

Land and poverty: the role of soil fertility and vegetation quality in poverty reduction

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ONLINE APPENDIX

Table A1. Summary statistics

Variables	(1) N	(2) mean	(3) sd	(4) min	(5) p10	(6) p25	(7) p75	(8) p90	(9) max
Poverty headcount ratio	3,303	33.28	19.13	0.400	9.900	17.10	46.97	59.80	93.60
Share cropland	3,303	0.354	0.250	0	0.0545	0.157	0.538	0.734	0.967
Share forest	3,303	0.370	0.263	0	0.0127	0.127	0.572	0.734	0.977
Share grassland	3,303	0.0683	0.125	0	0	0.000500	0.0672	0.223	0.863
Share urban	3,303	0.0269	0.0998	0	0.000358	0.00143	0.0134	0.0376	0.955
Top soil carbon	3,297	64.87	51.76	7.998	25.42	31.77	74.58	142.4	318.1
Precipitation	2,802	4.557	0.837	-0.261	3.518	4.036	5.193	5.459	6.464
NPP	3,225	0.494	0.786	-5.081	-0.453	0.167	1.047	1.263	1.669
Road density	3,295	2.832	1.156	-2.316	1.532	2.145	3.584	4.151	6.548
Ruggedness	3,299	11.38	1.249	3.158	9.782	10.65	12.30	12.64	13.71
GDP per capita	2,287	-5.427	1.807	-11.52	-7.686	-6.572	-4.222	-3.391	4.860
Population	3,290	13.56	1.574	4.706	11.56	12.54	14.51	15.34	19.14
Irrigation	3,294	5.56	9.911	0	0.01	0.32	6.12	15.64	80.46

Table A2. Observation / Year / Country Table

ISO3 country code	year															
	1996	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
afg								34					34			
arm														11		
aut													9			
bgd		7					7					7	28	28		
bgr									3				3			
bih						3				3						
blr														6	6	
bol													9			
bra		27										27				
btn														18		
chl		14						16			16		14			
cmr			10						10							
cod							8									
col				22	22	22	22			22	22	22	22	22		
cri												1	1	1	1	
dnk													5			
dom		32	32	32	32	32	32	32	32	32	32	32	32			
ecu									15	15	17	17	17	17	17	
est						15							15			
geo													10	7		
gin									8					8		
gtm								22					22			
hti														10		
hun													20	20		
idn			30	30	30	30	31	33	33	33	33	33	33	33	33	
ind						31						36	35			
irq									18					18		
jor												12				
kaz																14
kgz											9		9	9	9	
lao				18						18						17
lbn							6									
lbr									15							
lva													5	5		
mar			13						13							
mda													33			
mex										32		32		32		
mne													20	20		
moz	11				11					11						
nga						37						37				
nld														12		
npl												5				
pan										9	9	9	12	12	12	
pse					2		2	2			2	2	2			
rou												42	42			
rus				1									83	84		
sdn											15					
sle					3								3			
slv							14	14	14	14	14	14	14	14		
ssd											10					
svk													8			
svn												12	12			
swe													21			
syr									14							
tgo								5					5			
tjk											5					
tls									13							13
tun		21					21					21				
ven				24	24	24	24	24	24	24	24	24	24	24	24	
vnm												65		65		
yem							20									
zmb								9				9				

Table A3. First stage – the effect of rainfall on NPP

Variables	(1) IV	(2) IV - Rural	(3) IV - Rural no outliers	(4) IV - Rural SSA
Precipitation	0.62*** (0.04)	0.63*** (0.07)	0.64*** (0.08)	1.74*** (0.19)
Constant	-3.57*** (0.18)	-3.64*** (0.56)	-3.66*** (0.57)	-8.37*** (0.92)
Observations	2,738	1,362	1,306	104
R-squared	0.81	0.81	0.80	0.64
Country FE	YES	YES	YES	NO
Year FE	YES	YES	YES	NO

Robust standard errors in parentheses. *** p<0.01.

Table A4. First stage – the effect of precipitation on top soil carbon

Variables	(1) IV	(2) IV - Rural	(3) IV - Rural no outliers	(4) IV - Rural SSA
Precipitation	0.27*** (0.03)	0.20*** (0.04)	0.25*** (0.05)	0.34*** (0.08)
Constant	2.03*** (0.13)	2.18*** (0.19)	1.98*** (0.22)	1.90*** (0.42)
Observations	933	476	452	64
R-squared	0.74	0.74	0.71	0.65
Country FE	YES	YES	YES	NO
Year FE	YES	YES	YES	YES

Robust standard errors in parentheses. *** p<0.01.

Table A5. Second stage – the effect of top soil carbon on poverty including controls

Variables	(1) OLS	(2) IV	(3) IV- Rural	(4) IV - Rural no outliers
Top soil carbon	-4.63*** (1.09)	-0.92 (5.72)	-24.43*** (7.69)	-16.57** (8.35)
Precipitation	0.76 (1.24)			
Ruggedness	0.37 (0.40)	0.62 (0.55)	-0.87 (0.72)	0.10 (0.79)
Road density	-3.25*** (0.75)	-3.19*** (0.75)	-3.08** (1.47)	-3.20** (1.41)
Share cropland	5.33* (3.17)	5.76** (2.87)	-8.83 (6.27)	-6.38 (6.58)
Share urban	-5.33 (7.56)	-4.37 (7.18)	-36.63** (18.02)	-33.96** (16.81)
Share grassland	1.27 (4.48)	2.23 (4.34)	5.08 (10.22)	6.32 (10.03)
Share forest	4.41 (3.25)	3.74 (3.62)	-11.13 (7.35)	-11.81 (7.46)
Population	-1.24** (0.49)	-1.31*** (0.47)	-0.14 (0.72)	-0.06 (0.71)
Andisol	5.18** (2.46)	3.19 (4.04)	14.21*** (5.00)	11.31** (4.59)
Ardisol	-0.56 (2.35)	-0.23 (2.46)	-0.33 (5.85)	-3.85 (9.38)
Entisol	0.56 (1.75)	0.47 (1.66)	2.01 (2.11)	2.56 (2.11)
Gelisol	-5.89* (3.13)	-7.45** (3.71)		
Histosol	4.66** (2.31)	0.73 (6.57)	22.68*** (7.77)	16.05* (8.23)
Inceptisol	-1.27 (1.17)	-1.97 (1.58)	1.01 (1.67)	0.57 (1.58)
Mollisol	1.01 (1.13)	0.45 (1.17)	2.88* (1.49)	2.21 (1.42)
Oxisol	-6.39** (2.91)	-6.40** (2.78)	-0.43 (3.96)	-2.53 (3.88)
Rock	3.41 (3.19)	2.97 (3.06)	-1.82 (5.30)	-1.56 (6.20)
Sand	2.96 (6.37)	3.43 (5.78)	-18.77*** (4.46)	-16.20*** (4.97)
Spodosol	-2.23 (1.83)	-4.12 (3.46)	5.94 (4.52)	3.70 (3.94)
Ultisol	1.34 (1.90)	1.32 (1.83)	4.36* (2.47)	3.99* (2.41)

Vertisol	2.13 (2.75)	1.44 (2.91)	0.39 (2.88)	-1.19 (2.83)
Constant	65.17*** (10.48)	53.55** (23.31)	144.29*** (30.76)	107.28*** (32.18)
Observations	932	932	475	451
R-squared	0.77	0.76	0.76	0.80
Country FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A6. Second stage – the effect of top soil carbon on GDP per capita including controls

VARIABLES	(1) OLS	(2) IV	(3) IV - Rural	(4) IV - Rural no outliers
Top soil carbon	0.14** (0.06)	-0.27 (0.24)	0.57* (0.32)	0.58 (0.36)
Precipitation	-0.10 (0.06)			
Ruggedness	-0.08*** (0.02)	-0.11*** (0.03)	-0.03 (0.03)	-0.03 (0.04)
Road density	0.08* (0.04)	0.07* (0.04)	0.18*** (0.07)	0.17** (0.07)
Share cropland	-0.70*** (0.16)	-0.81*** (0.16)	-0.13 (0.23)	-0.13 (0.29)
Share urban	1.41*** (0.38)	1.20*** (0.37)	2.77*** (0.54)	2.80*** (0.60)
Share grassland	-0.46* (0.27)	-0.55** (0.26)	-0.35 (0.42)	-0.33 (0.46)
Share forest	-0.32* (0.17)	-0.27 (0.19)	0.34 (0.24)	0.36 (0.28)
Population	-0.93*** (0.02)	-0.92*** (0.03)	-0.93*** (0.04)	-0.93*** (0.04)
Andisol	-0.19** (0.09)	0.02 (0.15)	-0.44** (0.18)	-0.44** (0.19)
Ardisol	-0.10 (0.14)	-0.20 (0.17)	0.54*** (0.19)	0.55*** (0.19)
Entisol	-0.06 (0.07)	-0.05 (0.08)	-0.09 (0.08)	-0.09 (0.09)
Gelisol	0.75*** (0.19)	0.91*** (0.20)		
Histosol	0.96*** (0.13)	1.37*** (0.28)	0.62** (0.30)	0.61* (0.34)
Inceptisol	0.01 (0.06)	0.09 (0.08)	-0.17** (0.07)	-0.17** (0.07)
Mollisol	0.02 (0.05)	0.09 (0.07)	-0.02 (0.07)	-0.01 (0.08)
Oxisol	0.37*** (0.13)	0.35*** (0.13)	0.13 (0.14)	0.14 (0.15)
Rock	-0.24 (0.31)	-0.24 (0.32)	-1.25*** (0.13)	-1.25*** (0.14)
Sand	-0.22 (0.14)	-0.27 (0.18)	0.07 (0.17)	0.08 (0.19)
Spodosol	0.20* (0.11)	0.39** (0.16)	-0.00 (0.17)	-0.01 (0.19)
Ultisol	0.09 (0.08)	0.08 (0.08)	0.05 (0.08)	0.06 (0.08)

Vertisol	0.13 (0.12)	0.13 (0.12)	0.14 (0.12)	0.16 (0.13)
Constant	10.53*** (0.51)	8.82*** (1.08)	4.06*** (1.41)	4.05** (1.62)
Observations	635	635	338	329
R-squared	0.96	0.96	0.98	0.98
Country FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.