

# *Does state-holding matter the impact of business performance on environmental performance in China's manufacturers?*

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**Abstract:** The widespread state-holding of manufacturers and severe environmental pollution enlighten to investigate if Chinese government well coordinates the relationship between firms' business performance (operational performance, financial performance, and speed of development) and environmental performance. We use R&D investment, net profit rate, and growth to represent above 3 kinds of business performance, respectively. Empirical results show that R&D investment significantly positively interacts with environmental performance, while such state does not appear in the interaction between net profit rate as well as growth and environmental performance. Further, the moderating role of state-holding is not very positive.

## 1. Introduction

There is growing debate on channels to mitigate climate change, and prior experience shows that the worsening natural environment occurring in economic sectors, especially in manufacturers, is largely attributed to their less climate-friendly operation. In recent years, China is undertaking a huge environmental pressure because the rapid economic growth expands the scale of energy consumption and pollutants emission that trigger the severe and persistent haze as well [1]. As a country with a strong sense of international responsibility, enhancing manufacturers' environmental performance (EP) has been a key approach to achieve China's green economy.

## 2. Literature review

State-holding is a key way for government to involve in firms' operations. China's state-owned firms are described as the public sector, which implies that they are liable to share interests with public groups. The universal large-size of manufacturing firms and high liquidity of market information in China implies that most firms can access sufficient available resources for daily production by various channels [2]. In this case, internal resources will further help to enhance operational performance. Compared with R&D, the contribution of financial performance may be

weak and unstable, especially in China where the establishment of business ethics is facing the longstanding challenge. In this paper, we use net profit rate (NPR) to reflect financial performance due to its close link with firms' daily affairs. In reality, financial performance includes many indicators (e.g., ROE and ROA), while major shareholders usually first focus on the change of NPR because it directly shows the added monetary value created by operation activity [3]. In addition, prior literature focusing on business ethics in China implied that firms are experiencing the challenge from environmental crisis, while top managers still more focus on the political requirement with partly neglecting the nature of CSR that is to create sustainable social value [4]. In this case, we infer that the positive impact of GROWTH on EP is also weak in Chinese firms and then propose following hypotheses.

H1a. R&D positively influences EP in China's manufacturers.

H1b. State-holding positively moderates the impact of R&D on EP.

H1c. Stronger State-holding will trigger a greater impact that R&D makes to EP.

H2a. NPR weakly positively influences EP in China's manufacturers

H2b. State-holding positively moderates the impact of NPR on EP.

H2c. Stronger state-holding will trigger the greater impact that NPR makes to EP.

H3a. GROWTH positively influences EP in China's manufacturers.

H3b. State-holding positively moderates the impact of GROWTH on EP.

H3c. Stronger state-holding will trigger the greater impact that GROWTH makes to EP.

### **3. Research methodology**

#### **3.1. Data collection**

Based on the availability of data, we collect 1627 reports of Chinese listed manufacturing firms that cover CSR information from 2010 to 2021 to analyze the impact of BP on EP under the moderating role of state-holding. We regard each CSR report as an independent sample because for the same firm, their BP, EP, ownership structure, and some profiles will always change every year.

#### **3.2. Method and variables**

Dependent variable: This paper calculates the level of EP by multiplying the level of environmental activity and EMC. Independent variable: Based on our research goals, we define R&D, NPR, and GROWTH as independent variables. Moderating variable: We select the proportion of state-holding owned by top10 shareholders as the moderating variable. Control variable: (1) Firm's size (SIZE). (2) Firm's listed age (AGE). (3) Firm's pollution level (POLLUTION). (4) Firm's location (LOCATION). (5) Whether publishing environmental activity following GRI or ESG (GE). (6) Whether employing international accounting firm to audit annual performance (IA). (7) Diluted earnings per share (DEPS).

### **4. Empirical results**

#### **4.1. Test for full samples**

In Table 1, SIZE, POLLUTION, GE, and IA all significantly positively influence EP no matter whether considering SOS with maximum marginal contributions as 7.915, 31.756, 105.963, and 25.801, respectively. These data first supports that possessing sufficient internal resources and applying international management mode can help to enhance the level of EP. More importantly, it tells a positive case that the environmental management in China's heavy-polluting firms has made

a certain achievement. If not considering the moderating role of state-holding (Model 3), R&D still significantly positively influences EP, which verifies H1a. However, such case has not appeared in the impact of NPR and GROWTH, hence H2a and H3a are not supported, which indicates that compared with financial performance and speed of development, operational performance is more closely related to environmental management because it always directly influences the process of environmental management. In addition, state-holding significantly positively influences EP. At the same time, state-holding weakly positively moderates the impact of NPR and GROWTH on EP while fails to positively moderate the impact of R&D, which verifies H2b and H3b while H1b not. Such case indicates that the positive role of state-holding in the environmental management of China's manufacturers is limited. Here, what we need to note is that state-holding has not strengthened the impact of R&D on EP. To a great extent, the positive R&D reflects the will of firms to develop cleaner production in the context of such production mode is being widely accepted. Therefore, we expect that the driving force from both state-holding and strong sense of cleaner production jointly promote non-state-owned firms to improve the natural environment, which also shows a bright environmental management outlook in China's manufacturers.

Table 1: The impact of BP on EP: Full sample (N=1627)

| Variable             | Model 1           | Model 2           | Model 3           | Model 4           |
|----------------------|-------------------|-------------------|-------------------|-------------------|
| Constant             | 45.859(0.304)     | 4.260(0.925)      | 14.241(0.755)     | 8.102(0.860)      |
| SIZE                 | 6.610***(0.001)   | 7.915***(0.000)   | 7.091***(0.000)   | 7.080***(0.000)   |
| AGE                  | 0.500(0.236)      | 0.652(0.121)      | 0.718*(0.089)     | 0.738*(0.081)     |
| POLLUTION            | 26.697***(0.000)  | 31.756***(0.000)  | 31.064***(0.000)  | 30.724***(0.000)  |
| LOCATION             | -1.796(0.715)     | -5.808(0.240)     | -5.842(0.237)     | -6.209(0.210)     |
| GE                   | 105.053***(0.000) | 105.963***(0.000) | 105.688***(0.000) | 105.422***(0.000) |
| IA                   | 24.181***(0.000)  | 25.801***(0.000)  | 24.826***(0.000)  | 24.378***(0.000)  |
| DEPS                 | 3.735(0.378)      | 8.318*(0.070)     | 8.911*(0.053)     | 8.820*(0.056)     |
| R&D                  |                   | 4.810***(0.000)   | 5.016***(0.000)   | 7.744***(0.000)   |
| NPR                  |                   | -0.284**(0.021)   | -0.295**(0.016)   | -0.283(0.366)     |
| GROWTH               |                   | -0.012(0.887)     | -0.004(0.965)     | 0.005(0.978)      |
| State-holding        |                   |                   | 0.215**(0.035)    | 0.381**(0.013)    |
| R&D×State-holding    |                   |                   |                   | -0.075*(0.070)    |
| NPR×State-holding    |                   |                   |                   | -0.001(0.935)     |
| GROWTH×State-holding |                   |                   |                   | 0.000(0.939)      |
| F-value              | 69.20             | 52.25             | 48.01             | 37.96             |
| R2                   | 0.23              | 0.24              | 0.25              | 0.25              |

Note: p-values are in parentheses. \*p<0.1, \*\*p<0.05, \*\*\*p<0.001.

## 4.2. Heterogeneity test

Table 2 and Table 3 jointly introduce that a stronger state-holding better moderates the impact of NPR and GROWTH on EP, while a weaker state-holding only positively moderates the impact of NPR, which verifies H2c and H3c while fails to H1c. This case also describes a positive signal that mandatory regulation can push forward the impact of firms' development potential on environmental management, which suggests that with the involvement of state-holding, manufacturers have the opportunity to link future development capability with environmental management as early as possible, thereby reducing potential environmental risks. However, there is a problem that needs to be addressed is how to keep the leading role of state-holding in

environmental issues when firms' outlook is expected to be not optimistic.

Table 2: Empirical test for stronger state-holding (mean=38.29; N=981)

| Variable             | Model 1          | Model 2          | Model 3          | Model 4          |
|----------------------|------------------|------------------|------------------|------------------|
| Constant             | -1.871(0.974)    | -25.923(0.661)   | -28.065(0.635)   | -17.309(0.777)   |
| SIZE                 | 8.341***(0.001)  | 9.077***(0.000)  | 7.791***(0.003)  | 8.043***(0.003)  |
| AGE                  | 0.688(0.250)     | 0.849(0.158)     | 1.137* (0.070)   | 1.149*(0.069)    |
| POLLUTION            | 38.028***(0.000) | 41.119***(0.000) | 41.346***(0.000) | 42.278***(0.000) |
| LOCATION             | 1.454(0.831)     | -3.352(0.627)    | -3.789 (0.583)   | -4.593(0.507)    |
| GE                   | 96.972***(0.000) | 97.816***(0.000) | 98.819***(0.000) | 98.416***(0.000) |
| IA                   | 16.276*(0.051)   | 18.219**(0.028)  | 19.010**(0.022)  | 19.394**(0.020)  |
| DEPS                 | 5.491(0.294)     | 11.394**(0.045)  | 11.755**(0.039)  | 11.149*(0.050)   |
| R&D                  |                  | 3.891**(0.008)   | 4.053**(0.006)   | 4.787(0.488)     |
| NPR                  |                  | -0.320**(0.024)  | -0.344**(0.016)  | -1.061 (0.338)   |
| GROWTH               |                  | -0.063(0.590)    | -0.047(0.689)    | -1.156*(0.066)   |
| State-holding        |                  |                  | 0.510(0.111)     | 0.195(0.676)     |
| R&D×State-holding    |                  |                  |                  | -0.013(0.913)    |
| NPR×State-holding    |                  |                  |                  | 0.014(0.510)     |
| GROWTH×State-holding |                  |                  |                  | 0.021*(0.072)    |
| F-value              | 42               | 31.12            | 28.56            | 22.77            |
| R2                   | 0.23             | 0.24             | 0.24             | 0.25             |

Note: p-values are in parentheses. \*p<0.1, \*\*p<0.05, \*\*\*p<0.001.

Table 3: Empirical test for weaker state-holding (mean=38.29; N=646)

| Variable             | Model 1          | Model 2           | Model 3          | Model 4           |
|----------------------|------------------|-------------------|------------------|-------------------|
| Constant             | 74.6457(0.330)   | 13.5506(0.863)    | -7.4235(0.925)   | -21.0603(0.792)   |
| SIZE                 | 6.179*(0.074)    | 8.136**(0.020)    | 8.745**(0.013)   | 9.065**(0.010)    |
| AGE                  | -0.015(0.980)    | 0.113(0.848)      | 0.021(0.972)     | 0.083(0.889)      |
| POLLUTION            | 5.052(0.476)     | 12.015*(0.095)    | 12.447*(0.083)   | 11.552(0.110)     |
| LOCATION             | -8.577(0.224)    | -12.220*(0.084)   | -8.848(0.222)    | -8.899(0.220)     |
| GE                   | 116.753**(0.000) | 118.115***(0.000) | 117.956**(0.000) | 118.801***(0.000) |
| IA                   | 42.096***(0.000) | 41.360***(0.000)  | 36.501**(0.002)  | 34.295**(0.004)   |
| DEPS                 | -5.529(0.463)    | -4.029(0.626)     | -3.281(0.691)    | -3.780(0.651)     |
| R&D                  |                  | 5.658***(0.000)   | 5.675***(0.000)  | 7.758***(0.000)   |
| NPR                  |                  | -0.191(0.500)     | -0.154(0.586)    | -0.090(0.788)     |
| GROWTH               |                  | 0.091(0.481)      | 0.080(0.536)     | 0.119(0.491)      |
| State-holding        |                  |                   | 0.464*(0.051)    | 0.863**(0.027)    |
| R&D×State-holding    |                  |                   |                  | -0.128(0.171)     |
| NPR×State-holding    |                  |                   |                  | -0.007(0.769)     |
| GROWTH×State-holding |                  |                   |                  | -0.004(0.693)     |
| F-value              | 27.41            | 21.50             | 19.98            | 15.82             |
| R2                   | 0.23             | 0.25              | 0.26             | 0.26              |

Note: p-values are in parentheses. \*p<0.1, \*\*p<0.05, \*\*\*p<0.001.

### 4.3. Further discussion

Our results imply that Chinese government has attached great importance to the use of policy incentive to enhance the contribution of manufacturers' environmental management. Compared with early mandatory regulation, such positive change indicates that Chinese government fully respects the nature of firm that is regarding profit-taking as the primary goal. Further, it needs to note that state-holding does not always enable to play a positive role in business ethics, even hindering firms' outlook. We argue that protecting the natural environment should be a responsibility that firms must fulfill regardless of the level of their BP. At present, China's manufacturers are still exploring the channel for green operations. Accordingly, the proper political intervention will help to reverse firms' environmental-unfriendly behaviors in China. In this context, government guidance will normalize such management mode. In reality, regardless of the proportion of state-holding, its impact is always reflected in the process of firms' operations. As the EP of Chinese manufacturing firms is still low, the shareholders who hold large amount of state-holding should further emphasize the contribution of environmental management to enhancing firms' competitiveness and promote an effective transition of available resources into EP.

### 5. Conclusions

We find that only R&D significantly positively interacts with EP, while the interaction between NPR as well as GROWTH and EP does not show such state. Further, the positive role of state-holding in requiring firms to fulfill environmental responsibility is limited. Overall, the contribution of state-holding to firms' environmental responsibility is still scarce, which is largely reflected in the lower EP. We should be aware of a long-standing dilemma that is the imbalance development of China's regional economy that largely determines whether firms will continuously focus on environmental management.

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