Zhang Xinhe et al., 2023; Ni Kejin et al., 2021) reduce information and transaction costs, facilitating flexible cross-regional investment.

Internal Corporate Governance Factors: Governance structure, like non-state shareholder participation in SOEs (Zhuang Zixuan et al., 2023), and executive characteristics such as CEO background in private firms (Liang Jiaqi, 2021) also shape geographic investment preferences. This rich literature underscores a key question: what role does the increasingly critical institutional variable of environmental regulation play?

2.2 Environmental regulation and cross-regional investment: mechanism and evidence

The primary mechanism linking environmental regulation to investment location is the "Pollution Haven Effect." Regulation imposes a "compliance cost effect," increasing firms' operational burden (Gray, 1987; Jaffe et al., 1995) and pressuring productivity and profitability (Li Xiaosheng and An Qingxian, 2012; Xu Yankun and Qi Yu, 2017; Sheng Dan and Zhang Guofeng, 2019). This cost pressure motivates firms to shift investment from high-regulation to low-regulation regions to maintain competitiveness.

Li Juncheng et al. (2023) provide direct evidence from China, showing that environmental regulation increases corporate risk-taking and the scale of cross-regional investment, particularly in pollution-intensive sectors, confirming the "avoidance effect" with production costs as a key channel.

2.3 Positioning of this paper

Building on the foundation laid by Li Juncheng et al. (2023), this paper re-examines the proposition that "environmental regulation drives corporate cross-regional investment" using an extended sample period (2007–2023) and different model specifications. Its primary contribution is a focused analysis of the regional heterogeneity of this impact—specifically, testing for the "avoidance effect" in eastern regions and the "investment receiving effect" in western regions—to provide richer evidence on the spatial economic effects of environmental regulation.

3 Theoretical analysis and research hypotheses

Environmental regulation theoretically affects corporate investment through two channels: by increasing compliance costs, which may dampen investment, or by inducing innovation that enhances competitiveness (the Porter Effect). However, in practice, the immediate impact is often a substantial rise in costs for pollution abatement equipment, process modifications, and taxes. These costs place a heavier burden on firms, particularly in polluting industries.

Faced with this pressure, and given China's significant regional disparities, rational firms have a strong incentive to avoid high costs by relocating investment. This aligns with the "Pollution Haven Effect": when environmental standards are strict in one region (e.g., the developed Eastern coast) but laxer in others (e.g., parts of the Central and Western regions with lower factor costs), firms may shift investments to capitalize on regulatory arbitrage. Indeed, industries like steel and cement have shown such trends since 2007.

Therefore, we expect that environmental regulation primarily acts as a cost push, leading to an avoidance strategy rather than inducing local innovation in the aggregate sample. This leads to our core hypothesis:

H1: Higher environmental regulation intensity increases a firm's likelihood of cross-regional investment.

4 Research design

4.1 Data sources

This paper uses data from listed companies in China from 2007 to 2023, combined with regional environmental regulation indicators, to construct a panel dataset.

4.2 Variable definitions

Dependent Variable: Intensity of corporate cross-regional investment (measured by the number of cross-regional subsidiaries). (ICCI)

Core Explanatory Variable: Environmental regulation intensity (measured by SO₂ emissions of the host city). (ERI)

Control Variables:

- (1) Firm size, measured by the natural logarithm of total assets at year-end. (Size)
- (2) Asset-liability ratio, reflecting capital structure. (Lev)
- (3) Return on Equity (ROE), measuring profitability.
- (4) Book-to-market ratio, reflecting growth opportunities. (BM)
- (5) Listing age, controlling for firm lifecycle effects. (ListAge)
- (6) Shareholding ratio of the largest shareholder, controlling for the influence of ownership concentration. (Top1)

(7) Shareholding ratio of institutional investors, controlling for the role of external monitoring. (INST)

4.3 Empirical model

A two-way fixed effects model is employed to test the impact of environmental regulation on corporate cross-regional investment.

5 Empirical results and analysis

5.1 Descriptive Statistics

Table 1

Variables	Amount	Mean	Std	Min	Max
ICCI	43,737	41,035	68,518	0	682,922
ERI	49,164	10.07	25.96	0	487
Size	49,359	22.12	1.304	19.31	26.45
Lev	49,359	0.421	0.208	0.0278	0.934
ROE	49,279	0.0614	0.141	-1.127	0.469
BM	49,359	1.004	1.184	0.0514	10.14
ListAGE	49,359	2.005	0.952	0	3.434
Top1	49,325	0.341	0.149	0.0752	0.758
INST	49,258	0.441	0.247	0.00102	0.937

The table above reports the descriptive statistics of the main variables. It can be observed that there are considerable differences in variables such as environmental regulation intensity, firm size, capital structure, and profitability across the sample. For example, the significant gap between the maximum and minimum values of the environmental regulation indicator suggests obvious differences in the enforcement of environmental policies across regions; firm characteristic variables like size and asset-liability ratio also show wide distributions, indicating that the sample reasonably reflects heterogeneity among firms. This provides a good data foundation for further regression analysis.

5.2 Baseline regression results

Table 2

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ERI	-5.37e-05*** (5.32e-06)	-5.38e-05*** (5.31e-06)	-5.34e-05*** (5.34e-06)	-5.37e-05*** (5.34e-06)	-5.34e-05*** (5.41e-06)	-5.32e-05*** (5.43e-06)	-5.31e-05*** (5.45e-06)	-5.29e-05*** (5.43e-06)
Size		0.697 (0.563)	1.037* (0.575)	1.051* (0.614)	0.854 (0.571)	0.957 (0.587)	0.968 (0.594)	0.979 (0.634)
Lev			-4.901** (2.053)	-4.911** (2.230)	-5.174** (2.321)	-4.504* (2.384)	-4.467* (2.385)	-4.374* (2.393)
ROE				0.580 (1.457)	0.894 (1.235)	0.704 (1.236)	0.822 (1.218)	0.821 (1.219)
BM					0.400 (0.642)	0.332 (0.648)	0.340 (0.653)	0.327 (0.658)
ListAGE						-0.844 (0.611)	-0.937 (0.624)	-0.935 (0.627)
Top1							-2.355 (4.601)	-2.540 (4.509)
INST								-0.0142 (2.608)
Cons	18.06*** (1.245)	18.06*** (1.245)	3.458 (12.17)	-1.777 (12.29)	-2.098 (12.88)	2.075 (11.93)	0.533 (12.19)	0.966 (12.31)
R2	0.023	0.024	0.024	0.024	0.025	0.025	0.025	0.025
N	43,737	43,737	43,737	43,668	43,668	43,668	43,636	43,580

(Cluster-robust standard errors (clustered by firm) in parentheses, *p<0.10, **p<0.05, ***p<0.01)

The table above presents the baseline regression results. It can be seen that, under different model specifications, the environmental regulation variable is consistently significantly negative (at the 1% significance level), indicating that higher environmental regulation intensity makes firms more inclined to invest in other regions. This result robustly supports the "Pollution Haven Effect," i.e., firms evade strict environmental constraints through cross-regional investment.

Meanwhile, the results for the control variables are also in line with expectations: Firm size is significantly positive in some models, indicating that larger firms have greater capacity for cross-regional investment; the asset-liability ratio is significantly negative in most models, reflecting that firms under greater financing pressure find it harder to expand across regions; while indicators like profitability and growth opportunities show relatively insignificant results, suggesting

their limited role in corporate cross-regional investment.

Overall, the baseline regression results are consistent with the theoretical analysis: environmental regulation dampens firms' willingness to invest locally by increasing compliance costs, thereby pushing firms to relocate.

5.3 Robustness tests

Table 3

	(1) Exchange explanatory variable	(2) Exchange dependent variable
ERI	-1.21e-05*** (4.25e-06)	-3.86e-06*** (3.47e-07)
Size	0.890 (0.639)	0.0422 (0.0263)
Lev	-4.592* (2.410)	-0.0900 (0.0861)
ROE	1.182 (1.232)	0.0774 (0.0556)
BM	0.417 (0.655)	-0.00622 (0.0178)
ListAGE	-1.159* (0.631)	-0.0640** (0.0261)
Top1	-3.379 (4.509)	0.0920 (0.166)
INST	-2.269 (3.509)	0.0636 (0.103)
Cons	-3.156 (12.30)	0.692 (0.528)
R2	0.013	0.074
N	43580	43580

To verify the reliability of the conclusions, this paper conducted robustness checks from two aspects: replacing the environmental regulation indicator and changing the measurement method of the dependent variable. The results show that the environmental regulation variable remains significantly negative at the 1% level, with the same direction as the baseline regression. This further indicates that the conclusions of this paper are not driven by variable selection or model specification but are relatively robust.

5.4 Heterogeneity tests

Table 4

	(1) East	(2) Middle	(3) West
ERI	-0.000114*** (8.73e-06)	4.78e-06 (8.55e-06)	2.11e-06* (1.25e-06)
Size	1.373 (0.951)	0.748 (0.625)	0.113 (0.322)
Lev	-7.130** (3.403)	0.614 (1.699)	-0.641 (0.972)
ROE	1.960 (1.804)	-1.704* (1.030)	-0.126 (0.615)
BM	0.471 (0.969)	0.0961 (0.269)	0.237 (0.189)
ListAGE	-0.307 (0.886)	-0.820* (0.479)	0.00739 (0.353)
Top1	-6.277 (6.636)	1.219 (3.217)	-0.547 (1.619)
INST	-0.135 (3.706)	1.934 (1.465)	-0.946 (1.118)
Cons	8.401 (18.71)	-15.13 (13.65)	0.369 (6.341)
R2	30,685	7,221	5,674
N	0.048	0.149	0.048

To further explore the regional differences in the impact of environmental regulation on corporate cross-regional investment, this paper conducts regressions separately for the Eastern, Central, and Western regions. The findings are:

Eastern Region: The environmental regulation coefficient is significantly negative, indicating that strict environmental policies in the East significantly suppress local investment, thereby strengthening the tendency to relocate; the avoidance effect is most evident.

Central Region: The environmental regulation variable is not significant, suggesting a limited impact of regulation in this region.

Western Region: The environmental regulation variable is positive and significant at the 10% level, indicating that

regulation has actually attracted investment to some extent, which may be due to relatively loose regulation and more policy support, leading to the transfer of production capacity by enterprises there.

This result shows that the economic effects of environmental regulation have significant regional differences: under strict regulations in the East, firms exhibit an "avoidance effect"; whereas in the West, looser environments and policy advantages make an "investment receiving effect" prominent.

6 Conclusions and Implications

6.1 Research conclusions

This study finds that stricter environmental regulations in China primarily drive firms to relocate investments across regions ("Pollution Haven Effect"), rather than spur innovation ("Porter Effect"). Regional analysis shows strong avoidance behavior in the strictly regulated East, an absorption effect in the West, and insignificant impact in the Central region. Overall, regulations have raised compliance costs and redirected investment, without broadly incentivizing green innovation.

6.2 Policy implications

Policies should coordinate environmental standards across regions to prevent pollution transfer, supplement regulations with innovation incentives (e.g., green finance), and enhance monitoring in investment-receiving regions to avoid new pollution hotspots.

6.3 Limitations and future research

Future research could explore industry- and firm-heterogeneity and use multi-dimensional regulatory indicators. The Porter Effect may still exist within innovative subsamples.

About the Author

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