CLEARING THE SKY BY ESTABLISHING ENVIRONMENTAL COURTS: EVIDENCE FROM A QUASI-NATURAL EXPERIMENT IN CHINA

LIU, D. J.[1*] – XIAO, S. H.[1] – WU, D. S.[2]

[1]*School of International and Public Affairs, Shanghai Jiao Tong University, Shanghai, China*

[2]*School of Public Administration, Sichuan University, Chengdu, China*

**Corresponding author*
e-mail: Jared_1992@sjtu.edu.cn

(Received 18th Jun 2025; accepted 21st Aug 2025)

Abstract. The rule of law in environmental governance is the foundation for achieving high-quality development. Using the establishment of an environment and resources division (ERD) within the intermediate people's courts of prefecture-level cities in China as a quasi-natural experiment, this study constructs a multi-period difference-in-differences model to systematically examine the impact of environmental courts on regional air quality using panel data from 276 cities from 2014 to 2020. Results show that environmental courts can significantly reduce the regional air quality index (AQI), and this finding is strongly supported by a series of robustness checks. Furthermore, environmental courts reduce regional air pollution by improving environmental judicial efficiency, promoting citizens' environmental participation, and fostering regional technological transformation. Finally, environmental courts have stronger effects on AQI in resource-based cities as well as in cities where the mayors have been internally promoted and are 50 years old or younger. These findings provides support for environmental judicial specialization reform in China.
Keywords: *environmental judicial specialization reform, environment and resources division, air quality, quasi-natural experiment*

Introduction

China has achieved rapid economic development over the past 40 years of reform and opening up, but its extensive economic growth has also led to severe environmental pollution. According to the China Ecological and Environmental Status Report (2020) released by the Ministry of Ecology and Environment of China, 145 of China's 337 prefecture-level cities (43.3%) continuously fail to meet the national standards for air quality. Increasing air pollution constrains the efficient operation of the economy and the sustainable development of society, and also adversely influences residents' health and daily life. Accordingly, governments have continued to innovate environmental regulation methods to control air pollution. In China, the central government continues to intensify the supervision mechanism for environmental protection, such as the Central Environmental Inspection (CEI; Li et al., 2020; Wang et al., 2021). It also continues to improve the government administrative regulation system, including administrative penalties for environmental pollution and vehicle restrictions (Li and Yang, 2023; Qin et al., 2023). Furthermore, the government has established market-based governance mechanisms, such as the emission trading system (ETS; Du et al., 2022; Zhi et al., 2022). Although both the government-oriented and market-oriented governance mechanisms have significantly reduced air pollution in China, the air pollution problem persists (Shin, 2013; Fan and Zhao, 2019). Therefore, the establishment of a long-term governance mechanism is urgently needed.

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2305_1016310190
© 2025, ALÖKI Kft., Budapest, Hungary

In this context, environmental judicial system construction or rule of law in environmental governance has become the foundation of air pollution control (Liang and Gao, 2014), which usually includes the construction of a legal system and the improvement of judicial capacity. For example, China's legal system for environmental protection has been continuously improved since the official promulgation of the Environmental Protection Law of the People's Republic of China in 1989. However, environmental cases are usually characterized by complex attributes, investigation and evidence collection difficulties, and high requirements for trial specialization (Dai et al., 2023). Further, the traditional environmental judicial system, especially its trial institutions, is not completely independent from the administrative system, which limits such institutions' judicial effectiveness in performing their duties (Han et al., 2016; Qi et al., 2023). These have led to the failure of the traditional environmental judicial system to achieve the expected governance effect in practice (Wang, 2014). In particular, the lack of specialized environmental judicial institutions has led to China's environmental judicial system often confronting non-compliance with the law, difficulty in investigating violations and insufficient enforcement of the law, and environmental judicial system functions not being carried out effectively (Lv et al., 2011; Dai et al., 2023). Therefore, improving environmental judicial capacity has become a top priority in the construction of environmental rule of law, and it is also the key to environmental pollution control (Fan and Zhao, 2019; Qi et al., 2023). Environmental jurisdiction specialization reform centered on the establishment of trial institutions is an important element of improving environmental judicial capacity (Zhang, 2016).

Theoretically, the development of environmental trial organizations has both laid the foundation for improving environmental judicial capacity and provided a valuable opportunity to systematically evaluate the effects of environmental judiciary reform on environmental pollution governance. The first stream of literature focuses on the efficacy of the trial agencies and their impact on environmental cases. Studies have shown that environmental court provides a judicial basis for administrative penalties and compensations for rights and interests by defining and adjudicating environmental pollution behaviors promptly (Preston, 2008; Almer and Goeschl, 2010). It also centralizes the dispersed jurisdiction of environmental resource cases in the traditional judicial system, providing a general practice for responding to environmental crises and resolving environmental resource disputes (Walters and Westerhuis, 2013). Another stream of literature focuses on the impacts of environmental judiciary reform on firms' operating behaviors. Based on practices in China, studies have shown that environmental court significantly enhances enterprises' green technology innovation (Dai et al., 2023; Qi et al., 2023) and increases their investment in environmental protection (Zhai and Liu, 2019; Zhang et al., 2019b). In recent years, the effect of environmental justice reform on pollutant abatement has gradually attracted scholars' attention. Empirical studies show that environmental justice specialization reforms have significantly reduced the emission of wastewater (Deng et al., 2024), SO_2 (Zhou et al., 2024) and CO_2 (Hou et al., 2024; Zhao et al., 2022). However, the existing literature has mainly examined the impact of environmental courts on single pollutant, and no study examines its impacts on AQI and the underlying mechanism.

To fill this gap, in this study, we use ERD establishment within the intermediate people's court of prefecture-level cities in China as a quasi-natural experiment to systematically assess their impact on air quality. The contributions of this study are as follows. First, we systematically evaluated the impact of environmental courts on the

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2305_1016310190
© 2025, ALÖKI Kft., Budapest, Hungary

overall air quality of prefecture-level cities, which provide nuanced empirical evidence for its air quality improvement effects. Second, we analyze the intermediary mechanism of environmental judiciary specialization reform on regional air quality from the perspectives of environmental judicial efficiency, regional innovation, and public environmental participation and provide guidance for improving environmental judicial capacity. Third, we examine the heterogeneous impacts of environmental justice reform on air quality in terms of urban conditions and local executives' characteristics, specifying the conditions for the environmental benefits of ERD establishment.

Institutional background and research hypotheses

Institutional background: the specialized reform of the environmental judicial system in China

In the 1950s, some western countries, such as Germany, Australia and New Zealand, began to explore establishing environmental court system and gradually established environmental resource trial institutions, such as "Land and Environment Court" in New South Wales of Australia, in the late 1960s. As of 2010, more than 350 environmental trial institutions had been established in over 40 countries worldwide (Dunec, 2010) to conduct specialized trials on environmental cases. The specialized reform of the environmental judicial system in China can be divided into three stages. Firstly, the early exploration stage from 1989 to 2006. The reform began with the establishment of the environmental collegial panel (*huangbao heyiting*) in the Primary People's Court of *Qiaokou* District of Wuhan in 1989, and ended with the abolition of the environmental court in *Tiexi* District Primary People's Court of Shengyang in 2006. At this stage, some primary people's court started the exploration of environmental trail organizations construction by cooperating with local environmental protection departments. Secondly, the restarting stage of environmental judicial reform from 2007 to 2013. In November 2007, the first environmental court, namely the Ecological Protection Court, was established in Qingzhen county of Guiyang, Guizhou Province. However, China's environmental justice system construction was still in the exploratory stage, and only a few cities had established environmental courts (Qi et al., 2023). More importantly, environmental courts have not fully performed their role in practice due to reasons such as insufficient priority given to environmental judicial reform. Thirdly, the rapid development stage of environmental judicial specialization reform from 2014 to 2020. In June 2014, the Supreme People's Court (SPC) of China established an environment and resources division (ERD, *huanbao shenpanting*) within its organization, and in July of the same year, the SPC further issued the "*Opinions on Comprehensively Strengthening Environmental Resource Trial Work to Provide Strong Judicial Guarantees for Promoting the Ecological Civilization Construction*" (hereafter referred to as the "*Opinions*"), emphasizing the need to "give full play to the trial function of environmental judiciary, and reasonably set up ERD", which marking a new course of environmental justice in China. Against this background, environmental trial organizations, represented by ERDs, have been established at different levels of courts in China.

The ERD is a specialized trail organization for environmental resources cases set up within people's courts at various level. In terms of jurisdiction and rights, the ERD unifies the traditionally fragmented jurisdiction over environmental cases. Furthermore, in terms of trail model, the ERD usually implements the new 'three-in-one' trial model (i.e., criminal, civil, and administrative) or 'four-in-one' trail mechanism (i.e., the three-in-one

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2305_1016310190
© 2025, ALÖKI Kft., Budapest, Hungary

trial model and case enforcement) for criminal, civil and administrative cases (the Supreme People's Court, 2017, 2018, 2020, 2022), which is regarded as the most effective environmental trial authority (Zhang, 2016). According to *the Environmental and Resources Adjudication in China* released by the SPC (2022) of China, 1993 environmental resource trial institutions had been set up within people's courts at different levels nationwide. Furthermore, we have manually collected data on the establishment of ERDs in the Intermediate People's Courts of prefecture-level cities in China from the news reports on the official websites. A total of 78 prefectural-level cities have set up ERDs within intermediate people's courts from 2014 to 2020, and the distribution of their specific establishment time is shown in *Figure 1*.

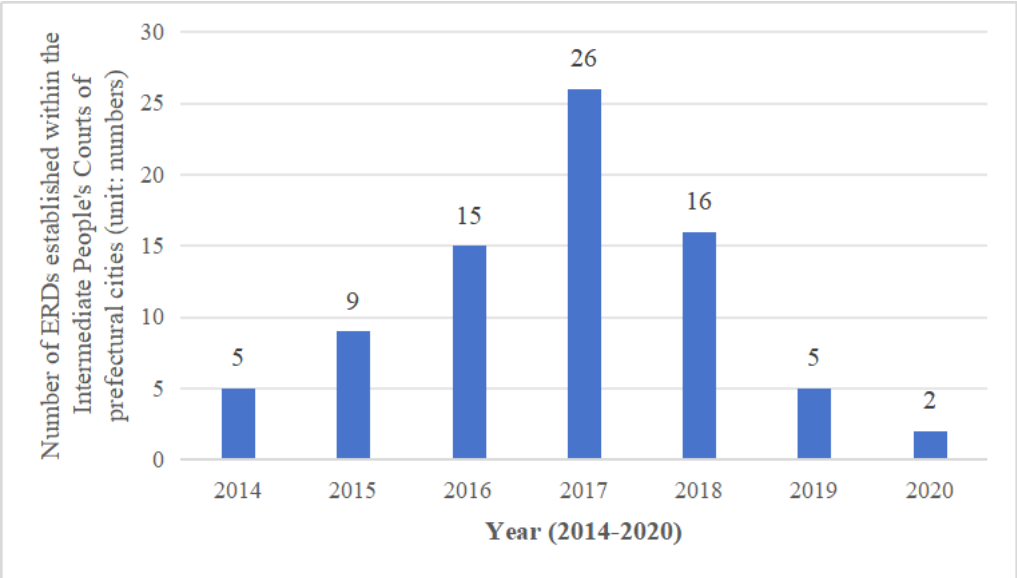

Figure 1. *The distribution of the establishment time for ERDs at prefecture level cities from 2014 to 2020*

ERD establishment, environmental judicial efficiency, and regional air quality

The establishment of an ERD can enhance environmental judicial efficiency by strengthening the centralized jurisdiction and trial of cases, promoting the cultivation of professional talent, and reinforcing the enforcement of cases, thus reducing air pollution. In terms of jurisdiction and rights, an ERD unifies the dispersed jurisdictions of environmental cases in the traditional judicial system, laying the foundation for achieving professional and efficient trial of environmental cases (McClellan, 2009; Preston, 2011; Fan and Zhao, 2019; Qi et al., 2023). Meanwhile, the effective centralization of case jurisdiction provides space for the adoption of an alternative judicial system within the existing legal framework, thus promoting judicial innovation and efficiency (Edwards, 2013; the Supreme People's Court, 2020; Qi et al., 2023). Furthermore, in terms of trial model, an ERD implements either the three-in-one or four-in-one trial model (Zhang, 2016), which can unify the judicial judgment scale for environmental cases and standardize the process of filing, trial, and enforcement of environmental cases (the Supreme People's Court, 2020, 2022; Dai et al., 2023).

In terms of talent cultivation, ERD establishment usually involves cultivating and selecting judges with professional skills in environmental cases, as well as establishing a

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2305_1016310190
© 2025, ALÖKI Kft., Budapest, Hungary

pool of environmental trial consulting experts and professional jurors (the Supreme People's Court, 2020). As a result, the ERD can improve the accuracy of case evidence collection and rulings, improving the efficiency of case trials, and reinforce case enforcement. Finally, for case enforcement, administrative penalties are the main means of handling environmental pollution disputes under China's traditional judicial system. However, under China's target responsibility system and political promotion system for local officials, rent-seeking behaviors, such as collusion between the government and enterprises, often occur in the pursuit of rapid economic development in the short term (Liang and Gao, 2014), which greatly weakens administrative penalties. A newly established ERD shares the same position as criminal, civil, administrative, intellectual property, and other divisions within the court, thus significantly enhancing the status of environmental judiciary. Therefore, it can also directly enhance the efficiency of case enforcement for the ERD (Fan and Zhao, 2019; Dai et al., 2023) and indirectly strengthen administrative penalties and further reduce local protectionist behaviors under the traditional environmental judicial system (Huang and Li, 2010).

ERD establishment, public environmental participation, and regional air quality

The establishment of an ERD promotes citizens' participation in environmental governance and supervision by boosting their trust in the government's capacity and by providing diversified participation paths, thus reducing air pollution. Public environmental participation is the process by which the public, as a governance subject, is embedded in the governance of public environmental affairs by exercising their political rights and forming governance networks with other subjects (Li, 2022). Public environmental participation is affected not only by individual demographic characteristics (Kollmuss and Agyeman, 2002; Munro, 2021) and individual perception and concern about environmental pollution (Zeng et al., 2016; Wang and Hao, 2020), but also by the governmental governance mechanism (Li et al., 2020) and internal participation expectations and external participation channels (Fan and Zhao, 2019).

The establishment of an ERD can promote public environmental participation in two ways. First, the ERD can effectively boost citizens' confidence in the rule of law by centralizing jurisdiction over cases, improving trial efficiency, and strengthening case enforcement, thus promoting active participation in environmental rights protection (Dai et al., 2023; Qi et al., 2023). Second, it promotes the improvement of laws and regulations to provide an institutional guarantee for environmental participation. To strengthen the constructions of the environmental trial system, the legislature and other departments have continuously refined supporting laws and regulations, such as the People's Jurors Law. The "*Opinions*" also emphasizes "vigorously promoting environmental civil public interest litigation, and increasing public participation and judicial openness in environmental resource trail." People's courts at all levels have also implemented a variety of measures to provide more channels for public participation with the goal of achieving environmental judicial openness, such as establishing a system for experts to serve as jurors, using official media to broadcast case trials simultaneously, holding public open days, and inviting the public to attend court hearings (the Supreme People's Court, 2017, 2018, 2020, 2022). Extensive public participation can strengthen the pre-supervision of environmental pollution behavior and reinforce the post-regulation of environmental pollution behavior by exerting pressure on the government, thus improving environmental performance (Zhang et al., 2019a; Li, 2022).

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2305_1016310190
© 2025, ALÖKI Kft., Budapest, Hungary

ERD establishment, technological innovation, and regional air quality

According to Porter's hypothesis, strict and reasonable environmental regulation can push enterprises to carry out green innovation (Porter and Linde, 1995; Brunnermeier and Cohen, 2003). Green technological innovation can further reduce air pollution by improving energy utilization efficiency (Zhou et al., 2016) and increasing green product supply (Yan et al., 2020). As the core of the environmental judicial system, ERD establishment could also help achieve high-quality development for the regional economy and air pollution control by promoting regional technological transformation, especially by pressuring enterprises to adopt green technological innovation.

ERD establishment can effectively improve the efficiency of case adjudication and enforcement, which directly constrain enterprises' negative environmental behaviors (Edwards, 2013). More importantly, it can further increase the potential costs for enterprises' illegal emissions (Xie and Xu, 2022), thus promoting green innovation (Turken et al., 2020; Dai et al., 2023; Qi et al., 2023). Additionally, the ERD enhances public awareness of environmental protection, especially promoting environmental pollution complaints and lawsuits against environmental pollution behaviors, which increases enterprises' exposure to litigation (Gao and Wen, 2021). Studies based on China's environmental judicial system have also shown that ERD establishment significantly increases enterprises' investment in environmental protection (Zhai and Liu, 2019; Zhang et al., 2019b) and enterprises' green technological innovation (Dai et al., 2023; Qi et al., 2023). Therefore, we propose the following research hypotheses:

H1: ERD establishment significantly improves the regional air quality of prefecture-level cities.

H2: ERD establishment improves regional air quality by enhancing environmental judicial system efficiency.

H3: ERD establishment improves regional air quality by encouraging citizens' environmental participation.

H4: ERD establishment improves regional air quality by promoting regional technological innovation.

Research design

Methodology

ERDs have been widely established within the intermediate people's courts of prefecture-level cities in China since the establishment of the ERD within the SPC of China in 2014 and the promulgation of the "*Opinions*" by the SPC in the same year. The different regions and periods in which ERD establishment has occurred presents a valuable opportunity to study its effect on regional air quality using a multi-period difference-in-differences (DID) model. Therefore, referring to the studies of Zhang et al. (2019b), and Qi et al. (2023), we construct the following multi-period DID model (*Eq. 1*):

$$AQI_{i,t} = \beta_0 + \beta_1 Court_{i,t} + \rho X_{i,t} + \gamma_t + \mu_i + \varepsilon_{i,t} \quad \text{(Eq.1)}$$

where $AQI_{i,t}$ denotes the annual average AQI of city *i* in year *t*. $Court_{i,t}$ denotes whether city *i* has established an ERD in year *t*. It equals 1 in year *t* onward if city *i* established an

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2305_1016310190
© 2025, ALÖKI Kft., Budapest, Hungary

ERD before June 30th of year *t* and 0 in year *t-1* and before. Furthermore, it equals 1 in year *t + 1* and onward if city *i* established an ERD after June 30th of year *t* and 0 in year *t* and prior. $X_{i,t}$ is a set of control variables, including the socioeconomic characteristics and meteorological conditions variables. γ_t is the time-fixed effect, μ_i is the city-fixed effect, and $\varepsilon_{i,t}$ is the error term. β_1 is the core coefficient of this study, which represents the effect of ERD establishment on regional air quality.

To test the theoretical mechanism discussed in the previous section, we construct the mediating effect model (*Eq. 2*) with reference to the studies of Fan and Zhao (2019), and Wu et al. (2023). In *Equation 2*, $M_{i,t}$ denotes the mediating variable; the other variables are the same as in *Equation 1*.

$$M_{i,t} = \beta_0 + \beta_1 Court_{i,t} + \rho X_{i,t} + \gamma_t + \mu_i + \varepsilon_{i,t} \quad \text{(Eq.2)}$$

Variables

Dependent variable

The dependent variable is regional air quality, which is measured by the air quality index (AQI) of prefecture-level cities. The larger the AQI is, the worse the air quality in the cities is. In 2013, China began to implement the "*Technical Regulation for Ambient Air Quality Assessment (On Trial)*" in some cities; it was fully rolled out across China in 2014. Therefore, we chose the sample period as 2014 to 2020. Furthermore, as the AQI index contains monthly data, we calculate the annual average of the AQI value as the specific indicator for the dependent variable. During the sample period from 2014 to 2020, the annual average AQI is collected for 276 cities in China. In addition, the AQI is a dimensionless composite index calculated by standardizing six pollutants, namely $PM_{2.5}$, PM_{10}, SO_2, NO_2, CO and O_3. Therefore, we further examine the impact of ERD establishment on the individual pollutants, following Wu et al. (2023). The raw data for AQI and the six pollutants concentrations used in this study are collected from the China Air Quality Online Monitoring and Analysis Platform (https://www.aqistudy.cn/historydata/).

Independent variable

The independent variable in this study is ERD establishment within the intermediate people's court of prefecture-level cities. Environmental trail organizations, represented by ERDs, have been widely set up within people's courts at different level since the establishment of ERD within the SPC of China in 2014. However, the ERD at the primary level suffer from a narrow scope of jurisdiction. Meanwhile, the ERD at provincial and higher courts receive fewer cases, most of which are second or final instance cases (Qi et al., 2023). Therefore, we selected the ERD established within the people's intermediate courts of prefecture-level cities as an indicator to identify policy shocks. During the sample period from 2014 to 2020, 78 cities established ERDs. These 78 cities are assigned to the treatment group and the remaining 198 cities without ERDs are assigned to the control group. In this study, ERD establishment is considered as a policy shock. The raw data on the ERD are mainly collected manually from the news reports on the official websites, including the provincial-level high people's courts, the prefecture-level cities' intermediate people's courts, the Rule of Law website, etc. (e.g., https://www.hncourt.gov.cn/public/detail.php?id=164865).

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2305_1016310190
© 2025, ALÖKI Kft., Budapest, Hungary

Mediating variables

The first mediating variable is environmental judicial efficiency, which includes both the efficiency of case trial and enforcement and the indirect efficiency of administrative punishment for environmental pollution (Fan and Zhao, 2019). We use the number of regional administrative penalty cases for environmental pollution to measure environmental judicial efficiency following the studies of Fan and Zhao (2019) and Zhang et al. (2019b). We use the number of administrative penalty cases per million yuan of GDP output value (*PenaltyGDP*) and the number of administrative penalty cases per 10 thousand people (*PenaltyPop*) as the specific measurement indicators. The raw data for administrative penalty cases are collected from the official PKULAW website (https://pkulaw.com/), and the China Environmental Yearbook (https://data.cnki.net/yearBook/single?id=N2021070108&pinyinCode=YZGHW).

The second mediating variable is citizens' environmental participation. The public can participate in environmental governance in various ways, including by making public complaints to the government through letters, phone calls, and the internet. Complaints can also effectively improve environmental governance performance by increasing enterprises' exposure to litigation and case enforcement (Zhang et al., 2019a). Therefore, following Xu and Lu (2009) and Fan and Zhao (2019), we use citizens' environmental complaints, including the number of citizens' environmental pollution complaints per billion yuan of GDP output value (*ComplaintGDP*) and the number of citizens' environmental pollution complaints per hundred thousand people (*ComplaintPop*), to measure public environmental participation. The raw data on regional environmental pollution complaints are collected from the China Environmental Yearbook.

The third mediating variable is regional technological innovation, which is usually measured by the number of patent applications and the number of green patents granted. Following Du et al. (2021) and Li et al. (2022), we use the logarithm of each city's invention patent applications (*InvPatent*) and the logarithm of each sample's total patent applications (*TotPatent*) to measure the regional technological innovation level. Additionally, we use the logarithm of green patents granted in each city (*GreenPat*) and the number of green patents granted per capita (*PerGreenPat*) to measure the regional green technological innovation level. The raw data for patent applications and green patent grants are collected from the State Intellectual Property Office of China database (https://pss-system.cponline.cnipa.gov.cn/conventionalSearch).

Control variables

Regarding the control variables, following Fan and Zhao (2019) and Wu et al. (2023), we first control the socioeconomic characteristics of each city, including the logarithm of GDP per capita (*GDP*) and its square term (GDP^2), the ratio of secondary industry output value to GDP (*Second*) and its square term ($Second^2$), population density (*PopDensity*), fiscal expenditure per capita (*FisExpenditure*), R&D investment per capita (*PerR&D*), actual foreign investment per capita (*PerFDI*), urban green area per capita (*GreenArea*), and the number of buses per capita (*PerBus*). Second, following Wang and Qiu (2021) and Wu et al. (2023), we control the meteorological conditions in each city, including the logarithm of sunshine hours (*Sunshine*), the logarithm of precipitation (*Precipitation*), average humidity (*Humidity*), average wind speed (*WindSpeed*), and average temperature (*Temperature*). Data on socioeconomic characteristics are collected from the China City Statistical Yearbook and Provincial Statistical Yearbooks

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2305_1016310190
© 2025, ALÖKI Kft., Budapest, Hungary

(https://data.cnki.net/yearBook?type=type&code=A). Data on meteorological conditions are collected from the Hourly Air Quality Monitoring website (https://www.AQIstudy.cn). *Table 1* presents the descriptive statistics of the variables.

Table 1. *Descriptive statistics*

Variables	Obs.	M	S.D.	Min.	Max.
Dependent variable: pollution indicators					
AQI	1932	79.084	22.403	18	230
$PM_{2.5}$ (μg/m^3)	1932	45.2	18.463	9	150
PM_{10} (μg/m^3)	1932	78.351	31.658	18	371
NO_2 （μg/m^3）	1932	30.545	10.245	5	91
O_3 (μg/m^3)	1932	88.316	15.247	23	160
Mediating variables					
PenaltyGDP (penalty cases/million CNY of GDP output value)	1932	1.72	1.212	.179	9.002
PenaltyPop (penalty cases/ten thousand people)	1932	1.044	1.102	.04	11.473
ComplaintGDP (complaint cases/billion CNY of GDP output value)	1932	.148	.145	.001	2.311
ComplaintPop (complaint cases/hundred thousand people)	1932	.834	1.01	.007	23.404
InvPatent (piece)	1932	6.7	1.681	2.639	11.913
TotPatent (piece)	1932	8.005	1.528	3.178	12.611
GreenPat (piece)	1932	4.935	1.529	2.079	8.83
PerGreenPat (piece/ten thousand people)	1932	.755	.959	.027	4.502
Socioeconomic characteristics variables					
GDP (CNY/person)	1932	10.807	.523	9.23	12.29
GDP^2	1932	117.057	11.359	85.19	151.04
Second (%)	1932	.437	.102	.11	.76
$Second^2$	1932	.201	.086	.01	.58
PopDensity (person/km^2)	1932	479.367	598.475	6	8,828
FisExpenditure (ten thousand CNY/person)	1932	1.05	.615	.31	13.507
PerR&D (hundred CNY/person)	1932	2.063	3.291	.054	42.593
PerFDI (hundred CNY/person)	1860	10.6	14.833	0	141.072
GreenArea (hm^2/person)	1932	18.103	21.236	.378	176.106
PerBus (vehicles/ten thousand people)	1932	3.211	3.292	.22	65.93
Meteorological conditions variables					
Sunshine (hour)	1932	7.557	.275	6.797	8.128
Precipitation (mm)	1932	6.806	.627	3.734	8.017
Humidity (%)	1932	69.704	10.432	36.258	84.828
WindSpeed (m/s)	1932	2.18	.495	1.063	4.126
Temperature (℃)	1932	15.596	5.283	-.352	25.697

Empirical results

Baseline regression results

Stepwise regression is used to examine the role of ERD establishment in regional air quality. *Table 2* reports the baseline regression results. The empirical results for Models 1–4 show that the coefficients of *Court* are stable and significant ($p < 0.05$), whether or not the control variables are included. For example, in Model 4, the two sets of control variables are included, and the coefficient of *Court* is −5.0946, which is significant ($p < 0.01$). These results show that ERD establishment can effectively reduce the regional

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2305_1016310190
© 2025, ALÖKI Kft., Budapest, Hungary

AQI. That is, environmental judiciary specialization reform represented by ERD establishment can improve cities' air quality. H1 is thus supported.

Table 2. *Average treatment effects of ERD establishment on the AQI and individual pollutants*

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
	AQI	AQI	AQI	AQI	$PM_{2.5}$	PM_{10}	NO_2	O_3
Court	−3.7614**	−4.9139***	−4.1010**	−5.0946***	−3.6636***	−4.8964**	−1.3975*	−2.7384*
	(−2.26)	(−3.16)	(−2.53)	(−3.33)	(−2.64)	(−2.38)	(−1.76)	(−1.97)
GDP		−136.4278*		−121.5596*	−95.8529	−142.4519	−68.3328**	−12.9003
		(−1.90)		(−1.68)	(−1.56)	(−1.51)	(−2.04)	(−0.23)
GDP^2		6.0733*		5.3253	4.0967	6.0224	3.2008**	0.7975
		(1.85)		(1.61)	(1.46)	(1.39)	(2.06)	(0.31)
Second		128.9978***		116.3440***	65.1409*	109.6601**	40.0020**	50.0259
		(3.33)		(2.97)	(1.83)	(2.10)	(2.58)	(1.39)
$Second^2$		−116.3701**		−107.2113**	−55.0879	−83.1970	−52.7161***	−69.9375*
		(−2.54)		(−2.31)	(−1.31)	(−1.36)	(−3.11)	(−1.73)
PopDensity		−0.0002		−0.0017	−0.0034	0.0023	−0.0035**	−0.0062***
		(−0.07)		(−0.62)	(−1.09)	(0.60)	(−2.23)	(−2.84)
FisExpenditure		−0.7218		−0.2986	−0.9840	8.5476**	−1.4174	−13.5394***
		(−0.23)		(−0.10)	(−0.36)	(2.33)	(−1.03)	(−4.62)
PerR&D		0.0867		−0.0240	−0.2503	−0.3864	−0.0673	0.4719**
		(0.35)		(−0.10)	(−1.07)	(−1.20)	(−0.51)	(2.19)
PerFDI		−0.0025		−0.0107	−0.0190	−0.0322	0.0096	0.0463
		(−0.09)		(−0.37)	(−0.70)	(−0.71)	(0.51)	(1.13)
GreenArea		−0.0676		−0.0670	−0.0667	−0.0078	−0.0141	−0.1116**
		(−1.23)		(−1.22)	(−1.55)	(−0.07)	(−0.81)	(−2.18)
PerBus		−0.3110***		−0.3214***	−0.1693**	−0.2590**	−0.1089***	−0.1131
		(−3.02)		(−3.39)	(−2.40)	(−2.54)	(−2.97)	(−0.51)
Sunshine			−3.6952	−4.5947	−8.0233*	−7.3166	3.7374**	23.7578***
			(−0.77)	(−0.92)	(−1.83)	(−1.17)	(2.07)	(6.49)
Precipitation			−6.6212***	−5.9497***	−4.8038***	−8.4449***	0.1440	0.7947
			(−3.81)	(−3.23)	(−3.08)	(−3.65)	(0.18)	(0.49)
Humidity			0.2803	0.2626	0.5594***	0.1991	−0.0543	−0.6920***
			(1.35)	(1.18)	(2.87)	(0.67)	(−0.55)	(−3.50)
WindSpeed			−8.7832***	−8.3906***	−5.5880**	−4.7732	−0.9431	−4.7722*
			(−3.46)	(−3.24)	(−2.47)	(−1.46)	(−0.80)	(−1.70)
Temperature			0.1475	0.2269	−0.1682	0.2207	−0.0046	0.6515***
			(0.98)	(1.17)	(−0.95)	(0.75)	(−0.05)	(3.39)
Constant	79.7205***	813.2318**	150.0848***	816.0751**	659.1704*	980.4986*	368.3790**	8.5618
	(282.75)	(2.07)	(3.63)	(2.04)	(1.94)	(1.88)	(2.05)	(0.03)
City FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1932	1858	1932	1858	1858	1858	1858	1858
Adj. R^2	0.69	0.71	0.69	0.71	0.68	0.74	0.76	0.59

(1) Robust t-statistics in parentheses; standard errors clustered at the city level;(2) *** p < 0.01, ** p < 0.05, * p < 0.1; (3) We examined the impact of environmental courts on all six individual pollutants, with $PM_{2.5}$, PM_{10}, NO_2 and O_3 statistically significant, and SO_2 and CO failed statistical significance tests

Furthermore, the benefits of environmental judiciary reform may vary significantly depending on the individual pollutants. Therefore, we investigate the effect of ERD establishment on different pollutants. *Table 2* reports these regression results. The results

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2305_1016310190
© 2025, ALÖKI Kft., Budapest, Hungary

for Models 5–8 show that the ERD establishment has significant negative effects on regional $PM_{2.5}$, PM_{10}, NO_2, and O_3 concentrations, with coefficients of −3.6636 ($p < 0.01$), −4.8964 ($p < 0.05$), −1.3975 ($p < 0.1$), and −2.7384 ($p < 0.1$), respectively. These results demonstrate that ERD establishment can significantly improve air quality.

The impact of environmental judiciary reform on cities' air quality may also varies with seasons due to the seasonal changes in social production activities and meteorological conditions. Therefore, we further examine the environmental effects of ERD establishment in different seasons. Model 1–4 in *Table 3* report the effects of ERD establishment on the AQI by season. Empirical results show that environmental judicial specialization reform was effective in spring, summer and winter, but the environmental benefits are more pronounced in winter and spring, with coefficients of −4.4220 ($p < 0.05$) and −3.7945 ($p < 0.01$), respectively. These results are consistent with Wu et al.' (2023) findings. On the one hand, the higher proportion of traditional energy consumption, such as coal, in winter and spring leads to more severe air pollution. On the other hand, the climate in China, especially in northern China, suffers from droughts and more frequent dusty weather in winter and spring, which further worsen air quality. While in summer, more precipitation and frequent cyclone activities allow air pollution diffusion easier. Therefore, the environmental benefits are more pronounced in winter and spring.

Table 3. *The treatment effects of ERD establishment on the AQI by season*

Variables	Model 1	Model 2	Model 3	Model 4
	Spring	Summer	Autumn	Winter
	AQI	AQI	AQI	AQI
Court	−3.7945***	−1.6636*	0.1651	−4.4220**
	(−2.80)	(−1.73)	(0.13)	(−2.46)
GDP	35.4746	29.3546	57.2884	170.8430***
	(0.92)	(0.85)	(1.32)	(2.91)
GDP^2	−1.5587	−1.2208	−1.8874	−8.0865***
	(−0.86)	(−0.77)	(−0.92)	(−2.96)
Second	19.9178	47.9687**	47.4910*	11.2090
	(0.66)	(2.38)	(1.65)	(0.21)
$Second^2$	−14.3701	−47.3721**	−39.8437	17.7589
	(−0.41)	(-2.09)	(−1.27)	(0.30)
PopDensity	0.0013	−0.0050***	0.0042*	−0.0017
	(0.70)	(−3.24)	(1.88)	(−0.53)
FisExpenditure	−1.9036	−5.8500***	−5.8411***	−4.5945
	(-0.94)	(−3.08)	(−2.64)	(−1.29)
PerR&D	0.5169***	0.3878***	0.5817***	0.0300
	(2.94)	(3.16)	(3.34)	(0.12)
PerFDI	−0.0463*	−0.0055	0.0257	−0.0452
	(−1.68)	(−0.14)	(0.84)	(−0.99)
GreenArea	−0.0117	−0.0378	−0.0526	−0.0139
	(−0.39)	(−1.63)	(−1.26)	(−0.27)
PerBus	0.0442	−0.0819	−0.0291	0.0768
	(0.63)	(−0.64)	(−0.49)	(1.08)
Sunshine	−7.7219**	9.4994***	−0.3586	1.4496
	(−2.51)	(3.70)	(−0.12)	(0.35)
Precipitation	−5.3100***	−5.8039***	−11.4392***	−12.5964***
	(−3.17)	(−4.08)	(−6.78)	(−5.90)

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2305_1016310190
© 2025, ALÖKI Kft., Budapest, Hungary

Variables	Model 1	Model 2	Model 3	Model 4
	Spring	Summer	Autumn	Winter
	AQI	AQI	AQI	AQI
Humidity	−0.1217	−0.1309	0.5413***	0.7085***
	(−0.76)	(−0.84)	(3.18)	(3.00)
WindSpeed	2.1417	−3.8645***	−4.6615**	−7.0161***
	(1.13)	(−2.82)	(−2.58)	(−2.92)
Temperature	0.4834**	0.0382	0.3359	−0.0866
	(2.50)	(0.30)	(1.61)	(−0.33)
Constant	−38.6588	−123.7632	−288.5801	−764.1726**
	(−0.18)	(−0.65)	(−1.24)	(−2.37)
City FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	1858	1858	1858	1858
Adj-R^2	0.79	0.87	0.79	0.88

Robust t-statistics in parentheses; standard errors clustered at the city level; *** p < 0.01, ** p < 0.05, * p < 0.1

Dynamic effects test

The key pre-assumption of the DID methodology is to fulfill the parallel trend, which requires the treatment and control groups to demonstrate similar trends in their AQI during the pre-shock period. Furthermore, public policy implementation in China is characterized by obvious implementation bias (O'Brien and Li, 1999). Many reforms achieve promising policy effects at their initial implementation stage but fail to achieve sustainable effects (Fan and Zhao, 2019). Therefore, we adopt the event study method to test the parallel trend between the two groups and examine the dynamic effects of environmental judiciary reform on regional air quality, with reference to Beck et al. (2010). We construct the following empirical model (*Eq. 3*):

$$AQI_{i,t} = \beta_0 + \sum_{j=-M}^{N} \delta_j \, Court_{i,t-j} + \rho X_{i,t} + \gamma_t + \mu_i + \varepsilon_{i,t} \qquad \text{(Eq.3)}$$

where $Court_{i,t-j}$ is a dummy variable denoting whether city *i* established an ERD in year *t-j*: if so, it equals 1, and 0 otherwise. *M* and *N* denote the number of years before and after ERD establishment, respectively. δ_0 measures the policy effect in the year in which the ERD is established. δ_{-M} to δ_{-1} measure the policy effect in periods 1 to *M* before ERD establishment. Similarly, δ_1 to δ_N measure the policy effect in periods 1 to *N* after ERD establishment. The parallel trend assumption is valid if there is no significant difference between the treatment and control groups in periods 1 to *M* before ERD establishment.

The minimum difference value between the year of ERD establishment and the policy shock year, namely 2014, is −6. However, when the difference equals −6 or −5, the sample size is small. Therefore, we cut the difference value up to −4 and construct dummy variables for the fourth (*Court* × *pre4*), third (*Court* × *pre3*), second (*Court* × *pre2*), first (*Court* × *pre1*), and current (*Court* × *current*) periods before the environmental judiciary reform. To avoid the multicollinearity problem, the first period before the reform (*Court* × *pre1*) is chosen as the benchmark group to discard. The maximum difference between the year of ERD establishment and the policy shock year is 6 in the dynamic effects test.

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2305_1016310190
© 2025, ALÖKI Kft., Budapest, Hungary

However, when the difference value equals 5 or 6, the number of samples is small. Therefore, we cut the difference up to 4 and construct dummy variables for the first (*Court* × *post1*), second (*Court* × *post2*), third (*Court* × *post3*), and fourth (*Court* × *post4*) periods after the environmental judiciary reform.

Table 4 reports the empirical results of the parallel trend test. The results for Models 1–4 show that the coefficients of *Court* × *pre4*, *Court* × *pre3*, and *Court* × *pre2* are not significant, whether or not the control variables are included. These results suggest that there is no significant difference in the AQI between the treatment and control groups before ERD establishment, which satisfies the parallel trend assumption. *Table 4* also reports the empirical results for the dynamic effects of environmental judiciary reform. The coefficients of *Court* × *post1*, *Court* × *post2*, *Court* × *post3*, and *Court* × *post4* in Models 1–4 are all significant after ERD establishment, both with and without the control variables. These results demonstrate that ERD establishment has effectively reduced the regional AQI and that its positive effects on air quality are sustainable.

Table 4. *Parallel trend and dynamic effects tests*

Variables	Model 1	Model 2	Model 3	Model 4
	AQI	AQI	AQI	AQI
Court × pre4	0.0673	0.7399	0.7399	1.3145
	(0.02)	(0.20)	(0.19)	(0.36)
Court × pre3	6.2428	6.8584	6.6920	7.2384
	(1.33)	(1.51)	(1.45)	(1.62)
Court × pre2	0.0057	0.4938	0.3596	0.8177
	(0.00)	(0.36)	(0.27)	(0.62)
Court × current	−0.5876	−1.0986	−0.7529	−1.1942
	(−0.44)	(−0.85)	(−0.57)	(−0.95)
Court × post1	−3.3026***	−4.3680***	−3.3302***	−4.2524***
	(−2.82)	(−3.68)	(−2.85)	(−3.59)
Court × post2	−3.4523**	−4.7340***	−3.5614***	−4.6606***
	(−2.52)	(−3.43)	(−2.66)	(−3.42)
Court × post3	−3.8672**	−5.6199***	−4.0889**	−5.5432***
	(−2.33)	(−3.32)	(−2.47)	(−3.26)
Court × post4	−6.5220***	−8.7655***	−6.1720**	−8.0931***
	(−2.71)	(−3.88)	(−2.55)	(−3.46)
GDP		−153.0887**		−136.8306*
		(−2.14)		(−1.90)
GDP^2		6.8887**		6.0716*
		(2.10)		(1.84)
Second		132.5615***		120.1451***
		(3.37)		(3.03)
$Second^2$		−123.2462***		−114.2392**
		(−2.66)		(−2.43)
PopDensity		0.0001		−0.0014
		(0.04)		(−0.53)
FisExpenditure		−1.1006		−0.6238
		(−0.35)		(−0.20)
PerR&D		0.0671		−0.0379
		(0.27)		(−0.16)
PerFDI		0.0042		−0.0039
		(0.15)		(−0.14)
GreenArea		−0.0707		−0.0695
		(−1.24)		(−1.22)
PerBus		−0.2989**		−0.3093***

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2305_1016310190
© 2025, ALÖKI Kft., Budapest, Hungary

Variables	Model 1	Model 2	Model 3	Model 4
	AQI	AQI	AQI	AQI
		(−2.48)		(−2.82)
Sunshine			−3.2715	−4.1170
			(−0.71)	(−0.85)
Precipitation			−6.8469***	−6.0300***
			(−3.95)	(−3.27)
Humidity			0.2924	0.2671
			(1.41)	(1.20)
WindSpeed			−8.5530***	−8.1132***
			(−3.33)	(−3.08)
Temperature			0.1648	0.2302
			(1.09)	(1.17)
Constant	79.4768***	897.6012**	146.4761***	889.2258**
	(307.30)	(2.30)	(3.64)	(2.23)
City FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	1932	1858	1932	1858
Adj. R^2	0.69	0.71	0.69	0.71

Robust t-statistics in parentheses; standard errors clustered at the city level; *** p < 0.01, ** p < 0.05, * p < 0.1

Placebo test

China has actively implemented green development strategies in recent years. Regional air quality improvement may be influenced by local governments' endeavors in addition to other factors. Therefore, we conduct a placebo test to exclude estimation bias caused by non-observable factors, following Zhang et al. (2019b). First, the cities are randomly assigned to the treatment and control groups. That is, whether cities established an ERD or not is randomly generated, and the number of randomly generated cities that "established" such a division in each year is the same as the number of cities that actually established an ERD in each year. Second, we conduct a regression on the randomly generated pseudo-treatment group and repeat the simulation process 1000 times to obtain the distribution of the coefficient values for the randomly generated samples. *Figure 2* shows that the distribution of the coefficients for the randomly generated samples is centered on 0 and has a normal distribution.

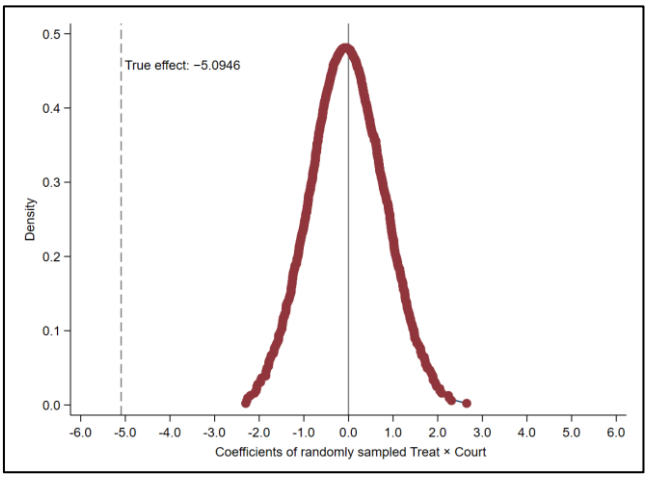

Figure 2. *Estimation coefficient distribution of the AQI placebo test*

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2305_1016310190
© 2025, ALÖKI Kft., Budapest, Hungary

The coefficient value of *Court* in Model 4 from *Table 2* (i.e., −5.0946) is located on the far-left side of the curve in *Figure 2*. These results exclude the influence of other unobservable factors and suggest that the effect of ERD establishment on air pollution is not coincidental.

Robustness tests

Excluding the effects of other policies

During the sample period from 2014 to 2020, the Chinese government has continued to improve its administrative regulatory system and its market regulatory mechanisms for environmental governance. Therefore, we further control for the effects of other environmental governance policies based on *Equation 1*. Firstly, empirical study has suggested that the emission trading system (ETS) can significantly reduce pollutant emissions and improve energy consumption structure (Du et al., 2022). Therefore, we control for the environmental benefit of the ETS (http://www.tanpaifang.com/paiwuquanjiaoyi/2017/07/1460032.html). The result for Model 1 in *Table 5* shows that ERD establishment still significantly reduces the regional AQI. Secondly, as an important supervision mechanism for environmental governance, studies have shown that the Central Environmental Inspection (CEI) can significantly improve environmental governance performance (Wang et al., 2021). Therefore, we control for the environmental benefit of the CEI (https://www.mee.gov.cn/ywgz/zysthjbhdc/dcjz/). The result for Model 2 in *Table 5* shows that ERD establishment still has significant negative impact on the AQI after controlling the CEI. Thirdly, study has also indicated that the Coal to Gas policy (CTG) can significantly improve urban air quality (Wu et a., 2023). Therefore, we also control the environmental benefit of the CTG policy (https://www.chinacace.org/news/fieldsview?id=8144). The result for Model 3 shows that environmental judicial reform can effectively reduce the regional AQI. Finally, study have shown that smart city construction (STC) offers a practical way for environmental governance (Wang and Liu, 2024). Therefore, we further control for the environmental benefit of the STC reform (http://jntzcjj.jinan.gov.cn/art/2022/1/13/art_88380_4767138.html). The result for Model 4 in *Table 5* shows that ERD establishment still has significant negative effect on the AQI. These results suggest that environmental judicial specialization reform can improve regional air quality. H1 is thus robustly supported.

Table 5. *Effect of ERD establishment on the AQI with controls for other policies*

Variables	Model 1	Model 2	Model 3	Model 4
	AQI	AQI	AQI	AQI
Court	−5.0408***	−5.1210***	−4.8792***	−5.1623***
	(−3.28)	(−3.36)	(−3.24)	(−3.34)
ETS	−0.8348			
	(−0.72)			
CEI		−0.8577		
		(−1.48)		
CTG			−8.1278***	
			(−3.34)	

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2305_1016310190
© 2025, ALÖKI Kft., Budapest, Hungary

Variables	Model 1	Model 2	Model 3	Model 4
	AQI	AQI	AQI	AQI
STC				3.3037
				(0.41)
GDP	−124.3928*	−123.3956*	−130.8694*	−125.7781*
	(−1.72)	(−1.70)	(−1.86)	(−1.76)
GDP^2	5.4535*	5.4202	5.7338*	5.5188*
	(1.65)	(1.64)	(1.78)	(1.69)
second	117.9421***	114.8750***	122.0895***	117.3346***
	(3.01)	(2.93)	(3.18)	(2.97)
$second^2$	−108.4106**	−105.6472**	−113.4160**	−108.7838**
	(−2.34)	(−2.27)	(−2.48)	(−2.32)
popdensity	−0.0019	−0.0017	−0.0022	−0.0017
	(−0.68)	(−0.59)	(−0.80)	(−0.61)
FisExpenditure	−0.1122	−0.3443	−0.0949	−0.2667
	(−0.04)	(−0.11)	(−0.03)	(−0.09)
PerR&D	−0.0315	−0.0403	−0.0432	−0.0245
	(−0.13)	(−0.17)	(−0.19)	(−0.10)
PerFDI	−0.0093	−0.0122	−0.0110	−0.0118
	(−0.32)	(−0.42)	(−0.37)	(−0.41)
GreenArea	−0.0695	−0.0664	−0.0668	−0.0691
	(−1.27)	(−1.21)	(−1.24)	(−1.25)
PerBus	−0.3187***	−0.3230***	−0.3485***	−0.3181***
	(−3.38)	(−3.39)	(−3.20)	(−3.38)
Sunshine	−4.5652	−4.4097	−2.3648	−4.6992
	(−0.91)	(−0.88)	(−0.46)	(−0.94)
Precipitation	−6.0625***	−6.0349***	−5.1299***	−5.9455***
	(−3.26)	(−3.27)	(−2.78)	(−3.22)
Humidity	0.2663	0.2587	0.1441	0.2689
	(1.20)	(1.17)	(0.64)	(1.21)
WindSpeed	−8.5878***	−8.5161***	−9.0335***	−8.4292***
	(−3.35)	(−3.25)	(−3.56)	(−3.26)
Temperature	0.2235	0.2093	0.4248**	0.2257
	(1.16)	(1.07)	(2.15)	(1.16)
Constant	832.0539**	825.3907**	852.3565**	838.3067**
	(2.08)	(2.06)	(2.18)	(2.12)
City FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	1858	1858	1858	1858
Adj-R^2	0.71	0.71	0.72	0.71

Robust t-statistics in parentheses; standard errors clustered at the city level; *** p < 0.01, ** p < 0.05, * p < 0.1

Monthly panel data analysis

In the baseline regression section, we empirically examined the impact of environmental judicial specialization reform on the regional AQI and the individual pollutants. To improve the accuracy of the model estimation, we constructed a "city—month" panel data to empirically examine the average treatment effect of

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2305_1016310190
© 2025, ALÖKI Kft., Budapest, Hungary

ERD establishment on the AQI and the six pollutants. Empirical results are shown in *Table 6*. The result for Model 1 shows that environmental courts have significant negative effect on regional AQI after controlling city fixed effect and month fixed effect. Model 2 further controls for cities' socioeconomic characteristics and meteorological conditions, the result shows that environmental courts or ERD establishment still has significant negative impact on regional AQI, with coefficients of −2.5664 ($p < 0.01$). These results further confirmed H1. Furthermore, the results for Models 3–5 show that the ERD establishment can effectively reduce the regional $PM_{2.5}$, PM_{10}, and O_3 concentrations, with coefficients of −2.0214 ($p < 0.05$), −3.5962 ($p < 0.05$), and −1.6737 ($p < 0.1$), respectively. These results further demonstrate that ERD establishment can significantly improve air quality. H1 is robustly supported.

Table 6. *Average treatment effect of ERD establishment on the AQI and individual pollutants by month*

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
	AQI	AQI	$PM_{2.5}$	PM_{10}	O_3
Court	−2.5032**	−2.5664***	−2.0214**	−3.5962**	−1.6737*
	(−2.44)	(−2.65)	(−2.26)	(−2.38)	(−1.76)
GDP		69.8275**	49.5700	150.9765***	16.2762
		(2.00)	(1.64)	(3.22)	(0.39)
GDP^2		−3.0132*	−2.2336	−6.8743***	−0.4208
		(−1.86)	(−1.59)	(−3.16)	(−0.22)
Second		36.3805	−14.2919	−18.8626	48.4894**
		(1.41)	(−0.59)	(−0.58)	(2.28)
$Second^2$		−25.7852	31.2722	48.0140	−50.5009**
		(−0.87)	(1.13)	(1.28)	(−2.01)
PopDensity		−0.0009	−0.0012	0.0026	−0.0035
		(−0.54)	(−0.70)	(1.03)	(−1.27)
FisExpenditure		−4.8335***	−2.3698	1.8019	−11.8527***
		(−2.62)	(−1.32)	(0.70)	(−6.04)
PerR&D		0.0028**	−0.0006	0.0020	0.0047***
		(2.12)	(−0.40)	(1.12)	(2.61)
PerFDI		−0.0204	−0.0203	−0.0608	0.0328
		(−0.90)	(−0.83)	(−1.33)	(1.07)
GreenArea		−0.0521**	−0.0428*	−0.0561	−0.0445
		(−2.23)	(−1.93)	(−1.17)	(−1.23)
PerBus		−0.0039	0.1086***	0.0026	0.0093
		(−0.08)	(2.67)	(0.04)	(0.08)
Sunshine		4.9506**	0.0137	−0.1409	17.4910***
		(2.14)	(0.01)	(−0.04)	(6.48)
Precipitation		−7.1179***	−5.9442***	−9.8954***	0.7669
		(−6.09)	(−6.25)	(−6.12)	(0.64)
Humidity		0.1820	0.5382***	0.3234*	−0.5433***
		(1.45)	(4.89)	(1.85)	(−3.83)

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2305_1016310190
© 2025, ALÖKI Kft., Budapest, Hungary

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
	AQI	AQI	$PM_{2.5}$	PM_{10}	O_3
WindSpeed		−4.7141***	−1.8352	−0.1593	−5.4603***
		(−3.41)	(−1.49)	(−0.07)	(−2.91)
Temperature		0.2365	−0.1937	0.2281	0.1202
		(1.32)	(−1.17)	(0.82)	(0.62)
Constant	77.3508***	−323.8478*	−216.7373	−712.5736***	−124.1456
	(386.05)	(−1.69)	(−1.32)	(−2.74)	(−0.55)
City FE	YES	YES	YES	YES	YES
Month FE	YES	YES	YES	YES	YES
Observations	20148	19139	19139	19139	19139
Adj. R^2	0.65	0.65	0.72	0.75	0.66

(1) Robust t-statistics in parentheses; standard errors clustered at the city level;(2) *** p < 0.01, ** p < 0.05, * p < 0.1;
(3) We examined the impact of environmental courts on all six pollutants using monthly panel data, with $PM_{2.5}$, PM_{10} and O_3 statistically significant, and SO_2 NO_2 and CO failed statistical significance tests

Potential mechanisms

Mechanism 1: Improving environmental judicial efficiency

We use *Equation 2* to test the potential environmental judicial efficiency mechanism. Models 1 and 2 in *Table 7* report the empirical results for the mechanism of environmental judicial efficiency. The results show that ERD establishment positively increases both the number of administrative penalty cases per million yuan of GDP output value (*PenaltyGDP*) and the number of administrative penalty cases per 10 thousand people (*PenaltyPop*). These results suggest that environmental judicial reform indirectly improves environmental judicial efficiency by strengthen administrative penalties. H2 is thus supported.

Table 7. *Mechanism analysis: environmental penalty cases and public environmental complaints*

Variables	Model 1	Model 2	Model 3	Model 4
	PenaltyGDP	***PenaltyPop***	***ComplaintGDP***	***ComplaintPop***
Court	0.3432***	0.2405***	0.0237***	0.0868*
	(2.77)	(2.69)	(3.27)	(1.83)
GDP	10.3105***	−4.3916	−0.1896	5.9648***
	(2.79)	(−1.21)	(−0.45)	(2.75)
GDP^2	−0.4646***	0.2383	0.0113	−0.2218**
	(−2.66)	(1.37)	(0.58)	(−2.13)
Second	8.0676***	3.3582**	0.7331*	−4.0611*
	(3.58)	(2.05)	(1.91)	(−1.92)
$Second^2$	−7.6335***	−2.6521	−0.4647	5.8168**
	(−3.16)	(−1.54)	(−1.17)	(2.36)
PopDensity	−0.0005***	−0.0006***	−0.0000*	−0.0010***
	(−2.76)	(−2.80)	(−1.74)	(−4.00)
FisExpenditure	−0.5131**	−0.1172	−0.0378**	−0.1688
	(−2.44)	(−0.74)	(−2.03)	(−1.13)
PerR&D	−0.0135	−0.0150	0.0026	0.0374*
	(−0.77)	(−0.88)	(1.05)	(1.83)
PerFDI	0.0066**	0.0043	0.0000	0.0024
	(2.08)	(1.27)	(0.12)	(1.58)

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2305_1016310190
© 2025, ALÖKI Kft., Budapest, Hungary

Variables	Model 1	Model 2	Model 3	Model 4
	PenaltyGDP	***PenaltyPop***	***ComplaintGDP***	***ComplaintPop***
GreenArea	−0.0014	−0.0015	0.0000	0.0018
	(−0.47)	(−0.67)	(0.09)	(0.47)
PerBus	−0.0034	0.0086	0.0007	0.0014
	(−0.40)	(0.86)	(1.35)	(0.36)
Sunshine	0.8612***	0.4068***	0.0361	0.2210*
	(3.65)	(2.74)	(1.38)	(1.69)
Precipitation	0.1222	0.1316	0.0407***	0.1187
	(0.98)	(1.39)	(2.77)	(1.64)
Humidity	−0.0586***	−0.0317**	0.0019	0.0205***
	(−3.49)	(−2.19)	(1.37)	(2.75)
WindSpeed	−0.3148**	−0.2585**	0.0005	−0.0045
	(−2.14)	(−2.58)	(0.03)	(−0.06)
Temperature	0.0252	0.0044	−0.0025	0.0073
	(1.21)	(0.34)	(−0.85)	(0.51)
Constant	−59.5549***	18.7611	0.0372	−40.6043***
	(−2.99)	(0.98)	(0.02)	(−3.54)
City FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	1858	1858	1858	1858
Adj. R^2	0.59	0.71	0.56	0.75

Robust t-statistics in parentheses; standard errors clustered at the city level; *** p < 0.01, ** p < 0.05, * p < 0.1

Mechanism 2: Promoting citizens' environmental participation

We further use *Equation 2* to examine the potential citizen environmental participation mechanism. Models 3 and 4 in *Table 7* report the empirical results for the mechanism of public environmental participation. The results show that ERD establishment positively increases *ComplaintGDP* and *ComplaintPop*, demonstrating that environmental judiciary specialization reform significantly improves citizens' environmental participation. H3 is thus supported.

Mechanism 3: pressing for regional technological innovation

Models 1–4 in *Table 8* report the results of the mediating effect of regional technological innovation. The empirical results for Models 1 and 2 show that ERD establishment positively increases *InvPatent* and *TotPatent*, and the coefficients of *Court* are 0.1327 and 0.0918, respectively. The regression results for Models 3 and 4 also show that ERD establishment significantly promotes *GreenPat* and *PerGreenPat*. These results suggest that environmental judiciary specialization reform, which is centered on environmental trial system construction, can facilitate regional technological transformation. H4 is thus robustly supported.

Table 8. *Mechanism analysis: regional technological innovation*

Variables	Model 1	Model 2	Model 3	Model 4
	InvPatent	***TotPatent***	***GreenPat***	***PerGreenPat***
Court	0.1327**	0.0918**	0.0740*	0.0836**
	(2.19)	(1.98)	(1.74)	(2.06)
GDP	4.8418**	8.1864***	3.6247**	−13.2976***
	(2.13)	(5.13)	(2.50)	(−6.77)

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2305_1016310190
© 2025, ALÖKI Kft., Budapest, Hungary

Variables	Model 1	Model 2	Model 3	Model 4
	InvPatent	***TotPatent***	***GreenPat***	***PerGreenPat***
GDP²	−0.2254**	−0.3851***	−0.1628**	0.6231***
	(−2.13)	(−5.21)	(−2.42)	(6.73)
Second	−1.2608	−2.3404**	−1.3913	−0.5628
	(−0.89)	(−2.26)	(−1.19)	(−0.68)
Second²	2.5608	3.2923***	2.0045	1.2389
	(1.64)	(2.86)	(1.55)	(1.30)
PopDensity	0.0001	0.0001	−0.0001	0.0002
	(0.62)	(0.67)	(−1.20)	(1.37)
FisExpenditure	0.1178	0.1270*	0.0547	0.0415
	(1.02)	(1.71)	(0.64)	(0.56)
PerR&D	0.0317**	0.0183***	−0.0022	0.0229*
	(2.22)	(2.82)	(−0.38)	(1.69)
PerFDI	0.0009	0.0004	−0.0006	−0.0028*
	(0.67)	(0.40)	(−0.64)	(−1.81)
GreenArea	−0.0001	0.0013	0.0017	0.0014
	(−0.02)	(1.25)	(1.32)	(0.89)
PerBus	−0.0074***	−0.0070***	−0.0024	0.0029
	(−2.98)	(−3.37)	(−1.16)	(0.79)
Sunshine	0.4156**	0.2471**	−0.3012***	−0.1393
	(2.38)	(2.06)	(−2.76)	(−1.42)
Precipitation	0.1087	0.0162	−0.1751***	−0.0351
	(1.22)	(0.27)	(−3.39)	(−0.66)
Humidity	0.0059	0.0069	0.0133**	0.0081
	(0.75)	(1.35)	(2.37)	(1.46)
WindSpeed	−0.2209*	−0.1006	−0.1132	−0.1770***
	(−1.80)	(−1.46)	(−1.59)	(−3.15)
Temperature	0.0141*	0.0049	−0.0071	0.0061
	(1.85)	(0.95)	(−0.91)	(1.16)
Constant	−23.3897*	−37.4774***	−12.0586	72.3272***
	(−1.96)	(−4.52)	(−1.53)	(6.87)
City FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	1858	1858	1858	1858
Adj. R^2	0.95	0.97	0.96	0.93

Robust t-statistics in parentheses; standard errors clustered at the city level; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Heterogeneity analysis

According to resource dependence theory, organizations are interactive with the environment in which they are embedded and maintain their sustainability by acquiring resources from the environment (Pfeffer and Salancik, 2003). Environmental judiciary specialization reform is also affected by internal and external factors such as the geographical location of the city, the endowment of urban resources, the characteristics of their local government officials, and the preferences of their superior governments.

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2305_1016310190
© 2025, ALÖKI Kft., Budapest, Hungary

Therefore, we further test the heterogeneous effects of the environmental judiciary reform in cities with different urban conditions.

Natural resource endowment for cities

First, we examine the heterogeneous impact of ERD establishment on the regional AQI based on the sample cities' natural resource endowments; that is, whether they are resource-based cities or non-resourced-based cities. We classify the sample cities as resource-based or non-resourced-based according to the "*National Sustainable Development Plan for Resource-based Cities (2013–2020)*" (https://www.gov.cn/zwgk/2013-12/03/content_2540070.htm) issued by the State Council of the People's Republic of China on November 12, 2013. Among the sample cities, a total of 112 resource-based cities are assigned a value of 1, and the remaining 164 non-resource-based cities are assigned a value of 0. *Table 9* reports the heterogeneous effects of natural resource endowment on the regional AQI. The empirical results for Models 1 and 2 show that ERD establishment reduces the regional AQI in both resource-based and non-resource-based cities. However, ERD establishment has more obvious effects on regional AQI reduction in the resource-based cities, as demonstrated by a comparison of the absolute values of the coefficient *Court* in Models 1 and 2 (7.9518 > 3.0467). A potential reason for this is that resource-based cities are dominated by natural resource extraction and processing, and their industrial development strongly relies on their resources (e.g., minerals). The resource-based cities are also characterized by a rough development mode, a high intensity of resource and energy consumption, and severe environmental pollution. Therefore, ERD establishment has significantly reduced the AQI in these cities by enhancing environmental judicial efficiency and promoting regional green transformation.

Table 9. *Results of heterogeneity tests of city conditions*

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	Resource-based city	Non-resource-based city	Internally promoted	Externally promoted	Age 50 or under	Over age 50
	AQI	AQI	AQI	AQI	AQI	AQI
Court	−7.9518***	−3.0467*	−6.9091**	−3.9881**	−11.9090***	−3.2749**
	(−2.77)	(−1.79)	(−2.13)	(−2.28)	(−3.02)	(−2.02)
GDP	−233.6956*	−57.6573	−42.0459	−137.8182*	−169.1293	−47.8997
	(−1.95)	(−0.62)	(−0.27)	(−1.66)	(−1.09)	(−0.55)
GDP^2	10.8356*	2.4450	1.9288	6.0023	6.6946	2.1819
	(1.96)	(0.57)	(0.26)	(1.58)	(0.93)	(0.55)
Second	209.5350***	−20.7230	88.6750	96.1876*	266.8175**	71.6778
	(4.48)	(−0.39)	(1.56)	(1.86)	(2.28)	(1.40)
$Second^2$	−227.6789***	64.4611	−104.5388	−75.7633	−238.1312*	−51.2308
	(−4.51)	(0.92)	(−1.49)	(−1.29)	(−1.67)	(−0.91)
PopDensity	−0.0741**	0.0019	−0.0187	−0.0011	−0.0245	−0.0011
	(−2.44)	(1.22)	(−0.85)	(−0.38)	(−1.00)	(−0.63)
FisExpenditure	−3.0735	0.4335	−0.5160	2.6846	13.9424*	−1.5835
	(−0.61)	(0.14)	(−0.12)	(0.73)	(1.80)	(−0.45)
PerR&D	−0.8855*	0.3510*	0.2021	−0.1019	−0.7377	0.1881
	(−1.97)	(1.74)	(0.58)	(−0.33)	(−0.71)	(0.83)
PerFDI	0.1018	−0.0357	−0.1048***	0.0236	0.0157	−0.0445
	(0.67)	(−1.19)	(−3.94)	(0.48)	(0.16)	(−1.52)

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2305_1016310190
© 2025, ALÖKI Kft., Budapest, Hungary

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	Resource-based city	Non-resource-based city	Internally promoted	Externally promoted	Age 50 or under	Over age 50
	AQI	AQI	AQI	AQI	AQI	AQI
GreenArea	−0.1371	0.0612	−0.1897	−0.0186	0.0185	−0.2002**
	(−1.53)	(1.11)	(−1.24)	(−0.32)	(0.21)	(−2.09)
PerBus	−2.3868***	−0.2038**	−1.4175***	−0.5467	−1.6882*	−0.3133***
	(−2.85)	(−2.27)	(−12.80)	(−1.01)	(−1.82)	(−5.53)
Sunshine	4.1944	−13.0131*	1.2707	−6.4822	−12.9119	−3.7045
	(0.54)	(−1.96)	(0.15)	(−1.06)	(−0.96)	(−0.72)
Precipitation	−2.2525	−8.6176***	−5.1129	−6.2657***	−6.3433*	−7.3978***
	(−0.59)	(−4.75)	(−1.27)	(−3.14)	(−1.73)	(−3.41)
Humidity	0.1515	0.3109	0.6557	0.2970	0.5777	0.4264
	(0.37)	(1.20)	(1.40)	(1.30)	(1.28)	(1.40)
WindSpeed	−7.9647	−8.7557***	−14.0698*	−6.6457**	−12.0194**	−4.2343
	(−1.43)	(−3.00)	(−1.92)	(−2.38)	(−2.29)	(−1.23)
Temperature	0.0024	0.2562	−0.7284	0.4335*	−0.5439	0.2527
	(0.01)	(1.18)	(−1.35)	(1.66)	(−1.34)	(0.96)
Gender			2.6808	4.8349**	5.6973	−1.8347
			(0.78)	(2.50)	(1.29)	(−0.68)
Age			−0.0446	0.0037	−0.9517*	−0.1115
			(−0.07)	(0.02)	(−1.68)	(−0.43)
Education			−1.4506*	−0.1935	0.3473	−0.1298
			(−1.80)	(−0.55)	(0.52)	(−0.27)
Tenure			−0.1392	−0.2807	−0.1813	−0.1396
			(−0.20)	(−0.95)	(−0.29)	(−0.45)
Constant	1316.8988**	560.7209	358.4210	917.7323**	1222.5630	393.2080
	(2.01)	(1.07)	(0.44)	(1.99)	(1.42)	(0.83)
Observations	746	1112	454	1377	517	1278
City FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Adj. R^2	0.65	0.78	0.77	0.73	0.71	0.74

Robust t-statistics in parentheses; standard errors clustered at the city level; *** p < 0.01, ** p < 0.05, * p < 0.1

Local government officials' geographical mobility

Studies have shown that local government officials' geographical mobility has a significant impact on local governance performance by influencing local government behavior (Zhu and Meng, 2020; Shi et al., 2021). Therefore, we examine the heterogeneous impact of ERD establishment on the regional AQI due to leadership mobility, following Zhu and Meng (2020) and Zhang et al. (2024). Under China's cadre and personnel management system, the mobility of prefecture-level city leadership can be divided into three directions: bottom-up promotions from within the same city, horizontal leadership mobility from peer cities, and top-down appointments from provinces to prefecture-level governments (Zhu and Meng, 2020; Zhang et al., 2024). The former is also referred to as internal promotion within the city and the latter two are referred to as external promotion from outside the city (Persson and Zhuravskaya, 2016). Therefore, following Persson and Zhuravskaya's (2016) study, we divide the sample cities based on their mayors' geographical mobility, namely those who received internal promotions within the city and those who received external promotions from outside the city, assigning values of 0 and 1, respectively. The raw data for mayors' individual

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2305_1016310190
© 2025, ALÖKI Kft., Budapest, Hungary

characteristics and mobility are collected from local governments' official websites and work reports as well as from the China Economy website (http://district.ce.cn/zt/rwk/index.shtml). *Table 9* reports the results for the heterogeneous effects examined using Models 3 and 4; the individual demographic characteristics (i.e., gender, ag e, education, and tenure) are controlled in both models. The empirical results demonstrate AQI reduction due to ERD establishment for both promotion groups. A comparison of the absolute values of the coefficient of *Court* (6.9091 > 3.9881) further demonstrates that ERD establishment has more obvious effects on AQI reduction for the internal promotion group.

Local government officials' age

Studies have also shown that local officials' individual characteristics have significant impacts on local governance performance (Yao and Zhang, 2015; Li et al., 2024). Therefore, we examine the heterogeneous effect of ERD establishment on the regional AQI due to mayor age. Firstly, according to "*Regulations on the Selection and Appointment of Party and Government Leading Cadres, 2019"* (*https://www.gov.cn/zhengce/2019-03/17/content_5374532.htm*)" and "*the Interim Provisions on the Tenure of Party and Government Leading Cadres* (*https://www.gov.cn/jrzg/2006-08/06/content_355808.htm*), civil servants are generally about 58 years old when they are appointed to provincial or ministerial-level positions, and they are required to serve in more than two positions at the lower level before they are promoted to the provincial or ministerial leadership, with average tenure for each position being about four years. Therefore, local officials usually need to be promoted as mayors at 50 years old or younger in order to get more opportunities for further promotion. Secondly, the age for enrolling in the national civil examination is usually 22 years old (namely the year of graduation from college), and meanwhile, empirical research based on local officials in China shows that it takes about 28.07 years for a civil servant to be promoted as mayor (Liu et al., 2023). Therefore, the age for civil servants to be promoted as mayors is around 50 years old. Thirdly, the average age for local officials to be appointed as mayors in this study is 51.3 years old. Based on the above analysis and referring to Wu et al.'s (2023) study, we group the sample cities based on mayor age: those with mayors 50 years old or under are assigned a value of 1, and those with mayors over 50 years old are assigned a value of 0. *Table 9* also reports the heterogeneous effects arising due to mayor age examined using Models 5 and 6. The results show that ERD establishment reduces the regional AQI in both groups, but it has more significant effects on AQI reduction for the group in which the mayors are 50 years old or under. The possible reasons are as follows. Firstly, as China's economic development model shifts from rough growth to high-quality development, the traditional target responsibility system (TRS) centered on economic growth has gradually shifted to a more comprehensive one covering economic growth, environmental protection, social equity and others (Zhang et al., 2024). Especially, the weight of environmental governance indicator has increased significantly (Zhang, 2021). Furthermore, under China's official promotion tournament (Zhou, 2007), younger local officials enjoy greater opportunities for further promotion. In addition, empirical study based on China's Coal to Gas policy also suggest that the environmental governance benefits are more pronounced for mayors younger than 50 (Wu et al., 2023). Therefore, they have a strong motivation to pursue higher environmental governance performance and thereby obtain a greater advantage in peer competition (Li and Zhou, 2005).

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2305_1016310190
© 2025, ALÖKI Kft., Budapest, Hungary

Conclusion and policy implications

Increasing environmental pollution has become an important challenge to sustainable economic and social development. To promote the long-term governance of environmental pollution, China and other transition economies are making efforts to improve their environmental judicial capacity, an important element of which is ERD establishment. Therefore, we use ERD establishment within the intermediate people's court of prefecture-level cities in China as a quasi-natural experiment to systematically examine the impact of environmental courts on regional air quality based on panel data of 276 cities from 2014 to 2020. We also analyze the potential intermediary mechanism of environmental judiciary specialization reform on regional air quality, including improving environmental judicial efficiency, encouraging public environmental participation, and pressing for regional innovation. In doing so, we provide empirical support for environmental judicial capacity construction and local government environmental governance.

The empirical results of this study highlight four main findings. First, ERD establishment can effectively reduce the regional AQI. This finding is firmly supported by a series of robustness tests. Second, ERD establishment has a dynamic effect on air pollution control, such that the ERD can continuously improve air quality. Third, ERD establishment reduces regional air pollution by improving environmental judicial efficiency, encouraging citizens' environmental participation, and promoting regional technological transformation. Fourth, the heterogeneous impact of different urban conditions on the regional AQI show that ERD establishment has more obvious effects on AQI reduction in resource-based cities as well as in cities where the mayors have been internally promoted and are aged 50 or under.

The policy implications of this study's empirical findings should also be considered. First, the government should continuously promote environmental judiciary specialization reform, especially by strengthening ERD establishment. The baseline regression results show that ERD establishment reduces regional air pollution and serves as an important institutional arrangement for regional environmental judicial capacity improvement. Therefore, environmental judiciary reform needs to be continuously promoted. Second, it is necessary to standardize the environmental judiciary enforcement standards and to reinforce the construction of an accountability system. Specifically, the process for environmental case management, trial, and enforcement must be standardized and strict enforcement standards for illegal behaviors must be developed. Accountability in environmental case enforcement must also be strengthened. Third, we need to improve the supporting environmental laws and regulations to promote citizens' environmental participation. The intermediary mechanism results suggest that environmental judiciary reform significantly reduce the AQI by promoting public environmental participation. Therefore, we need to improve the supporting environmental laws, and provide both online and offline channels for environmental participation.

Acknowledgements. We thank Prof. Pan Zhang for his insightful comments on the earlier versions of this paper.

Conflict of interests. The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2305_1016310190
© 2025, ALÖKI Kft., Budapest, Hungary

REFERENCES

[1] Almer, C., Goeschl, T. (2010): Environmental crime and punishment: empirical evidence from the German penal code. – Land Economics 86(4): 707-726.
[2] Brunnermeier, S. B., Cohen, M. A. (2003): Determinants of environmental innovation in US manufacturing industries. – Journal of Environmental Economics and Management 45(2): 278-293.
[3] Dai, Y. H., Tong, X. C., Wang, L., Xing, F. (2023): Can legal enhancements promote green innovation? – Journal of Financial Research 2: 115-133 (in Chinese).
[4] Deng, J., Li, M., Li, Y., Lu, J. (2024): Effect of environmental courts on pollution abatement: a spatial difference-in-differences analysis. – Sustainability 16(4): 1452.
[5] Du, K., Cheng, Y., Yao, X. (2021): Environmental regulation, green technology innovation, and industrial structure upgrading: the road to the green transformation of Chinese cities. – Energy Economics 98: 105247.
[6] Du, Z., Xu, C., Lin, B. (2022): Does the emission trading scheme achieve the dual dividend of reducing pollution and improving energy efficiency? Micro evidence from China. – Journal of Environmental Management 323: 116202.
[7] Dunec, J. L. (2010): Greening justice: creating and improving environmental courts and tribunals. – Natural Resources & Environment 25(2): 63.
[8] Edwards, V. (2013): A review of the Court of Justice's case law in relation to waste and environmental impact assessment: 1992-2011. – Journal of Environmental Law 25(3): 515-530.
[9] Fan, Z. Y., Zhao, R. J. (2019): Does rule of law promote pollution control? Evidence from the establishment of the environmental court. – Economic Research Journal 54(03): 21-37 (in Chinese).
[10] Gao, H. Y., Wen, H. Y. (2021): The impact of environmental rule of law on bond financing cost: evidence from environmental courts in China. – Journal of Financial Research 12: 133-151 (in Chinese).
[11] Han, C., Liu, X., Wang, H. (2016): Incentives and behavioral preferences of regulatory officials—a new solution to environmental regulation failure in the absence of independence. – Journal of Management World 2: 82-94 (in Chinese).
[12] Hou, X., Yang, J., Hou, C. (2024): Can strengthening environmental justice promote carbon reduction? Evidence from environmental courts in China. – Environmental Science and Pollution Research 1-18.
[13] Huang, S., Li, G. B. (2010): The legitimacy and justification of the Environmental Protection Court—discussing with Dr. Liu Chao. – Law Review 28(05): 54-59 (in Chinese).
[14] Kollmuss, A., Agyeman, J. (2002): Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? – Environmental Education Research 8(3): 239-260.
[15] Li, H., Zhou, L. A. (2005): Political turnover and economic performance: the incentive role of personnel control in China. – Journal of Public Economics 89(9-10): 1743-1762.
[16] Li, H., Qian, Z., Yang, C., Zheng, X., Wu, Y. (2024): How do the characteristics of local officials affect land urbanization bubble? A case study of Hangzhou, China. – Applied Geography 162: 103147.
[17] Li, J. (2022): Public participation in China: the case for environmental enforcement. – Journal of Chinese Governance 7(2): 159-179.
[18] Li, L., Yang, L. (2023): Effects of driving restrictions on air quality and housing prices: evidence from Chengdu, China. – Transportation Research Part A: Policy and Practice 176: 103829.
[19] Li, L., Li, M., Ma, S., Zheng, Y., Pan, C. (2022): Does the construction of innovative cities promote urban green innovation? – Journal of Environmental Management 318: 115605.

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2305_1016310190
© 2025, ALÖKI Kft., Budapest, Hungary

[20] Li, R., Zhou, Y., Bi, J., Liu, M., Li, S. (2020): Does the central environmental inspection actually work? – Journal of Environmental Management 253: 109602.
[21] Liang, P. H., Gao, N. (2014): Turnover of personnel, legal environment and local environmental pollution. – Journal of Management World 6: 65-78 (in Chinese).
[22] Liu, X., Li, X., Wang, S. (2023): Educational background and career experience: a study on the promotion time of prefectural-level leaders: empirical analysis based on 293 prefecture-level cities in China. – Journal of Huazhong University of Science and Technology (Social Science Edition): 37(4):129-140 (in Chinese).
[23] Lv, Z. M., Zhang, Z. M. (2011): Survey on the current situation of environmental justice in China: a study based on thousands of environmental judgment documents. – Law Science 4: 82-93 (in Chinese).
[24] McClellan, P. (2009): The recent experience of the Land & Environment Court, Australia. – 22nd ALJA Annual Conference, pp. 1-20.
[25] Munro, N. (2021): Explaining public participation in environmental governance in China. – Environmental Values 30(4): 453-475.
[26] O'Brien, K. J., Li, L. (1999): Selective policy implementation in rural China. – Comparative Politics 31(2): 167-186.
[27] Persson, P., Zhuravskaya, E. (2016): The limits of career concerns in federalism: evidence from China. – Journal of the European Economic Association 14(2): 338-374.
[28] Pfeffer, J., Salancik, G. R. (2003): The External Control of Organizations: A Resource Dependence Perspective. – Stanford University Press, St. Redwood City, CA.
[29] Porter, M. E., Linde, C. V. D. (1995): Toward a new conception of the environment-competitiveness relationship. – Journal of Economic Perspectives 9(4): 97-118.
[30] Preston, B. J. (2008): Operating an environment court: the experience of the Land and Environment Court of New South Wales. – Environmental and Planning Law Journal 25(6): 385-409.
[31] Preston, B. J. (2011): Benefits of judicial specialization in environmental law: The Land and Environment Court of New South Wales as a case study. – Pace Environmental Law Review 29(2): 396-440.
[32] Qi, X., Wu, Z., Xu, J., Shan, B. (2023): Environmental justice and green innovation: a quasi-natural experiment based on the establishment of environmental courts in China. – Ecological Economics 205: 107700.
[33] Qin, Z., Liang, Y., Yang, C., Fu, Q., Chao, Y., Liu, Z., Yuan, Q. (2023): Externalities from restrictions: examining the short-run effects of urban core-focused driving restriction policies on air quality. – Transportation Research Part D: Transport and Environment 119: 103723.
[34] Shi, X., Xi, T., Zhang, X., Zhang, Y. (2021): "Moving umbrella": Bureaucratic transfers and the comovement of interregional investments in China. – Journal of Development Economics 153: 102717.
[35] Shin, S. (2013): China's failure of policy innovation: the case of sulphur dioxide emission trading. – Environmental Politics 22(6): 918-934.
[36] The Ministry of Ecology and Environment of China (2021): The China Ecological and Environmental Status Report 2020. – The Ministry of Ecology and Environment of China, Beijing.
[37] The Supreme People's Court of China (2017, 2018, 2020, 2022): Environmental and Resources Adjudication in China. – The Supreme People's Court, Beijing.
[38] Turken, N., Carrillo, J., Verter, V. (2020): Strategic supply chain decisions under environmental regulations: When to invest in end-of-pipe and green technology. – European Journal of Operational Research 283(2): 601-613.
[39] Walters, R., Westerhuis, D. S. (2013): Green crime and the role of environmental courts. – Crime, Law and Social Change 59: 279-290.

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2305_1016310190
© 2025, ALÖKI Kft., Budapest, Hungary

[40] Wang, Q., Liu, Y. (2024): Beautifying urban environment: smart city construction and sustainable pollution control in China. – Journal of Environmental Management 371: 123262.
[41] Wang, S. Y. (2014): Discussion on ecological civilization construction and environmental judicial reform. – China Legal Science 3: 54-71 (in Chinese).
[42] Wang, W., Sun, X., Zhang, M. (2021): Does the central environmental inspection effectively improve air pollution? An empirical study of 290 prefecture-level cities in China. – Journal of Environmental Management 286: 112274.
[43] Wang, Y., Hao, F. (2020): Public perception matters: individual waste sorting in Chinese communities. – Resources, Conservation and Recycling 159: 104860.
[44] Wang, Z., Qiu, S. (2021): Can "energy saving and emission reduction" demonstration city selection actually contribute to pollution abatement in China? – Sustainable Production and Consumption 27: 1882-1902.
[45] Wu, D., Xie, Y., Liu, D. (2023): Rethinking the complex effects of the clean energy transition on air pollution abatement: evidence from China's coal-to-gas policy. – Energy 283: 128413.
[46] Xie, L., Xu, L. (2022): Environmental public interest litigation in China: findings from 570 court cases brought by NGOs, public prosecutors and local government. – Journal of Environmental Law 34(1): 53-81.
[47] Xu, B., Lu, J. Y. (2009): Foreign direct investment, processing trade, and the sophistication of China's exports. – China Economic Review 20(3): 425-439.
[48] Yan, Z., Zou, B., Du, K., Li, K. (2020): Do renewable energy technology innovations promote China's green productivity growth? Fresh evidence from partially linear functional-coefficient models. – Energy Economics 90: 104842.
[49] Yao, Y., Zhang, M. (2015): Subnational leaders and economic growth: evidence from Chinese cities. – Journal of Economic Growth 20: 405-436.
[50] Zeng, C., Niu, D., Li, H., Zhou, T., Zhao, Y. (2016): Public perceptions and economic values of source-separated collection of rural solid waste: a pilot study in China. – Resources, Conservation and Recycling 107: 166-173.
[51] Zhai, H. Y., Liu, Y. W. (2019): Does environmental justice specialization promote corporate environmental governance? – China Population, Resources and Environment 29(06): 138-147 (in Chinese).
[52] Zhang, G., Deng, N., Mou, H., Zhang, Z. G., Chen, X. (2019a): The impact of the policy and behavior of public participation on environmental governance performance: empirical analysis based on provincial panel data in China. – Energy Policy 129: 1347-1354.
[53] Zhang, P. (2021): Target interactions and target aspiration level adaptation: How do government leaders tackle the "environment-economy" nexus? – Public Administration Review 81(2): 220-230.
[54] Zhang, P., Liu, D., Lyu, S. (2024): Leadership mobility and target adaptation: Does previous target achievement matter? – Public Performance & Management Review 47(1): 204-231.
[55] Zhang, Q., Yu, Z., Kong, D. (2019b): The real effect of legal institutions: environmental courts and firm environmental protection expenditure. – Journal of Environmental Economics and Management 98: 102254.
[56] Zhang, Z. M. (2016): Empirical review of the development of environmental justice specialization: a study focusing on environmental trial institutions and environmental trial mechanisms. – China Legal Science 6: 177-196 (in Chinese).
[57] Zhao, Y., Zheng, L., Zhu, J. (2022): Could environmental courts reduce carbon intensity? Evidence from cities of China. – Journal of Cleaner Production 377: 134444.
[58] Zhi, H., Ni, L., Zhu, D. (2022): The impact of emission trading system on clean energy consumption of enterprises: evidence from a quasi-natural experiment in China. – Journal of Environmental Management 318: 115613.

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2305_1016310190
© 2025, ALÖKI Kft., Budapest, Hungary

[59] Zhou, J., Mao, X. Q., Hu, T., Zeng, A., Xing, Y. K., Corsetti, G. (2016): Implications of the 11th and 12th Five-Year Plans for energy conservation and CO_2 and air pollutants reduction: a case study from the city of Urumqi, China. – Journal of Cleaner Production 112: 1767-1777.
[60] Zhou, L. A. (2007): Governing China's local officials: an analysis of promotion tournament model. – Economic Research Journal 7(36): 36-50 (in Chinese).
[61] Zhou, P., Huang, X., Song, F. M. (2024): The deterrent effect of environmental judicature on firms' pollution emissions: evidence from a quasi-natural experiment in China. – China Economic Review 88: 102291.
[62] Zhu, X., Meng, T. (2020): Geographical leadership mobility and policy isomorphism: narrowing the regional inequality of social spending in China. – Policy Studies Journal 48(3): 806-832.

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2305_1016310190
© 2025, ALÖKI Kft., Budapest, Hungary