Article

Environmental Courts, Environment and Employment: Evidence from China

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Abstract: Whether environmental governance will cause unemployment has always been an aspect that the government needs to pay attention to in the process of making environmental policies, and is also a concern of residents. This paper analyzes the policy effect of environmental courts, which is a very important policy tool for the legalization of China's environmental governance. While investigating whether environmental courts can effectively improve environmental quality, we also analyze its possible impact on employment and the specific mechanisms. The results show that: (1) After the establishment of environmental courts, the PM2.5 concentration has been significantly reduced. (2) While improving the environmental quality, environmental courts will produce a weak employment promotion effect. (3) Environmental courts affect the amount of employment through cost effect, factor substitution effect and innovation effect. This study provides empirical evidence for China and other developing countries to promote the legalization of environmental governance.

Keywords: environmental courts; environment; employment

1. Introduction

Environmental problems will seriously affect the health and wellbeing of residents [1,2], restricting the high-quality development of China's economy. As a nonexclusive and non-competitive public good, there is obvious market failure in environmental protection. In order to strengthen pollution governance, the government has implemented a lot of command and control environmental regulation policies, such as environmental administrative punishment, which has played an important role in pollution control [3]. Furthermore, market oriented environmental regulation policies represented by emissions trading are also gradually playing a role [4]. However China's environmental problems have not been fundamentally solved. Some administrative command-style governance only caused the effect of temporary environmental improvement [5], such as the "two sessions blue" phenomenon. Green water and green mountains are just like golden mountains and silver mountains. As an important exploration of China's environmental legalization, will environmental courts bring environmental improvements? Clarifying whether environmental courts can restrict the negative externalities of enterprises from the legal level has important theoretical and practical significance for improving China's environmental quality.

Employment is not only related to the stability of economic development, but is also closely related to the life and welfare of residents. There is no agreement on the employment impact of environmental regulation in the existing literature. In the existing literature research, the relationship between environmental regulation policy and employment can be divided into three categories. Stricter environmental regulations lead to the loss of employment [6–9]. The study of Sheriff et al. [9] shows that the air quality standards of US increase the marginal cost and reduce the output of fossil fuel power enterprises, which leads to the reduction of the employment. Stricter environmental regulations do not affect employment [10–12]. Research by Berman and Bui [10] shows that strict air

quality regulations in the South Coast region have very limited impact on local employment, and air quality regulations have nothing to do with local unemployment. Other literatures have found that stricter environmental regulations have a positive impact on employment [13,14], and environmental policy can achieve a double dividend. Yamazaki's research [14] shows that Columbia's revenue-neutral carbon tax has a positive impact on employment through output effect, redistribution effect and factor substitution effects. In addition, there are also literatures examining the impact of clean energy and renewable energy on jobs [15–17]. These studies show that clean energy policies can create more jobs as a whole, which can also provide inspiration for us to investigate the employment effect of environmental courts. As an important exploration of the legalization of environmental governance, we should pay attention to the possible employment effects of environmental courts.

Specifically, this paper attempts to make an incremental contribution in the following points. Firstly, this paper evaluates the effectiveness of environmental courts. Environmental courts have been around for some time in practice, but the academic evaluation of the effectiveness is still rare. This paper discusses the policy effectiveness, provides theoretical and empirical evidence for environmental courts, and makes a good connection between academia and practice. Secondly, as the largest developing country in the world, China's employment stability is vital to economic development. However, the existing literature does not pay attention to the employment impact of environmental courts. This paper evaluates the impact of this special environmental regulation policy on employment and clarifies the impact mechanisms. Finally, this paper provides a reference for emerging markets to formulate environmental protection policies. Emerging markets have a high speed of economic development, great potential for development, and the corresponding environmental problems are also more prominent. This paper argues that only when the formulation of environmental policy touches the judicial level, can we effectively implement the original intention of environmental protection policies. This provides a new perspective for emerging market policy makers to make environmental policies.

The rest of the paper proceeds as follows. Section 2 introduces the background and current situation of environmental courts, as well as China's environmental problems and the necessity of environmental courts. In addition, we also analyze the mechanism of environmental courts affecting employment. Section 3 is the empirical design, including model establishment, sample selection, data source and explanation. Section 4 shows the empirical analysis. Section 5 discusses the dynamic effects of environmental courts on employment, and conducts a placebo test with the conclusions. Section 6 is conclusions.

2. Institutional Background and Mechanism Analysis

2.1. Institutional Background

In order to clarify the possible environmental and employment impacts of environmental courts, we must deeply understand the institutional background of environmental courts. Relevant experience shows that the establishment of environmental courts is an effective way for many countries to deal with environmental problems, promote the specialization of environmental justice and improve the efficiency of environmental justice [18]. Since the 1970s, foreign countries been actively exploring environmental judicial specialization, and have had many successes in the construction of environmental law. In September 2005, New South Wales in Australia established the Environment and Land Court, which put an end to the scattered environmental jurisdiction and disorderly handling of environmental disputes during the rapid economic development. In 1990, Vermont set up an environmental court, which was specially responsible for hearing the environmental cases, and made an important contribution to the local environmental protection and ecological civilization construction. These successful experiences provide reference for the specialization of environmental justice in other countries. According to statistics, as of 2010, more than 40 countries (including both developing and developed countries) have established more than 350 specialized environmental courts.

The process of China's environmental legalization began in the late 1970s. China's formal environmental legislation, the "Environmental Protection Law (Trial)", was passed at the eleventh session of the National People's Congress in 1979, marking the beginning of China's efforts to establish a legal framework for the environment. After the promulgation of the new "Civil Procedure Law" and the new "Environmental Protection Law", there is an urgent need for specialized judicial institutions to interpret relevant judicial provisions and environmental cases. Environmental cases have their particularity, complexity, and long-term nature. This requires not only the establishment of reasonable trial mechanisms and procedures, but also professionals with legal and environmental resource protection knowledge backgrounds.

China's court system is divided into four levels: The primary people's court, the intermediate people's court, the provincial higher people's court and the supreme people's court. The people's courts at all levels (except the primary people's courts) divide cases into criminal cases, civil cases and administrative cases according to their attributes, which are heard by criminal, civil and administrative departments respectively. Environmental cases are also classified as corresponding cases according to their attributes. Under the demand of ecological civilization construction, Guiyang Intermediate People's Court and Qingzhen People's Court set up an environmental resources court (environmental court) under the original legal and judicial system in 2007, which began to actively explore the specialization of environmental justice in China. According to the White Paper on China's Environmental Resources Trial (2016–2017) issued by the Supreme People's Court, 149 intermediate people's courts have set up environmental courts. Based on the operation experience of foreign environmental courts, and combined with the specific situation of China, the current environmental courts in China mainly adopt the "three trials in one" model, that is, environmental civil cases, environmental administrative cases, and environmental criminal cases are unified into environmental courts. The more experienced Guizhou Intermediate People's Court took the lead in carrying out the trial mode of "four-in-one", which is responsible for the execution of the trial results on the basis of the "three-in-one" model.

2.2. Environmental Issues and Environmental Courts

According to 2018 China Ecological and Environment Statement, 64.2% of China's city air quality is not up to the standard, 338 cities experienced heavy air pollution for 1899 days and excessive air pollution for 822 days. Among them, the days with PM2.5 as the primary pollutant accounted for 60% of the days with heavy air pollution and above, and the days with PM10 as the primary pollutant accounted for 37.2%. At the same time, according to the official website of the National Bureau of Statistics of China, China's total energy consumption reached 4.719 billion tons of standard coal in 2018, of which coal accounted for 59% of total energy consumption, which will undoubtedly further put pressure on improving environmental quality.

China's early environmental regulation policies were dominated by government intervention (command and control type), such as access restrictions, emission standards and so on. Due to the disadvantages of command control policy, such as "one size fits all" management mode, insufficient incentives for environmental technology innovation and lack of flexibility in the governance process, the efficiency of environmental governance is low. Afterwards, China began to pay attention to the role of the market. However, market-based environmental regulation policies have difficulties in the initial quota distribution, transaction process supervision and other aspects. In addition, the phenomenon of market segmentation still exists in China, the regional development is unbalanced, and the unified transaction market is difficult to form. Therefore, new environmental governance methods are urgently needed to solve the environmental problems. The construction of environmental courts has become the objective demand of China's current environmental governance.

Compared with the traditional environmental regulation methods, environmental courts have its own particularity. Firstly, environmental courts can unify the standard of

law enforcement and make it easier for environmental cases to enter the judicial process. Secondly, environmental courts can enhance the environmental awareness of the government and the public and strengthen public participation. Thirdly, environmental courts can create a more normalized pressure on enterprises. However, China's environmental judicial system and the level of environmental law enforcement still need to be improved. According to the China Environmental Statistics Annual report, in 2010 alone, the national environmental protection system received a total of 677,000 environmental reports involving environmental pollution and ecological destruction, while only over 100,000 environmental cases were concluded nationwide from 2002 to 2014 (Data from the analysis of environmental cases tried by courts in China from 2002 to 2011.). This shows that China's environmental judicial construction still has many deficiencies, and the environmental court can just improve and strengthen the construction of environmental justice.

Under the condition that the system of laws and regulations is basically complete, environmental courts are conducive to promote the specialization of environmental justice, improve the efficiency of environmental justice, strengthen public participation, and then realize the normalization of environmental governance in China. To protect the environment is to protect productive forces. Since the first environmental court in Guizhou Intermediate People's Court in 2007, the exploration of environmental courts has gone through 13 years. Then, will environmental courts contribute to China's ecological civilization? How can environmental courts affect employment?

2.3. Mechanism Analysis

In theory, there are three possible ways for environmental court to affect employment: Cost effect, factor transfer effect and innovation effect. Firstly, the most direct impact of environmental courts on enterprises is the cost effect. On the one hand, when facing more normalized environmental governance pressure, enterprises must invest a certain amount of environmental governance costs to avoid the more expensive punishment by, which lead to the increase of enterprise operating costs. However, the increased investment in environmental governance cannot bring about an increase in output. In order to avoid the profit loss, enterprises may transfer the cost of environmental governance to consumers, leading to higher product prices. As a result of rising product prices, some consumers are forced to reduce their demand, and manufacturers are forced to reduce production scale. Production and consumption fall into a vicious circle, and some enterprises may even withdraw from the market. All of these will eventually feed back to the labor factor market, which will negatively affect the demand of enterprises for labor factors. However, Berman and Bui [10] further demonstrated that if environmental regulation causes microenterprises to increase investment in emission reduction facilities, it will positively affect enterprises' output by reducing their marginal cost, thus increasing their demand for labor factors. On the other hand, innovation is the core performance of enterprise competitiveness. When facing more normalized environmental governance pressure, enterprises may reduce R&D investment or even stop R&D, thus weakening their innovation ability. If an enterprise has strong innovation capabilities, its impact on employment is self-evident.

Secondly, environmental courts will cause enterprises to take strategic environmental action and affect the employment through factor transfer effect. Factor transfer effect mainly refers to that the emission reduction behavior also require the input of labor factors. Enterprises usually meet the requirements of environmental regulations in two ways. One is to install terminal treatment facilities; the other is to upgrade the production process technology to achieve cleaner production. The former usually has a complementary effect with employment, which requires more labor input to operate the equipment; the latter has a substitution effect with employment. In general, the technological upgrading of the production process has a certain degree of technical bias on the employees. In addition, in order to avoid the environmental pressure brought by the environmental court, enterprises are more inclined to use clean labor to replace the energy, which is conducive to the

improvement of employment in social production. Given the current situation in China, most enterprises meet the requirements of environmental governance through terminal emission reduction, so the expected factor transfer effect may positively affect employment.

Finally, a normalized approach to environmental governance may be more conducive to stimulating enterprises to carry out R&D, which in turn is conducive to the improvement of a country's employment level. According to Porter and Van der Linde [19], appropriate environmental regulation can trigger enterprises to innovate, which will offset the increased costs caused by compliance with environmental regulation policies, and reduce the production cost of enterprises as a whole, so as to improve the market competitiveness of enterprises. In this case, enterprises pursuing profit maximization will expand the enterprise scale and actively promote employment. Through the above mechanism analysis, it can be found that environmental courts may positively affect employment through innovation effect and factor transfer effect, and may also damage employment through cost effect. At the same time, the impact of innovation effect and cost effect on employment can be tested by the total effect of output. Therefore, the impact of environmental courts on employment is not clear in theory, which needs to be further explored in the empirical model.

3. Model Design and Data Description

3.1. Model and Data for Environmental Effect Testing

In order to examine the environmental effect brought by environmental courts, this paper uses panel data of 281 prefecture level cities in China from 2004 to 2016 for empirical test. Our research design adopts the DID (difference-in-difference) method to evaluate the impact of environmental courts on environmental quality. The DID method has many advantages in dealing with endogenous problems, which is very suitable for our research. PM2.5 concentration can be a more comprehensive measure of the air quality of a country. Therefore, this section selects PM2.5 as the measurement of environmental quality. The data of environmental courts is manually collected by the authors according to news reports from the official websites of the local people's courts. China's administrative region is divided into provincial-level administrative region, prefecture-level administrative region, county-level administrative region and township-level administrative region. Prefecture-level administrative region mainly include prefecture level cities, which belong to the scope of provincial administrative region. There are 333 prefecture-level administrative regions in China, of which 293 are prefecture level cities. The municipality directly under the central government is a special city, which is directly under the jurisdiction of the central government. Its legal and administrative status is the same as that of the provincial-administrative region. Therefore, in China, municipalities directly under the central government are administrative units one level higher than prefecture-level cities. At present, China has four municipalities directly under the Central Government: Beijing, Tianjin, Shanghai and Chongqing. Considering the different administrative levels of Beijing, Tianjin, Chongqing and Shanghai, in order to reduce the impact of sample heterogeneity, this paper excluded them. The basic econometric model is as following:

$$\ln p_{ct} = \alpha_0 + \alpha_1 \, court_{ct} + \theta X + \mu_c + \gamma_t + \varepsilon_{ct} \tag{1}$$

where subscript *c* represents a certain city and subscript t represents time. p_{ct} represents the environmental variable at the city level, which is mainly measured by PM2.5 concentration; court is a dummy variable, if a city has set up an environmental court since a certain year, the value is 1, otherwise the value is 0; μ_c is the city fixed effect, which controls the characteristics of the city level that does not change with time; γ_t is a time fixed effect; *X* is other control variables. Based on the STIRPAT model [20] and the environmental Kuznets curve [21], and considering that the regional fixed asset investment can reflect the local economic development to a large extent, this paper selects the regional gross domestic product (gdp), population density (pop), industrial structure (industry), which is expressed as the proportion of the secondary industry in the regional gross domestic

product, per capita technology expenditure (tec), and fixed asset investment (fixedinv) are used as control variables in model (1). In order to test whether the EKC hypothesis is valid in this paper, and taking into account the possible non-linear impact of industrial structure on the city environment, this paper introduces the quadratic term of regional GDP and the quadratic term of industrial structure in the control variables.

3.2. Model and Data for Employment Effect Testing

The construction of environmental courts is the objective demand of environmental governance in China, and the employment problem is also very important for China's economic stability and the smooth realization of economic transformation. Similarly, we use the DID method to evaluate the impact of environmental courts on employment, see Model 2 for details. When examining the impact of environmental courts on enterprise employment, this paper uses the data of Chinese listed companies from 2004 to 2016. By the end of 2016, there were 3081 listed companies (Data comes from Wind database) in Shanghai Stock Exchange and Shenzhen Stock Exchange. Environmental courts are mainly to improve China's environmental quality, while the financial industry and service industry have no production links and almost no pollution. Therefore, according to the industry code published by China Securities Regulatory Commission, this paper deletes the samples of listed companies belonging to the financial industry and service industry. When a listed company has suffered losses for two consecutive years, or when there is financial fraud, the annual report cannot express opinions, the company's assets are insolvent, etc., the company name will be marked with ST (special treatment). When a listed company has suffered losses for three consecutive years, the stock exchange will issue *ST to it, warning the company of the risk of delisting. Both ST and *ST indicate that the company's operations have abnormal conditions, and its employment will naturally be greatly affected. In order to avoid the interference of abnormal state enterprises, this paper further deletes the samples of listed companies in ST and *ST status. After processing, this paper finally gets 1968 samples of listed companies for empirical model (2).

$$\ln labor_{ict} = \beta_0 + \beta_1\ court_{ct} + \phi X + \delta_i + \sigma_c + \lambda_t + \varepsilon_{ict} \qquad (2)$$

where subscript *i* represents a certain listed company, and the other subscripts are the same as formula (1). $\ln labor_{ict}$ is the logarithm of the number of employees (listed companies); court is a dummy variable of environmental courts; if a city has set up an environmental court since a certain year, and the enterprise is located in the city, it will be assigned a value of 1, otherwise it will be assigned a value of 0; δ_i is the fixed effect at the enterprise level, which controls the characteristics that do not change with time; σ_c is the city fixed effect, which controls the characteristics that do not change with time at the city level; λ_t is the time fixed effect, which controls some factors that change with time, such as macroeconomic shocks, fiscal and monetary policies, etc.; *X* is the control variable, including enterprise-level control variables and city-level control variables. Taking into account the scale of enterprise assets, operating conditions, operating results will have an impact on corporate employment, so the enterprise-level control variables are: Net interest rate of total assets (roa), rate of human capital return (rop), net profit rate of sales (npms), asset-liability ratio (alr), long-term capital debt ratio (dlcr), equity multiplier (em), net profit (npro), total assets (size). In order to make the empirical results not affected by urban heterogeneity, the control variables at the city level are: Per capita GDP (pgdp), industrial structure (industry), financial environment (finance), the number of ordinary colleges and universities (school), per capita expenditure on science and technology (tec). Table 1 shows all the variable descriptions and data sources used in this paper.

Table 1. Description of variables.

Variable Symbol	Variable Meaning
court	Dummy variable of environmental courts
wwater	Total discharge of industrial wastewater of cities
gdp	Gross domestic product of cities
pgdp	Per capita GDP of cities
pop	Population density of cities
industry	The added value of secondary industry accounts for the GDP(cities)
fixedinv	Total investment in fixed assets in cities
finance	Total balance of deposits and loans of financial institutions at the end of the year(cities)
tec	Per capita expenditure on science and technology (cities)
school	Number of ordinary colleges and universities(cities)
labor	Total number of employees of listed companies
roa	Net interest rate of total assets of listed companies
rop	Rate of human capital return of listed companies
npms	Net profit rate of sales of listed companies
alr	Asset-liability ratio of listed companies
dlcr	Long-term capital debt ratio of listed companies
em	Equity multiplier of listed companies
innovation	Research and development expenditure of listed companies
npro	Net profit of listed companies
size	Total assets of listed companies

Note: The contents in the table are arranged by the author.

All the city data used in this paper are from China Urban Statistical Yearbook, and all enterprise data are from the Wind database. In addition, according to the news reports on the official websites of the Intermediate People's Courts, the author manually collected data on whether and when the city had set up an environmental court. Table 2 shows the descriptive statistics of the data.

Table 2. Descriptive statistical analysis.

Varibles	Mean	Sd	Min	Max	N
PM2.5	0.41	0.15	0.05	0.91	3653
lnwwater	9.21	0.90	6.53	11.23	3653
court	0.05	0.22	0.00	1.00	3653
lngdp	17.17	1.05	14.54	19.09	3653
pop	698.27	415.98	58.67	2426.45	3653
industry	49.51	7.84	28.95	68.84	3653
lnfixedinv	16.53	0.99	13.73	18.01	3653
tec	140.19	641.74	0.09	25,396.16	3653
school	18.84	20.42	1.00	81.00	3653
lnfinance	18.11	1.31	15.09	20.62	18,071
lnlabor	7.47	1.19	4.70	10.63	17,341
roa	0.07	0.08	−0.18	0.33	18,065
rop	1.51	1.85	−4.09	9.92	17,354
alr	0.45	0.21	0.06	1.02	18,068
dlcr	0.14	0.17	0	0.76	16,326
em	2.13	1.16	1.06	8.55	17,880
npro	1.84	4.38	−5.76	29.84	18,071
size	46.67	95.71	1.22	663.20	18,069

Note: This table reports the summary statistics of main variables.

The unit of PM2.5 is $\mu g/m^3$, which is reduced by 100 times as the explained variable in this paper. This section provides a detailed description of empirical models, data sources and indicator selection, providing support for empirical research.

4. Empirical Results

4.1. Environmental Effect at City Level

Table 3 shows the results of how environmental courts affect environmental quality. We mainly concern about the coefficient of variable court. Column (6) is the result of adding individual fixed effects at the city level, year fixed effects, and control variables, and the robust standard error is shown in parentheses. From column (6), it can be seen that the environmental courts have significantly reduced the PM2.5 concentration, that is, the environmental courts are conducive to the improvement of urban environmental quality. The control variables show that: With the improvement of economic development level, a country's strength and awareness of environmental protection continue to strengthen, and the environmental quality will be improved. However, our results do not support the EKC curve hypothesis. The impact of population density on urban environmental quality is the same as the level of urban economic development. It is mainly considered that the areas with higher population density are generally the economically developed areas in China. The improvement of industrial structure to environmental quality is not statistically significant. Per capita expenditure on science and technology can reflect the local input technology to a certain extent, and its impact on air quality is numerically negligible. The fixed asset investment is an economic activity in the construction and purchase of fixed assets, which mainly includes activities such as fixed asset update, reconstruction, expansion, and new construction, fixed asset investment in various cities is an important reflection of local economic development, so it is in line with the impact of GDP on air quality, showing a negative relationship.

Table 3. Environmental effect test of environmental courts.

	PM2.5					
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
court	−0.0102 **	−0.0088 **	−0.0087 **	−0.0088 **	−0.0088 **	−0.0082 **
	(0.0040)	(0.0040)	(0.0039)	(0.0039)	(0.0039)	(0.0039)
lngdp		−0.0701 ***	−0.0748 ***	−0.0639 **	−0.0641 **	−0.0476 *
		(0.0243)	(0.0242)	(0.0256)	(0.0257)	(0.0264)
lngdp2		0.0011	0.0013	0.0010	0.0010	0.0007
		(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)
pop			−0.0000 *	−0.0000 *	−0.0000 *	−0.0000 *
			(0.0000)	(0.0000)	(0.0000)	(0.0000)
industry				−0.0014 *	−0.0013 *	−0.0010
				(0.0007)	(0.0007)	(0.0007)
industry2				0.0000	0.0000	0.0000
				(0.0000)	(0.0000)	(0.0000)
tec					−0.0000	−0.0000
					(0.0000)	(0.0000)
lnfixedinv						−0.0095 ***
						(0.0032)
cons	0.3671 ***	1.1964 ***	1.2423 ***	1.1747 ***	1.1761 ***	1.1306 ***
	(0.0007)	(0.1991)	(0.1998)	(0.2186)	(0.2188)	(0.2193)
Observations	3653	3653	3653	3653	3653	3653
R-squared	0.9476	0.9482	0.9483	0.9484	0.9484	0.9485
City fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses. *, ** and *** indicate statistical significance at 10%, 5% and 1% respectively.

PM2.5 is a comprehensive indicator of air quality, but the impact of industrial wastewater is not considered. Therefore, this paper takes industrial wastewater as a robustness test. The test results are shown in Table 4. Column (6) of Table 4 is the result of adding individual fixed effects at the city level, year fixed effects, and control variables. It can be seen from column (6) that environmental courts have significantly reduced the discharge of industrial wastewater. The control variables indicate that the level of economic development and the discharge of industrial wastewater show a positive relationship, and the EKC curve hypothesis does not hold. Population density, investment in fixed assets, and per capita science and technology expenditures show the same direction for industrial wastewater discharge and PM2.5 concentration. Different from the environmental courts' influence on PM2.5 concentration, the relationship between urban industrial structure and industrial wastewater discharge is inverted U-shaped. The reason may be that when the secondary industry develops to a certain extent, the cost of pollution control equipment and technology will decrease with the increase of its scale, and the corresponding sewage discharge will increase first and then decrease. Column (7) examines the impact of environmental courts on per capita industrial wastewater discharge, and the coefficient of court is still significantly negative, indicating that environmental courts can significantly reduce per capita industrial wastewater discharge.

Table 4. Robustness test-index replacement.

	Lnwwater						Lnpwwater
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
court	−0.0613	−0.0680 *	−0.0697 *	−0.0715 *	−0.0723 *	−0.0669 *	−0.0690 *
	(0.0400)	(0.0405)	(0.0404)	(0.0404)	(0.0404)	(0.0402)	(0.0399)
lngdp		0.1461	0.2120	0.6645 **	0.6539 **	0.7997 **	0.8924***
		(0.2735)	(0.2739)	(0.3260)	(0.3265)	(0.3329)	(0.3340)
lngdp2		−0.0010	−0.0030	−0.0105	−0.0101	−0.0129	−0.0192 **
		(0.0085)	(0.0085)	(0.0094)	(0.0094)	(0.0095)	(0.0095)
pop			0.0003 ***	0.0003 ***	0.0003 ***	0.0003 **	0.0001
			(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
industry				0.0192 **	0.0197 **	0.0224 **	0.0225 **
				(0.0098)	(0.0098)	(0.0098)	(0.0098)
industry2				−0.0003 ***	−0.0003 ***	−0.0003 ***	−0.0003 ***
				(0.0001)	(0.0001)	(0.0001)	(0.0001)
tec					−0.0000**	-0.0000 **	−0.0000 **
					(0.0000)	(0.0000)	(0.0000)
lnfixedinv						−0.0843 **	−0.0889 **
						(0.0361)	(0.0361)
cons	8.3696 ***	6.2871 ***	5.6320 **	0.1485	0.2168	−0.1873	−5.7980 **
	(0.0070)	(2.3417)	(2.3558)	(2.8858)	(2.8887)	(2.9249)	(2.9314)
Observations	3653	3653	3653	3653	3653	3653	3653
R-squared	0.8736	0.8738	0.8740	0.8757	0.8758	0.8760	0.8454
City fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses. *, ** and *** indicate statistical significance at 10%, 5% and 1% respectively.

The empirical results in this section show that environmental courts can not only significantly improve air quality, but also have a significant impact on the treatment of industrial wastewater. Therefore, environmental courts play an irreplaceable role in curbing environmental pollution. The judicial method of environmental governance meets the requirements of China's environmental governance, which is conducive to the promotion of China's ecological civilization construction.

4.2. Employment Analysis at the Enterprise Level

On the one hand, China's environmental problems are prominent, which has severely affected the high-quality development of the economy. According to Section 4.1, environmental courts can significantly reduce PM2.5 concentration and industrial wastewater discharge, and improve air quality. On the other hand, China's employment situation is still severe, and the total employment pressure will exist for a long time. Employment is not just an economic problem, but also related to national social harmony and political stability. At this stage, the Chinese government will still emphasize that employment priority is an important part of the current macroeconomic policy. From the mechanism analysis in Section 2.3, it can be seen that the impact of environmental courts on employment is not clear in theory, which needs to be empirically tested by using the Equation (2). Table 5 is the empirical result of Equation (2). Column (3) is the final result of controlling firm-fixed effects, year-fixed effects, and adding enterprise-level control variables and city-level control variables. From the results of column (3), we can see that the coefficient of court is significantly positive, which indicates that environmental courts have not adversely affected employment while improving air quality and reducing sewage discharge.

Table 5. Empirical results of environmental courts on employment.

	ln Labor		
	(1)	**(2)**	**(3)**
court	0.0273	0.0309 *	0.0314 *
	(0.0175)	(0.0164)	(0.0166)
Control Variable (city)	No	No	Yes
Control Variable (company)	No	Yes	Yes
Company fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Observations	17,341	15,205	15,205
R-squared	0.8658	0.8904	0.8907

Notes: Content of the table is the empirical results of model (2). Standard errors in parentheses. * indicates statistical significance at 10%.

The results in Table 5 show that environmental courts can improve the quality of China's environment, but also increase employment. Policy makers and residents need not worry about the unemployment that environmental courts may bring. The specific mechanisms of environmental courts affecting employment become our focus next.

4.3. Analysis of Mechanism

Based on the empirical conclusion that environmental courts can achieve both the environment and employment dividends, this section discusses how environmental courts affect employment. Specifically, by referring to the methods of Li et al. [22], Shi and Xu [23], this paper introduces the intermediary variables directly into the model as explained variables, and shows the theoretical logic of the empirical results in detail.

Table 6 shows the results of the mechanism test. In column (1), the explained variable is the emission charges under the management expense in the annual report of listed company. Environmental courts will form a normal environmental protection pressure on the local area. Enterprises will carry out relevant strategic environmental protection interactions under the pressure, such as installing terminal emission reduction equipment, technical transformation and upgrading of production equipment. According to the "Regulations on the Collection and Use of Pollution Discharge Fees" promulgated by the State Council, emission charges are the fee that individual businesses have to pay to discharge pollutants into the environment. If after the establishment of the environmental court, the company carries out emission reduction activities, the company's pollution fee will be significantly reduced. Therefore, we manually collect emission charges under the management fee in

the annual report of the listed company, and then proves that environmental courts will affect the enterprise's environmental protection behavior.

Table 6. Mechanism test and heterogeneity analysis.

Varibles	Lnpe	Innovation	Lnoutput	Lnlabor	
	(1)	(2)	(3)	(4)	(5)
court	−0.3268 ***	0.0349 *	0.0763 ***	0.0614 ***	0.0808 ***
	(0.1060)	(0.0189)	(0.0167)	(0.0179)	(0.0195)
scourt				−0.0004 ***	
				(0.0302)	
tcourt					−0.1453 ***
					(0.0001)
Control Variable	Yes	Yes	Yes	Yes	Yes
Company fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	1299	11,566	15,604	15,205	15,205
R-squared	0.8214	0.8411	0.9112	0.8908	0.8909

Notes: The contents of column (1)–(3) are empirical results of environmental courts affecting employment. The content of (4)–(5) are the empirical results of the heterogeneity analysis. Standard errors in parentheses. * and *** indicate statistical significance at 10% and 1% respectively.

As shown in column (1) of Table 6, emission charges in the areas where environmental courts are established are on average less than those of enterprises without environmental courts, indicating that environmental courts have led to enterprise environmental protection activities. On the other hand, labor factors and energy factors have a mutual substitution relationship in the production process. The environmental pressure brought by the environmental courts urge companies to adjust the ratio of labor and energy input, reduce the input of pollution-producing energy factors as much as possible, and increase the input of clean labor factors. Therefore, the environmental courts will positively affect employment through factor transfer effect.

The explained variable in column (2) of Table 6 is R&D expenditure, which is the enterprise's innovation behavior measured from the input level. As can be seen from the empirical result in column (2), compared with the enterprises not affected by environmental courts, environmental courts can significantly increase the R&D expenditure. The existence of stricter environmental regulations has the "Porter effect", that is, environmental courts can force enterprises to innovate, improve product competitiveness, and promote profit-maximizing enterprises to expand the production scale, thus increasing the demand for labor factors.

In column (3) of Table 6, the explained variable is the output of the listed company. The cost effect and innovation effect of environmental courts are ultimately reflected in the total output. According to the annual report data of the listed company, this paper takes the sum of the operating income and the inventory value as the output measurement index. It is generally believed that environmental regulation increases the environmental compliance cost and reduces the output of enterprises, thus reducing labor demand. However, Berman and Bui [10] also pointed out that when environmental regulations cause enterprises to increase investment in emission reduction facilities, it will increase the output of enterprises by reducing the marginal cost of enterprises, which in turn increase their demand for labor. In addition, the innovation behavior of enterprises will also affect the labor demand by improving the competitiveness of enterprises and influencing the output of enterprises. According to column (3), environmental courts significantly increases the output of enterprises. The promotion of innovation effect and factor transfer effect on employment can offset the loss of employment caused by the cost effect.

In summary, the environmental court can achieve a double dividend. However, according to the coefficient of court in Table 5, it can be found that its positive impact on employment is small.

4.4. Heterogeneity Analysis

This section analyzes the impact of environmental courts on the employment of heterogeneous enterprises, mainly focusing on the enterprise scale and the nature of enterprise ownership. The empirical method is to introduce the interaction between environmental courts (variable of court) and the other two variables (type, size).

Columns (4)–(5) of Table 6 shows the empirical results of the heterogeneity analysis. Column (4) is the result of enterprise scale heterogeneity, and the variable scout is the interaction term between the variable court and size. According to the results in column (4), environmental courts have a positive impact on employment as a whole, which is consistent with the empirical results of model (2), but for largescale enterprises, its positive impact is smaller than small. The reason is that largescale enterprises are more likely to engage in rent-seeking behavior when they are not clear about the positive impact brought about by environmental courts. In addition, according to the government's asylum theory, when environmental regulations are strengthened, local governments are more likely to intervene in environmental justice [24] to protect large-scale enterprises for their own interests or in the face of promotion incentives. Therefore, compared with small-scale enterprises, environmental courts have less positive impact on large-scale enterprises' employment.

Column (5) is the heterogeneity analysis of the nature of enterprise ownership, and tcourt is the interaction term between the variable court and type (the nature of the enterprise ownership). The nature of enterprise ownership is a dummy variable. When it is a state-owned enterprise, it is assigned a value of 1, otherwise it is assigned a value of 0. According to the results in column (5), compared with state-owned enterprises, environmental courts have a greater positive impact on employment of non-stateowned enterprises. Because state-owned enterprises are often closely related to local protection, that is, state-owned enterprises are more closely linked to the government than non-state-owned enterprises. In the context of stricter environmental regulations, state-owned enterprises are more likely to receive political asylum from local governments due to the nature of their ownership. In addition, state-owned enterprises are all large-scale enterprises, so as large-scale enterprises, the government is more likely to intervene in environmental justice, which to some extent verifies the empirical results of column (4). In summary, when the environmental court is established, local non-state enterprises will assume more environmental responsibilities. The complementary effect of terminal emission reductions on employment and the positive output effects brought about by innovation will be greater. Therefore, the positive impact of environmental courts on employment of non-state enterprises is greater.

According to the results of heterogeneity analysis, we can get enlightenment. During the operation of environmental courts, we should pay more attention to the justice and independence of judicial procedure, and weaken the government's administrative intervention in local economic development and environmental protection.

5. Discussion

Among the existing policy evaluation methods, the DID has its unique advantages in alleviating the endogeneity, so it is reasonable to use DID to evaluate the impact of environmental courts on employment. Table 5 shows in detail the results of environmental courts on employment, but the results reflect only the average impact, and do not reflect the differential impact of environmental courts during the implementation of the policy. In addition, because of the existence of the control group, the DID method can effectively solve the endogenous problem in policy evaluation. However, the premise that DID results meet the consistency is that the experimental group and the control group meet the parallel trend assumption, that is, there can be differences between the experimental group

and the control group before the policy implementation, but they must have the same trend. This section constructs the following econometric model by drawing on existing research [22,25–28] to solve the above two issues.

$$\ln labor_{ict} = \beta_0 + \beta_k \sum_{k=-3}^{k=5} court_{ct_{0+k}} + \phi X + \delta_i + \sigma_c + \lambda_t + \varepsilon_{ict} \tag{3}$$

where t_0 indicates the year when an environmental court was established in a city, t_{0+k} indicates the k years before and after the establishment of an environmental court, $beta_k$ is the coefficient of a series of window periods established by environmental courts, the interpretation of other variables is the same as that of model (2). In this paper, the empirical analysis is carried out by selecting k from -3 to 5.

Figure 1 visually shows the estimated results of the threshold with the 90% confidence interval. According to Figure 1, before the establishment of environmental courts, there was no significant difference between the experimental group and the control group, which satisfied the assumption that the parallel trend of DID method. In addition, in the year and the first year of the implementation of the policy, there is no significant impact on employment. In the second year, the positive impact on employment gradually increased. In the fourth year, there is no significant positive impact on employment. The possible reason is that when environmental court was established, the strategic emission reduction actions and innovation effects of enterprises did not immediately appear. The positive impact of environmental courts on employment has a stage of positive impact. Four years after the establishment of the environmental court, due to its normalized environmental regulatory pressure, there will no longer be a significant positive impact on employment, but it will also not result in employment losses.
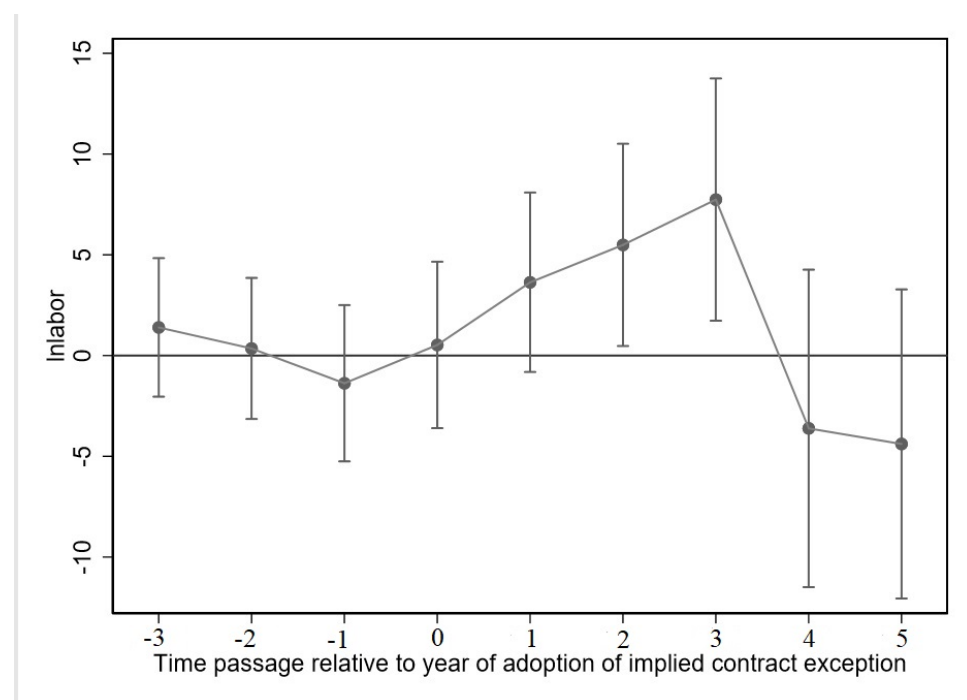

Figure 1. Dynamic effect.

By adding control group, the method of DID can reduce endogenous problems to a certain extent, and this paper has added individual fixed effect and year fixed effect. However, in the process of assessing the impact of environmental courts on employment, there may still be some unobservable factors that change with time and individuals, leading to biases in the estimated results. In order to further test whether the results of this paper are caused by unobservable factors at the city, enterprise, and year levels, this paper conducted

a placebo test by randomly assigning experimental groups in cities [22,29,30]. In order to increase the credibility of the placebo test, this random process was performed 500 times at random. Figure 2 shows the probability density distribution of the course coefficient of the model (2) randomly selected 500 times. As can be seen from Figure 2, the estimated values of the randomly selected coefficients are concentrated near zero, the average value of the coefficient is 0.00, and the p values are all greater than 0.1, indicating that the randomly selected environmental courts have no effect on employment. It further shows that the estimation of environmental courts on employment is robust.
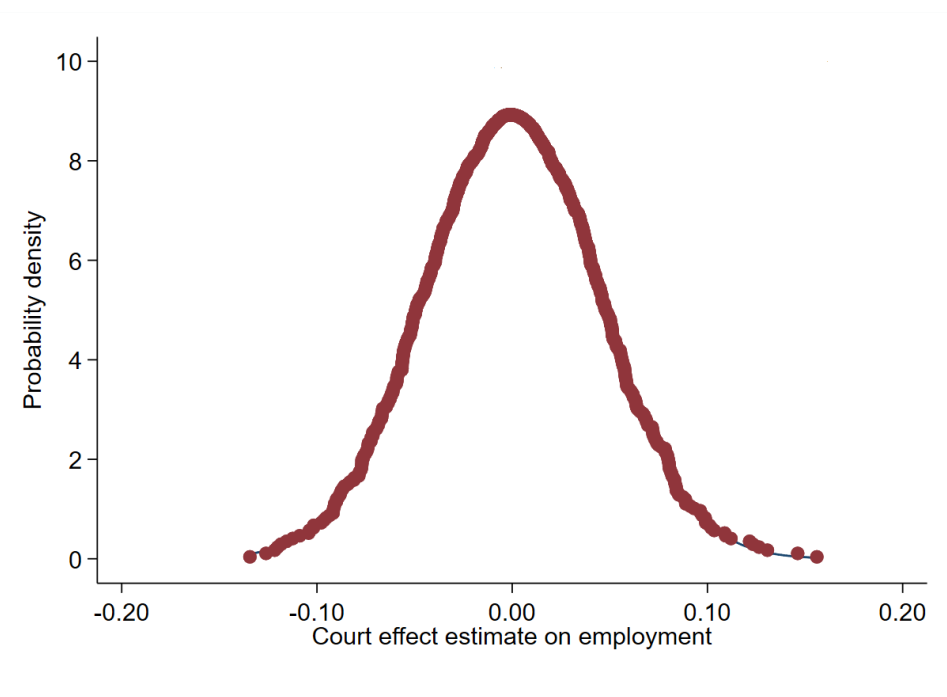
Figure 2. Placebo test.

6. Conclusions

This paper uses DID method to evaluate the impact of environmental courts on environmental improvement and employment in China. The study found that: (1) Environmental courts can significantly improve the local environmental quality. (2) While improving the quality of the environment, environmental courts can produce a weak employment promotion effect. Policy makers and residents need not worry that environmental courts will harm employment. (3) For large-scale enterprises and state-owned enterprises, the positive impact of environmental courts on employment is weak, because the judicial strength of environmental courts is weakened by the rent-seeking of enterprises and the administrative intervention of local governments. Generally speaking, with China's relatively complete environmental legislation, environmental courts, as an important exploration of environmental justice specialization, will help curb China's current environmental pollution problems and promote the legalization and normalization of environmental governance. At the same time, environmental courts will not cause employment losses.

This paper clarifies the importance of environmental courts for China's current environmental governance. Considering that environmental courts are an important part of the legalization of China's environmental governance, and compared to traditional environmental regulation methods, there are certain particularities. Therefore, this paper also further clarifies the impact of environmental courts on employment and its impact mechanism, and providing enlightenment to policy makers to further promote the construction of the environmental courts and formulate relevant economic policies. In addition, the research of this paper can also provide enlightenment for advancing the legalization of environmental governance in emerging markets and other developing countries. Air pollu-

tion will affect the health of workers, such as the infection of cardiopulmonary diseases and respiratory diseases, resulting in the decrease of physical stamina and working days of workers. Long term exposure to air with poor environmental quality will also shorten the life expectancy of workers [31]. Therefore, poor environmental quality will lead to lower productivity of workers, which may lead to more employees. However, this paper only focuses on the impact of environmental courts on the number of jobs, and does not focus on the impact of environmental courts on the quality of employment, that is, on the labor productivity of employees. The level of labor productivity is very important to the development of enterprises and a country's economy, which will also become the focus of our future research.

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