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Can Civilized City Construction Promote Enterprise Green Innovation?

Xuwei Tang [1,2,*], Qi Zhang [1,3], Chunxin Li [2], Haitao Zhang [4] and Haiyun Xu [5]

[1] School of Economics and Management, China University of Petroleum-Beijing, Beijing 102249, China; zhangqi@cup.edu.cn
[2] CNPC Economics and Technology Research Institute, Beijing 100120, China; lichunxin@cnpc.com.cn
[3] Tianshan Research Institute, Karamay 834000, China
[4] CNPC Managers Training Institute, Beijing 100096, China; zhtqh@petrochina.com.cn
[5] CNPC Natural Gas Sales Branch, Beijing 100007, China; hy.xu@petrochina.com.cn
* Correspondence: tangxuwei@cup.edu.cn; Tel.: +86-18322227930

Abstract: The existing research shows that when facing the trade-off between economic benefits and green innovation, enterprises often prioritize economic gains, and how to promote enterprise green innovation (EGI) has become a pressing issue that needs to be solved at this stage. Against this backdrop, China's Civilized City Construction (CCC) policy, which emphasizes the coordinated development of economic, political, ecological, and spiritual civilization, places higher demands on enterprise environmental behaviors. This creates an opportune moment to investigate the relationship between urban governance policies and EGI. In this study, we employ a Difference-in-Differences (DID) model to examine whether the CCC policy can promote EGI and reveal its underlying mechanisms. The research findings indicate that CCC significantly promotes EGI. The policy improves EGI levels by strengthening regional environmental regulations and increasing environmental subsidy levels. This finding provides lessons for advancing enterprise sustainability strategies and new perspectives for global urban governance policy formulation and implementation.

Keywords: Civilized City Construction policy; enterprise green innovation; Difference-in-Differences mode; regional environmental regulations

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1. Introduction

The motivation for EGI is multifaceted, intertwined with various factors, and emerges as a proactive response by enterprises to increasingly critical environmental issues and constantly changing market conditions [1–3]. Through green innovation, enterprises can attain comprehensive and long-term advantages in sustainability, market competition, and regulatory compliance [4]. The existing research indicates that the driving forces behind EGI stem from considerations related to the environment, society, regulations, and the market [5,6]. First, the stakeholder theory suggests that the image of enterprises in society is increasingly in the spotlight and that public concern about environmental issues in particular has pushed enterprises to take on more environmental responsibility [7–9]. Meanwhile, in the face of increasing environmental requirements, enterprises, under pressure from multiple stakeholders, will release positive signals to stakeholders by adopting green innovations to show that they are playing an active role in sustainable development, reducing environmental pollution, wasting resources, and improving the efficiency of resource utilization, so as to build up an environmentally friendly corporate image [10]. Secondly, legitimacy theory suggests that governments and international organizations continue to strengthen the formulation and implementation of environmental regulations, which puts more stringent environmental requirements on enterprises, and that if enterprises want to achieve long-term sustainable development, they must follow the legal requirements and

implement environmental protection measures, such as green innovation, to ensure institutional recognition and alleviate the legitimacy pressure [11,12]. Concurrently, intensifying market competition compels enterprises to continually enhance the environmental quality of their products and service levels. This not only helps consolidate the market share but also attracts more environmentally conscious consumers, boosting the competitive edge of enterprises in the market.

Currently, environmental issues such as climate change, resource depletion, and ecosystem collapse have transcended national borders, becoming global focal points of concern [13,14]. These issues not only threaten the balance of natural ecosystems but also have profound implications for the sustainability of human society. With the escalation of global environmental problems, the demand for a better ecological environment is increasing [15,16]. Simultaneously, enterprises, as one of the most influential economic entities, are identified as major culprits and contributors to environmental pollution, drawing attention from the media, the public, and the government, among other societal sectors [17–19]. Undeniably, enterprises have made significant contributions to economic growth; however, their actions have raised the dilemma of "greed versus green". As environmental issues become a "threat" to public life, various sectors of society begin to condemn pollution-causing enterprises for environmental destruction [20]. In this context, enterprises may be compelled by legitimacy pressure to overhaul their business and production models, intensify research and development of green technologies and innovations, and meet more stringent environmental standards [21,22]. However, existing research indicates that when faced with the trade-off between economic benefits and green innovation, enterprises often prioritize economic gains and overlook the green innovation required for sustainable development due to the high economic costs involved [23]. Therefore, how to promote EGI has become a critical issue requiring urgent attention.

Under this background, some countries and cities are beginning to implement governance policies aimed at guiding enterprises to participate in green development and catalyzing their transition to sustainability [24–26]. Among these initiatives, China's CCC policy provides an opportunity to explore the relationship between urban governance policies and EGI. On the one hand, the civilized city brand is a prestigious reflection of the high level of civilization in Chinese cities, comprehensively representing the city's level of civilized development. The CCC policy emphasizes the coordinated development of economic, political, ecological, and spiritual civilization, placing higher legitimacy demands on enterprise environmental behaviors from multidimensional perspectives [27,28]. On the other hand, compared to other policies, the CCC evaluation system is more comprehensive in terms of environmental governance, protection, and regulatory aspects. Its evaluation methods and assessment systems are also more stringent, exerting greater constraints on enterprises [29]. Particularly, the assessment system incorporates selection and review mechanisms, prompting local governments to enhance supervision and governance measures for enterprises to win the evaluation [30,31]. However, the existing research does not conclusively determine whether this policy can promote enterprise environmental behavior and enhance green innovation. Similarly, the existing research lacks clarity on the influencing mechanisms of such policies on EGI behaviors. Therefore, at this stage, there is an urgent need to clarify whether CCC can promote EGI and what the mechanism of its influence is.

On this basis, this paper further analyzes whether CCC can promote EGI and its mechanisms through the DID model. The contributions of this study are as follows: On one hand, against the background of increasingly serious global environmental problems, this paper explores the effect of the CCC on EGI and its mechanism on the global consensus of sustainable development, which not only provides more specific and practical analytical experience for future research but also presents a new perspective to deepen our understanding of the relationship between urban governance and corporate sustainable development. On the other hand, through the quantitative assessment, this study not only summarizes the successful experiences and practices but also identifies the existing

problems and challenges, thus putting forward corresponding policy recommendations and reform directions. Such specific and practical suggestions not only contribute to improving the effect of the current policy but also provide an important reference for future related policies that demonstrate in-depth thinking and specific guidance for the promotion of green transformation in enterprises and sustainable development in cities.

2. Literature Review and Research Hypothesis

2.1. Literature Review

The relationship between urban construction and EGI is a core issue currently receiving significant attention in the field of sustainable development. As the central hub of human activities, the level of urban development directly affects the distribution of global resources and the sustainability of the environment [32,33]. Enterprises, as the driving force behind urban economic systems, not only impact their own competitiveness through their performance in green innovation but also profoundly shape the ecological landscape of cities [34,35]. Firstly, scientifically and reasonably governed cities and the construction of green infrastructure play a crucial role in reducing urban resource consumption and environmental pollution. This includes measures such as increasing urban green spaces, optimizing transportation systems, and introducing renewable energy sources. These actions not only enhance the ecological environment of cities but also provide a more favorable business environment for enterprises, stimulating their active participation in urban construction.

Secondly, EGI, as a core element of corporate social responsibility, has long been a focus of scholarly research. Existing studies elucidate the pivotal role of green innovation in the sustainability of enterprises [36]. Enterprises can enhance their competitiveness and gain consumer recognition in the market by introducing clean technologies, optimizing production processes, and driving the research and development of green products [37]. These research findings reveal the positive impact of enterprises actively engaging in green innovation on their own development and the overall green upgrading of the industry chain. Simultaneously, collaborative innovation between cities and enterprises is considered a key mechanism for promoting sustainable development [38,39]. City governments can provide a better external environment for enterprises by formulating environmental policies, offering incentives, and supporting green technology research and development, thus reducing the costs of enterprises engaging in green innovation [40]. This collaborative innovation mechanism fosters positive interaction between cities and enterprises during the sustainable development process, mutually propelling the progress of green development.

CCC, as an important means of promoting sustainable urban development, has received much attention from scholars in recent years. However, although a number of studies have been conducted to explore the effects and impacts of CCC implementation, there are still some shortcomings [27]. First, there is a relative lack of current assessment of the implementation effects of CCC, especially since its specific impact in promoting EGI has not been systematically studied. The existing studies are often limited to policy advocacy and statistics of surface data, lacking in-depth analysis of actual policy implementation as well as EGI behavior [41]. Second, there is a lack of research frameworks and theoretical models. Although existing studies have explored related areas such as urban governance, corporate social responsibility, and innovation theory, they often lack systematic theoretical guidance, resulting in research results that lack depth and breadth. In addition, the research methodology is relatively single, often limited to qualitative or quantitative analysis, and it lacks multi-perspective and multi-level methodological innovation [42]. The complex mechanisms and pathways by which CCC drives EGI have not been sufficiently studied.

In summary, the existing literature reveals the close and intricate relationship between urban construction and EGI. Despite the existence of these theoretical frameworks, there remains a research gap in the current literature: a lack of in-depth investigation into the mechanisms and approaches through which CCC specifically promotes EGI. The existing research often focuses on a singular perspective, either urban construction or EGI, lacking a

comprehensive understanding of the relationship between the two. Nevertheless, from the available research, it is evident that CCC provides space for enterprises' green development. Scientific planning and the construction of environmentally friendly infrastructure, such as sewage treatment plants and waste disposal facilities, provide a greener production foundation for enterprises, making it easier for them to obtain green certifications and enhance their competitiveness in the green market. However, the actual effectiveness of these efforts is yet to be determined.

2.2. Research Hypothesis

Civilization has the most fundamental impact on societal development by shaping ideal beliefs, moral concepts, and value systems. The advancement of urban civilization can reshape the collective perception of social responsibility by governments, enterprises, and society as a whole [43]. Firstly, the development of urban civilization can innovate the governance perspective of the government, enhancing the institutional supply of social responsibility for enterprises at all levels. On one hand, improvements in enterprise social responsibility rely on the refinement of governmental governance perspectives [44,45]. The higher the level of urban civilization, the higher the effectiveness of ideological concepts and institutional governance in its regulatory rules. On the other hand, the supply of democratic, scientific, and standardized external institutions prompts enterprises to shape new organizational cultures, structures, and conventions, thereby propelling enterprises toward the sharing of social values [46,47]. Secondly, the development of urban civilization can cultivate the altruistic views of enterprises, enhancing the intrinsic motivation of enterprise owners and executives to fulfill social responsibilities. Altruism suggests that the pure moral cultivation of enterprise owners or the ethical culture within an enterprise can compel it to shoulder social responsibilities. Thirdly, the development of urban civilization can foster public values, enhancing overall societal supervision and constraints on enterprise social responsibility. The development of civilization can shape public values regarding fairness, justice, empathy, and friendliness, inspiring public awareness of rights, responsibilities, and the monitoring of enterprise behavior [48]. On this basis, citizens' values can converge to form societal consensus, guiding public opinion through media, networks, and other channels, and forming constraints on enterprise behavior under reputation mechanisms. Numerous studies have highlighted the advantages of social supervision, such as widespread foundation, numerous channels, and low costs, which can alleviate information asymmetry issues between governments and enterprises, constraining tax compliance, charitable donations, and environmental governance behavior.

The CCC has profound implications for promoting EGI. The essence of this relationship lies in the higher demands that urban construction places on the environmental and operational practices of enterprises, simultaneously creating more market opportunities for enterprises [49]. Firstly, as urban attention to environmental protection and sustainability continues to rise, the CCC advocates stricter environmental standards and requirements. This compels enterprises not only to comply with more stringent environmental regulations but also to surpass these requirements actively, adopting and promoting green technological innovations. In order to meet or exceed urban environmental standards, enterprises must increase investment in green innovation, optimize production processes, reduce resource wastage, and steer products and services toward more environmentally sustainable directions. Secondly, governments in the CCC often formulate a series of green policies, providing incentives such as rewards, tax reductions, and financial support to enterprises. This policy support not only lowers the costs of enterprises engaging in green innovation but also provides greater economic returns, making green innovation more attractive. Encouraged by such policies, enterprises are more willing to engage in green technology research and development, leading to the continuous emergence of green innovation. For example, government subsidies or tax incentives for enterprises that use renewable energy will encourage them to adopt more renewable energy technologies. By granting subsidies or incentives to enterprises for the application of green technologies and

the research and development of resource-saving and environmentally friendly products, the government can stimulate enterprises to actively engage in green innovation. Such a subsidy policy can reduce the economic cost for enterprises to invest in green innovation, thus increasing the incentive for EGI.

Furthermore, CCC creates broader market opportunities for enterprises. As urban residents' awareness of environmental protection and sustainability increases, the demand for green products and services also grows. Through green innovation, enterprises can better meet market demands, enhance product competitiveness, and expand market share. The expansion of these market opportunities provides enterprises with better development prospects and becomes an intrinsic driving force for EGI. Additionally, the CCC emphasizes social responsibility and sustainable development, gradually making enterprises realize that participating in the ecological construction of cities not only provides a competitive advantage in business but also establishes a positive social image. Through this process, enterprises gradually recognize that green innovation is not only a contribution to the environment but also a fulfillment of their own social responsibility, helping to establish a positive image in society. Therefore, CCC, through various aspects such as raising environmental standards, policy support, and creating market opportunities, stimulates enterprises to actively engage in green innovation. On this basis, Hypothesis 1 and Hypothesis 2 are proposed:

Hypothesis 1. *CCC can promote EGI.*

Hypothesis 2. *CCC will promote EGI by increasing the regional environmental regulations and environmental subsidy levels.*

3. Data and Method

3.1. Data

3.1.1. Dependent Variable

This study follows the approach of existing research and employs the natural logarithm (ln) of the "sum of green invention patent applications, green utility model patent applications, and plus one" to reflect the overall level of green innovation for enterprises [50,51].

3.1.2. Independent Variable

$DID_{i,t}$ is a dummy variable representing the CCC policy. If enterprise i's city is designated as a civilized city in year t, then the value of $DID_{i,t}$ for the years t and beyond is set to 1; otherwise, it is set to 0. If the enterprise i's city has never been designated as a civilized city, the $DID_{i,t}$ remains 0 throughout the sample period.

3.2. Method

The empirical research in this paper considers how to accurately identify the impact of the CCC policy on the level of EGI. Currently, most relevant studies evaluating policy effects employ the DID method. This method can help mitigate endogeneity issues to identify the net effect of the CCC policy on EGI as accurately as possible [52,53]. DID is applicable to long-term panel data and requires policy interventions to be temporally identifiable, and can effectively control for endogeneity problems and selection bias, with the advantage of being able to effectively control for time-invariant individual characteristics and unobserved time-varying factors, thus reducing endogeneity problems and improving the reliability and credibility of research results [54]. First, DID can help researchers solve the endogeneity problem. When analyzing policy impacts, there are often many individual characteristics or time trends that may affect the results. By comparing the changes in the same entity before and after the implementation of policies, the double differencing method can exclude the interference of individual fixed characteristics and time trends, thus effectively controlling the endogeneity problem [55]. Second, DID can reduce the impact of selection bias. In research, there are often some individual characteristics that may affect the results, and the

double difference method can better control these individual differences, thus reducing the impact of selection bias on the research results. In addition, DID is more reliable in causal inference. By comparing the changes in the same entity before and after the implementation of the policy, the impact of the policy on EGI can be assessed more accurately, reducing the potential impact of external shocks or policy changes on the results, thus improving the reliability of causal inference. Given the variations in different batches of the CCC policy over time in China, this paper adopts a multi-period DID model for empirical research. Following the existing research, the baseline regression model is set as follows:

$$Green_{i,j,t} = \alpha + \beta DID_{i,j} + Controls_{i,t} + \theta_i + \eta_t + \varphi_t + \varepsilon_{i,t} \quad (1)$$

In this context, I represents the enterprise, j denotes the city, and t signifies time; $Green_{i,j,t}$ denotes the level of EGI for enterprise i in city j during year t. $DID_{i,t}$ is a binary variable representing whether city i was designated as a civilized city in year t, taking a value of 1 if true and 0 otherwise. $Controls_{i,t}$ encompasses company- and regional-level control variables. θ_i and η_t, respectively, denote enterprise and city, and industry fixed effects to control for unobservable factors at the industry and city levels that do not vary over time and may affect the level of EGI. φ_t represents year fixed effects to control for macroeconomic environmental influences. $\varepsilon_{i,t}$ is the error term. The parameter β is the key coefficient of interest in this study, reflecting the average treatment effect of the policy shock of being designated as a civilized city on the EGI level of enterprises in the respective cities. All regressions employ robust standard errors and clustering at the company level.

3.3. Variable Setting and Descriptive Statistics

Drawing upon existing research, this study introduces a set of enterprise-level control variables into the model to address potential influences on the level of EGI and mitigate the issue of omitted variables [56–59]. These variables are as follows: company size (SIZE), where larger enterprises, attracting more attention and valuing social image and reputation, are inclined to engage in more green innovation; company profitability (ROA) and net profit growth rate (Growth), as enterprises with strong profitability and sufficient cash flow are better positioned to provide financial support for and ensure the sustainability of green innovation; financial leverage (LEV) and inventory ratio (INV), as enterprises with high debt burden and inventory may reduce investment in green innovation due to financial pressure; enterprise age (AGE), influencing the importance placed on green innovation by enterprises; controlled for Tobin's Q value (TobinQ) and the shareholding ratio of the top ten largest shareholders (TOP10). Finally, considering the potential impact of regional macroeconomic development on the level of EGI, the model incorporates the regional gross domestic product (GDP) and industrialization level of the city. Enterprise-related data and regional economic data are from the WIND database, the CSMAR database, and the China Urban Statistical Yearbook. Variable definitions are provided in Table 1; descriptive statistics are shown in Table 2.

Table 1. Variable setting and descriptive statistics.

Variable Symbol	Variable Definition	Measurement Mode
SIZE	Enterprise size	Take the logarithm of the total assets of enterprise
ROA	Enterprise profitability	Enterprise net profit divided by total assets
Mshare	Level of managerial share ownership	Management shareholding figure divided by total equity
Growth	Net profit growth rate	Current year operating income less previous year operating income/previous year operating income
Lev	Financial leverage	Total enterprise liabilities divided by total assets
INV	Inventory ratio	Ratio of net inventory to total assets
Age	Enterprise age	The number of years the enterprise has been listed is logarithmic

Table 1. *Cont.*

Variable Symbol	Variable Definition	Measurement Mode
TobinQ	Tobin's Q value	(Market value of tradable shares + number of non-tradable shares × net assets per share + book value of liabilities)/total assets
Top10	Top ten largest shareholders	Number of shares held by top 10 shareholders/total number of shares
GDP	Regional gross domestic product	The gross domestic product of the city in which enterprise is located
IND	Level of industrialization	The proportion of the added value of the secondary industry in GDP of the city where enterprise is located

Table 2. Descriptive statistics.

Variable	Obs	Mean	Std.Dev.	Min	Max
SIZE	27,223	0.503	0.891	0	3.932
ROA	27,223	0.465	0.499	0	1
Mshare	27,223	12.945	19.976	0	68.894
Growth	27,223	−0.143	3.049	−20.395	9.563
Lev	27,223	3.509	3.166	1.165	20.183
INV	27,223	22.037	1.281	19.83	26.094
Age	27,223	1.922	0.923	0	3.258
TobinQ	27,223	0.051	0.054	−0.139	0.221
Top10	27,223	0.149	0.134	0	0.706
GDP	27,223	59.562	15.044	24.093	90.497
IND	27,223	2.799	1.996	0.897	11.724

4. Results and Discussion

4.1. Baseline Regression Result

Table 3 reports the baseline regression results of the impact of the CCC policy on the EGI level. Column (1) presents results without the inclusion of industry fixed effects and regional fixed effects. The regression coefficient of DID is reported as 0.082, and it is significantly positively correlated with the EGI level at the 1% significance level. After incorporating industry fixed effects, as shown in column (2), the regression coefficient of DID is 0.083, and it remains significantly positive at the 1% significance level. Finally, with the inclusion of regional fixed effects in column (3), the regression coefficient of DID is 0.041, still significantly positive at the 5% significance level. At this point, the adjusted R-squared value increases from 0.197 to 0.294, indicating further optimization of the model fit and an enhancement of explanatory power.

Table 3. Baseline regression result.

	(1)	(2)	(3)
Variable	**y**	**y**	**y**
DID	0.082 ***	0.083 ***	0.041 **
	(3.34)	(3.66)	(1.96)
INV	−0.447 ***	−0.321 ***	−0.329 ***
	(−6.18)	(−3.80)	(−3.71)
Mshare	0.001 *	−0.000	−0.000
	(1.75)	(−0.49)	(−0.62)
Growth	−0.006 **	−0.006 ***	−0.006 ***
	(−2.54)	(−2.76)	(−2.79)
Lev	−0.014 ***	−0.011 ***	−0.012 ***
	(−5.01)	(−4.10)	(−4.32)

Table 3. *Cont.*

	(1)	(2)	(3)
Variable	**y**	**y**	**y**
Size	0.205 *** (10.85)	0.218 *** (12.36)	0.211 *** (11.89)
Age	−0.161 *** (−10.71)	−0.105 *** (−7.40)	−0.099 *** (−6.85)
ROA	0.404 * (1.86)	0.669 *** (3.24)	0.684 *** (3.37)
TOP10_w	−0.005 *** (−5.52)	−0.004 *** (−4.30)	−0.003 *** (−3.93)
TobinQ	0.003 (0.70)	−0.005 (−1.03)	−0.007 (−1.50)
GDP	0.003 ** (2.10)	0.001 (0.90)	0.002 (0.89)
IND	0.007 *** (4.61)	0.006 *** (4.51)	0.003 (1.49)
Constant	−3.536 *** (−8.58)	−3.952 *** (−10.27)	−3.784 *** (−9.80)
Year fixed effect	Yes	Yes	Yes
Industry fixed effect	No	Yes	Yes
Regional fixed effect	No	No	Yes
Observations	27,223	27,223	27,219
Adjusted R^2	0.197	0.269	0.294

Note: The brackets are robust t values, and the standard error clustering is at the enterprise level. *, ** and *** are significant at the levels of 10%, 5%, and 1%, respectively.

4.2. Robustness Test

4.2.1. Parallel Trends Test

One concern regarding the above empirical results is that if the level of green innovation for enterprises in the treatment group had a faster-expanding trend before the implementation of the CCC policy, and this trend did not change due to the policy implementation, there could be an issue of overestimation in the aforementioned results. One approach to alleviate this concern is to conduct a parallel trends test, meaning that, before the establishment of the city clusters, the EGI levels in the treatment group and control group exhibited similar trends and there were no systematic differences [60]. In this way, it can be inferred that this selective bias did not lead to estimation bias. The parallel trends test is set up as follows:

$$Green_{i,j,t} = \alpha + \sum_{n=-7}^{8} \beta_n DID_{i,j}^{n} + Controls_{i,t} + \theta_i + \eta_t + \varphi_t + \varepsilon_{i,t} \quad (2)$$

Here, the meaning of $DID_{n,i,t}$ ($n = -7, \ldots, 8$) is a dummy variable representing whether enterprise i is in the nth year after city t was designated as a civilized city. For example, $DID_{-2,i,t} = 1$ indicates that in the current year, enterprise i is in the second year before city t was designated as a civilized city; otherwise, it is 0. $DID_{2,i,t} = 1$ indicates that in the current year, enterprise i is in the second year after city t was designated as a civilized city; otherwise, it is 0. The main sample's time span is from 2006 to 2020. The years eight years after the establishment and beyond ($n = 8$) are grouped together, and the years seven years before the establishment and before ($n = -7$) are grouped together. Following the existing research, the year before the policy implementation (i.e., $n = -1$) is set as the baseline group. $Controls_{i,t}$ are the enterprise and regional-level control variables (refer to

the baseline regression). θ_i and η_t, respectively, represent industry fixed and city fixed effects to control for unobservable factors at the enterprise and city levels that do not vary over time and may affect the EGI level. φ_t is the year fixed effect to control for the impact of the macroeconomic environment. $\varepsilon_{i,t}$ is the error term.

Figure 1 illustrates the results of the parallel trends test. The estimated results show that the interaction term coefficients β_{-7}, β_{-6}, β_{-5}, . . ., and β_{-1} are all not statistically significant. This indicates that in the years before the implementation of the CCC policy, there were no significant differences in the level of green innovation between the experimental group and the control group. Therefore, it can be inferred that the experimental group and the control group in this study passed parallel trends before the experiment, satisfying the prerequisite for applying the DID model.

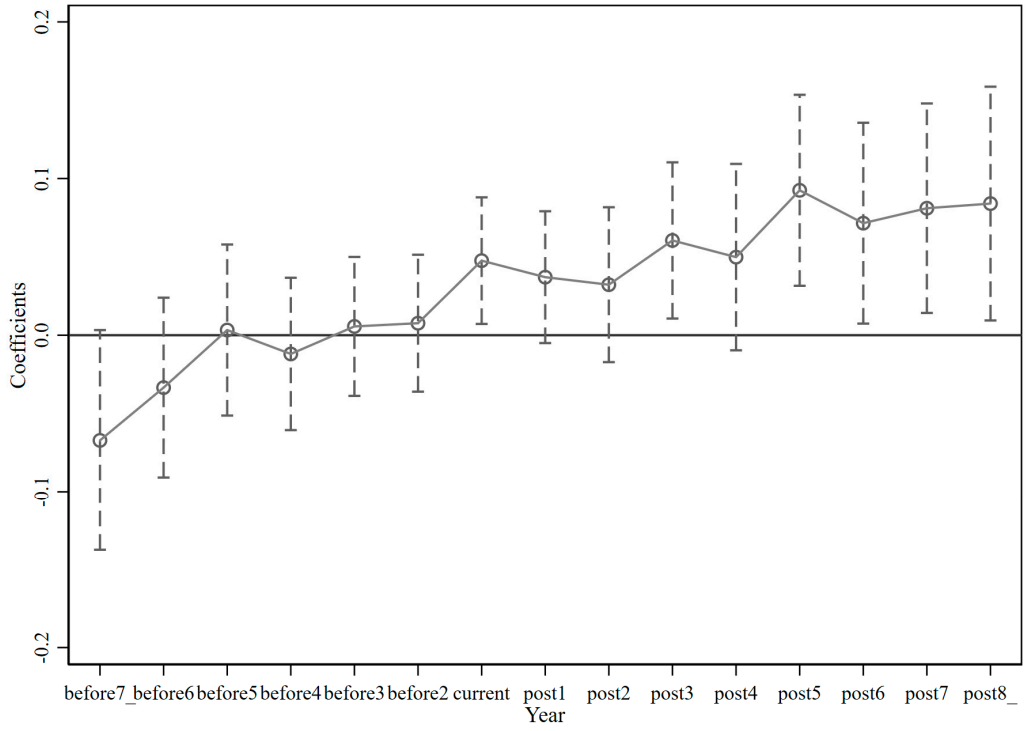

Figure 1. Parallel trends test.

4.2.2. Placebo Test

This study also conducted 1000 placebo tests to control for the influence of unobservable factors on the estimation results [61,62]. Specifically, for randomly selected iterations, the interaction term *DID* was randomly assigned to each enterprise in the sample, constructing a pseudo-variable called *False_DID*. The constructed pseudo-variable was then substituted for the real interaction term, *DID*, and the baseline model was re-estimated. This process was repeated 1000 times. Figure 2 illustrates the distribution of T-values based on the estimation using *False_DID*. From Figure 2, it is evident that the T-values from the 1000 placebo tests follow a normal distribution centered around zero. Most of the results are not statistically significant, indicating that the findings of this study are consistent with the counterfactual test. This suggests that unobserved macro factors or factors varying over time are unlikely to impact the main findings of this study.

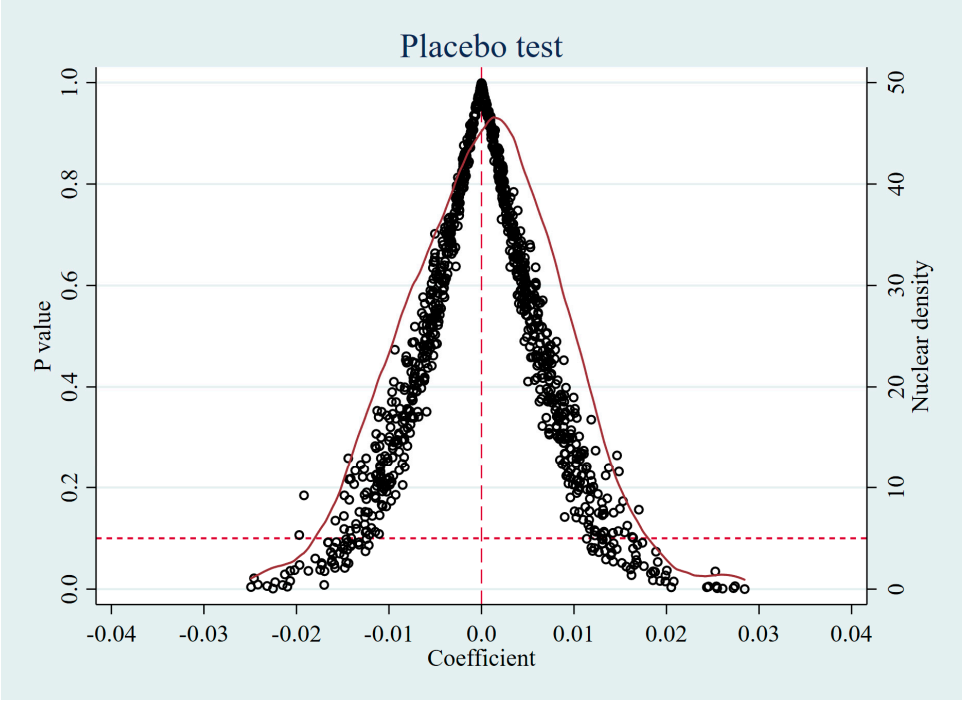

Figure 2. Placebo test.

4.2.3. Change Policy Implementation Time

To avoid the possibility that the differences in the green innovation levels between the treatment group enterprises and the control group enterprises are due to temporal changes, this study, following existing research, artificially shifted the implementation time of CCC policy by 1 year and 2 years [63,64]. Pseudo-policy times were constructed, and regressions were conducted. The results indicate that the coefficient estimate of *DID* did not pass the significance test at the 10% level. This suggests that there is no systematic difference in the time trends between the treatment group enterprises and the control group enterprises, providing further evidence that CCC policy has increased the level of EGI; the results are shown in Table 4.

Table 4. Robustness test.

	The Policy is 1 Year Ahead of Schedule	The Policy is 2 Years Ahead of Schedule	T-1 Green Innovation	T-2 Green Innovation	PSM-DID
Variable	**y**	**y**	**y**	**y**	**y**
DID	0.032 (1.29)	0.033 (1.27)	0.051 ** (2.04)	0.050 * (1.77)	0.074 ** (2.25)
INV	−0.329 *** (−3.55)	−0.328 *** (−3.55)	−0.365 *** (−3.52)	−0.431 *** (−3.99)	−0.358 *** (−3.27)
Mshare	−0.000 (−0.53)	−0.000 (−0.52)	−0.000 (−0.52)	−0.000 (−0.43)	−0.000 (−0.00)
Growth	−0.006 *** (−3.09)	−0.006 *** (−3.08)	−0.012 *** (−2.75)	−0.012 *** (−2.64)	−0.006 ** (−2.23)
Lev	−0.012 *** (−4.66)	−0.012 *** (−4.67)	−0.015 *** (−4.95)	−0.015 *** (−4.33)	−0.012 *** (−3.72)
Size	0.211 *** (14.66)	0.211 *** (14.65)	0.226 *** (14.78)	0.244 *** (13.92)	0.206 *** (14.11)

Table 4. *Cont.*

	The Policy is 1 Year Ahead of Schedule	The Policy is 2 Years Ahead of Schedule	T-1 Green Innovation	T-2 Green Innovation	PSM-DID
Variable	**y**	**y**	**y**	**y**	**y**
Age	−0.098 *** (−6.17)	−0.098 *** (−6.16)	−0.105 *** (−6.13)	−0.112 *** (−6.08)	−0.093 *** (−5.52)
ROA	0.685 *** (3.65)	0.685 *** (3.65)	1.106 *** (4.48)	1.108 *** (3.82)	0.822 *** (4.15)
TOP10_w	−0.003 *** (−3.06)	−0.003 *** (−3.06)	−0.003 *** (−3.00)	−0.003 *** (−2.70)	−0.004 ** (−2.58)
TobinQ	−0.007 (−1.42)	−0.006 (−1.41)	−0.006 (−1.35)	−0.003 (−0.45)	−0.011 * (−1.93)
GDP	0.002 (0.82)	0.001 (0.81)	0.002 (1.15)	0.003 (1.04)	0.002 (0.96)
IND	0.003 (1.30)	0.003 (1.29)	0.004 (1.38)	0.005 (1.54)	0.004 (1.46)
Constant	−3.778 *** (−13.80)	−3.781 *** (−13.77)	−4.126 *** (−13.17)	−4.504 *** (−11.68)	−3.720 *** (−10.59)
Year fixed effect	Yes	Yes	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes	Yes	Yes
Regional fixed effect	Yes	Yes	Yes	Yes	Yes
Observations	27,219	27,219	21,248	16,822	14,127
Adjusted R^2	0.294	0.294	0.303	0.317	0.283

Note: The brackets are robust t values, and the standard error clustering is at the enterprise level. *, ** and *** are significant at the levels of 10%, 5%, and 1%, respectively.

4.2.4. Replace the Explained Variable

Taking into account the substantial time required for green innovation from research and development input to output of results, this study selected the green patent application quantity in the t-1 year and t-2 year to measure the level of green innovation for the current year [65–67]. The results indicate that the coefficient of DID remains significantly positive, providing further evidence that the CCC policy has increased the level of EGI; the results are shown in Table 4.

4.2.5. Propensity Score Match-DID (PSM-DID)

To further rule out possible selectivity bias in the sample, this paper uses the PSM-DID model for robustness testing. For consideration of the matching effect and other factors, this paper uses the Logit model to estimate the propensity score and adopts the one-to-one nearest neighbor matching method. The regression results of the PSM-DID model are shown in Table 4, and compared with the previous benchmark regression results (Table 3), it can be seen that the direction of the coefficients and the significance of the DID have not been changed, which indicates that the empirical results of this paper are robust.

5. Further Analysis

5.1. Influence Mechanism Analysis

The empirical analysis above has confirmed the positive promoting effect of CCC policy on EGI levels. In this section, the study will further explore the mechanisms through which CCC policy enhances EGI levels. The theoretical analysis suggests that CCC policy, by altering the external environment faced by enterprises, strengthens the intensity of environmental regulations and subsidies, thereby promoting EGI. To directly verify the impact of this mechanism, this study draws on the existing research and constructs two indicators

to measure the intensity of regional environmental regulations ($ER_{i,j}$) and environmental subsidy levels ($SUB_{i,j}$) [68–70]. The regression model is designed as follows:

$$ER_{i,j}(SUB_{i,j}) = \alpha + \beta DID_{i,j} + Controls_{i,t} + \theta_i + \eta_t + \varphi_t + \varepsilon_{i,t} \quad (3)$$

Columns (1) and (2) of Table 5, respectively, report the regression results of the mechanism test with regional environmental regulation intensity and enterprise environmental subsidy intensity as dependent variables. The results indicate that the coefficients of DID are both significantly positive, suggesting that after the region is designated as a civilized city, the environmental regulation intensity of the region strengthens, and enterprises receive increased environmental subsidies. In other words, the CCC policy enhances the regional environmental regulation intensity and increases the environmental subsidies provided to enterprises, thereby promoting the level of green innovation in enterprises.

Table 5. Influence mechanism analysis.

	(1)	(2)
Variable	$ER_{i,j}$	$SUB_{i,j}$
DID	−0.042 ***	0.066 *
	(−13.66)	(1.66)
INV	−0.005	−0.368 **
	(−1.32)	(−2.20)
Mshare	0.000	0.002 **
	(0.76)	(2.01)
Growth	−0.000	−0.006
	(−1.42)	(−1.49)
Lev	−0.000	−0.025 ***
	(−1.35)	(−4.98)
Size	−0.000	0.865 ***
	(−0.72)	(47.29)
Age	0.000	−0.098 ***
	(0.16)	(−4.21)
ROA	0.014	1.801 ***
	(1.47)	(5.89)
TOP10_w	−0.000 ***	−0.005 ***
	(−3.00)	(−3.49)
TobinQ	0.000	0.027 ***
	(0.66)	(3.15)
GDP	0.002 ***	0.010 ***
	(9.66)	(3.12)
IND	−0.005 ***	0.003
	(−25.42)	(0.74)
Constant	0.151 ***	−2.899 ***
	(14.65)	(−6.89)
Year fixed effect	Yes	Yes
Industry fixed effect	Yes	Yes
Regional fixed effect	Yes	Yes
Observations	23,438	24,446
Adjusted R^2	0.855	0.492

Note: The brackets are robust t values, and the standard error clustering is at the enterprise level. *, ** and *** are significant at the levels of 10%, 5%, and 1%, respectively.

5.2. Heterogeneity Analysis

5.2.1. Green Innovation Classification

Following the practices of existing research, this study decomposes the overall level of enterprise green innovation into the pursuit of "quality" and "quantity" of green innovation, measured, respectively, by the quantity of green invention patent applications and green utility model patent applications [71,72]. The results, as shown in columns (1) and (2) of Table 6, indicate that the CCC policy is not significantly associated with the "quality" of green innovation in enterprises but shows a significant positive association with the "quantity" of green innovation.

Table 6. Heterogeneity analysis.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Variable	**y**	**y**	**y**	**y**	**y**	**y**	**y**	**y**	**y**	**y**
DID	0.052 ***	0.022	0.039	0.054 *	0.026	0.052 *	0.059 *	0.024	0.031	0.053 *
	(2.69)	(1.29)	(1.55)	(1.67)	(0.78)	(1.77)	(1.67)	(0.89)	(1.08)	(1.93)
INV	−0.229 ***	−0.340 ***	−0.118	−0.593 ***	−0.153	−0.406 ***	−0.297 **	−0.356 ***	−0.202 **	−0.420 ***
	(−2.88)	(−4.96)	(−1.38)	(−4.26)	(−1.53)	(−3.16)	(−2.50)	(−2.99)	(−2.42)	(−3.57)
Mshare	−0.000	−0.000	−0.001	0.000	−0.001	−0.001	0.000	−0.002 **	0.000	−0.001
	(−0.88)	(−0.31)	(−1.01)	(0.54)	(−0.80)	(−0.79)	(0.42)	(−2.31)	(0.41)	(−1.17)
Growth	−0.002	−0.005 ***	−0.003	−0.009 ***	−0.005 *	−0.008 **	−0.008 **	−0.003	−0.003	−0.016 ***
	(−1.22)	(−3.10)	(−1.34)	(−2.95)	(−1.69)	(−2.52)	(−2.41)	(−1.25)	(−1.28)	(−3.90)
Lev	−0.006 **	−0.009 ***	−0.013 ***	−0.009 **	−0.008 **	−0.015 ***	−0.014 ***	−0.006 *	−0.008 ***	−0.014 ***
	(−2.42)	(−5.07)	(−4.65)	(−2.32)	(−2.07)	(−4.37)	(−3.90)	(−1.76)	(−2.58)	(−4.44)
Size	0.206 ***	0.151 ***	0.112 ***	0.241 ***	0.131 ***	0.228 ***	0.207 ***	0.217 ***	0.171 ***	0.239 ***
	(10.06)	(9.15)	(7.34)	(9.48)	(6.39)	(10.17)	(8.20)	(10.15)	(9.96)	(10.95)
Age	−0.069 ***	−0.075 ***	−0.082 ***	−0.097 ***	−0.099 ***	−0.108 ***	−0.076 ***	−0.131 ***	−0.135 ***	−0.096 ***
	(−5.32)	(−6.52)	(−5.22)	(−4.48)	(−5.20)	(−5.33)	(−3.86)	(−6.77)	(−6.76)	(−5.95)
ROA	0.429 **	0.377 **	0.597 ***	0.978 ***	0.310	0.942 ***	1.151 ***	0.169	0.511 **	0.903 ***
	(2.20)	(2.37)	(2.88)	(3.29)	(1.25)	(3.28)	(3.86)	(0.69)	(2.46)	(3.24)
TOP10_w	−0.003 ***	−0.002 **	−0.003 ***	−0.004 ***	−0.005 ***	−0.004 ***	−0.003 **	−0.004 ***	−0.004 ***	−0.003 ***
	(−3.02)	(−2.13)	(−4.19)	(−2.83)	(−4.56)	(−2.95)	(−2.33)	(−3.80)	(−4.53)	(−2.98)
TobinQ	0.003	−0.007 **	−0.015 ***	−0.009	−0.014 **	−0.013 **	−0.010	−0.003	−0.010 *	−0.007
	(0.77)	(−2.06)	(−2.72)	(−1.40)	(−2.28)	(−2.11)	(−1.63)	(−0.53)	(−1.90)	(−1.29)
GDP	0.002	−0.000	0.001	0.001	0.002	−0.000	0.002	0.002	0.001	0.002
	(1.23)	(−0.09)	(0.69)	(0.37)	(0.66)	(−0.11)	(0.45)	(0.87)	(0.29)	(0.81)
IND	0.006 ***	−0.001	0.004	0.003	0.007 *	0.005	0.003	0.004	0.001	0.004
	(2.66)	(−0.70)	(1.52)	(0.76)	(1.72)	(1.56)	(0.95)	(0.91)	(0.20)	(1.49)
Constant	−4.008 ***	−2.705 ***	−1.707 ***	−4.418 ***	−2.074 ***	−4.057 ***	−3.781 ***	−3.841 ***	−2.777 ***	−4.422 ***
	(−8.98)	(−7.48)	(−5.17)	(−7.86)	(−4.65)	(−8.23)	(−6.77)	(−8.61)	(−7.45)	(−9.17)
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regional fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	27,219	27,219	13,685	11,904	8179	13,665	14,390	12,816	10,797	16,399
Adjusted R^2	0.249	0.227	0.250	0.331	0.234	0.271	0.281	0.317	0.269	0.309

Note: The brackets are robust t values, and the standard error clustering is at the enterprise level. *, ** and *** are significant at the levels of 10%, 5%, and 1%, respectively.

5.2.2. Monitoring Pressure

If CCC has a positive promoting effect on EGI levels, would this effect change with variations in regulatory pressure? The escalating environmental pollution issue not only leads to an increase in government environmental regulations but also intensifies the focus on sustainable development in the capital market [73]. Firstly, the media serve as a crucial external supervisor in the capital market. With broad coverage, it connects various participants in the capital market, including investors, enterprise management, regulators, analysts, and more. Increased media coverage makes enterprises more visible to the public, not only increasing the market's demand for specific information about

enterprises but also influencing stakeholders' attitudes and decisions as well as the attention of regulatory authorities [74,75]. Enterprises receiving more media attention face greater external supervisory pressure, which may prompt them to adopt more proactive green innovation strategies. To verify this impact, this study uses the quantity of financial media reports on enterprises to measure the level of media attention they receive. Based on this indicator's annual median value, the sample is divided into high and low media attention groups for group testing. As shown in columns (3) and (4) of Table 6, the impact of CCC on EGI is significant only in the group with high media attention, consistent with expectations.

Secondly, considering the supervisory and governance roles that analysts play in promoting green innovation and sustainable development, this study further conducts group testing using the analyst attention variable [76]. The sample is divided into high and low capital market attention groups based on the annual median value of this variable, and separate tests are conducted. Columns (5) and (6) of Table 6 report the regression results, showing that the positive impact of CCC on EGI levels is significant when analyst attention is high. This may be because, during periods of high attention, CCC has a greater impact on the operational uncertainty of enterprises, prompting them to enhance EGI levels as a coping mechanism.

5.2.3. Regional Economic Development Level Differences

This study, using the median of the per capita GDP for each city as a benchmark, divides the sample into two groups: developed economic regions and underdeveloped economic regions, and subsequently conducts group regression [77]. This approach is often used in heterogeneity analysis, and its main purpose is to explore the difference in the impact of CCC on EGI at different economic levels, so as to provide more accurate guidance for policy formulation and implementation. Policies and measures can be adjusted according to the characteristics and needs of different regions to improve the implementation effect of policies. The results, as shown in columns (7) and (8) of Table 6, indicate that the policy effect of CCC on enhancing EGI levels is not significant for enterprises located in underdeveloped regions, while for enterprises in developed regions, the DID coefficient is significantly positive. This may be attributed to the relatively few outstanding enterprises in economically underdeveloped areas. Green innovation activities require the consumption of internal resources within enterprises and often necessitate a foundation in operational performance. Consequently, enterprises in these regions may face challenges in undertaking green innovation activities.

5.2.4. Enterprise Internal Control

Enterprise internal control plays a crucial role in facilitating green innovation within organizations. A robust internal control system not only aids in better project management for green innovation but also enhances an enterprise's adaptability and execution capabilities in this domain [78,79]. Firstly, through risk management, internal control assists enterprises in identifying, evaluating, and managing risks related to environmental regulatory compliance, technological uncertainties, and market dynamics, providing vital support for decision-making in the realm of green innovation. Secondly, internal control ensures the effective allocation of resources, encompassing funds, human resources, and technological support, thereby driving the implementation of green innovation projects and increasing their chances of success [80]. Financial oversight, a pivotal aspect of internal control, ensures the sound financial management and supervision of green innovation projects, including cost control, budget management, and accurate financial reporting. Furthermore, a sound internal control system contributes to ensuring that enterprises comply with relevant environmental regulations and standards during green innovation, thereby strengthening their corporate social responsibility image [81,82]. Establishing training and incentive programs through internal control mechanisms can also enhance employee engagement in green innovation, fostering a corporate culture supportive of environmentally

sustainable practices. Therefore, the soundness of enterprise internal control establishes a solid foundation for success in sustainable development and environmental protection.

In this regard, this study categorizes enterprises into two groups based on internal control scores, distinguishing between those with and without deficiencies. The regression results, as presented in columns (9) and (10) of Table 6, indicate that the policy effect of CCC on raising EGI levels is not significant for enterprises with internal control deficiencies. However, for enterprises without internal control deficiencies, the DID coefficient is significantly positive. This observation suggests that a well-established internal control system is beneficial for enterprises in mitigating potential risks, as it effectively monitors and constrains managerial behavior, thereby suppressing moral hazards and adverse selection actions.

5.3. Discussion

First of all, green innovation, as one of the important strategies for enterprises to cope with environmental problems and market changes, is crucial for their sustainable development. Through in-depth research on the impact of CCC on EGI, we can provide reference and guidance for enterprises and governments to promote the realization of the goals of sustainable development and environmental protection [31]. Second, this study introduces CCC as a research object, which expands the research perspective on the mechanism of urban governance policy's influence on corporate behavior, and has a certain degree of research innovation [30]. The results of the study show that CCC promotes EGI by strengthening environmental regulation efforts and increasing environmental subsidies. This study is different from previous studies in comparison.

The consistency with other studies is that this study confirms the positive impact of CCC on EGI, which is in line with some of the findings of previous studies. Many studies have already emphasized the role of policies in incentivizing environmentally friendly business behavior, which in turn promotes the development of green innovation in firms [83]. Meanwhile, the findings suggest that environmental regulation and environmental subsidies are important drivers of civilized city building policies, which is also consistent with previous studies. Previous studies have pointed out that government environmental regulations and incentives can effectively guide enterprises to adopt green technologies and innovations [84].

The difference with other studies is that this study introduces CCC as the object of study, expanding the research perspective on the mechanism of urban governance policies' influence on firms' behavior [43]. Compared with traditional urban development policies, CCC pays more attention to environmental protection and sustainable development, so the impact on EGI may have special characteristics. Meanwhile, the findings point out that CCC has a significant promotional effect on the quantity of EGIs, but the effect on the quality of EGIs is not yet significant [85]. This finding provides a new perspective on the impact of policies on the quality of EGI and provides a direction for further research in the future.

6. Conclusions

6.1. Conclusions

This study holds significant research implications and innovation in exploring the relationship between CCC and EGI. Firstly, green innovation, as a crucial strategy adopted by enterprises in response to increasingly severe environmental issues and dynamically changing market environments, holds paramount importance for the sustainable development of enterprises. A thorough investigation into the impact of CCC on EGI can provide valuable insights and guidance for both enterprises and governments, facilitating the achievement of sustainable development and environmental protection goals. Secondly, by choosing CCC policy as the research focus, this study delves into the promoting role of urban governance policies on EGI, expanding the research perspective on the impact

mechanisms of urban governance policies on enterprise behavior, and demonstrating a degree of research innovation.

This study contributes to filling the research gap regarding the relationship between CCC and EGI, introducing CCC policy as a research subject, and broadening the understanding of driving forces. The findings confirm the positive impact of CCC policy on EGI. The results regarding the impact mechanism indicate that CCC policy enhances regional environmental regulations and increases environmental subsidies for enterprises, thereby elevating their levels of green innovation. Additionally, heterogeneous results suggest a significant positive promotion effect of this policy on the quantity of EGI, but its impact on the quality of green innovation is not yet significant.

Future research could employ more diverse empirical research methods to enhance the reliability and applicability of research conclusions. Moreover, considering the limitations of causal relationships in this study, future research might adopt more rigorous research designs and analytical methods to further validate the findings and propose more actionable policy recommendations. In addition to quantitative analysis, future research can also adopt qualitative research methods, such as case studies and in-depth interviews, to dig deeper into the intrinsic motivation and practical experience of enterprises' green innovation so as to provide a more comprehensive reference for policy formulation. At the same time, future research can deeply explore the mechanism of CCC's influence on EGI. Specifically, in-depth analysis can be carried out from the aspects of policy implementation effect, enterprise response strategy, and industry chain influence, in order to better understand the path of policy influence on enterprise behavior.

6.2. Policy Recommendations

Based on the results of this study, some policy recommendations for CCC can be put forward to promote the further development of EGI: First, the government can encourage enterprises to increase their investment in green technology R&D and innovation by providing economic incentives such as environmental protection subsidies and tax concessions. Especially for green product production, energy saving, and emission reduction, the government should increase subsidies to reduce the cost of enterprise innovation and increase the enthusiasm of enterprises for green innovation. Secondly, the government should also strengthen the supervision and evaluation of the implementation of the CCC. It should establish a sound regulatory system, strengthen the supervision and inspection of enterprises' environmental protection behaviors, and impose severe penalties on enterprises violating environmental regulations to ensure the implementation of the policy. At the same time, the government can encourage enterprises to cooperate with scientific research institutions and universities to strengthen green technology innovation and transformation. Through the establishment of scientific and technological innovation platforms, the establishment of scientific research project funding, etc., to promote the transformation of scientific and technological achievements into actual productivity and promote the rapid development of EGI. Finally, the government can strengthen the information disclosure and publicity of enterprises' green innovation achievements to enhance the public's awareness and recognition of enterprises' environmental protection behaviors. Through the establishment of a green product certification system and the release of corporate environmental behavior rankings, enterprises are guided to pay more attention to environmental protection and green development.

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