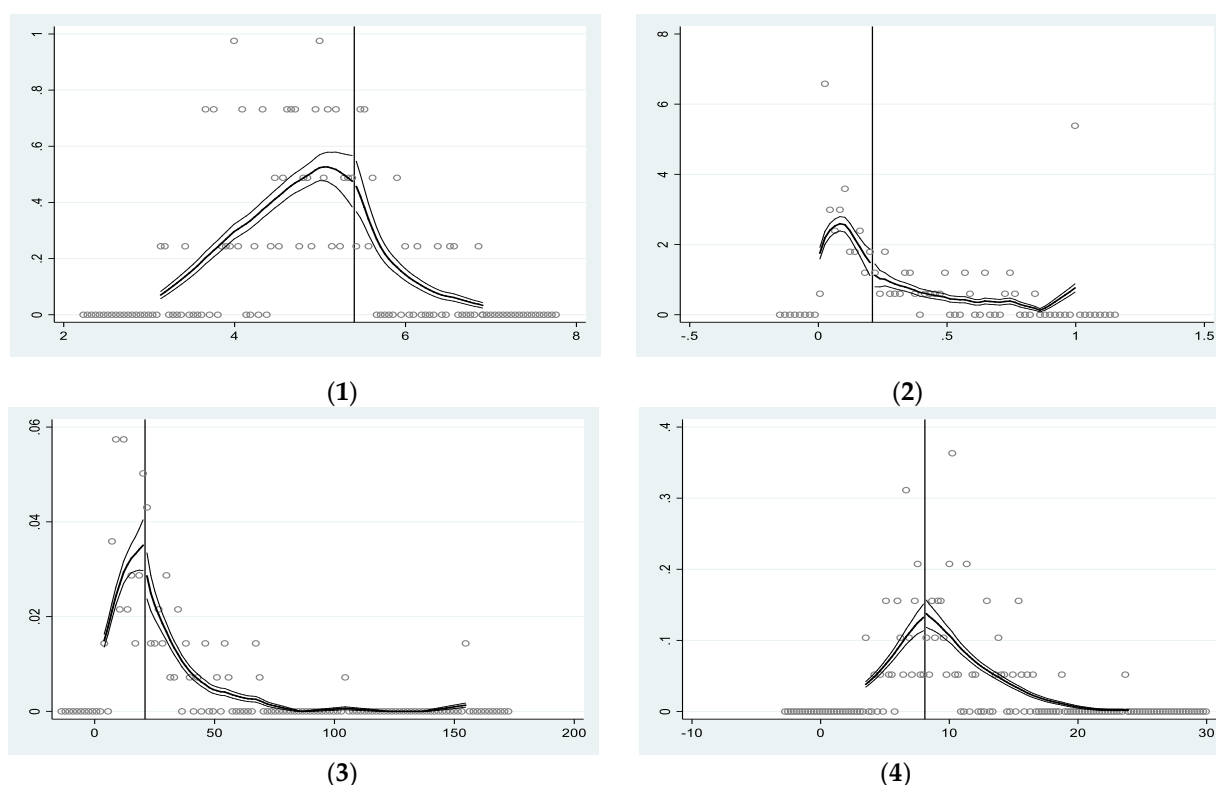


## Supplementary Materials

Because the research methods used in this paper are different from the past, we used McCrary Model to test the rationality of regression discontinuity method in this paper [1]. And the validity of the previous regression results was verified by robust-ness test and placebo test. The influence of nature, environment, and society on the implementation of “River Chief System” (RCS) is excluded by adding control variables. Second, we verify the results with different bandwidths [2]. We then verified the validity of the discontinuity selected in this paper by selecting different discontinuity points through the placebo test [3,4]. Due to the limitation of the length of the article, we have included the McCrary test, robustness test, and placebo test in this section.

### 1. McCrary Test

We think it is necessary to analyze the scientific nature of the regression discontinuity. Through the regression analysis of McCrary model [1], it was designed to verify that the use of the regression discontinuity method in this paper is suitable and reasonable in terms of measurement. The test results of river length, the proportion of the river length, per capita environmental expenditure, and per capita sewage discharge are shown in (1)–(4) of Figure S1, respectively.



**Figure S1.** McCrary test. River length, the proportion of the river length, per capita environmental expenditure, and per capita sewage discharge (1)–(4).

The estimated coefficients of river length, the proportion of the river length, per capita environmental expenditure, and per capita sewage discharge are 0.02, −0.17, −0.14, and 0.04, respectively, while the standard error is 0.15, 0.23, 0.13, and 0.1, respectively. The hypothesis that the density function is continuous at the breakpoint is acceptable for all four variables. It can be seen from the figure that the confidence intervals of the estimated density functions on both sides of the discontinuity point are largely overlapping, so the density functions on both sides of the discontinuity point are significantly different.



Note: This table reports the estimates of eight regressions, two different bandwidths are selected for regression. \*\*\*, \*\* and \* are significant at 1%, 5% and 10% levels. The standard error in brackets passed the robustness test, heteroscedasticity test and independence test.

The robustness test verified that the results of the regression discontinuity are reliable, river length, proportion of the river length, per capita environmental expenditure, and per capita sewage discharge significantly affect the governance effect of RCS, in which river length and per capita sewage discharge are inversely proportional to the governance effect of RCS, proportion of the river length and per capita environmental expenditure is directly proportional to the governance effect of RCS. On the other hand, the test also proved that the control variables (covariables) we selected were also significantly effective. The hypothesis in this paper was also verified by controlling other covariables, and the regression results above were further interpreted and verified.

We selected two new discontinuities as the placebo test [3,4], in order to further verify the reliability of our choice of breakpoints by negating other discontinuities. The results of the placebo test are shown in Table S3. All of the four estimates failed to pass the effective significance when other discontinuities were set up. Therefore, it can be confirmed that the discontinuities selected in this paper are valid.

**Table S3.** Placebo test results (select different time as break points).

Estimator	CWQ		DO		COD <sub>Mn</sub>		N – NH <sub>3</sub>	
Different discontinuities	D1	D2	D1	D2	D1	D2	D1	D2
AS	−0.20 (0.18)	−0.38 (0.78)	0.16 (0.39)	1.23 (1.31)	0.25 (0.38)	−0.03 (1.24)	−0.06 (0.05)	0.32 (0.53)
AC	−0.22 (0.23)	0.23 (0.19)	−0.38 (0.47)	1.70 (0.64)	0.10 (0.30)	−0.18 (0.41)	−0.02 (0.08)	−0.15 (0.11)
ESC	−0.37 (0.32)	0.63 (0.43)	−0.2 (0.55)	−0.70 (0.93)	−0.14 (0.38)	1.41 (0.95)	0.08 (0.40)	−0.66 (0.41)
EP	−0.05 (0.14)	0.26 (0.25)	−0.20 (0.61)	−0.27 (0.43)	0.65 (0.40)	0.63 (0.79)	0.05 (0.09)	−0.04 (0.08)
Covariables	No	No	No	No	No	No	No	No
N	1032	1032	1032	1032	1032	1032	1032	1032

Note: This table reports the estimates of eight regressions, two different discontinuities are selected for regression. \*\*\*, \*\* and \* are significant at 1%, 5% and 10% levels. The standard error in brackets passed the robustness test, heteroscedasticity test and independence test.

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