Liberation technology

Mobile Phones and Political Mobilization in Africa

Marco Manacorda

QMUL, CEP (LSE), CEPR & IZA

Andrea Tesei

QMUL & CEP (LSE)

March 2015

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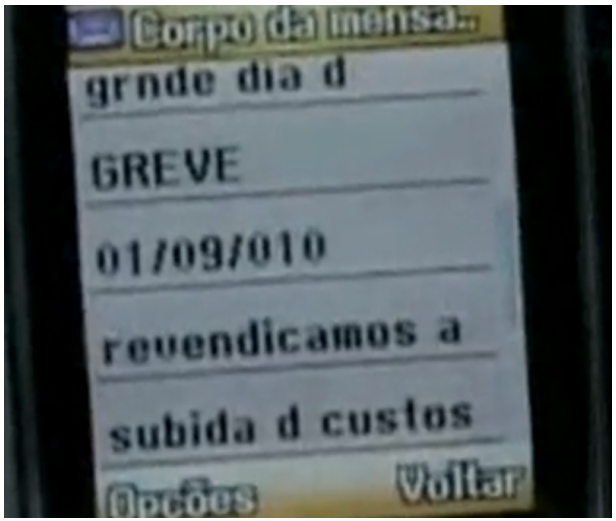
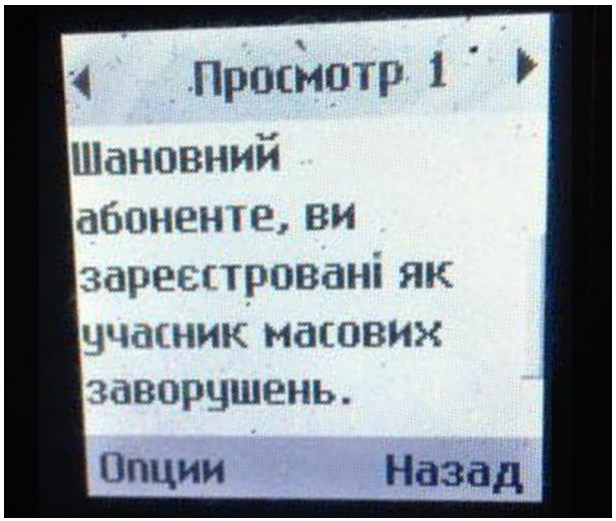
Activists (Mozambique 2010)



Government (Ukraine 2014)



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  4. Auxiliary geographical, economic and social data at 55 X 55 km level

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  - Mechanisms

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- Insurgency, conflict and mobile phones (Pierskalla and Hollenbach 2013, Shapiro and Weidmann 2012)

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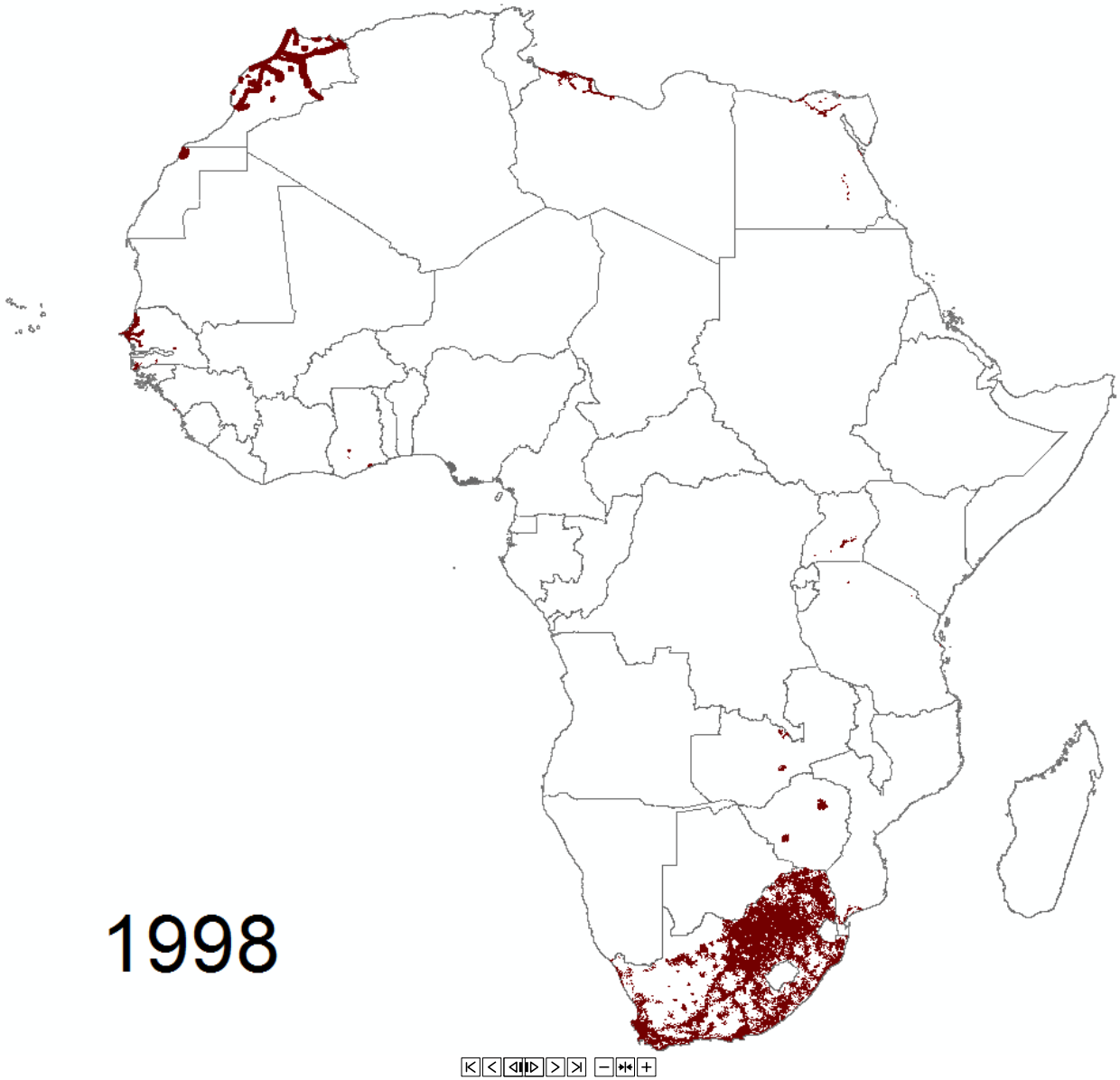
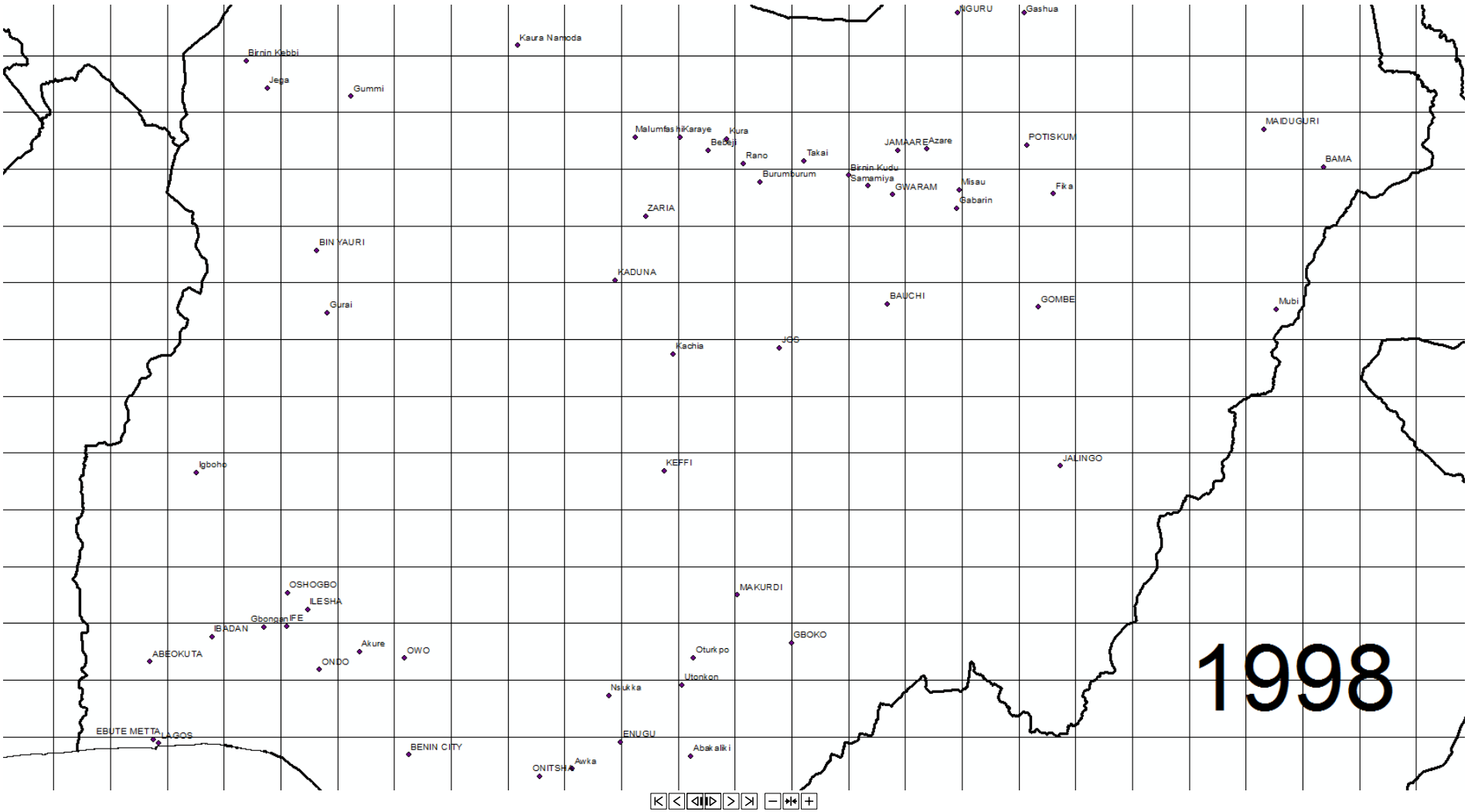
- Link cell and protest data at level of cell assuming population uniformly distributed within cells

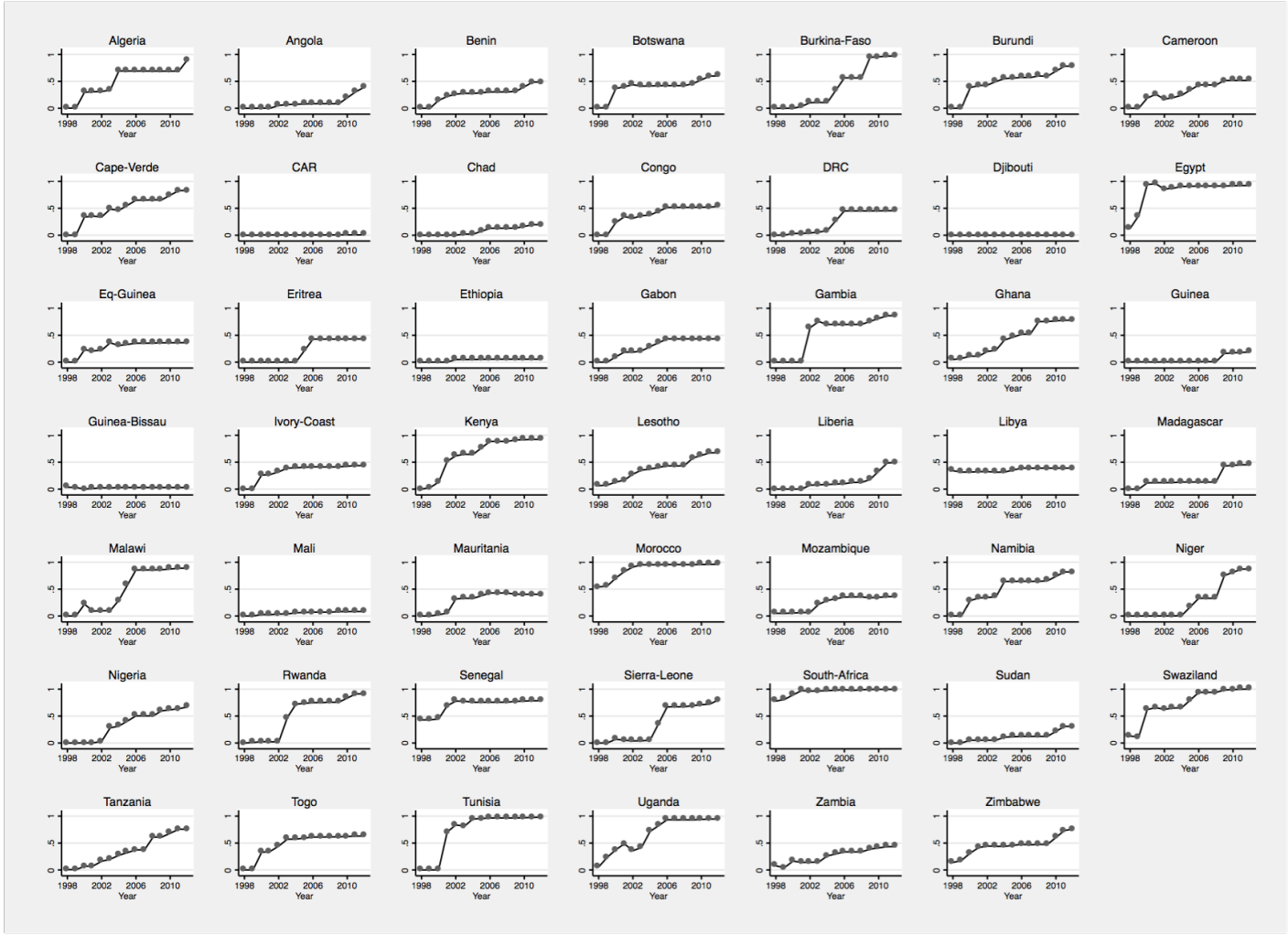
2G Diffusion, 1998-2012



2G Diffusion, Nigeria 1998-2012



Spread of mobile phone technology across the continent (% pop. in reach of signal)



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- Sources: Africa News, Agence France Press, Xinhua, Associated Press Online, Associated Press Worldstream, BBC Monitoring, United Press International, Washington Post, Google News (from 2003) etc. in both English and vernacular (no social media)

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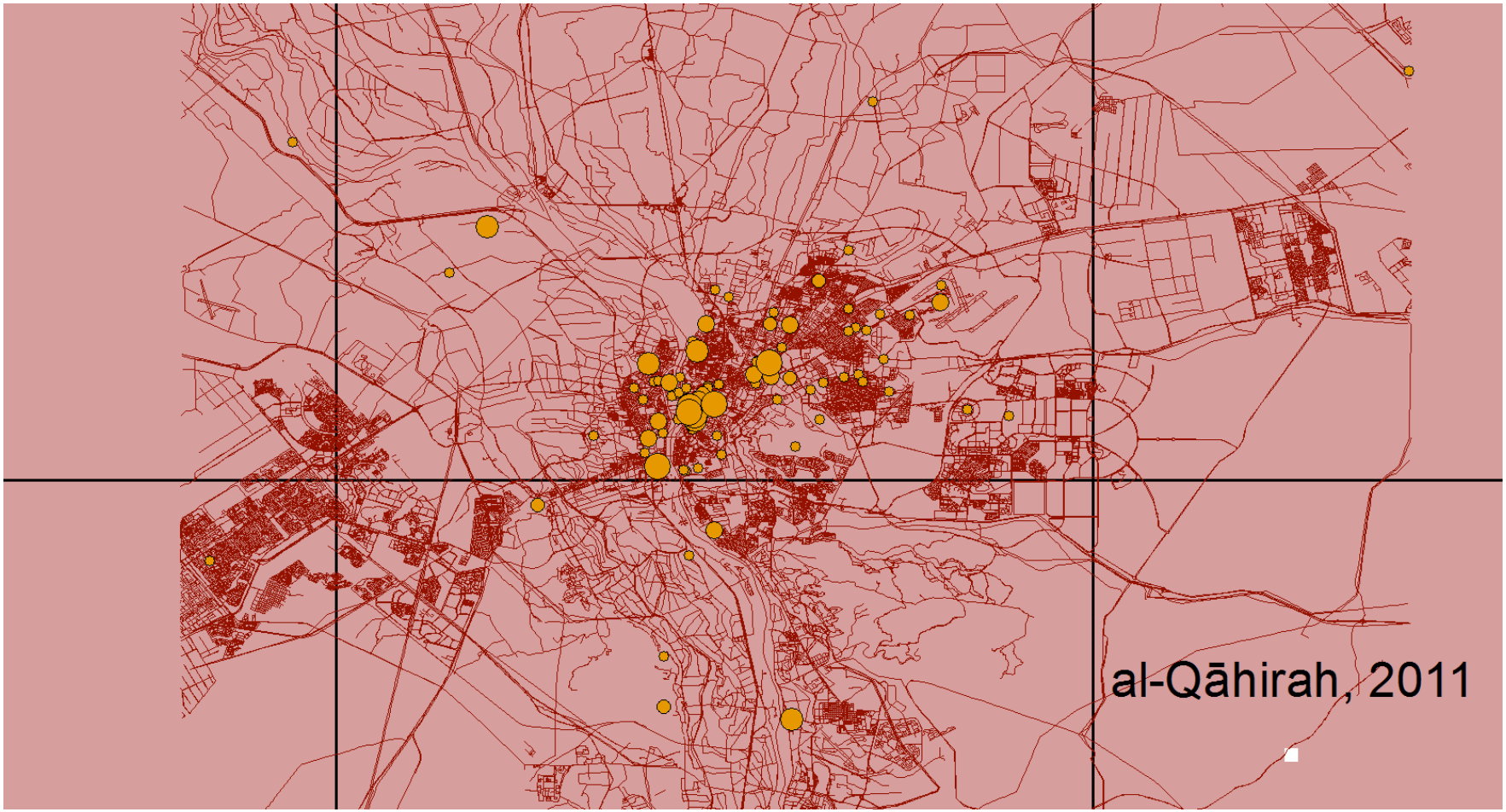
Cairo, 2011



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    - ★ Specialized geo-referenced data set on protests in Africa compiled from Agence France Press and Associated Press

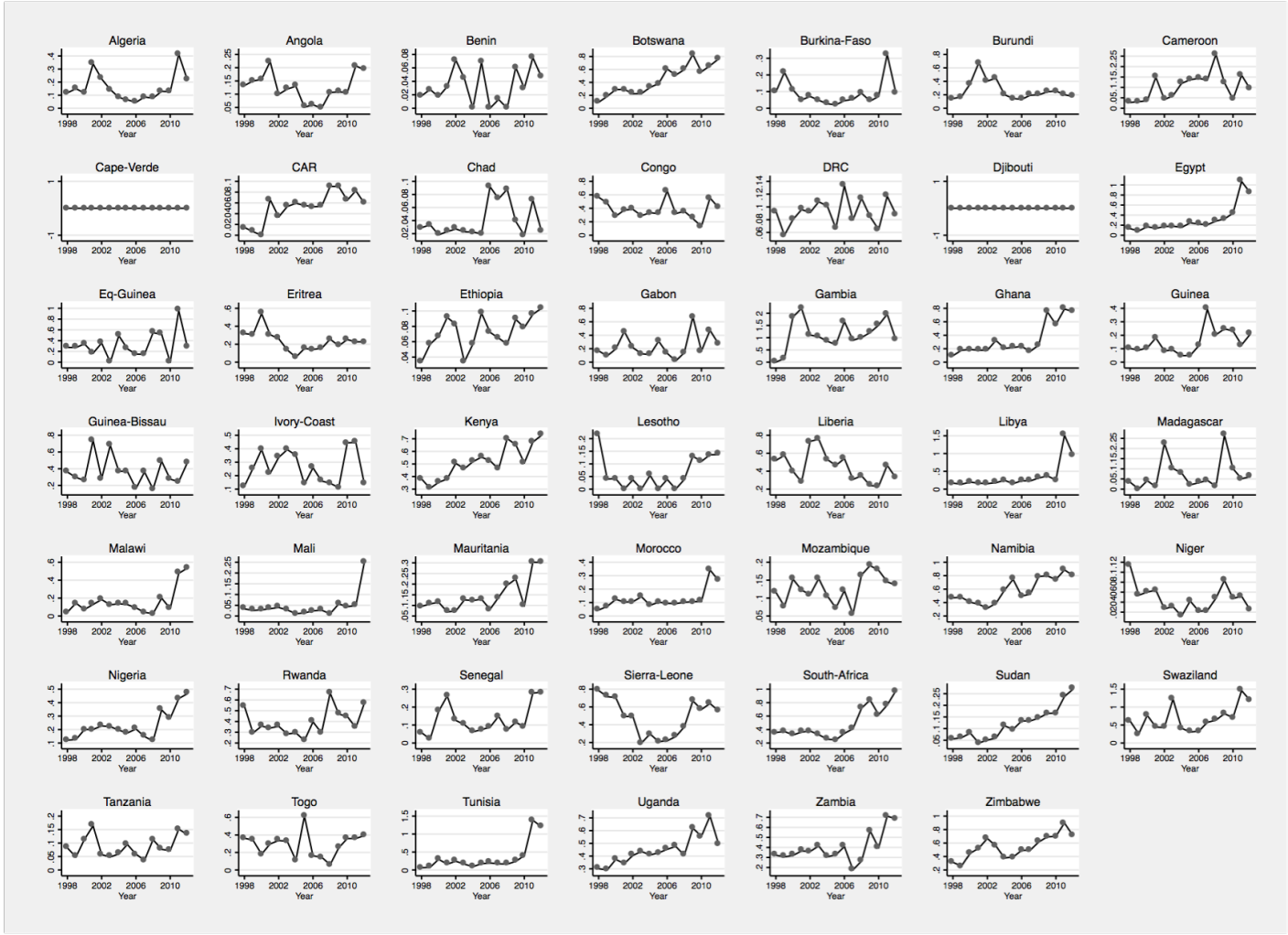
Descriptive Statistics. Protests - micro data

	Number obs.	Fraction	Number of sources	Number of Articles	Number of days
			GDELT (1998-2012)		
Demonstrations	48,871	62.31	4.12	21.06	1.50
Riots	12,961	16.53	3.79	19.28	1.29
Strikes	6,731	8.58	2.41	11.83	1.21
Others	9,869	12.58	4.19	21.77	1.35
Total	78,432	100	3.92	20.06	1.41
			ACLED (1998-2012)		
Total	9,152	100			1.21
			SCAD (1998-2011)		
Demonstrations	5,621	25.31			2.64
Riots	16,585	74.69			3.11
Total	22,206	100			2.84

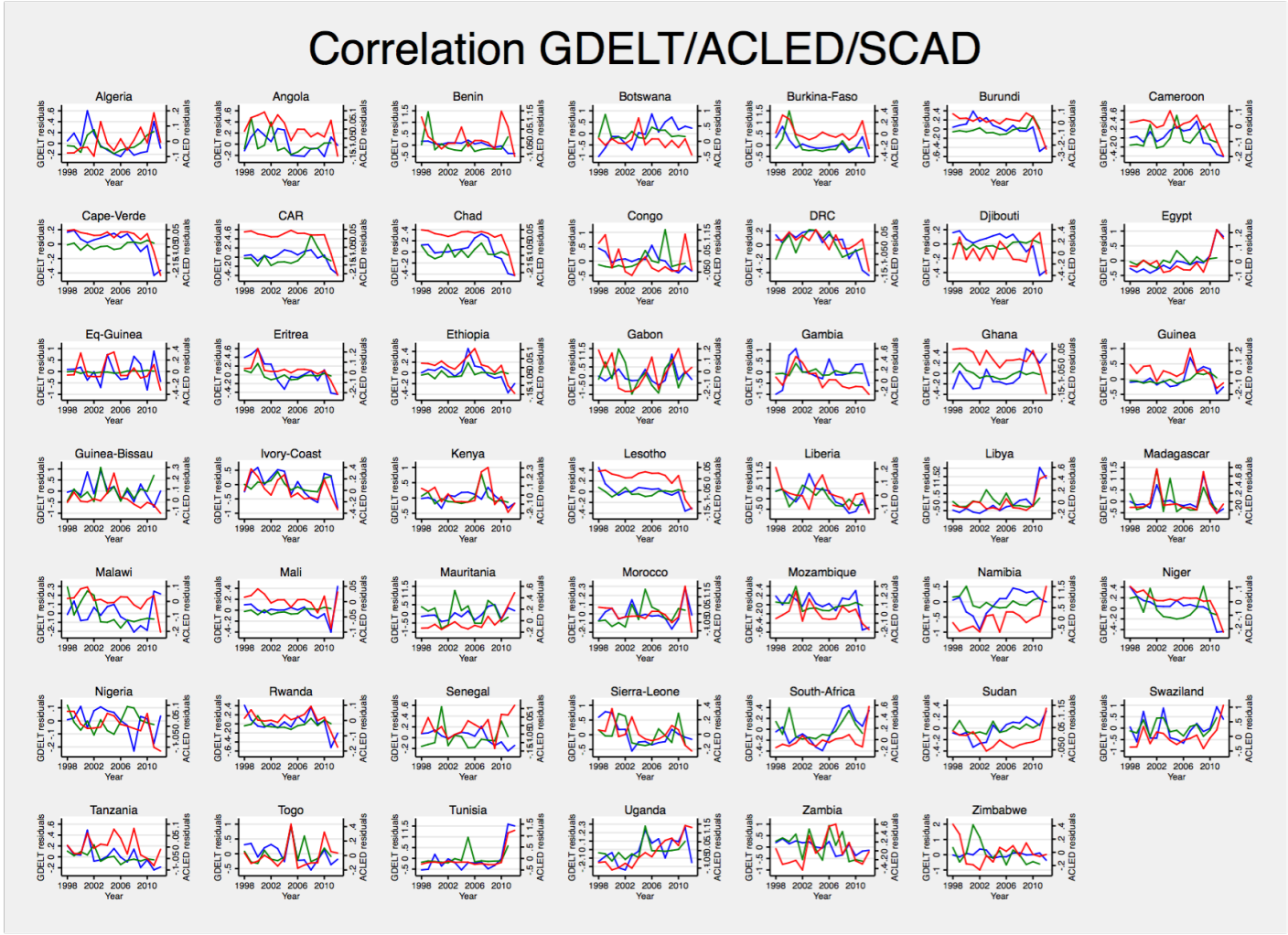
Descriptive Statistics. Main variables - cell level

	Avg.	Std. Dev.	Min.	Max.
Population (1000*s*)	84.32	266.78.5	0	12,860
Mobile Phone 2*G Coverage* (%)	0.43	0.42	0	1
Mobile Phone 3*G Coverage* (%)	0.02	0.09	0	1
Protests per 100,000 *pop.* – *GDELT*	0.58	6.56	0	10,0000
Protests per 100,000 *pop.* – *ACELD*	0.07	0.642	0	1,146.13
Protests per 100,000 *pop.* – *SCAD*	0.17	4.76	0	10,166.5

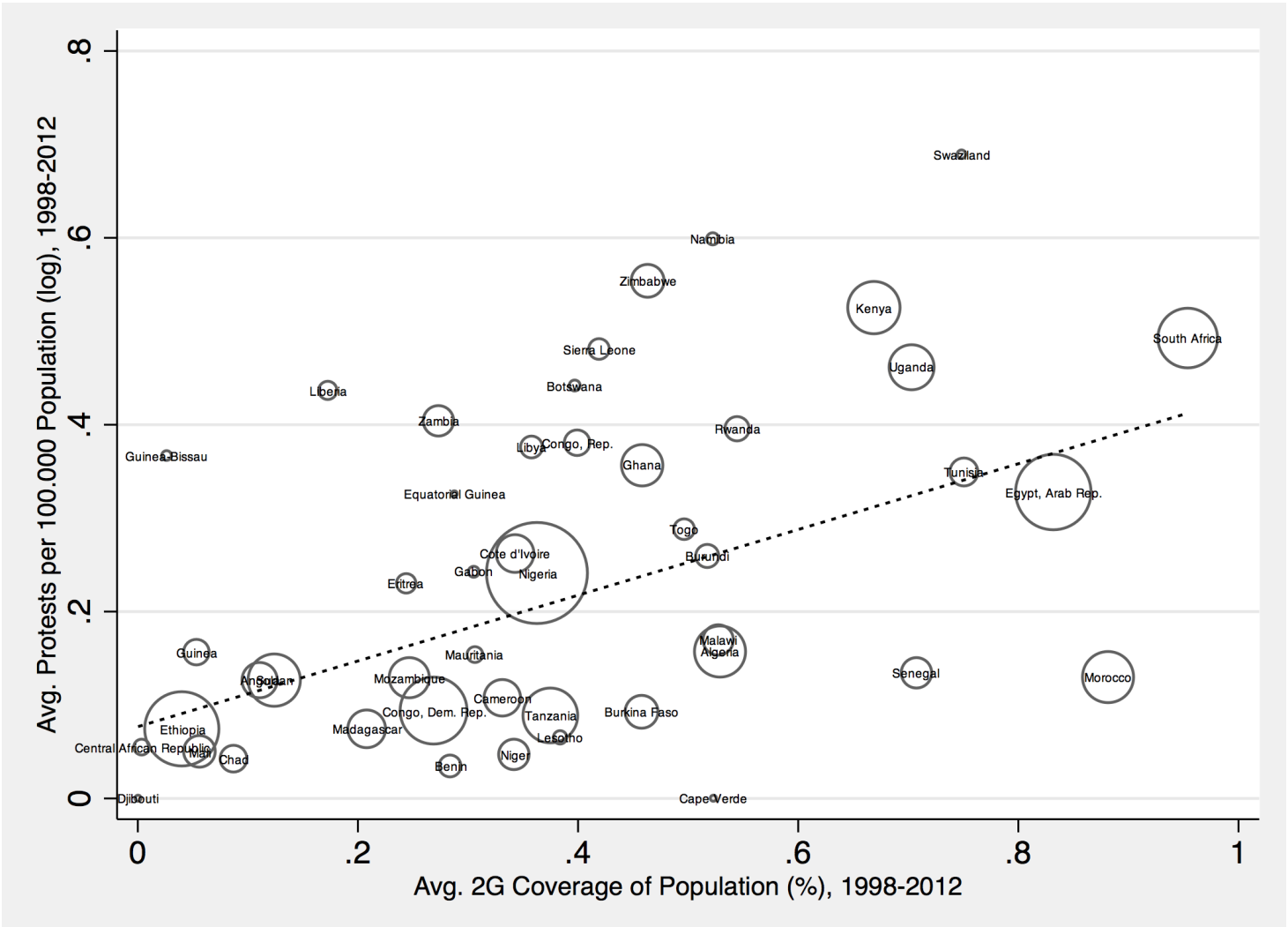
Protests per capita - GDELT (logs, net of country and time effects)



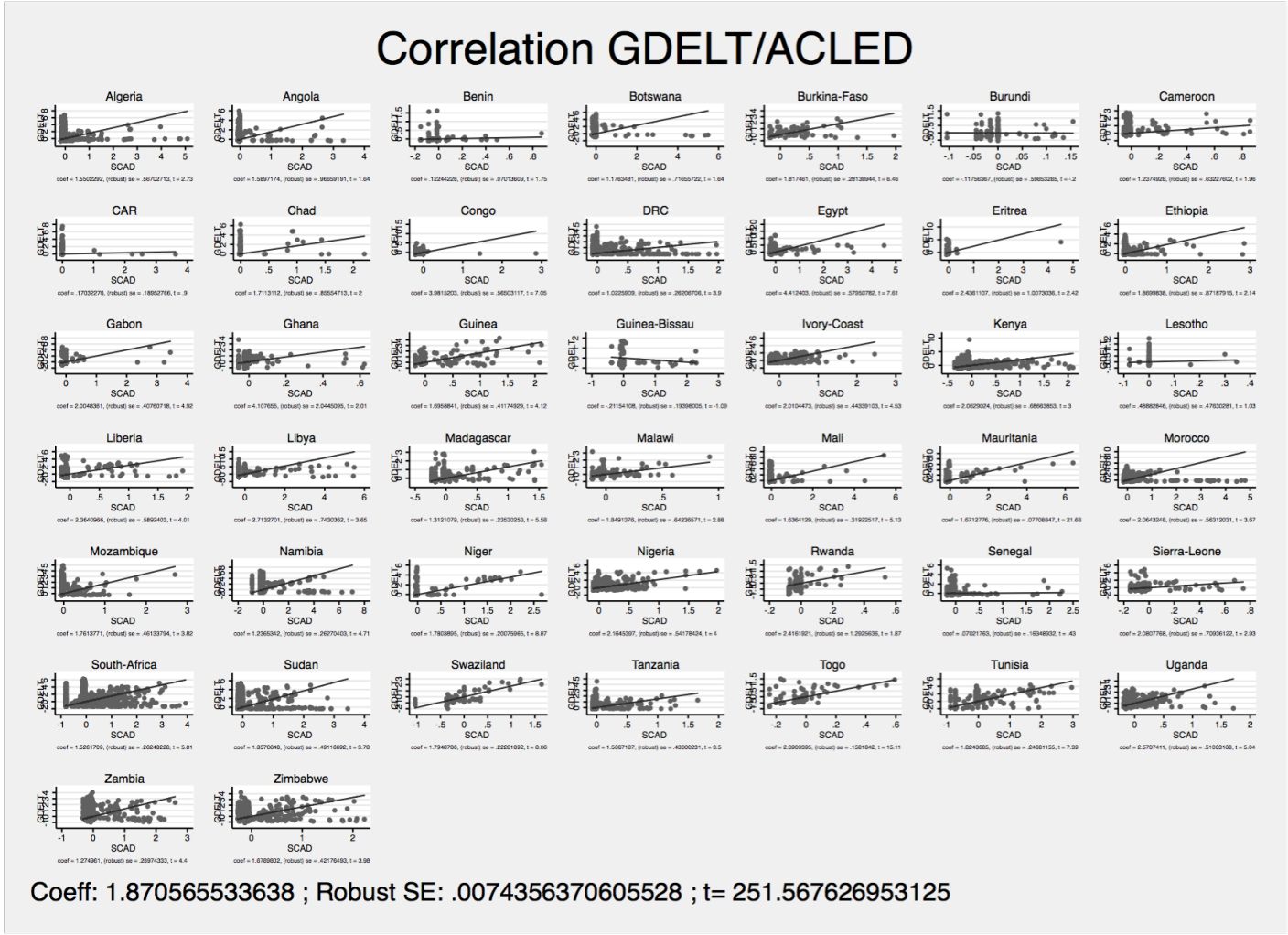
Protests per capita - GDELT, ACLED, SCAD (logs, net of country and time effects



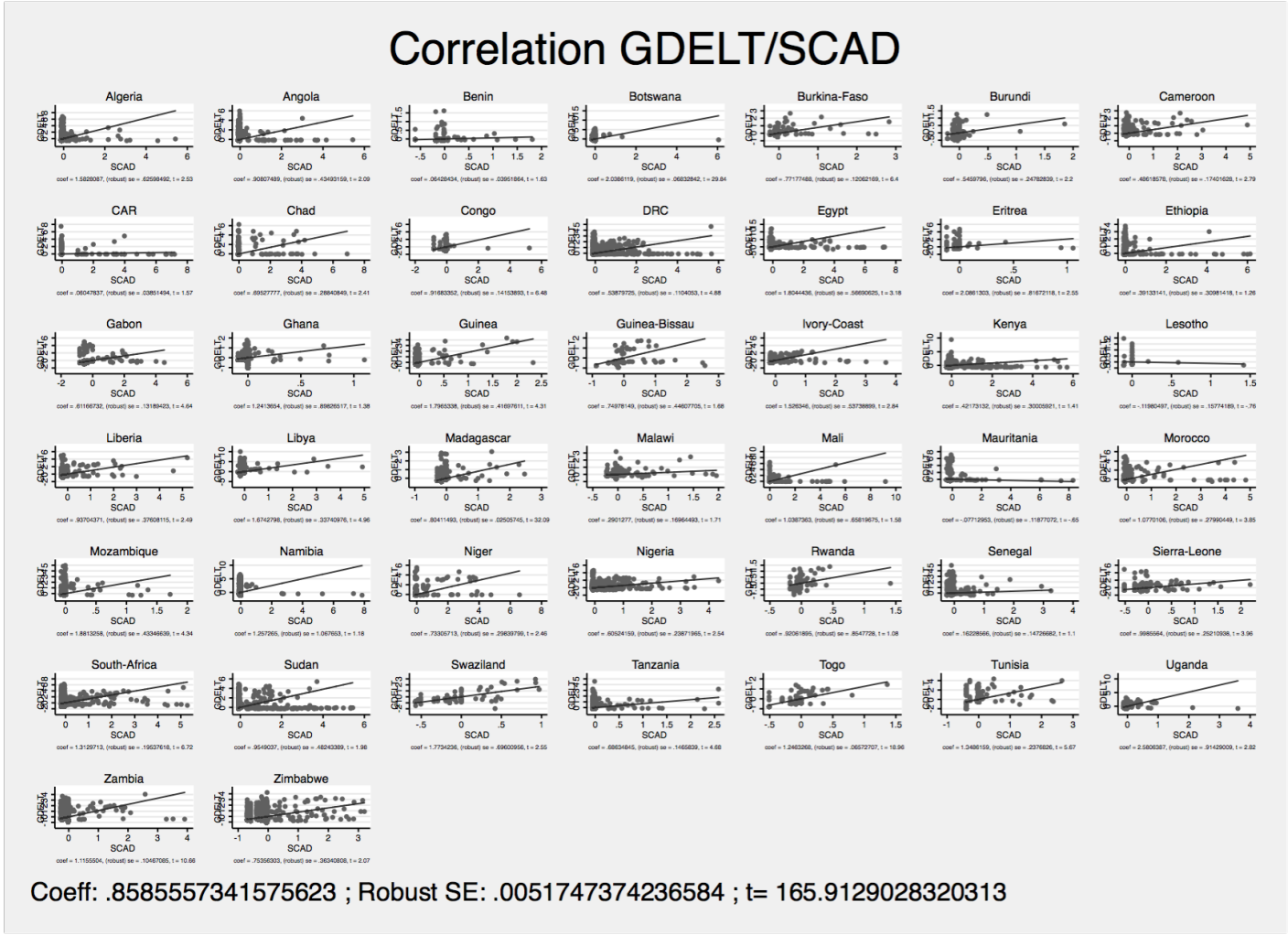
Protests per capita and mobile phone coverage across countries



Protests per capita - GDELT vs ACLED - within country variation



Protests per capita - GDELT vs SCAD - within country variation

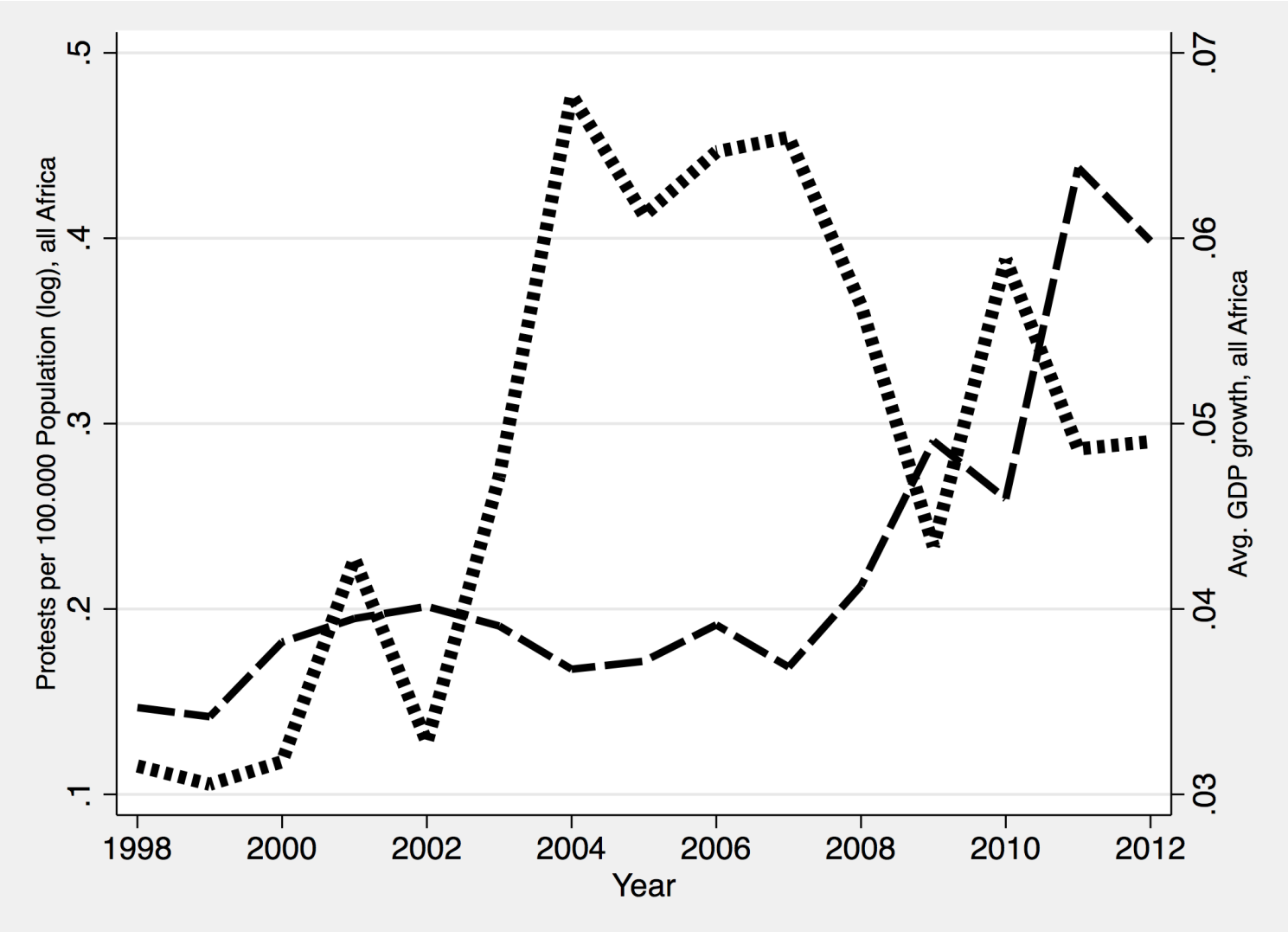


Descriptive Statistics. Main variables by cells

	Avg.	Std. Dev.	Min.	Max.
Per Capita Income (*USD* 2005)	2,299.0	2,707.2	208.7	15,300.6
Border Distance (100 *km*)	1.73	1.47	0	10.54
Capital Distance (100 *km*)	3.57	3.35	0.04	19.48
Travel Time nearest city pop. $\geq 20K$(*hours*)	4.42	3.77	0.16	106.9
Travel Time nearest city pop. $\geq 50K$(*hours*)	4.21	3.69	0	102.2
Coast(*dummy*)	0.15	0.36	0	1
Primary Roads (100 *km*)	0.87	0.99	0	5.22
Primary Roads Paved (100 *km*)	0.49	0.72	0	4.66
Primary Roads Good Conditions (100 *km*)	0.26	0.49	0	3.80
Secondary Roads (100 *km*)	1.42	1.10	0	6.40
Electricity Network (100 *km*)	0.86	1.18	0	7.55
Infant Mortality Rate (1,000)	8.91	3.71	1	20.31
Mountain (%)	0.23	0.32	0	1
Forest (%)	0.23	0.25	0	1
Irrigated (%)	0.08	0.17	0	0.87
Diamonds (*dummy*)	0.03	0.18	0	1
Minerals (*dummy*)	0.22	0.42	0	1
Oil (*dummy*)	0.13	0.33	0	1
Temperature (*Celsius degrees*)	23.12	4.25	4.06	31.41
Precipitation (*mm.*)	876.2	487.5	69.39	3,296.4
Drought (*n. of years*)	1.44	1.25	0	11
Distance from drought (100 *km*)	1.74	0.56	0	4.56
Flashrate (*per* Km^2 *per year*)	17.32	13.80	0	163.1
Country GDP growth (%)	0.049	0.041	-0.33	0.63

Time-Series Relation between GDP Growth and Protest

- Lower opportunity cost and greater grievances during recessions



Specification and identification

- Cell-level regressions:

$$Y_{gct} = \beta_0 + \beta_1 Cov_{gct} + \beta_2 Cov_{gct} x \Delta lnGDP_{ct} + d_{gc} + d_{ct} + X'_{gc}\beta_{ct} + \epsilon_{gct}$$

  - g: Cell
  - c: Country
  - t: Time

  - Y_{gct}: log(protests/pop+1)
  - Cov_{gct}: Fraction cell area with mobile phone coverage
  - $\Delta lnGDP_{ct}$: country-level growth rate in GDP
  - d_{gc}: cell FE
  - d_{ct}: country X time FE
  - X_{gc}: baseline covariates (restrict β_{ct}=$\beta_c t$)

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- Diff-in-diff within countries (pooled)
- Weighted by cell population
- SE clustered by cell/region/country

Baseline Regressions

Table 1. Baseline Regressions

	Log Protest per 100,000 population (GDELT)			
	(1)	(2)	(3)	(4)
Coverage	0.019	0.105***	0.001	0.089***
	(0.015)	(0.024)	(0.016)	(0.024)
Coverage $*$ Δ*lnGDP*		-1.649***		-1.712***
		(0.339)		(0.342)
Cell characteristics	No	No	Yes	Yes
Observations	155,194	155,194	155,194	155,194

Dependent variable is the log (protests per 100,000 population + 1). All specifications are weighted by cell population and include Cell FE, as well as Country*Year FE. Columns (3) and (4) interact a country-specific linear trend with the baseline cell-specific characteristics. These include: Average cell population over the period in classes of 50,000 population; Border distance; Capital distance; Travel time to nearest large city (20K, 50K population); Primary Roads (total; paved; good conditions); Secondary Roads; Electricity network; Infant mortality rate; Share of land: mountain, forest, irrigated; Oil fields; Diamond fields; Mines; Average temperature and precipitation; Years of drought; distance from the closest cell undergoing drought. Standard errors in parenthesis are Huber robust and clustered at the cell level. * Significantly different from zero at the 90% level, ** 95% level, *** 99% level.

Baseline Regressions

Table 1B. Baseline Regressions (ACLED and SCAD)

	Log Protest per 100,000 pop. (ACLED)				**Log Protest per 100,000 pop. (SCAD)**			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Coverage	0.009	0.030**	-0.001	0.019	0.014	0.041*	0.025	0.052**
	(0.006)	(0.013)	(0.006)	(0.014)	(0.015)	(0.021)	(0.017)	(0.023)
Coverage $*$ Δ*lnGDP*		-0.408*		-0.385*		-0.513*		-0.513*
		(0.222)		(0.226)		(0.272)		(0.276)
Cell characteristics	No	No	Yes	Yes	No	No	Yes	Yes
Observations	155,194	155,194	155,194	155,194	144,857	144,857	144,857	144,857

Magnitude of effects

- 5 p.p. fall in GDP growth associated to increase in yearly protest/days per capita differential between areas with and without coverage of 8%

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- Similar effects with and without large set of controls
- Similar effects in GDELT, ACLED and SCAD

Additional Regressions

Table 3. Additional Regressions

	Log Protest per 100,000 (GDELT)			
	Exclude capital	Below/Above 0	3G	2G and 3G
	(1)	(2)	(3)	(4))
Coverage	0.051**			0.091***
	(0.023)			(0.024)
Coverage $*$ $\Delta lnGDP$	-0.941***			-1.732***
	(0.314)			(0.338)
Coverage 3*G*			0.493***	0.497***
			(0.190)	(0.188)
Coverage 3*G* $*$ $\Delta lnGDP$			-0.092	-0.065
			(0.257)	(0.240)
Coverage $*$ $\Delta lnGDP_{\|<0}$		-2.190***		
		(0.651)		
Coverage $*$ $\Delta lnGDP_{\|\geq 0}$		-0.814***		
		(0.245)		
Coverage $*$ $I(\Delta lnGDP \geq 0)$		-0.001***		
		(0.000)		
Cell characteristics	Yes	Yes	Yes	Yes
Observations	154,504	155,194	155,194	155,194

See footnote Table 1

▸ ACLED and SCAD

Magnitude of effects

- Stronger in - but not driven by - capital cities

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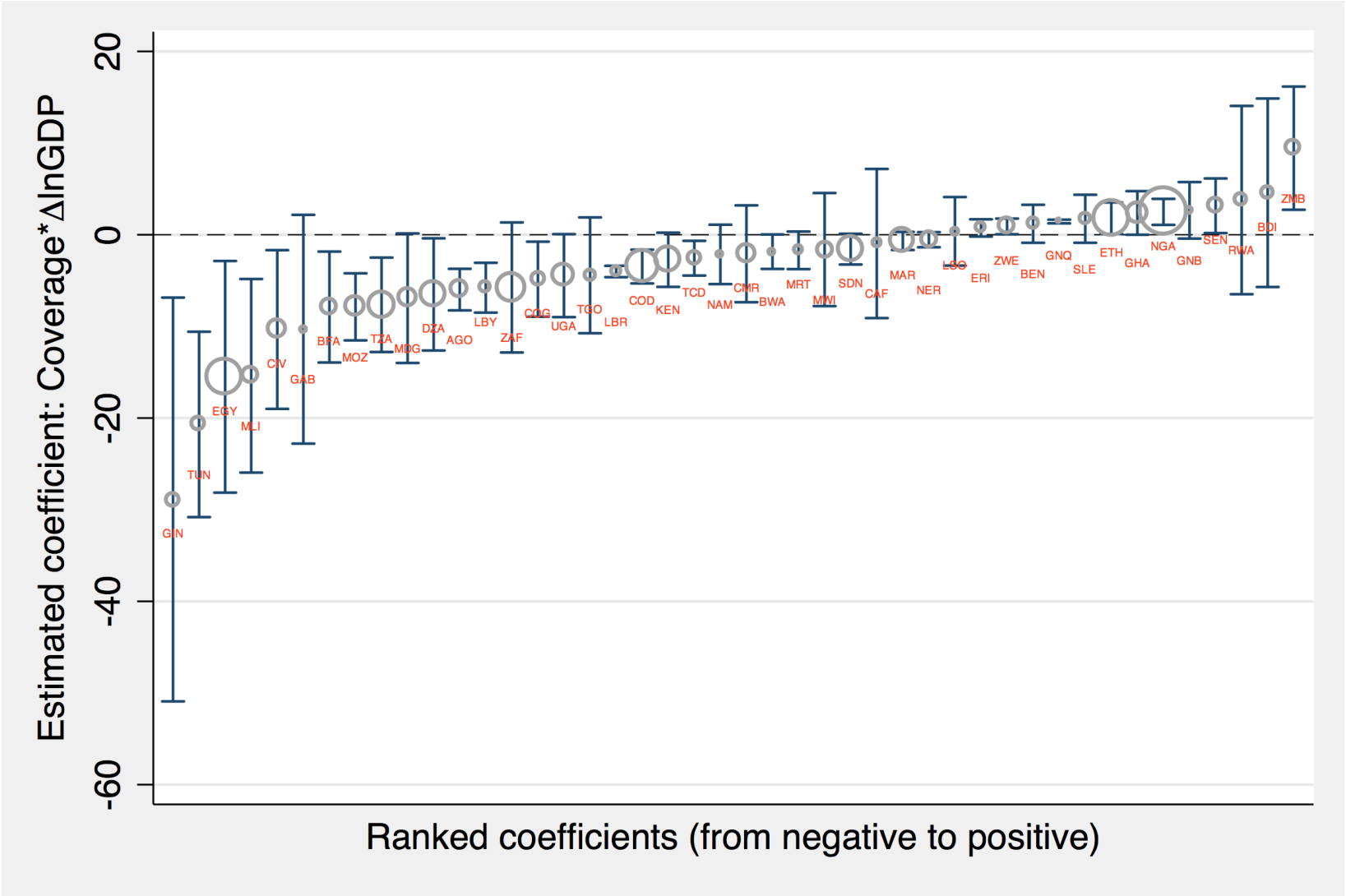
- Stronger in - but not driven by - capital cities
- Asymmetric effect: largely associated to recessions
- Effect of 3G at low levels of growth but interaction not significant

Estimates by country



Country Covariates

Country Covariates

	Source	Coverage Years	Mean	Std. Dev.
		Economic Characteristics		
lnGDP	World Bank	1998-2012	6.470	0.988
Gini Index	World Bank	Different years (max 5)	42.27	7.82
		Education Characteristics		
Literacy Rate	World Bank	2000, 2005, 2010	59.92	16.81
Secondary Education	World Bank	2000, 2005, 2010	26.79	17.6
Tertiary Education	World Bank	2000, 2005, 2010	4.21	3.45
		Business Characteristics		
Days start business	World Bank	Different years (max 3)	22.97	15.02
Ease business	World Bank	2012	143	39.58
		Institutional Characteristics		
Polity2	Polity IV (Marshall and Gurr)	1998-2012	1.063	4.244

Country Covariates

Table 2. Country Covariates

	Economy	Education	Business	Institutions
	(1)	(2)	(3)	(4))
Gini Index	-0.045	-0.109	-0.070	-0.214*
	(0.103)	(0.101)	(0.095)	(0.108)
lnGDP	0.320	0.441	0.434	0.534
	(0.243)	(0.315)	(0.353)	(0.331)
Literacy Rate		-0.019	-0.043	0.002
		(0.031)	(0.034)	(0.038)
Secondary Education		0.028	0.002	-0.023
		(0.030)	(0.054)	(0.051)
Tertiary Education		-0.356***	-0.426***	-0.476***
		(0.104)	(0.098)	(0.093)
Days start business			-0.128**	-0.213***
			(0.050)	(0.059)
Ease business			-0.009	0.021
			(0.018)	(0.021)
Polity2				0.183*
				(0.102)
Polity2 sq.				0.072*
				(0.035)
Observations	45	45	45	45

Dependent variable: estimated coefficient of $Coverage * \Delta lnGDP$. Regressions weighted by the inverse of square of standard error.

Magnitude of effects

- Responsiveness to mobile phone coverage is higher in:

Magnitude of effects

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  - Countries with more red tape: a 1 s.d. in the number of days to open an activity (15) increases the interaction coefficient by 3, roughly two times the effect
  - In weak autocratic countries (u-shaped, min at Polity2 score -1.3), a 1 s.d. increase (fall) in polity score (4.24) from pure autocracies (democracies) roughly doubles the effect

Instrumentation

- Coverage possibly endogenous

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  - Electricity grid
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- Likely not excludable

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  - Population
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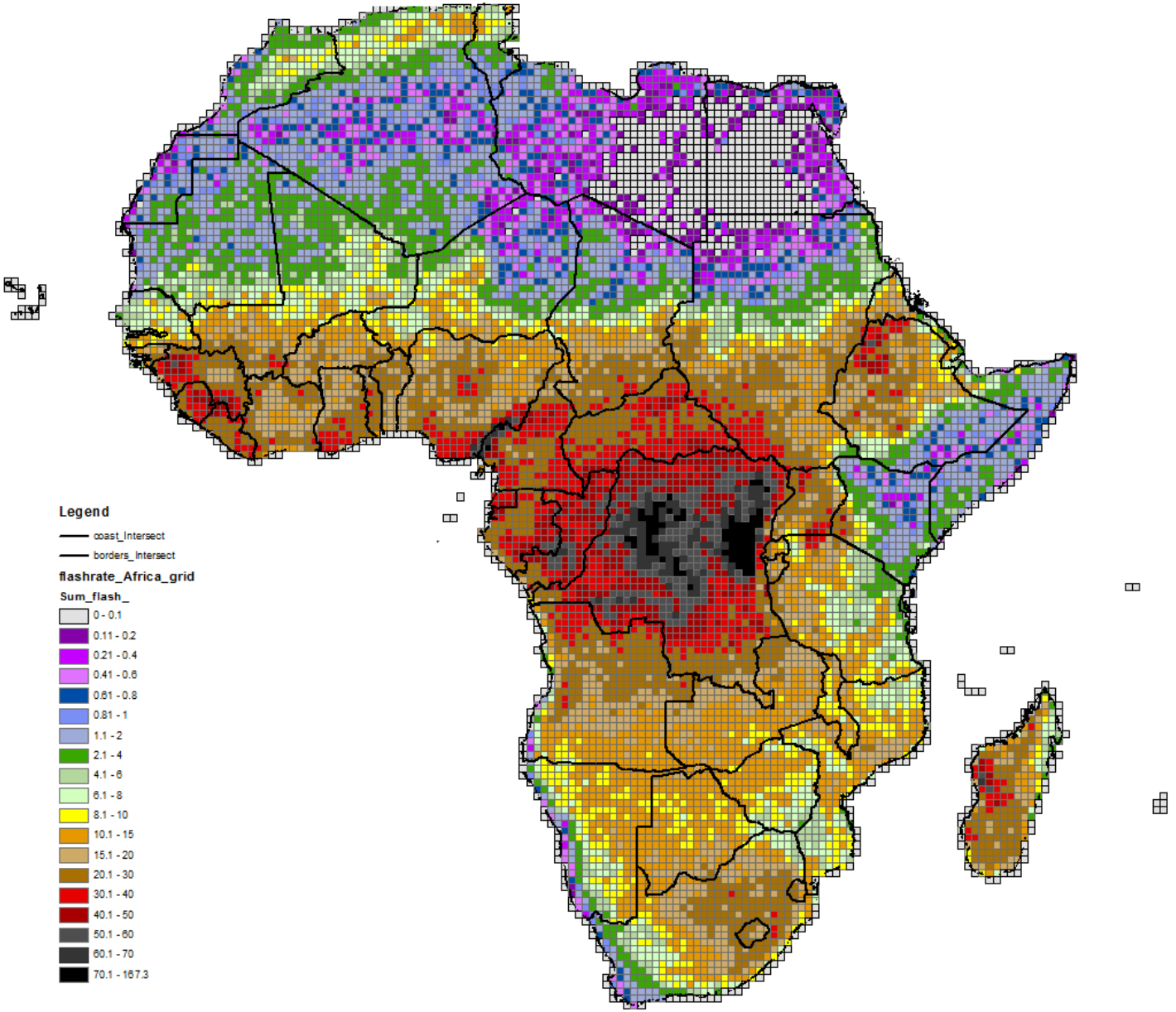
  - Electricity grid
  - Installation and maintenance costs: accessibility (elevation, slope, distance from main road, distance from the nearest large city)
- Likely not excludable
- Lightning strikes: damage mobile phones infrastructure and negatively affect connectivity, acting on both supply and demand (Andersen et al. 2012, Andersen and Dalgaard 2013, ITU 1997, 2003)

Flash density in Africa



Instrumentation

- Instrument Cov_{gct} by Z_{gct}

$$Z_{gct} = F_{gc} x Cov_{ct}$$

- F_{gc}=average cell flash density
- Cov_t=continent-wide trend in coverage

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$$Cov_{gct} = \delta_0 + \delta_1 Z_{gct} + \delta_2 Z_{gct} x \Delta lnGDP_{ct} + d_{gc} + d_{ct} + X'_{gc}\delta_{ct} + e_{gct}$$

Instrumentation

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$$Cov_{gct} x \Delta lnGDP_{ct} = \gamma_0 + \gamma_1 Z_{gct} + \gamma_2 Z_{gct} x \Delta lnGDP_{ct} + d_{gc} + d_{ct} + X'_{gc}\gamma_{ct} + v_{gct}$$

First Stage

Table 4. First Stage Regressions

	Mobile Phone Percentage Coverage (GSMA)					
	Cov_{gct}	Cov_{gct}	$Cov_{gct} * \Delta lnGDP_{ct}$	Cov_{gct}	Cov_{gct}	$Cov_{gct} * \Delta lnGDP_{ct}$
	(1)	(2)	(3)	(4)	(5)	(6)
Flashrate	-0.002	-0.002	0.000*	-0.004**	-0.005***	0.000
	(0.001)	(0.001)	(0.000)	(0.002)	(0.002)	(0.000)
Flashrate $*$ $\Delta lnGDP$		0.006	-0.005**		0.012	-0.006**
		(0.008)	(0.002)		(0.008)	(0.003)
Cell characteristics	No	No	No	Yes	Yes	Yes
F-statistic	1.31	1.25	3.08	4.54	4.45	3.90
Observations	159,194	159,194	159,194	159,194	159,194	159,194

Dependent variable is 2G/3G percentage coverage in the cell. The explanatory variable is the average cell flash density interacted by the continent-wide trend in coverage. All specifications include Cell FE, as well as Country*Year FE. Columns (4)-(6) interact a country-specific linear trend with the baseline cell-specific characteristics. These include: Average cell population over the period in classes of 50,000 population; Border distance; Capital distance; Travel time to nearest large city (20K, 50K population); Primary Roads (total; paved; good conditions); Secondary Roads; Electricity network; Infant mortality rate; Share of land: mountain, forest, irrigated; Oil fields; Diamond fields; Mines; Average temperature and precipitation; Years of drought; distance from the closest cell undergoing drought. Standard errors in parenthesis are Huber robust and clustered at the cell level. * Significantly different from zero at the 90% level, ** 95% level, *** 99% level.

Magnitude of effects

- Predicts a differential expansion of coverage in cells 1 s.d. of flash rates (13.79) apart of 5.5 p.p. over entire period

Table 5. Instrumental Variable Regressions

	Log Protest per 100,000 (GDELT)					
	GDELT		ACLED		SCAD	
	(1)	(2)	(3)	(4)	(5)	(6)
Coverage	-0.441	0.215	-0.272	0.001	-0.113	-0.137
	(0.431)	(0.380)	(0.227)	(0.191)	(0.576)	(0.518)
Coverage $*$ Δ*lnGDP*		-7.480***		-3.106**		0.300
		(2.819)		(1.593)		(2.207)
A-R p-value		[0.01]		[0.05]		[0.94]
Cell characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Observations	155,194	155,194	155,194	155,194	144,857	144,857

Dependent variable is the log (protests per 100,000 population + 1). The endogenous variable *Coverage* is instrumented by $F_{gc} * Cov_t$, where F_{gc} is the average cell flash density and Cov_t is the continent-wide trend in coverage. In square brackets are reported the p-values based on the Anderson-Rubin test of statistical significance. A key property of the test is that it is robust to weak instruments. The version of the test we implement is robust to heteroskedasticity and arbitrary within-cell correlation of the residuals (Andrews and Stock, 2005). All specifications include Cell FE and Country*Year FE. All columns interact a country-specific linear trend with the baseline cell-specific characteristics. These include: Border distance; Capital distance; Travel time to nearest large city (20K, 50K, 100K, 500K); Primary Roads (total; paved; good conditions); Secondary Roads; Infant mortality rate; Share of land: mountain, forest, irrigated; Oil fields; Diamond fields; Mines; Ethno-linguistic fragmentation. Standard errors in parenthesis are Huber robust and clustered at the cell level. * Significantly different from zero at the 90% level, ** 95% level, *** 99% level.

Magnitude of effects

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- Seems to suggest coverage negatively associated to protests, possibly due to omitted variables

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- IV estimates roughly 5 times OLS
- Seems to suggest coverage negatively associated to protests, possibly due to omitted variables
- Measurement error

Conclusions

- We use unique data on protest and mobile phone coverage to show previously undocumented causal effect of mobile phone technology on political mobilization
- In line with economic theory, we find a negative relation between economic growth and the level of protest
- Political mobilization magnified by mobile phone availability
- If anything OLS underestimated
- Strong support for mobile activism argument
- Ongoing work:
  - Channels: information, coordination? Returns to participation? Empowerment? Increasing reporting?
  - Validate instrument: placebo tests

Additional Regressions

Table 3B. Additional Regressions (ACLED and SCAD)

	Log Protest per 100,000 (ACLED)				Log Protest per 100,000 (SCAD)			
	Exclude capital	Below/Above 0	3G	2G and 3G	Exclude capital	Below/Above 0	3G	2G and 3G
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Coverage	0.012			0.019	0.053***			0.051**
	(0.008)			(0.013)	(0.019)			(0.023)
Coverage $*$ $\Delta lnGDP$	-0.209*			-0.391*	-0.457**			-0.503*
	(0.114)			(0.220)	(0.214)			(0.276)
Coverage 3*G*			0.291***	0.291***			0.033	0.032
			(0.109)	(0.109)			(0.102)	(0.102)
Coverage 3*G* $*$ $\Delta lnGDP$			-0.500***	-0.494***			-0.919	-0.860
			(0.162)	(0.158)			(0.927)	(0.897)
Coverage $*$ $\Delta lnGDP_{\|<0}$		-0.485				-2.407***		
		(0.657)				(0.650)		
Coverage $*$ $\Delta lnGDP_{\|\geq 0}$		-0.175*				0.338		
		(0.103)				(0.209)		
Coverage $*$ $I(\Delta lnGDP \geq 0)$		-0.000***				0.000		
		(0.000)				(0.000)		
Cell characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	154,504	155,194	155,194	155,194	144,214	144,857	144,857	144,857

See footnote Table 1

▸ Back

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Back

Example of Automated Coding (from Schrodt, 2013)

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  Source: IRQ GOV
  Target: TUR

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  Target: IRQKRD

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  Source: IRQ GOV
  Target: TUR

- Second event:

  Event Code: 195 (ASSAULT: Conduct suicide, car, or other non-military bombing)
  Source: TUR
  Target: IRQKRD REB

Back

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     - ★ Share of mountains (UNEP, 2002), forests (Globcover, 2009), irrigated land (FAO, 2000)
     - ★ Infant mortality rate (SEDAC, 2000)
     - ★ Oilfields (PRIO, 2007), diamond fields (PRIO, 2005)
     - ★ Primary roads, secondary roads (ADB/AICD, 2008)
     - ★ Electricity transmission network (ADB/AICD, 2008)
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