Water Wars

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December 15, 2024

Motivation

- Access to water essential for human life and economic activity:
  - 57% of the global population suffer water scarcity (Mekonnen and Hoekstra, 2016)
  - Climate change exacerbates the issue
  - Cooperation in water management and the potential for conflicts over water access key concern for policy-makers (UN, 2023)

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  - Climate change exacerbates the issue
  - Cooperation in water management and the potential for conflicts over water access key concern for policy-makers (UN, 2023)
- Controlling rivers and lakes allows to use surface water for economic needs:
  - Recession agriculture
  - Irrigation channels
  - Water points for animals

Accelerating water wars

Haitham Nouri , Tuesday 18 Jul 2023

Conflict over water in the Fertile Crescent and East Africa due to dam construction and climate change is harming livelihoods, increasing food insecurity, and fuelling international tensions, writes Haitham Nouri

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Conflict over water as farmers upstream divert rivers

RIVER DRIES, DOWNSTREAM FARMERS SUFFER

Thika residents unblock diverted River Ndarugu

Farmers say they had been given permission by a chief to block the river and use the water for irrigation

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SUB-SAHARAN AFRICA | LAND AND FOOD

Communal Conflicts Across the Kenyan-Ugandan Border

Livestock raiding and competition for water and pastures lead to cycles of reciprocal violence between pastoralist groups in the Kenyan-Ugandan border region. More frequent and severe droughts as well as the proliferation of weapons from war-torn neighbour countries are further aggravating this situation.

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World Business Markets Sustainability Legal Breakingviews

World

As water falls short, conflict between herders and farmers sharpens

This paper

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- *Detect conflicts related to water resources:*
  - Where? Granular data on rivers network:
    - Up-downstream relationship
    - Water presence
  - When? Low rainfall in the regiom

This paper

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- Focus on Africa:
  - Largely agrarian
  - Lack irrigation $\rightarrow$ rainfall, wells, rivers and lakes
  - Weak states & ethnic grievances

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Contributions to the literature

- Climate change and weather shocks influence on conflict Burke, Hsiang and Miguel, 2015; Sarsons, 2015; Harari and La Ferrara, 2018; ...

  ⇝ Control of freshwater resources as a specific mechanism Eberle et al, 2020; McGuirk and Nunn, 2023

  ⇝ Rivers network as exact structure of spatial spillovers König et al, 2017; McGuirk and Nunn, 2023

- Natural resources and conflict Dube and Vargas, 2013; Berman et al, 2017; McGuirk and Burke, 2020; Adhvaryu et al, 2021; ...

  ⇝ Water as a resource curse

i) **Data**

ii) **Empirical strategy & Main Results**

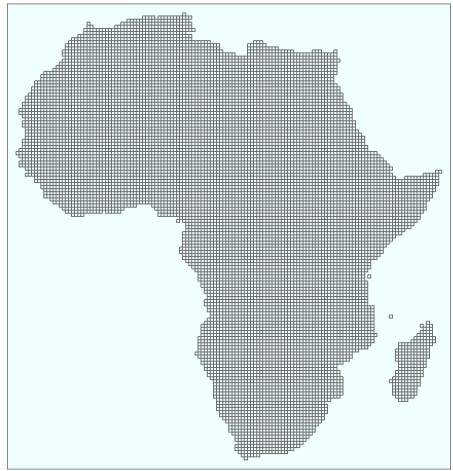
iii) **Heterogeneity**

iv) **Conclusion**

Data

Data

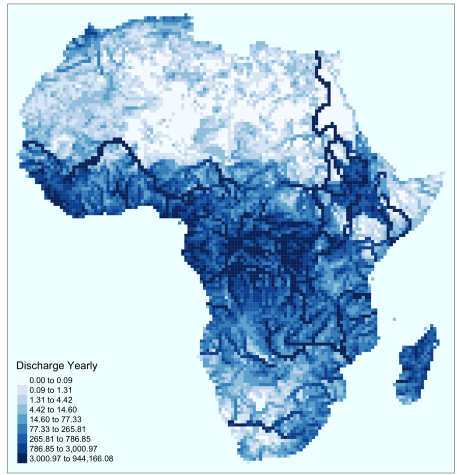
- Panel at $0.5° \times 0.5°$ cell-year level for period 1997-2021.



Data

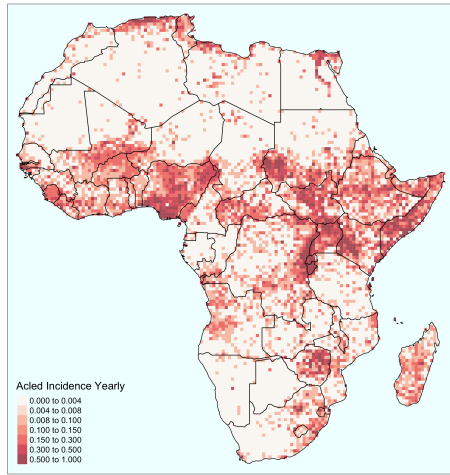
- ⋆ Panel at $0.5° \times 0.5°$ cell-year level for period 1997-2021.

- Hydrology
  - Discharge: Volume rate of water flow, $0.05° \times 0.05°$ ERA5
  - Rivers network: Upstream/Downstream relationships HydroSHEDS



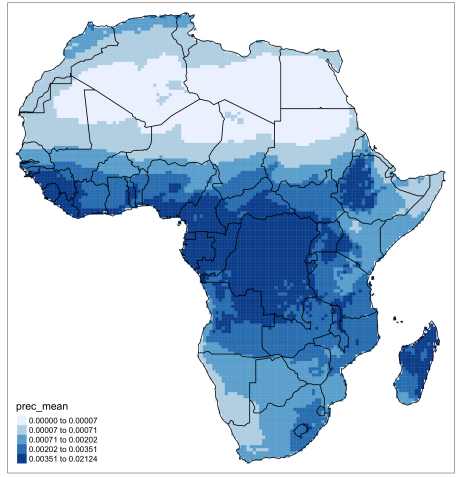
Data

- ⋆ Panel at $0.5° \times 0.5°$ cell-year level for period 1997-2021.
- Hydrology
- Conflicts
  - ACLED: violent events 1997-2021.



Data

- ⋆ Panel at $0.5° \times 0.5°$ cell-year level for period 1997-2021.
  - Hydrology
  - Conflicts
  - Rainfall
    - Yearly precipitation ERA5 1951-2021
    - **Shock:** calendar year rainfall $\leq$ 15th percentile of a location's long-run rainfall distribution (as in Burke et al. 2015 EJ and Corno et al. 2020 ECMA)



Variables Definition

- Neighborhood: all cells within 180 km radius

  (Harari and La Ferrara, 2018)

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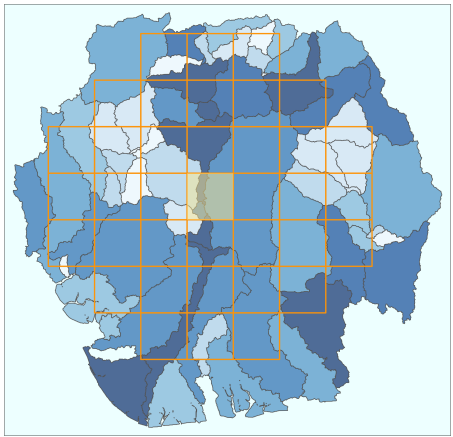
  - Overlap grid cells with basins.



Variables Definition

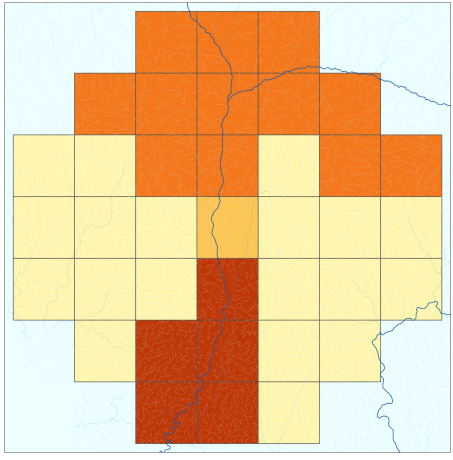
- Neighborhood: all cells within 180 km radius

  (Harari and La Ferrara, 2018)

- Upstream/downstream relationships:

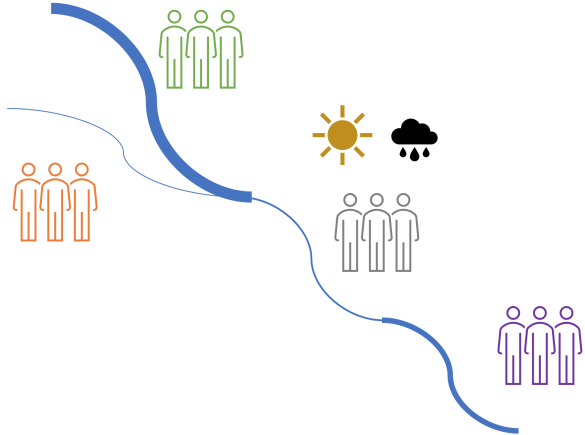
  - Overlap grid cells with basins.

  - For each cells select basin with highest discharge $\rightarrow$ unique identifier up-down.

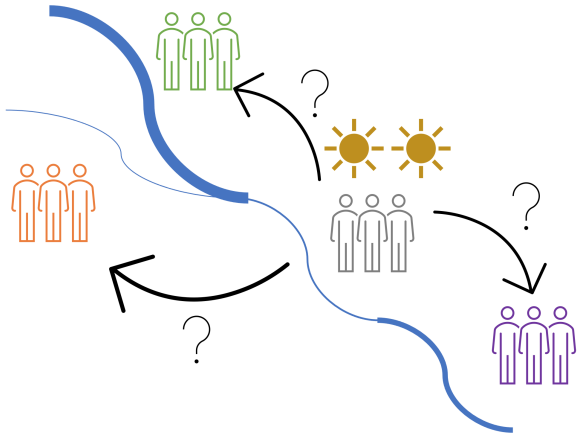


Empirical strategy & Main Results

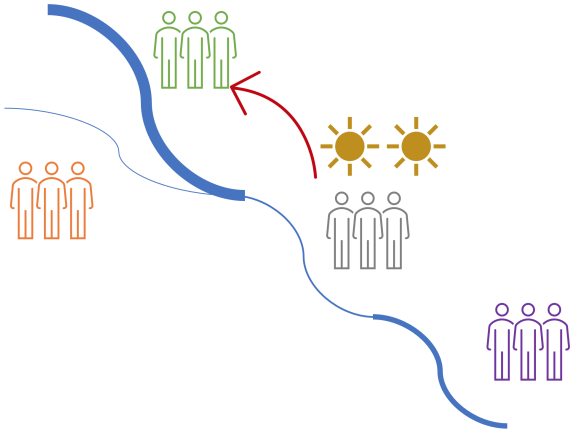
Stylized example



Stylized example



Stylized example



Econometric Specification

$$y_{it} = \gamma_1 Shock_{it}^{Own} + \gamma_2 \text{Water Rich}_{it} + \beta_1 Shock_{it}^{Down} + \beta_2 Shock_{it}^{Down} \times \text{Water Rich}_{it} + \lambda_1 Shock_{it}^{Up} + \lambda_2 Shock_{it}^{Up} \times \text{Water Rich}_{it} + \mu_i + \mu_{ct} + \varepsilon_{it}$$

- $y_{it} \in (0, 1)$: conflict incidence
- *Shock Own:* rainfall shock in own cell *i*
- *Shock Down:* rainfall shock in a neighboring downstream cell
- *Shock Up:* rainfall shock in a neighboring upstream cell
- *Water Rich:* own water richness
- μ: cell and country-year fixed effects

Water Richness

H: *Water rich cells experience more conflict than water poor cells when low rainfall in a neighbouring (downstream) cell* ($\beta_2 > 0$)

Water Richness

H: *Water rich cells experience more conflict than water poor cells when low rainfall in a neighbouring (downstream) cell* ($\beta_2 > 0$)

1. **Water Amount:** log of average water discharge present in the cell in a given year.

Water Discharge

	Incidence (ACLED)				
	(1)	(2)	(3)	(4)	(5)
Water Discharge	0.0010	0.0007	0.0010	0.0009	0.0009
	(0.0009)	(0.0010)	(0.0009)	(0.0009)	(0.0009)
Water Discharge × Shock Down	0.0011***		0.0011***		0.0012***
	(0.0004)		(0.0004)		(0.0004)
Water Discharge × Shock Up		0.0003		0.0003	-0.0002
		(0.0005)		(0.0005)	(0.0005)
Shock Down	0.0008		0.0010		0.0009
	(0.0017)		(0.0018)		(0.0018)
Shock Up		-0.0018		-0.0024	-0.0014
		(0.0020)		(0.0021)	(0.0021)
Shock Own			-0.0005	0.0020	0.0000
			(0.0017)	(0.0016)	(0.0017)
Cell FE	✓	✓	✓	✓	✓
Country-Year FE	✓	✓	✓	✓	✓
Dep. Var. Mean	0.08201	0.08201	0.08201	0.08201	0.08201
R^2	0.42101	0.42095	0.42101	0.42096	0.42101
Cells	10,228	10,228	10,228	10,228	10,228
Observations	255,700	255,700	255,700	255,700	255,700

Water richness

H: *Water rich cells experience more conflict than water poor cells when low rainfall in a neighboring (downstream) cell* ($\beta_2 > 0$)

1. **Water Amount:** log of average water discharge present in the cell in a given year.
2. **Water Monopolist:** own cell has $\geq$ water than any other cell in neighbourhood in a year.
3. **Water Monopolist +:** own cell has $\geq$ water than any other cell in neighbourhood & $\geq$ water than continent-year median.

All Measures

	Incidence (ACLED)		
	Water Discharge	Water Monopolist	Water Monopolist +
	(1)	(2)	(3)
Water Measure	0.0009	0.0120	0.0151
	(0.0009)	(0.0098)	(0.0106)
Water Measure × Shock Down	0.0012***	0.0181	0.0336**
	(0.0004)	(0.0123)	(0.0170)
Water Measure × Shock Up	-0.0002	-0.0020	-0.0046
	(0.0005)	(0.0118)	(0.0144)
Shock Own	0.0000	-0.0004	-0.0004
	(0.0017)	(0.0017)	(0.0017)
Shock Down	0.0009	0.0049***	0.0048***
	(0.0018)	(0.0015)	(0.0015)
Shock Up	-0.0014	-0.0018	-0.0018
	(0.0021)	(0.0017)	(0.0017)
Cell FE	✓	✓	✓
Country-Year FE	✓	✓	✓
Dep. Var. Mean	0.08201	0.08201	0.08201
R^2	0.42101	0.42101	0.42103
Cells	10,228	10,228	10,228
Observations	255,700	255,700	255,700

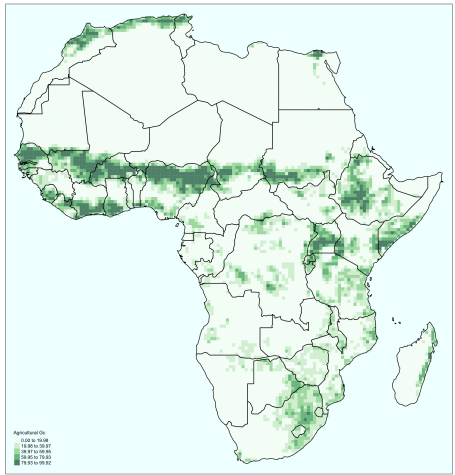
Sensitivity Analysis

- **Inference**: allow for spatial correlation
- Alternative **conflict** types
- Alternative **conflict** data: UCDP ged
- Additional **controls**: population, temperature, lagged conflict
- Alternative **radius**
- Alternative **rainfall shocks**

Heterogeneity

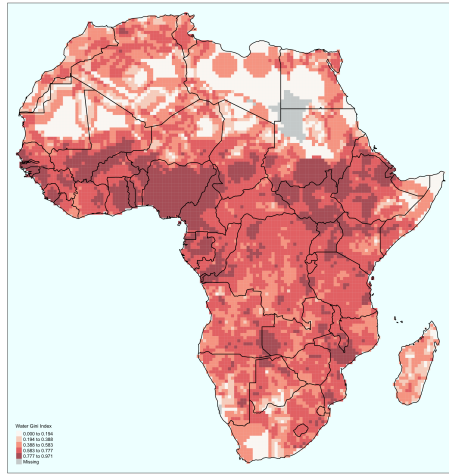
Heterogeneity

- Agriculture: ↑ returns access water



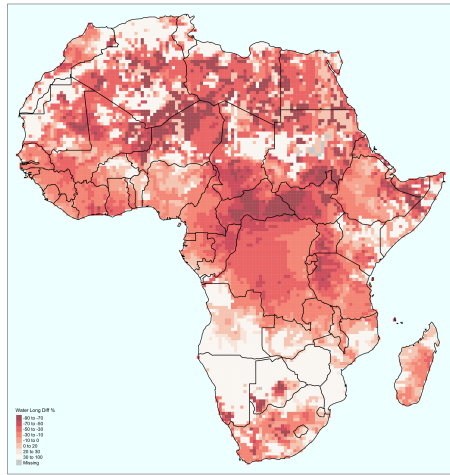
Heterogeneity

- Agriculture: ↑ returns access water
- Ethnic grievances: ↑ cooperation costs
  Inequality in water ownership between groups:
  - Polarization index
  - Gini index
  - Theil index



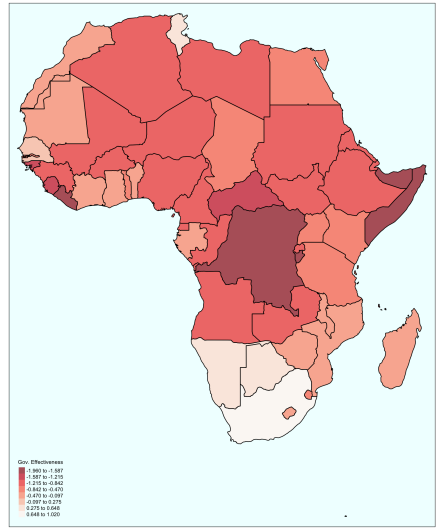
Heterogeneity

- Agriculture: ↑ returns access water
- Ethnic grievances: ↑ cooperation costs
- Water stress: long-run change in water presence

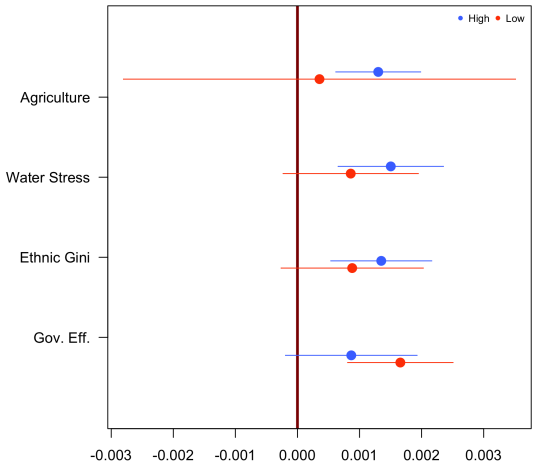


Heterogeneity

- Agriculture: ↑ returns access water
- Ethnic grievances: ↑ cooperation costs
- Water stress: long-run change in water presence
- Institutional quality:
  - Democracy
  - Rule of law
  - Government effectiveness
  - Corruption



Heterogeneity



Conclusion

- Granular data on rivers network, rainfall, local violence on entire African continent over period 1997–2021
  $\rightsquigarrow$ Competition over water resources can lead to local violence

- Unequal distribution water resources + structure rivers network relevant when thinking about climate-conflict relationship

- Formal and informal institutions matter for natural resource governance: weak states and ethnic inequality in control water exacerbate issue

- Issue may become worse with climate change: stronger effects in regions experiencing long-term decline in water presence

Thank you!

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Summary Statistics

Variable	Mean	SD	Min	Median	Max	N
Panel A: *Conflicts*						
Incidence (ACLED)	0.0820	0.2744	0	0	1.0000	255,700
Incidence Battles	0.0543	0.2266	0	0	1.0000	255,700
Incidence Violence	0.0557	0.2293	0	0	1.0000	255,700
Incidence Protests	0.0415	0.1995	0	0	1.0000	255,700
Incidence Riots	0.0351	0.1840	0	0	1.0000	255,700
Incidence (GED)	0.0304	0.1716	0	0	1.0000	337,524
Panel B: *Water measures*						
Water Discharge (ln)	3.6334	3.2151	0	3.0318	14.131	255,700
Water Monopolist	0.0172	0.1299	0	0	1.0000	255,700
Water Monopolist +	0.0125	0.1113	0	0	1.0000	255,700
Panel C: *Rainfall shocks*						
Shock Down	0.2556	0.4362	0	0	1.0000	255,700
Shock Down p10	0.1742	0.3793	0	0	1.0000	255,700
Shock Down p20	0.3337	0.4715	0	0	1.0000	255,700
Shock Own	0.1971	0.3978	0	0	1.0000	255,700
Shock Own p10	0.1273	0.3333	0	0	1.0000	255,700
Shock Own p20	0.2664	0.4421	0	0	1.0000	255,700
Shock Up	0.1755	0.3804	0	0	1.0000	255,700
Shock Up p10	0.1225	0.3278	0	0	1.0000	255,700
Shock Up p20	0.2235	0.4166	0	0	1.0000	255,700
Panel D: *Other variables*						
Agricultural Cover	15.889	24.458	0	2.3642	99.917	255,700
Discharge Long Diff	195.79	2,479.2	-100.00	-16.739	99,670	255,275
Democratic	-0.9225	0.8486	-2.2008	-0.9961	0.9389	255,700
Rule of Law	-0.9089	0.6794	-2.1447	-1.0216	0.5845	255,700
Government Effectiveness	-0.7418	0.6503	-1.9599	-0.9236	1.0205	255,700
Corruption	-0.7347	0.6259	-1.6479	-0.8607	0.8180	255,700
RQ Index	0.5050	0.3053	0	0.5665	1.0000	252,650
Gini Index	0.5614	0.2472	0	0.6171	0.9712	252,650
Theil Index	0.8042	0.5596	0	0.7192	3.3539	252,650
Temperature (day)	27.306	3.4748	10.836	27.239	37.245	255,700
Temperature	24.462	3.4479	8.1089	24.596	34.057	255,700
Population	94,578	317,839	0	20,116	18,604,352	255,700

Water Discharge Conley

	Incidence (ACLED)				
	(1)	(2)	(3)	(4)	(5)
Water Discharge	0.0010	0.0007	0.0010	0.0009	0.0009
	(0.0013)	(0.0013)	(0.0012)	(0.0012)	(0.0012)
Water Discharge × Shock Down	0.0011**		0.0011**		0.0012**
	(0.0006)		(0.0006)		(0.0006)
Water Discharge × Shock Up		0.0003		0.0003	-0.0002
		(0.0006)		(0.0006)	(0.0006)
Shock Down	0.0008		0.0010		0.0009
	(0.0024)		(0.0024)		(0.0023)
Shock Up		-0.0018		-0.0024	-0.0014
		(0.0025)		(0.0025)	(0.0024)
Shock Own			-0.0005	0.0020	0.0000
			(0.0021)	(0.0021)	(0.0021)
Cell FE	✓	✓	✓	✓	✓
Country-Year FE	✓	✓	✓	✓	✓
Dep. Var. Mean	0.08201	0.08201	0.08201	0.08201	0.08201
R^2	0.42101	0.42095	0.42101	0.42096	0.42101
Cells	10,228	10,228	10,228	10,228	10,228
Observations	255,700	255,700	255,700	255,700	255,700

ACLED Conflict Categories

	Incidence (ACLED)	Incidence Battles	Incidence Violence	Incidence Protests	Incidence Riots
	(1)	(2)	(3)	(4)	(5)
Water Discharge	0.0009	0.0013*	-0.0008	0.0006	-0.0006
	(0.0009)	(0.0008)	(0.0008)	(0.0007)	(0.0006)
Water Discharge × Shock Down	0.0012***	0.0013***	0.0011***	0.0001	0.0001
	(0.0004)	(0.0004)	(0.0004)	(0.0003)	(0.0003)
Water Discharge × Shock Up	-0.0002	-0.0003	0.0002	0.0002	0.0005
	(0.0005)	(0.0004)	(0.0004)	(0.0003)	(0.0003)
Shock Own	0.0000	0.0004	-0.0011	-0.0011	-0.0030**
	(0.0017)	(0.0015)	(0.0015)	(0.0013)	(0.0012)
Shock Down	0.0009	0.0005	0.0001	-0.0004	-0.0010
	(0.0018)	(0.0016)	(0.0015)	(0.0014)	(0.0012)
Shock Up	-0.0014	-0.0032*	-0.0011	-0.0007	-0.0016
	(0.0021)	(0.0018)	(0.0018)	(0.0016)	(0.0014)
Cell FE	✓	✓	✓	✓	✓
Country-Year FE	✓	✓	✓	✓	✓
Dep. Var. Mean	0.08201	0.05431	0.05570	0.04152	0.03507
R^2	0.42101	0.36651	0.38268	0.39875	0.37082
Cells	10,228	10,228	10,228	10,228	10,228
Observations	255,700	255,700	255,700	255,700	255,700

Water Discharge GED

	Incidence (GED Geo3)		
	Water Discharge	Water Monopolist	Water Monopolist +
	(1)	(2)	(3)
Water Measure	-0.0003	0.0147**	0.0129*
	(0.0006)	(0.0072)	(0.0070)
Water Measure × Shock Down	0.0005*	0.0143*	0.0305**
	(0.0003)	(0.0086)	(0.0124)
Water Measure × Shock Up	-0.0004	-0.0018	-0.0058
	(0.0003)	(0.0079)	(0.0095)
Shock Own	0.0012	0.0012	0.0012
	(0.0011)	(0.0011)	(0.0011)
Shock Down	0.0001	0.0017*	0.0016*
	(0.0011)	(0.0010)	(0.0010)
Shock Up	-0.0007	-0.0021*	-0.0021**
	(0.0013)	(0.0011)	(0.0011)
Cell FE	✓	✓	✓
Country-Year FE	✓	✓	✓
Dep. Var. Mean	0.03039	0.03039	0.03039
R^2	0.28764	0.28768	0.28771
Cells	10,228	10,228	10,228
Observations	337,524	337,524	337,524

Additional Controls

	Incidence (ACLED)			
	(1)	(2)	(3)	(4)
Water Discharge	0.0009	0.0013	0.0015	0.0008
	(0.0009)	(0.0010)	(0.0010)	(0.0009)
Water Discharge × Shock Down	0.0012***	0.0012***	0.0012***	0.0011**
	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Water Discharge × Shock Up	-0.0001	-0.0002	-0.0002	-0.0002
	(0.0005)	(0.0005)	(0.0005)	(0.0005)
Shock Own	0.0000	-0.0004	-0.0006	-0.0002
	(0.0017)	(0.0017)	(0.0017)	(0.0017)
Shock Down	0.0009	0.0007	0.0005	0.0004
	(0.0018)	(0.0018)	(0.0018)	(0.0018)
Shock Up	-0.0014	-0.0015	-0.0015	-0.0002
	(0.0021)	(0.0021)	(0.0021)	(0.0020)
Log pop.	0.0046			
	(0.0048)			
Temp.		0.0044**		
		(0.0022)		
Temp. (day)			0.0059***	
			(0.0020)	
Lagged Incidence				0.1701***
				(0.0051)
Cell FE	✓	✓	✓	✓
Country-Year FE	✓	✓	✓	✓
Dep. Var. Mean	0.08201	0.08201	0.08201	0.08366
R^2	0.42102	0.42103	0.42104	0.44153
Cells	10,228	10,228	10,228	10,228
Observations	255,700	255,700	255,700	245,472

Radius 200 Km

	Incidence (ACLED)		
	Water Discharge	Water Monopolist	Water Monopolist +
	(1)	(2)	(3)
Water Measure	0.0009	0.0104	0.0093
	(0.0009)	(0.0106)	(0.0112)
Water Measure × Shock Down	0.0010**	0.0217*	0.0341**
	(0.0004)	(0.0123)	(0.0168)
Water Measure × Shock Up	-0.0001	-0.0053	-0.0061
	(0.0005)	(0.0114)	(0.0133)
Shock Own	0.0003	-0.0001	-0.0001
	(0.0017)	(0.0017)	(0.0017)
Shock Down	0.0008	0.0042***	0.0041***
	(0.0018)	(0.0015)	(0.0015)
Shock Up	-0.0018	-0.0018	-0.0019
	(0.0020)	(0.0017)	(0.0017)
Cell FE	✓	✓	✓
Country-Year FE	✓	✓	✓
Dep. Var. Mean	0.08201	0.08201	0.08201
R^2	0.42100	0.42100	0.42101
Cells	10,228	10,228	10,228
Observations	255,700	255,700	255,700

Radius 160 Km

	Incidence (ACLED)		
	Water Discharge	Water Monopolist	Water Monopolist +
	(1)	(2)	(3)
Water Measure	0.0009	0.0102	0.0125
	(0.0009)	(0.0080)	(0.0087)
Water Measure × Shock Down	0.0014***	0.0133	0.0224
	(0.0005)	(0.0109)	(0.0144)
Water Measure × Shock Up	-0.0001	-0.0059	-0.0066
	(0.0005)	(0.0104)	(0.0125)
Shock Own	-0.0001	-0.0005	-0.0005
	(0.0017)	(0.0017)	(0.0017)
Shock Down	0.0002	0.0049***	0.0049***
	(0.0020)	(0.0016)	(0.0016)
Shock Up	-0.0015	-0.0015	-0.0016
	(0.0022)	(0.0018)	(0.0018)
Cell FE	✓	✓	✓
Country-Year FE	✓	✓	✓
Dep. Var. Mean	0.08201	0.08201	0.08201
R^2	0.42102	0.42100	0.42101
Cells	10,228	10,228	10,228
Observations	255,700	255,700	255,700

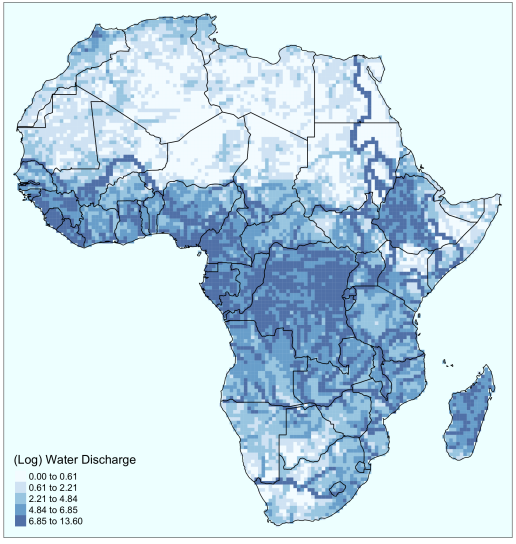
Rainfall shocks G10

	Incidence (ACLED)		
	Water Discharge	Water Monopolist	Water Monopolist +
	(1)	(2)	(3)
Water Measure	0.0010	0.0125	0.0163
	(0.0009)	(0.0095)	(0.0104)
Water Measure × Shock Down	0.0014***	0.0275**	0.0458***
	(0.0005)	(0.0137)	(0.0172)
Water Measure × Shock Up	0.0003	-0.0073	-0.0104
	(0.0005)	(0.0120)	(0.0138)
Shock Own	0.0006	0.0002	0.0002
	(0.0020)	(0.0020)	(0.0020)
Shock Down	-0.0003	0.0043**	0.0043**
	(0.0022)	(0.0017)	(0.0017)
Shock Up	-0.0008	0.0009	0.0009
	(0.0024)	(0.0020)	(0.0020)
Cell FE	✓	✓	✓
Country-Year FE	✓	✓	✓
Dep. Var. Mean	0.08201	0.08201	0.08201
R^2	0.42102	0.42101	0.42103
Cells	10,228	10,228	10,228
Observations	255,700	255,700	255,700

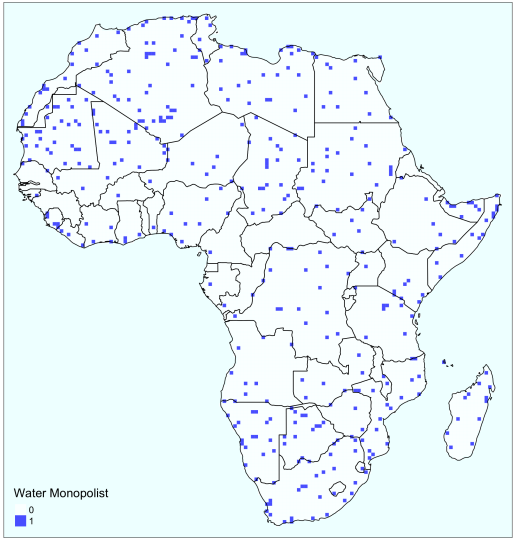
Rainfall shocks G20

	Incidence (ACLED)		
	Water Discharge	Water Monopolist	Water Monopolist +
	(1)	(2)	(3)
Water Measure	0.0010	0.0095	0.0115
	(0.0010)	(0.0100)	(0.0108)
Water Measure × Shock Down	0.0013***	0.0218**	0.0386***
	(0.0004)	(0.0104)	(0.0143)
Water Measure × Shock Up	-0.0007	-0.0009	-0.0027
	(0.0005)	(0.0105)	(0.0128)
Shock Own	0.0031**	0.0028*	0.0028*
	(0.0015)	(0.0015)	(0.0015)
Shock Down	-0.0031*	0.0008	0.0008
	(0.0017)	(0.0014)	(0.0014)
Shock Up	0.0003	-0.0023	-0.0023
	(0.0019)	(0.0016)	(0.0016)
Cell FE	✓	✓	✓
Country-Year FE	✓	✓	✓
Dep. Var. Mean	0.08201	0.08201	0.08201
R^2	0.42100	0.42100	0.42103
Cells	10,228	10,228	10,228
Observations	255,700	255,700	255,700

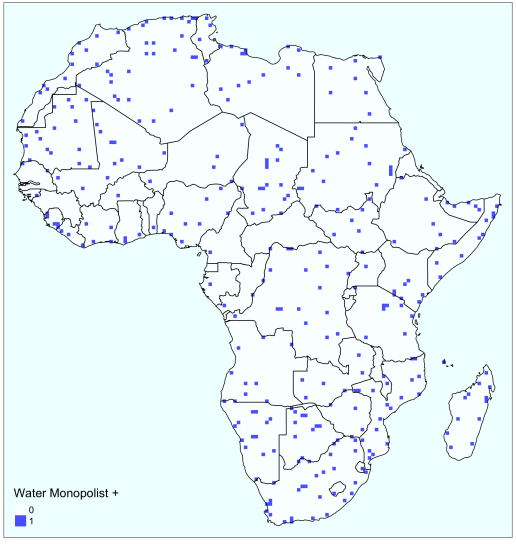
Water Discharge Map



Water Monopolist



Water Monopolist +



Framework

- Low rainfall $\rightarrow$ value of surface water $\uparrow$
- i affected by drought is more inclined to seek access to water in neighboring cells, particularly if these cells are abundant in water
- Contend for access to water in upstream locations, as they already have some level of access to water that will flow through their own cell and eventually downstream to other, potentially water-rich, areas

⋆ A cell more likely to experience *conflict over water resources* if it is water rich and a drought happens in a cell located downstream

Heterogeneity: Agriculture

	Incidence (ACLED)			
	Agri Yes	Agri No	Agri50 H	Agri50 L
	(1)	(2)	(3)	(4)
Water Discharge	0.0010	0.0019**	0.0016	0.0010
	(0.0012)	(0.0009)	(0.0015)	(0.0011)
Water Discharge × Shock Down	0.0014**	0.0001	0.0018**	0.0010
	(0.0006)	(0.0019)	(0.0007)	(0.0007)
Water Discharge × Shock Up	-0.0003	0.0000	-0.0005	-0.0008
	(0.0006)	(0.0020)	(0.0008)	(0.0007)
Shock Own	-0.0024	0.0000	-0.0028	-0.0015
	(0.0023)	(0.0013)	(0.0028)	(0.0017)
Shock Down	-0.0009	0.0008	-0.0058	0.0025
	(0.0033)	(0.0016)	(0.0046)	(0.0017)
Shock Up	-0.0010	0.0001	0.0016	-0.0007
	(0.0038)	(0.0016)	(0.0053)	(0.0018)
Cell FE	✓	✓	✓	✓
Country-Year FE	✓	✓	✓	✓
Dep. Var. Mean	0.11341	0.00995	0.13336	0.03066
R^2	0.41907	0.28129	0.43298	0.33517
Cells	7,124	3,104	5,114	5,114
Observations	178,100	77,600	127,850	127,850

Heterogeneity: Ethnic Grievances

	Incidence (ACLED)					
	RQ H	RQ L	Gini H	Gini L	Theil H	Theil L
	(1)	(2)	(3)	(4)	(5)	(6)
Water Discharge	0.0014	0.0016	0.0010	0.0022**	0.0017	0.0019*
	(0.0013)	(0.0015)	(0.0016)	(0.0011)	(0.0016)	(0.0011)
Water Discharge × Shock Down	0.0017***	0.0003	0.0017**	0.0006	0.0018***	0.0008
	(0.0007)	(0.0006)	(0.0007)	(0.0007)	(0.0007)	(0.0007)
Water Discharge × Shock Up	-0.0001	-0.0008	-0.0006	-0.0004	-0.0008	-0.0001
	(0.0007)	(0.0006)	(0.0008)	(0.0007)	(0.0008)	(0.0007)
Shock Own	-0.0010	-0.0012	-0.0033	0.0007	-0.0031	0.0007
	(0.0025)	(0.0024)	(0.0027)	(0.0020)	(0.0027)	(0.0019)
Shock Down	-0.0026	0.0028	-0.0029	0.0022	-0.0044	0.0025
	(0.0031)	(0.0023)	(0.0040)	(0.0019)	(0.0039)	(0.0019)
Shock Up	0.0028	-0.0031	0.0022	-0.0018	0.0036	-0.0026
	(0.0034)	(0.0026)	(0.0046)	(0.0022)	(0.0045)	(0.0021)
Cell FE	✓	✓	✓	✓	✓	✓
Country-Year FE	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	0.08727	0.07869	0.11787	0.04808	0.11907	0.04687
R^2	0.41479	0.44586	0.42949	0.39843	0.42989	0.39681
Cells	5,054	5,052	5,054	5,052	5,054	5,052
Observations	126,350	126,300	126,350	126,300	126,350	126,300

Heterogeneity: Water Stress

	Incidence (ACLED)			
	Above Median Change	Below Median Change	Positive Change	Negative Change
	(1)	(2)	(3)	(4)
Water Discharge	0.0017*	-0.0013	0.0019*	0.0007
	(0.0010)	(0.0023)	(0.0010)	(0.0019)
Water Discharge × Shock Down	0.0001	0.0019***	-0.0007	0.0015***
	(0.0007)	(0.0006)	(0.0010)	(0.0005)
Water Discharge × Shock Up	0.0003	-0.0004	0.0012	-0.0005
	(0.0007)	(0.0006)	(0.0010)	(0.0006)
Shock Own	-0.0007	-0.0002	0.0064**	-0.0046**
	(0.0026)	(0.0023)	(0.0028)	(0.0021)
Shock Down	0.0055**	-0.0028	0.0023	-0.0001
	(0.0026)	(0.0026)	(0.0028)	(0.0024)
Shock Up	-0.0004	-0.0023	-0.0025	-0.0007
	(0.0028)	(0.0030)	(0.0028)	(0.0029)
Cell FE	✓	✓	✓	✓
Country-Year FE	✓	✓	✓	✓
Dep. Var. Mean	0.08827	0.07593	0.07136	0.08813
R^2	0.43971	0.41519	0.42857	0.42647
Cells	5,106	5,105	3,670	6,541
Observations	127,650	127,625	91,750	163,525

Heterogeneity: Institutional Quality

	Incidence (ACLED)							
	Dem H	Dem L	RLaw H	RLaw L	Gov Eff H	Gov Eff L	Corrupt H	Corrupt L
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Water Discharge	0.0004	0.0016	-0.0007	0.0031	0.0018**	-0.0007	-0.0008	0.0036*
	(0.0008)	(0.0022)	(0.0009)	(0.0019)	(0.0009)	(0.0023)	(0.0009)	(0.0020)
Water Discharge × Shock Down	0.0001	0.0017***	0.0006	0.0016***	0.0005	0.0017***	0.0005	0.0012**
	(0.0006)	(0.0006)	(0.0007)	(0.0006)	(0.0007)	(0.0006)	(0.0006)	(0.0006)
Water Discharge × Shock Up	0.0003	-0.0005	0.0005	-0.0006	-0.0004	0.0002	-0.0003	-0.0001
	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0006)	(0.0007)
Shock Own	0.0012	-0.0015	-0.0011	0.0007	0.0036	-0.0033	-0.0015	0.0012
	(0.0023)	(0.0025)	(0.0024)	(0.0024)	(0.0023)	(0.0025)	(0.0020)	(0.0027)
Shock Down	-0.0027	0.0056*	-0.0025	0.0049*	0.0027	-0.0006	-0.0015	0.0052
	(0.0022)	(0.0029)	(0.0024)	(0.0027)	(0.0022)	(0.0030)	(0.0019)	(0.0033)
Shock Up	-0.0041	0.0010	-0.0035	0.0003	0.0015	-0.0050	-0.0017	-0.0008
	(0.0025)	(0.0033)	(0.0027)	(0.0032)	(0.0024)	(0.0034)	(0.0022)	(0.0037)
Cell FE	✓	✓	✓	✓	✓	✓	✓	✓
Country-Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	0.05527	0.11018	0.06696	0.09751	0.06949	0.09575	0.05603	0.10840
R^2	0.36197	0.44512	0.37419	0.45222	0.41544	0.42323	0.41074	0.41853
Cells	5,247	4,981	5,188	5,040	5,351	4,877	5,154	5,074
Observations	131,175	124,525	129,700	126,000	133,775	121,925	128,850	126,850