

Online Appendix: Spatial Diffusion of Economic Shocks in Networks

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A Additional Data Description

A.1 Subnational Districts and Countries

Our analysis focuses on 5944 subnational districts, i.e., ADM2 regions, in 53 countries across the African continent. The list of countries and the number of subnational regions belonging to each country appear in Table A1. The geographic dispersion of subnational regions is graphically represented in Figure A1.

Figure A1: Districts in Africa



Table A1: List of Countries

	Country	No. of districts
1	Algeria	1,504
2	Angola	163
3	Benin	76
4	Botswana	25
5	Burkina Faso	301
6	Burundi	133
7	Cameroon	58
8	Cape Verde	16
9	Central African Republic	51
10	Chad	53
11	Comoros	3
12	Ivory Coast	50
13	Democratic Republic of the Congo	38
14	Djibouti	11
15	Egypt	26
16	Equatorial Guinea	6
17	Eritrea	50
18	Ethiopia	72
19	Gabon	37
20	Gambia	13
21	Ghana	137
22	Guinea	34
23	Guinea-Bissau	37
24	Kenya	48
25	Lesotho	10
26	Liberia	66
27	Libya	32
28	Madagascar	22
29	Malawi	253
30	Mali	51
31	Mauritania	44
32	Mauritius	10
33	Morocco	54
34	Mozambique	128
35	Namibia	107
36	Niger	36
37	Nigeria	775
38	Republic of Congo	46
39	Rwanda	142
40	Sao Tome and Principe	2
41	Senegal	30
42	Sierra Leone	14
43	Somalia	74
44	South Africa	354
45	Sudan	26
46	Swaziland	4
47	Tanzania	136
48	Togo	21
49	Tunisia	267
50	Uganda	162
51	Western Sahara	4
52	Zambia	72
53	Zimbabwe	60

A.2 Ethnic Homelands

The ethnic connectivity matrix is based on the digitized map version of the Murdock (1958) map of the boundaries of ethnic homelands in Africa shown in Figure A2. Using the spatial overlay tool in ArcMap 10.2, we combined the ADM2 polylines from Figure A1 with the ethnic homeland polylines from Figure A2 to assign each district the ethnicity of the ethnic homeland that covers the largest area of this district.

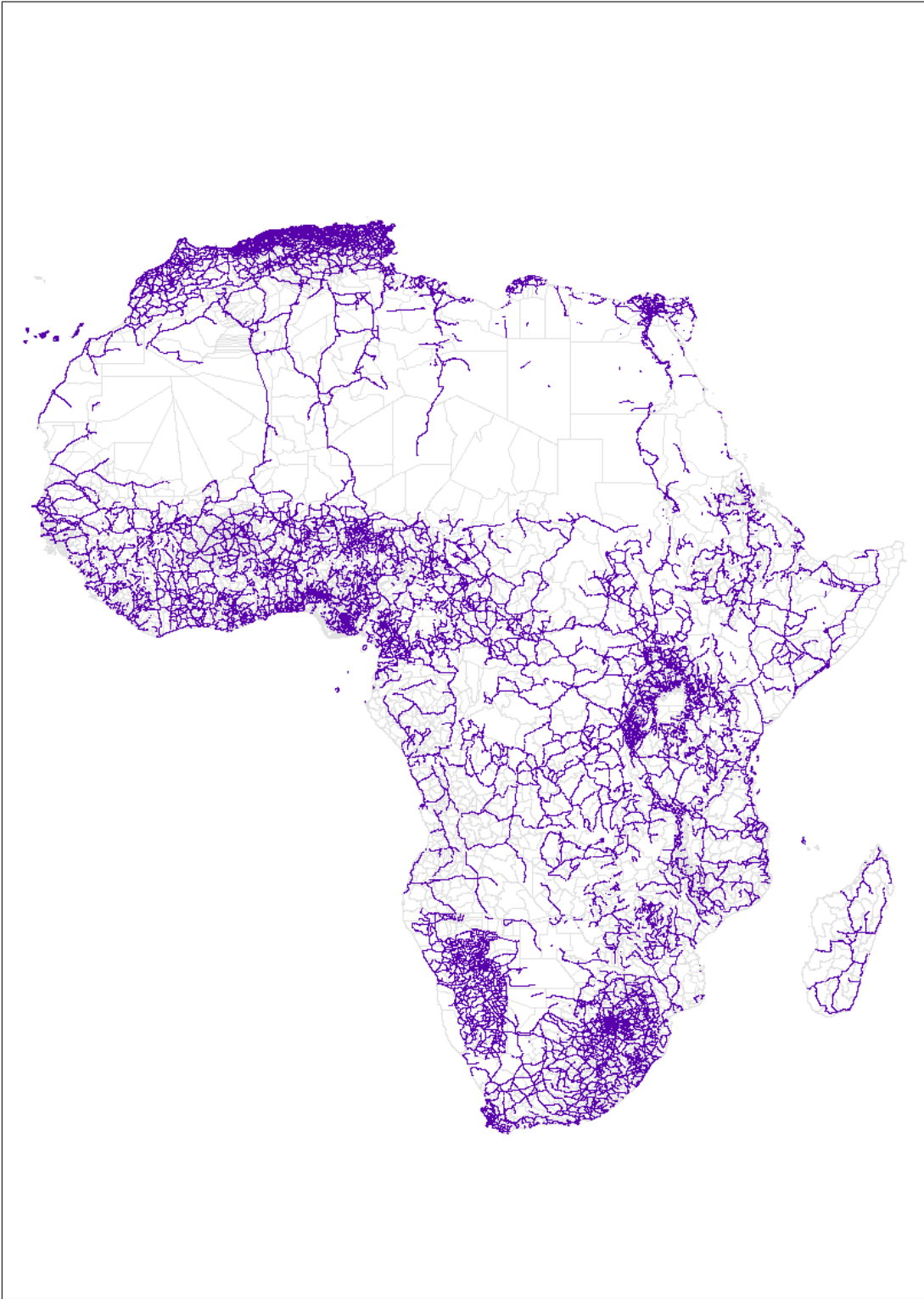
Figure A2: Ethnic Homelands in Africa



A.3 Road Network

Figure A3 shows the network of primary and secondary roads (in purple) from the OpenStreetMap data, with the district boundaries in the background (in light-gray).

Figure A3: Primary and Secondary Roads in Africa



A.4 Mines & Minerals

Figure A4 shows the location of mines from the SNL Minings & Metals database, with the district boundaries in the background. Table A2 lists the different types of minerals covered in this database as well as the source for the information on the world market price of these minerals.

Figure A4: Distribution of Mines in Africa

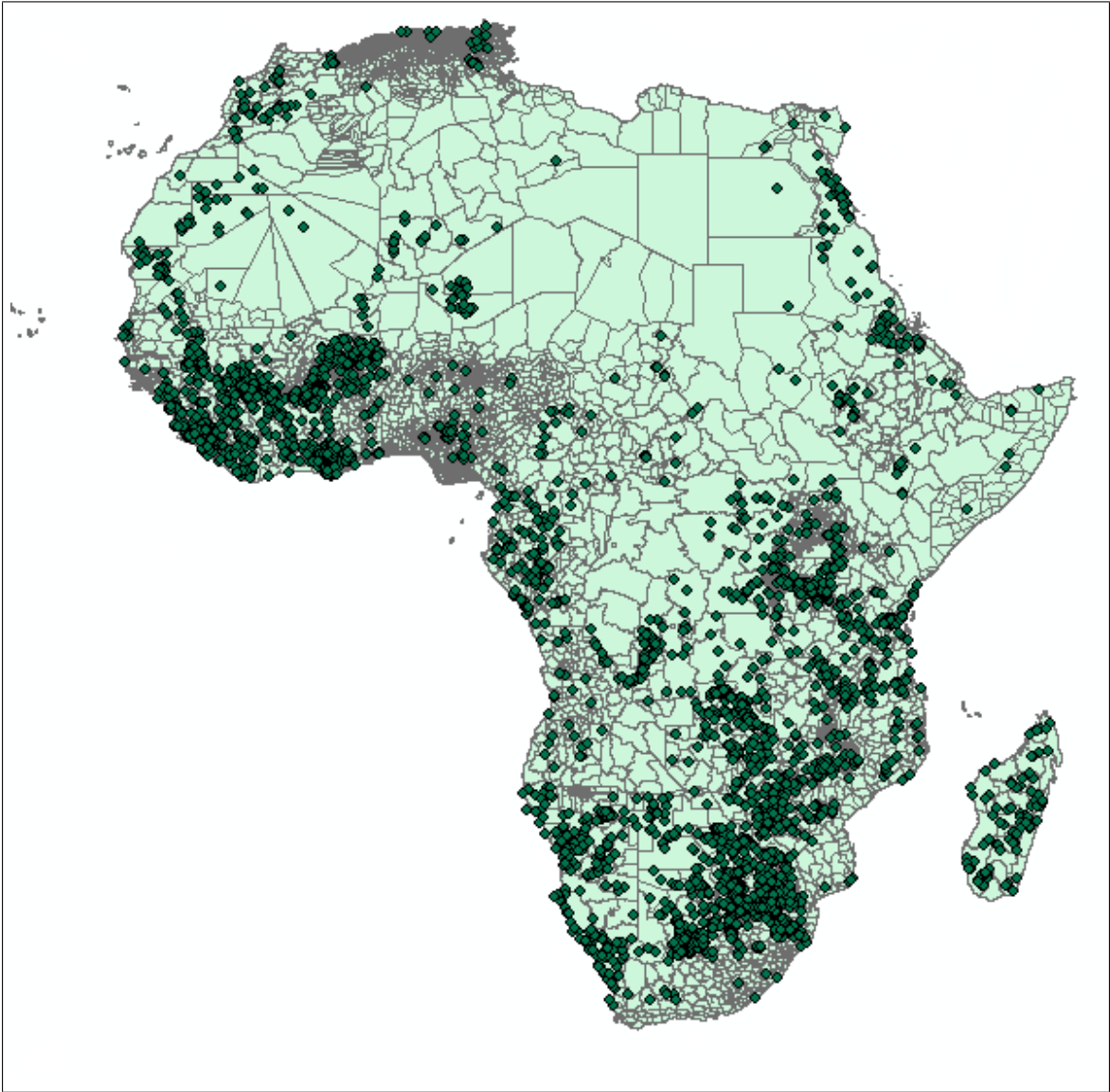


Table A2: List of Minerals

	Name	Measure	Source
1	Antimony	Tonnes	USGS Commodity Prices
2	Bauxite	Tonnes	USGS Commodity Prices
3	Chromite	Tonnes	USGS Commodity Prices
4	Coal	Tonnes	World Bank
5	Cobalt	Tonnes	USGS Commodity Prices
6	Copper	Tonnes	SNL-Thomas Reuters
7	Diamond	Carats	USGS Commodity Prices
8	Gold	Ounces	SNL-Thomas Reuters
9	Graphite	Tonnes	USGS Commodity Prices
10	Ilmenite	Tonnes	USGS Commodity Prices
11	Iron	Tonnes	World Bank
12	Lanthanide	Tonnes	USGS Commodity Prices
13	Lead	Tonnes	World Bank
14	Lithium	Tonnes	USGS Commodity Prices
15	Managanese	Tonnes	USGS Commodity Prices
16	Nickel	Tonnes	World Bank
17	Niobium	Tonnes	USGS Commodity Prices
18	Palladium	Ounces	SNL-Thomas Reuters
19	Phosphate	Tonnes	World Bank
20	Platinum	Ounces	SNL-Thomas Reuters
21	Potash	Tonnes	World Bank
22	Rutile	Tonnes	USGS Commodity Prices
23	Silver	Ounces	World Bank
24	Tin	Tonnes	SNL-Thomas Reuters
25	Tantalum	Tonnes	USGS Commodity Prices
26	Tungsten	Tonnes	USGS Commodity Prices
27	Uranium Oxide	Pounds	International Monetary Fund
28	Vanadium	Tonnes	USGS Commodity Prices
29	Yttrium	Tonnes	SNL-Thomas Reuters
30	Zinc	Tonnes	SNL-Thomas Reuters
31	Zircon	Tonnes	USGS Commodity Prices

B Correlation between Subnational GDP and Subnational Nighttime Lights in Africa

Hodler and Raschky (2014, Appendix B) document a strong correlation between GDP per capita and nighttime lights in subnational administrative regions using the subnational GDP data by Gennaioli et al. (2014). In Table B1, we replicate their analysis using their data, but restricting the sample to the 82 subnational regions from the nine African countries for which Gennaioli et al. (2014) provide subnational GDP data. These countries are: Benin, Egypt, Kenya, Lesotho, Morocco, Mozambique, Nigeria, South Africa, and Tanzania. Comparing the results reported in Table B1 with those in Hodler and Raschky (2014) suggests that the relation between subnational GDP per capita and subnational nighttime lights is very similar in Africa as elsewhere.

Table B1: Subnational GDP and Nighttime Lights in Africa

	(1)	(2)
$Light_{ict}$	0.291*** (0.005)	0.354*** (0.047)
R-squared	0.688	0.688
Observations	1,200	1,200
Region FE	NO	YES

Notes: Dependent variable is the logarithm of regional GDP per capita. OLS regressions. $Light_{ict}$ is the logarithm of average nighttime lights. Robust standard errors in parentheses. ***, **, * indicate significance at the 1, 5 and 10%-level, respectively.

C Main Result (complete table)

Table C1: Connectivity based on ethnicity, geography and roads

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
	Dependent variable: $Light_{ict}$							
<i>Ethnicity W Light_{jct}</i>	0.552*** (0.015)	0.271 (0.176)					0.160*** (0.013)	0.342*** (0.122)
<i>Inv Dist W Light_{jct}</i>			0.550*** (0.012)	0.639*** (0.131)			0.246*** (0.011)	0.305*** (0.124)
<i>Inv Road W Light_{jct}</i>					0.556*** (0.010)	0.280** (0.113)	0.393*** (0.015)	0.361*** (0.116)
<i>Population_{ict}</i>	0.243*** (0.033)	0.179*** (0.035)	0.178*** (0.027)	-0.023 (0.031)	0.162*** (0.026)	-0.098*** (0.033)	0.095*** (0.026)	-0.220*** (0.036)
<i>Conflict_{ict}</i>	-0.011* (0.006)	-0.012** (0.006)	-0.011* (0.006)	-0.011* (0.006)	-0.010** (0.005)	-0.013** (0.006)	-0.008 (0.005)	-0.006 (0.006)
<i>Ethnicity W Population_{jct}</i>	-0.377*** (0.041)	0.096 (0.060)					-0.171*** (0.035)	-0.256*** (0.057)
<i>Ethnicity W Conflict_{jct}</i>	-0.031*** (0.011)	-0.043** (0.018)					-0.019* (0.011)	-0.020 (0.017)
<i>Inv Dist W Population_{jct}</i>			-0.247*** (0.039)	0.363*** (0.042)			-0.021 (0.036)	0.240*** (0.046)
<i>Inv Dist W Conflict_{jct}</i>			-0.018* (0.011)	-0.018 (0.015)			-0.009 (0.011)	-0.012 (0.015)
<i>Inv Road W Population_{jct}</i>					-0.128*** (0.035)	0.582*** (0.043)	0.048 (0.041)	0.475*** (0.050)
<i>Inv Road W Conflict_{jct}</i>					-0.004 (0.009)	-0.018 (0.012)	0.004 (0.010)	0.001 (0.013)
<i>MP_{ict}</i>	0.125*** (0.014)	0.118*** (0.015)	0.120*** (0.013)	0.116*** (0.014)	0.111*** (0.013)	0.112*** (0.014)	0.115*** (0.014)	0.107*** (0.016)
First stage:	Dependent variable: $Light_{jct}$							
<i>MP_{jct}</i>		0.121*** (0.015)		0.124*** (0.014)		0.119*** (0.014)		0.123*** (0.015)
First-stage F-stat		63.83		85.00		71.90		63.64
Observations	101,048	101,048	101,048	101,048	101,048	101,048	101,048	101,048
District FE	YES	YES	YES	YES	YES	YES	YES	YES
Country-year FE	YES	YES	YES	YES	YES	YES	YES	YES
Additional controls	YES	YES	YES	YES	YES	YES	YES	YES

Notes: This table corresponds to Table 2 in Section 6, but reports the coefficient estimates on all (second-stage) control variables. Even columns report standard fixed effects regressions with district and country-year fixed effects, and odd columns IV estimates. See Section 4 for the definitions of all variables. The first stage further includes the control variables indicated in Section 5. Standard errors, clustered at the network level, are in parentheses. ***, **, * indicate significance at the 1, 5 and 10% level, respectively.

D Robustness: Province-Year Fixed Effects

Table D1: Province-Year Fixed Effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Dependent variable: $Light_{ict}$								
$Ethnicity W Light_{jct}$	0.044** (0.019)	0.301 (0.187)					-0.029 (0.019)	0.469*** (0.151)
$Inv Dist W Light_{jct}$			0.118*** (0.015)	0.748*** (0.119)			0.037** (0.014)	0.473*** (0.101)
$Inv Road W Light_{jct}$					0.220*** (0.013)	0.779*** (0.108)	0.214*** (0.017)	0.484*** (0.119)
First stage: Dependent variable: $Light_{jct}$								
MP_{jct}		0.132*** (0.015)		0.131*** (0.014)		0.133*** (0.015)		0.136*** (0.016)
First-stage F-stat		74.15		89.56		84.44		69.15
Observations	101,048	101,048	101,048	101,048	101,048	101,048	101,048	101,048
District FE	YES	YES	YES	YES	YES	YES	YES	YES
Province-year FE	YES	YES	YES	YES	YES	YES	YES	YES
Additional controls	YES	YES	YES	YES	YES	YES	YES	YES

Notes: Even columns report standard fixed effects regressions with district and province(ADM1)-year fixed effects, and odd columns IV estimates. See Section 4 for the definitions of all variables. $Ethnicity W Light_{jct}$ is weighted $Light_{jct}$ with weights based on the row-normalized ethnicity matrix. $Inv Dist W Light_{jct}$ ($Inv Road W Light_{jct}$) is weighted $Light_{jct}$ with weights based on the row-normalized matrix of the inverse altitude-adjusted geodesic distances (inverse road distances) truncated at 70km. Additional control variables are population, conflict and MP_{ict} as well as weighted population and conflict in districts $j \neq i$. MP_{jct} is an interaction term based on cross-sectional information on the location of mines and time-varying world prices of the commodities produced in these mines (see equation (11)). The first stage further includes the control variables indicated in equation (10). Standard errors, clustered at the network level, are in parentheses. ***, **, * indicate significance at the 1, 5 and 10%-level, respectively.

E Robustness: Temporal and Spatial Lags

Table E1: Temporal and Spatial Lags

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Dependent variable: $Light_{ict}$								
$Ethnicity W Light_{jct-1}$	0.350*** (0.019)	0.457** (0.200)					0.114*** (0.017)	0.356*** (0.130)
$Inv Dist W Light_{jct-1}$			0.334*** (0.014)	0.695*** (0.138)			0.147*** (0.013)	0.366*** (0.132)
$Inv Road W Light_{jct-1}$					0.333*** (0.011)	0.279** (0.117)	0.229*** (0.014)	0.317*** (0.122)
First stage: Dependent variable: $Light_{jct-1}$								
MP_{jct-1}		0.111*** (0.015)		0.115*** (0.014)		0.111*** (0.015)		0.114*** (0.016)
First-stage F-stat		51.56		65.42		56.89		49.56
Observations	101,048	101,048	101,048	101,048	101,048	101,048	101,048	101,048
District FE	YES	YES	YES	YES	YES	YES	YES	YES
Country-year FE	YES	YES	YES	YES	YES	YES	YES	YES
Additional controls	YES	YES	YES	YES	YES	YES	YES	YES

Notes: Even columns report standard fixed effects regressions with district and country-year fixed effects, and odd columns IV estimates. See Section 4 for the definitions of all variables. $Ethnicity W Light_{jct}$ is weighted $Light_{jct}$ with weights based on the row-normalized ethnicity matrix. $Inv Dist W Light_{jct}$ ($Inv Road W Light_{jct}$) is weighted $Light_{jct}$ with weights based on the row-normalized matrix of the inverse altitude-adjusted geodesic distances (inverse road distances) truncated at 70km. Additional control variables are population, conflict and MP_{ict} as well as weighted population and conflict in districts $j \neq i$. MP_{jct} is an interaction term based on cross-sectional information on the location of mines and time-varying world prices of the commodities produced in these mines (see equation (11)). The first stage further includes the control variables indicated in equation (10). Standard errors, clustered at the network level, are in parentheses. ***, **, * indicate significance at the 1, 5 and 10%-level, respectively.

F Robustness: Spatial Clustering of Standard Errors

Table F1: Spatial Clustering of Standard Errors

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Dependent variable: $Light_{ict}$								
$Ethnicity W Light_{jct}$	0.552*** (0.015)	0.271 (0.165)					0.160*** (0.012)	0.342*** (0.107)
$Inv Dist W Light_{jct}$			0.550*** (0.012)	0.639*** (0.132)			0.246*** (0.011)	0.305*** (0.112)
$Inv Road W Light_{jct}$					0.556*** (0.012)	0.280** (0.126)	0.393*** (0.013)	0.361*** (0.108)
First stage: Dependent variable: $Light_{jct}$								
MP_{jct}		0.121*** (0.013)		0.124*** (0.014)		0.119*** (0.013)		0.123*** (0.013)
First-stage F-stat		82.84		84.89		79.70		84.66
Observations	101,048	101,048	101,048	101,048	101,048	101,048	101,048	101,048
District FE	YES	YES	YES	YES	YES	YES	YES	YES
Country-year FE	YES	YES	YES	YES	YES	YES	YES	YES
Additional controls	YES	YES	YES	YES	YES	YES	YES	YES

Notes: Even columns report standard fixed effects regressions with district and country-year fixed effects, and odd columns report IV estimates. See Section 4 for the definitions of all variables. $Ethnicity W Light_{jct}$ is weighted $Light_{jct}$, with weights based on the row-normalized ethnicity matrix. $Inv Dist W Light_{jct}$ ($Inv Road W Light_{jct}$) is weighted $Light_{jct}$, with weights based on the row-normalized matrix of the inverse altitude-adjusted geodesic distances (inverse road distances) truncated at 70km. Additional control variables are population, conflict and MP_{ict} as well as weighted population and conflict in districts $j \neq i$. MP_{jct} is an interaction term based on cross-sectional information on the location of mines and time-varying world prices of the commodities produced in these mines (see equation (11)). The first stage further includes the control variables indicated in equation (10). Spatially clustered standard errors are in parentheses, allowing for spatial correlation up to 70km and for infinite serial correlation. ***, **, * indicate significance at the 1, 5 and 10% level, respectively.

G Robustness: Grid-Cells as Unit of Observation

Table G1: Grid-Cells as Unit of Observation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Dependent variable: $Light_{ict}$								
$Eth W Light_{jct}$	0.517*** (0.010)	0.356*** (0.094)					0.168*** (0.010)	0.392*** (0.055)
$Inv Dist W Light_{jct}$			0.518*** (0.007)	0.422*** (0.074)			0.338*** (0.012)	0.250*** (0.037)
$Inv Road W Light_{jct}$					0.420*** (0.007)	0.604*** (0.053)	0.173*** (0.010)	0.413*** (0.067)
First stage: Dependent variable: $Light_{jct}$								
MP_{jct}		0.258*** (0.020)		0.247*** (0.018)		0.231*** (0.018)		0.230*** (0.020)
First-stage F-stat		165.30		197.93		172.06		128.58
Observations	175,695	175,695	175,695	175,695	175,695	175,695	175,695	175,695
District FE	YES	YES	YES	YES	YES	YES	YES	YES
Country-year FE	YES	YES	YES	YES	YES	YES	YES	YES
Additional controls	YES	YES	YES	YES	YES	YES	YES	YES

Notes: The units of observation are rectangular grid cells of 0.5×0.5 degrees (i.e., around 55×55 km at the equator). Even columns report standard fixed effects regressions with district and country-year fixed effects, and odd columns report IV estimates. See Section 4 for the definitions of all variables. $Ethnicity W Light_{jct}$ is weighted $Light_{jct}$, with weights based on the row-normalized ethnicity matrix. $Inv Dist W Light_{jct}$ ($Inv Road W Light_{jct}$) is weighted $Light_{jct}$, with weights based on the row-normalized matrix of the inverse altitude-adjusted geodesic distances (inverse road distances) truncated at 70km. Additional control variables are population, conflict and MP_{ict} as well as weighted population and conflict in districts $j \neq i$. MP_{jct} is an interaction term based on cross-sectional information on the location of mines and time-varying world prices of the commodities produced in these mines (see equation (11)). The first stage further includes the control variables indicated in equation (10). Standard errors, clustered at the network level, are in parentheses. ***, **, * indicate significance at the 1, 5 and 10%-level, respectively.

H Robustness: Excluding Top Mineral Producers

Table H1: Dropping Large Players

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Dependent variable: $Light_{ict}$								
$Ethnicity W Light_{jct}$	0.546*** (0.015)	0.394*** (0.125)					0.120*** (0.014)	0.477*** (0.102)
$Inv Dist W Light_{jct}$			0.630*** (0.012)	0.398*** (0.128)			0.362*** (0.015)	-0.001 (0.107)
$Inv Road W Light_{jct}$					0.552*** (0.011)	0.420*** (0.092)	0.317*** (0.014)	0.497*** (0.098)
First stage: Dependent variable: $Light_{jct}$								
MP_{jct}		0.211*** (0.019)		0.214*** (0.018)		0.208*** (0.018)		0.211*** (0.019)
First-stage F-stat		127.84		149.95		132.30		118.38
Observations	95,030	95,030	95,030	95,030	95,030	95,030	95,030	95,030
District FE	YES	YES	YES	YES	YES	YES	YES	YES
Country-year FE	YES	YES	YES	YES	YES	YES	YES	YES
Additional controls	YES	YES	YES	YES	YES	YES	YES	YES

Notes: Sample is restricted to districts of countries that do not belong to the top ten producers for any mineral under consideration over the period 1997–2013 (see Table A2). Even columns report standard fixed effects regressions with district and country-year fixed effects, and odd columns IV estimates. See Section 4 for the definitions of all variables. $Ethnicity W Light_{jct}$ is weighted $Light_{jct}$ with weights based on the row-normalized ethnicity matrix. $Inv Dist W Light_{jct}$ ($Inv Road W Light_{jct}$) is weighted $Light_{jct}$ with weights based on the row-normalized matrix of the inverse altitude-adjusted geodesic distances (inverse road distances) truncated at 70km. Additional control variables are population, conflict and MP_{ict} as well as weighted population and conflict in districts $j \neq i$. MP_{jct} is an interaction term based on cross-sectional information on the location of mines and time-varying world prices of the commodities produced in these mines (see equation (11)). The first stage further includes the control variables indicated in equation (10). Standard errors, clustered at the network level, are in parentheses. ***, **, * indicate significance at the 1, 5 and 10%-level, respectively.

I Robustness: Fiscal Channel

Table I1: Controlling for Connectivity based on ADM1 Networks

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
	<i>Light_{ict}</i>							
<i>Ethnicity W Light_{jct}</i>	0.315*** (0.014)	0.274 (0.169)					0.126*** (0.013)	0.295** (0.123)
<i>Inv Dist W Light_{jct}</i>			0.386*** (0.013)	0.522*** (0.127)			0.209*** (0.012)	0.288** (0.114)
<i>Inv Road W Light_{jct}</i>					0.441*** (0.012)	0.396*** (0.115)	0.360*** (0.015)	0.382*** (0.108)
<i>ADM1 W Light_{jct}</i>	0.434*** (0.018)	0.256 (0.266)	0.329*** (0.014)	0.834*** (0.152)	0.270*** (0.013)	0.236 (0.148)	0.142*** (0.014)	0.292** (0.130)
First stage:	<i>Light_{jct}</i>							
<i>MP_{jct}</i>		0.123*** (0.015)		0.126*** (0.015)		0.122*** (0.015)		0.124*** (0.016)
First-stage F-stat		63.59		74.76		66.71		62.21
Observations	101,048	101,048	101,048	101,048	101,048	101,048	101,048	101,048
District FE	YES	YES	YES	YES	YES	YES	YES	YES
Country Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Additional Controls	YES	YES	YES	YES	YES	YES	YES	YES

Notes: Even columns report standard fixed effects regressions with district and country-year fixed effects, and odd columns IV estimates. See Section 4 for the definitions of all variables. *Ethnicity W Light_{jct}* is weighted *Light_{jct}* with weights based on the row-normalized ethnicity matrix. *Inv Dist W Light_{jct}* (*Inv Road W Light_{jct}*) is weighted *Light_{jct}* with weights based on the row-normalized matrix of the inverse altitude-adjusted geodesic distances (inverse road distances) truncated at 70km. *ADM1 W Light_{jct}* is weighted *Light_{jct}* with weights based on the row-normalized ADM1 matrix, which identifies whether districts belong to the same ADM1 unit. Additional control variables are population, conflict and *MP_{ict}* as well as weighted population and conflict in districts $j \neq i$. *MP_{jct}* is an interaction term based on cross-sectional information on the location of mines and time-varying world prices of the commodities produced in these mines (see equation (11)). The first stage further includes the control variables indicated in equation (10). Standard errors, clustered at the network level, are in parentheses. ***, **, * indicate significance at the 1, 5 and 10%-level, respectively.

J Robustness: Contiguity Network

Table J1: Connectivity based on contiguity

	(1)	(2)
	OLS	IV
Dependent variable: $Light_{ict}$		
$Contiguity\ W\ Light_{jct}$	0.746*** (0.008)	0.607*** (0.158)
First stage: Dependent variable: $Light_{jct}$		
MP_{jct}		0.127*** (0.014)
First-stage F-Stat		83.17
Observations	101,048	101,048
District FE	YES	YES
Country-year FE	YES	YES
Additional controls	YES	YES

Notes: Column (1) reports the standard fixed effects regression with district and country-year fixed effects, and column (2) the IV estimates. See Section 4 for the definitions of all variables. $Contiguity\ W\ Light_{jct}$ is weighted $Light_{jct}$ with weights based on the row-normalized contiguity matrix. Additional control variables are population, conflict and MP_{ict} as well as weighted population and conflict in districts $j \neq i$. MP_{jct} is an interaction term based on cross-sectional information on the location of mines and time-varying world prices of the commodities produced in these mines (see equation (11)). The first stage further includes the control variables indicated in equation (10). Standard errors, clustered at the network level, are in parentheses. ***, **, * indicate significance at the 1, 5 and 10%-level, respectively.

K Robustness: Geodesic Network without Adjustment for Variability in Altitude

Table K1: Geodesic Network without Adjustment for Variability in Altitude

	(1)	(2)	(3)	(4)
	OLS	IV	OLS	IV
Dependent variable: $Light_{ict}$				
<i>Ethnicity W Light_{jct}</i>			0.110*** (0.013)	0.396*** (0.124)
<i>Inv Dist W Light_{jct}</i>	0.664*** (0.012)	0.750*** (0.156)	0.374*** (0.013)	0.439*** (0.132)
<i>Inv Road W Light_{jct}</i>			0.330*** (0.014)	0.396*** (0.113)
First stage:		Dependent variable: $Light_{jct}$		
MP_{jct}		0.127*** (0.014)		0.124*** (0.015)
First-stage F-stat		88.61		64.99
Observations	101,048	101,048	101,048	101,048
District FE	YES	YES	YES	YES
Country-year FE	YES	YES	YES	YES
Additional controls	YES	YES	YES	YES

Notes: Even columns report standard fixed effects regressions with district and country-year fixed effects, and odd columns IV estimates. See Section 4 for the definitions of all variables. *Ethnicity W Light_{jct}* is weighted $Light_{jct}$ with weights based on the row-normalized ethnicity matrix. *Inv Dist W Light_{jct}* (*Inv Road W Light_{jct}*) is weighted $Light_{jct}$ with weights based on the row-normalized matrix of the inverse geodesic distances without adjustment for the variability in altitude (inverse road distances) truncated at 70km. Additional control variables are population, conflict and MP_{ict} as well as weighted population and conflict in districts $j \neq i$. MP_{jct} is an interaction term based on cross-sectional information on the location of mines and time-varying world prices of the commodities produced in these mines (see equation (11)). The first stage further includes the control variables indicated in equation (10). Standard errors, clustered at the network level, are in parentheses. ***, **, * indicate significance at the 1, 5 and 10%-level, respectively.

L Robustness: Alternative Ethnicity Network

Table L1: Alternative Ethnicity Network

	(1)	(2)	(3)	(4)
	OLS	IV	OLS	IV
Dependent variable: $Light_{ict}$				
$Ethnicity W Light_{jct}$	0.750*** (0.032)	1.146 (0.710)	0.189*** (0.017)	0.717 (0.467)
$Inv Dist W Light_{jct}$			0.283*** (0.013)	0.271** (0.109)
$Inv Road W Light_{jct}$			0.410*** (0.017)	0.426*** (0.112)
First stage: Dependent variable: $Light_{jct}$				
MP_{jct}		0.121*** (0.024)		0.123*** (0.023)
First-stage F-stat		26.72		29.07
Observations	101,048	101,048	101,048	101,048
District FE	YES	YES	YES	YES
Country-year FE	YES	YES	YES	YES
Additional controls	YES	YES	YES	YES

Notes: Even columns report standard fixed effects regressions with district and country-year fixed effects, and odd columns IV estimates. See Section 4 for the definitions of all variables. $Ethnicity W Light_{jct}$ is weighted $Light_{jct}$ with weights based on the row-normalized alternative ethnicity matrix, as discussed in Section 6.2. $Inv Dist W Light_{jct}$ ($Inv Road W Light_{jct}$) is weighted $Light_{jct}$ with weights based on the row-normalized matrix of the inverse altitude-adjusted geodesic distances (inverse road distances) truncated at 70km. Additional control variables are population, conflict and MP_{ict} as well as weighted population and conflict in districts $j \neq i$. MP_{jct} is an interaction term based on cross-sectional information on the location of mines and time-varying world prices of the commodities produced in these mines (see equation (13)). The first stage further includes the control variables indicated in equation (12). Standard errors, clustered at the network level, are in parentheses. ***, **, * indicate significance at the 1, 5 and 10%-level, respectively.

M Networks within and across Countries

We create two new sets of connectivity matrices: The first one only includes connected districts j which are in the same country as district i (*Within Country*), while the second one only includes connected districts j that are in other countries than district i (*Outside Country*).

Table M1 below looks at only within country connectivity. Accordingly, the ethnicity matrix here only captures districts which are of the same ethnicity and belong to the same country. The inverse distance (road) matrix captures districts where the geodesic (road) distance is less than 70km and which belong to the same country. Compared to the main specification that allows for spill-overs within and between countries, the estimated ρ 's for ethnic and inverse distance connectivity are also positive but smaller in magnitude and no longer statically significant. In contrast, the ρ for road connectivity is larger in magnitude and highly statistically significant.

Table M2 isolates outside-country spillover effects. Accordingly, the ethnicity matrix here only captures district which are of the same ethnicity and which *do not* belong to the same country. The inverse distance (road) matrix captures districts where the geodesic (road) distance is less than 70km, and *do not* belong to the same country. Here a different pattern emerges. Ethnic and geographic connectivity are more important for between country spill-overs, while the effect of road-connectivity is smaller and not statistically significant.

Table M1: Within-Country Networks

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
	<i>Light_{ict}</i>							
<i>Ethnicity W Light_{ict}</i> (<i>Within Country</i>)	0.484*** (0.014)	-0.035 (0.140)					0.144*** (0.013)	0.147 (0.101)
<i>Inv Dist W Light_{ict}</i> (<i>Within Country</i>)			0.504*** (0.011)	0.393*** (0.110)			0.236*** (0.012)	0.115 (0.113)
<i>Inv Road W Light_{ict}</i> (<i>Within Country</i>)					0.479*** (0.011)	0.278*** (0.103)	0.318*** (0.015)	0.482*** (0.106)
First stage: <i>MP_{ict}</i>		0.121*** (0.014)		0.128*** (0.014)		0.117*** (0.014)		0.122*** (0.015)
First-stage F-stat		75.79		90.17		70.16		68.83
Observations	101,048	101,048	101,048	101,048	101,048	101,048	101,048	101,048
District FE	YES	YES	YES	YES	YES	YES	YES	YES
Country-year FE	YES	YES	YES	YES	YES	YES	YES	YES
Additional controls	YES	YES	YES	YES	YES	YES	YES	YES

Notes: Even columns report standard fixed effects regressions with district and country-year fixed effects, and odd columns IV estimates. See Section 4 for the definitions of all variables. *Ethnicity W Light_{ict}* (*Within Country*) is weighted *Light_{ict}* for districts belonging to the same country, with weights based on the row-normalized ethnicity matrix. *Inv Dist W Light_{ict}* (*Within Country*) (*Inv Road W Light_{ict}* (*Within Country*)) is weighted *Light_{ict}* for districts belonging to the same country, with weights based on the row-normalized matrix of the inverse altitude-adjusted geodesic distances (inverse road distances) truncated at 70km. Additional control variables are population, conflict and *MP_{ict}* as well as weighted population and conflict in districts $j \neq i$. *MP_{ict}* is an interaction term based on cross-sectional information on the location of mines and time-varying world prices of the commodities produced in these mines (see equation (13)). The first stage further includes the control variables indicated in equation (12). Standard errors, clustered at the network level, are in parentheses. ***, **, * indicate significance at the 1, 5 and 10%-level, respectively.

Table M2: Outside-Country Networks

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
	<i>Light_{ict}</i>							
<i>Ethnicity W Light_{ict}</i> (<i>Outside Country</i>)	0.262*** (0.010)	0.291** (0.146)					0.177*** (0.010)	0.382*** (0.096)
<i>Inv Dist W Light_{ict}</i> (<i>Outside Country</i>)			0.221*** (0.010)	0.504*** (0.140)			0.102*** (0.011)	0.678*** (0.123)
<i>Inv Road W Light_{ict}</i> (<i>Outside Country</i>)					0.228*** (0.009)	0.380*** (0.111)	0.151*** (0.010)	0.144 (0.105)
First stage:	<i>Light_{ict}</i>							
<i>MP_{ict}</i>		0.127*** (0.013)		0.126*** (0.012)		0.116*** (0.013)		0.126*** (0.013)
First-stage F-stat		91.73		105.79		86.46		90.49
Observations	101,048	101,048	101,048	101,048	101,048	101,048	101,048	101,048
District FE	YES	YES	YES	YES	YES	YES	YES	YES
Country-year FE	YES	YES	YES	YES	YES	YES	YES	YES
Additional controls	YES	YES	YES	YES	YES	YES	YES	YES

Notes: Even columns report standard fixed effects regressions with district and country-year fixed effects, and odd columns IV estimates. See Section 4 for the definitions of all variables. *Ethnicity W Light_{ict}* (*Outside Country*) is weighted *Light_{ict}* for districts not belonging to the same country, with weights based on the row-normalized ethnicity matrix. *Inv Dist W Light_{ict}* (*Outside Country*) (*Inv Road W Light_{ict}* (*Outside Country*)) is weighted *Light_{ict}* for districts not belonging to the same country, with weights based on the row-normalized matrix of the inverse altitude-adjusted geodesic distances (inverse road distances) truncated at 70km. Additional control variables are population, conflict and *MP_{ict}* as well as weighted population and conflict in districts $j \neq i$. *MP_{ict}* is an interaction term based on cross-sectional information on the location of mines and time-varying world prices of the commodities produced in these mines (see equation (13)). The first stage further includes the control variables indicated in equation (12). Standard errors, clustered at the network level, are in parentheses. ***, **, * indicate significance at the 1, 5 and 10%-level, respectively.

N Top-Ten Key Player Rankings for Populous Countries

Table N1: Top-Ten Key Player Rankings for Populous Countries

(1) Country	(2) Province	(3) District Rank	(4) Overall KP Rank	(5) Overall Katz-Bon Rank	(6) Overall Betw. Rank	(7) Overall Eig. Rank	(8) Ethnicity KP Rank	(9) Road KP Rank	(10) Inv.Dist KP Rank
Ethiopia									
Ethiopia	Addis Ababa	Zone 4*	1	6	47	14	2	2	1
Ethiopia	Addis Ababa	Zone 3*	2	7	38	16	6	4	3
Ethiopia	Addis Ababa	Zone 2*	3	8	43	16	3	3	5
Ethiopia	Addis Ababa	Zone 6*	4	10	59	16	10	11	7
Ethiopia	Oromia	North Shewa (K4)	5	12	48	67	27	8	8
Ethiopia	Addis Ababa	Zone 5*	6	9	44	14	4	6	2
Ethiopia	Tigray	Mekele	7	2	49	70	5	7	6
Ethiopia	Addis Ababa	Addis Ababa*	8	4	38	16	1	1	4
Ethiopia	Amhara	West Gojam	9	17	10	9	18	9	9
Ethiopia	Amhara	Bar Dar Sp. Zone	10	14	59	57	7	10	10
Egypt									
Egypt	Al Qalyubiyah		1	9	17	3	1	1	1
Egypt	Al Gharbiyah		2	5	11	1	3	4	3
Egypt	Al Minufiyah		3	10	16	6	2	3	4
Egypt	Ash Sharqiyah		4	6	6	2	6	5	5
Egypt	Ad Daqahliyah		5	2	8	5	9	11	2
Egypt	Dumyat		6	1	22	20	8	9	11
Egypt	Al Buhayrah		7	11	7	7	13	10	7
Egypt	Al Qahirah*		8	8	15	8	10	6	6
Egypt	Bani Suwayf		9	14	13	10	15	16	12
Egypt	Kafr ash Shaykh		10	4	20	14	12	13	15
Democratic Republic of the Congo (DRC)									
DRC	Kivu	Sud-Kivu	1	3	9	2	20	1	20
DRC	Bas-Congo	Matadi	2	15	30	1	2	2	1
DRC	Kasaï-Oriental	Mbuji-Mayi	3	5	30	2	3	5	4
DRC	Kasaï-Oriental	Tshilenge	4	7	29	2	17	37	4
DRC	Katanga	Lubumbashi	5	11	30	2	1	3	2
DRC	Kivu	Bukavu	6	1	28	37	6	8	6
DRC	Bas-Congo	Boma	7	2	26	38	4	7	3
DRC	Kinshasa City	Kinshasa*	8	18	18	2	5	6	7
DRC	Kivu	Nord-Kivu	9	9	8	2	19	9	19
DRC	Bas-Congo	Bas-Fleuve	10	4	25	36	18	10	8
South Africa (SA)									
SA	Gauteng	Johannesburg*	1	82	228	4	1	1	1
SA	Western Cape	Kuils River*	2	263	339	228	10	3	5
SA	Gauteng	Roodepoort*	3	86	266	10	4	11	3
SA	Western Cape	Mitchells Plain*	4	261	344	228	8	2	8
SA	Gauteng	Benoni*	5	73	257	12	7	10	6
SA	KwaZulu-Natal	Durban	6	13	129	199	9	4	7
SA	Gauteng	Boksburg*	7	72	108	3	2	8	2
SA	Gauteng	Kempton Park*	8	77	200	5	17	6	9
SA	Gauteng	Soweto*	9	85	245	6	3	7	4
SA	Gauteng	Soshanguve*	10	104	313	26	14	12	13

Tanzania									
Tanzania	Dar-Es-Salaam	Ilala	1	124	39	82	5	3	1
Tanzania	Dar-Es-Salaam	Kinondoni	2	126	37	7	4	1	2
Tanzania	Arusha	Arusha	3	40	110	83	3	2	4
Tanzania	Dar-Es-Salaam	Temeke	4	125	119	86	7	4	5
Tanzania	Arusha	Arumeru	5	39	99	28	24	7	18
Tanzania	Kilimanjaro	Moshi Urban	6	31	111	14	6	5	6
Tanzania	Kilimanjaro	Moshi Rural	7	36	26	17	21	15	30
Tanzania	Kaskazini-Unguja	Kaskazini 'B'	8	131	103	4	25	11	9
Tanzania	Kilimanjaro	Rombo	9	33	81	17	63	34	132
Tanzania	Mwanza	Nyamagana	10	28	114	111	2	6	3

Notes: Overall key-player (KP) rank is based on the ρ_s estimated in column (8) of Table 2. Overall Katz-Bonacich rank is based on the ρ_s estimated in column (8) of Table 2 and a weighting vector of 1. Ethnicity KP rank is based on ρ_1 estimated in column (2) of Table 2. Inverse distance KP rank is based on ρ_2 estimated in column (4) of Table 2. Road KP rank is based on ρ_3 estimated in column (6) Table 2. * indicate districts that are (part of) capital cities. South Africa has three capital cities i.e. Pretoria (Gauteng), Bloemfontein (Free State) and Cape Town (Western Cape). The number of districts per country are: Ethiopia 72, Egypt 26 (ADM1 level), DRC 38, South Africa 354, and Tanzania 136.

O Top-Ten Rankings from Policy Experiments for Kenya and Nigeria

Table O1 presents the ten districts in Nigeria and Kenya where a counterfactual increase in economic activity (see Section 8.1) would have the largest overall impact. Table O2 presents the ten districts in Nigeria and Kenya where a counterfactual improvement of the road connectivity (see Section 8.2) would have the largest overall impact.

Table O1: Top-Ten Rankings from Policy Experiment 1 – Nighttime Lights

(1) Country	(2) Province	(3) District	(4) Overall Rank	(5) Overall Key-Player Rank
Nigeria				
Nigeria	Lagos	Surulere	1	9
Nigeria	Lagos	Mainland	2	8
Nigeria	Lagos	Shomolu	3	16
Nigeria	Lagos	Oshodi/Isolo	4	18
Nigeria	Bayelsa	Nembe	5	771
Nigeria	Lagos	Amuwo Odofin	6	10
Nigeria	Lagos	Alimosho	7	14
Nigeria	Lagos	Kosofe	8	25
Nigeria	Bayelsa	Brass	9	769
Nigeria	Delta	Warri South-West	10	772
Kenya				
Kenya	Coast	Lamu	1	48
Kenya	Central	Machakos	2	47
Kenya	Coast	Kilifi	3	46
Kenya	Coast	Kwale	4	3
Kenya	Central	Kiambu	5	5
Kenya	Central	Murang'a	6	7
Kenya	Eastern	Machakos	7	6
Kenya	Eastern	Embu	8	19
Kenya	Rift Valley	Nakuru	9	4
Kenya	Central	Kirinyaga	10	10

Notes: Overall rank reflects the district's overall impact from increasing its average nighttime light pixel value by 10 on average nighttime lights across African districts (see Section 8.1 for a more detailed explanation). This counterfactual exercise is based on the ρ s estimated in column (8) of Table 3. Nigeria has 775 districts, and Kenya has 48 districts.

Table O2: Top-Ten Rankings from Policy Experiment 2 – Roads

(1) Country	(2) Province	(3) District	(4) Overall Rank	(5) Overall Key-Player Rank
Nigeria				
Nigeria	Rivers	Bonny	1	763
Nigeria	Rivers	Okrika	1	21
Nigeria	Rivers	Khana	3	99
Nigeria	Delta	Burutu	4	75
Nigeria	Delta	Warri North	5	79
Nigeria	Rivers	Andoni/O	6	127
Nigeria	Delta	Ughelli South	7	45
Nigeria	Rivers	Abua/Odu	8	42
Nigeria	Rivers	Akukutor	9	766
Nigeria	Bayelsa	Yenegoa	10	31
Kenya				
Kenya	Central	Machakos	1	47
Kenya	Eastern	Wajir	2	31
Kenya	Eastern	Meru	3	43
Kenya	Central	Nyeri	3	8
Kenya	Central	Kirinyaga	5	10
Kenya	Central	Murang'a	6	7
Kenya	Eastern	Machakos	6	6
Kenya	Rift Valley	Narok	8	9
Kenya	Coast	Kwale	9	3
Kenya	Rift Valley	Bomet	10	24
Kenya	Rift Valley	Nakuru	10	4

Notes: Overall rank reflects the district's overall impact from adding a road link to the contiguous district with the highest average nighttime light pixel value to which there exists no road link (see Section 8.2 for a more detailed explanation). This counterfactual exercise is based on the ρ s estimated in column (8) of Table 3. Nigeria has 775 districts, and Kenya has 48 districts.

P Top-Ten Rankings from Policy Experiments for Other Populous Countries

Table P1 presents the ten districts in Ethiopia, Egypt, DRC, South Africa, and Tanzania where a counterfactual increase in economic activity (see Section 8.1) would have the largest overall impact. Table P2 presents the ten districts in the same country where a counterfactual improvement of the road connectivity (see Section 8.2) would have the largest overall impact.

Table P1: Top-Ten Rankings from Policy Experiment 1 (Nighttime Lights) for Populous Countries

(1) Country	(2) Province	(3) District	(4) Overall Rank	(5) Overall KP Rank
Ethiopia				
Ethiopia	Amhara	West Gojam	1	9
Ethiopia	Addis Ababa	Addis Ababa	2	8
Ethiopia	Addis Ababa	Zone 5	3	6
Ethiopia	Addis Ababa	Zone 4	4	1
Ethiopia	Afar	Zone 5	5	70
Ethiopia	Oromia	East Shewa	6	69
Ethiopia	Oromia	West Shewa	7	13
Ethiopia	Amhara	North Shewa (K3)	8	68
Ethiopia	Addis Ababa	Zone 2	9	3
Ethiopia	Addis Ababa	Zone 3	10	2
Egypt				
Egypt	Suhaj		1	18
Egypt	Al Jizah		2	24
Egypt	Asyut		3	19
Egypt	Qina		4	20
Egypt	Al Minya		5	22
Egypt	Matruh		6	26
Egypt	As Suways		7	23
Egypt	Al Bahr al Ahmar		8	25
Egypt	Ad Daqahliyah		9	5
Egypt	Al Wadi al Jadid		10	13

Democratic Republic of the Congo (DRC)				
DRC	Katanga	Haut-Shaba	1	37
DRC	Équateur	Sud-Ubangi	2	38
DRC	Kivu	Sud-Kivu	3	1
DRC	Katanga	Lubumbashi	4	5
DRC	Kivu	Nord-Kivu	5	9
DRC	Bas-Congo	Boma	6	7
DRC	Kinshasa City	Kinshasa	7	8
DRC	Bandundu	Mai-Ndombe	8	32
DRC	Kasai-Oriental	Tshilenge	9	4
DRC	Bas-Congo	Cataractes	10	36
South Africa (SA)				
SA	Western Cape	Wynberg	1	11
SA	Gauteng	Pretoria	2	22
SA	Gauteng	Kempton Park	3	8
SA	Gauteng	Randburg	4	16
SA	Gauteng	Wonderboom	5	37
SA	Gauteng	Germiston	6	13
SA	Western Cape	Goodwood	7	26
SA	Gauteng	Alberton	8	21
SA	Gauteng	Bronkhorstspuit	9	339
SA	Gauteng	Johannesburg	10	1
Tanzania				
Tanzania	Zanzibar West	Magharibi	1	135
Tanzania	Morogoro	Morogoro Rural	2	136
Tanzania	Iringa	Iringa Rural	3	16
Tanzania	Mwanza	Ilemela	4	134
Tanzania	Pwani	Mafia	5	130
Tanzania	Zanzibar South and Central	Zansibar Central	6	11
Tanzania	Arusha	Arumeru	7	5
Tanzania	Arusha	Simanjiro	8	127
Tanzania	Kaskazini-Unguja	Kaskazini 'B'	9	8
Tanzania	Kilimanjaro	Moshi Rural	10	7

Notes: Overall rank is based on counterfactual analysis described in Section 8.1 and the ρ s estimated in column (8) of Table 3. Overall key-player (KP) rank is based on the ρ s estimated in column (8) of Table 3 as well. The number of districts per country are: Ethiopia 72, Egypt 26 (ADM1 level), DRC 38, SA 354, and Tanzania 136.

Table P2: Top-Ten Rankings from Policy Experiment 2 (Roads) for Populous Countries

(1) Country	(2) Province	(3) District	(4) Overall Rank	(5) Overall KP Rank
Ethiopia				
Ethiopia	Tigray	Central Tigray	1	17
Ethiopia	Tigray	Easetern Tigray	2	16
Ethiopia	Afar	Zone 5	3	70
Ethiopia	Tigray	Southern Tigray	4	65
Ethiopia	Afar	Zone 4	4	71
Ethiopia	Amhara	South Gonder	6	66
Ethiopia	Amhara	West Gojam	6	9
Ethiopia	Amhara	North Wollo	8	54
Ethiopia	Addis Ababa	Zone 5	9	6
Ethiopia	SNNP*	Konso Special Woreda	10	29
<i>*Southern Nations, Nationalities and Peoples</i>				
Egypt				
Egypt	Al Qalyubiyah		1	1
Egypt	Ad Daqahliyah		1	5
Egypt	Asyut		3	19
Egypt	Al Minufiyah		3	3
Egypt	Suhaj		3	18
Egypt	Al Fayyum		3	11
Egypt	Al Qahirah		3	8
Egypt	Al Iskandariyah		3	12
Egypt	Al Isma‘iliyah		3	15
Egypt	Al Buhayrah		3	7
Egypt	Al Gharbiyah		3	2
Egypt	Kafr ash Shaykh		3	10
Egypt	Dumyat		3	6
Egypt	Bani Suwayf		3	9
Democratic Republic of the Congo (DRC)				
DRC	Bas-Congo	Bas-Fleuve	1	10
DRC	Bas-Congo	Boma	2	7
DRC	Bas-Congo	Matadi	2	2
DRC	Kivu	Sud-Kivu	4	1
DRC	Bas-Congo	Cataractes	5	36
DRC	Kasaï-Occidental	Lulua	6	34
DRC	Kivu	Nord-Kivu	7	9
DRC	Kasaï-Occidental	Kasaï	8	21
DRC	Équateur	Équateur	9	16
DRC	Orientale	Ituri	10	15

South Africa (SA)				
SA	Orange Free State	Bloemfontein	1	115
SA	Orange Free State	Botshabelo	1	27
SA	Orange Free State	Thaba’Nchu	3	99
SA	Orange Free State	Dewetsdorp	4	283
SA	Mpumalanga	Moutse	5	65
SA	Gauteng	Cullinan	6	190
SA	Mpumalanga	Moretele	7	352
SA	Mpumalanga	Mdutjana	7	41
SA	Mpumalanga	Mbibana	9	114
SA	Limpopo	Bochum	10	349
SA	Limpopo	Seshego	10	77
Tanzania				
Tanzania	Kilimanjaro	Mwanga	1	116
Tanzania	Kilimanjaro	Same	2	115
Tanzania	Kagera	Bukoba Rural	3	22
Tanzania	Manyara	Simanjiro	4	123
Tanzania	Manyara	Karatu	5	103
Tanzania	Mtwara	Masasi	6	72
Tanzania	Manyara	Mbulu	7	64
Tanzania	Mwanza	Nyamagana	8	10
Tanzania	Mwanza	Lake Victoria	8	40
Tanzania	Mara	Lake Victoria	10	94

Notes: Overall rank is based on counterfactual analysis described in Section 8.2 and the ρ s estimated in column (8) of Table 3. Overall key-player (KP) rank is based on the ρ s estimated in column (8) of Table 3 as well. The number of districts per country are: Ethiopia 72, Egypt 26 (ADM1 level), DRC 38, SA 354, and Tanzania 136.