

Article

Chinese-Style Fiscal Decentralization, Ecological Attention of Government, and Regional Energy Intensity

Mingxiong Bi ¹, Chencheng Wang ¹, Dian Fu ², Xun Tan ¹, Shurong Yu ¹, Junbai Pan ³ and Kun Lv ^{1,*} ¹ Business School, Ningbo University, Ningbo 315211, China² Teaching and Education College, Ningbo University, Ningbo 315211, China³ School of Economics, Lanzhou University, Lanzhou 730000, China

* Correspondence: lvkun@nbu.edu.cn

Abstract: The impact of Chinese-style fiscal decentralization on regional energy intensity has long been disputed by the supporters of “federal environmentalism” and those who hold “race to the bottom” views. At the same time, with the transformation of China’s development mode, the Chinese government is paying increasing attention to the protection of ecological civilization and the realization of sustainable development, and the government’s attention to the ecological environment is becoming an important factor affecting regional energy intensity. Therefore, this paper takes the fiscal decentralization and ecological attention of local governments in China as the research object and analyzes their impact mechanism on regional energy intensity. Firstly, the entropy weight method was used to measure the comprehensive score of fiscal decentralization of Chinese local governments, and the text analysis method was used to obtain the ecological attention index of Chinese provincial local governments, which was sorted into panel data of 30 provinces (municipalities and autonomous regions) in mainland China from 2007 to 2019. The spatial econometric model and panel threshold model are structured as the means for analyzing the impact that fiscal decentralization and the ecological attention of local governments have, respectively, on regional energy intensity targets. We obtained the following conclusions: Chinese fiscal decentralization can significantly improve the regional energy intensity, and the fiscal decentralization of a region can significantly reduce the energy intensity in nearby regions; the enhancement of ecological attention of local governments will significantly inhibit regional energy intensity, and also has a significant inhibitory effect on the energy intensity of neighboring regions. As the threshold variable—which is the ecological attention of local governments—increases and reaches a certain level, fiscal decentralization will significantly and reversely inhibit regional energy intensity, indicating that the ecological attention of local governments can moderate the distortion of fiscal decentralization with regards to regional energy efficiency.

Keywords: fiscal decentralization; fiscal governance; ecological attention of government; energy intensity; spatial measurement model; threshold model



Citation: Bi, M.; Wang, C.; Fu, D.; Tan, X.; Yu, S.; Pan, J.; Lv, K.

Chinese-Style Fiscal Decentralization, Ecological Attention of Government, and Regional Energy Intensity.

Energies **2022**, *15*, 8408. <https://doi.org/10.3390/en15228408>

Academic Editors: Bowen Yi, Hongguang Nie and Jinhua Xu

Received: 6 September 2022

Accepted: 1 November 2022

Published: 10 November 2022

Publisher’s Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2022 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

China’s economic reform, which started in the late 1970s, has long been guided by economic growth, and has always maintained a high level of economic growth under conditions of high energy consumption and high pollution. In essence, China’s economic growth over the last 40 years has been generally extensive [1]. With the slowdown in economic growth that has occurred since 2010, China has entered “three superposition stages” of “growth speed shift period”, “structural adjustment pain period”, and “pre-stimulus policy digestion period”, facing the severe tests of excess production capacity, ecological environment damage, and unsustainable development [2,3].

Therefore, China’s long-term development model involving a high dependence on energy is unsustainable. This aspect has manifested in the increasingly prominent contradiction between China’s fossil energy depletion and huge energy consumption. In 2020,

China's primary energy consumption reached 145.46 EJ, accounting for 26.1% of the total global primary energy consumption. A large amount of China's fossil energy relies on imports, while the unit GDP energy consumption (energy intensity) is 1.28 tons of standard coal/10,000 yuan, which is 1.5 times the world average. On the one hand, China's high energy intensity has led to a series of climate, environmental, and ecological problems, which is contrary to the desire for better lives for Chinese residents. In recent years, a global consensus about the need to confine increasing temperatures since industrialization to 2 °C by 2100 has been reached, which means that China's remaining CO₂ emissions has to be maintained at about 1150×10^8 t– 3400×10^8 t; this is well below China's projected total emissions under its current patterns.

After the Chinese government became aware of these problems, some measures were taken; notably, the goal of “carbon neutrality” was proposed in September 2020, which clearly takes carbon emission reduction as a basic government goal that will guide the government to formulate and implement policies. Moreover, in March 2021, *the 14th Five-Year Plan for National Economic and Social Development and the Long-term 2035 Goals Outline*, formulated by the Chinese Central Government, also explicitly placed reducing energy intensity by 13.5% as the government's medium- and long-term economic and social development goals. Relieving regional energy intensity has become a key indicator of China's sustainable development.

For a long time, China's fiscal governance has been considered to be closely related to regional energy issues and its ecological environment, especially under the Chinese-style fiscal decentralization system, and there is much research that discuss the roles and mechanisms of regional fiscal governance behaviors regarding regional energy ecological issues. Those who hold the view of “environmental federalism” believe that improving the level of fiscal decentralization is conducive to the local ecological livability competition among local governments under a “vote with their action” situation with their residents, and thus vigorously supporting eco-friendly industries and green industries, promoting energy efficiency, and restraining energy intensity [4–6]. Other scholars believe that China's fiscal decentralization system will drive local governments to carry out a “race to the bottom”, that is, local governments will not compete to improve local livability. On the contrary, they need to support traditional, resource-wasting industries to maintain economic growth in the short term, thereby making the region a “pollution paradise” [7,8] and thus forming a path to continuously strengthen energy intensity.

Fiscal decentralization, as an important part of central and local fiscal relations, is a guaranteed institutional arrangement that involves the implementation of fiscal power and fiscal expenditure responsibilities in the field of ecological energy [9]. Chinese-style fiscal decentralization determines whether local government officials can independently use part of the financial resources to support the development of a certain local field [10], but at the same time, the promotion of Chinese officials relies on the assessment of the central government and higher governments [11]. Therefore, if local government officials, as “politicians”, want to win the “promotion tournament”, their fiscal governance attention would have to meet the assessment indicators set by the central government [12]. If the central government cares more about short-term growth, local governments will invest financial resources in industries with higher short-term profits [13], and, conversely, local governments will have to pay more attention to the sustainability of social development [14]. In addition, local government officials in China have limited tenure and are more concerned about the short-term results of fiscal policies. Some environmentally friendly industries with low short-term benefits and uncertainties in growth are often not favored by their fiscal bias [15].

Another noteworthy phenomenon is that, as China's industry regulation and institution construction is not thorough [13], many energy-intensive and high-pollution industries are still using rent-seeking means and information asymmetry with the government to engage in business activities that are unfavorable to alleviating energy intensity [16]. There are also many people engaged in illegal speculative activities with encrypted virtual cur-

rency, such as mining [17–19]. Although the practice was officially completely banned and outlawed in 2021 [20], the long-term ineffective consumption of electricity has put great pressure on the energy use of developing countries such as China [21].

In 2012, the Chinese central government placed “ecological civilization construction” in the “the Five-sphere Integrated Plan” [22] and promoted improvements in the regional ecological environment and energy efficiency using an assessment index of local government performance through legislation [23]. Previous short-term economic behaviors, such as “GDP only” and “growth only”, which local government officials undertook to obtain promotions, were eased and improved [24]. The local governments gradually showed a certain preference for fiscal governance for the construction of an ecological civilization. Local governments, under the exogenous pressure of senior government, may show certain “environmental federalism” decision-making tendencies; however, contrary to the view of “environmental federalism”, it is believed that the local governments’ motives to protect the regional ecological environment and improve regional energy efficiency are derived from higher government rather than immigration [25].

However, it should be noted that China is still a developing country that is immature in terms of economic and social development. In many regions, especially those that are falling backward, fiscal governance in the process of economic growth and ecological protection often cannot be balanced [26]. The central government’s appraisal of local economic growth performance is significantly higher than the performance of ecological protection, so the local governments’ focus on regional energy efficiency and energy intensity mechanisms is not clear.

The impact of fiscal decentralization on regional energy intensity is still controversial, and the literature discussing the relationship between the spatial effect of fiscal decentralization and regional energy intensity has been limited. In addition, there is still no research on the relationship between the ecological attention of local governments and regional energy intensity in China. Furthermore, there is no literature that analyzes the joint influence mechanism of fiscal decentralization and the ecological attention of local governments on regional energy intensity under the Chinese fiscal decentralization system. Therefore, this paper used panel data of 30 provinces (municipalities and autonomous regions) in mainland China from 2007 to 2019 to analyze the influence that the ecological attention of local governments has on regional energy intensity against the background of fiscal decentralization in China by constructing the spatial econometric model and the threshold model, and then obtained relevant conclusions and put forward policy suggestions.

2. Literature Review

2.1. Review of Research on Fiscal Decentralization and Regional Energy Intensity

At present, few scholars have taken the correlation between fiscal decentralization and regional energy intensity as a research object, but the ecological environmental effect formed by fiscal decentralization has been revealed by many scholars.

The earliest scholars who studied decentralization believed that fiscal decentralization, as a kind of decentralization, would promote the government to form a “benevolent government” [27] and further promote the supply of public goods [28]. At the same time, combined with the “political man” hypothesis proposed by the new institutional economics, the theory of “environmental federalism” was finally formed [4,29]. This theory aims to explain that the government will consider the decision-making logic of residents “voting with their feet” and take the ecological livability of the jurisdiction as the main development goal [30,31]; meanwhile, “environmental federalism” believes that competition formed by decentralization can promote regional green innovation levels and production efficiency by facilitating the government’s financial support for enterprise R&D and cracking down on polluting enterprises [32,33]—so as to improve regional energy utilization efficiency.

In addition, some scholars believe that fiscal decentralization will form a “race to the bottom” effect among local governments under the influence of “GDP worship” and the “promotion tournament” [34], that is, local governments take short-term economic

growth as the primary goal of fiscal governance, so they will vigorously support and invest in traditional energy-intensive industries. Such behavior not only aggravates environmental pollution and damage [35], but also enhances enterprise R&D expenditures and lowers enterprise innovation levels and motivation [36] by increasing rent-seeking behavior and regional path dependence [37], thereby reducing the regional energy utilization efficiency [38].

To sum up, there are still differences in the academic views on fiscal decentralization, and the research on the correlation between fiscal decentralization and regional energy intensity is not in-depth enough. Therefore, this paper will make an in-depth analysis of this issue based on existing research.

2.2. Review of Research on Ecological Attention of Government

Many scholars are noticing that government attention and attention allocation can effectively affect the role of the “visible hand” on factor allocation, and then affect regional economic and social development and other economic factors. Limited by the scarcity of information resources and financial resources, the government can only allocate limited resources within a limited scope. On this basis, the attention of the government to some fields becomes particularly important [39]. Among them, Jones et al. [40] took the lead in introducing the concept of attention from the field of psychology to political science through long-term research on the relationship between government attention distribution and government decision-making so as to analyze the impact of government attention on government decision-making.

At present, most international scholars conduct textual analyses on government documents to investigate the state of a government’s attention allocation and many scholars have also tested the change in government attention based on this method. From the perspective of new institutional economics, a government’s attention can play an important role in the fields of citizens’ political rights [41], public services [42], residents’ welfare [43], industrial development [44], etc. At the same time, the government can transform its attention into policies and administrative orders, thus promoting and influencing the development of related fields. In addition, research by some scholars has shown that national institutions [45], political parties [46], the media, and public opinion alter the government’s attention by changing the information that the government holds, and thus affecting the government’s decisions [29,47]. Hence, the attention of the government is considered to be an intermediary variable, through which many exogenous factors can influence the government’s decision-making.

Under the theoretical framework of government attention, the ecological attention of a government is one of its branches. Although there are few direct studies on the government’s ecological attention in the world, many scholars have taken environmental regulation as an object of analysis to study the government’s attention to the ecological environment and its protection. In existing studies, environmental regulation has been proved to have a certain impact on variables such as regional ecological environment [48], residents’ happiness [49], and technological innovation [50]. Among these, the impact mechanism of environmental regulation on the technological innovation and industrial transformation has provided this paper with some ideas. Nevertheless, academic study of the ecological attention of governments at these current stages is inadequate, especially with regards to the correlation between the ecological attention of the government and regional energy intensity. This has also become one of the marginal contributions of this study.

3. Theoretical Mechanism

3.1. Fiscal Decentralization and Regional Energy Intensity

The thesis of Chinese fiscal decentralization originated from tax reforms during 1994: the Chinese government sorted taxes into a central tax, local tax, and central and local shared tax according to the principle of combining governance and fiscal power. Two sets of tax management systems, central and local, were constructed, with two sets of tax revenue

collection and administration institutions being built. To confirm the local revenues and expenditures, a system of tax rebates and transfer payments from the central fiscal to the local fiscal was implemented. As a result, the fiscal decentralization pattern of the central government and the local government was formed.

The Chinese-style fiscal decentralization that China formed is a unique decentralization system that is modelled after the reform of the tax-sharing system [51] that is, this fiscal decentralization system does not mean that local governments and local government officials can allocate fiscal resources in accordance with the goal of maximizing local benefits [52], but it is necessary to first target senior governments' assessment indicators to maximize the benefits (promotions) to local government officials [18,53,54]; however, due to the informational asymmetry between the central government and the local government, which leads to the principal-agent problem [55] and the obvious differences in the actual situation in each region, the central government requires relatively uniform standards for the assessment of local government officials [56]. The government's assessment goals often deviate from the goal of maximizing regional benefits. Fiscal decentralization means that local governments have greater authority to use fiscal policies to achieve their own goals. This behavior is mainly manifested in the "race to the bottom" that local government officials participate in around a single economic growth goal.

Since its reform and opening up, the outside world has considered that China has to undergo a selection mechanism for local officials based on an economic performance evaluation, i.e., a "promotion tournament" [57]. Whether local government officials can be promoted is highly correlated with the local economic growth performance during their tenure. Driven by this incentive, local government officials adopt short-term economic behaviors, formulate short-term economic development goals, and introduce policies that are conducive to short-term economic growth within their limited time in office, while also neglecting long-term social and economic benefits [58]. Therefore, after the reform of the tax-sharing system, local government officials relied on limited fiscal resources for investing in high numbers of traditional industries in their region, given that such industries have short cycles, mature technologies, and can obtain higher economic returns in the short term [59,60]; however, such industries fall backward in technology, have high pollution emissions, and suffer energy losses, which is unfavorable to alleviating the energy intensity of the region and improving the level of regional energy utilization [61]. At the same time, with the development of the economy and society, the progress in science and technology has provided an opportunity to alleviate and suppress regional energy intensity, thereby promoting regional energy utilization efficiency and avoiding energy waste. Ecological and environmentally friendly high-tech industries, such as photovoltaic power generation and green infrastructure, are emerging globally [62]. These high-tech industries can essentially achieve a greater output on the premise of reducing energy consumption, that is, improving energy efficiency [63]; however, these industries have novel concepts, complex technologies, and are still in the introductory stages of their life cycle [64]. This means that they cannot bring economic benefits to the region in the short term, that they require high up-front investment, and that they also face uncertainty and other risks in terms of scientific and technological research and development [65]. Therefore, they are not favored by local governments [66]. The phenomenon of a "race to the bottom" among local governments in China has a significant distortion effect on regional energy utilization efficiency and a negative impact on restraining regional energy intensity [67].

Based on China's regional perspective, the intensity of fiscal decentralization represents the intensity of short-term economic behavior among local government officials aiming to win the "promotion tournament". A region with greater strength in terms of the fiscal decentralization of power has more resources to participate in the "race to the bottom competition" between local government officials; thus, this produces a crowding-out effect [68] to eco-friendly industries and green innovative industries, thereby causing them to assemble in other regions. Therefore, the greater the intensity of fiscal decentralization, the more it could reversely alleviate the energy intensity level of other regions. In other

words, an increased degree of fiscal decentralization in a region can significantly inhibit the energy intensity of other regions, and the spatial effect of regional fiscal decentralization is significantly negatively based on the regional energy intensity.

Based on the above mechanism and an analysis of the effect of fiscal decentralization on energy intensity, the following hypotheses are proposed:

Hypothesis 1. *The fiscal decentralization of local governments in China has significantly enhanced regional energy intensity.*

Hypothesis 2. *The spatial effect of the fiscal decentralization of local governments in China has a significant mitigating effect on regional energy intensity.*

3.2. Ecological Attention of Local Government and Regional Energy Intensity

Fiscal behavior is an important tool for governments at all levels to intervene and influence the market. Since China's reform and opening-up, fiscal behavior has always been a basic guarantee for the implementation of China's reform strategy and has had a significant impact on China's economic and social development, industrial structure adjustments, ecological and environmental protections, and energy efficiency improvements [69,70]. The Third Plenary Session of the 18th Communist Party of the China Central Committee proposed that fiscal measures should become the foundation, and an important pillar, of national governance in China and that they should become a national governance category spanning the economic, political, cultural, social and ecological civilization fields, with the fiscal governance of local governments providing a key link [71]. After the Chinese government put forward the "carbon neutral" and "carbon peak" goals, the improvement of regional energy efficiency, curbing of energy waste, and alleviation of energy intensity has provided tasks and challenges [72] that local governments need to face. Therefore, it is important [73] for the local government to correctly use fiscal policy, make reasonable and scientific fiscal policy decisions, and guide fiscal policy to play a positive role in stimulating the development of the energy conservation industry and ecologically friendly industries.

The fiscal governance characteristics and fiscal governance style of local governments can greatly affect the ecological environment and energy utilization within regions. Droste et al. (2017) [74] believe that integrating ecological indicators in the fiscal relationship between the federal government and state government can effectively coordinate improvements in the ecological environment and ecological efficiency between German states, and comprehensively alleviate regional energy intensity. Zhang et al. (2022) [75] found that, during the implementation of fiscal policy, adding energy intensity targets can effectively suppress the improvements in regional energy intensity and promote energy utilization efficiency.

In a study of the influence mechanism that the relevant policies of local governments have on economic variables, the government's policy of "attention" is often introduced as a reference indicator. As a basic concept in psychological research, "attention" was introduced into the study of policy mechanisms by many scholars. Simon [76] believed that "attention" is a scarce resource in the decision-making process, and decision-makers are limited by various constraints and could not realize the maximum benefits in the process of making decisions. Thus, their attention must be allocated, and areas that receive more attention will crowd out areas that receive less attention [40]. This theory of attention is actually a decision-making theory based on bounded rationality. Many scholars introduced this theory into the study of government decision-making behavior [77], arguing that governments and decision-makers may also be influenced by information, and due to the decision-making costs, different levels of attention may be paid to different fields in their jurisdiction. Areas that attract more attention will have the opportunity to develop preferentially, as attention is also a scarce resource. From this perspective, the ecological attention of local governments profoundly influences the regional energy efficiency and energy intensity.

Generally speaking, since the Five-Sphere Integrated Plan of economic, political, cultural, social, and ecological construction proposed by the 18th Congress of the Communist Party of China in 2012, local fiscal governance in China has always been centered around these five aspects [78]. Among them, ecological civilization construction is the final goal for implementation; local governments have obviously undervalued this goal and implemented fewer policies regarding this goal than for other goals, especially when there is a contradiction between ecological civilization construction goals and economic construction goals. Local governments, influenced by the Chinese-style “promotion tournament” [79], are often driven by the “race to the bottom” effect to achieve the former priority [80,81]. At the same time, with the goal of economic construction, both China’s central government and local governments at all levels set corresponding economic growth targets, and junior local governments are under pressure from the economic growth targets of senior governments, thereby “increasing pressure level by level [82]”. Local government officials and policy makers act as “short-sighted economic people [83]”, paying more attention to short-term economic growth and implementing short-term economic behaviors. As a result, traditional, energy-intensive industries with mature technology, a short cycle, and high short-term economic benefits are more favored, thereby crowding out eco-friendly industries and green industries [84]. Fiscal policy is clearly biased towards energy waste and ecological destruction. The distortion of the ecological attention of local governments leads to a decline in the region’s overall energy efficiency, and energy intensity is not effectively alleviated.

Therefore, the goal-setting link of local government fiscal governance has a strong influence on the regional energy utilization [85]. When the local government’s fiscal governance leans towards protecting the regional ecological environment and realizing energy conservation and green technology development, the original distortion and damage to the ecological environment caused by the local government’s short-term economic behavior will be corrected by the development energy conservation and energy efficiency improvements in fiscal policy and industrial policy [86]. In recent years, the status of China’s ecological civilization construction in the Five-Sphere Integrated Plan has gradually been ascending. Under the constraints of the “double carbon” target, the goal of constructing an ecological civilization is gradually being given attention by the local government’s fiscal management [87]. The driving force of ecological civilization construction has gradually transformed into an endogenous power, which has been caused by competition between local governments regarding their ecological civilization construction performance. This is derived from the exogenous pressure that the central government places on local governments. In recent years, the construction of an ecological civilization has been frequently mentioned [88,89] in government work reports of some ecologically fragile or seriously environmentally damaged areas, such as Tibet, Qinghai, and Ningxia. Governments in eastern coastal regions have given their full attention to the promotion of fiscal policies for energy conservation and emission reduction behaviors and incentives, hoping to break through the limitations of energy scarcity to regional development by improving energy efficiency and governing the ecological and environmental damage due to previous extensive development [90,91]. Therefore, the more that local governments’ fiscal governance preferences tend towards ecological environment protection, and local governments become committed to regional energy utilization efficiency, the greater the policy-gripper tool effect that local governments have on ecological environmental protection and regional energy intensity [92]. Fiscal policy tools can guide regional resources to accumulate and suppress regional energy intensity and improve regional energy utilization efficiency [93].

Similar to the influence of fiscal decentralization on regional energy intensity, the ecological attention of the local government also has a spatial effect [94]. The more partial the fiscal governance goals of local governments to constructing an ecological civilization, the more they can ease the intensity of the “promotion tournaments” between local governments; that is, when one or several local governments set regional governance goals of sustainable and environmentally friendly development instead of their previous

short-term economic behavior decisions, this can guide other local governments to adopt the same development model [95]. In turn, a spatial effect will guide the whole region to coordinate improvements in regional energy utilization efficiency. With the issuance of the “Evaluation and Assessment Methods of Ecological Civilization Construction Objectives” by the Chinese central government in 2016, and local governments’ ecological civilization construction performance using a “rewarded and punished simultaneously mechanism”, an evaluation system for local government officials was formally established and is based on the evaluation of ecological civilization construction goals. Although the implementation of economic construction goals dominates, with the central government’s continuous development of regional ecological civilization construction policies in recent years [23], competition among local governments is gradually changing from a “race to the bottom” to a “competition to the top [96]”. Therefore, from the perspective of spatial effects, when a province’s fiscal governance shows a high preference for ecological goals, this will inevitably lead to competition between other provinces regarding the construction of an ecological civilization, thereby providing restraint and alleviating energy intensity in the market, and further avoiding energy consumption waste and high-emission policies, which will guide the development of green innovation industries and eco-friendly industries within the region.

Based on the above, and the impact of the local government’s fiscal governance targets on regional energy intensity, this paper puts forward the following hypotheses:

Hypothesis 3. *The ecological attention of local government objectives significantly suppresses the regional energy intensity effect.*

Hypothesis 4. *The ecological attention of the local government will produce a spatial effect that significantly alleviates regional energy intensity.*

3.3. Fiscal Decentralization and Energy Intensity under the Regulation of Ecological Target Preference

The performance of the Chinese-style fiscal decentralization system can influence regional development depending on the method that the central government uses to assess the performance of the local government and the local government’s response to this assessment [97,98]. Therefore, when the central government’s assessment of the local government changes, this will inevitably lead to a change in the ecological attention of the local government.

At China’s current development stage, its innovation and economic strength compared to developed countries largely falls behind [99]. For a considerable period of time, the contradiction between the two major goals of ecological civilization construction and economic construction remained [100]. The new development concept proposed by the Chinese government places “stabilizing economic growth” as a top priority. China’s declining economic growth speed prompted central and local governments to refocus on growth factors. At the same time, in the documents issued by the central government, the ecological performance assessment of local governments’ fiscal governance is a “softer constraint” compared to the assessment of economic performance, which provides local governments with greater discretion at the level of ecological governance, with no further laws requiring them to implement regulations. These factors mean that China’s fiscal decentralization system continues to be a “race to the bottom” between local governments.

However, it should be noted that, with the issuance of important documents of the Chinese government—such as the “party and government leading cadres of ecological environment damage responsibility method” and “ecological civilization construction target evaluation method”—the central government’s assessment of the ecological construction goal of the local government has gradually become stricter, thereby forcing local governments to gradually increase their preference for ecological construction goals throughout the process of fiscal governance [101]. As mentioned in the file, the “ecological civilization

construction target evaluation method" is necessary to establish a local green development index evaluation system and, among the index systems, the first priority should be regional energy efficiency, which will show that the central government considers regional energy intensity to be greatly important to their assessment. This could be conducive to local governments' putting forward a series of policies to curb waste in the production of energy and the development of a green industry [102]. Therefore, enhancing the ecological attention of the local government can lead to corrections to fiscal decentralization, forming a "race to the bottom competition". The correction mechanism is likely to be non-linear; namely, when the ecological preference is small, the negative externalities' regulation of fiscal decentralization is not obvious. This only becomes obvious when the ecological preference reaches a certain level and the previous "race to the bottom competition" of fiscal decentralization can be corrected by a "race to the top competition", thereby reversing regional energy intensity.

Based on the above analysis of fiscal decentralization's effect on energy intensity while regulating ecological target preferences, this paper puts forward the following hypothesis:

Hypothesis 5. *When the ecological attention of the local government is low, the distortion in regional energy intensity cannot be significantly corrected; only when the ecological attention of the local government reaches a certain level can the "race to the bottom competition" of fiscal decentralization be significantly changed into a "top by top competition".*

4. Model Building and Variable Introduction

4.1. Model Building

As part of the theoretical mechanism, this paper provides five hypotheses about this research. Among them, Hypotheses 1–4 describe the respective mechanisms of fiscal decentralization and governments' ecological attention on regional energy intensity, and the spatial effects of fiscal decentralization and government ecological attention in this research framework. Hypothesis 5 describes the non-linear influence of fiscal decentralization on regional energy intensity under the ecological attention of local governments.

To prove Hypotheses 1–4, this paper constructed a spatial econometric model to analyze the mechanism existing in the hypothesis. Spatial econometric models can avoid the problem that traditional econometrics does not consider: the spatial dependence among economic variables. This model can also estimate the spatial effect of economic variables, so it is the most appropriate model for the verification of the hypothesis in this paper.

In addition, this paper constructs a panel threshold model to verify Hypothesis 5. The panel threshold model can estimate the threshold of threshold variables and explain the non-linear changes of the mechanism of the core explanatory variables on the explained variables before and after the threshold values. Therefore, this paper uses this model to explore the relationship among governments' ecological attention, fiscal decentralization, and regional energy intensity.

4.1.1. Spatial Econometric Model Construction

According to the research of Le Sage and other scholars [103], which considered spatial correlations, the most common spatial measurement models are as follows: spatial Durbin model (SDM), spatial autoregressive model (SAR), and spatial error model (SEM). Among these, SAR examines the spatial spillover effect of dependent variables between regions. While SEM mainly examines the missing variables included in the independent variables, SDM can simultaneously measure the spatial spillover effect and error term spatial dependence of dependent variables. This paper constructs the spatial autoregression model (SAR), spatial error model (SEM), and spatial Durbin model (SDM) based on the spatial effects of variables in Hypotheses 2 and 4, respectively.

Model 1:

$$EI_{it} = \rho W \cdot EI_{it} + \alpha_1 FD_{it} + \alpha_2 EP_{it} + \sum \beta X_{it} + \gamma_t + u_i + \varepsilon_{it} \quad (1)$$

Model 2:

$$EI_{it} = \alpha_1 FD_{it} + \alpha_2 EP_{it} + \sum \beta X_{it} + \gamma_t + \lambda W \cdot v_{it} + u_i + \varepsilon_{it} \quad (2)$$

Model 3:

$$EI_{it} = \rho W \cdot EI_{it} + \alpha_1 FD_{it} + \alpha_2 EP_{it} + \sum \beta X_{it} + \theta W(EI_{it} + \sum \beta X_{it}) + \gamma_t + u_i + \varepsilon_{it} \quad (3)$$

In Models 1–3, ρ is the spatial autocorrelation coefficient, W is the spatial weight matrix, and θ is the lag regression coefficient of the explanatory variable. The robustness of Models 1–3, and which model is suitable for this study, will be examined later.

4.1.2. Panel Threshold Model Construction

In view of hypothesis H5, it is necessary to verify that the distortion in fiscal decentralization on regional energy utilization efficiency is corrected under the regulation of the local governments' ecological attention. This paper establishes a panel threshold model according to Hansen (1999) to first set the traditional single threshold regression model:

Model 4:

$$EI_{it} = u_i + \alpha_1 FD_{it} \times I(EP_{it} \leq \gamma) + \alpha_2 FD_{it} \times I(EP_{it} > \gamma) + \sum \beta X_{it} + \varepsilon_{it} \quad (4)$$

γ is the threshold value; I represents the indicative function, and the other variables are as in Models 1–3. As there may be a double threshold or triple threshold in the panel threshold model, it is necessary to construct the corresponding number of threshold models for analysis. This paper does not report these, but the number of threshold models will be tested in the post-empirical analysis and parameter estimation.

4.2. Variables and Data Sources

4.2.1. Interpreted Variable

(1) Regional Energy intensity (EI)

Regional energy intensity can more accurately measure a region's energy efficiency. This depends on the scale of clean energy used in production and regional energy conservation and emission reductions. This paper refers to Xu Yang and He Yongxiu's (2016) [104] research, which used the annual energy consumption and actual GDP ratio to measure energy intensity. This index can be obtained by direct query from the *China Energy Statistical Yearbook*, and the unit is "ton standard coal/10,000 yuan" (In 2007, the average exchange rate between USD and RMB was about 7.6. In 2019, the average exchange rate between USD and RMB was about 6.9). The lower the regional energy intensity, the lower the energy a region consumes per unit of GDP and the higher the regional energy utilization efficiency.

4.2.2. Interpret Variables

(1) Fiscal Decentralization Index (FD)

Fiscal decentralization has long been an economic variable that scholars have focused on. In the measurement of this variable, Oates [70] first adopted the income and expenditure index to measure fiscal decentralization and used it to demonstrate how the power devolved from higher government to lower government, that is, the size of fiscal power that is held by the local government compared to the central government.

In the research of Chinese fiscal decentralization, Jin and Zhou [105] were some of the first ones to use the relative value of local government budget revenues (expenditure) and the central budget revenue (expenditure) as the proxy variable for the local government fiscal decentralization index. This measurement method is equivalent to dividing the fiscal decentralization into the fiscal decentralization of revenue and expenditure and is used by many Chinese scholars [106]; however, some scholars also pointed out that this measurement method needs to go through per capita standardization [107]. Therefore, based on this method and by referring to the research of Bai Junhong and Lu Jiayu [108],

this paper constructs a fiscal decentralization index measurement index system with a fiscal revenue decentralization index and fiscal support decentralization index as sub-indicators (Shown in Table 1), and further measures the fiscal decentralization index of local governments in China based on the two sub-indicators.

Table 1. Fiscal Decentralization Index (FD) Measurement Index System.

Measurement Indicators	Measurement Method	Data Source
Fiscal Revenue Decentralization	Per Capita Provincial Budget Revenue/Per Capita Central Budget Revenue	China Statistical Yearbook [109] and Statistical Yearbooks of Each Provinces (http://www.stats.gov.cn/tjsj/ndsj/), accessed on 1 March 2022)
Fiscal Expenditure Decentralization	Per Capita Provincial Budget Expenditure/Per Capita Central Budget Expenditure	

After constructing the index system of the fiscal decentralization index, as shown in Table 1, the entropy weight method is used to evaluate and measure the fiscal decentralization index. Traditional evaluation methods, such as AHP, rely on expert scores too much, thus they are highly subjective and unable to evaluate indexes objectively; however, the entropy weight method can obtain information entropy according to the characteristics of the data itself, which is more objective. In this study, since the two sub-indexes are equally important to the target index—the fiscal decentralization index (FD)—the entropy weight method is adopted in this paper.

(2) Ecological Attention of Local Government Index (EP)

This paper used text analyses to obtain the word frequency of specific words from the government work report of the Chinese government to represent the ecological preference of local government governance objectives. Lu Shengfeng et al. (2020) [110] provided a general analysis method to obtain the government’s ecological attention. Therefore, in the process of specific text analyses, this paper adopted the analysis and research paradigm methods of Lu Shengfeng, and, on this basis, obtained the ecological attention index (EP) of local Chinese governments.

As the Chinese government’s fiscal target has a “five-in-one” overall layout, namely, economic construction, political construction, cultural construction, social construction, and ecological civilization construction, and due to the low amount of text and low word frequency of the provincial government’s report, this cannot reflect the local government’s fiscal governance target. Therefore, this paper selected the specific words “economy”, “politics”, “culture”, “society”, and “ecology” in the government work reports of the prefecture-level municipal governments of 30 provinces in mainland China from 2007 to 2019 as the extraction objects. This paper used Python language to extract these specific words from the provincial government’s work report.

During this specific process, this paper first collected the government work reports of local governments from the official websites of municipal governments at various levels from 2007 to 2019. This paper searched for and completed missing texts using Google and other search engines. After the text was obtained, Python and jieba word segmentation were first used for accurate word segmentation, and then the dictionary was created. Repetitive words in word segmentation were manually removed during this process. Secondly, the text was preprocessed, and the preprocessing process was divided into two steps: (1) word segmentation, where the text is read into Python and divided into words using stuttering word segmentation, thereby building the custom dictionary; and (2) the stop words are removed, wherein stop words refer to words that have no actual meaning and are only used to connect and help express words, such as “of”, “and”, “or”, etc. This step filtered the words from the participle, and if a word was determined to be in the stop word list, it was eliminated.

In this paper, the data analysis module NLTK in Python was used for word frequency statistics, and output was tabulated data; then, further data analysis and processing was conducted. We first calculated the specific word frequency at the prefecture level, which formed the provincial-specific word frequencies. Then, we used the ratio of “ecological” frequency that every province uses, and the total frequency of the words “ecological”, “economy”, “politics” “culture”, and “social” as proxy variables of Chinese governments’ ecological attention index (EP) was found.

4.2.3. Control Variable

Since the regional political environment, development level, innovation ability, and industrial structure may have a corresponding impact on the regional energy front, the corruption degree (Cor), Financial Development Index (Fin), regional innovation ability (In), and industrial structure deviation (TL) are taken as the control variables in this model.

(1) Level of Corruption (Cor)

According to the study by Li Zihao and Liu Huihuang [111], the number of cases (corruption, bribery, and malfeasance and infringement) per person is taken as the proxy index to measure the degree of regional corruption. The number of public officials and the number of duty crimes were both derived from the *China Inspection Yearbook* [112].

(2) Financial Development Index (Fin)

Financial development can exert a certain influence on regional energy intensity by regulating the industrial structure and affecting enterprise activities and government decision-making. As early as the middle of the 20th century, many scholars have been studying the definition and connotation of the concept of financial development. Among them, Goldsmith was the first to put forward the concept of financial related ratio (FIR) [113], which is the ratio between all financial assets and all real assets, namely the value of national wealth, so as to measure the degree of financial development. This index is often used to represent the degree of financial development.

This paper measures the Financial Development Index (Fin) based on Goldsmith’s research, and the specific measurement formula is (balance of deposits of financial institutions + balance of loans of financial institutions)/GDP. The data used in the measurement comes from the *China Statistical Yearbook*, *China Financial Yearbook* [114], and the statistical yearbooks of each province.

(3) Regional Innovation Capacity (In)

This paper adopted the comprehensive score of the provincial-level “Comprehensive Utility Value of China’s Regional Innovation Capability” in the “*China Regional Innovation Capability Evaluation Report*” (2007–2019), which was jointly issued by the China Science and Technology Development Strategy Group and the Chinese Academy of Sciences as the representative data of regional innovation capability. The variable measurement included five indicators of provincial knowledge creation, knowledge acquisition, enterprise innovation, innovation environment, and innovation performance. These five indicators were divided into 20 secondary indicators and 40 third-level indicators, which together constitute China’s provincial innovation. The ability evaluation system and its comprehensive score provides the regional innovation ability of the variable that was explained in this paper.

(4) Industrial Structure Deviation Index (TL)

This paper refers to the method of Gan Chunhui et al. (2011) [115] to construct the Theil index, and the Theil index is constructed as follows:

$$TL_{i,t} = \sum_{i=1}^n \left(\frac{Y_{i,t}}{Y} \right) \ln \left(\frac{Y_{i,t}}{L_{i,t}} / \frac{Y}{L} \right) \quad (5)$$

In the formula, Y is the total output value of the three industries; $Y_{i(i=1,2,3),t}$ is the output value of the first, second, and third single industrial sectors; $Y_{i(i=1,2,3),t}$ is the total

working population of the three industries and the working population of the first, second, and third single industrial sectors.

The Theil index value represents the degree of deviation in the industrial structure. The larger the Theil index value, the more the industrial structure deviates from the equilibrium state.

4.2.4. Spatial Weight Matrix

In this paper, the spatial weight matrix of economic distance is used as the spatial weight matrix that is adopted by the spatial measurement model. The spatial weight matrix of economic distance can reflect the economic dependence between geographical units, that is, the “distance” within the economic space. The spatial weight of economic distance can represent the interprovincial economic gap (Delgado and Alvarez, 2007 [116]). The expression of the economic distance space weight matrix is as follows:

$$W_{ik}^n = \begin{cases} \frac{1}{|y_i - y_k|} & i \neq k \\ 1 & i = k \end{cases} \quad (6)$$

where W_{ik} represents the elements in the spatial weight matrix of the economic distance between region i and region k , y_i is the average annual per capita GDP of region i , and y_k is the average annual per capita GDP of region k . The larger the matrix value, the higher the economic similarity and association between the two corresponding geographic units; that is, there may be frequent economic interactions and economic exchanges between the geographic units.

4.3. Descriptive Statistics and Spatial Agglomeration of Variables

4.3.1. Descriptive Statistics of the Variables

Table 2 reports the descriptive statistical results of the regional energy intensity (EI), fiscal decentralization index (FD), ecological attention of local government index (EP), and the control variables of the 30 provinces in mainland China from 2007 to 2019.

Table 2. Descriptive Statistical Results of the Variables.

Variable Symbol	Variable Name	Mean	Variance	Minimum	Maximum
EI	Regional energy intensity	0.964	0.573	0.021	3.506
FD	Fiscal decentralization index	0.556	0.241	0.014	0.998
EP	Ecological attention of local government index	0.143	0.083	0.022	0.487
Cor	degree of spoilage	0.002	0.0008	0.000021	0.005
Fin	Financial Development Index	2.985	1.135	1.288	8.131
In	Regional innovation capability	29.199	10.487	15.78	59.55
TL	Industrial structure deviation from the index	0.235	0.150	0.017	0.800
Sample total time	$n = 390$ 2007–2019				

4.3.2. Spatial Distribution of the Core Variables

As this paper explores the variables’ spatial effects using the spatial measurement model, and the spatial dependence of core variables needs to be discussed first, when there is a “high–high correlation” (high spatial correlation between regions with high variable value) and “low–low correlation” (high spatial correlation between regions with low variable value) in most spaces, the variables show a spatial dependence.

To preliminarily analyze the spatial dependence of variables and intuitively show the geographical distribution of the core variables, this paper reports on the regional energy intensity (EI), fiscal decentralization index (FD), and ecological attention of the local government index (EP) in Figure 1a–c during 2007 and 2019. Through Figure 1, we can

preliminarily determine that there is an obvious “high–high association” and “low–low association” in the core variables of this paper.

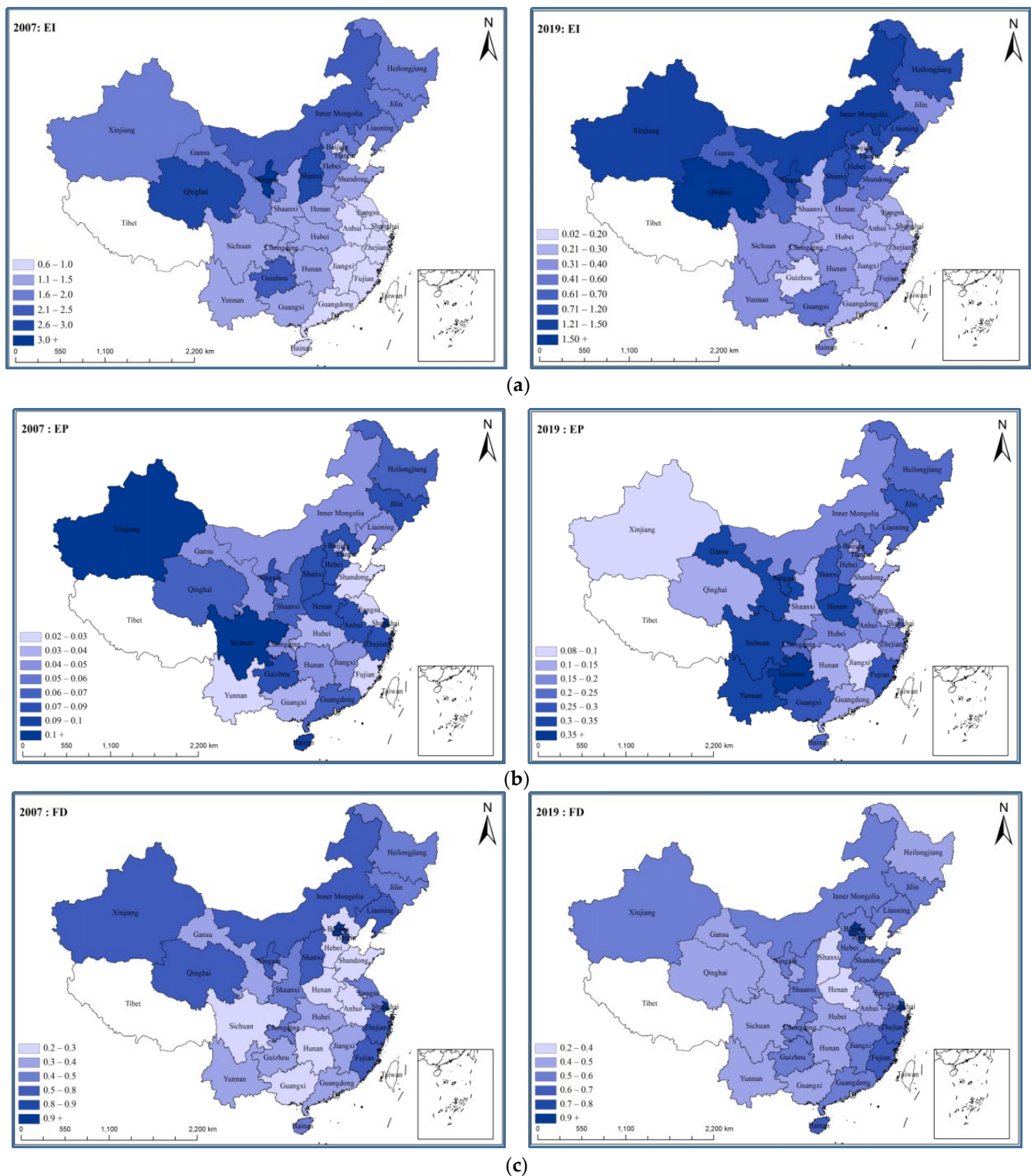


Figure 1. Spatial Distribution of the Core Variables during 2007 and 2019. (a) The Spatial and Temporal Distribution of EI in 2007 and 2019; (b) The Spatial and Temporal Distribution of FD in 2007 and 2019; (c) The Spatial and Temporal Distribution of EP in 2007 and 2019.

5. Empirical Analysis and Hypothesis Verification

5.1. Spatial Effect Regression Analysis

5.1.1. Spatial-Dependence Discrimination of the Explained Variables

Before conducting the spatial panel measurement analysis, we should judge whether the data show a spatial dependence. If there is no spatial dependence, it is not suitable to use the spatial measurement model for empirical analysis. In this paper, Moran's I index (EI) (Long Xiaoning, 2014 [117]) was adopted to conduct a global spatial self-correlation test. The global Moran's I index fluctuates in the $[-1, 1]$ interval, and a positive value indicates an overall positive spatial correlation with higher levels of interaction; a negative value indicates a negative correlation, closer to 1, with a higher correlation; and 0 indicates a spatial non-correlation. After measuring the global Moran's I index for the regional energy intensity of each year, the Z statistic was used to test the index for significance and identify whether the spatial interaction was significant. Table 3 reports the global Moran's I index and its significance for the regional energy intensity (EI) from 2007–2019.

Table 3. Global Moran's I and Significance of Chinese Mainland Region in 2007–2019.

A Particular Year	Moran 's I	p-Value	A Particular Year	Moran 's I	p-Value
2007	0.079 ***	0.000	2014	0.067 ***	0.000
2008	0.079 ***	0.000	2015	0.067 ***	0.000
2009	0.082 ***	0.000	2016	0.067 ***	0.000
2010	0.074 ***	0.000	2017	0.066 ***	0.000
2011	0.068 ***	0.000	2018	0.058 ***	0.000
2012	0.066 ***	0.000	2019	0.055 ***	0.000
2013	0.067 ***	0.000			

*** $p < 0.01$.

Table 3 shows that, during each year from 2007–2019, the Moran's I index, based on the economic distance spatial weight matrix—at the 1% significance level—rejected the null hypothesis. The Moran's I index is not equal to the zero-alternative hypothesis, thereby indicating that the spatial interaction law of regional energy intensity during the study period is an important feature of the regional energy efficiency changes in China. The Moran's I index was generally positive during the study period, thereby indicating that the energy intensity of the Chinese mainland region mostly has a “high–high association” or “low–low association”.

5.1.2. Selection and Testing of the Spatial Econometric Models

This paper selected an appropriate model from the spatial Durbin model, spatial error model, and spatial autoregression model for text analysis [103,118]. To determine the benchmark model of the study, this paper first conducted the LM test. As Table 4 shows, the LM (lag) and LM (error) of the traditional linear regression model (OLS) and their robust forms (Robust LM (lag) and Robust LM (error)) are significant at 1%, indicating that the null hypothesis was rejected and that the spatial effects should be included in the study. The spatial Durbin model was chosen to analyze the spatial effects.

In addition, Table 4 reports the LR test results for the space-fixed effect (Ind) and time-fixed effect (Time). The corresponding LR values of the time- and space-fixed effects were 787.26 and 116.06, respectively, and the corresponding p -values were both 0.0000. These are all significant at 1% level, indicating that the model should include both space- and time-fixed effects; therefore, the space and time dual-fixed effect model was used (Both). While the statistical value of the Hausman test was 57.48, the null hypothesis of using a random effect (re) was rejected, which indicated that a fixed effect (fe) should be used in this paper.

Table 4. Selection and Testing of the Spatial Measurement Models.

Statistical Quantity	Umerical Value	p-Value
LM (lag)	90.612 ***	0.000
Robust LM (lag)	21.693 ***	0.000
LM (error)	150.403 ***	0.000
Robust LM (error)	74.218 ***	0.000
LR test for Both Time	787.26 ***	0.0000
LR test for Both Ind	116.06 ***	0.0000
Hausman test for fe re	57.48 ***	0.0000
Wald test for SDM SAR	58.75 ***	0.0000
Wald test for SDM SEM	39.34 ***	0.0000
LR test for SDM SAR	108.53 ***	0.0000
LR test for SDM SEM	105.56 ***	0.0000

*** $p < 0.01$.

Finally, it was necessary to combine the Wald test or LR test to make further determinations. The correlation results showed that the Wald value of the spatial Durbin model reduced to the spatial autoregressive model was 58.75 ($p = 0.0000$) and the LR value = 108.53 ($p = 0.0000$); the Wald value of the spatial error model was 39.34 ($p = 0.0000$) and the LR value was 105.56 ($p = 0.0000$). All were significant at the 1% level, indicating that the null hypothesis was rejected and that the model should not be simplified. In conclusion, the spatial Durbin model with dual-fixed effects was used for follow-up studies. After the above test, the paper finally analyzed the issue by using the spatial Durbin model with the fixed effect and dual-fixed effects of time and space.

5.1.3. Spatial Econometric Regression Analysis

Table 5 shows the results of the parameter estimates of the spatial Durbin model based on the spatial weight matrix of the economic distance, and the estimation of the direct, indirect, and in-total effects of the explanatory variables. Limited by space, this paper only reports the results of all of the control variables included in the spatial Durbin model.

In Table 5, the spatial autoregression coefficient (ρ) passed the 1% significance level test. In the model estimates, the provincial energy intensity rose by 2.824 units as other province's energy intensities dropped 1 unit, showing that, at the current stage, the Chinese provincial "bottom competition" is still very fierce and the regional synergy "by top competition" mechanism that alleviates energy intensity is not formed.

The main effect coefficient of the fiscal decentralization index (FD) is 1.037, and its coefficient is significantly different from 0 at the significance level of 1%, which is basically consistent with the conclusion of the H1 hypothesis, that is, fiscal decentralization will drive the "race to the bottom" phenomenon among local governments in China to form a significant distortion of regional energy utilization efficiency. It is fully verified that fiscal decentralization will distort the level of regional energy utilization, hinder energy intensity mitigation, and play a significant role in promoting the improvement of regional energy intensity. At the current stage, although the issue of ecological civilization construction and the promotion of regional energy efficiency are identified as a basic national policy in China, due to the economic construction in the concrete implementation process, the goal of energy conservation and emission reductions cannot be achieved in the short term. Additionally, the construction of an ecological civilization also cannot be carried out by local government officials using "one by one to the top competition" between the endogenous powers.

The main effect regression coefficient of the local government ecological attention index (EP) is -0.307 , passing the 10% significance level test. The ecological attention of local governments can reflect the local government's attention to the construction of an ecological civilization and their degree of participation in the "competition to the top". Therefore, when the local government's attention to ecology increases, this region will support more ecologically and environmentally friendly high-tech industries, such as new energy technology, chip technology, photovoltaic power generation, and green infrastruc-

ture, which is bound to promote the level of regional energy utilization and thus play a role in alleviating and inhibiting regional energy intensity. The analysis results of the main effect of regression in the spatial econometric model verifies H1 and H3; namely, for regional energy intensity, fiscal decentralization will strengthen regional resource misallocation and distort energy utilization efficiency, while the ecological attention of the local government regarding regional energy intensity is opposite to that of fiscal decentralization.

Table 5. Results of the Spatial Effect Regression.

	SDM	Direct Effect	Indirect Effect	Total Effect
FD	1.037 *** (5.38)	0.639 *** (4.00)	−2.606 *** (−7.31)	−1.967 *** (−7.30)
EP	−0.307 * (−1.84)	−0.586 *** (−4.68)	−1.764 ** (−2.54)	−2.350 *** (−3.32)
Cor	−17.91 (−1.13)	−15.90 (−1.27)	3.162 (0.05)	−12.74 (−0.19)
Fin	−0.0114 (−0.37)	−0.00797 (−0.33)	0.0248 (0.23)	0.0168 (0.15)
In	0.00400 (1.03)	0.00114 (0.39)	−0.0184 (−1.47)	−0.0173 (−1.38)
TL	0.398 *** (2.88)	0.663 *** (5.55)	1.661 *** (3.46)	2.325 *** (4.66)
W × FD	−7.846 *** (−7.37)			
W × EP	−7.806 *** (−3.12)			
W × Cor	−37.59 (−0.16)			
W × Fin	0.0532 (0.14)			
W × In	−0.0642 (−1.37)			
W × TL	7.549 *** (4.22)			
Time fixed effect		yes		
Area fixed effect		yes		
ρ		−2.477 *** (−4.41)		
Variance Sigma2_e		0.0158 *** (12.06)		
n		390		
R2		0.510		

t statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The spatial coefficient of the fiscal decentralization index (FD) is -7.846 , passing the 1% significance test. Under the economic distance of the spatial weight matrix of other provinces, the energy intensity will decrease by 7.846 , which is consistent with the theoretical mechanism analysis of H2; that is, the extrusion effect that fiscal decentralization has on the green industry and high-tech industry will turn into a space effect, cross-regionally alleviating regional energy intensity. Meanwhile, the coefficient of $W \times EP$ is 7.806 , which is also significant at the level of 1%. This indicates that the ecological attention of local governments regarding the energy intensity of one region will be transmitted to other regions through the spatial effect. Consequently, this spatial effect assumes that the central government will provide positive incentives to local governments that take the lead in improving their ecological attention and gradually change the traditional assessment system, which places single economic growth as the local government's performance assessment standard. Only then could regions that take the lead on ecological benefits and

energy efficiency play a demonstrative role and imitate “environmental federalism” among Chinese provinces.

In the decomposition regression analysis of the spatial effects, the direct effect of the fiscal decentralization index (FD) is 0.639, which is significant at the 1% level. This means increasing the fiscal decentralization of local governments will significantly strengthen the local energy intensity and restrain the process of improving energy utilization efficiency, further establishing H1. The indirect effect of the fiscal decentralization index (FD) is -2.606 , passing the 1% significance test. This shows that the fiscal decentralization of local governments has a negative spatial spillover effect on the regional energy intensity; that is, the increased fiscal decentralization of the local government will squeeze a part of the eco-friendly and energy-saving high-tech industries into other regions, thus establishing H2.

Similarly, the direct effect coefficient of the ecological attention index (EP) indicates that the local energy intensity is significantly decreased by 0.586; the indirect effect coefficient indicates that the increased ecological attention of local governments significantly reduces the energy intensity level by 1.764 units, thus fully verifying H3 and H4.

5.1.4. Robustness Test

(1) Add Possible Missing Variables

The control variables of this paper are selected as regional corruption, regional urbanization rate, regional innovation capability, and regional industrial structure deviation. In addition, this paper considers that factors such as financial development, policy environment, and opening to the outside world may also impact regional energy intensity. Therefore, the degree of advances in industrial structure and financial marketization, fiscal transparency, and the actual level of foreign direct investment (RMB 100 million) were introduced into the spatial econometric model of this paper as control variables to estimate these parameters. The degree of financial marketization (FM) in China was reported in the “China Marketization Index—Annual Report on the Relative Progress of Marketization in Various Regions” by Fan Gang and Wang Xiaolu; the degree of fiscal transparency (FT) was published by the most prominent authority on the subject, the Shanghai University of Finance and Economics in China. The comprehensive score of China’s provinces’ fiscal transparency was used as its proxy variable; the data on actual foreign direct investments (RMB 100 million) (FDI) came from the *China Statistical Yearbook* from each year. The Advanced Industrial Structure (AIS) was measured by the formula $AIS_{i,t} = \frac{Y_{i,3,t}}{Y_{i,2,t}}$, where $AIS_{i,t}$ represents the industrial structure of region i during period t , and furthermore, the larger the value, the more advanced the region’s industrial structure. The estimation results are shown in Table 6 and the test results can fully verify the robustness of the model.

Table 6. Robustness Test—Adding Possible Missing Variables.

Variable	Department of Numerical Values	Statistics
FD	1.029 ***	(5.47)
EP	−0.405 **	(−2.64)
Control variable	Control	
W × FD	−4.670 ***	(−3.64)
W × EP	−5.036 **	(−2.09)
W × control variable	Control	
Time fixed effect	yes	
Area fixed effect	yes	
ρ	−2.932 ***	(−4.24)
Variance		
Sigma2_e	0.0132 ***	(11.65)
n	390	
R2	0.468	

t statistics in parentheses ** $p < 0.05$, *** $p < 0.01$.

(2) Eliminate the Years that May Cause Interference

In October 2007, the Chinese central government identified the construction of an ecological civilization as one of the goals of the nation's struggles and construction needs. Since then, this has generally become a goal of local fiscal governance. As 2007 was a period of policy adjustment, this year may provide some interference in this paper. After excluding this year, the panel data from 2008–2019 were estimated again; the estimated results are reported in Table 7 and show that the study in this paper is robust.

Table 7. Robustness Test—Years of Possible Interference Were Removed.

Variable	Department of Numerical Values	Statistics
FD	1.000 ***	(5.62)
EP	−0.308 **	(−2.21)
Control variable	Control	
W × FD	−4.676 ***	(3.25)
W × EP	−4.865 **	(−2.14)
W × control variable	Control	
Time fixed effect	yes	
Area fixed effect	yes	
ρ	−2.278 ***	(−3.68)
Variance		
Sigma2_e	0.00956 ***	(11.30)
<i>n</i>	360	
R2	0.444	

t statistics in parentheses ** $p < 0.05$, *** $p < 0.01$.

(3) Eliminate the Areas that May Cause Interference

In some Chinese provinces, such as Ningxia and Qinghai, there were sharp contradictions between economic construction goals and the ecological governance goals. As Ningxia and Qinghai are inland regions, they lack capital and technology, and their economic development is lagging. This means that they particularly rely on government policies to prompt economic construction and promote economic growth. These provinces also have serious ecological problems, such as desertification and a fragile ecological foundation, which governments must properly handle. Therefore, in these provinces, fiscal governance may use “discretion” and the target preference will show a high level of volatility between economic construction and ecological protection. This could interfere with the study in this paper, so this paper eliminated Ningxia and Qinghai and conducted another space Durbin model regression analysis. The estimated results are reported in Table 8 and show that the study in this paper is robust.

Table 8. Robustness Test—Excluding Areas with Possible Interference.

Variable	Department of Numerical Values	Statistics
FD	0.939 ***	(5.42)
EP	−0.291 *	(−1.92)
Control variable	Control	
W × FD	−4.673 ***	(−4.00)
W × EP	−6.397 ***	(−2.76)
W × control variable	Control	
Time fixed effect	yes	
Area fixed effect	yes	
ρ	−2.498 ***	(−4.05)
Variance		
Sigma2_e	0.0106 ***	(11.18)

Table 8. Cont.

Variable	Department of Numerical Values	Statistics
n	364	
R2	0.473	

t statistics in parentheses * $p < 0.10$, *** $p < 0.01$.

5.2. Panel Threshold Model Analysis

5.2.1. Threshold Effect Test and Threshold Value Estimation

To further explore the influence and the function of fiscal decentralization regarding regional energy intensity following adjustments to the ecological attention of the local government, and to verify H4, this paper adopted the Hansen (1999) panel threshold model. A repeated simulation likelihood ratio of 300 times was conducted using the Bootstrap method to test the existence and rationality of the threshold effect. The test results are shown in Table 9. Based on the estimation results of F statistics, the ecological attention of the local government index (EP) passed the single threshold and double threshold tests, but not the triple threshold test. It was determined that this paper should use the double threshold effect for regression analysis.

Table 9. The Threshold Effect Tests and the Threshold Value Estimates.

The Threshold Variable	The Threshold Order	Threshold Value	p Price	The 95% Confidence Interval Was Used	Bootstrap	Seed Value
FM	A single threshold	0.0963 ***	0.0000	[0.0925 0.0966]	300	101
	Double threshold	0.2754 ***	0.0000	[0.2708 0.2793]	300	101
	Triple threshold	0.2857	0.6367	[0.2827 0.2867]	300	101

t statistics in parentheses *** $p < 0.01$.

5.2.2. Likelihood Ratio Statistical Function Test

By drawing the likelihood ratio function diagram, the corresponding specific threshold value can be determined when the value of the likelihood ratio statistics function LR is 0. In Figure 2a, when the LR is 0, the threshold variable is 0.0963; in Figure 2b, when the LR is 0, the threshold variable is 0.1955.

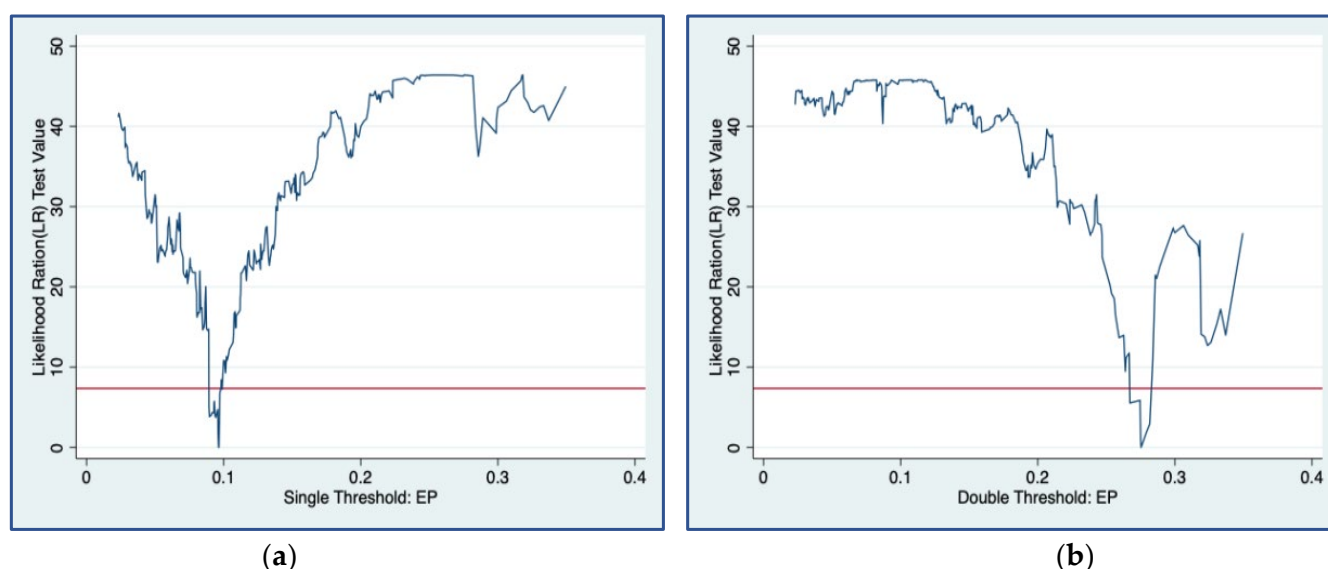


Figure 2. Likelihood Ratio Statistical Function Test Plots in Figure. (a) Threshold Variable (EP) Likelihood Ration (LR) Statistic Under Single Threshold; (b) Threshold Variable (EP) Likelihood Ration (LR) Statistic Under Double Threshold.

In addition, the corresponding confidence interval of single threshold value 0.0963 is [0.0925 0.0966], and the corresponding confidence interval of double threshold value 0.2754 is [0.2708 0.2793]. These are both at the critical likelihood value, which is under the 5% significance level (the red line of LR statistic). The confidence intervals are within the acceptable domain of the original hypothesis in the threshold model, thereby passing the double threshold estimate of authenticity.

5.2.3. Analysis of the Panel Threshold Model Estimation Results

This paper took the ecological attention of local government index (EP) as the threshold dependent variable and the fiscal decentralization index (FD) as the core explanatory variable. Stata16.0 was used to estimate the parameters of the dual threshold model. The parameter estimation results are shown in Table 10.

Table 10. Panel Threshold Model Estimation Results.

Variable	Department of Numerical Values	Statistics
Cor	38.87	(1.32)
Fin	−0.240 ***	(−5.20)
In	0.00834 *	(1.72)
TL	0.967 *	(1.82)
FD ($EP \leq 0.0963$)	−0.452	(−1.00)
FD ($0.0963 < EP \leq 0.2754$)	−0.698	(−1.51)
FD ($EP > 0.2754$)	−1.146 **	(−2.45)
_cons	1.488 ***	(3.80)
<i>n</i>	390	
R ²	0.688	

t statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

According to the results of the threshold effect test, when the ecological attention of the local government index (EP) is located in the first and second intervals, that is, when EP is smaller than 0.0963 and $0.0963 < EP < 0.2754$, the coefficients of the fiscal decentralization index (FD) are −0.452 and −0.698, respectively—but not significant. The ecological attention of lower-level local governments can lead the government to show a certain tendency to restrain energy intensity and “top competition”; however, because its level and strength do not reach a certain level, they lack the driving force to provide positive incentives for government energy conservation and emission reduction efforts. This makes it difficult to guide local governments under the Chinese-style fiscal decentralization system to alter their “race to the bottom” behavior decision. Instead, they support green industries and high-tech industries to ease regional energy intensity and improve regional energy utilization efficiency.

When $EP > 0.2754$, the fiscal decentralization index (FD) coefficient is −1.146, passing the 5% significance test. This shows that, after reaching a certain threshold, the ecological attention of local governments will adjust the distortion in regional energy utilization caused by the “race to the bottom”—the result of fiscal decentralization—leading fiscal decentralization to reversely inhibit regional energy intensity.

However, in terms of the double threshold value of EP (0.2754), the ecological attention of local governments in most provinces of China did not reach or exceed this threshold during most of the period from 2007 to 2019. The panel data studied in this paper included 390 samples from 30 provinces in mainland China from 2007 to 2019, among which only 30 samples of local government ecological attention exceeded the threshold value of 0.2754.

In particular, only Shanxi Province (2019), Fujian Province (2017, 2018, 2019), Henan Province (2010, 2018, 2019), Guangxi Province (2017, 2018, 2019), Sichuan Province (2018, 2019), Yunnan Province (2014, 2015, 2016, 2017, 2019), Shaanxi Province (2014), Gansu (2019), and the Ningxia Hui Autonomous Region (2008, 2010, 2013, 2014, 2015, 2016, 2017, 2018, 2019) have local governments with ecological attention exceeding 0.2754, which can

play a role in correcting the “race to the bottom” caused by fiscal decentralization; this list illustrates the following information:

First, most provinces with an EP index higher than the threshold value of 0.2457 are in the central and western regions in China. Fujian Province is the only one to reach this threshold in the developed eastern area in recent years. Furthermore, the EP index of the Ningxia Hui Autonomous Region is at a high level during most years; this was partly due to the fragile ecological basis of the central and western regions, and because the ecological environment greatly restricts the sustainability of regional economic development, so more attention is paid to ecological protection in policymaking. Relying on the developed economic conditions, the eastern region took the lead in upgrading and optimizing the industrial structure. The damage to the ecological environment caused by industrialization was alleviated, and the ecological environment situation was better than that of the central and western regions. It also shows that local governments in the eastern region, which is the engine of China’s economic growth and the main source of tax revenue, pay more attention to the competition of “growth indicators” than those in the central and western regions; however, they pay less attention to the construction of an ecological civilization.

Secondly, in the view of time, most of the years when the EP index is higher than the threshold value of 0.2457 were concentrated in recent years, although the central government of China had set ecological civilization construction as a policy goal of local governments as early as 2007 to guide their behavior decisions. Therefore, on the whole, China still lacks the endogenous power to drive local governments to actively change short-term economic behaviors and alleviate regional energy intensity, and the “race to the bottom” that is formed by fiscal decentralization cannot be significantly regulated. On one side, local governments need to accelerate the implementation of ecological civilization construction. Regardless, the more important aspect is that the central government needs to come up with better mechanisms and governance measures to guide local governments in managing the problem between economic development and energy efficiency improvement.

6. Conclusions and Policy Recommendations

6.1. Conclusions

This paper empirically analyzed the influence of China’s fiscal decentralization policies and local governments’ ecological attention to regional energy intensity by successively constructing the spatial econometric model and panel threshold model. The following conclusions can be drawn:

Firstly, Chinese-style fiscal decentralization will significantly improve regional energy intensity, while increasing local governments’ ecological attention will significantly inhibit regional energy intensity. The main effect and direct effect coefficients of the spatial Durbin model could fully verify these two conclusions.

Second, a region’s fiscal decentralization and the ecological attention of the local government will significantly inhibit other forms of regional energy intensity, including fiscal decentralization, due to the regional ecologically friendly and energy-saving high-tech industry’s “spatial spillover effect”. This will significantly inhibit the space effect of regional energy intensity. As the local governments’ ecological attention is influenced by adjustments in central government policy, competition between Chinese local governments should be “mandatorily reformed” to obtain “federal fiscal” tendencies. This would significantly alleviate the space effect of regional energy intensity.

Finally, in the panel threshold effect regression, the ecological attention of local governments under the fiscal decentralization regulations of regional energy intensity produced a reverse inhibition. When the local government’s ecological attention reaches the double threshold level, fiscal decentralization can have a significant mitigation effect on regional energy intensity.

Certainly, in addition to the marginal contribution contained in the above conclusions, the study of this paper also has some shortcomings. First of all, the panel data in this paper is from the Chinese provincial perspective, such empirical analysis is too macroscopic and

the situation of China's prefecture-level cities, districts, and counties needs to be presented in further research. In addition, the research perspective of this paper should also be extended to the enterprise and other micro-fields. Finally, in the process of measuring fiscal decentralization, this paper adopts the index of budgetary revenue (expenditure), which is consistent with most previous studies; however, this paper believes that in future research it is still necessary to analyze this problem from the perspective of fiscal final accounts, given that the government's fiscal policy implementation behavior is not completely based on the budget and plan, and in most cases, the government's decision will deviate from the budget. This is also a flaw in the current discussion of Chinese-style fiscal decentralization, which needs to be given more attention by scholars in future research.

6.2. Policy Recommendations

Based on the above analysis and conclusions, this paper puts forward the following policy suggestions:

- (1) The Chinese central government should continue to firmly and clearly place the construction of an ecological civilization in a prominent position. Improving regional energy efficiency and regional energy intensity, in particular, should be fiscal goals for central and local governments. This is not only conducive to the protection of ecological civilization, but it is more conducive to eliminating backward capacity and promoting the optimization and upgrading of the industrial structure;
- (2) China's assessment of local governments by the central government should be reformed further. To ensure economic development, more emphasis should be placed on the local government's performance in terms of ecological protection and improvements in regional energy efficiency. The "race to the bottom" between local governments should be alleviated and local governments' fiscal systems should be guided to create ecological targets, thereby changing the "race to the bottom competition" to a "top by top competition";
- (3) The Chinese central government and local government should attach importance to long-term economic and social benefits and ecological benefits. Particular attention should be paid to the fiscal support for regional new energy technologies, chip technologies, photovoltaic and green infrastructure, and the ecologically and environmentally friendly high-tech industry. Life-cycle stages should evolve at a faster pace, and technological innovation should form an endogenous driving force for improving energy efficiency, alleviating energy intensity, guiding the conversion of old and new kinetic energy, and gradually eliminating the "spatial spillover effect" of these industries due to the "race to the bottom competition";
- (4) Local governments should balance the relationship between economic development and the construction of an ecological civilization. In the eastern coastal areas of China, with mature technical conditions and a developed economy, a transformation of traditional energy sources to renewable and sustainable new energy sources should be promoted, thereby uniting the alleviation of energy intensity with the goals and requirements of further economic and social development. For some underdeveloped areas of China, especially in the ecologically fragile western region, the central government needs to use tools, including transfer payments, to help coordinate the contradiction between economic development and ecological and environmental protection and guide advanced technology and talents to enter these areas to effectively alleviate the regional energy intensity.

Author Contributions: Conceptualization, M.B. and K.L.; methodology, software, validation, formal analysis, and writing—original draft preparation, M.B. and K.L.; investigation, and resources, D.F. and X.T.; writing—review and editing, and supervision, C.W., J.P. and S.Y. All authors have read and agreed to the published version of the manuscript.

Funding: The General Scientific Research Project of Zhejiang Provincial Department of Education (Y202044040), Zhejiang Provincial Philosophy and Social Science Planning Project (19XXJC02ZD-2,19XXJC02ZD-3).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The authors would like to thank the editors and anonymous reviewers for their thoughtful and constructive comments.

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

References

1. Chang, T.; Chu, H.; Chen, W. Energy consumption and economic growth in 12 Asian countries: Panel data analysis. *Appl. Econ. Lett.* **2013**, *20*, 282–287. [\[CrossRef\]](#)
2. Elzen, D.; Fekete, H.; Höhne, N. Greenhouse gas emissions from current and enhanced policies of China until 2030: Can emissions peak before 2030. *Energy Policy* **2016**, *89*, 224–236. [\[CrossRef\]](#)
3. Mi, Z.; Zheng, J.; Meng, J. China's energy consumption in the new normal. *Earth Future* **2018**, *6*, 1007–1016. [\[CrossRef\]](#)
4. Tiebout, C.M. A pure theory of local expenditures. *J. Political Econ.* **1956**, *64*, 416–424. [\[CrossRef\]](#)
5. Song, M.; Du, T.; Tan, H. Impact of fiscal decentralization on green total factor productivity. *Int. J. Prod. Econ.* **2018**, *205*, 359–367. [\[CrossRef\]](#)
6. Zhou, M.; Wang, T.; Yan, L. Has economic competition improved China's provincial energy ecological efficiency under fiscal decentralization? *Sustainability* **2018**, *10*, 2483. [\[CrossRef\]](#)
7. Liu, L.; Ding, D.; He, J. Fiscal Decentralization, Economic Growth, and Haze Pollution Decoupling Effects: A Simple Model and Evidence from China. *Comput. Econ.* **2017**, *54*, 1423–1441. [\[CrossRef\]](#)
8. Wang, F.; He, J.; Niu, Y. Role of foreign direct investment and fiscal decentralization on urban haze pollution in China. *J. Environ. Manag.* **2022**, *49*, 305–316. [\[CrossRef\]](#)
9. Liu, Y.; Martinez-Vazquez, J.; Wu, A. Fiscal Decentralization, Equalization, and Intra-provincial Inequality in China. *Int. Tax Public Financ.* **2017**, *24*, 248–281. [\[CrossRef\]](#)
10. Yang, S.; Li, Z.; Li, J. Fiscal Decentralization, Preference for Government Innovation and City Innovation Evidence from China. *Chin. Manag. Stud.* **2020**, *14*, 391–409. [\[CrossRef\]](#)
11. Wang, Z.; Yao, Y.; Zhang, J. The Competence-loyalty Tradeoff in China's Political Selection. *J. Comp. Econ.* **2022**, *50*, 369–393. [\[CrossRef\]](#)
12. Chen, X.; Ke, Y.; Li, H.; Song, Y.; Peng, Y. Does the Promotion Pressure on Local Officials Matter for Regional Carbon Emissions? Evidence Based on Provincial-level Leaders in China. *Environ. Geochem. Health* **2021**, *44*, 2881–2903. [\[CrossRef\]](#) [\[PubMed\]](#)
13. Wang, K.; Zhao, B.; Ding, L.; Miao, Z. Government Intervention, Market Development, and Pollution Emission Efficiency: Evidence from China. *Sci. Total Environ.* **2021**, *757*, 143738. [\[CrossRef\]](#) [\[PubMed\]](#)
14. Cao, Y.; Liu, J.; Yu, Y.; Wei, G. Impact of Environmental Regulation on Green Growth in China's Manufacturing Industry-based on the Malmquist-lobenberger Index and the System Gmm Model. *Environ. Sci. Pollut. Res.* **2020**, *27*, 41928–41945. [\[CrossRef\]](#)
15. Zhang, Z.; Jin, T.; Meng, X. From Race-to-the-bottom to Strategic Imitation: How Does Political Competition Impact the Environmental Enforcement of Local Governments in China? *Environ. Sci. Pollut. Res.* **2020**, *27*, 25675–25688. [\[CrossRef\]](#)
16. Du, Z.; Zheng, L.; Lin, B. Does Rent-Seeking Affect Environmental Regulation? Evidence from the Survey Data of Private Enterprises in China. *J. Glob. Inf. Manag.* **2022**, *30*, 436–463.
17. Martínez-Vázquez, J.; Lago-Peñas, S.; Sacchi, A. The impact of fiscal decentralization: A survey. *J. Econ. Surv.* **2017**, *31*, 1095–1129. [\[CrossRef\]](#)
18. Truby, J. Decarbonizing Bitcoin: Law and policy choices for reducing the energy consumption of Blockchain technologies and digital currencies. *Energy Res. Soc. Sci.* **2018**, *44*, 399–410. [\[CrossRef\]](#)
19. Jana, R.; Ghosh, I.; Wallin, M. Taming Energy and Electronic Waste Generation in Bitcoin Mining: Insights from Facebook Prophet and Deep Neural Network. *Technol. Forecast. Soc. Chang.* **2022**, *45*, 178. [\[CrossRef\]](#)
20. Sang, X.; Leng, X.; Xue, L.; Ran, X. Based on the Time-Spatial Power-Based Cryptocurrency Miner Driving Force Model, Establish a Global CO₂ Emission Prediction Framework after China Bans Cryptocurrency. *Sustainability* **2022**, *14*, 5332. [\[CrossRef\]](#)
21. Meynkhard, A. Energy efficient development model for regions of the Russian federation: Evidence of crypto mining. *Int. J. Energy Econ. Policy* **2019**, *9*, 16–21. [\[CrossRef\]](#)
22. Dong, F.; Pan, Y.; Zhang, X.; Sun, Z. How to Evaluate Provincial Ecological Civilization Construction? The Case of Jiangsu Province, China. *Int. J. Environ. Res. Public Health* **2020**, *17*, 5334. [\[CrossRef\]](#) [\[PubMed\]](#)
23. Huang, S.; Ding, Y.; Failler, P. Does the Government's Environmental Attention Affect Ambient Pollution? Empirical Research on Chinese Cities. *Sustainability* **2022**, *14*, 3242. [\[CrossRef\]](#)

24. Tang, P.; Jiang, Q.; Mi, L. One-vote Veto: The Threshold Effect of Environmental Pollution in China's Economic Promotion Tournament. *Ecol. Econ.* **2021**, *45*, 185–195. [\[CrossRef\]](#)
25. Li, N.; Feng, C.; Shi, B.; Kang, R.; Wei, W. Does the Change of Official Promotion Assessment Standards Contribute to the Improvement of Urban Environmental Quality? *J. Clean. Prod.* **2022**, *43*, 348–376. [\[CrossRef\]](#)
26. Zhang, H.; Zhu, Z.; Fan, Y. The Impact of Environmental Regulation on the Coordinated Development of Environment and Economy in China. *Nat. Hazard.* **2018**, *91*, 473–489. [\[CrossRef\]](#)
27. Oates, E. *Fiscal Federalism*; Harcourt Brace Jovanovich: New York, NY, USA, 1972; Volume 7, pp. 16–34.
28. Basoglu, A.; Uzar, U. An empirical evaluation about the effects of environmental expenditures on environmental quality in coordinated market economies. *Environ. Sci. Pollut. Res.* **2019**, *26*, 23108–23118. [\[CrossRef\]](#)
29. Withagen, C.; Halsema, A. Tax Competition Leading to Strict Environmental Policy. *Int. Tax Public Financ.* **2013**, *20*, 434–449. [\[CrossRef\]](#)
30. Ramanathan, R.; Black, A.; Nath, P. Impact of environmental regulations on innovation and performance in the UK industrial sector. *Manag. Decis.* **2010**, *48*, 1493–1513. [\[CrossRef\]](#)
31. Manello, A. Productivity growth, environmental regulation and win-win opportunities: The case of chemical industry in Italy and Germany. *Eur. J. Oper. Res.* **2017**, *262*, 733–743. [\[CrossRef\]](#)
32. Hottenrott, H.; Rexhauser, S. Policy-induced environmental technology and inventive efforts: Is there a crowding out? *Ind. Innov.* **2015**, *22*, 375–401. [\[CrossRef\]](#)
33. Dijkstra, R.; Fredriksson, G. Regulatory environmental federalism. *Annu. Rev. Resour. Econ.* **2010**, *15*, 319–339. [\[CrossRef\]](#)
34. Zahid, M.; Ghaemi, M.; Li, S. The effect of fiscal decentralization, environmental regulation, and economic development on haze pollution: Empirical evidence for 270 Chinese cities during 2007–2016. *Environ. Sci. Pollut. Res.* **2022**, *29*, 20318–20332.
35. Iqbal, N.; Abbasi, K.R.; Shinwari, R.; Guangcai, W.; Ahmad, M.; Tang, K. Does exports diversification and environmental innovation achieve carbon neutrality target of OECD economies?—ScienceDirect. *J. Environ. Manag.* **2021**, *32*, 291–302.
36. Lópezpez, R.; Mitra, S. Corruption, pollution, and the Kuznets environment curve. *J. Environ. Econ. Manag.* **2000**, *40*, 137–150. [\[CrossRef\]](#)
37. Elheddad, M.; Djellouli, N.; Tiwari, K. The relationship between energy consumption and fiscal decentralization and the importance of urbanization: Evidence from Chinese provinces. *J. Environ. Manag.* **2020**, *53*, 264–276. [\[CrossRef\]](#)
38. Ocasio, W. Towards an Attention-Based View of the Firm. *Strateg. Manag. J.* **1997**, *18*, 187–206. [\[CrossRef\]](#)
39. Jones, B.; Baumgartner, R. *The Politics of Attention: How Government Prioritizes Problems*; University of Chicago Press: Chicago, IL, USA, 2005; Volume 34, pp. 65–77.
40. Flavin, P.; Franko, W. Government's Unequal Attentiveness to Citizens' Political Priorities. *Policy Stud. J.* **2017**, *45*, 659–687. [\[CrossRef\]](#)
41. Zhang, W.; Zhou, Y.; Li, J. Does the Attention of the Chinese Government Influence Chinese Nutrition, Exercise, and Health? Based on the Content Analysis of the Central Government Work Reports from 1978 to 2020. *Front. Nutr.* **2021**, *8*, 544–567. [\[CrossRef\]](#)
42. Mortensen, P. Political attention and public spending in the United States. *Policy Stud. J.* **2009**, *37*, 435–455. [\[CrossRef\]](#)
43. Townsend, B.; Friel, S.; Schram, A. What Generates Attention to Health in Trade Policy Making? Lessons from Success in Tobacco Control and Access to Medicines: A Qualitative Study of Australia and the (Comprehensive and Progressive) Trans-Pacific Partnership. *Kerman Univ. Med. Sci.* **2020**, *10*, 55–60. [\[CrossRef\]](#) [\[PubMed\]](#)
44. Montpetit, É.; Foucault, M. Canadian federalism and change in policy attention: A comparison with the United Kingdom. *Can. J. Political Sci.* **2012**, *44*, 656–703. [\[CrossRef\]](#)
45. Breeman, G.; Lowery, D.; Poppelaar, C. Political attention in a coalition system: Analysing Queen's speeches in the Netherlands 1945–2007. *Acta Politica* **2009**, *44*, 1. [\[CrossRef\]](#)
46. Sevenans, J. How mass media attract political elites' attentiod. *Eur. J. Political Res.* **2018**, *57*, 153–170. [\[CrossRef\]](#)
47. Guan, Y.; Zhai, Z.; Wang, Y. Foreign direct investment, environmental regulation, and haze pollution: Empirical evidence from China. *Environ. Sci. Pollut. Res.* **2009**, *55*, 27571–27584. [\[CrossRef\]](#) [\[PubMed\]](#)
48. Guo, S.; Wang, W.; Zhang, M. Exploring the impact of environmental regulations on happiness: New evidence from China. *Environ. Sci. Pollut. Res.* **2020**, *27*, 19484–19501. [\[CrossRef\]](#)
49. Zhao, S.; Jiang, Y.; Wang, S. Innovation stages, knowledge spillover, and green economy development: Moderating role of absorptive capacity and environmental regulation. *Environ. Sci. Pollut. Res.* **2019**, *26*, 25312–25325. [\[CrossRef\]](#)
50. Xu, H.; Li, X. Effect mechanism of Chinese-style decentralization on regional carbon emissions and policy improvement: Evidence from China's 12 urban agglomerations. *Environ. Dev. Sustain.* **2022**, *12*, 32–43. [\[CrossRef\]](#)
51. Bird, R.; Vaillancourt, F. *Fiscal Decentralization in Developing Countries*; Cambridge University Press: Cambridge, UK, 2010; Volume 66, pp. 646–673.
52. He, C.; Zhou, Y.; Huang, Z. Fiscal decentralization, political centralization, and land urbanization in China. *Urban Geogr.* **2016**, *37*, 436–457. [\[CrossRef\]](#)
53. Ma, Y. Improved Local Implementation under Central Inspection? Evidence from Social Mandates in China. *Public Perform. Manag. Rev.* **2021**, *44*, 817–841. [\[CrossRef\]](#)

54. Wu, J.; Xu, M.; Zhang, P. The impacts of governmental performance assessment policy and citizen participation on improving environmental performance across Chinese provinces. *J. Clean. Prod.* **2018**, *17*, 227–238. [\[CrossRef\]](#)
55. Li, X.; Xu, H. Effect of local government decision-making competition on carbon emissions: Evidence from China's three urban agglomerations. *Bus. Strategy Environ.* **2020**, *29*, 2418–2431. [\[CrossRef\]](#)
56. Wang, L.; Kong, D.; Zhang, J. Does the Political Promotion of Local Officials Impede Corporate Innovation? *Emerg. Mark. Financ. Trade* **2019**, *56*, 1159–1181. [\[CrossRef\]](#)
57. Meng, K. Promotion Tournament, Labor Market Tightening and Pension Generosity: A Comparative Public Policy Analysis of Pension System for Urban Workers in China. *J. Comp. Policy Anal.* **2020**, *22*, 383–404.
58. Zhou, F.; Tan, M. *Relationship between the Central Government and Local Governments of Contemporary China*; Springer: Berlin/Heidelberg, Germany, 2017; Volume 10, pp. 43–83.
59. Du, J.; Sun, Y. The nonlinear impact of fiscal decentralization on carbon emissions: From the perspective of biased technological progress. *Environ. Sci. Pollut. Res.* **2021**, *28*, 29890–29899. [\[CrossRef\]](#) [\[PubMed\]](#)
60. Konisky, D. Regulator Attitudes and the Environmental Race to the Bottom Argument. *J. Public Adm. Res. Theory* **2008**, *18*, 321–344. [\[CrossRef\]](#)
61. Zhang, K.; Zhang, Z.; Liang, Q. An empirical analysis of the green paradox in China: From the perspective of fiscal decentralization. *Energy Policy* **2017**, *103*, 203–211. [\[CrossRef\]](#)
62. Nández, L. The Tax Incentives in the IVTM and “Eco-Friendly Cars”: The Spanish Case. *Sustainability* **2020**, *12*, 33–98.
63. Yu, K.; Gong, R.; Hu, S. Based on analytic hierarchy process to discuss key factors in high-tech industrial ecology development. *Ekoloji* **2018**, *27*, 449–454.
64. Wang, Y.; Yang, Y.; Fu, C. Environmental regulation, environmental responsibility, and green technology innovation: Empirical research from China. *PLoS ONE* **2021**, *16*, e0257670. [\[CrossRef\]](#)
65. Wang, D.; Zhang, Z.; Shi, R. Fiscal Decentralization, Green Technology Innovation, and Regional Air Pollution in China: An Investigation from the Perspective of Intergovernmental Competition. *Int. J. Environ. Res. Public Health* **2022**, *19*, 8456. [\[CrossRef\]](#) [\[PubMed\]](#)
66. Oates, E. Fiscal Competition or Harmonization? Some Reflection. *Natl. Tax J.* **2001**, *54*, 33–65. [\[CrossRef\]](#)
67. Yang, X.; Tang, D. Environmental regulations, Chinese-style fiscal decentralization, and carbon emissions: From the perspective of moderating effect. *Stoch. Environ. Res. Risk Assess.* **2021**, *45*, 1–14. [\[CrossRef\]](#)
68. Guo, P.; Li, J.; Kuang, J. Low-Carbon Governance, Fiscal Decentralization and Sulfur Dioxide Emissions: Evidence from a Quasi-Experiment with Chinese Heavy Pollution Enterprises. *Sustainability* **2022**, *14*, 3220. [\[CrossRef\]](#)
69. Antzoulatos, A.; Apergis, N.; Tsoumas, C. Financial Structure and Industrial Structure. *Bull. Econ. Res.* **2011**, *63*, 109–139. [\[CrossRef\]](#)
70. Surugiu, R.; Surugiu, C.; Nica, M. Fiscal Policy and Economic Growth: Explanation with Empirical Analysis. *Actual Probl. Econ.* **2012**, *34*, 476–481.
71. Zhang, S.; Chen, S. Local Governance Performance in China: A Fiscal Perspective. *Emerg. Mark. Financ. Trade* **2014**, *26*, 45–63. [\[CrossRef\]](#)
72. Zhang, R.; Hanaoka, T. Deployment of electric vehicles in China to meet the carbon neutral target by 2060: Provincial disparities in energy systems, CO₂ emissions, and cost effectiveness. *Resour. Conserv. Recycl.* **2021**, *170*, 105–116. [\[CrossRef\]](#)
73. Kong, D.; Zhu, L.; Bateman, I. Governments Fiscal Squeeze and Firms Pollution Emissions: Evidence from a Natural Experiment in China. *Environ. Resour. Econ.* **2022**, *81*, 833–866. [\[CrossRef\]](#)
74. Droste, N.; Ring, I.; Schroter-Schlaack, C. Integrating Ecological Indicators into Federal-State Fiscal Relations: A policy design study for Germany. *Environ. Policy Gov.* **2017**, *27*, 484–499. [\[CrossRef\]](#)
75. Zhang, P.; Wang, H. Do provincial energy policies and energy intensity targets help reduce CO₂ emissions? Evidence from China. *Energy* **2022**, *245*, 12–24. [\[CrossRef\]](#)
76. Simon, H. *Administrative Behavior. A Study of Decision-Making Processes in Administrative Organization*; New York Free Press: New York, NY, USA, 1947; Volume 13, pp. 45–61.
77. Stone, N.; Henig, R.; Jones, D. *Building Civic Capacity: The Politics of Reforming Urban Schools. Studies in Government and Public Policy*; University Press of Kansas: Lawrence, KS, USA, 2001; Volume 118, pp. 197–205.
78. Xie, M.; Duan, H.; Kang, P. Toward an Ecological Civilization: China's Progress as Documented by the Second National General Survey of Pollution Sources. *Engineering* **2021**, *7*, 6–17. [\[CrossRef\]](#)
79. Wang, J.; Lei, P. The tournament of Chinese environmental protection: Strong or weak competition? *Ecol. Econ.* **2021**, *181*, 65–74. [\[CrossRef\]](#)
80. Zhang, L.; Zhang, H.; Jiang, H. Tournament incentives, internal promotion and corporate social responsibility: Evidence from China. *Eur. J. Financ.* **2021**, *45*, 416–436. [\[CrossRef\]](#)
81. Amigues, J.; Durmaz, T. A Two-Sector Model of Economic Growth with Endogenous Technical Change and Pollution Abatement. *Environ. Model. Assess.* **2019**, *24*, 703–725. [\[CrossRef\]](#)
82. Shen, F.; Liu, B.; Luo, F. The effect of economic growth target constraints on green technology innovation. *J. Environ. Manag.* **2021**, *292*, 112–127. [\[CrossRef\]](#)

83. Chen, L.; Gao, M. The effects of three types of China's official turnover on air quality: A regression discontinuity study. *Growth Change* **2020**, *51*, 1081–1101. [\[CrossRef\]](#)
84. Bhattacharya, A.; Sen, D. Labor policy and multinational firms: The “race to the bottom” revisited. *Rev. Dev. Econ.* **2021**, *25*, 1515–1537. [\[CrossRef\]](#)
85. Wu, Y.; Zhou, X. Research on the Efficiency of China's Fiscal Expenditure Structure under the Goal of Inclusive Green Growth. *Sustainability* **2021**, *13*, 9725. [\[CrossRef\]](#)
86. Turcsin, L.; Mairesse, O.; Macharis, C. Encouraging Environmentally Friendlier Cars via Fiscal Measures: General Methodology and Application to Belgium. *Energies* **2013**, *6*, 471–491. [\[CrossRef\]](#)
87. Lu, B.; Yue, S.; Chen, M. A Study on the Mechanism of Environmental Information Disclosure Oriented to the Construction of Ecological Civilization in China. *Sustainability* **2022**, *14*, 6378. [\[CrossRef\]](#)
88. Ding, W.; Yu, H.; Zhao, C. Impacts of historical socio-economic development policies on eco-environment in great Dunhuang region of China. *Environ. Policy* **2016**, *55*, 258–265. [\[CrossRef\]](#)
89. Lv, T.; Hu, H.; Xie, H. An empirical relationship between urbanization and carbon emissions in an ecological civilization demonstration area of China based on the STIRPAT model. *Environ. Dev. Sustain.* **2022**, *12*, 87–90. [\[CrossRef\]](#)
90. Ye, G.; Zhu, C. Research on Urban Ecological Civilization and Low-Carbon Economy in the Yangtze River Delta. *Adv. Mater. Res.* **2012**, *524*, 3667–3673. [\[CrossRef\]](#)
91. Hu, M.; Sarwar, S.; Li, Z. Spatio-Temporal Differentiation Mode and Threshold Effect of Yangtze River Delta Urban Ecological Well-Being Performance Based on Network DEA. *Sustainability* **2021**, *13*, 4550. [\[CrossRef\]](#)
92. Wu, S.; Han, H. Energy transition, intensity growth, and policy evolution: Evidence from rural China. *Energy Econ.* **2022**, *105*, 105–117. [\[CrossRef\]](#)
93. Azhgaliyeva, D.; Liu, Y.; Liddle, B. An empirical analysis of energy intensity and the role of policy instruments. *Energy Policy* **2020**, *145*, 87–90. [\[CrossRef\]](#)
94. Thanh, S.; Canh, N. Local Governance: Impacts of Fiscal Decentralization on Government Size and Spending Composition in Vietnam. *Asian Econ. J.* **2019**, *33*, 311–340. [\[CrossRef\]](#)
95. Vence, X.; Sugey, S.D.L. Taxation for a Circular Economy: New Instruments, Reforms, and Architectural Changes in the Fiscal System. *Sustainability* **2021**, *13*, 4581. [\[CrossRef\]](#)
96. Tan, J.; Tan, Z.; Chan, K. The impact of a tournament approach on environmental performance: The case of air quality disclosure in China. *Appl. Econ.* **2020**, *53*, 2125–2140. [\[CrossRef\]](#)
97. Chygryn, O.; Petrushenko, Y.; Vysochyna, A. Assessment of Fiscal Decentralization Influence on Social and Economic Development. *Montenegrin J. Econ.* **2018**, *14*, 69–84. [\[CrossRef\]](#)
98. Gao, S.; Wang, L.; Liu, N. Fiscal decentralization and corporate investment: Empirical evidence from China. *J. Econ. Policy Reform* **2019**, *22*, 51–68. [\[CrossRef\]](#)
99. Yong, G.; Fujita, T.; Park, H. Recent progress on innovative eco-industrial development. *J. Clean. Prod.* **2016**, *114*, 1–10. [\[CrossRef\]](#)
100. Geng, Y.; Maimaituerxun, M.; Zhang, H. Coordinated interactions between economy and atmospheric environment: Temporal-spatial comparisons from China. *Environ. Dev. Sustain.* **2022**, *17*, 77–90. [\[CrossRef\]](#)
101. Robert, T.; Gole, W. *Public Administration as Development Discipline*; Marcel Dekker: New York, NY, USA, 1997; Volume 13, pp. 45–61.
102. Li, S.; Zhang, W.; Zhao, J. Does green credit policy promote the green innovation efficiency of heavy polluting industries?—Empirical evidence from China's industries. *Environ. Sci. Pollut. Res.* **2022**, *23*, 46721–46736. [\[CrossRef\]](#)
103. Le Sage, P.; Pace, K. Introduction to spatial econometrics. *J. Reg. Sci.* **2010**, *65*, 1014–1101.
104. Elhorst, J. Applied spatial econometrics: Raising the bar. *Spat. Econ. Anal.* **2010**, *5*, 9–28. [\[CrossRef\]](#)
105. Jin, J.; Zou, F. How does fiscal decentralization affect aggregate, national, and subnational government size? *J. Urban Econ.* **2000**, *52*, 270–293. [\[CrossRef\]](#)
106. Zhang, Y.; Gong, L. Tax sharing reform, fiscal decentralization and China's economic growth. *China Econ. Q.* **2005**, *5*, 76–109.
107. Chen, S.; Gao, L. Central Local Relations: Measurement of Fiscal Decentralization and Revaluation of Its Mechanism. *Manag. World* **2012**, *6*, 43–59.
108. Bai, J.; Lu, J. Research on the Mechanism of the Influence of Fiscal Decentralization on Environmental Pollution. *J. Political Econ.* **2017**, *10*, 37–56.
109. Statistics Bureau of the People's Republic of China. *China Statistical Yearbook*; Statistics Press: Beijing, China, 2012; Volume 5, pp. 77–93.
110. Xu, Y.; He, Y. Energy-Economic-Environment Relationship in China Based on Asymmetric Error Correction Model. *Chin. Electr. Power* **2016**, *49*, 114–118.
111. Lu, S.; Li, X.; Lu, H. A Study on the Characteristics of Local Government Fiscal Governance: Empirical Evidence from text recognition in the Chinese Government Work Report. *Financ. Stud.* **2020**, *23*, 99–114.
112. The Supreme People's Procuratorate of the People's Republic of China. *China Prosecutorial Yearbook*; China Prosecutorial Publishing House: Beijing, China, 2018; Volume 55, pp. 133–154.
113. Goldsmith, W. *Financial Structure and Development*; Yale University Press: New Haven, CT, USA, 1969; Volume 34, pp. 236–276.
114. The People's Bank of China. *China Financial Yearbook*; The People's Bank of China: Beijing, China, 2020; Volume 4, pp. 15–23.

-
115. Li, Z.; Liu, H. Foreign Direct Investment, Regional Corruption and Environmental Pollution: An Empirical Study Based on Threshold Effect. *Int. Trade J.* **2013**, *57*, 50–61.
 116. Gan, C.; Zheng, R.; Yu, X. The Impact of Industrial Structure Change on Economic Growth and Fluctuation in China. *Econ. Res. J.* **2011**, *46*, 4–16.
 117. Delgado, M.; Álvarez, I. Network Infrastructure Spillover in Private Productive Sectors: Evidence from Spanish High Capacity Roads. *Appl. Econ.* **2007**, *39*, 1583–1597. [[CrossRef](#)]
 118. Long, S.; Zhu, Y.; Cai, W.; Li, S. An empirical analysis of tax competition among county governments in China based on the spatial econometric model. *Econ. Res.* **2014**, *49*, 41–53.