Content

Exclusion of AVMR for Pollutants 2
Placebo test 2
Alter fixed effects and clustered levels 2
Estimator for average treatment effects 3
Replace independent variable 3
Excluding policy interference 3
Sensitivity analysis 4
Robust Estimation of Staggered DID 4
Supplementary Tables 4
Supplementary Figures 8
Supplementary References 11

Supplementary Notes

Exclusion of AVMR for Pollutants

The lack of a significant effect of AVMR on PEC in the later stages may be attributed to its impact on pollutant emissions. AVMR may change environmental conditions, thereby changing the public's perception of the environmental conditions and impacting PEC. Previous studies provide evidence that pollutant emissions influence PEC. Hence, we investigate the impact of AVMR on the emissions of various pollutants. In contrast to the results presented by Cao et al. (2022b) [1], we conclude that AVMR does not on significant pollution emissions. As shown in columns (1)-(4) of Supplementary Table 3, we examine the effect of AVMR on centralized wastewater treatment rates, industrial soot emissions, per capita carbon dioxide emissions, and air quality, respectively. The results indicate that AVMR did not significantly affect any of these indicators.

Placebo test

We employ placebo tests to address the impact of non-randomized policy pilot selection on the results. Initially, we conduct 500 and 1000 resets for each of the 76 policy pilot cities, as illustrated in (a) and (b) of Supplementary Fig. 4. Subsequently, we carry out 500 and 1,000 resets for the policy pilot time, depicted in (c) and (d) of Supplementary Fig. 4. The results indicate that the regression coefficients adhere to a normal distribution, clustering around the zero point. Additionally, most p-values are not statistically significant, reinforcing the aforementioned findings' robustness.

Alter fixed effects and clustered levels

We employ fixed effects at high latitudes and multidimensional interaction clustering standard errors based on the baseline regression to alleviate the problem of omitted variables at high latitude latitudes in the original model. Supplementary Fig. 5. shows that AVMR is still on PEC after accounting for high-dimensional fixed effects and clustering.

Estimator for average treatment effects

In addition to relaxing the assumption of homogeneous treatment effects in traditional fixed-effects models and the inference of stable control variables, we additionally estimate the average treatment effects of AVMR using Regression Adjustment (RA), Inverse Probability Weighting (IPW), Augmented Inverse Probability Weighting (AIPW), and Inverse Probability Weighted Regression Adjustment (IPWRA) estimators [2-4]. The results in Supplementary Table 4 demonstrate that AVMR significantly positively affects PEC.

Replace independent variable

We adopt the approach of replacing independent variables to mitigate the impact of the calculation method for independent variables on the results. As shown in columns (1)-(4) of Supplementary Table 5, the independent variables are the search index of "environmental pollution" of cell phones (PEC_M), the search index of "environmental pollution" of PC (PEC_P), the haze search index (PECW), the haze search index of cell phones (PECW_M) and the haze search index of PC (PECW_P). The results indicate a significant positive effect of AVMR on PEC.

Excluding policy interference

Other concurrent environmental policies may influence AVMR's impact on PEC. Studies have confirmed that the new energy model city pilot program, central environmental protection inspections, and carbon emissions trading pilot policies positively impact public environmental awareness, green consumption, corporate social responsibility, government environmental governance, and pollution reduction [5-10]. Hence, the mentioned policies may impact PEC. We include dummy variables to mitigate the policies' interference with the benchmark results. The results in Supplementary Table 6 indicate that AVMR maintains a significant positive effect on PEC even when accounting for the aforementioned environmental policies.

Sensitivity analysis

Following the approach of Rambachan and Roth (2023), we conduct a sensitivity analysis on parallel trends [11]. Following the methodology of Biasi and Sarsons (2020), we choose standard errors with a maximum degree of deviation (Mbar) doubled [12]. Supplementary Fig. 6. presents the results of the treatment effects in the second and third years after policy implementation at the 90% confidence level under the bounds on relative magnitudes and the smoothing restriction, respectively. The results exhibit a degree of robustness.

Robust Estimation of Staggered DID

We re-estimate the synergistic effect using the estimators proposed by Abraham and Sun (2018) and Cengiz et al. (2019) [13, 14]. Supplementary Fig. 7. shows that the synergistic effect of AVMR and PILR promote PEC for a longer time than AVMR alone.

Supplementary Tables

Supplementary Table 1. Control variables for Eq.(3)

Control variable	Symbol	Definition
Financial leverage	lev	Formula: total liability/Total assets
Enterprise size	size	Natural logarithm of total assets at the end of the period
Financial performance	ROA	Formula: net profit/Average balance of total assets
Growth capacity	growth	Year-on-year growth rate of operating income
Duality of COB and CEO	dual	Whether the chairman and general manager of the enterprise are the same person
Number of employees	staff	Natural logarithm of number of employees
Management remuneration	bonus	Natural logarithm of total management remuneration
Board size	lnbos	Natural logarithm of the number of board members
Shareholding concentration	Top10	Shareholding of top ten shareholders

Supplementary Table 2. EID index system

First-level	Second-level indicators	Third-level indicators

indicators		
Soft disclosures	The EID carrier	Annual report of listed companies
		Social responsibility report
		Environmental report
	Environmental management disclosure	Environmental protection concept
		Environmental goals
		Environmental protection management system
		Environmental education and training
		Environmental protection special action
		Emergency mechanism for environmental incidents
		Environmental honors or awards
		“Three Simultaneties” system
Hard disclosures	Environmental regulation and certification disclosure	Pollutant discharges up to standard
		Key pollution monitoring units
		Sudden environmental accident
		Environmental violations
		Environmental petition cases
		Have you passed ISO14001 certification
		Have you passed ISO9001 certification
	Disclosure of environmental liabilities	Wastewater discharge
		COD emission
		CO2 emission
		Smoke and dust emission
		SO2 emission
		Production of industrial solid waste
	Environmental performence and goverance disclosure	Emission reduction and treatment
		Wastewater emission reduction and treatment
		Dust and smoke control
		Utilization and disposal of solid waste
		Noise,light pollution and radiation

		control
		Implementation of cleaner production

Notes: Assigned a value of 0 for non-disclosure, 1 for qualitative description, and 2 for quantitative description.

Supplementary Table 3. Estimation results of Auditing Vertical Management Reform's effects on pollutants

VARIABLES	CST	ISD	perCO2	AQ
	(1)	(2)	(3)	(4)
did	0.746	0.136	-0.099	0.017
	(0.57)	(1.51)	(-0.60)	(1.10)
Controls	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
City FE	YES	YES	YES	YES
Observations	1,971	2,020	2,027	1,476
R-squared	0.332	0.021	0.698	0.504

Notes: t-values in parentheses. Significance levels: ***p < 0.01, **p < 0.05, *p < 0.1. The coefficients of control variables are not reported to save space.

Supplementary Table 4. Results of estimators for average treatment effects

VARIABLES	PEC				
	FE	RA	IPW	AIPW	IPWRA
	(1)	(2)	(3)	(4)	(5)
ATT	0.322**	1.532***	1.532***	1.532***	1.532***
	(2.11)	(4.26)	(4.26)	(4.26)	(4.26)
Controls	YES	YES	YES	YES	YES
Observations	2,028	2,621	2,621	2,621	2,621

Notes: z-values in parentheses. Significance levels: ***p < 0.01, **p < 0.05, *p < 0.1.

Supplementary Table 5 Estimation results of replacing independent variables

VARIABLES	PEC_M	PEC_P	PECW	PECW_M	PECW_P
	(1)	(2)	(3)	(4)	(5)
did	0.229***	0.122***	0.116***	0.174***	0.218***
	(3.11)	(3.26)	(3.19)	(2.85)	(6.39)
Controls	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
City FE	YES	YES	YES	YES	YES

Observations	2,028	2,028	2,028	2,028	2,028
R-squared	0.818	0.705	0.961	0.925	0.933

Notes: t-values in parentheses. Significance levels: ***p < 0.01, **p < 0.05, *p < 0.1. The coefficients of control variables are not reported to save space.

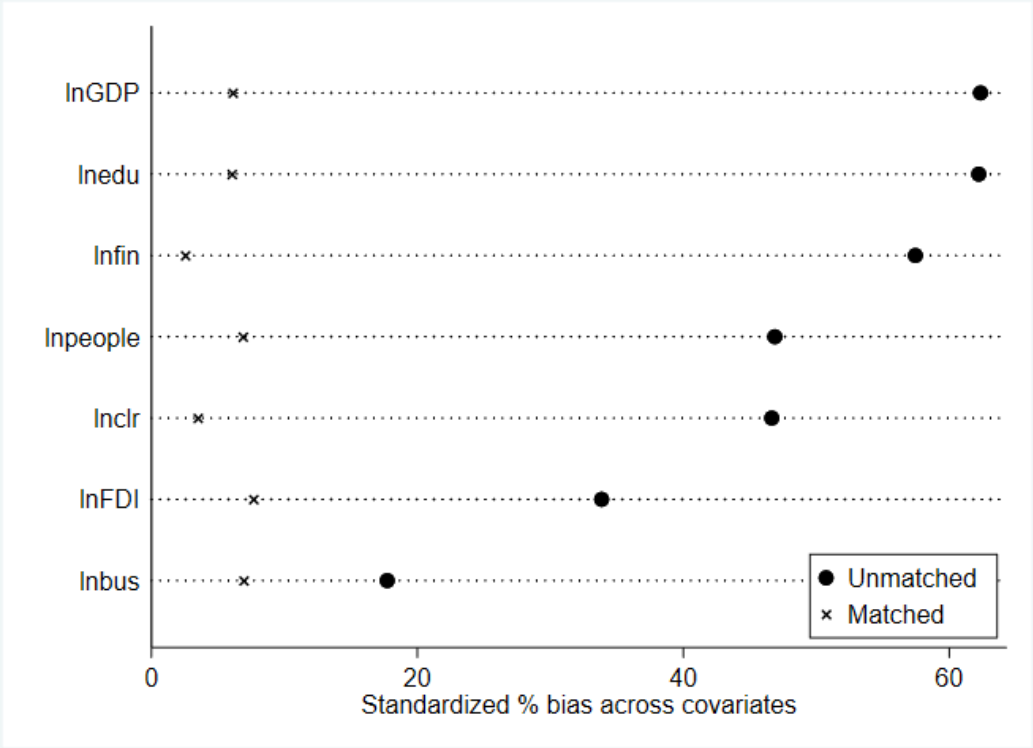
Supplementary Table 6. Estimation results of excluding policy interference

VARIABLES	PEC		
	(1)	(2)	(3)
did	0.324**	0.323**	0.330**
	(2.12)	(2.12)	(2.17)
NEDC	-0.062		
	(-0.34)		
CEPI		0.134*	
		(1.94)	
CET			0.121
			(0.60)
Controls	YES	YES	YES
Year FE	YES	YES	YES
City FE	YES	YES	YES
Observations	2,028	2,028	2,028
R-squared	0.253	0.254	0.254

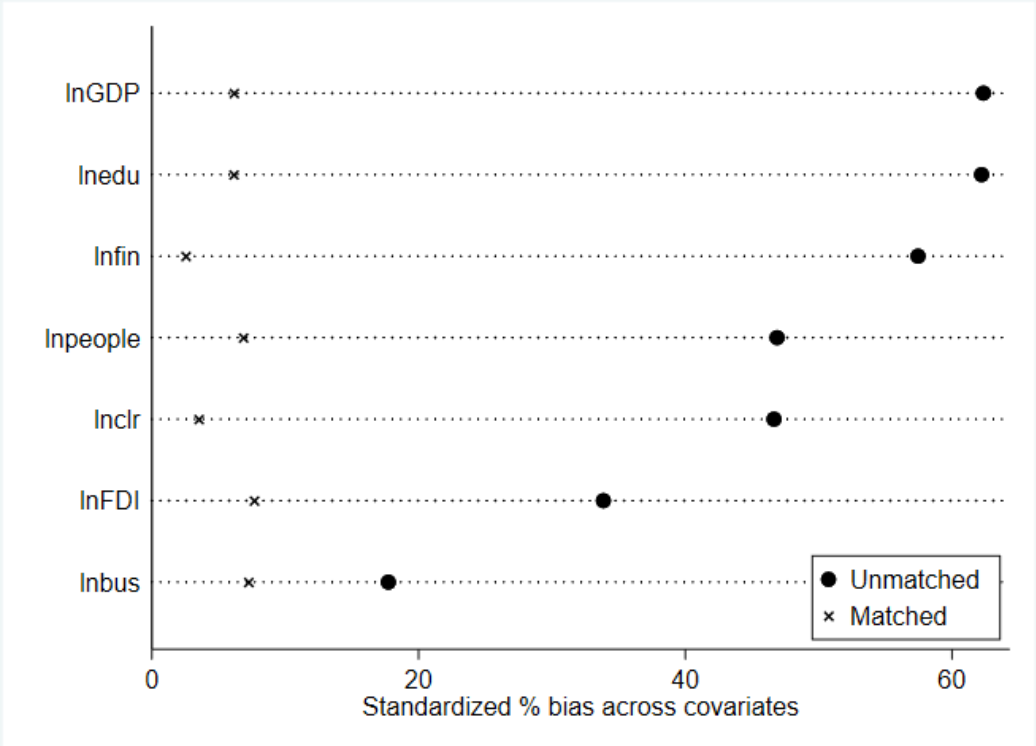
Notes: t-values in parentheses. Significance levels: ***p < 0.01, **p < 0.05, *p < 0.1. The coefficients of control variables are not reported to save space.

Supplementary Figures

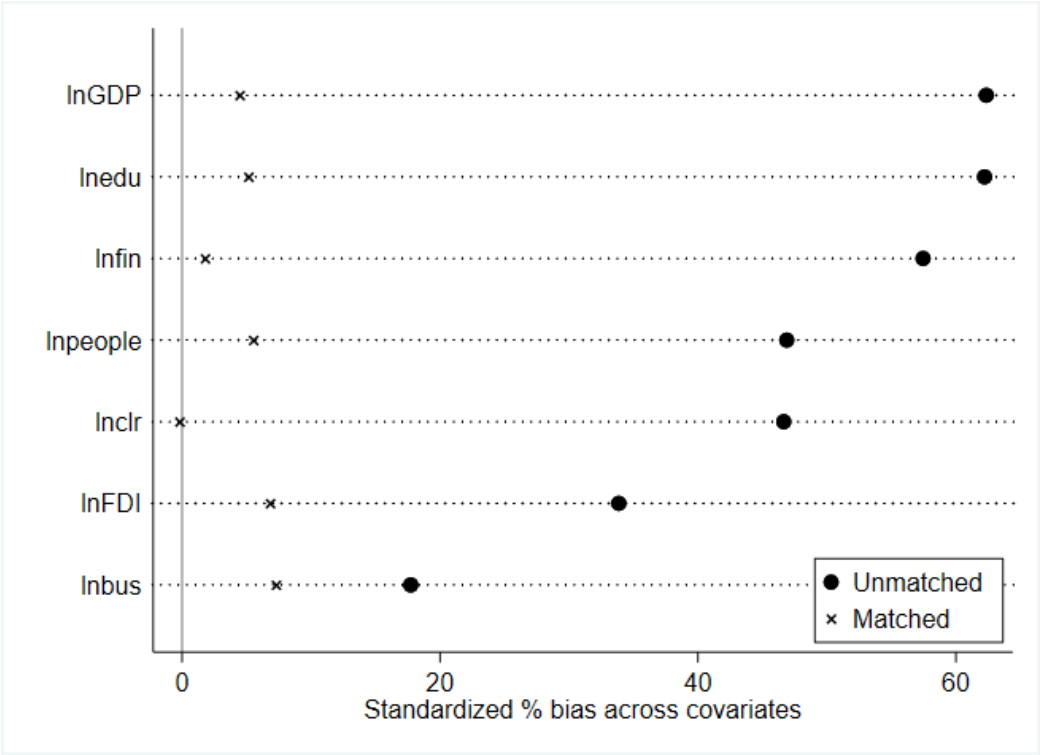
Supplementary Fig. 1. Balance test for radius matching



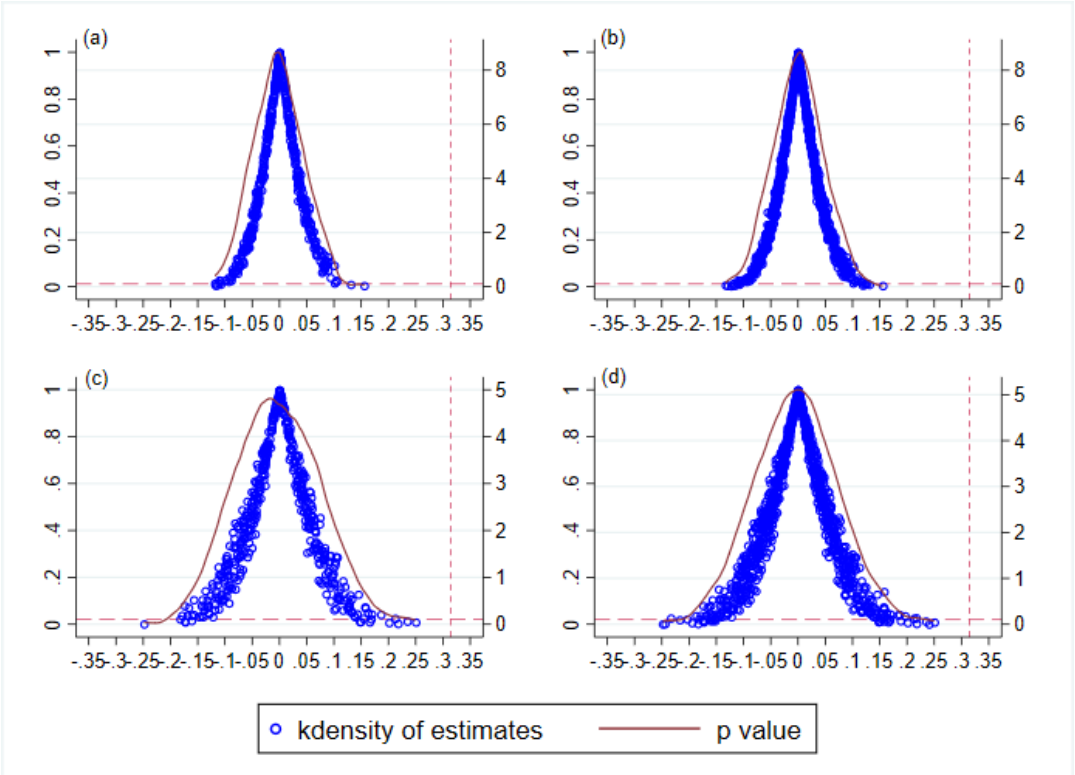
Supplementary Fig. 2. Balance test for kernel matching



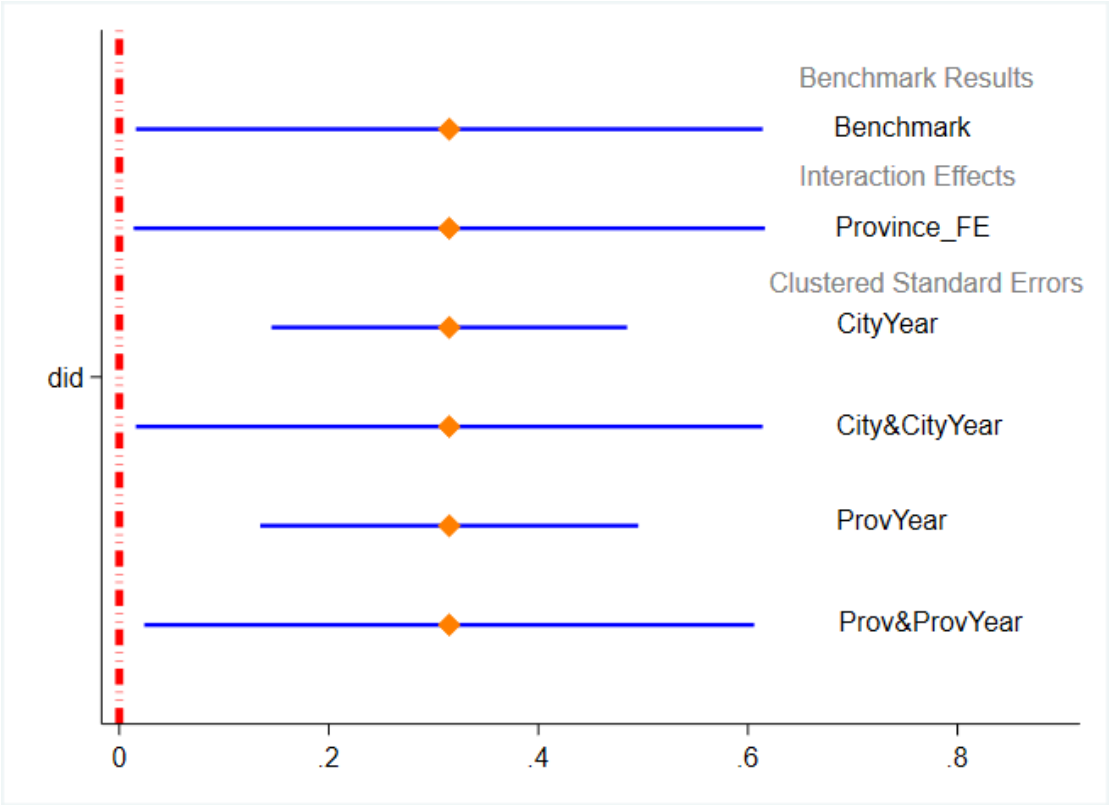
Supplementary Fig. 3. Balance test for caliper matching



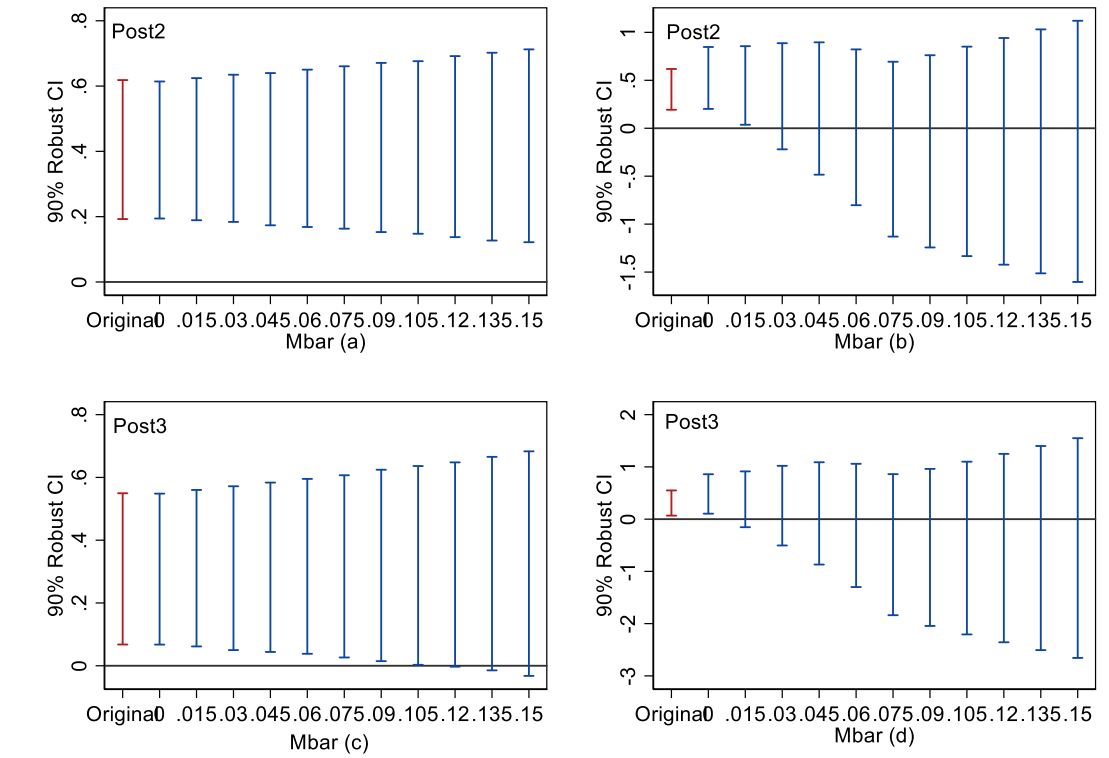
Supplementary Fig. 4. Placebo test



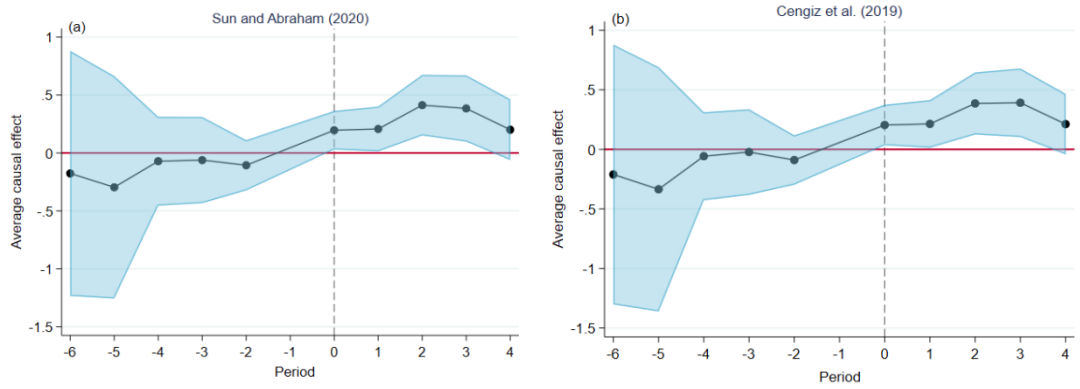
Supplementary Fig. 5. High-dimensional fixed effects and clustering levels



Supplementary Fig. 6. Sensitivity analysis



Supplementary Fig. 7. Robust Estimation of Staggered DID



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