Study on the Impact of Common Institutional Ownership on Corporate Green Transformation in the Context of “Dual Carbon”: Evidence from China

Jingtai Wu, Xinyi Cai *, Fei Zuo and Yue Dong

Abstract: Corporate green transformation is important for the realization of China’s “double carbon” goal and the construction of a green economy, but existing studies only explored the role of policy factors or internal corporate factors in influencing them, ignoring the driving factors of corporate green transformation in an industry. Based on the perspective of inter-industry enterprise linkage, combined with principal–agent theory and signaling theory, this study uses the data of Shanghai and Shenzhen A-share listed companies from 2010 to 2021 and employs multiple linear regression to investigate the impact of common institutional ownership on corporate green transformation and its mechanism of action. The empirical findings show that common institutional ownership can significantly promote corporate green transformation, and the findings still hold after robustness tests. Principal–agent costs, total factor productivity, financing constraints, and business credit play a partial mediating role in this, and common institutional ownership has a better promotion effect on the enhancement of the degree of the green transformation of enterprises in non-heavily polluted industries. The results of this study not only can enrich the research on the economic consequences of joint institutional ownership but also have important guiding significance for China to promote the green transformation of enterprises and build a green economic system.

Keywords: common institutional ownership; corporate green transformation; synergistic governance effects; information sharing effects

1. Introduction

Since the reform and opening up, China’s economy has been improving for a long time, and industry has been prosperously developing, but the ecological problems brought by the long-standing high pollution and low efficiency industrial model need to be solved. In recent years, China has continuously introduced relevant policies to promote the greening of production services. The report of the 20th National Congress of the Communist Party of China proposed to “accelerate the green transformation of development, implement comprehensive conservation strategies, and develop green and low-carbon industries”; China’s vision of achieving peak carbon and carbon neutrality in 2020 pointed out the direction for comprehensive green and low-carbon transformation. In the context of green development, implementing the new development concept and promoting enterprises to carry out green transformation have become the necessary path for China’s industries to adapt to for the new development stage [1]. As a microscopic subject of economic development and the main source of ecological pollution, enterprises are an indispensable role in establishing a sound green economic system [2]. However, due to the imperfect market mechanism, the relevant system and financial supply cannot fully cover the investment in and risk of the green transformation of enterprises, and the spillover of green transformation results in positive externality with fewer policy compensation measures, which makes the subjective
initiative of enterprises’ transformation low [3,4]. Therefore, it is of great practical significance to explore the driving force of enterprise green transformation for both national and enterprise green development.

Corporate green transformation is an inevitable choice for enterprises to break through the dual constraints of limited resources and environmental pollution and achieve sustainable development [5], which can not only shape competitive advantages for enterprises [6–8] but also gain corporate performance [7,9]. Some scholars took a macro perspective to deepen the impact of national regulatory policies and environmental regulatory tools on the green transformation of enterprises: an environmental protection tax [10], environmental enforcement supervision [11], and a mandatory social responsibility disclosure [12] can force enterprises to make green transformation, while tax incentives [13] can effectively improve enterprises’ financial situation and drive green transformation. Some other scholars studied the impact of related financial policies: green financial policies can stimulate the green transformation of highly polluting enterprises [14], environmental regulation can stimulate the process of green finance and promote the green transformation of an industry [15], and green credit policies can guide the flow of capital from high-polluting industries to emerging industries, thus supporting the development of green industries [16]. Some scholars also explored the impact of internal decisions on green transformation from within firms: corporate equity pledges can inhibit green transformation activities in terms of willingness and ability [17,18], encouraging the introduction of key equipment, and energy conservation and emission reduction can help firms to make green transformation [19].

From an industry perspective, some studies found that there is a cohort effect and an upward convergence of enterprise green technology innovation among enterprises in the same industry [20]; green technology innovation is an important element of green transformation [21], innovation can have a positive impact on carbon emission reductions [22], and the cohort effect of enterprises overlaid with policy tools can release a greater transformation driving force. Therefore, it is important to explore the drivers of green transformation among enterprises in the same industry and to stimulate the upward convergence of green transformation among the same group of enterprises in order to bring the incentive effect of environmental policies into play.

However, there are fewer studies in the extant literature on the drivers of green transformation among firms in the same industry, and there are no studies on the cohort effects that drive green transformation. Then, based on the perspective of industry enterprise linkage, are there any factors affecting the green transformation of enterprises? What are their role mechanisms? Is there any difference in the influence effect on different types of enterprises? This paper focuses on these issues, hoping to provide new perspectives for enterprise green transformation.

Common institutional ownership is a common informal system in capital markets in which institutional investors hold shares in multiple firms in the same industry at the same time. The current research focuses on two aspects. From a negative perspective, common institutional investors form a network of linkages that “collude” to maximize profits and reduce the efficiency of corporate investment [23]; they undermine the market price mechanism, reduce the degree of competition [24], and then use their information and resources to conceal their advantages. From a positive perspective, institutional investors can use their “strengths” to monitor and discipline management and reduce agency problems by using industry knowledge and shareholders’ rights [25]; reduce the degree of corporate surplus management and improve the quality of financial reporting [26,27]; promote external financing and develop resource channels [28,29]; promote information and technology integration across boundaries and promote the agglomeration of production factors [30]; and improve corporate governance to enhance value and integrate resources for firms [31].

A few scholars also studied the impact of common institutional ownership on enterprise transformation, and Wang Xinguang found that common institutional ownership can play a positive role as a factor of production to facilitate digital transformation and alleviate the “cold start” dilemma of digital transformation [32]. In the context of green development,
can inter-industry enterprise linkages (i.e., common institutional ownership) still play a positive role as a factor of production and, thus, influence the green transformation of enterprises? This paper selects Shanghai and Shenzhen A-share listed companies from 2010 to 2021 as a research sample to explore the impact of common institutional ownership on corporate green transformation. The research contribution of this paper is as follows. First, in terms of research intention, this paper breaks through the limitations of governmental environmental protection policies as well as individual enterprise decision-making perspectives and studies its impact on corporate green transformation based on the prevalent institutional investor linkage behavior in the capital market. Second, in terms of research data, this paper measures corporate green transformation in terms of both green governance performance and green innovation capability, which is a more comprehensive measurement and increases the reliability of the findings. Third, in terms of research content, we open the “black box” of the mechanism of common institutional ownership on corporate green transformation. Through the four paths of “reducing principal–agent cost”, “improving total factor productivity”, “alleviating financing constraints”, and “improving business credit”, the role mechanism of common institutional ownership is explored in depth.

2. Hypotheses and Theoretical Model

Green transformation is the process of enterprises seeking sustainable development, adjusting the allocation of internal and external resources, changing the mode of operation and organization, and obtaining new green competitive advantages [33]. At the present stage, enterprises face two major challenges in green transformation. First, according to the delegated agency theory, in order to maximize their own interests, executives, during their tenure, may make short-sighted behaviors that are detrimental to the long-term development of the company, such as cutting R&D investment, financial fraud, etc., and would like to establish their authority and reputation with short-lived high earnings to avoid the risk of being fired or demoted due to substandard performance. The shareholders’ judgment of the management ability of managers as a criterion is usually based on the performance of the company after they take office, but the characteristics of enterprise green transformation R&D investment, a low success rate, a long cycle, and the results of externalities [3] determine that the green transformation behavior of the enterprise faces difficulties in improving the performance of the management during their term in office. The sooner companies make the green transition in the context of “dual-carbon”, the more they are able to reap the long-term benefits, so there is a principal–agent problem between executives and shareholders, which leads to a decline in the willingness of enterprises to carry out green transformation. Second, green transformation requires a sustained and stable cash flow [34], and technological improvements and capital investments in all aspects of business operations are difficult for many companies to sustain and have to be deterred by a lack of capacity.

Common institutional ownership can help corporations alleviate two major challenges: On the one hand, common institutional ownership monitors the short-sighted behavior of top managers, alleviates the principal–agent conflict between shareholders and executives [35], and increases the incentive for green transformation. On the other hand, institutional investors can directly inject capital into enterprises to alleviate part of the capital problem. In addition, according to signaling theory, common institutional ownership joining an enterprise is a signal that the enterprise is operating well and is more likely to be favored by upstream and downstream enterprises. The greater the number of listed companies linked by common institutional ownership is, the more likely it is to provide more accurate information, thus better reducing the information asymmetry of the investing enterprises, easing financing constraints, improving commercial credit, and enhancing the green transformation ability of enterprises.

Based on the above analysis, we propose the following hypothesis:
Hypothesis (H1). In the context of “double carbon”, common institutional ownership can enhance the degree of the green transformation of enterprises.

2.1. Collaborative Governance Effect

Corporate green transformation is prone to agency problems due to its characteristics such as high risk, high investment, and the difficulty to transform results. Common institutional investors, as shareholders of enterprises, focus on the long-term development of enterprises and can actively supervise the economic decisions of management, thus promoting the green transformation of enterprises. On the one hand, common institutional investors can accumulate a large amount of experience in homogeneous business practices in the same industry, have stronger expertise, and have a voice and influence in the industry [36], and once managers make decisions that are detrimental to the long-term interests of the enterprise, institutional investors can identify and oppose them more quickly [26] and may choose to exit the enterprise if their opposition is ineffective [36]. The withdrawal of institutional investors can send a stronger negative signal to the market, influence other investors’ decisions, and cause a greater negative impact on the firm. Therefore, common institutional investors are more capable of performing their monitoring duties than small- and medium-sized shareholders who can only express their dissatisfaction with the company by “voting with their feet” when they discover the short-sighted behavior of corporate managers [37]. On the other hand, if common institutional investors have a higher expectation of corporate earnings, they pay more attention to the long-term profitability during the shareholding period [37], which means that the long-term value of the shareholding company is more important [38], thus reducing the short-term performance pressure of the company’s executives and alleviating the principal–agent problem.

At present, the green transformation of enterprises is mainly realized by accelerating capital renewal, improving resource utilization efficiency [21], and optimizing energy-use structure. Common institutional investors can enhance their business decisions, scientifically allocate corporate resources, optimize input and output [39], improve total factor productivity, and promote the green transformation of enterprises through their good industry knowledge and experience. Common institutional investors can also make forward-looking decisions that are more in line with policy trends by virtue of their strengths and sensitivities within an industry [29] and are better able to recognize the need for transformation as the state accelerates the green transformation of enterprises, thus promoting green transformation. Based on the above analysis, we make the following hypotheses:

Hypothesis (H1a). Principal–agent costs play a mediating role in the impact of common institutional ownership on corporate green transformation.

Hypothesis (H1b). The total factor productivity of firms mediates the effect of common institutional ownership on corporate green transformation.

2.2. Information Sharing Effect

The information sharing effect of common institutional ownership on the green transformation of enterprises is mainly reflected in three aspects: First, it alleviates information asymmetry and reduces the vicious competition of the linked enterprises. Second, it eases the financing constraints, improves the business credit of enterprises, and promotes the long-term development of an industry. Third, there is a positive spillover effect of green innovation among industries, and common institutional ownership can make the spillover effect stronger among its linked enterprises and promote the exchange of green innovation technology, knowledge, and information, thus promoting the green transformation of enterprises.

When there are more homogeneous products and services in the industry, there is excessive competition among firms, and they adopt vicious competition tactics such as a price war to obtain better resources and a higher market share, which, in turn, causes further
pollution such as overcapacity and lower quality [40]. Common institutional ownership, in order to ensure maximum portfolio benefits, coordinates to reduce ineffective competition and transaction frictions among investing firms [41], promotes cooperation among investing firms, reduces losses caused by firms implementing overly competitive strategies, and, thus, promotes the green transformation of firms.

Green transformation is a high-risk decision that requires a large quantity of resources and information security. Social network theory suggests that network relationships can help firms pool scarce resources [40], and common institutional ownership has rich social network relationships that can help green transformation firms access market resources, broaden corporate financing channels, and alleviate financing constraints, thus making it easier to obtain funds to support green innovation activities [42]. In terms of information, common institutional ownership can improve the comparability of accounting information and the quality of information disclosure [27], thus enhancing information transparency, reducing the degree of information asymmetry for external stakeholders such as banks, and increasing bargaining power for firms [43]. At the same time, common ownership, as an institutional investor, signals to the market that the company is “well-specialized”, provides commercial backing for the company’s value, and enhances its commercial credit. Finally, common institutional investors can more accurately identify and interpret the accounting information of enterprises in the industry, acquire a large amount of knowledge about fair value assessment, form a scale effect [44], improve industry expertise, help investment enterprises enhance their ability to obtain information on technological innovation, build a bridge between investment enterprises and the capital market, and, ultimately, promote the green transformation of enterprises.

The inclusion of common institutional ownership not only promotes corporate innovation [30] but also promotes the diffusion of innovations within the industry. The diffusion of new knowledge and technology promotes product and institutional innovation within the industry [45], thus forming a positive feedback chain for technological innovation, which, in turn, enhances the ability of firms to undertake green transformation. Based on the above analysis, we make the following hypotheses:

**Hypothesis (H1c).** Common institutional ownership promotes corporate green transformation by easing financing constraints.

**Hypothesis (H1d).** Common institutional ownership promotes corporate green transformation by enhancing business credit.

In summary, the theoretical model of this paper is shown in Figure 1.

![Figure 1. The theoretical model.](image)

### 3. Methods

#### 3.1. Date and Sample

This paper selects the data of listed enterprises in Shanghai and Shenzhen A-shares from 2010–2021. The year 2010 was chosen as the starting year because, in 2010, the Ministry of Environmental Protection issued the **Guidelines for Disclosure of Environmental**
Information of Listed Companies, which encourages listed companies to disclose the values and environmental protection concepts of operators in their environmental reports and provides a source of data for this paper to measure green governance performance. Before conducting the test, the data are processed as follows: First, the financial and insurance listed enterprises are excluded. Second, ST, *ST, PT, and IPO effects are excluded from the observation period. Third, to ensure data quality, samples with no missing data for at least three consecutive years are retained. Finally, enterprises with missing key data are excluded. And all micro-level continuous variables are treated with 1% and 99% tail shrinkage. Institutional investor data (quarterly) and financial data were obtained through the CSMAR database, and green patent application data were obtained from the CNRDS database.

3.2. Measurement of Variables

3.2.1. Dependent Variable

Corporate green transformation (Gre). Existing studies usually use the number of green patent applications to measure the degree of corporate green transformation but ignore the improvement of corporate green performance aspects. Therefore, drawing on the research results of Huizhong Lu [46], the degree of corporate green transformation is measured in terms of both green innovation capability and green governance performance.

First is green governance performance (Grescore). In this paper, we construct an index evaluation system from the following seven aspects: whether the company has clear environmental protection objectives, whether it has an environmental protection management system, whether it takes special actions for environmental protection, whether it develops an environmental emergency mechanism, whether it implements the “three simultaneous” system, whether it provides environmental protection education and training for employees, and whether it receives environmental protection honors or awards. If the above behaviors are present, the value is 1; otherwise, it is 0. The higher the value is, the higher the company’s green governance performance is.

Second is green innovation capability (GreInva). The number of green patent applications of the company, plus one to take the logarithm, is used to measure the green innovation ability.

3.2.2. Independent Variables

Drawing on the research results of He and Huang and Du Yong [25,27], this paper constructs a common institutional ownership indicator based on three dimensions. First, the common institutional ownership dummy variable (Coz1), which is 1 if the firm has common institutional investors in that year and 0 otherwise. A common institutional investor is defined as an institutional investor who holds no less than 5% of the shares of two or more companies in the same industry (according to the 2012 industry classification of the Securities and Futures Commission, other industries are classified as primary, and manufacturing industries are classified as secondary). Second, degree of common institutional ownership linkage (Coz2), which represents if the company is jointly held by several common institutional investors in the current year, plus 1 to take the logarithm. Third, co-institutional ownership percentage (Coz3), which indicates the sum of all co-institutional investors’ shareholdings in the company during the year. The original data of co-institutional ownership are constructed based on quarterly basis. If the company is invested in by co-institutional investors in any quarter of the year, the company is considered to have co-institutional ownership for the current year, and the corresponding annual indicator data are taken as the average value of quarterly indicators.

3.2.3. Mediating Variables

First, in the theoretical analysis, common agency ownership can mitigate the principal–agent problem between executives and shareholders through strict monitoring and lower expectations of management’s short-term performance. Drawing on a study by Tseng,
Chun-Hua [29] used operating income/total assets to represent executive-shareholder agency costs (Agency).

Second, common institutional ownership actively participates in the internal production and management decisions of the enterprise, improves corporate governance, and, thus, enhances total factor productivity. It not only avoids pollution caused by resource wastage but also promotes the green transformation of enterprises through cost savings. This paper uses the LP method to measure the total factor productivity of enterprises (TFP_LP).

Third, the inclusion of common institutional ownership can reduce the degree of information asymmetry of firms, attract the attention of investors, and, thus, reduce the cost of external financing and alleviate financing constraints [47]. In this paper, we use the more robust SA index to measure the financing constraint. Referring to the study of Zhong Qiuyan [48], the SA index is taken as an absolute value, and the larger the value is, the higher the financing constraint is.

Fourth, commercial credit mainly refers to the behavior of enterprises that defer payment when purchasing materials and commodities and take up part of the funds of other enterprises, which is equivalent to a short-term loan from the supplier to the enterprise [49]. Commercial credit is a low-cost mode of financing and, therefore, has a high demand for its use regardless of the firm’s own cash flow. Co-institutional investors, as investors with a longer-term strategic vision and senior experience in the market, invest in companies that are more likely to gain the trust of suppliers and can enhance their commercial credit. In the case of sound corporate operations, commercial credit can provide long-term stable working capital and provide ample funds for corporate green transformation. Drawing on previous research, accounts payable/total assets were used to measure business credit (Business) [50].

3.2.4. Control Variables

The control variables include the following: (1) company size (Size): company size as a logarithm of total company assets; (2) actual debt ratio (Lev): calculated using total liabilities/total assets; (3) profitability (ROA): calculated using net profit/total assets; (4) growth (Growth): calculated using (total assets at the end of the period—total assets at the end of the previous period)/total assets at the end of the previous period; (5) largest holder rate (Top1): indicates the percentage of shares held by the largest shareholder; (6) ins investor prop (INS): indicates the percentage of shares of listed companies held by institutional investors; (7) listing years (Age): the measurement of listing year is the time for enterprises to be listed; (8) concurrent position (Merge): whether the chairman and the general manager are the same person; 0: No; 1: Yes; (9) board size (Bsize): the number of board directors is measured by taking the logarithm; (10) independent director ratio (Indep): measured using the ratio of the number of independent directors to the size of the board; (11) international big four (Big4): whether the auditor is from the international big four; 0: No; 1: Yes.

3.3. Model Construction

In order to test the specific mechanism of common institutional ownership on green business transformation in the context of “dual carbon”, the following model is constructed:

\[
\text{Gre}_{it} = \beta_0 + \beta_1 \text{Coz}_{it} + \beta_2 \text{CVs}_{it} + \sum_j \text{Industry}_j + \sum_t \text{Year}_t + \epsilon_{it}
\]  

\[
\text{Agency}_{it} = \alpha_0 + \alpha_1 \text{Coz}_{it} + \alpha_2 \text{CVs}_{it} + \sum_j \text{Industry}_j + \sum_t \text{Year}_t + \epsilon_{it}
\]  

\[
\text{Gre}_{it} = \gamma_0 + \gamma_1 \text{Coz}_{it} + \gamma_1 \text{Agency}_{it} + \gamma_2 \text{CVs}_{it} + \sum_j \text{Industry}_j + \sum_t \text{Year}_t + \epsilon_{it}
\]
\begin{align*}
    TEP_{LP\,i,t} &= a_0 + a_1 \text{Coz}_{i,t} + a_2 \text{CVs}_{i,t} + \sum_j \text{Industry}_j + \sum_t \text{Year}_t + \epsilon_{i,t} \quad (4) \\
    \text{Gre}_{i,t} &= \gamma_0 + \gamma_1 \text{Coz}_{i,t} + \gamma_1 TEP_{LP\,i,t} + \gamma_2 \text{CVs}_{i,t} + \sum_j \text{Industry}_j + \sum_t \text{Year}_t + \epsilon_{i,t} \quad (5) \\
    \text{SA}_{i,t} &= a_0 + a_1 \text{Coz}_{i,t} + a_2 \text{CVs}_{i,t} + \sum_j \text{Industry}_j + \sum_t \text{Year}_t + \epsilon_{i,t} \quad (6) \\
    \text{Gre}_{i,t} &= \gamma_0 + \gamma_1 \text{Coz}_{i,t} + \gamma_1 \text{SA}_{i,t} + \gamma_2 \text{CVs}_{i,t} + \sum_j \text{Industry}_j + \sum_t \text{Year}_t + \epsilon_{i,t} \quad (7) \\
    \text{Business}_{i,t} &= a_0 + a_1 \text{Coz}_{i,t} + a_2 \text{CVs}_{i,t} + \sum_j \text{Industry}_j + \sum_t \text{Year}_t + \epsilon_{i,t} \quad (8) \\
    \text{Gre}_{i,t} &= \gamma_0 + \gamma_1 \text{Coz}_{i,t} + \gamma_1 \text{Business}_{i,t} + \gamma_2 \text{CVs}_{i,t} + \sum_j \text{Industry}_j + \sum_t \text{Year}_t + \epsilon_{i,t} \quad (9)
\end{align*}

The subscript \( i \) in the model denotes the enterprise; \( t \) denotes time; \( \text{Gre}_{i,t} \) is the degree of green transformation of the enterprise, measured by \( \text{GreInva} \) and \( \text{GreScore} \), and the larger the value is, the higher the degree of green transformation of the enterprise is; \( \text{Coz}_{i,t} \) is the common institutional ownership of listed companies, expressed in three dimensions, \( \text{Coz1} \), \( \text{Coz2} \), and \( \text{Coz3} \); \( \text{CVs}_{i,t} \) is the control variable; \( \text{Industry}_j \) is the industry dummy variable, \( \text{Year}_t \) is the year dummy variable; and \( \epsilon_{i,t} \) is the random disturbance term. \( \text{Agency} \) is the cost of principal–agent, and the larger the value is, the lower the cost of principal–agent is. \( TEP_{LP\,i,t} \) is the total factor productivity, and the larger the value is, the higher the factor productivity is. \( \text{SA}_{i,t} \) is the degree of financing constraint; taking the \( \text{SA}_{i,t} \) index as absolute value, the larger the value is, the higher the financing constraint is. In order to avoid the problem of multicollinearity, eliminate the enterprise size and age in the control variables of models (6) and (7). \( \text{Business}_{i,t} \) is the business credit, and the larger the value is, the higher the business credit of the firm is.

### 4. Empirical Test and Results

#### 4.1. Descriptive Statistics

Table 1 shows that the maximum value of \( \text{GreScore} \) is 0.857 and that the minimum value is 0.000, indicating that there are companies with the highest green governance performance in the sample that have completed six of the seven indicators; there are also samples that have not completed any indicators; and there are large differences in green governance performance among listed companies. The average value of \( \text{Coz1} \) is 10.5%, indicating that more than 10% of the companies in the study sample have common. The minimum value of \( \text{Coz2} \) is 0.000, which indicates that some companies have more room for improvement in introducing common institutional ownership. The mean value of \( \text{Coz3} \) is 2.6%, and the maximum value is 53.7%, which indicate that the shareholding ratio of common institutional investors among listed companies varies widely, and the results of control variables are basically consistent with the previous literature.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Max</th>
<th>Min</th>
<th>Obs</th>
</tr>
</thead>
<tbody>
<tr>
<td>GreScore</td>
<td>0.155</td>
<td>0.214</td>
<td>0.857</td>
<td>0.000</td>
<td>27,128</td>
</tr>
<tr>
<td>GreInva</td>
<td>0.894</td>
<td>1.177</td>
<td>4.754</td>
<td>0.000</td>
<td>27,128</td>
</tr>
<tr>
<td>Coz1</td>
<td>0.105</td>
<td>0.307</td>
<td>1.000</td>
<td>0.000</td>
<td>27,128</td>
</tr>
<tr>
<td>Coz2</td>
<td>0.073</td>
<td>0.220</td>
<td>0.896</td>
<td>0.000</td>
<td>27,128</td>
</tr>
<tr>
<td>Coz3</td>
<td>0.026</td>
<td>0.093</td>
<td>0.537</td>
<td>0.000</td>
<td>27,128</td>
</tr>
<tr>
<td>Size</td>
<td>22.226</td>
<td>1.281</td>
<td>26.244</td>
<td>19.954</td>
<td>27,128</td>
</tr>
</tbody>
</table>
Table 1. Cont.

<table>
<thead>
<tr>
<th>Variable</th>
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<th>Std. Dev.</th>
<th>Max</th>
<th>Min</th>
<th>Obs</th>
</tr>
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<tbody>
<tr>
<td>Lev</td>
<td>0.431</td>
<td>0.204</td>
<td>0.883</td>
<td>0.056</td>
<td>27,128</td>
</tr>
<tr>
<td>ROA</td>
<td>0.037</td>
<td>0.060</td>
<td>0.194</td>
<td>−0.247</td>
<td>27,128</td>
</tr>
<tr>
<td>Growth</td>
<td>0.144</td>
<td>0.245</td>
<td>1.382</td>
<td>−0.291</td>
<td>27,128</td>
</tr>
<tr>
<td>Top1</td>
<td>34.643</td>
<td>14.631</td>
<td>74.300</td>
<td>9.340</td>
<td>27,128</td>
</tr>
<tr>
<td>INS</td>
<td>43.651</td>
<td>24.553</td>
<td>90.447</td>
<td>0.312</td>
<td>27,128</td>
</tr>
<tr>
<td>Indep</td>
<td>37.533</td>
<td>5.335</td>
<td>57.140</td>
<td>33.330</td>
<td>27,128</td>
</tr>
<tr>
<td>Bsize</td>
<td>8.569</td>
<td>1.673</td>
<td>15.000</td>
<td>5.000</td>
<td>27,128</td>
</tr>
<tr>
<td>Merge</td>
<td>0.268</td>
<td>0.443</td>
<td>1.000</td>
<td>0.000</td>
<td>27,128</td>
</tr>
<tr>
<td>Age</td>
<td>2.883</td>
<td>0.333</td>
<td>3.497</td>
<td>1.792</td>
<td>27,128</td>
</tr>
<tr>
<td>Big4</td>
<td>0.053</td>
<td>0.224</td>
<td>1.000</td>
<td>0.000</td>
<td>27,128</td>
</tr>
</tbody>
</table>

Table 2 presents the between-group difference tests according to whether the firms have common institutional investors or not. The results show that the median and mean values of corporate green performance and corporate innovativeness are significantly higher for the sample with co-institutional ownership than for the other samples, which supports the hypothesis of this paper to some extent.

Table 2. Univariate test results.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coz1 = 0</th>
<th>Coz1 = 1</th>
<th>Difference Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Obs Mean</td>
<td>Median</td>
<td>Obs Mean</td>
</tr>
<tr>
<td>GreScore</td>
<td>24,279</td>
<td>0.142</td>
<td>2849 0.267</td>
</tr>
<tr>
<td>GreInva</td>
<td>24,279</td>
<td>0.832</td>
<td>2849 1.421</td>
</tr>
</tbody>
</table>

Note: *** indicate that the significance levels are 1%.

4.2. Hypothesis Testing

According to Hypothesis (H1), common institutional ownership can enhance corporate green transformation motivation and capability, i.e., it can positively affect green innovation capability and green governance performance. Table 3 shows the results of the benchmark regressions of common institutional ownership and corporate green transformation. Among them, (1)–(3) are the regression results with green governance performance as the explanatory variable, and (4)–(6) are the regression results with green innovation capability. From the results, the regression coefficients of Coz1, Coz2, and Coz3 are all statistically significant at the 1% level, indicating that there is a positive relationship among co-agency ownership, corporate green governance performance, and corporate green innovation capability. That is, the higher the degree of the common institutional ownership linkage and shareholding ratio, the higher the corporate green governance performance and green innovation capacity is, and Hypothesis (H1) is verified. The conclusion of this study proves that co-institutional investors are able to make synergistic governance of enterprises with their industry experience, management knowledge, and private information, which, in turn, alleviates the problem of the insufficient motivation and capacity of enterprises to make green transformation and promotes enterprises to make green transformation.

Hypothesis (H1a) proposes that the inclusion of common institutional ownership effectively inhibits top management’s short-sighted behavior and reduces principal–agent costs, which, in turn, enhance top management’s willingness to make a green transition. Using operating income/total assets to calculate the agency cost (Agency), i.e., the asset turnover ratio, the higher the value is, the lower the agency cost is. Substituting it into models (1) and (2), the results are shown in Table 4, the significance of the relevant indicators meets the criteria of the mediating effect test, and the Z value of the Sobel test is significant at the 1% statistical level. Columns (1) and (2) show the regression results of the quantities of common institutional ownership, shareholding ratio, and shareholder–executive agency costs, the coefficients of which are 0.0617, 0.1714, and significant, respectively, indicating that common institutional ownership can significantly reduce the principal–agent costs.
of executives. These results are consistent with the direction of the findings of existing studies [29]. Columns (3)–(6) are the regression results of common institutional ownership on corporate green transformation after adding agency costs; in the results, the regression coefficients of agency costs and common institutional ownership are positive and significant, indicating that agency costs play a partly intermediary role in common institutional ownership. Hypothesis (H1a) is verified.

Table 3. Direct effect tests.

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<th>GreInva</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
</tr>
<tr>
<td>Coz1</td>
<td>0.0368***</td>
<td>0.1276***</td>
</tr>
<tr>
<td>(8.2100)</td>
<td>(5.7985)</td>
<td></td>
</tr>
<tr>
<td>Coz2</td>
<td>0.0541***</td>
<td>0.1784***</td>
</tr>
<tr>
<td>(8.5478)</td>
<td>(5.7694)</td>
<td></td>
</tr>
<tr>
<td>Coz3</td>
<td>0.1165***</td>
<td>0.4175***</td>
</tr>
<tr>
<td>(7.6020)</td>
<td>(5.6674)</td>
<td></td>
</tr>
<tr>
<td>_cons</td>
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<td>−1.2060***</td>
</tr>
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<td>(−38.9467)</td>
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</tr>
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<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Year fe</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Industry fe</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>N</td>
<td>27,128</td>
<td>27,128</td>
</tr>
<tr>
<td>r2_a</td>
<td>0.3022</td>
<td>0.3025</td>
</tr>
<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
</tr>
<tr>
<td>Coz2</td>
<td>0.0623***</td>
<td>0.0529***</td>
</tr>
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<td>(5.3964)</td>
<td>(8.3714)</td>
<td></td>
</tr>
<tr>
<td>Coz3</td>
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<td>0.1134***</td>
</tr>
<tr>
<td>(5.8882)</td>
<td>(7.3954)</td>
<td></td>
</tr>
<tr>
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<td>−1.2428***</td>
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<td>Yes</td>
</tr>
<tr>
<td>Year fe</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Industry fe</td>
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<td>Yes</td>
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<tr>
<td>r2_a</td>
<td>0.3263</td>
<td>0.3266</td>
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</table>

Note: *** indicate that the significance levels are and 1%.

Table 4. Agency cost mediating-effect tests.

<table>
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<td>(3)</td>
</tr>
<tr>
<td>Coz2</td>
<td>0.0623***</td>
<td>0.0529***</td>
</tr>
<tr>
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<td>(8.3714)</td>
<td></td>
</tr>
<tr>
<td>Coz3</td>
<td>0.1714***</td>
<td>0.1134***</td>
</tr>
<tr>
<td>(5.8882)</td>
<td>(7.3954)</td>
<td></td>
</tr>
<tr>
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<td>−1.2428***</td>
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<td>(−39.9496)</td>
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<tr>
<td>Year fe</td>
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<td>Yes</td>
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<tr>
<td>Industry fe</td>
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<tr>
<td>r2_a</td>
<td>0.3263</td>
<td>0.3266</td>
</tr>
</tbody>
</table>

Note: *** indicate that the significance levels are and 1%.

Hypothesis (H1b) proposes that common institutional ownership with better industry skills and more advanced experience helps firms to improve resource utilization, thus saving resources and increasing the degree of the green transformation of firms. The test results are shown in Table 5. The coefficients of Coz2 and Coz3 in columns (1) and (2) are positive and significant at the 1% level, indicating that common institutional ownership can significantly enhance the total factor productivity of enterprises; these results are consistent with existing studies [39]. In columns (3)–(6), the coefficients of TFP_LP, Coz2, and Coz3 are significantly positive, the Z-value of the Sobel test is significant at the 1% level, and Hypothesis (H1b) is verified, indicating that common institutional ownership enhances the degree of the green transformation of enterprises by enhancing their total factor productivity. In particular, the regression coefficient of Coz3 on TFP_LP is 0.2647, and the regression coefficients of Coz3 and TFP_LP on GreInva are 0.3906 and 0.1017.
respectively, indicating that the shareholding ratio of common institutional ownership has a greater impact on the total factor productivity of enterprises and that the shareholding ratio of common institutional ownership has a greater enhancement of the green innovation capacity by affecting the total factor productivity.

Table 5. Test for total factor productivity mediating effects.

<table>
<thead>
<tr>
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<th>TFP_LP</th>
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<th>GreInva</th>
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<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>Coz2</td>
<td>0.0794 ***</td>
<td>0.0538 ***</td>
<td>0.1703 ***</td>
</tr>
<tr>
<td></td>
<td>(4.6353)</td>
<td>(8.5004)</td>
<td>(5.5283)</td>
</tr>
<tr>
<td>Coz3</td>
<td>0.2647 ***</td>
<td>0.1155 ***</td>
<td>0.3906 ***</td>
</tr>
<tr>
<td></td>
<td>(6.5620)</td>
<td>(7.5355)</td>
<td>(5.3038)</td>
</tr>
<tr>
<td>TFP_LP</td>
<td>0.0038 **</td>
<td>0.0036 **</td>
<td>0.1023 ***</td>
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<tr>
<td></td>
<td>(2.0701)</td>
<td>(1.9805)</td>
<td>(9.9541)</td>
</tr>
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<td>_cons</td>
<td>−4.3569 ***</td>
<td>−4.3352 ***</td>
<td>−8.6252 ***</td>
</tr>
<tr>
<td></td>
<td>(−44.4252)</td>
<td>(−44.3536)</td>
<td>(−50.2557)</td>
</tr>
<tr>
<td>CVs</td>
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<td>Yes</td>
<td>Yes</td>
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<td>Yes</td>
</tr>
<tr>
<td>Industry fe</td>
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<td>Yes</td>
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<tr>
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<td>27,128</td>
<td>27,128</td>
</tr>
<tr>
<td>r2_a</td>
<td>0.7314</td>
<td>0.7316</td>
<td>0.3021</td>
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<tr>
<td>Sobel</td>
<td>4.772 ***</td>
<td>6.735 ***</td>
<td>4.301 ***</td>
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<tr>
<td></td>
<td>(177.4785)</td>
<td>(177.5218)</td>
<td>(19.487)</td>
</tr>
</tbody>
</table>

Note: ** and *** indicate that the significance levels are 5% and 1%, respectively.

According to Hypothesis (H1c), common institutional ownership can reduce the information asymmetry of enterprises, reduce financing constraints, and, thus, obtain more funds for corporate green transformation and increase green transformation capacity. As shown in Table 6, since $SA$ is treated as an absolute value, the larger $SA$ is, the higher the financing constraint is, and columns (1) and (2)'s $Coz2$ and $Coz3$ are negative, indicating that common institutional ownership can alleviate the financing constraints of firms; the higher the percentage of common institutional ownership shareholding is, the more it can alleviate the financing constraints of firms, which is consistent with Yang Xingquan's conclusions [51]. Columns (3)–(6)'s $Coz2$, $Coz3$, and $SA$ index coefficients are significant at the 1% level, and the coefficient of the $SA$ index is negative and passes the Sobel test. This indicates that common institutional ownership promotes the green transformation of enterprises by alleviating their financing constraints. Hypothesis (H1c) is as expected.

Table 6. Test for mediating effects of financing constraints.

<table>
<thead>
<tr>
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<th>GreInva</th>
</tr>
</thead>
<tbody>
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<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>Coz2</td>
<td>−0.0491 ***</td>
<td>0.0900 ***</td>
<td>0.4478 ***</td>
</tr>
<tr>
<td></td>
<td>(−7.0832)</td>
<td>(13.7065)</td>
<td>(13.1541)</td>
</tr>
<tr>
<td>Coz3</td>
<td>−0.1011 ***</td>
<td>0.1890 ***</td>
<td>0.9519 ***</td>
</tr>
<tr>
<td></td>
<td>(−5.8858)</td>
<td>(11.9768)</td>
<td>(11.8198)</td>
</tr>
<tr>
<td>SA</td>
<td>−0.0416 ***</td>
<td>−0.0425 ***</td>
<td>−0.5048 ***</td>
</tr>
<tr>
<td></td>
<td>(−7.7151)</td>
<td>(−7.8623)</td>
<td>(−16.2678)</td>
</tr>
<tr>
<td>_cons</td>
<td>3.7595 ***</td>
<td>3.7609 ***</td>
<td>−0.0436 *</td>
</tr>
<tr>
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<td>(177.4785)</td>
<td>(177.5218)</td>
<td>(1.9039)</td>
</tr>
<tr>
<td>CVs</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Year fe</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Industry fe</td>
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<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>N</td>
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<td>27,128</td>
<td>27,128</td>
</tr>
<tr>
<td>r2_a</td>
<td>0.2753</td>
<td>0.2749</td>
<td>0.2870</td>
</tr>
<tr>
<td>Sobel</td>
<td>6.036 ***</td>
<td>6.154 ***</td>
<td>7.348 ***</td>
</tr>
</tbody>
</table>

Note: * and *** indicate that the significance levels are 10% and 1%, respectively.
From Hypothesis (H1d), it can be seen that common institutional investors, as large shareholders with deep credentials and a good reputation in an industry, are more likely to gain the trust of upstream and downstream enterprises after joining the enterprise, thus enhancing commercial credit and alleviating some of the capital problems, which, in turn, increases the enterprise’s green transformation capability and enhances the degree of green transformation. The results are shown in Table 7: the coefficients of Coz2 and Coz3 in columns (1) and (2) are 0.01 and 0.199, which indicate that common institutional ownership enhances business credit; in columns (3)–(6), Business, Coz2, and Coz3 are positive and significant at the 1% level; and the results of Sobel’s test are significant, which indicate that business credit plays a partly mediating role in the effect of common institutional ownership on corporate green transformation. Hypothesis (H1d) is tested. This result indicates that common institutional investors, through their information resource advantage, enhance the business credit of the invested firms, give working capital security to the invested firms, and ultimately promote the green transformation of the firms.

#### Table 7. Test for the mediating effect of business credit.

<table>
<thead>
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<th>GreInva</th>
</tr>
</thead>
<tbody>
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<td></td>
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<td>(2)</td>
<td>(3)</td>
</tr>
<tr>
<td>Coz2</td>
<td>0.0100 *** (5.5639)</td>
<td>0.0534 *** (8.4366)</td>
<td>0.1563 *** (5.1079)</td>
</tr>
<tr>
<td>Coz3</td>
<td>0.0199 *** (4.3420)</td>
<td>0.1151 *** (7.5057)</td>
<td>0.3735 *** (5.0421)</td>
</tr>
<tr>
<td>Business</td>
<td>0.0697 *** (3.7871)</td>
<td>0.0712 *** (3.8685)</td>
<td>2.2133 *** (20.1820)</td>
</tr>
<tr>
<td>_cons</td>
<td>0.1264 *** (12.8392)</td>
<td>0.1243 *** (12.6450)</td>
<td>−1.2148 *** (−39.0278)</td>
</tr>
<tr>
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<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Year fe</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Industry fe</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
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<td>N</td>
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<td>27,128</td>
<td>27,128</td>
</tr>
<tr>
<td>r2_a</td>
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<td>0.3827</td>
<td>0.3028</td>
</tr>
<tr>
<td>Sobel</td>
<td>3.073 *** 5.581 *** 2.951 *** 4.755 ***</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: *** indicate that the significance levels are 1%.

#### 4.3. Robustness Tests

In this section, we test the robustness of our findings by varying the common institutional ownership threshold and by controlling for annual trends in an industry.

Drawing on the study of Pan Yue et al. [23], we set the threshold of common institutional ownership shareholding at 10% and put it into model (1) to test the results in Table 8, which show that the presence of common institutional ownership (Coz12), the number of common institutional investors (Coz22), and the shareholding percentage (Coz32) are significant at the 1% level for the degree of the green transformation of firms; the findings are consistent with the hypothesis.

In contrast, due to the long time span of the sample, there may be cyclical fluctuations in different industries, and the degree of corporate green transformation may also be influenced by industry policies and environmental regimes; investors’ decisions cannot avoid being influenced by these factors, leading to biased results. Drawing on the study of Jennings, J. [52], using industry × year fixed effects, the regression results are shown in Table 9, and the regression coefficients of the variables are all significant at the 1% level, indicating that our benchmark results are robust.

In addition, we also used the PSM and Heckman’s two-stage approach for the empirical regressions for robustness checks. The PSM mean treatment effect is significant at the 1% level, and the coefficients of corporate green performance and corporate innovativeness are significantly positive, which indicate that common institutional ownership still promotes corporate green transformation after excluding sample self-selection interference. The ro-
business results of the PSM and Heckman’s two-stage approach are shown in Appendix A, Tables A1 and A2.

**Table 8.** Changing the common institutional ownership threshold test.

<table>
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</tr>
</thead>
<tbody>
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<tr>
<td>Coz12</td>
<td>0.0447 ***</td>
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</tr>
<tr>
<td>Coz22</td>
<td>0.0645 ***</td>
<td>0.2221 ***</td>
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<tr>
<td></td>
<td>(7.9174)</td>
<td>(5.6478)</td>
</tr>
<tr>
<td>Coz32</td>
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<td>0.4702 ***</td>
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<tr>
<td>Year fe</td>
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<td>Yes</td>
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<td>Industry fe</td>
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<tr>
<td>r²_a</td>
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<td>0.3022</td>
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</table>

Note: *** indicate that the significance levels are 1%.

**Table 9.** Control industry—annual trend test.

<table>
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</tr>
<tr>
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<td>(8.1000)</td>
<td>(5.7268)</td>
</tr>
<tr>
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<td>0.0645 ***</td>
<td>0.2221 ***</td>
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<tr>
<td></td>
<td>(8.4292)</td>
<td>(5.7000)</td>
</tr>
<tr>
<td>Coz3</td>
<td>0.1160 ***</td>
<td>0.4086 ***</td>
</tr>
<tr>
<td></td>
<td>(7.5508)</td>
<td>(5.7524)</td>
</tr>
<tr>
<td>_cons</td>
<td>-1.2143 ***</td>
<td>-0.9161 ***</td>
</tr>
<tr>
<td></td>
<td>(-26.4310)</td>
<td>(-49.7353)</td>
</tr>
<tr>
<td>CVs</td>
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<td>Yes</td>
</tr>
<tr>
<td>Year × Industry</td>
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<td>Yes</td>
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<td>27,128</td>
</tr>
<tr>
<td>r²_a</td>
<td>0.3061</td>
<td>0.3063</td>
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</tbody>
</table>

Note: *** indicate that the significance levels are 1%.

### 5. Heterogeneity Investigations

The green transformation of enterprises is affected by the nature of an industry, and the green performance of enterprises in heavily polluting industries is poor. The inclusion of co-institutional investors may not change the poor green performance in the short term either, but enterprises may improve the status quo by improving corporate green innovation. To test this hypothesis, the grouping variable ifhp is constructed in accordance with the Ministry of Environmental Protection’s 2008 Circular on the Issuance of the *List of Listed Industries for Environmental Audit and Management*, which is 1 if the firm belongs to a heavily polluting industry and 0 otherwise.

The results of the regression on the grouping of the firms’ green performance are shown in Table 10. The coefficients of common institutional ownership are 0.0513, 0.750, and 0.1816, which are also significant in non-heavily polluting industry firms, indicating that the number of common institutional ownerships and the percentage of shareholding play a good role in the green governance performance of non-heavily polluting firms. In contrast, the regression coefficients of Coz1 and Coz2 are not significant in the group of heavily polluting firms. What is more special is that in column (6), common institutional ownership even significantly reduces the green performance of the firms; however, why is there such a contrast in the effect of common institutional ownership on green governance
performance in heavily polluting firms? For this reason, we conduct a more in-depth study.

Table 10. Green governance performance classification regression (whether it belongs to heavily polluting industry).

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<th>(2)ifhp = 1</th>
<th>(3)ifhp = 0</th>
<th>(4)ifhp = 1</th>
<th>(5)ifhp = 0</th>
<th>(6)ifhp = 1</th>
</tr>
</thead>
<tbody>
<tr>
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<td>0.0513 ***</td>
<td>-0.0108</td>
<td>0.0750 ***</td>
<td>-0.0165</td>
<td>0.1816 ***</td>
<td>-0.0756 ***</td>
</tr>
<tr>
<td></td>
<td>(9.7624)</td>
<td>(-1.1616)</td>
<td>(10.0433)</td>
<td>(-1.2791)</td>
<td>(9.6834)</td>
<td>(-2.7191)</td>
</tr>
<tr>
<td>Coz2</td>
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<td>-0.0165</td>
<td>0.1816 ***</td>
<td>-0.0756 ***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-2.7191)</td>
<td></td>
<td>(-31.6163)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>_cons</td>
<td>-1.0633 ***</td>
<td>-1.4015 ***</td>
<td>-1.0598 ***</td>
<td>-1.4038 ***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-31.7227)</td>
<td>(-21.3181)</td>
<td>(-31.6163)</td>
<td>(-21.3466)</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>(-31.6163)</td>
<td>(-31.7262)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(-21.6878)</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year fe</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Province fe</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>19,566</td>
<td>7562</td>
<td>19,566</td>
<td>7562</td>
<td></td>
<td></td>
</tr>
<tr>
<td>r2_a</td>
<td>0.2086</td>
<td>0.2484</td>
<td>0.2090</td>
<td>0.2484</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>Yes</td>
<td>Yes</td>
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<tr>
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<td>0.2484</td>
<td>0.2090</td>
<td>0.2491</td>
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<td></td>
</tr>
</tbody>
</table>

Note: *** indicate that the significance levels are 1%.

In Table 10, the effect of common institutional ownership shareholding on firms’ green governance performance in firms in heavily polluting industry is different than expected, possibly due to the presence of several different institutional investors with divergent views on transition decisions when the common institutional ownership shareholding is too high. It is hypothesized that common institutional ownership and green governance performance in heavily polluting industries are in an inverted U. To verify this speculation, the quadratic term \( (COZ3) \) of the common institutional shareholding ratio is added to model (1), and the results are shown in Table 11: the coefficients of \( COZ3 \) and \( COZ3 \) are 0.2782 and \(-0.5046\), with opposite signs and with good significance, which indicates that the inverted U-shaped relationship is established, and, finally, it reports that the two U-shaped tests of the regression have significant t-values. The results show that there is an inverted U-shaped relationship between common institutional ownership and corporate green performance in heavily polluting industries, with the apex at 0.27, indicating that common institutional ownership below 27% can significantly contribute to corporate green performance.

Table 11. U-shaped test of co-institutional investor ownership and green governance performance in heavily polluting industries.

<table>
<thead>
<tr>
<th>GreScore</th>
<th>(1)ifhp = 1</th>
<th>(2)ifhp = 1</th>
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</thead>
<tbody>
<tr>
<td>Coz3</td>
<td>0.8195 ***</td>
<td>0.2782 ***</td>
</tr>
<tr>
<td></td>
<td>(7.2301)</td>
<td>(2.9077)</td>
</tr>
<tr>
<td>COZ3</td>
<td>-1.2572 ***</td>
<td>-0.5046 **</td>
</tr>
<tr>
<td></td>
<td>(-5.0170)</td>
<td>(-2.4634)</td>
</tr>
<tr>
<td>_cons</td>
<td>0.2240 ***</td>
<td>-1.3270 ***</td>
</tr>
<tr>
<td></td>
<td>(75.4047)</td>
<td>(-19.5961)</td>
</tr>
<tr>
<td>CVs</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Year fe</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Province fe</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Industry fe</td>
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<td>Yes</td>
</tr>
<tr>
<td>N</td>
<td>7562</td>
<td>7562</td>
</tr>
<tr>
<td>r2_a</td>
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<td>0.3109</td>
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<td>U-test</td>
<td>T-value</td>
<td>Extreme values</td>
</tr>
<tr>
<td></td>
<td>3.27 ***</td>
<td>0.33</td>
</tr>
<tr>
<td></td>
<td>2.01 **</td>
<td>0.27</td>
</tr>
</tbody>
</table>

Note: **, and *** indicate that the significance levels are 5%, and 1%, respectively.
Table 12 shows the regression results of common institutional ownership on firms’ green innovation capability in both heavily polluting and non-heavily polluting industries. Common institutional ownership is significant at the 1% level in both heavily polluting industries and non-heavily polluting industries, but the coefficient of green innovation capacity is higher in heavily polluting industries, with the coefficients of Coz1, Coz2, and Coz3 being 0.2105, 0.2837, and 0.8624, respectively. This may be because heavily polluted industries are more eager to improve the green performance of firms by means of green innovation and to change the high amount of pollution and high energy consumption.

**Table 12. Regression results of green innovation capability (whether it belongs to heavily polluting industry).**

<table>
<thead>
<tr>
<th>GreScore</th>
<th>(1) ifhp = 0</th>
<th>(2) ifhp = 1</th>
<th>(3) ifhp = 0</th>
<th>(4) ifhp = 1</th>
<th>(5) ifhp = 0</th>
<th>(6) ifhp = 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coz1</td>
<td>0.1484 ***</td>
<td>0.2105 ***</td>
<td>0.2039 ***</td>
<td>0.2837 ***</td>
<td>0.3202 ***</td>
<td>0.8624 ***</td>
</tr>
<tr>
<td></td>
<td>(4.8530)</td>
<td>(5.1219)</td>
<td>(4.7001)</td>
<td>(5.0437)</td>
<td>(3.0235)</td>
<td>(6.9962)</td>
</tr>
<tr>
<td>Coz2</td>
<td></td>
<td></td>
<td>0.2837 ***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(5.0437)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coz3</td>
<td></td>
<td></td>
<td></td>
<td>0.8624 ***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(6.9962)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CVs</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
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<tr>
<td>Province fe</td>
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<td>N</td>
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<td>19,566</td>
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<td>19,566</td>
<td>7562</td>
</tr>
<tr>
<td>r2_a</td>
<td>0.2018</td>
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<td>0.2017</td>
<td>0.3544</td>
<td>0.2011</td>
<td>0.3570</td>
</tr>
</tbody>
</table>

Note: *** indicate that the significance levels are 1%.

6. Discussion and Conclusions
6.1. Research Conclusions

Based on the inter-industry enterprise linkage perspective, combined with principal–agent theory and signaling theory, this study analyzes the relationship between common institutional ownership and corporate green transformation. The main conclusions of this study are as follows. (1) Common institutional ownership has a positive impact on enterprise green transformation. Common institutional ownership can not only enhance the motivation and ability of corporate green transformation and promote the enhancement of corporate green innovation ability and green governance performance but also promote the diffusion of green innovation in an industry and stimulate the upward convergence of green innovation in the industry. Therefore, common institutional ownership is one of the effective factors in promoting enterprises and green transformation. (2) Principal–agent costs, total factor productivity, financing constraints, and business credit partially mediate the effect of common institutional ownership on firms’ green transformation. When common institutional ownership joins a firm, its shareholder status exerts a synergistic governance effect, and its own powerful information and resources exert an information sharing effect. In this process, common institutional ownership supervise managers’ short-sighted behavior, reduce principal–agent costs, improve the efficiency of enterprise operation and resource utilization based on experience, and enhance total factor productivity. Common institutional ownership has an information advantage in the industry, and it also uses its expertise to improve the disclosure of enterprise information, which alleviates the financing constraints, gains the trust of both upstream and downstream enterprises, and enhances commercial credit, thus enhancing the enterprise’s motivation and capacity for green transformation. (3) Common institutional ownership is effective for the green governance performance of enterprises in non-heavily polluting industries and more effective for the green innovation capacity of enterprises in heavily polluting industries. Under the background of “double carbon”, the regulation and green development of heavily polluting industry is more important, and many policies are specially formulated for enter-
prises in heavily polluting industry; however, it is really difficult to improve governance performance in the short term, so it is better to seek transformation by improving the green ability of enterprise innovation. After joining a heavily polluting industry, the common institutional ownership is more aware of the imminent green transformation of the heavily polluting industry in this context and enhances the green innovation capacity. However, the shareholding ratio of common institutional ownership has an inverted U-shaped relationship with green governance performance, and its shareholding ratio is not easy to exceed 27%.

6.2. Practical Implications

This study has a certain significance in guiding how to better promote the green transformation of enterprises:

(1) Corporate level: common institutional ownership can give full play to the synergistic corporate governance effect and information sharing effect, which has a positive impact on the green transformation of enterprises. Therefore, listed enterprises can actively introduce co-institutional investors and increase their shareholding ratio, and enterprises in heavily polluting industries can control their shareholding ratio below 27% to give full play to the positive effect of co-institutional ownership on the green transformation of enterprises and enhance the motivation and ability of the green transformation of enterprises. The degree of the green transformation of enterprises can also be indirectly enhanced by encouraging executives to carry out green transformation, enhancing the utilization rate of enterprise resources, improving the information status of enterprises, and strengthening upstream and downstream cooperation. Enterprises in an industry should communicate and cooperate with each other, fully recognizing the benefits brought to the industry by the spillover of the results of green transformation, as well as the fact that green development can bring better competitive advantages to enterprises and actively carry out green transformation.

(2) Common institutional ownership level: common institutional investors should actively participate in corporate decision making, exercise shareholders’ power, ensure long-term corporate interests, reduce the short-sightedness of corporate managers, provide professional advice for corporate development, enhance corporate total factor productivity, and promote the green transformation of enterprises. They should also provide resources and information to the invested enterprises, and, at the same time, they should safeguard stakeholders and ensure that the information disclosed by the invested enterprises is true and reliable, to effectively alleviate the financing constraints of the enterprises and enhance their commercial credit. There are differences in the effect of common institutional ownership on the green innovation capacity and green governance performance of enterprises in a heavily polluting industry, and it is also necessary to cooperate with relevant national environmental policies to achieve effective complementarity between environmental systems and market regulation for different situations; close attention needs to be paid to the green governance performance of enterprises to ensure their green development. Finally, within its linkage network, encouraging innovation sharing among enterprises and promoting the upward convergence of green innovation among enterprises in the same cluster not only internalizes the spillover effects of innovation into portfolio gains but also promotes exchanges to reduce trade frictions. Fully exploring the driving factors of the green transformation of enterprises in an industry and combining them with policy tools adds a driving force to green transformation. Promoting the proliferation of green innovation results in the industry driving its innovation of systems and products and guiding the whole industry to actively carry out green transformation.

(3) Regulator level: government departments should give full play to the role of common institutional ownership as an informal mechanism in the market, provide a good governance environment and institutional safeguards for common institutional ownership, and further promote the participation of common institutional investors in
corporate governance to their advantage. At the same time, the government should create a favorable environment for the green transformation of enterprises and, as far as possible, carry out policy compensation measures at the early stage of the transformation in order to reduce the principal–agent problem, alleviate financing constraints, and encourage enterprises to carry out green transformation. Finally, the central government and local governments should emphasize the importance and necessity of the green development of enterprises and industries in the context of “dual-carbon”, give full play to the guiding advantages of the “dual-carbon” context, and strengthen the implementation of sustainable development strategies while encouraging joint investment. At the same time, they should encourage common institutional investors to see their foresight and drive enterprises in an industry to carry out green transformation.

6.3. Theoretical Contribution

Our research involves two main theoretical contributions. First, common institutional ownership is one of the key drivers of green transformation in companies. Corporate green transformation is considered to be the best way for companies to seek competitive advantage in the context of “dual carbon”. However, scholars’ studies mostly focused on the influence of environmental policies, green finance, and internal decision making, without exploring whether there are drivers within the industry. Empirical analysis reveals that common institutional ownership has a positive impact on corporate green transformation. This finding enriches the economic consequences of common institutional ownership and fills the gap of the existing drivers of green transformation in an industry. Second, to address the dilemma of corporate green transition, enhancing green transition willingness and ability is a breakthrough method. Through the analysis, it is found that principal–agent cost, total factor productivity, financing constraints, and business credit have a mediating effect between joint institutional ownership and corporate green transition; this result not only enriches the application scenarios and mechanisms of principal–agent theory and signaling theory but also provides a reliable path for joint institutional ownership to better enhance corporate green transition.

Author Contributions: Conceptualization, X.C. and J.W.; methodology, X.C.; software, X.C.; validation, X.C. and J.W.; formal analysis, X.C.; investigation, data curation, X.C.; writing—original draft preparation, X.C.; writing—review and editing, X.C. and Y.D.; supervision, F.Z. and J.W.; funding acquisition, J.W. and F.Z. All authors have read and agreed to the published version of the manuscript.

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Informed Consent Statement: Not applicable.

Data Availability Statement: The data and models used during the study are available from the corresponding author by request.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Common institutional investors examine the disclosed information and financial data of the company before investing and may have subjective preferences for characteristics such as the profitability and growth of the company; companies with these characteristics are more likely to be favored, so the degree of common institutional ownership linkage and shareholding ratio increases. Therefore, the promotion of firms’ green transformation in the baseline regression results may not be due to common institutional ownership playing a role but rather to the firm’s characteristic variables. To eliminate these potential sample selection biases, Heckman’s two-stage approach is used: control variables are lagged (lag CVs), and a Probit model is constructed to calculate the inverse Mills ratio (imr) to examine
whether firm characteristics in the previous period influence the incorporation of common institutional ownership. The imr was added to model (1) as a control variable.

The results are shown in Table A1. The imr is significant at the 1% level for both firm green performance and green innovation capacity, indicating that there is, indeed, a sample selection bias, so further testing of the baseline regression findings is required. After eliminating the sample selection bias, the regression coefficients of common institutional ownership on corporate green performance and corporate green innovation are still significant at the 1% level, which is consistent with the baseline regression findings.

Table A1. Heckman’s two-stage model test.

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coz2</td>
<td>0.0561 *** (8.1882)</td>
<td>0.1213 *** (7.2573)</td>
<td>0.1715 *** (5.1684)</td>
<td>0.4231 *** (5.2958)</td>
</tr>
<tr>
<td>Coz3</td>
<td>–0.0236 *** (–7.1622)</td>
<td>–0.0238 *** (–7.2314)</td>
<td>–0.0528 *** (–2.7354)</td>
<td>–0.0535 *** (–2.7711)</td>
</tr>
<tr>
<td>imr</td>
<td>–0.8851 *** (–16.0385)</td>
<td>–0.8921 *** (–16.1591)</td>
<td>–8.5604 *** (–27.4226)</td>
<td>–8.5623 *** (–27.4597)</td>
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<td>Yes</td>
<td>Yes</td>
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</table>

Note: *** indicate that the significance levels are 1%.

To further control for the problem of sample selection bias, PSM-OLS was used as a test. The sample with common institutional ownership was used as the experimental group and the rest as the control group. Covariates were tested using control variables, year, and industry fixed effects, using nearest-neighbor matching with the put-back (1:1) method to identify the control group sample with the most similar characteristics to the experimental group.

The endogeneity problem is further addressed using the PSM and a similar double-differencing approach. The sample observation interval without a co-institutional investor is changed to the sample with one as the experimental group (Treat = 1) and the rest of the sample as the control group (Treat = 0). After is a time dummy variable, and the value is taken as 0 before the co-institutional investor is added and 1 after.

Table A2. PSM-OLS and PSM-DID.

<table>
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<th>(5)</th>
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<td>0.0405 *** (4.6150)</td>
<td>0.0937 *** (4.5671)</td>
<td>0.1528 *** (3.6002)</td>
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</table>

Note: **, and *** indicate that the significance levels are 5%, and 1%, respectively.
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