

Institutions' quality and environmental pollution in Africa

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ONLINE APPENDIX

Table A1. Summary statistics

Variables	Obs.	Mean	Std. Dev.	Min	Max
ln(CO2 metric tons per capita)	1,087	1.2392	1.968262	0.0217895	9.985813
ln(realgdppc2015)	1,098	7.239212	1.026276	5.458347	9.725995
Industrialization	1,094	10.92507	6.383108	0.2326077	49.87942
Natural resource rents	1,087	11.43422	11.78323	0.0023598	88.59235
Energy intensity	1,079	6.607884	3.933727	1.030000	26.91
Internet	1,076	10.85336	16.21787	0	84.12036
Trade openness	1,085	56.70088	29.99614	12.71291	263.3339
Polity2	1,115	1.736607	5.087595	-7	10
Control of corruption	1,089	-0.5907948	0.6161149	-1.848734	1.420243
Political stability	1,089	-0.5069209	0.8892792	-3.312951	1.283142
Rule of law	1,089	-0.6750714	0.6572977	-2.590877	1.023956
Regulatory quality	1,089	-0.6637407	0.6681563	-2.547726	1.196947
Voice and accountability	1,089	-0.5910421	0.733785	-2.226054	1.007172
Government effectiveness	1,091	-0.6864513	0.6330635	-2.445096	1.16092
Governance index	1,091	-0.6190035	0.6208872	-2.410851	0.8757154

Source: Authors.

Table A2. Correlation matrix

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
ln(CO2 metric tons per capita)	(1)	1.0000															
ln(real GDPPC)	(2)	0.7833	1.0000														
ln(real GDPPC) squared	(3)	0.7586	0.9978	1.0000													
Industrialization	(4)	0.2313	0.2859	0.2926	1.0000												
Natural resource rents	(5)	0.3262	0.1582	0.1323	-0.1004	1.0000											
Energy intensity	(6)	-0.2287	-0.5229	-0.5374	-0.0805	-0.0001	1.0000										
Internet	(7)	0.3481	0.5108	0.5145	0.1658	-0.2292	-0.3053	1.0000									
Trade openness	(8)	0.2651	0.4205	0.4253	0.0537	0.1117	-0.1564	0.2425	1.0000								
Polity2	(9)	-0.1095	0.0244	0.0381	0.0898	-0.2920	-0.0514	0.0400	0.0580	1.0000							
Control of corruption	(10)	-0.1816	0.2873	0.2896	0.1451	-0.5009	-0.2543	0.2656	0.2403	0.2052	1.0000						
Political stability	(11)	-0.2730	0.4305	0.4275	0.0767	-0.2404	-0.2519	0.1617	0.3555	0.3177	0.6129	1.0000					
Rule of law	(12)	-0.2432	0.4148	0.4166	0.1947	-0.4766	-0.3325	0.3457	0.2218	0.2708	0.8765	0.6915	1.0000				
Regulatory quality	(13)	0.1695	0.3402	0.3465	0.1394	-0.5109	-0.3640	0.2771	0.0850	0.3015	0.8092	0.5877	0.8860	1.0000			
Voice and accountability	(14)	-0.0626	0.1701	0.1810	0.1045	-0.5516	-0.1575	0.2159	0.0895	0.3708	0.6833	0.5262	0.7611	0.7547	1.0000		
Government effectiveness	(15)	0.3099	0.4795	0.4845	0.2824	-0.4869	-0.3169	0.3584	0.1832	0.2452	0.8429	0.5766	0.8973	0.8680	0.6739	1.0000	
Governance index	(16)	-0.2359	0.4037	0.4079	0.1725	-0.5151	-0.3144	0.3006	0.2305	0.3305	0.9022	0.7780	0.9604	0.9178	0.8319	0.9058	1.0000

Source: Authors.

Table A3. Variance inflation factor (VIF) test

	VIF	1/VIF	VIF	1/VIF	VIF	1/VIF	VIF	1/VIF
	Control of corruption		Political stability		Rule of law		Regulatory quality	
ln(real GDPPC)	2.49	0.401912	2.83	0.353918	2.70	0.369853	2.66	0.375440
Natural resource rents	1.96	0.511404	1.57	0.637821	1.94	0.516676	1.98	0.504664
Internet	1.60	0.625563	1.68	0.594720	1.59	0.629558	1.61	0.623024
Energy intensity	1.43	0.698080	1.42	0.706093	1.44	0.695522	1.48	0.674201
Trade openness	1.31	0.765514	1.33	0.753071	1.26	0.792325	1.25	0.801785
Industrialization	1.14	0.879052	1.16	0.864995	1.14	0.879035	1.14	0.876467
Polity2	1.12	0.894477	1.19	0.839853	1.14	0.881035	1.15	0.869845
Control of corruption	1.75	0.572663						
Political stability			1.71	0.583981				
Rule of law					2.00	0.501219		
Regulatory quality							1.98	0.505163
Voice and accountability								
Government effectiveness								
Governance index								
Mean VIF	1.60		1.61		1.65		1.66	

Table A3. Variance inflation factor (VIF) test (continued)

	VIF	1/VIF	VIF	1/VIF	VIF	1/VIF
	Voice & accountability		Government effectiveness		Governance index	
ln(real GDPPC)	2.46	0.407301	3.09	0.323409	2.86	0.350201
Natural resource rents	1.89	0.529137	2.13	0.470166	2.15	0.465639
Internet	1.59	0.628952	1.60	0.623951	1.62	0.616350
Energy intensity	1.42	0.705674	1.42	0.704703	1.43	0.698965
Trade openness	1.25	0.801207	1.25	0.802671	1.27	0.786973
Industrialization	1.14	0.876937	1.15	0.870991	1.14	0.877663
Polity2	1.19	0.841140	1.13	0.888674	1.16	0.859826
Control of corruption						
Political stability						
Rule of law						
Regulatory quality						
Voice and accountability	1.72	0.581504				
Government effectiveness			2.32	0.43046		
Governance index					2.24	0.445936
Mean VIF	1.58		1.76		1.73	

Source: Authors.

Table A4. Cross-sectional dependence (CSD) and unit root tests

	CSD test	Unit root tests	
	Pesaran (2015, 2021)	Breitung lambda stat	Pesaran (2007) Zt-bar
ln(CO2 metric tons per capita)	33.93*** (0.000)	-0.774 (0.278)	0.152 (0.225)
ln(real GDPPC)	59.94*** (0.000)	0.085 (0.457)	0.028 (0.526)
ln(real GDPPC) squared	60.00*** (0.000)	0.967 (0.634)	-0.781 (0.157)
Industrialization	58.91*** (0.000)	0.081 (0.448)	0.024 (0.498)
Natural resource rents	28.03*** (0.000)	-1.950** (0.045)	-2.955*** (0.005)
Energy intensity	113.34*** (0.000)	-1.778** (0.047)	-1.637** (0.039)
Internet	137.24*** (0.000)	-1.615** (0.049)	-1.881** (0.041)
Trade openness	76.21*** (0.000)	-0.471 (0.356)	-1.719** (0.044)
Polity2	8.81*** (0.000)	-3.238*** (0.000)	-4.012*** (0.000)
Control of corruption	-0.78 (0.434)	-4.376*** (0.000)	-5.657*** (0.000)
Political stability ...	-0.90 (0.369)	-3.968*** (0.000)	-4.845*** (0.000)
Rule of law	-1.58 (0.115)	-5.217*** (0.000)	-7.563*** (0.000)
Regulatory quality	-0.94 (0.361)	-6.257*** (0.000)	-3.820*** (0.000)
Voice and accountability	1.13 (0.258)	-5.247*** (0.000)	-4.333*** (0.000)
Government effectiveness	5.52*** (0.000)	-3.455*** (0.000)	-3.199*** (0.000)
Governance index	-0.39 (0.693)	-3.012*** (0.000)	-5.786*** (0.000)

Source: Authors.

Table A5. The political regime characteristics on CO2 emissions

	Dependent variable: CO2 emissions (metric tons per capita, in log)					
	Autocracy		Anocracy		Democracy	
Lagged dep. var.	0.217 (0.0764)	0.175 (0.100)	0.526 (0.0231)	0.339 (0.0284)	0.645 (0.0286)	0.620 (0.0370)
ln(GDPPC)	6.730 (2.078)	5.666 (4.667)	3.686 (0.287)	6.078 (0.523)	4.336 (0.545)	3.786 (0.773)
ln(GDPPC) squared	-23.37 (8.825)	-13.34 (20.60)	-11.50 (0.990)	-19.81 (1.949)	-14.37 (2.018)	-11.37 (2.863)
Industrialization		0.0410 (0.0258)		0.0141 (0.00304)		0.00534 (0.00415)
Natural resource rents		0.00270 (0.00922)		0.00169 (0.00152)		0.000285 (0.00349)
Energy intensity		0.158 (0.133)		0.0201 (0.00948)		0.0459 (0.0140)
Internet		-0.0177 (0.00783)		-0.00278 (0.000712)		-0.00197 (0.000871)
Trade openness		0.0177 (0.00981)		0.00247 (0.000647)		0.000591 (0.000711)
Governance index	-0.0818 (0.224)	-1.191 (0.552)	0.0934 (0.0493)	-0.270 (0.0690)	-0.0267 (0.0604)	-0.0736 (0.0734)
Observations	99	87	915	710	432	353
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of instruments	11	14	33	34	25	36
Number of countries	15	15	42	42	41	41
AR1 p-value	0.000	0.006	0.000	0.006	0.000	0.000
AR2 p-value	0.865	0.575	0.022	0.044	0.386	0.033
Hansen p-value	0.553	0.235	0.466	0.264	0.371	0.566
DHT for instruments						
(a) In level						
Hansen excluding groups	0.388	0.782	0.636	0.445	0.876	0.493

Diff(null H=exogenous)	0.470	0.545	0.542	0.267	0.583	0.377
(b) iv(years, eq(d))						
Hansen excluding groups	0.558	540.009	0.673	0.386	0.704	0.553
Diff(null H=exogenous)	0.690	0.594	0.467	0.272	0.362	0.666

Notes: Standard errors in parentheses.

Source: Authors.

Table A6. The governance index characteristics on CO2 emissions

	Dependent variable: CO2 emissions (metric tons per capita, in log)			
	Negative governance index		Positive governance index	
Lagged dep. var.	0.0427 (0.0313)	0.324 (0.0344)	0.730 (0.0611)	0.641 (0.0734)
ln(GDPPC)	3.508 (0.331)	5.199 (0.520)	2.412 (2.240)	3.476 (2.583)
ln(GDPPC) squared	-9.821 (1.147)	-16.26 (1.939)	-7.778 (9.322)	-12.64 (10.74)
Industrialization		-0.0229 (0.00328)		0.00542 (0.0151)
Natural resource rents		-0.00143 (0.00152)		0.0145 (0.0153)
Energy intensity		-0.00741 (0.0103)		0.204 (0.0796)
Internet		-0.00594 (0.000988)		0.00632 (0.00298)
Trade openness		0.00242 (0.000614)		0.00262 (0.00211)
Polity2	-0.0243 (0.00456)	-0.00203 (0.000619)	-0.0350 (0.272)	-0.00452 (0.001152)
Observations	811	801	260	270
Time fixed effects	Yes	Yes	Yes	Yes
Number of instruments	22	40	10	14
Number of countries	35	35	15	15
AR1 p-value	0.000	0.000	0.000	0.000
AR2 p-value	0.352	0.157	0.736	0.239
Hansen p-value	0.563	0.661	0.620	0.674
DHT for instruments				
(a) In level				
Hansen excluding groups	0.636	0.507	0.337	0.525
Diff(null H=exogenous)	0.527	0.721	0.428	0.756
(b) iv(years, eq(d))				
Hansen excluding groups	0.744	0.624	0.322	0.434
Diff(null H=exogenous)	0.543	0.720	0.430	0.527

Notes: Standard errors in parentheses.

Source: Authors.

Table A7. Subregional heterogeneity (pooled OLS estimates)

	Dependent variable: CO2 emissions (metric tons per capita, in Log)									
	Eastern Africa		Central Africa		Northern Africa		Southern Africa		Western Africa	
ln(GDPPC)	5.229 (0.130)	5.630 (0.209)	11.51 (0.761)	13.14 (0.797)	27.59 (3.387)	41.41 (6.323)	25.49 (7.635)	-7.557 (6.232)	-0.543 (0.377)	-0.693 (0.519)
ln(GDPPC) squared	-15.91 (0.447)	-17.09 (0.681)	-38.34 (2.835)	-43.99 (3.069)	-100.8 (14.24)	-158.4 (25.59)	-84.63 (29.27)	45.13 (23.97)	3.210 (1.289)	3.729 (1.786)
Industrialization		0.0101 (0.00505)		0.0212 (0.00756)		0.00946 (0.0111)		0.00757 (0.0178)		0.00761 (0.00147)
Natural resource		0.00341 (0.00227)		0.00532 (0.00498)		0.0235 (0.0109)		0.0571 (0.0276)		0.00270 (0.00169)
Energy intensity		0.0191 (0.00349)		0.0207 (0.0393)		0.697 (0.103)		0.661 (0.0639)		0.0118 (0.00374)
Internet		-0.00170 (0.00195)		-0.0126 (0.00386)		-0.00109 (0.00252)		0.0165 (0.00624)		0.00101 (0.00108)
Trade openness		-0.00140 (0.000888)		-0.00791 (0.00303)		0.0135 (0.00656)		-0.0161 (0.00247)		0.00124 (0.000819)
Polity2	-0.0111 (0.00213)	-0.000115 (0.000611)	-0.154 (0.0202)	-0.0732 (0.0247)	0.0168 (0.0125)	-0.00044 (0.00145)	0.871 (0.129)	0.299 (0.0516)	-0.00444 (0.00156)	-0.00117 (0.000508)
Governance index	-0.0134 (0.0310)	-0.0786 (0.0366)	0.505 (0.153)	0.350 (0.150)	-1.173 (0.204)	-0.987 (0.481)	-5.375 (0.502)	-2.247 (0.677)	-0.0267 (0.0156)	-0.0104 (0.0241)
Constant	25.69 (0.861)	27.23 (1.254)	68.98 (5.652)	79.92 (6.559)	200.4 (32.15)	325.7 (55.64)	144.9 (61.03)	-129.2 (50.23)	-8.274 (2.376)	-9.422 (3.296)
Observations	366	351	185	179	120	111	117	101	302	297
R-squared	0.935	0.962	0.930	0.980	0.971	0.994	0.812	0.986	0.773	0.814
Fisher Stat	741.72	731.45	571.31	475.68	488.16	1557.37	111.44	483.32	194.67	93.25
Prob.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors in parentheses.

Source: Authors.

Table A8. Controlling for Environmental Vulnerability Index (pooled OLS estimates)

	Dependent variable: CO2 emissions (metric tons per capita, in log)							
	Resilient countries		At-risk countries		Vulnerable countries		Highly vulnerable countries	
ln(GDPPC)	12.72 (1.807)	-5.722 (5.564)	13.71 (0.769)	13.74 (1.010)	7.229 (0.433)	7.735 (0.630)	-58.16 (16.48)	-9.127 (7.855)
ln(GDPPC) squared	-45.21 (6.693)	29.38 (23.33)	-43.89 (2.639)	-44.13 (3.603)	-21.45 (1.468)	-23.62 (2.160)	253.7 (70.62)	63.15 (28.77)
Industrialization		0.0451 (0.00770)		0.0672 (0.0130)		0.0141 (0.00314)		-0.00953 (0.0546)
Natural resource		-0.00149 (0.00739)		0.00204 (0.00837)		-0.00442 (0.00298)		-0.0247 (0.0374)
Energy intensity		0.279 (0.0979)		-0.00154 (0.0117)		-0.0109 (0.00856)		1.296 (0.0629)
Internet		0.0203 (0.00304)		-0.00749 (0.00719)		-0.00663 (0.00233)		0.0124 (0.00900)
Trade openness		-0.00494 (0.000795)		-0.00971 (0.00326)		0.00640 (0.000765)		0.0370 (0.00864)
Polity2	-0.0367 (0.0158)	-0.0129 (0.0077)	-0.016 (0.0019)	-0.0311 (0.0100)	-0.00340 (0.00359)	-0.000281 (0.000650)	-0.3010 (0.229)	-0.167 (0.133)
Governance index	-0.207 (0.108)	-0.409 (0.208)	-0.262 (0.155)	-0.601 (0.143)	-0.1194 (0.2390)	-0.2430 (0.1920)	-0.402 (0.989)	-1.271 (1.230)
Constant	87.00 (13.28)	-75.89 (52.80)	74.93 (4.886)	77.35 (7.059)	33.42 (2.681)	37.88 (3.993)	-584.2 (162.0)	-199.5 (56.24)
Observations	175	170	315	300	413	398	177	171
R-squared	0.938	0.974	0.890	0.932	0.919	0.938	0.414	0.986
Fisher Stat	470.79	413.10	144.12	117.62	853.63	560.71	15.75	563.81
Prob.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors in parentheses.

Source: Authors.

Table A9. CO2 memory effect

	Dependent variable: CO2 emissions (metric tons per capita, in log)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lag 1 Dep. var.	0.0363 (0.0281)	0.328 (0.0308)	0.0487 (0.0300)	0.277 (0.0326)	0.0524 (0.0298)	0.276 (0.0332)	0.0768 (0.0266)	0.283 (0.0338)
Lag 2 Dep. var.			-0.0972 (0.0312)	0.139 (0.0352)	-0.0305 (0.0325)	0.138 (0.0357)	-0.00161 (0.0297)	0.147 (0.0366)
Lag 3 Dep. var.					-0.230 (0.0341)	0.00575 (0.0345)	-0.155 (0.0311)	0.0246 (0.0380)
Lag 4 Dep. var.							-0.0956 (0.0291)	-0.0432 (0.0368)
ln(GDPPC)	4.568 (0.312)	5.873 (0.554)	4.593 (0.342)	5.701 (0.540)	5.158 (0.363)	5.670 (0.573)	6.408 (0.355)	5.757 (0.579)
ln(GDPPC) squared	-13.60 (1.100)	-19.28 (2.068)	-13.62 (1.197)	-18.68 (2.018)	-15.39 (1.265)	-18.57 (2.128)	-19.39 (1.231)	-18.89 (2.148)
Industrialization		0.0182 (0.00333)		0.0151 (0.00334)		0.0150 (0.00337)		0.0148 (0.00338)
Natural resource		0.00171 (0.00163)		0.00272 (0.00161)		0.00274 (0.00161)		0.00305 (0.00164)
Energy intensity		0.0233 (0.0104)		0.0221 (0.0101)		0.0219 (0.0102)		0.0224 (0.0102)
Internet		-0.00394 (0.00101)		-0.00441 (0.000990)		-0.00441 (0.000992)		-0.00436 (0.000994)
Trade openness		0.00345 (0.000722)		0.00355 (0.000703)		0.00355 (0.000704)		0.00362 (0.000707)
Polity2	-0.0119 (0.00503)	0.00451 (0.00543)	-0.0113 (0.00539)	0.00574 (0.00529)	-0.00645 (0.00556)	0.00571 (0.00530)	-0.0113 (0.00521)	0.00598 (0.00531)
Governance index	0.212 (0.0724)	-0.295 (0.0803)	0.178 (0.0758)	-0.296 (0.0781)	0.0285 (0.0805)	-0.295 (0.0785)	-0.0419 (0.0764)	-0.318 (0.0810)
Observations	1,075	1,061	1,024	1,011	972	964	921	913

Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of instruments	40	45	36	45	38	44	39	41
Number of countries	50	50	50	50	48	48	47	47
AR1 p-value	0.015	0.022	0.014	0.005	0.008	0.009	0.001	0.004
AR2 p-value	0.524	0.754	0.403	0.525	0.302	0.545	0.736	0.835
Hansen p-value	0.325	0.252	0.309	0.256	0.279	0.508	0.748	0.703
DHT for instruments								
(a) In level								
Hansen excluding groups	0.421	0.128	0.531	0.331	0.242	0.816	0.242	0.913
Diff(null H=exogenous)	0.268	0.235	0.7323	0.468	0.268	0.350	0.628	0.749
(b) iv(years, eq(d))								
Hansen excluding groups	0.657	0.436	0.444	0.516	0.809	0.575	0.465	0.578
Diff(null H=exogenous)	0.723	0.848	0.545	0.748	0.342	0.746	0.853	0.626

Notes: Standard errors in parentheses.

Source: Authors.

Table A10. Robustness checks with pollution indicators

	(1)	(2)	(3)	(4)
	Methane	Nitrous oxide	PM _{2.5}	Total GHG
Lagged dep. var.	0.296 (0.0389)	0.318 (0.0409)	-0.0839 (0.0658)	0.367 (0.0380)
ln(GDPPC)	0.358 (0.382)	-2.058 (0.482)	15.58 (23.03)	-0.497 (0.322)
ln(GDPPC) squared	1.689 (1.443)	9.702 (1.817)	-104.1 (89.42)	4.902 (1.248)
Industrialization	0.00564 (0.00216)	0.00259 (0.00273)	0.178 (0.134)	0.00441 (0.00179)
Natural resource	0.000828 (0.00105)	0.00345 (0.00135)	0.106 (0.0628)	0.00139 (0.000865)
Energy intensity	0.0236 (0.00687)	0.0391 (0.00869)	0.663 (0.520)	0.0388 (0.00608)
Internet	-0.00408 (0.000587)	-0.00181 (0.000746)	0.0784 (0.0300)	-0.000718 (0.000495)
Trade openness	0.000814 (0.000415)	0.00116 (0.000541)	0.00167 (0.0204)	0.000669 (0.000340)
Polity2	-0.00261 (0.000422)	-4.06e-05 (0.000535)	-0.0354 (0.0047)	-0.00147 (0.000349)
Governance index	-0.0571 (0.0534)	-0.0459 (0.0069)	-9.892 (2.930)	-0.3403 (0.0439)
Observations	1,044	992	738	997
Time fixed effects	Yes	Yes	Yes	Yes
Number of instruments	43	45	30	36
Number of countries	50	45	41	45
AR1 p-value	0.026	0.033	0.025	0.046
AR2 p-value	0.835	0.965	1.014	0.836

Hansen p-value	0.316	0.223	0.410	0.287
DHT for instruments				
(a) In level				
Hansen excluding groups	0.630	0.337	0.740	0.540
Diff(null H=exogenous)	0.377	0.444	0.332	0.377
(b) iv(years, eq(d))				
Hansen excluding groups	0.646	0.505	0.433	0.535
Diff(null H=exogenous)	0.532	0.657	0.854	0.557

Notes: Standard errors in parentheses.

Source: Authors.

Table A11. Institutions and ecological footprint

	Dependent variable: total ecological footprint and its components						
	Total	Built-up land	Carbon	Cropland	Fishing grounds	Forest products	Grazing land
Lagged dep. var.	0.7965 (0.0142)	0.9045 (0.0504)	0.8345 (0.0732)	0.7575 (0.078)	0.8805 (0.0269)	0.8745 (0.1018)	0.8925 (0.0765)
ln(GDPPC)	0.1065 (0.0164)	-0.0035 (0.0367)	0.0305 (0.0229)	0.0395 (0.0231)	0.0015 (0.1595)	0.0665 (0.0167)	-0.0135 (0.3395)
ln(GDPPC) squared	-0.1005 (0.0622)	0.1195 (0.2225)	-0.0785 (0.0622)	-0.0735 (0.0673)	0.2645 (0.3403)	-0.0665 (0.0446)	0.1285 (0.3693)
Industrialization	0,0670 (0,0044)	0,0163 (0,0046)	0,0123 (0,0788)	0,0162 (0,0447)	0,0510 (0,0440)	0,0770 (0,0081)	0,0790 (0,0467)
Natural resource	0,0116 (0,0027)	0,0115 (0,0075)	0,0115 (0,0125)	0,0200 (0,0076)	0,0936 (0,0283)	0,0129 (0,0033)	0,0289 (0,0111)
Energy intensity	0,0530 (0,0114)	0,0050 (0,1140)	0,0520 (0,0119)	0,0690 (0,0110)	0,0290 (0,0220)	0,0630 (0,0110)	0,0194 (0,0100)
Internet	0,0985 (0,0504)	0,0097 (0,0204)	0,0978 (0,0304)	0,0870 (0,0404)	0,0783 (0,0026)	0,0814 (0,0630)	0,0226 (0,0058)
Trade openness	0,0161 (0,0018)	0,0152 (0,0018)	0,0167 (0,0013)	0,0615 (0,0383)	0,0183 (0,0188)	0,0133 (0,0074)	0,0190 (0,0011)
Polity2	-0,5375 (0,0198)	-0,0095 (0,0246)	-0,0695 (0,0602)	-0,0085 (0,028)	-0,0375 (0,1386)	-0,0395 (0,0429)	0,0035 (0,2302)
Governance index	-0,3505 (0,0477)	-0,1035 (0,0756)	-0,1325 (0,0699)	-0,0835 (0,0725)	-0,0525 (0,0493)	-0,1635 (0,1215)	-0,1865 (0,4477)
Observations	1,024	1,035	1,020	1,005	1,022	1,028	1,022
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of instruments	28	31	33	29	35	37	38
Number of countries	49	49	49	49	49	49	49
AR1 p-value	0.0344	0.0556	0.0258	0.0578	0.0467	0.0323	0.0244
AR2 p-value	0.6734	0.5393	0.7132	0.6157	0.6147	0.627	0.6148
Hansen p-value	0.7734	0.7933	0.7273	0.8146	0.738	0.772	0.7564
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes

DHT for instruments							
(a) In level							
Hansen excluding groups	0.2185	0.3725	0.2825	0.6715	0.2685	0.2595	0.7015
Diff(null H=exogenous)	0.5815	0.7735	0.7195	0.4715	0.6225	0.5175	0.2335
(b) iv(years, eq(d))							
Hansen excluding groups	0.6225	0.6495	0.2685	0.4315	0.3965	0.9315	0.6625
Diff(null H=exogenous)	0.3935	0.5955	0.6635	0.5335	0.5215	0.6145	0.5545

Notes: Standard errors in parentheses.

Source: Authors.

Table A12. Alternative institutional measures and pollution in Africa

	Dependent variable: CO2 emissions (metric tons per capita, in log)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lagged dep. var.	0.335 (0.0312)	0.334 (0.0312)	0.333 (0.0313)	0.325 (0.0313)	0.247 (0.0328)	0.733 (0.0558)	0.718 (0.0491)	0.496 (0.0305)
ln(GDPPC)	5.531 (0.544)	5.485 (0.543)	5.455 (0.540)	5.709 (0.551)	6.689 (0.590)	1.476 (1.220)	-0.393 (1.038)	5.345 (0.482)
ln(GDPPC) squared	-18.00 (2.032)	-17.84 (2.026)	-17.76 (2.023)	-18.65 (2.056)	-21.42 (2.202)	-5.842 (4.480)	0.953 (3.739)	-16.48 (1.709)
Industrialization	0.0196 (0.00338)	0.0192 (0.00336)	0.0192 (0.00340)	0.0191 (0.00337)	0.0180 (0.00330)	0.0106 (0.00571)	0.0108 (0.00507)	-0.0144 (0.00281)
Natural resource	0.00125 (0.00166)	0.00140 (0.00165)	0.00138 (0.00165)	0.000903 (0.00166)	0.00354 (0.00173)	0.000612 (0.00273)	-0.00011 (0.00211)	-0.00210 (0.00164)
Energy intensity	0.0182 (0.0103)	-0.0179 (0.0103)	0.0181 (0.0103)	0.0198 (0.0103)	-0.0100 (0.0111)	0.0192 (0.0180)	-0.00096 (0.0158)	0.00419 (0.00873)
Internet	-0.0030 (0.000938)	-0.0031 (0.000935)	-0.0031 (0.000936)	-0.0032 (0.000937)	-0.0051 (0.000961)	0.00524 (0.00520)	0.00946 (0.00438)	-0.00472 (0.000889)
Trade openness	0.00325 (0.000726)	0.00330 (0.000724)	0.00331 (0.000725)	0.00325 (0.000726)	0.00293 (0.000779)	0.00193 (0.00164)	0.000997 (0.00101)	0.00137 (0.000535)
Polity2	-0.00177 (0.000686)	-0.00162 (0.000684)	-0.00155 (0.000673)	-0.00139 (0.000670)	-0.000511 (0.000783)	0.000211 (0.000828)	-0.000182 (0.000722)	-0.00153 (0.000687)
Public corruption	0.117 (0.0019)							
Executive corruption		0.0335 (0.0075)						
Political corruption			0.0121 (0.0048)					
Military in politics				-0.267 (0.107)				
Gov. stability					-0.152 (0.0287)			

Law and order						-0.0206 (0.0697)			
Dem. accountability							-0.00324 (0.0253)		
Bureaucracy								0.0625 (0.0212)	
Observations	956	956	956	956	854	951	879	861	
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of instr.	43	45	38	44	39	40	38	35	
Number of countries	47	47	47	47	45	47	44	44	
AR1 p-value	0.045	0.022	0.044	0.015	0.038	0.029	0.011	0.041	
AR2 p-value	0.628	0.758	0.807	0.629	0.506	0.649	0.740	0.567	
Hansen p-value	0.427	0.334	0.521	0.398	0.351	0.700	0.880	0.582	
DHT for instruments									
(a) In level									
Hansen excluding groups	0.393	0.100	0.503	0.303	0.214	0.388	0.214	0.328	
Diff(null H=exogenous)	0.140	0.207	0.095	0.140	0.340	-0.078	0.500	0.624	
(b) iv(years, eq(d))									
Hansen excluding groups	0.409	0.268	0.196	0.298	0.631	0.287	0.207	0.227	
Diff(null H=exogenous)	0.295	0.420	0.617	0.320	0.614	0.318	0.525	0.492	

Notes: Standard errors in parentheses.

Source: Authors.

Table A13. Institutions and pollution in Africa: IV-2SLS estimates

	Dependent variable: CO2 emissions (metric tons per capita, in log)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ln(GDPPC)	6.786 (1.271)	7.033 (1.205)	6.837 (1.185)	7.021 (1.147)	6.753 (1.164)	6.825 (1.195)	6.880 (1.172)
ln(GDPPC) squared	-20.96 (4.243)	-21.77 (4.005)	-21.15 (3.830)	-21.54 (3.694)	-20.92 (3.728)	-21.19 (3.845)	-21.20 (3.792)
Industrialization	-0.0329 (0.00430)	-0.0320 (0.00430)	-0.0327 (0.00445)	-0.0321 (0.00436)	-0.0332 (0.00402)	-0.0329 (0.00421)	-0.0326 (0.00434)
Natural resource	-0.00350 (0.00297)	-0.00368 (0.00299)	-0.00247 (0.00319)	-0.00272 (0.00299)	-0.00184 (0.00281)	-0.00215 (0.00325)	-0.00272 (0.00322)
Energy intensity	0.00233 (0.0112)	0.00258 (0.0109)	0.00155 (0.00989)	0.000478 (0.00933)	-0.000423 (0.00895)	0.000782 (0.0102)	0.00233 (0.0101)
Internet	-0.00464 (0.00183)	-0.00501 (0.00186)	-0.00481 (0.00207)	-0.00549 (0.00214)	-0.00466 (0.00206)	-0.00470 (0.00211)	-0.00492 (0.00209)
Trade openness	0.00199 (0.000751)	0.00208 (0.000750)	0.00234 (0.000815)	0.00218 (0.000775)	0.00224 (0.000798)	0.00233 (0.000815)	0.00233 (0.000811)
Polity2	-0.00261 (0.00116)	-0.00193 (0.000930)	-0.00268 (0.00125)	-0.00243 (0.00121)	-0.00305 (0.00122)	-0.00277 (0.00123)	-0.00253 (0.00120)
Control of corr.	-0.0848 (0.0512)						
Political stability		-0.0658 (0.0349)					
Rule of law			-0.0227 (0.0046)				
Regulatory quality				-0.157 (0.0597)			
Voice and account.					-0.202 (0.0603)		

Gov. effectiveness						-0.0124 (0.0026)	
Governance index							-0.0641 (0.0004)
Constant	36.94 (7.531)	38.29 (7.083)	37.32 (6.556)	37.35 (6.271)	37.32 (6.212)	37.65 (6.517)	37.17 (6.498)
Observations	591	591	591	591	591	591	591
R-squared	0.989	0.990	0.990	0.990	0.990	0.990	0.990
Country dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time dummy	No	No	Yes	Yes	Yes	Yes	Yes
Fisher Stat	1359.20	1444.67	977.91	990.91	975.89	985.37	988.41
Prob.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Kleibergen-Paap	39.857	41.222	38.659	40.258	41.578	39.247	38.451
Cragg-Donald	70.246	75.568	72.249	78.257	75.698	74.123	71.486
Stock-Yogo (10%)	19.93	19.93	19.93	19.93	19.93	19.93	19.93
Hansen p-val.	0.1857	0.1174	0.1001	0.1635	0.1246	0.0969	0.0957

Notes: Robust standard errors in parentheses.

Source: Authors.