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Fiscal Decentralization, Government Environmental Preference and Industrial Green Transformation

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Abstract: Based on the theory of fiscal decentralization and sustainable development, and the mechanism analysis about fiscal decentralization and government environmental preference to promote industrial green transformation, using China's provincial panel data from 2006 to 2019, this paper empirically tests the effect of fiscal decentralization and government environmental preference on industrial green transformation by stepwise regression, threshold effect analysis, and the panel simultaneous equation. Results show that fiscal decentralization promotes industrial green transformation, but it also has a certain inhibitory effect on the government's environmental preference, which results in an insufficient government role in the process of industrial green transformation. In the long run, the influence of fiscal decentralization and government environmental preference has a threshold effect; also, regional heterogeneity exists, as with regional economic level improvement, the influence became stronger. According to the regional survey, fiscal decentralization has a positive effect on industrial green transformation in the eastern region, while it has no significant effect in the central region and a negative effect in the western region. Therefore, countermeasures are put forward, from aspects such as fiscal decentralization and environmental power structure reform, to optimizing the performance evaluation mechanism for improving the government's environmental preference, so as to have a positive effect on the green transformation of industries.

Keywords: fiscal decentralization; government environmental preference; industrial green transformation; threshold effect

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1. Introduction

Green industrial transformation is an important strategic measure to realize industrial clean production, reduce environmental pollution, and promote high-quality economic development. Since the reform and opening up, China's industrial economy has developed rapidly and generated enormous economic benefits. However, China's sustainable development has been severely hindered by the prior extensive mode of growth, which exhibits the characteristics of high energy consumption and high pollution. Promoting industrial green transformation while persisting in the direction of intensive development is a practical option to achieve high-quality economic development in the new era, one in which the new development pattern is dominated by domestic economic circulation but mutually promoted by a domestic and international dual-cycle economic model that has been gradually structured. Fiscal expenditure and environmental policies play a critical role in adjusting market value, curbing industrial pollution, and promoting industrial green transformation, since the optimal supply level of public goods and green development depend on the government's fiscal expenditure and policy preference. Fiscal decentralization is an institutional arrangement for the distribution of financial power relations between

the central and local governments based on their powers and responsibilities, and plays a decisive role in the allocation mode and efficiency of local financial resources [1]. China has started implementing a green development strategy as a result of the growth in its industrial economy, encountering more resource and environmental limits, along with the demand of the people for improved living conditions in terms of ecology and health. Government spending on environmental protection and green technology innovation is also increasing. Due to a certain extent, the subjective selectivity of local government behavior preference, the incentive compatibility between its policy choice and environmental protection will have a far-reaching impact on industrial green transformation. A systematic study of the internal relationship between fiscal decentralization, government environmental preference, and industrial green transformation has important theoretical value and practical significance for exploring the reform of financial systems and promoting high-quality economic development in the new era.

For industrial green transformation and long-term economic growth, technological progress and climate change are sustainable key factors, especially technological progress, which can improve the efficiency of petrochemical energy and reduce the cost of green energy supply. Sustained development is important [2]. The academic community has continued to pay more attention to industrial green transformation in recent years as a result of issues such as global warming and green trade barriers, with others becoming more and more prominent. Research on industrial green transformation is necessary to support China's formulation of high-quality economic development goals and the implementation of green development strategies. The research group of the Industrial Economics Institute of Chinese Social Sciences Academy believes that industrial green transformation is an industrial development process that takes technological innovation as the core driving force, resource conservation and environmental protection as the guidance, thereby achieving economic and ecological benefits—a double win—leading to sustainable development [3], which is a transformation and upgrading that combines resource conservation, environmental protection, and efficiency improvement. Its core lies in the improvement of resource utilization efficiency, the reduction of energy consumption and pollution emissions, and the improvement of sustainable development indicators [4]. Introducing the negative externalities of global warming brought about by greenhouse gases such as carbon dioxide into the economic growth model, in the long run; the economy may experience continuous negative growth or even sudden collapse [5]. It is said that technological progress is the most important, and whether technological progress can reduce resource and environmental constraints, scholars are optimistic, but they cannot be technology fanatics [6]. A thorough study of the influencing factors and ways of the industrial green transformation can provide theoretical basis and practical guidance for promoting local green development. Energy consumption, industrial structure, and green technology innovation are the main factors affecting industrial green transformation [7]. Industrial green transformation includes reducing energy consumption during inputs, reducing pollution emissions during production, and improving green product added value in R&D designs, process flows, and markets [8].

Appropriate environmental regulation and technological progress is the basic driving force to promote industrial green transformation [9,10]. In recent years, compared with the concept of green transformation and sustainable development, the traditional energy paradigm has rapidly failed [11]. Traditional energy paradigms cannot effectively address major social and policy issues. Concerns about energy security, climate change, and economic unsustainability require a transformation to renewable, energy-efficient and low-carbon technological advancements [12]. Research shows that the greater the proportion of renewable, energy-saving, and low-carbon energy sources, the more sustainable economic growth and green development will be [13]. The continuous rise in energy prices not only has an important impact on the household energy consumption costs, building materials, and engineering costs of various countries, but also puts pressure on the development of relevant industries around the world [14]. To this end, some scholars believe that

strengthening green investment will help promote green technology progress through the carbon market and achieve sustainable economic development [15]. Green finance allows financial institutions to set carbon trading prices to promote green development [16]. Green investment can help industrial green transformation and green industry chain upgrading by influencing carbon emission intensity. Improvement of the green finance development index and promotion of non-fossil energy use are important ways to reduce carbon emission intensity [17]. Green technological progress, energy structure optimization, and new energy applications brought about by the new energy revolution can produce remarkable green effects [18,19], and become an important force to promote industrial green transformation. Existing research has carried on exploring beneficial green industry transformation measurements: one is the comprehensive index system method, which mainly uses the DPSIR model, entropy-weight TOPSIS model, analytic hierarchy process, and other multi-dimensional comprehensive evaluation systems, to conduct comprehensive evaluation [20]; the second is the green total factor productivity method, which uses the SBM model and Malmquist–Luenberger index to calculate the industrial green total factor productivity [21–23]; and the third is the elastic decoupling value method, which uses the intensity (rate) of environmental pressure and resource consumption slower than the intensity (rate) of industrial growth to quantitatively measure industrial green transformation [24], and uses the elastic decoupling value method to comprehensively measure industrial green transformation according to energy, emissions, and industrial wastewater emission [25,26].

Industrial green transformation has the attribute of public goods, so it needs to perfect the supporting system, such as the corresponding software and hardware environment, fiscal revenue, and direct capital input [27]. Government financial support is indispensable in China, which adopts the dual-track model of government and market in resource allocation. Government support will have a profound impact on environmental regulation, green technology innovation, and other activities. Under the system of fiscal decentralization, subject to term limits, fiscal constraints, and other factors, local governments may be lacking the willingness and motivation to invest heavily in environmental protection and green development with a long output cycle; only under strict environmental supervision and rigid environmental binding index appraisals can the local government's environmental policy implementation effect improve remarkably [28,29]. Under the conditions of a perfect market and scientific public policy, local government will promote environmental protection and provide higher environmental quality for people through financial support in order to maximize public welfare [30,31]. When it comes to assessing economic performance, local governments are more focused on fiscal support for economic growth and environmental deregulation [32]; increased fiscal decentralization exacerbates regional environmental pollution [33–35].

Scientific systems and positive environmental protection can mitigate the negative effects of fiscal decentralization on environmental pollution [36]. It is necessary to include such indicators as the construction of ecological civilization, environmental protection, and green development into the scope of local government performance assessment and audit of leading cadres' departure from office, strengthening the ecological and environmental protection and the main responsibility of green development of local governments [37]. In fact, fiscal decentralization does not necessarily lead to environmental pollution, but may also promote the quality of environmental protection [38]. The effectiveness of environmental policy implementation and environmental quality improvement under fiscal decentralization depends on local governments' environmental preferences and their environmental protection behaviors. Local governments' environmental preferences can lead to financial support for enterprises to conduct environmental governance and green technology innovation [39]; indeed, when local governments are encouraged to rely on scientific and technological innovation in environmental governance, fiscal decentralization will facilitate industrial green transformation [7].

The environmental preferences of local governments and the heterogeneity of their policy implementation have a differentiated impact on the allocation of resources and the mode of industrial development [40]. Performance appraisal orientation can help to motivate local governments to conduct environmental governance through scientific and technological innovation, promoting industrial green transformation [4].

Industrial green transformation needs government support; subsidies and tax incentives provided by the government to enterprises and individuals engaged in green production and consumption, through fiscal expenditure and environmental policies, which can remedy market failures, achieve economies of scale, and promote industrial transformation [41]. Government environmental preference is an important factor influencing policy implementation and industrial green transformation, which can guide enterprises to take into account the market and environmental behavior and promote the integration of eco-environmental protection and socioeconomic development. Local governments should deal well with the relationship between economic development and environmental protection, combining the "soft constraint" of ecological environmental protection with the "hard index" of economic growth, so as to reduce energy consumption, resource waste, environmental pollution, and ecological damage during industrial development [42]. Fiscal incentives give local governments a strong incentive to maintain market order and promote economic growth, but they may also increase tolerance for industrial pollution and make it difficult to perform their environmental regulatory duties effectively in the short term [43]. Due to the long cycle of green technology innovation input compensation, the social benefits are significantly higher than the individual benefits; also, enterprises may lack motivation, which requires local governments to play the role of resource allocation and public interest maintenance [44]. The local government's environmental preference and the implementation effort of environmental policy largely determine the quality of environmental protection and the construction of ecological civilization. The strictness and scientific nature of the environmental system is the basis for achieving green development, but it will be difficult to achieve the desired goals if local governments do not implement them properly [37].

Research on the impact of fiscal decentralization on industrial green transformation in China is relatively limited. The existing study has not yet developed a systematic analysis of the mechanism of fiscal decentralization on industrial green transformation, and the issue of how fiscal decentralization affects the government's environmental preference and the industrial green transformation is still controversial, which needs to be clarified. Therefore, based on the theory of fiscal decentralization and sustainable development, this paper theoretically analyzes how the internal mechanism of fiscal decentralization and government's environmental preference influenced industrial green transformation. This empirical study was conducted on 30 Chinese provincial panel data sets from 2006 to 2019. To control the endogenous problem of the government's environmental preference, a three-stage least squares test was conducted by constructing simultaneous equations. In order to provide the scientific basis for optimizing the fiscal decentralization system and promoting high-quality development, this paper systematically explores the mechanism of fiscal decentralization and government environmental preference on industrial green transformation, the influence degree, and the regional difference. Compared with the existing research, the marginal contribution of this paper mainly includes the following aspects: Firstly, this paper fills a research gap on the impact of fiscal decentralization on industrial green transformation. There is no theoretical and empirical analysis on how fiscal decentralization affects industrial green transformation in the existing literature. This paper explores the impact of fiscal decentralization on industrial green transformation from the perspectives of regional and economic development levels; it is found that there are regional differences and threshold effects of economic development level impacting fiscal decentralization in industrial green transformation, which provides a scientific basis for promoting fiscal decentralization system reform in the new era. Secondly, it explores the intermediate effect of government's environmental preference on the impact of fiscal

decentralization on industrial green transformation, and deepens the research of fiscal decentralization on industrial green transformation. The empirical results show that fiscal decentralization has an inhibitory effect on the government's environmental preferences and obscures the extent of the impact of the government's environmental preferences on industrial green transformation. This shows that, in the process of promoting fiscal decentralization system reform, effective measures should be taken to restrain the "promotion tournament" effect of local government's emphasis on economic growth but being light on green development. Thirdly, it examines the regional heterogeneity of the impact of fiscal decentralization and government's environmental preferences on industrial green transformation, and provides empirical support for promoting differentiated fiscal decentralization and supporting system reform in different regions.

2. Research Hypothesis

Due to the large investment, slow income, and obvious spillover of green benefits, local government financial expenditure and environmental policy support are needed. Therefore, we here focus on explaining the mechanism of fiscal decentralization, government environmental preference on industrial green transformation, regional differences and transmission channels, and put forward the corresponding research hypotheses.

Fiscal decentralization, as an institutional arrangement to regulate the relationship between fiscal power and responsibility between the central and local governments, plays a decisive role in the mode of allocation of local resources and efficiency. It also has an important impact on the green development of industry. In fact, the fiscal decentralization system has stimulated the local government to promote economic growth's intrinsic power and improved the resources allocation efficiency. The extensive mode of growth is the root of environmental pollution. The goal of green industrial development can be achieved if strict environmental standards encourage the transformation of the economic development pattern, the performance appraisal guidance is correct, local government officials set up green development concepts, and integrate resource conservation and environmental protection into the process of social and economic development. Local governments have an advantage in information compared to the federal government, and they can create more focused environmental regulation policies and offer public goods that are tailored to local economic development. They can also take into account the actual needs of industrial economic development in their respective regions, promote the green transformation of local industries, and increase the fiscal expenditure required for the development of industrial transformation, such as for public infrastructure and supporting services, etc.

In view of the effect of fiscal decentralization on green industrial transformation, green development is conducive to promoting resource conservation and environmental protection, reducing the negative externalities of industrial production, promoting the sustainable development of local economy, and improving the well-being of residents and the local business environment, in line with the pursuit of maximizing local long-term interests. The local governments have a greater capacity for gathering, analyzing, and professionally managing information about the industrial structure, environmental pollution, and economic development of their own regions [45–47]. Fiscal decentralization encourages local governments to allocate funds more accurately, improves the effectiveness of government administration and the standard of environmental governance, reduces the time and financial costs associated with environmental testing and green technology innovation, and promotes more effective public product support. In particular, under the strict constraints of positive incentives for the continuous improvement of the level of economic development and the examination of environmental regulations, fiscal decentralization is conducive to the follow-up and evaluation of local governments' financial investment in ecological and environmental protection, scientific and technological innovation, etc. The evaluation's findings indicate that in order to increase the effectiveness of resource allocation for environmental protection and scientific and technological innovation, as well as to strengthen fiscal decentralization to promote industrial green transformation, ecologi-

cal environment protection measures and green technology R&D investments should be adjusted and improved. Local governments will be given more financial and administrative authority as a result of fiscal decentralization, giving them the means and capacity to enhance the standard of public services provided, implement efficient incentive programs, and use monitoring tools to encourage economic growth and environmental protection, leading to high integration. Based on the above analysis, the following research hypothesis is put forward:

Hypothesis 1 (H1). *Fiscal decentralization can help to improve the autonomy of local government's fiscal expenditure, strengthen their capacity to direct and ensure economic transformation and upgrading, and promote green industrial transformation.*

Due to the multi-dimensional target selection of local governments in economic development and environmental protection, the degree of environmental preference has a profound impact on environmental protection and green technology innovation. The environmental preference of local government means the preference for policy support and management of environmental protection and green development, which is mainly manifested in allocating a larger proportion of financial resources and policies to the field of environmental protection and management. From the perspective of fiscal decentralization affecting local government expenditure structure and environmental governance process, fiscal decentralization is an important factor affecting local government environmental preference and its behavior. Because environmental protection and green development have a remarkable externality and overflow characteristic, local governments with the attribute of "rational choice" tend to devote financial resources to public services and infrastructure projects that can promote rapid economic growth; to some extent, this has a crowding-out effect on public expenditure such as green technology innovation and ecological environment protection [35]. Local governments will focus their financial investment on projects that drive rapid economic growth, while the proportion of investment in green development projects will drop as industrial companies pursue economic profit maximization; this agile market sense urges them to take an active part in the investment projects preferred by the government, which reduces the investment in regional ecological environment protection and green development resources, and restricts the industrial green transformation.

The financial decentralization system framework, which is the unification of financial power, executive power, and responsibility, is helpful for local governments to better integrate the ecological civilization construction and the concept of green development into the governance process, and to enhance their environmental preference, thoroughly implementing environmental regulations and policies on environmental regulation. That is to say, it will be helpful to strengthen the main responsibility of ecological environment protection and the green development of the local government to bring ecological environment protection and a green development index into the performance evaluation of local government. Effective promotion of environmental protection and industrial green transformation requires strengthening local government environmental preferences, scientifically allocating financial resources, and making achievements in ecological and environmental protection and green technology innovation, but success will always have our science of governance philosophy. In the process of promoting the industrial green transformation, we should scientifically construct and strictly implement a perfect assessment index system for environmental protection, enhancing the environmental preference of local governments.

On the basis of the above analysis, fiscal decentralization can not only realize the expansion of local governments' autonomy in the allocation of financial resources, but also affect their environmental preferences, through the local government's environmental preference to ecological environment protection; green technology innovation behavior produces this function. Therefore, the following research hypotheses are proposed.

Hypothesis 2 (H2). *The improvement of local government's environmental preference can strengthen environmental protection and green technology innovation, and as a result, plays a positive role in promoting industrial green transformation.*

Hypothesis 3 (H3). *Fiscal decentralization will restrain local government's environmental preference and restrict industrial green transformation and upgrading. However, with the improvement of economic development, fiscal decentralization will increase the government's environmental preferences, encourage local governments to increase their expenditure on environmental governance and green technology innovation, and enable local governments to fulfill their function of optimizing the allocation of green resources, promoting industrial green transformation.*

Different regions of our nation currently have varying levels of economic growth, which leads to regional differences in social governance capacity and environmental awareness. The impact of fiscal decentralization and local government's environmental preference on industrial green transformation is characterized by regional heterogeneity. The level of regional economic development has become the threshold variable of the influence of fiscal decentralization and government's environmental preference on the economic system. The economy in the eastern part of China has entered the stage of intensive and high-quality development. Technological innovation, brand building, and service quality have become the main driving force for the high-quality economic development. Public infrastructure is relatively perfect, local governments' infrastructure construction has adequate financial funds, and the whole society's innovation, green development concept has been deeply popular. The scientific fiscal decentralization and the government's increasing environmental preference provide institutional conditions and behavioral support for increasing the expenditure on ecological environmental protection and scientific and technological innovation; local governments tend to optimize fiscal expenditure structure based on eco-environmental protection and green technology innovation, thus effectively promoting the green transformation of local industry. The Midwestern has a relatively low level of economic development, and there are relatively few funds, talents, and public infrastructure to support ecological and environmental protection and green technology innovation; the industrial economy is in the transformation stage from extensive growth to intensive development. On the one hand, local governments often permit industrial investment projects at a large scale, with a low technical content and short effectiveness cycle because of the requirements of rapid economic growth; on the other hand, the public infrastructure of the Midwestern Sectional Figure Skating Championships is relatively antiquated. The financial input for spending on ecological and environmental protection and public goods is under a lot of pressure, since the short-term marginal revenue of the financial investment in green development is much lower than the marginal benefit of the financial investment in other projects. As a result, the direct and indirect financial expenditures for ecological environment protection and green technology innovation are easy to squeeze out. The green transformation of the industry is therefore hindered by local governments' weakening in environmental preferences and decreased spending on ecological environment conservation and green technology innovation. Based on the above, research Hypothesis 4 is proposed.

Hypothesis 4 (H4). *Fiscal decentralization and government environmental preferences regarding the impact of industrial green transformation have the characteristics of regional dependence. In the economically developed eastern region, fiscal decentralization can enhance the government's environmental preference and promote industrial green transformation. Relatively speaking, fiscal decentralization has a limited role in promoting industrial green transformation in the central region; in the western regions, where the economy is relatively underdeveloped, fiscal decentralization inhibits the government's environmental preference and restricts industrial green transformation.*

Based on the above research assumptions, the following will build an indicator system of five dimensions according to the connotation of industrial green transformation devel-

opment, based on the main indicators of industrial green development of the Ministry of Industry and Information Technology, and with the entropy method, to calculate a set of comprehensive indicators of industrial green transformation. On the basis of reference to the core explanatory variables of fiscal decentralization and government environmental preference measurement in academic circles, data collection and collation are carried out using statistical yearbooks from science and technology, environment, and finance, and then an empirical analysis is carried out.

3. Research Design

3.1. Model Setup

(1) Stepwise Regression Analysis Model

In order to test the comprehensive effect of fiscal decentralization on industrial green transformation, combined research Hypothesis 1, a benchmark regression model is set up based on theoretical analysis.

$$lngrind_{it} = \beta_0 + \beta_1 lnfisc_{it} + \sum \beta_j X_{it}^j + \varepsilon_{it} \quad (1)$$

In Equation (1), $lngrind$ means the degree of green transformation of the industry as the explained variable, $lnfisc$ is the level of fiscal decentralization, the key explanatory variables. X is the control variable, specifically including $lnpgdp$ for the level of regional economic development, expressed in terms of the per capita GDP of the region; $lnintd$ stands for the level of local information technology, representing the support conditions of regional informatization for the industrial green transformation; and $lnlogis$ stands for the level of regional logistics development, representing the supporting environment of regional supporting services for industrial green transformation, with $lnradi$ representing the input intensity of regional R&D funds, representing the supporting environment of regional scientific and technological innovation for industrial green transformation, and $lnergf$ representing the level of environmental governance; it represents the supporting environment of environmental regulation intensity to industrial green transformation, and the level of performance evaluation. i represents the region, t represents the year, β is the regression coefficient, and ε represents the regression error term.

In order to empirically test the effect of fiscal decentralization on industrial green transformation by influencing local governments' environmental preferences, we use the model design based on Baron and Kenny [48] and the stepwise regression method [1] for reference. Taking the degree of industrial green transformation as the explained variable and the government's environmental preference as the core explanatory variable, this paper tests the influence degree of local government's environmental preference on the industrial green transformation. Then, taking government's environmental preference as the explained variable and fiscal decentralization as the core explanatory variable, the paper empirically tests the degree of influence of fiscal decentralization on government's environmental preference, by setting up the following stepwise regression model.

$$lngrind_{it} = \gamma_0 + \gamma_1 lnenpf_{it} + \sum \gamma_j X_{it}^j + \varepsilon_{it} \quad (2)$$

$$lnenpf_{it} = \alpha_0 + \alpha_1 lnfisc_{it} + \sum \alpha_j Z_{it}^j + \varepsilon_{it} \quad (3)$$

$$lngrind_{it} = \omega_0 + \omega_1 lnfisc_{it} + \omega_2 lnenpf_{it} + \sum \omega_j X_{it}^j + \varepsilon_{it} \quad (4)$$

In Equations (2)–(4), X and Z represent control variables; $lnenpf$ stands for local government environmental preference. If fiscal decentralization can affect local governments' environmental preferences and thus indirectly affect industrial green transformation, α_1, γ_1 should be significant, and if $\alpha_1\gamma_1$ and β_1 are consistent with the direction of the positive and negative values, $\alpha_1\gamma_1$ is the intermediary effect that affects the fiscal decentralization for industrial green transformation by influencing the local government's environmental preference; and if $\alpha_1\gamma_1$ and β_1, the positive and negative values, are in the opposite direction,

then $\alpha_1\gamma_1$ is the masking effect of fiscal decentralization on industrial green transformation; that is, the indirect effect of government's environmental preference conceals the true degree of the impact of fiscal decentralization on the green transformation of industry. If fiscal decentralization not only has a direct effect on industrial green transformation, but also has an indirect effect on promoting industrial green transformation through local government's environmental preference, ω_1 and ω_2 are significant. After controlling the direct impact of fiscal decentralization, the indirect impact of fiscal decentralization through local government environmental preferences to promote industrial green transformation is $\alpha_1\omega_2$. If ω_1 is not significant, while ω_2 is significant, it shows that fiscal decentralization has an indirect effect on industrial green transformation through local government's environmental preference, which is a complete intermediary variable.

(2) Threshold Model

The threshold effect model can automatically identify and determine the threshold value, and divide the samples into different groups according to different economic development levels; empirical analysis was performed of the threshold effect of the regional economic development level affected by fiscal decentralization and government environmental preference on industrial green transformation. This paper adopts Hansen's proposed panel threshold regression model (1999). First, to examine the "threshold effect" of fiscal decentralization and government environment preference on economic development of industrial green transformation, 30 provinces were endogenously grouped on the basis of the threshold test, and the threshold characteristics of the sample economic development effects were estimated and tested for significance, and the regional economic development level was selected as the threshold variable. A one-stage threshold regression model was constructed as follows:

$$lngrind_{it} = b + \eta_1 lnfisc_{it} \times I(lnpgdp \leq \gamma) + \eta_2 lnfisc_{it} \times I(lnpgdp > \gamma) + \sum \theta_j X_{it}{}^j + \varepsilon_{it} \quad (5)$$

$$lnenpf_{it} = \alpha + \beta_1 lnfisc_{it} \times I(lnpgdp \leq \gamma) + \beta_2 lnfisc_{it} \times I(lnpgdp > \gamma) + \sum \delta_j X_{it}{}^j + \varepsilon_{it} \quad (6)$$

Formulas (5) and (6) are the two threshold-effect test models, with industrial green transformation and government environmental preference as explained variables, fiscal decentralization as the threshold effect variable, and ε and γ as the random disturbance and threshold values, respectively. At that time, $lnpgdp \leq \gamma$, and the corresponding indicator function $I(\cdot) = 1$, otherwise = 0; similarly, at that time, $lnpgdp > \gamma$, and the corresponding indicator function $I(\cdot) = 1$, otherwise = 0. X is the control variable, and the variable is the same as before.

3.2. Measurement of Industrial Green Transformation

Due to the connotation of industrial green transformation development, industrial green transformation refers to the process of industrial development to achieve intensive utilization of energy resources, significantly improve the level of cleaner production, reduce pollutant emissions, improve total factor productivity, and enhance the capacity for sustainable development [8]. Based on the improvement of production efficiency, industrial green transformation emphasizes the continuous improvement of green development indicators, such as resource utilization, ecological environment protection, and pollution emission reduction [9]. Drawing on the research methods of Deng et al. [4], and based on the Industrial Green Development Goals emphasized in the Industrial green development plan (2016–2020) issued by the Ministry of Industry and Information Technology, the index system of industrial green transformation is constructed from the five dimensions of energy resource utilization efficiency, industrial pollution degree, industrial structure optimization, production efficiency promotion, and circular economy development. Table 1 is the indicator composition of industrial green transformation.

Table 1. Index system of industrial green transformation.

First-Level Indicators	Second-Level Indicators	Methods for Calculating
Energy resources utilization efficiency	Energy consumption of industrial value added of enterprises above the scale	The proportion of energy consumption in industrial value added
	Water consumption of industrial value-added of enterprises above the scale	The proportion of industrial water consumption to industrial value added
The degree of environmental pollution	The proportion of carbon dioxide emissions per unit of industrial value added	The proportion of sulfur dioxide emissions per unit of industrial value added
	SO_2 emissions per unit of industrial value added	Industrial SO_2 emissions as a proportion of industrial value added
	waste water emissions per unit of industrial value added	Industrial waste water emissions as a proportion of industrial value added
Industrial structure optimization	High-tech output proportion	High-tech as a percentage of industrial value added
Productivity growth	Total factor productivity	Stochastic frontier method to calculate total factor productivity
Development of circular economy	Comprehensive reuse rate of industrial solid waste	The comprehensive utilization rate of solid waste accounts for the proportion of its production

3.3. Setting of Explanatory Variables and Control Variables

(1) Explanatory Variable

① Fiscal decentralization. Fiscal decentralization is an important institutional factor that affects local government's policy preference and implementation process. The higher the degree of fiscal decentralization, the higher the degree of autonomous fiscal expenditure. Drawing on the existing research ideas and methods [1], the ratio of per capita fiscal expenditure at the provincial level to that at the central level was chosen as the proxy variable for the degree of fiscal decentralization; thus, fiscal decentralization = per capita fiscal expenditure of each province/per capita fiscal expenditure of the central level, which can eliminate the "False" decentralization phenomenon caused by the correlation between the scale of fiscal expenditure and the scale of local population.

② Environmental preference of local government. The input intensity of local government to ecological environment protection and pollution control is an important factor affecting and determining environmental quality and green development. The financial expenditure of local government on eco-environmental protection and green science and technology innovation can reflect its eco-environmental preference and action degree to a certain extent, affecting the local industrial production change and eco-environmental quality [27]. The agent variable of local government's environmental preference is the proportion of pollution control and environmental protection expenditure in the local fiscal expenditure.

(2) Control Variables

Industrial green transformation consists of complex systems engineering; in order to more fully reflect the impact of industrial green transformation factors, the control variables are set up from the aspects of economic development environment, technical support, resource conditions, and institutional environment. Among them, the economic development environment includes the level of regional economic development, expressed in terms of GDP per capita; the technical support conditions, including the intensity of R&D investment; and the level of Internet development. The first level index system of the latter Internet development design includes four dimensions—information and communication infrastructure, Internet information resources, Internet technology application, and Internet development environment—using the entropy method to construct the provincial Internet development level index, supporting facilities to select the level of regional logistics development representatives, expressed by the per capita turnover of goods. The institutional environment includes the intensity of environmental governance, the process

of marketization, and the performance appraisal index. In order to avoid the problems of correlation and endogenesis between the environmental governance intensity index and the Industrial Green Development Index [8], the agency variable is the proportion between the frequency of words related to "Environmental Protection" and "Green Development" in the local government work report and the number of words in the Government Work Report. The local government work report usually appears at the beginning of the year, which can have an overall impact on the economic activities of the whole year, reflecting the intensity of the local government's environmental regulation and effectively avoiding endogenous problems.

3.4. Data Source and Processing

Considering data availability and validity, the panel data of 30 provinces, except for Tibet, Hong Kong, Macao, and Taiwan, from 2006 to 2018 were selected as samples. Variable indicators relating to prices were adjusted for the 2011 period based on constant prices. The data of indicators of industrial green transformation, fiscal decentralization, and government environmental preference, and the control variables, were mainly from China Statistical Yearbook, China Science and Technology Statistical Yearbook, China Statistical Report on Internet Development, China Environmental Statistical Yearbook, the National Bureau of Statistics of the People's Republic of China, the EPS data platform, China's environmental database, and China's energy database. Simple descriptive statistics of each variable are shown in Table 2.

Table 2. Descriptive statistics of the data.

Variable	Mean	Std. Dev.	Min	Max
lngrind	−0.033	0.349	−1.059	0.590
lnfisc	−0.099	0.375	−0.685	1.032
lnenpf	−3.568	0.383	−4.857	−2.681
lnergf	−5.872	0.359	−6.644	−5.062
lnpgdp	10.372	0.640	8.528	11.768
lnintd	−1.718	0.668	−4.406	−0.264
lnlogis	−0.194	0.807	−2.132	2.618
lnradi	−4.419	0.624	−6.215	−2.802

4. Empirical Test and Analysis

4.1. Benchmark Regression Analysis

Industrial green transformation is characterized by gradual continuity. With the system GMM, the comprehensive impact of fiscal decentralization on it can be empirically tested. As shown in Table 3, from the regression results of national data, the regression coefficient of fiscal decentralization for industrial green transformation was significantly positive at the 5% confidence level, which confirmed the validity of Hypothesis 1. On the one hand, industrial green transformation is the fundamental way to achieve sustainable growth, and fiscal decentralization can guarantee local governments to play an effective role in technological progress and environmental governance. On the other hand, the local governments have more information, which is advantageous to the development of the regional industrial economy and the ecological environment, and fiscal decentralization helps to enhance the local government's sense of responsibility, strengthen their supervision, and provide guidance on the protection of the ecological environment; thereby, industrial green transformation is promoted. The results of the regional regression show that fiscal decentralization has a significant positive effect on industrial green transformation in the eastern region, but not in the central region, and the regression coefficient in the western region is significantly negative; the empirical results thus verify Hypotheses 1 and 4. The above research conclusions are also supported by empirical research [10,38]; it shows that the degree of fiscal decentralization's effect on industrial green transformation is influenced

by the regional economic development level and has nonlinear characteristics. What follows in the passage will be further tested by the threshold effect model.

Table 3. Regression results of the impact of fiscal decentralization on industrial green transformation.

	The Whole Country (1)	The East (2)	The Central (3)	The West (4)
$lngrind_{-1}$	0.657 ***	0.761 ***	0.797 ***	0.559 ***
	(16.68)	(12.5)	(14.53)	(8.05)
lnfisc	0.808 **	0.091 **	2.979	−2.030 ***
	(2.13)	(2.21)	(1.6)	(−2.18)
lnpgdp	0.221 ***	0.152 ***	0.237 *	0.330 **
	(6.13)	(3.82)	(4.58)	(4.19)
lnintd	−0.150 ***	−0.093 **	−0.171 *	−0.193 **
	(−4.03)	(−2.05)	(−3.22)	(−2.56)
lnlogis	0.084 ***	0.057 ***	0.032*	0.082 *
	(4.53)	(2.66)	(1.78)	(1.73)
lnradi	0.104 ***	0.003 **	0.245 ***	0.29 **
	(4.62)	(3.95)	(5.04)	(2.21)
lnergf	−0.090 ***	−0.073 ***	0.056 **	−0.112 ***
	(−6.21)	(−3.15)	(2.48)	(−4.30)
_cons	−2.553 ***	−2.084 ***	−1.933 ***	−3.772 ***
	(−5.95)	(−4.41)	(−3.29)	(−3.74)
Wald-χ2	9059.62	4221.26	4205.11	2420.74
p-value	0.000	0.000	0.000	0.000

Note: The values in parentheses are Z; ***, **, and * represent significant regression results at the 1%, 5%, and 10% levels, respectively.

Regarding the control variable, the regional economic development level, logistics development degree, and research and development investment intensity have a remarkable positive function to the industrial green transformation. With the development of the local economy, local governments have stronger faith and investment ability in green development concepts and ecological environment protection. The higher the level of economic development, the higher the public's awareness of green consumption and environmental rights, and the more local governments tend to promote green development through R&D innovation and supporting facilities construction, providing a solid foundation for industrial green transformation. The regression coefficient of the Internet development level is obviously negative, which may be due to the Internet development promoting consumption, investment, and technology diffusion; however, due to the GDP performance orientation and the short-term profit maximization of enterprises, industrial green transformation is inhibited. In addition to the significant positive effect of environmental regulation intensity on industrial green transformation in the central region, the regression coefficients for the other regions are significantly negative. Areas with high attention to environmental governance may also be areas with severe resource constraints and pollution, putting high pressure on the ecological environment. Where industrial transformation and upgrading are slow and green technologies are relatively backward, the result shows that the intensity of environmental regulation has no positive effect on the green transformation of industry.

4.2. Analysis of the Indirect Effect of Government's Environmental Preference

Fiscal decentralization, based on the principle of unification of power and responsibility, strengthens the power of fiscal expenditure and resource allocation of local governments. This paper first tests the impact of government environmental preferences on industrial green transformation. If government environmental preferences can significantly promote industrial green transformation, then one can further test the extent to which fiscal decentralization affects government environmental preferences. If both are significant, it shows that there is an indirect effect of fiscal decentralization through the government's environmental preferences, affecting industrial green transformation. Table 4 reports that the regression analysis of Model (2), by GMM, shows that the regression coefficient of the government's environmental preference to industrial green transformation is positive at

the 1% confidence level, which indicates that government's environmental preference can positively influence industrial green transformation. Supported by the concept of green innovation and sustainable development, local governments can promote the industrial green transformation by increasing the support of eco-environmental protection and Green Technology R&D. To further test the degree to which fiscal decentralization affects the government's environmental preferences, the regression analysis of Model (3) shows that the regression coefficient of fiscal decentralization impacting government's environmental preference is significantly negative at the 5% confidence level, which indicates that fiscal decentralization can restrain government's environmental preference. The reason is that the local government tends to put disposable financial resources into the fields with quick effect and high income, which has a restraining effect on the government's environmental preference. Shen [9] and Deng et al. [4] also confirmed that fiscal decentralization based on local government competition has an impact on local government environmental governance strategies. On the whole, fiscal decentralization can promote the green transformation of industry, but it also has a restraining effect on the environmental preference of the government, affects the efficiency of local governments in promoting the green transformation of industry, and causes a delay in the green transformation of industry. The indirect effect of fiscal decentralization to restrain government's environmental preference is −0.018 ($\alpha_1\gamma_1$). The overall effect of fiscal decentralization on industrial green transformation is 0.808, and the effect of fiscal decentralization on industrial green transformation is 0.826.

Table 4. Results of the indirect effect test.

	(1)	(2)	(3)	(4)
	Lngrind	***Lngrind***	***Lnenpf***	***Lngrind***
$lngrind_{-1}$	0.657 *** (16.68)	0.721 *** (17.82)	-	0.704 *** (17.3)
lnenpf	-	0.066 *** (3.68)	-	0.071 *** (3.9)
$lnenpf_{-1}$	-	-	0.539 *** (8.73)	-
lnfisc	0.808 ** (2.13)	-	−0.271 ** (−2.31)	0.906 ** (−2.41)
lnpgdp	0.221 *** (6.13)	0.212 *** (6.00)	0.153 * (1.7)	0.183 *** (4.95)
lnintd	−0.150 *** (−4.03)	−0.150 *** (−4.06)	−0.183 * (−1.85)	−0.134 *** (−3.61)
lnlogis	0.084 *** (4.53)	0.085 *** (4.68)	-	0.074 *** (3.96)
lnradi	0.104 *** (4.62)	0.084 *** (3.95)	0.163 ** (2.16)	0.102 *** (4.6)
lnergf	−0.090 *** (−6.21)	−0.101 *** (−7.05)	0.054 (1.29)	−0.095 *** (−6.65)
_cons	−2.553 *** (−5.95)	−2.383 *** (−5.69)	−2.523 ** (−2.07)	v1.913 *** (−4.20)
Wald-χ^2	9059.62	9134.65	1551.13	9286.08
p-value	0.000	0.000	0.000	0.000

Note: The values in parentheses are Z; ***, **, and * represent significant regression results at the 1%, 5%, and 10% levels, respectively.

Finally, the indirect effect of the government's environmental preference was re-examined. In order to test the effect of fiscal decentralization on industrial green transformation after controlling for government environmental preference, the regression results of Model (4) show that the regression coefficient of government environmental preference impacting industrial green transformation is significantly positive at the 1% confidence level. After controlling for the influence of government's environmental preference, the regression coefficient of fiscal decentralization is still significantly positive at the 5% confidence level, and the regression coefficient is 0.906, which is larger than the 0.808 of Model

(1); it verifies the existence of the government's environmental preference concealment effect. The adjusted masking effect value is -0.019 ($\alpha_1\omega_2$). The above conclusions verify the Hypotheses 2 and 3.

4.3. Threshold Effect Test of Fiscal Decentralization and Local Government's Environmental Preference

Because of China's vast territory, there are differences in the level of regional economic development. Does fiscal decentralization have regional differences in promoting local governments' environmental preferences and green industrial transformation? A threshold regression model was used to identify the impact of fiscal decentralization on local government's environmental preference and industrial green transformation under different economic development levels. MATLAB 2008b software (Natick, MA, USA) was used for the threshold regression. The Bootstrap sampling method was used to simulate the likelihood ratio statistic 2000 times and estimate the threshold value and related statistics. Table 5 reports the results of the threshold effect model.

Table 5. Threshold effects of regional heterogeneity.

Variable	*Lngrind*	Variable	*Lnenpf*
lnenpf	0.029 ** (2.8)	*lnenpf*	-
lnintd	−0.253 *** (−8.87)	*lnintd*	−0.221 *** (−4.77)
lnlogis	0.014 (1.04)	*lnlogis*	-
lnradi	0.102 *** (4.40)	*lnradi*	0.053 (1.26)
lnergf	0.113 *** (3.50)	*lnergf*	0.133 ** (2.25)
lnfisc (*lnpgdp* ≤ *9.989*)	0.051 (0.70)	*lnfisc* (*lnpgdp* ≤ *10.469*)	−0.150 ** (−2.18)
lnfisc (*lnpgdp* > *9.989*)	0.076 ** (2.37)	*lnfisc* (*lnpgdp* > *10.469*)	0.468 *** (5.06)
R^2	0.662	R^2	0.702
n	390	n	390

Note: The values in parentheses are Z; ***, and ** represent significant regression results at the 1%, and 5% levels, respectively.

First of all, the threshold effect test of the industrial green transformation, with the regional economic development level as the threshold value and the financial decentralization as the core explanatory variable, shows that when the natural logarithm LNPGDP of the regional economic development level is below the threshold value of 9.989, the regression coefficient of fiscal decentralization is not significant, which shows that at the stage of a low level of economic development in regions, the impact on industrial green transformation is mainly due to a substitution effect, and local governments pursue industrial economic growth more; however, insufficient attention has been paid to the green transformation of industry; when LNPGDP is above the threshold, fiscal decentralization is significantly positive at the 5% level, which indicates that in the stage or region with a relatively high level of economic development, the effect of fiscal decentralization on industrial green transformation is mainly an income effect, and it is positive to promote industrial green transformation.

Secondly, the threshold effect test of fiscal decentralization on government's environmental preference shows that when the LNPGDP is less than or equal to the threshold value of 10.469, the regression coefficient of fiscal decentralization on government's environmental preference is significantly negative at the 5% level; it shows that the fiscal decentralization has an obvious substitution effect on the government's environmental preference at this stage of economic development, and the local governments pay more attention to those areas that are easy to achieve results from during their term of office.

When the LNPGDP is above the threshold, the regression coefficient of fiscal decentralization impacting a government's environmental preference is significantly positive at the 1% significance level; it shows that fiscal decentralization has an obvious income effect on the environmental preference of the government in the high economic development Area, and the consciousness of ecological protection and the intensity of environmental governance increase accordingly. It is worth noting that the threshold value of the impact of fiscal decentralization on the government's environmental preferences is higher than the threshold value of the impact of fiscal decentralization on industrial green transformation, which is due to the function of economic growth and sustainable development. In order to meet the requirements of long-term and short-term performance evaluation, the government's environmental preference focuses on sustainable growth and sustainable development, and needs to be based on the economic development level, development concept, and ecological environment performance evaluation. Therefore, the effect of fiscal decentralization and government's environmental preference on industrial green transformation is influenced by the regional economic development level, which has obvious regional heterogeneity. The conclusion of the benchmark regression analysis is further verified.

4.4. Endogenous Treatment and Robustness Test: Based on a Three-Stage Least Squares Test

Government's environmental preference and industrial green transformation are not one-way causality; there may be an endogenous relationship, an interaction. Local government's environmental preference under fiscal decentralization is an important motive force to promote green development, where the higher the degree of the government's environmental preference, the more effective the implementation of policies, such as ecological environment protection and green science and technology innovation, will be; and the more obvious the promotion of the industrial green transformation will be, the higher the local government's environmental preference, the more ecological environment protection and green development support policies will be adopted. In order to avoid the problem of the deviation of the estimation result caused by the omission of the reverse causality in the stepwise regression analysis, simultaneous equations were constructed to test the complex causality between them in order to overcome the defects mentioned above. In order to avoid the problem that the estimation results deviate from the consistency due to the omission of the inverse causality in the stepwise regression analysis, a simultaneous equation group was constructed to test the complex causality between the two, and explore the impact of fiscal decentralization on industrial green transformation and the indirect effect of government environmental preference. Taking government's environmental preference and industrial green transformation as endogenous variables and all other variables as exogenous variables, combining the results of the empirical analysis, the following simultaneous equations were constructed.

$$\begin{cases} lngrind_{it} = h_0 + h_1 lnenpf_{it} + h_2 lnfisc_{it} + \sum h_j X_{it}^j + \varepsilon_{it} \\ lnenpf_{it} = l_0 + l_1 lngrind_{it} + l_2 lnfisc_{it} + \sum l_j Z_{it}^j + \varepsilon_{it} \end{cases} \quad (7)$$

The explanatory variables of Equation (7) are industrial green transformation and government environmental preference, and the key explanatory variables are government environmental preference, industrial green transformation, and fiscal decentralization, respectively. Z and X in the equations represent the controlling variables. In order to guarantee the validity and consistency of the estimation results of the simultaneous equations, a three-stage least squares test was selected. The system estimation method can make full use of the constraints and information of all equations to estimate each equation, and determine all parameter estimates of each equation at the same time, and an asymptotically efficient unbiased estimator was obtained. The results are shown in Tables 6 and 7.

Table 6. Results of the three-stage least squares test for the national data.

	Lnenpf			*Lnergf*		
	coef	***Z***	***p* > |z|**	**coef**	***Z***	***p* > |z|**
lngrind						
lnenpf/lnergf	0.303	2.93	0.003	0.325	3.52	0.000
lnfisc	0.036	1.71	0.066	0.186	1.86	0.039
lnpgdp	0.072	1.72	0.085	0.233	5.86	0.000
lnintd	0.473	4.97	0.000	0.197	6.36	0.000
lnlogis	0.335	1.82	0.057	0.008	1.84	0.043
_con	1.855	4.52	0.000	0.285	1.92	0.042
lnenpf/lnergf						
lngrind	0.912	2.55	0.011	0.273	1.87	0.051
lnfisc	−0.309	−3.65	0.000	−0.367	−4.99	0.000
lnpgdp	0.554	3.61	0.000	0.233	2.66	0.006
lnradi	0.108	1.86	0.039	0.129	1.75	0.056
_con	0.285	1.63	0.069	0.808	5.26	0.000
R^2		0.680			0.685	
Chi^2		348.56			334.12	
p-value		0.000			0.000	

Table 7. Results of the three-stage least squares test for the regional data.

Sample	**The East**		**The Central**		**The West**	
Variable	***Lngrind***	***Lnenpf***	***Lngrind***	***Lnenpf***	***Lngrind***	***Lnenpf***
lngrind	-	0.086 (0.27, 0.693)	-	1.184 *** (5.00)	-	6.693 *** (8.32, 0.000)
lnenpf	1.251 *** (2.80, 0.004)	-	0.292 (1.47, 0.108)	-	0.617 *** (4.45, 0.000)	-
lnfisc	5.143 ** (1.96, 0.022)	0.583 *** (5.98, 0.000)	2.161 (0.80, 0.732)	0.234 (1.55, 0.210)	–3.596 *** (–5.44, 0.000)	–2.159 *** (–7.01, 0.000)
lnpgdp	0.429 ** (1.93, 0.012)	0.388 *** (2.61, 0.006)	0.195 ** (2.75, 0.036)	0.768 * (6.43, 0.000)	0.332 *** (5.04, 0.000)	2.988 *** (7.37, 0.000)
lnintd	−0.234 ** (−2.31, 0.021)	-	0.712 *** (6.48, 0.000)	-	0.492 *** (9.18, 0.000)	-
lnlogis	0.123 * (1.75, 0.072)	-	0.074 *** (2.87, 0.008)	-	0.008 (0.42, 0.801)	-
lnradi	-	0.057 (0.64, 0.652)	-	–0.014 (–0.13, 0.071)	-	0.438 *** (4.88, 0.000)
_con	4.479 *** (3.53, 0.000)	–7.056 *** (–3.71, 0.000)	1.802 ** (2.04, 0.046)	–11.915 *** (–8.88, 0.000)	3.966 *** (6.55, 0.000)	2.476 ** (5.43, 0.000)
R^2	0.421	0.688	0.728	0.521	0.331	0.594
Chi2	548.36	65.52	333.99	121.77	334.32	122.56
p-value	0.000	0.000	0.000	0.000	0.000	0.000
obs	143	143	104	104	143	143

Note: In parentheses are Z-values and *p*-values. *, **, and *** indicate significance levels of 10%, 5%, and 1%, respectively.

From the view of the effect of government's environmental preference on industrial green transformation, the regression coefficients of the whole country and the eastern and western regions were significantly positive, while those of the central regions were positive, but not significant. From the view of the effect of industrial green transformation on government's environmental preference, the regression coefficient of the whole country and the central and western regions was positive, while the regression coefficient of the eastern region was positive, but not significant. The above results confirm that there is an inverse causal relationship between local government's environmental preference and industrial green transformation. The fiscal decentralization in the east and the whole country has a positive effect on the green transformation of industry; the central region has a positive but not significant effect, and the western region has a significantly negative

effect. The regression coefficient of fiscal decentralization to government's environmental preference is significantly negative in the whole country and the western region, positive in the eastern region, and not positive in the central region. In order to verify the robustness of the above empirical research, the simultaneous equations use the three-stage least squares method for regression analysis to replace local government environmental preference with environmental regulation indicators. The results in Table 7 indicate the consistency of the regression analysis of the simultaneous equations. The endogenous test results based on simultaneous equations demonstrate the validity of empirical findings in this paper, and also effectively verify the research hypothesis.

5. Conclusions

Based on fiscal decentralization and sustainable development theory, this paper systematically analyzed the direct impact of fiscal decentralization on industrial green transformation and its indirect effect mechanism through government environmental preference, and by using 2006–2019 provincial panel data, a stepwise regression model and threshold effect model were used to test the validity of the model. In order to control the endogenous problem of the government's environmental preference, panel simultaneous equations were further constructed, and the robustness was tested by using the three-stage least squares method. The main conclusions are as follows:

Firstly, fiscal decentralization can promote the green transformation of industry, but restrain the government's environmental preference to some extent. The impact of fiscal decentralization and the government's environmental preference on industrial green transformation is influenced by factors such as the level of regional economic development, and there exists a threshold effect, which has a positive effect on the green transformation of industry.

Secondly, strengthening the government's environmental preference can effectively enhance the government's environmental function and promote the green transformation of regional industry. The government's environmental preference can effectively affect the implementation of ecological environment protection and green development policies, and promote the industrial green transformation. Environmental governance and green development have the attribute of public goods, and require the support of the government in terms of financial expenditure and policy implementation.

Thirdly, the impacts of fiscal decentralization on the green transformation of local industry and the indirect effect of local government's environmental preference have regional heterogeneity. Fiscal decentralization can promote the government's environmental preference and industrial green transformation in the eastern region, but it has no significant effect on the government's environmental preference and industrial green transformation in the central region, while it has a negative effect on the government's environmental preference and industrial green transformation in the western region. The government's environmental preference has a positive effect on the industrial green transformation of the whole country and various regions, but it is not significant in the central region. The economic development level of each region is the threshold factor that affects its difference.

The policy implications are as follows:

First of all, we should continue to deepen the reform of the fiscal decentralization system based on the principle of unification of financial rights, powers, and responsibilities, and give local governments more financial autonomy. At the same time, it is essential to maximize local governments' effectiveness in allocating public funds and to strengthen their commitment to environmental protection and sustainable development. It is essential to strengthen the evaluation and supervision of local governments' expenditure on environmental protection and green technology innovation, and resolve the problem of the relationship between the central government and local governments in terms of Information asymmetry and agency. In particular, it is necessary to strengthen the incentive and restraint of eco-environmental protection and green development in the assessment and

promotion of officials, so as to effectively reduce the inhibition of government expenditure on environmental preferences.

Furthermore, to promote the environmental preference of local governments, it is necessary to adopt the guidance of environmental governance by law, the scientific evaluation of political achievements, and the concept of green development, as well as consider the level of economic development and the actual situation of resources and environment in each region. In the process of public decision-making and policy implementation, the red line of ecological protection, the upper limit of resource exploitation, and the bottom line of environmental quality should be strictly enforced, and local governments should be encouraged to take ecological and environmental protection and green development as guidance.

Last but not least, the structural reform of fiscal decentralization and environmental affairs should be carried out according to local conditions. The eastern region has a high level of economic development and a strong sense of eco-environment and green development. We should focus on the coordinated reform of fiscal decentralization, and on environmental and economic power. In the central region, we should strengthen the examination, assessment, and supervision of local government's environmental expenditure, strengthening the incentive for local governments to protect the environment and promote green development, enhancing the level of government's environmental preference. We should increase the level of environmental intervention and support for green development in the western region and strengthen the mechanism for evaluating the performance of the government in environmental protection and green development. In particular, we should accelerate policy implementation pertaining to environmental infrastructure construction, environmental monitoring and supervision, and green science and technology innovation, and gradually strengthen the positive influence of fiscal decentralization in promoting government environmental preferences and industrial green transformation.

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