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Research article

Climate risk and renewable energy development: the non-linear moderating role of institutional environment

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Supplementary

Appendix

Table A.1. Definitions and sources of variables.

Variables	Definition	Sources
Dependent variable		
REE	Renewable energy development, renewable power electricity generation (Gwh)	International Renewable Energy Agency (IRENA)
Explanatory variable		
CMV	Climate risk, Climate vulnerability (ND vulnerability Index)	Notre Dame Global Adaptation Index
Threshold variables		
CR	National institutional environment, Composite Risking Rating (Scores with a range from 0 to 100)	International Country Risk Guide (ICRG)
ER	Economic institutional environment, Economic Risk Rating (Scores with a range from 0 to 50)	International Country Risk Guide (ICRG)
FR	Financial institutional environment, Financial Risk Rating (Scores with a range from 0 to 50)	International Country Risk Guide (ICRG)

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Variables	Definition	Sources
Dependent variable		
PRR	Political institutional environment, Political Risk Rating (Scores with a range from 0 to 100)	International Country Risk Guide (ICRG)
Control variables		
LGDP	GDP (current US$)	World Development Indicators (WDI)
FDI	Foreign direct investment, net outflows (% of GDP)	World Development Indicators (WDI)
LCOE	Carbon dioxide (CO_2) emissions (total) excluding LULUCF (Mt CO_2e)	World Development Indicators (WDI)
COAL	Coal (quad Btu)	Energy Information Administration (EIA)

Table A.2. Replacement of the dependent variable.

Dependent variable	RED							
Threshold variables	CR		ER		FR		PRR	
Regimes	Low-Regime	High-Regime	Low-Regime	High-Regime	Low-Regime	High-Regime	Low-Regime	High-Regime
Models	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CMV	−0.1290***	0.0010	−0.1339***	0.0006	−0.1342***	0.0152***	−0.1053***	−0.1574***
	(−7.7761)	(0.1399)	(−8.3996)	(0.1294)	(−8.3528)	(3.1980)	(−6.1670)	(−3.4083)
$RED_{i,t-1}$	0.0342**	0.1399***	0.0672***	0.0875	0.0462***	0.1560***	0.1606***	−0.1833**
	(1.9851)	(4.9128)	(3.2636)	(3.4065)	(3.0677)	(4.1049)	(6.2915)	(−2.5379)
Controls Included	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1955		1955		1955		1955	
Location parameters, c	4.1835		3.5507		3.5997		4.4829	
Slope parameters, γ	71.7491		130.1348		32.5793		9.8423	

Notes: ***, **, and * indicate the 1%, 5%, and 10% significance levels, respectively. The T-statistic are in parentheses.

Table A.3. Exclusion of the effects of the COVID-19.

Dependent variable	RED							
Threshold variables	CR		ER		FR		PRR	
Regimes	Low-Regime	High-Regime	Low-Regime	High-Regime	Low-Regime	High-Regime	Low-Regime	High-Regime
Models	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CMV	-0.0945^{***}	-0.0079	-0.1016^{***}	-0.0299	-0.1095^{***}	0.0144^{***}	-0.0835^{***}	-0.0626
	(−5.0216)	(−0.9043)	(−5.2569)	(−4.3205)	(−5.9733)	(3.3607)	(−4.2448)	(−1.6083)
$RED_{i,t-1}$	0.0284^{*}	0.0660^{***}	0.0673^{***}	0.0161	0.0321^{**}	0.0826^{***}	0.1003^{***}	-0.1039^{**}
	(1.8847)	(2.9875)	(4.6245)	(0.7136)	(2.4838)	(2.9432)	(5.4970)	(−2.5909)
Controls Included	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1785		1785		1785		1785	
Location parameters, c	4.1847		3.6359		3.5886		4.4314	
Slope parameters, γ	38.2631		153.5509		33.5764		11.3110	

Notes: ***, **, and * indicate the 1%, 5%, and 10% significance levels, respectively. The T-statistic are in parentheses

Table A.4. CMV lagged one period regression results.

Dependent variable	RED							
Threshold variables	CR		ER		FR		PRR	
Regimes	Low-Regime	High-Regime	Low-Regime	High-Regime	Low-Regime	High-Regime	Low-Regime	High-Regime
Models	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L.CMV	-0.1068^{***}	-0.0027	-0.1163^{***}	0.0062	-0.1174^{***}	0.0130^{***}	-0.0948^{***}	-0.0918^{**}
	(−5.8075)	(−0.3603)	(−6.3467)	(1.4808)	(−6.4107)	(3.1947)	(−4.8701)	(−2.3446)
$RED_{i,t-1}$	0.0298^{*}	0.0815^{***}	0.0451^{***}	0.0619^{***}	0.0397^{***}	0.0942^{***}	0.1184^{***}	-0.1434^{***}
	(1.9525)	(3.7582)	(2.6989)	(3.0298)	(2.9287)	(3.2650)	(6.1521)	(−3.1693)
Controls Included	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1955		1955		1955		1955	
Location parameters, c	4.1793		3.5356		3.5934		4.4507	
Slope parameters, γ	68.8206		121.2242		41.5800		11.9302	

Notes: ***, **, and * indicate the 1%, 5%, and 10% significance levels, respectively. The T-statistic are in parentheses.

Table A.5. Two-step system GMM estimates of the dynamic quadratic model.

Variables	(1) Coefficients	(2) p-value
L.RED	0.942***	0.000
CMV	−0.082**	0.014
CMV^2	0.001**	0.028
LGDP	0.025	0.236
FDI	−0.000	0.605
LCOE	0.000	0.103
COAL	−0.001	0.480
Constant	1.745**	0.044
Observations	1,870	
Number of countries	85	
AR (1) test	−4.155	0.000
AR (2) test	−0.045	0.964
Sargan test	176.81	0.000
Hansen test	78.42	0.891

Notes: This table reports the estimation results of the Syst-GMM estimator. The AR(1) and AR(2) tests for autocorrelation have a null hypothesis of no autocorrelation, while the Sargan-Hansen test has the null hypothesis that the model and overidentifying conditions are correct specified with pvalues. ***, **, and * stand for 1%, 5%, and 10% significant level, respectively