Economics 270B
Ph.D. Development Economics

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University of California, Berkeley

Lecture 11 – April 20, 2015

I. Overview of International Economic Development
Lecture 1: Understanding economic growth and development (1/26)
Lecture 1B: Persistence of historical institutions and shocks
(read during holiday week of 2/16)

Lecture 2: The Psychology of Poverty (2/2)

II. Human Capital in Economic Development
Lectures 3-4: Education (2/9, 2/23)
Lectures 5-7: Health and nutrition (3/2, 3/9, 3/16)

III. Political economy
Lectures 8-9: Democracy, Corruption and Development (3/30, 4/6)
(guest lectures by Prof. Fred Finan)

Lectures 10-11: The Political Economy of Conflict (4/13, 4/20)
Lecture 12: Ethnic and Social Divisions (4/27)

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- Prerequisites: Graduate economic theory, econometrics

- Grading:
  Four referee reports – 40%
  Two problem sets – 20%
  → Problem set #2 due this Thursday (4/23)

  Research proposal – 30%
  → Due Friday 5/1

  Class participation – 10%
  No final exam

- All readings are available on bCourses

Any questions?

Lecture 11 outline

(1) Understanding the relationship between climate, income and conflict (Hsiang, Burke and Miguel 2013)

(2) Closely related – rainfall shocks and civil conflict (Miguel, Satyanath and Sergenti 2004)

(1) Violence and economic development

- Since 1980 over 60% of all countries have had at least one year of armed civil conflict, with at least 25 battle deaths (PRIO/Uppsala dataset)

- Rates are particularly high in less developed regions: approximately **70%** in Asia, Sub-Saharan Africa

- The use or threat of force is a central political economy issue in many low income countries. Wars can destroy physical capital, reduce human capital accumulation, and impact both formal and informal institutions (norms, “culture”, etc.)

(1) Leading questions in the field

- **Why** do civil wars occur when they are so destructive?

- Why do many civil wars last so long?
- How does the threat of violence affect electoral politics?
- What trade-offs between civilian vs. military production?
- How can peace be structured to prevent future conflict?
- What is the “industrial organization” and “personnel economics” of armed groups?
- How do conflict and the environment/climate interact?

- What is war’s impact on later development? Physical capital, human resources, technology, “institutions” …

(1) Hsiang, Burke and Miguel (2013)

- Hsiang, Burke and Miguel (2013, *Science*) assess existing research, and analyze (and re-analyze) multiple datasets, to estimate the impact of climatic conditions on political conflict and violence across societies and throughout history.

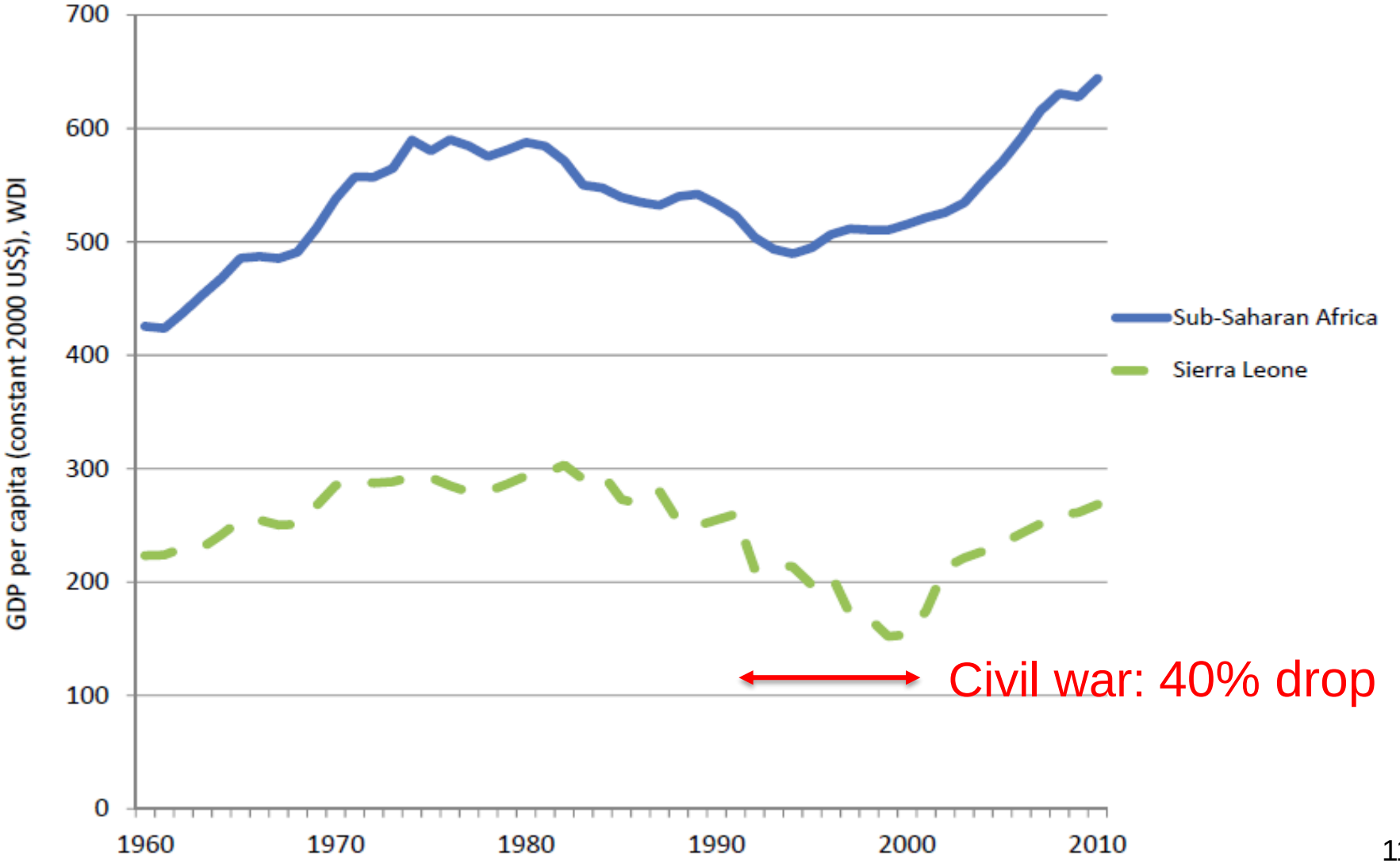
- **Main conclusion:** broad agreement that high temperatures and other extreme climate outcomes are associated with more violence.
- Obvious link to income shocks in largely agrarian, low-income settings, but potentially other channels (e.g., psychological responses such as aggression)

(1) Hsiang, Burke and Miguel (2013)

- Many scholars emphasize the role of political conflict and violence in Africa's poor economic performance

- Serious, adverse consequences, e.g.:
- Per capita income fell 40% in Sierra Leone, 1991-2002.
- Millions of civilian deaths in DR Congo since 1997

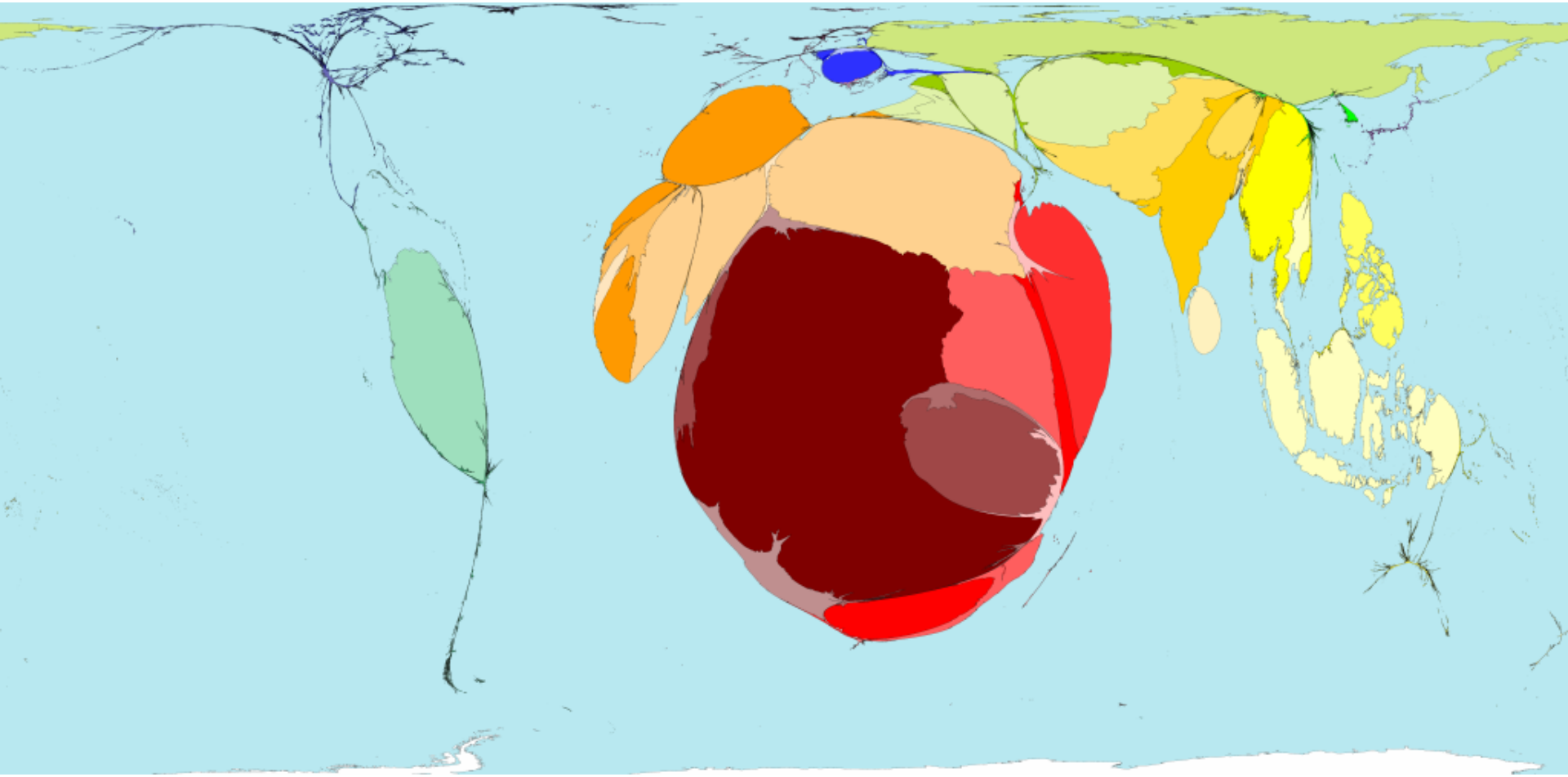
(1) Hsiang, Burke and Miguel (2013)



(1) Hsiang, Burke and Miguel (2013)

- Climatic change may be particularly important for Africa
- Models predict that temperature increases will be large for Africa by 2050, at 2^{o} C (3-4^{o} F) on average

Why Africa? Area scaled to 2002 battle deaths



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- Low income economies are sensitive to climate:
- Rainfall and temperature linked to economic growth in low-income countries (Miguel et al 2004, Dell et al 2012)

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- Low income economies are sensitive to climate:
- Rainfall and temperature linked to economic growth in low-income countries (Miguel et al 2004, Dell et al 2012)
- Will climate change increase violence and derail economic growth in less developed regions?

(1) Hsiang, Burke and Miguel (2013)

- Existing research spans multiple academic disciplines (economics, political science, criminology, history, archeology, climate science), timeframes, scattered datasets, statistical methods, and conceptual frameworks

- No comprehensive assessment, synthesis or meta-analysis exists to make sense of this growing literature, with its important implications for understanding climate change impacts, and policy priorities globally

(1) Hsiang, Burke and Miguel (2013)

- The four main goals of our paper are to:

1. **Assess this growing literature**, using broad inclusion criteria (violence ranging from crime, land grabs, riots, irregular political leader exit, to civil war);
2. Obtain data, replicate, and **reanalyze data** using a common, rigorous statistical approach (where possible), i.e., use panel data with location and time fixed effects;

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3. **Highlight patterns** in the findings and broad areas of agreement across studies;
4. Identify gaps in the literature, and research approaches that will shed more light on the speed of **adaptation and the underlying mechanisms**, e.g., economic vs. psychological factors (i.e., aggression). Ongoing work.

(1) Hsiang, Burke and Miguel (2013)

- 60 studies (published, unpublished), using >40 datasets.
- The field is expanding rapidly: since writing we have found >10 new studies; the median study year is 2011.

- New analysis: obtained 16 different datasets, and re-analyzed data from 11 papers and reinterpreted results from 6 others, sometimes with divergent results and conclusions than the original article.

(1) Hsiang, Burke and Miguel (2013)

- Econometric identification issues are major issues in this literature: conflict affects the economy, and may also be affected by economic conditions.

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- Climate variation offers a potentially useful “natural experiment” to understand the effect of income shocks

- Many studies suffer from glaring issues: many do not include location fixed effects or time controls; include outcomes (i.e., income) as “controls” (i.e., “bad control”); do not jointly estimate the impact of climate variables.
- Miguel, Satyanath and Sergenti (2004) began addressing these issues

(1) Hsiang, Burke and Miguel (2013)

- Three main types of studies:

1. Observational studies using panel data (N=38)

- Mainly economics, political science, criminology
- E.g., is armed conflict more common in Africa in high temperature and/or low rainfall years?

2. Experimental psychology studies (N=2)

- Are lab subjects more aggressive at high temperatures?

3. Historical climatology and paleoclimatology (N=10)

- Did key episodes in Chinese history (dynasty collapse) occur during climatic anomalies, using “tree ring” data?

(1) Hsiang, Burke and Miguel (2013)

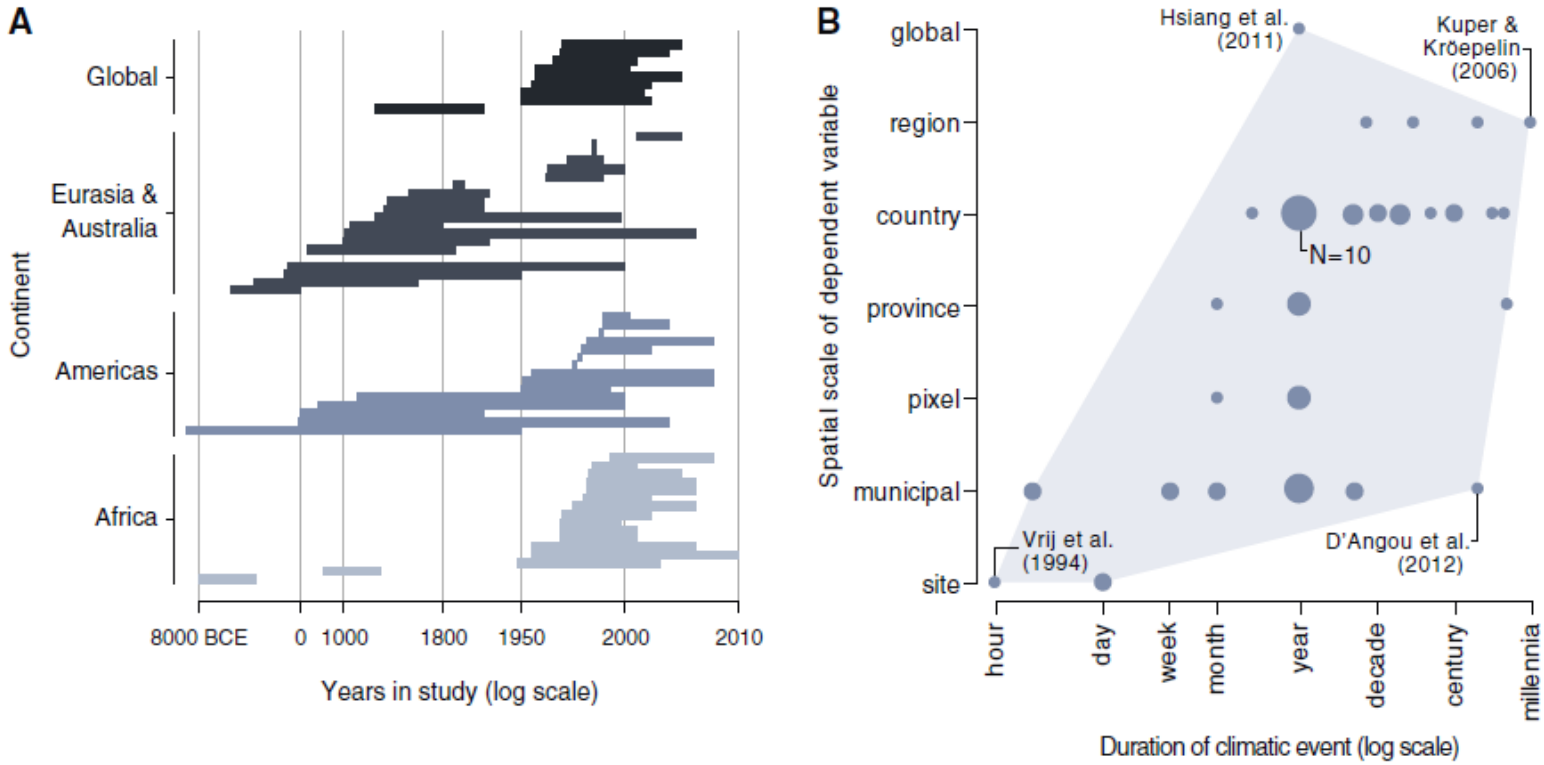

Fig. 1. Samples and spatiotemporal resolutions of 60 studies examining intertemporal associations between climatic variables and human conflict. (**A**) The location of each study region (*y* axis) plotted against the period of time included in the study (*x* axis). The *x* axis is scaled according to log years before the present but is labeled according to the year of the common era. (**B**) The level of aggregation in social outcomes (*y* axis) plotted against the time scale of climatic events (*x* axis). The envelope of spatial and temporal scales where associations are documented is shaded, with studies at extreme vertices labeled for reference. Marker size indicates the number of studies at each location, with the smallest bubbles marking individual studies and the largest bubble denoting 10 studies.

(1) Hsiang, Burke and Miguel (2013)

- Evidence from a variety of civilizations (Maya, Angkor Wat, Chinese dynasties, Akkadian empire) that exceptionally dry and/or hot periods are associated with political collapse
- E.g., the Maya civilization experienced three extended multi-year droughts in the 9th century AD that are thought to have precipitated its collapse (Haug et al. 2003, *Science*)

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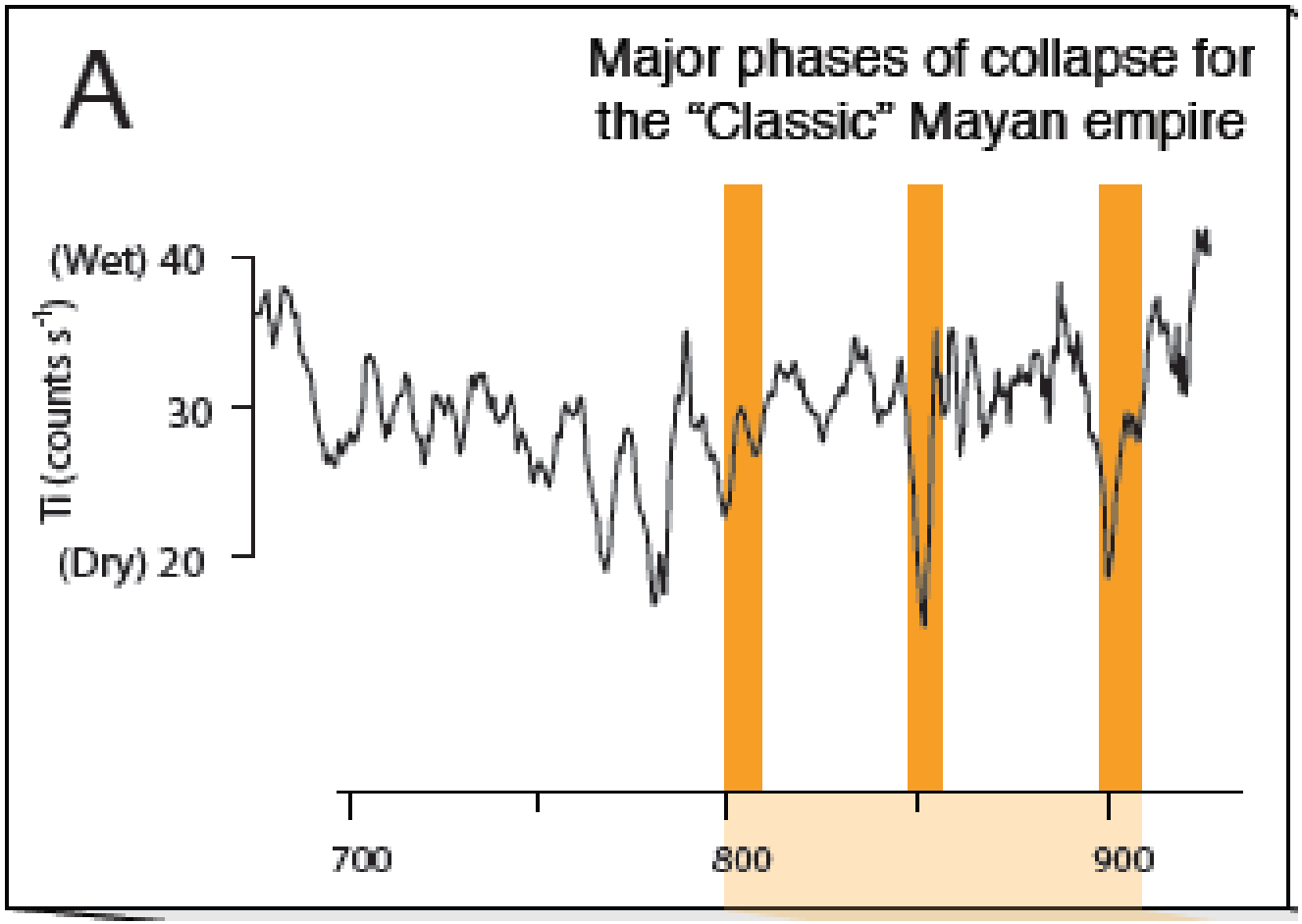
Mexico



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- E.g., the Maya civilization experienced three extended multi-year droughts in the 9th century AD that are thought to have precipitated its collapse (Haug et al. 2003, *Science*)
- Collapse of 9th century Chinese Tang dynasty linked to same extended drying (Yancheva et al. 2007, *Nature*)
- Relevance: had incomes similar to poor countries today, i.e., historical Maya (~$400), China (~$600)
- Caveat: “keys under the lamppost”? These studies do not test hypotheses on the universe of societies.

(1) Hsiang, Burke and Miguel (2013)

- Laboratory studies find impacts of ambient temperature on subject aggression; possible hormonal channels.

- Vrij et al. (1994): Dutch police in a training exercise were more likely to shoot at a simulated intruder when randomly placed in a high temperature room (27^{o} C / 80^{o} F) than at lower temperature (21^{o} C / 70^{o} F).
- Perceived the intruder as more dangerous in surveys.
- Does aggression “escalate” potential conflicts?

- Kenrick et al. (1986): high temperatures are linked to more horn honking in a field experiment, when experimenters deliberately stood still at green lights

(1) Hsiang, Burke and Miguel (2013)

- Largest number of studies estimate impacts of climate on national-scale violence, often on armed civil conflict
- **Miguel, Satyanath and Sergenti (2004)** were first to show that civil conflict is more likely following adverse rainfall shocks across African countries during 1981-1999. Rainfall correlates with GDP growth (IV first stage)

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- Building on MSS, many recent studies regress outcome y on temperature deviation (rather than changes, Ciccone 2011), precipitation deviation, and country and time fixed effects:

$$y_{it} = \alpha + \beta_1 Temp_{it} + \beta_2 Precip_{it} + \eta_i + \delta_t + \varepsilon_{it}$$

(1) Hsiang, Burke and Miguel (2013)

- The results are remarkably consistent: all 27 empirical studies that focus on temperature estimate a positive association between higher temperatures and violence. Extremely unlikely to happen by chance (<1 in a million).
- 16 of 18 rainfall studies have a consistent sign

- Three quarters of these estimates are statistically significant at 95% confidence.

- The pattern emerges at scales ranging from the village, to region, country and even global scale, using a common econometric specification.

(1) Hsiang, Burke and Miguel (2013)

- Four studies illustrate the relationship across scales:
- Village level: re-analyze the link between climate and witch killing in Miguel (2005, *REStud*), using temperature instead of extreme rainfall.

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- Region level: re-analyze O'Laughlin et al. (2012, *PNAS*) with pixel FE and show higher temperature is associated with more violence (raids, riots, battles) since 1990.

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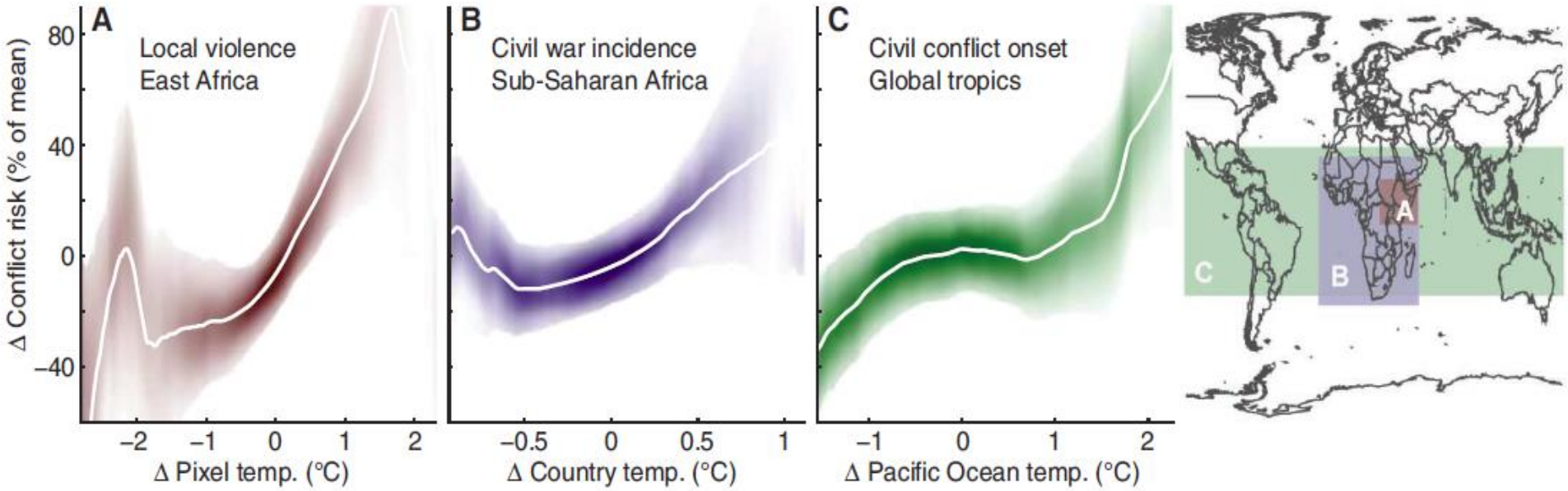
- Region level: re-analyze O'Laughlin et al. (2012, *PNAS*) with pixel FE and show higher temperature is associated with more violence (raids, riots, battles) since 1990.
- Country level: higher temperature increases civil war risk in Sub-Saharan Africa (Burke et al. 2009, *PNAS*).
- Global: higher temperature is associated with more civil conflict in the tropics, exploiting climate variation induced by El Niño (ENSO) (Hsiang et al 2011, *Nature*). ENSO variation explains 21% of conflict onsets since 1950.

(1) Hsiang, Burke and Miguel (2013)



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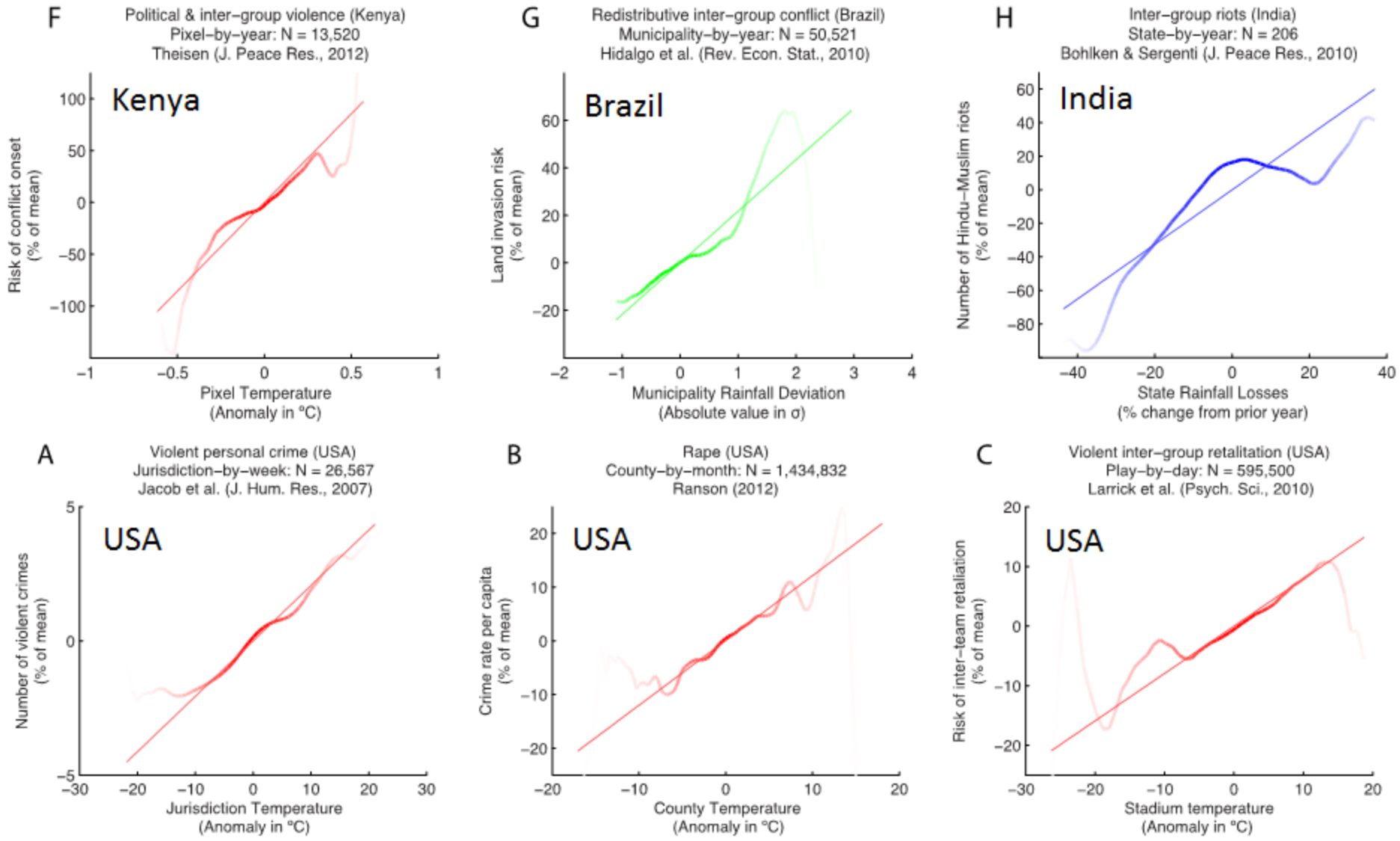

(1) Hsiang, Burke and Miguel (2013)

- Four issues are key to assessing impacts:

1. Magnitude of effects
2. Channels of impacts (i.e., economic vs. psychological)
3. Adaptation to a warmer climate
4. General equilibrium effects (speculative)

(1) Hsiang, Burke and Miguel (2013)

1. Magnitude of effects:

- Are effects “large”?
- The median effect size: a 1 s.d. change in climate is associated with a +14% increase in intergroup conflict.
- In a **meta-analysis** (where individual estimates are weighted by their statistical precision), the mean impact of a 1 s.d. change is a 11.1% (s.e. 1.3%) increase in intergroup conflict

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- Alternative approach: Bayesian meta-analysis, which estimates the underlying heterogeneity in “true” effects, if estimates cannot be explained by sampling variation (Gelman et al 1995)

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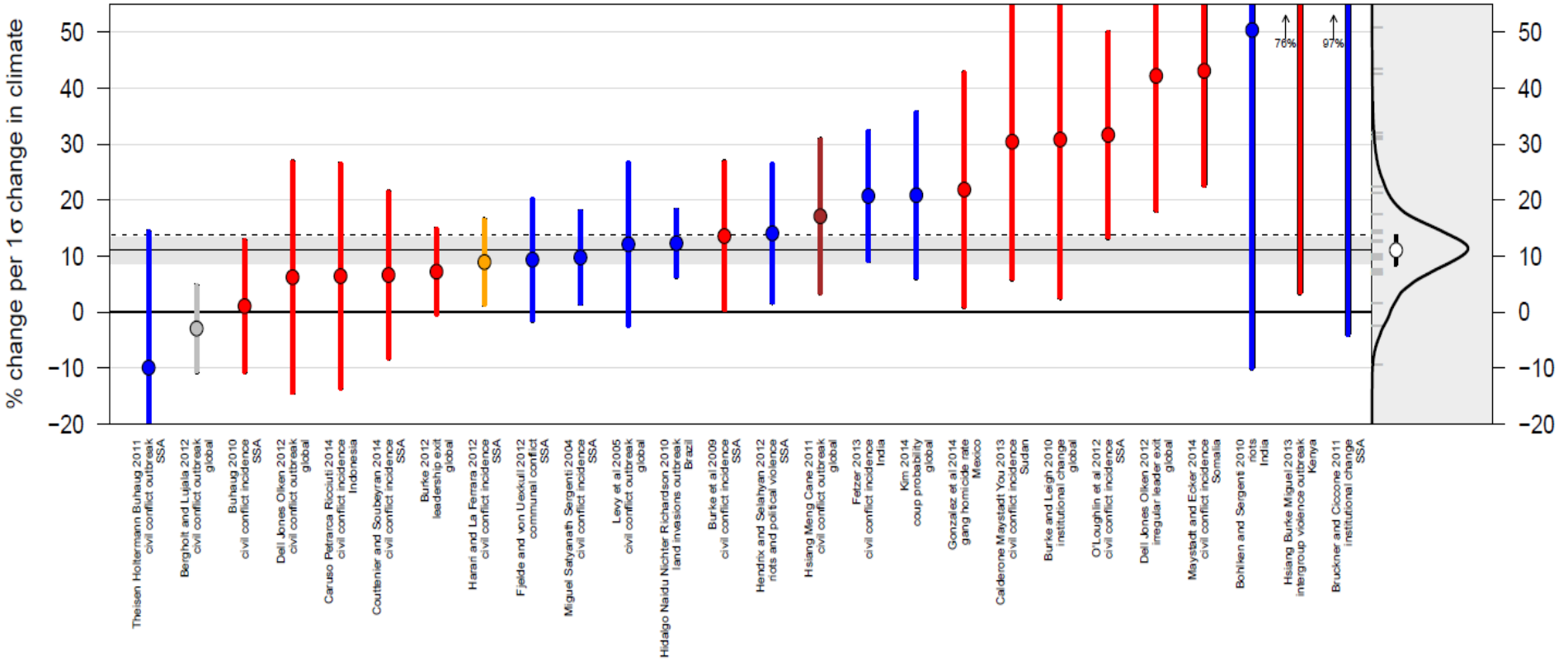
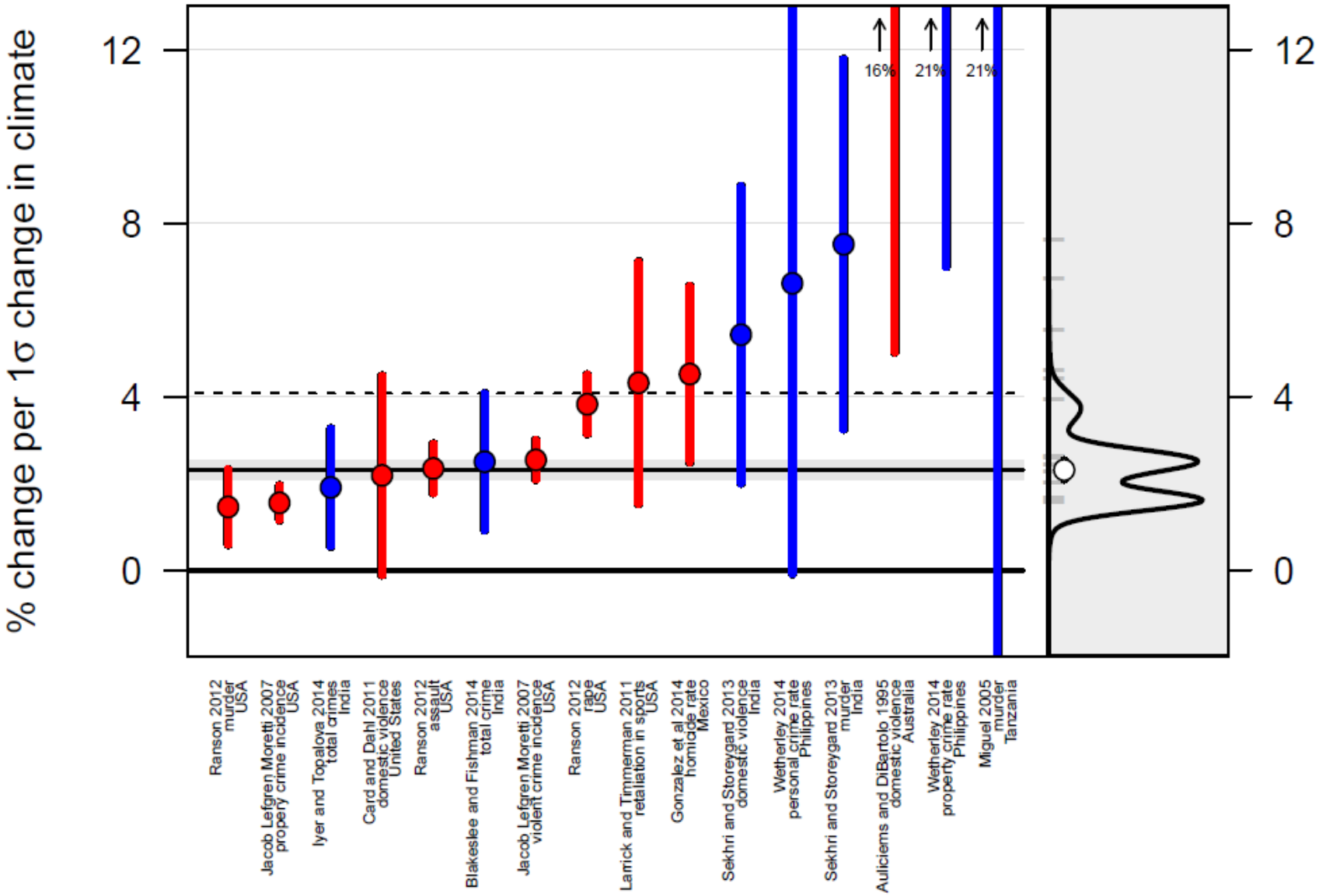


(1) Hsiang, Burke and Miguel (2013)

1. Magnitude of effects:

- Are effects “large”?
- For interpersonal violence (e.g., crime), the median standardized effect is smaller, at +4% per 1 s.d. change.

(1) Hsiang, Burke and Miguel (2013)



(1) Hsiang, Burke and Miguel (2013)

1. Magnitude of effects:

- Is publication bias a concern?
- Probably not: t-statistics do significantly increase with sample size (unlike some other literatures in Economics, e.g., the minimum wage literature surveyed by Card and Krueger 1995)
- Also included unpublished working papers, in case editorial decisions “filter out” papers with certain types of results.

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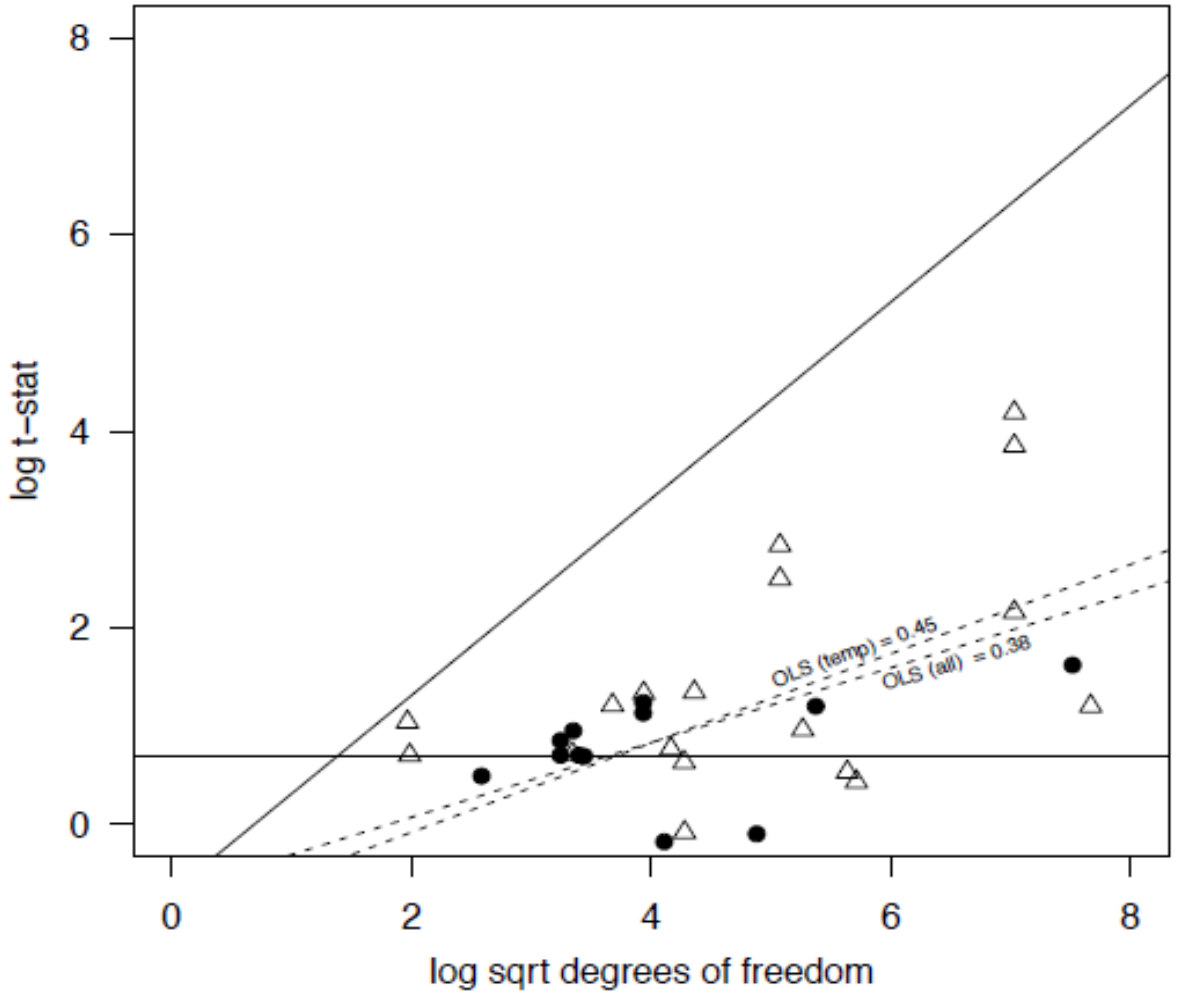


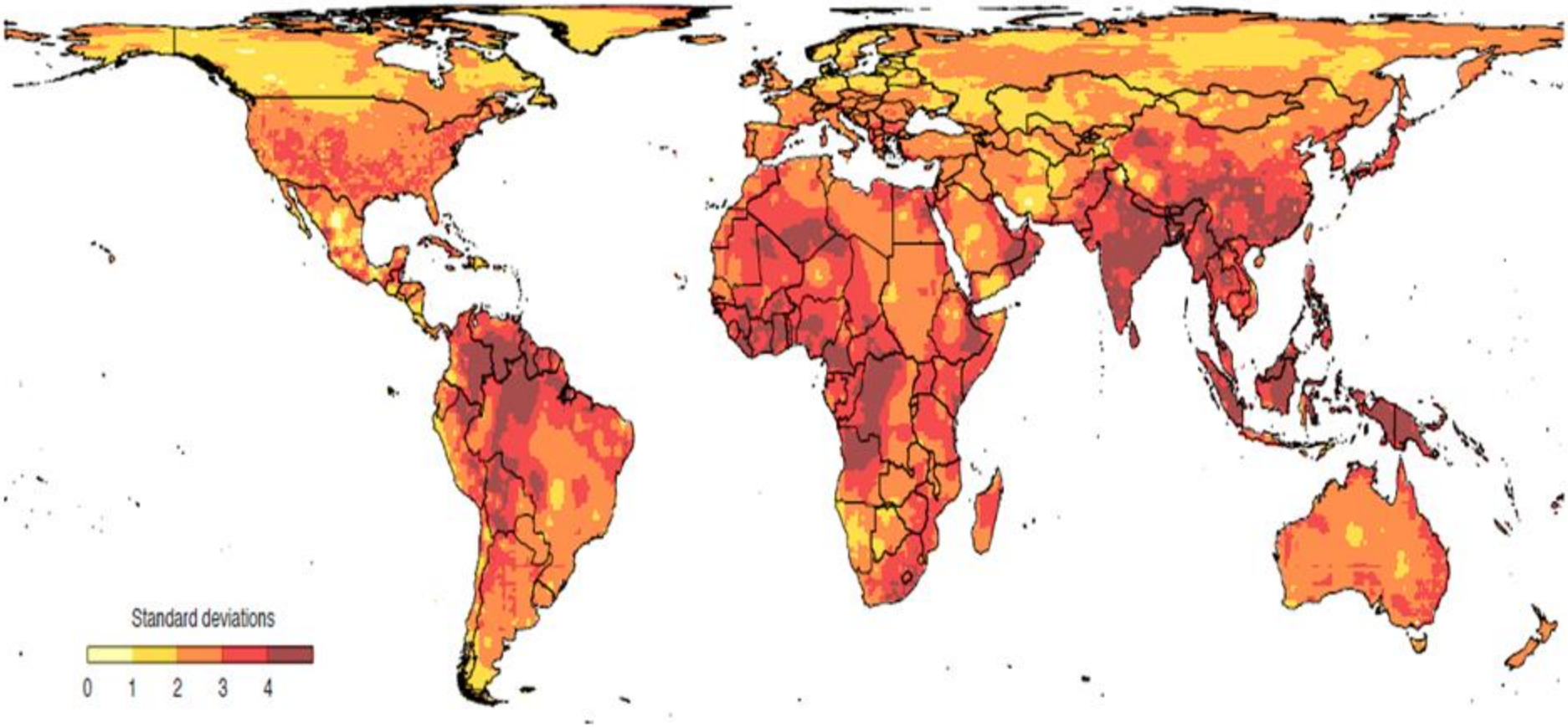
Supplementary Figure S4: Relationship between log of t-stat and log of the square root of the degrees-of-freedom, using author reported t-statistics. Circles represent studies focusing on rainfall, triangles studies focusing on temperature.

(1) Hsiang, Burke and Miguel (2013)

- Most of Sub-Saharan Africa is projected to experience average warming of at least 3 s.d. (2 C) by 2050, suggesting the risk of violent conflict could rise considerably.

- Beyond average changes, precipitation variability is likely to increase, potentially exacerbating effects

(1) Hsiang, Burke and Miguel (2013)



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- Economic channels seem to be important empirically:
- **High temperatures reduce economic growth (Dell et al. 2012)**, agricultural output (Lobell et al 2008), labor productivity (Graff-Zivin and Neidell 2013, Hsiang 2010)

- In both the witch killing data and Harari and La Ferrara (2012), lagged growing season weather shocks have a much larger effect than non-growing season weather, suggesting that agricultural output is a key mechanism

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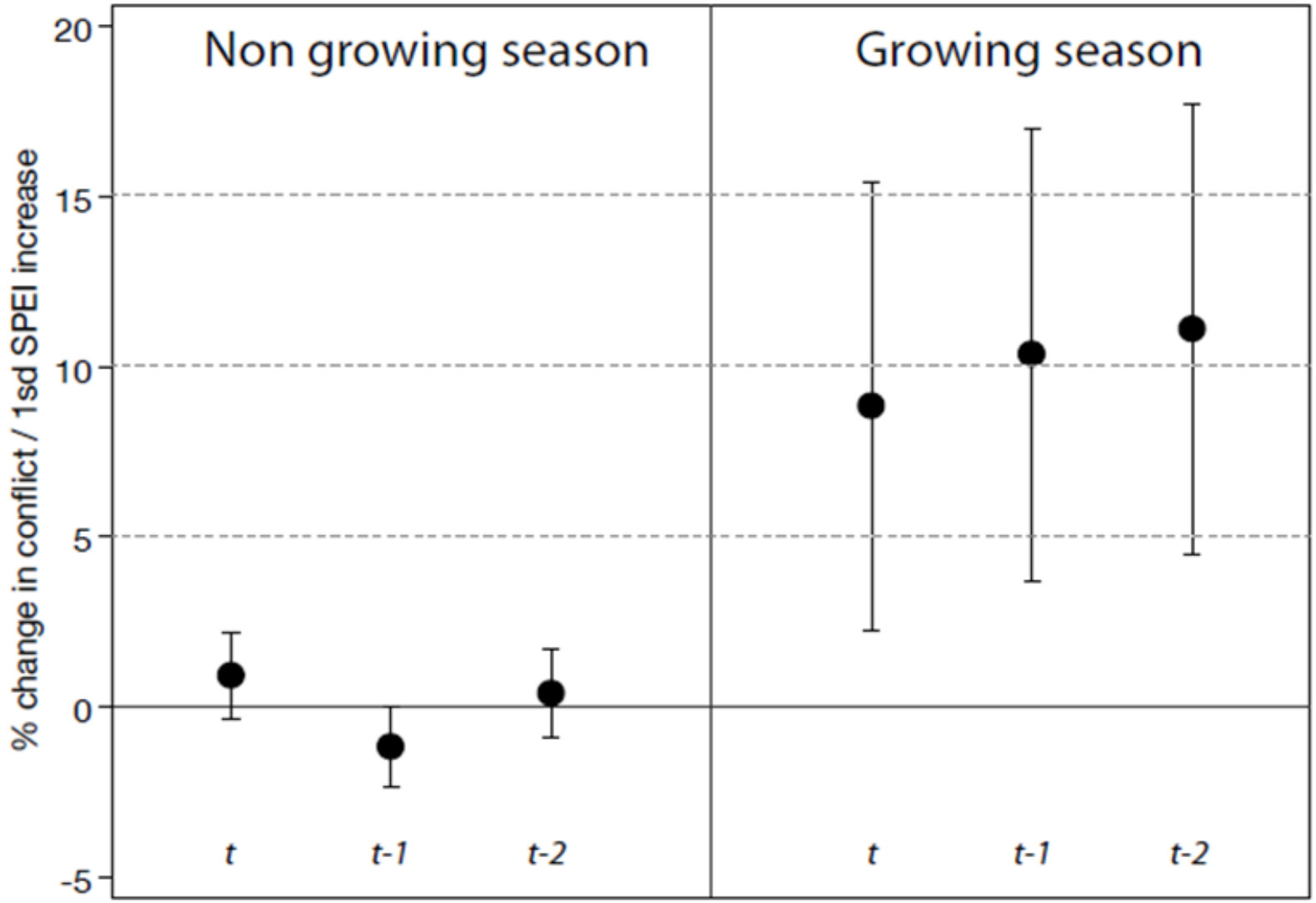

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- The link between temperature and violent crime means **aggression** also likely contributes, although its precise contribution to inter-group violence remains unclear.

(1) Hsiang, Burke and Miguel (2013)

3. Adaptation to a warmer climate:

- A key unresolved question is whether societies can adapt to future warming to limit adverse impacts.
- Unfortunately, the existing evidence suggests that any adaptation is likely to be partial:

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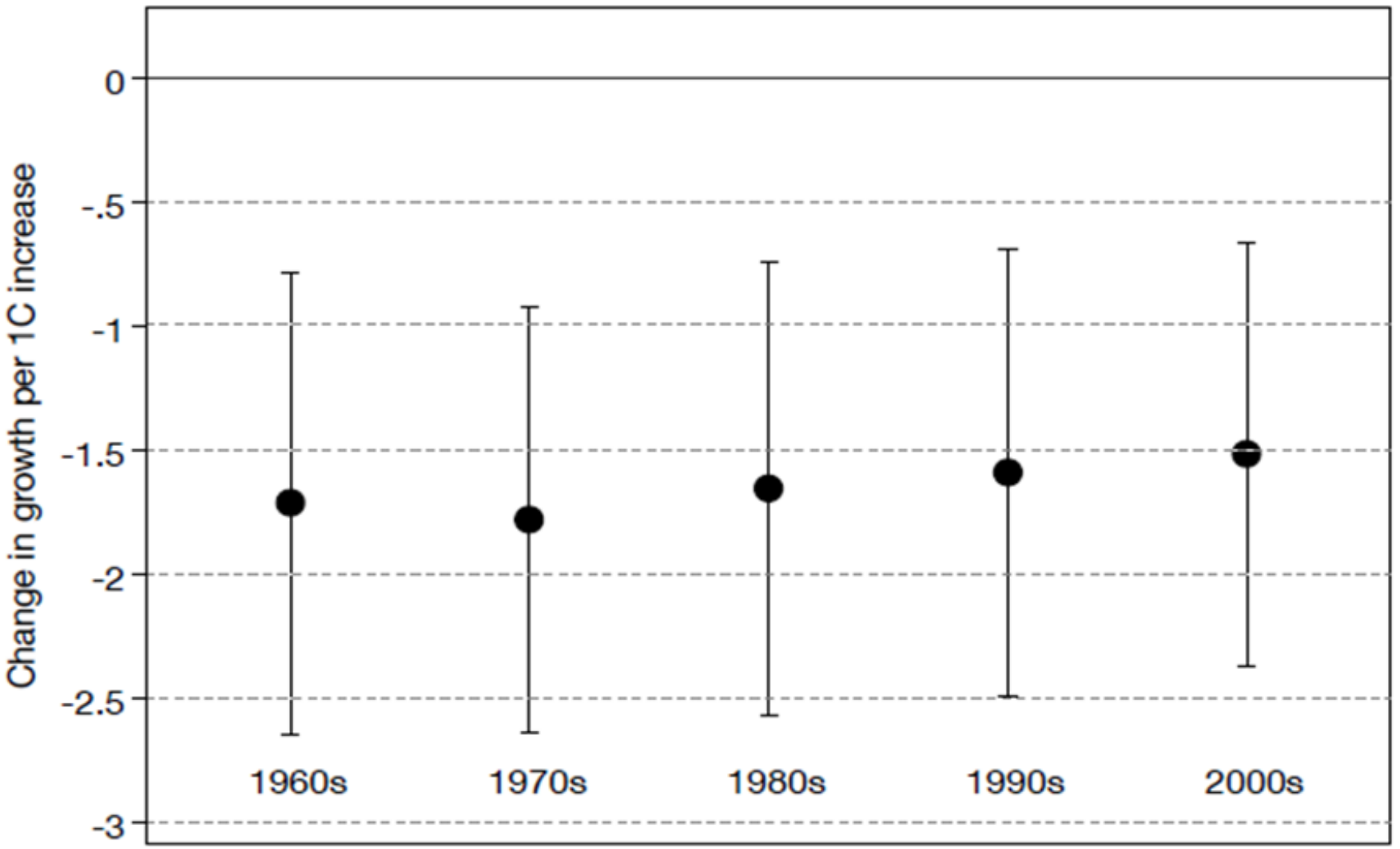

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a) Even with declining reliance on agriculture, African economic growth rates have not become less sensitive to high temperature over time: -1.5% growth per 1^0 C

b) The relationship is not significantly different for African countries at various levels of democracy and income

c) Rapidly rising temperatures over the coming decades will make adaptation even more challenging

(1) Hsiang, Burke and Miguel (2013)

3. Adaptation to a warmer climate:

- Other work indicates adaptation is likely to be costly:
- Minimal adaptation (~15%) of Indian agriculture to monsoon intensity over decades (Taraz 2013)
- Even in the U.S., the sensitivity of agricultural output and crime to temperature is nearly unchanged over the past few decades (Burke and Emerick 2012; Ranson 2012)

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- Even in the U.S., the sensitivity of agricultural output and crime to temperature is nearly unchanged over the past few decades (Burke and Emerick 2012; Ranson 2012)
- Annual sensitivity of country economic growth to temperature is similar to medium-run (15-year) sensitivity (Dell et al. 2012), suggesting slow adaptation
- Annual sensitivity of local conflict to temperature is similar to medium-run sensitivity in East Africa (using the same data as O'Loughlin et al 2012)

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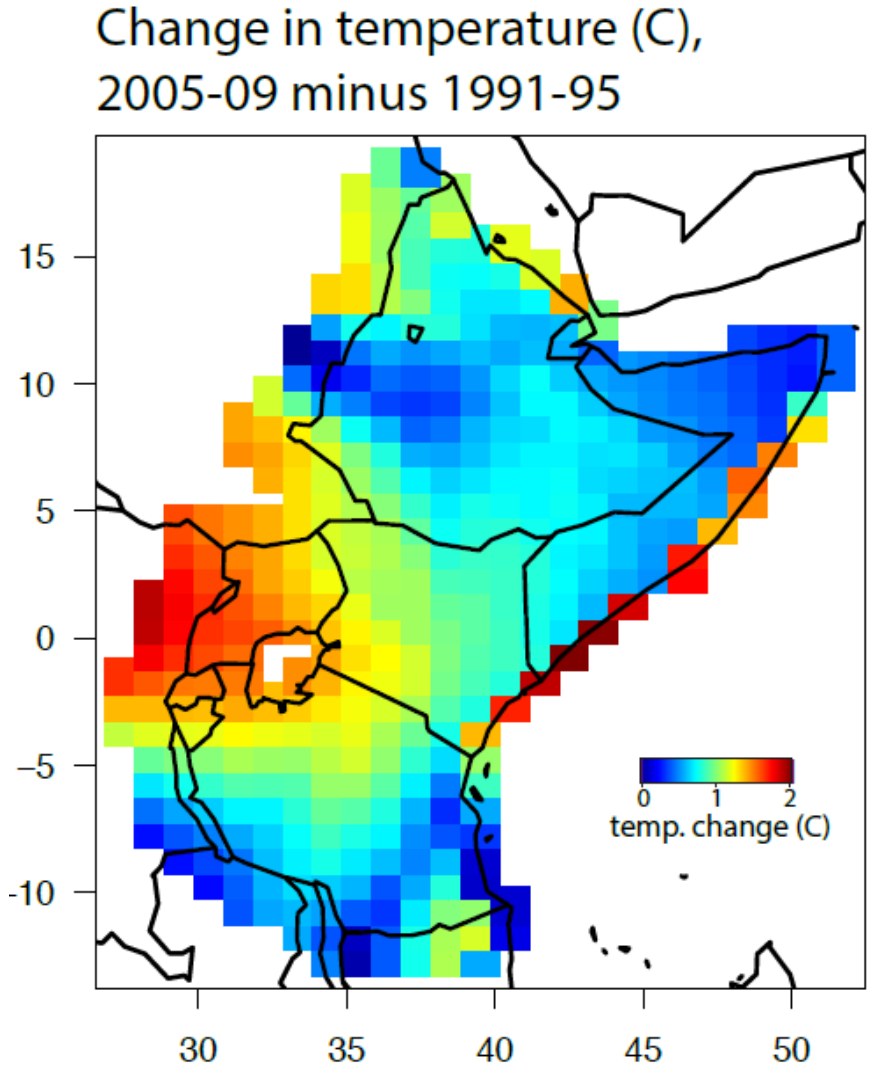

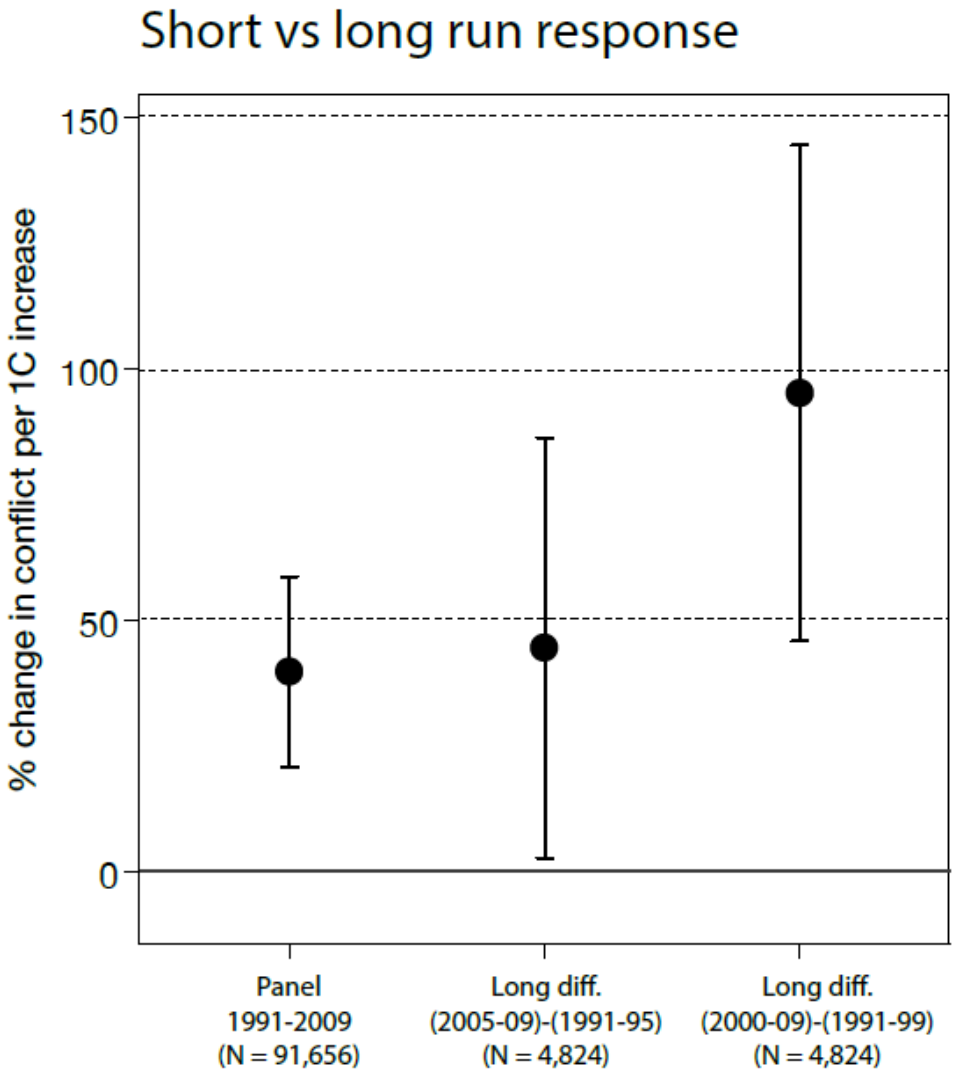

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4. Global general equilibrium effects:

- Most studies are “local”, i.e., examining how temperature shocks in one country (or pixel) affects violence there
- Broader impacts are possible on world food prices, through regional wars and refugee flows, etc.

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- Broader impacts are possible on world food prices, through regional wars and refugee flows, etc.
- Complicated interactions possible, e.g., did record high global food prices in early 2011 – caused in part by the historic 2010 drought in China – help “spark” North African Arab Spring unrest?
- High temperatures will increase relative productivity at far northern latitudes, and faster innovation could amplify effects (Desmet and Rossi-Hansberg 2013)

(1) Hsiang, Burke and Miguel (2013)

- Implications:
- With global mitigation (pollution control) efforts currently stalled politically, an adaptation agenda is desperately needed

- E.g., the development of new crop varieties, weather insurance schemes, and peace-building programs that will reduce sensitivity to future climate change.
- “Rapid” targeted foreign aid to countries experiencing climate shocks might also be useful, if it dampens effects working through economic conditions (Miguel 2007)

(2) Miguel, Satyanath, Sergenti (2004, *JPE*)

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- Builds on earlier work by Collier and Hoeffler (1998), and Fearon and Laitin (2003, *APSR*)

  -- “Greed versus grievance” debate: are armed groups primarily driven by private economic returns (e.g., looting, diamonds) or by ideological motivations?

  -- Scholars in the climate-conflict debate have taken similar positions re: economic vs. other factors

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- Of course these two explanations are not mutually exclusive, and both could apply to some degree in particular cases. Finding a link between poverty and violence does not resolve the debate

(2) Miguel, Satyanath, Sergenti (2004, *JPE*)

- The two central econometric identification problems:

  (1) Endogeneity: civil wars (or the risk of future civil war) can affect economic conditions, through investment, trade, population displacement, destruction of capital

  (2) Omitted variable bias: countries with effective institutions (or leaders) may both have better economic outcomes and be more peaceful

(2) Miguel, Satyanath, Sergenti (2004, *JPE*)

- MSS (2004) try to deal with these concerns in turn:

  (1) Endogeneity:

  -- Use rainfall shocks as IVs for economic growth rates. This seemed reasonable in largely agrarian societies where most households rely on rain-fed agriculture

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  -- Is the exclusion restriction credible? How else could rainfall affect civil war, other than through economic growth rates? Recent evidence leads us to prefer the reduced form results to the IV results.

(2) Miguel, Satyanath, Sergenti (2004, *JPE*)

- MSS (2004) try to deal with these concerns in turn:

  (2) Omitted variable bias:

  -- Include country fixed effects and country specific time trends in most specifications, to capture levels (and trend) differences across countries

(2) Miguel, Satyanath, Sergenti (2004, *JPE*)

- MSS (2004) :

In the first stage, MSS study the relationship between rainfall variations and economic growth:

$$growth_{it} = a_{1i} + X'_{it}b_1 + c_{1,0}\,\Delta R_{it} + c_{1,1}\,\Delta R_{i,t-1} + d_{1i}\,year_t + e_{1it} \qquad (1a)$$

Economic growth in country i in year t is measured by per capita GDP. Rainfall variation is captured by current and lagged rainfall growth ($\Delta R_{i,t}$ and $\Delta R_{i,t-1}$). MSS experimented with a variety of instruments for economic growth, including rainfall levels and deviations from mean rainfall levels. Although results are similar amongst these measures, current and lagged rainfall growth give the strongest first stage relationship and were thus the focus of the article. Country characteristics (X_{it}) are controlled for, and country fixed effects (a_i) and country-specific time trends ($d_i year_t$) are included to capture additional variation. e is the disturbance term.

To establish the relationship between economic growth and conflict, MSS carry out the following second stage analysis:

$$conflict_{it} = \alpha_{2i} + X'_{it}\beta_2 + \gamma_{2,0}\,growth_{it} + \gamma_{2,1}\,growth_{i,t-1} + \delta_{2i}\,year_t + \varepsilon_{2it} \qquad (1b)$$

(2) Miguel, Satyanath, Sergenti (2004, *JPE*)

- Use standard cross-country income data, with all of its flaws and likely measurement error. This is another potential rationale for the IV approach, to reduce the attenuation bias

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- Use standard cross-country income data, with all of its flaws and likely measurement error. This is another potential rationale for the IV approach, to reduce the attenuation bias

- **PRIO/Uppsala conflict database** – focus on the lower 25 death conflict threshold. This seems most appropriate for most (small) African countries, although we present results with the higher 1000 death threshold as well.

- 743 observations. Some interesting cases – e.g., Democratic Republic of Congo – are missing too much economic data to be included. 27% of country-year cases had conflict. 38 conflicts started during the period

(2) Miguel, Satyanath, Sergenti (2004, *JPE*)

- **Global Precipitation Climatology Project (GPCP)** monthly rainfall data since 1979, uses both satellite and rainfall gauge data

- Focus on year to year changes in rainfall for the country as a whole. This has the strongest first stage predictive power for economic growth rates – stronger than, say, using an indicator for extreme rainfall shocks only

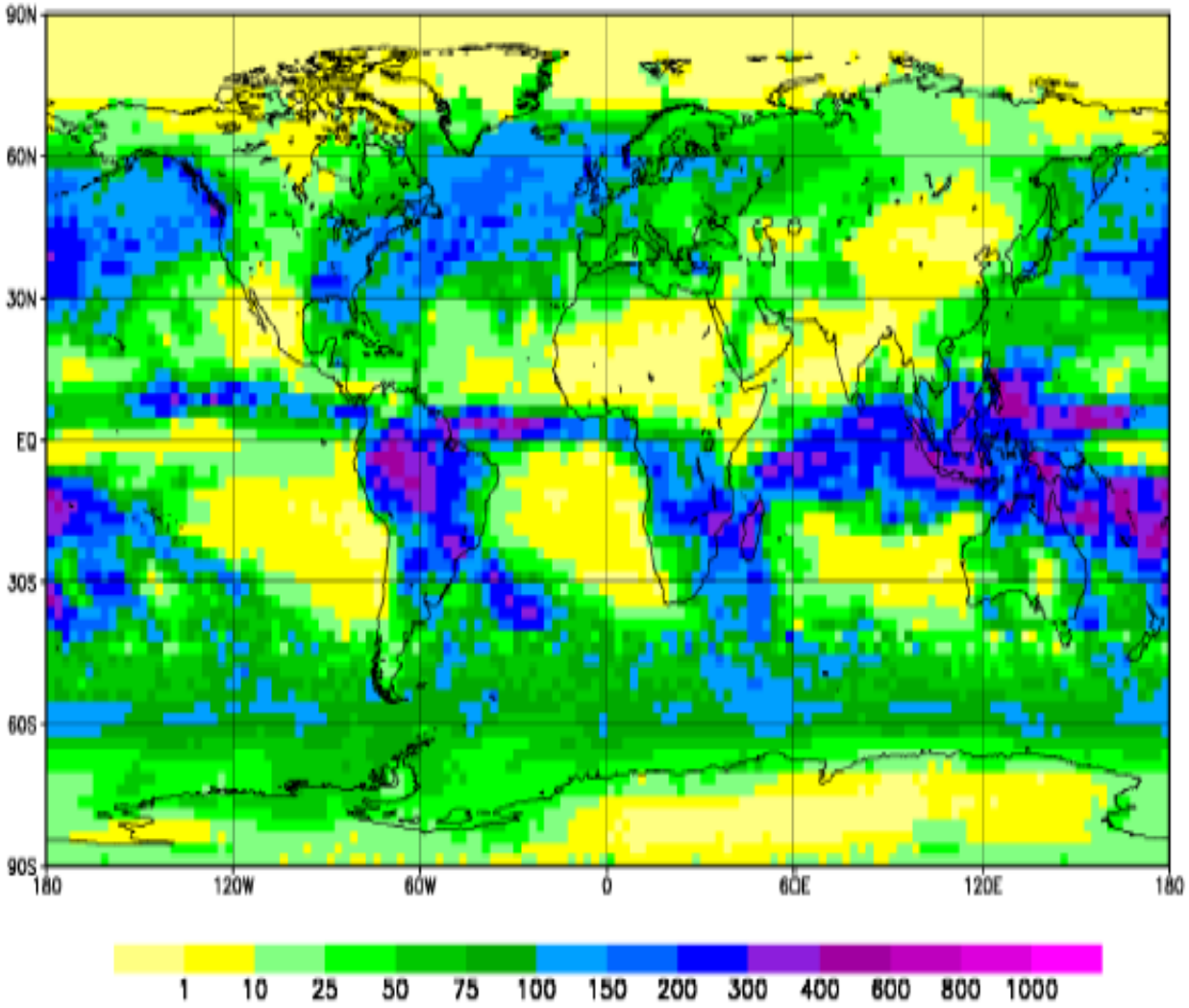

Fig. 1: Global precipitation (mm/month) for January 1999 from the GPCP-V2 combined data set.

TABLE 2
RAINFALL AND ECONOMIC GROWTH (First-Stage)
Dependent Variable: Economic Growth Rate, t

EXPLANATORY VARIABLE	ORDINARY LEAST SQUARES				
	(1)	(2)	(3)	(4)	(5)
Growth in rainfall, t	.055***	.053***	.049***	.049***	.053***
	(.016)	(.017)	(.017)	(.018)	(.018)
Growth in rainfall, $t-1$	.034**	.032**	.028**	.028*	.037**
	(.013)	(.014)	(.014)	(.014)	(.015)
Growth in rainfall, $t+1$				.001	
				(.019)	
Growth in terms of trade, t					−.002
					(.023)
Log(GDP per capita), 1979		−.011			
		(.007)			
Democracy (Polity IV), $t-1$		.0000			
		(.0007)			
Ethnolinguistic fractionalization		.006			
		(.044)			
Religious fractionalization		.045			
		(.044)			
Oil-exporting country		.007			
		(.019)			
Log(mountainous)		.001			
		(.005)			
Log(national population), $t-1$		−.009			
		(.009)			
Country fixed effects	no	no	yes	yes	yes
Country-specific time trends	no	yes	yes	yes	yes
R^2	.02	.08	.13	.13	.16
Root mean square error	.07	.07	.07	.07	.06
Observations	743	743	743	743	661

TABLE 3
RAINFALL AND CIVIL CONFLICT (Reduced-Form)

Explanatory Variable	Dependent Variable: Civil Conflict ≥25 Deaths (OLS) (1)	Dependent Variable: Civil Conflict ≥1,000 Deaths (OLS) (2)
Growth in rainfall, t	−.024	−.062**
	(.043)	(.030)
Growth in rainfall, $t-1$	−.122**	−.069**
	(.052)	(.032)
Country fixed effects	yes	yes
Country-specific time trends	yes	yes
R^2	.71	.70
Root mean square error	.25	.22
Observations	743	743

TABLE 4

ECONOMIC GROWTH AND CIVIL CONFLICT

EXPLANATORY VARIABLE	DEPENDENT VARIABLE: Civil Conflict ≥25 Deaths						DEPENDENT VARIABLE: Civil Conflict ≥1,000 Deaths
	Probit (1)	OLS (2)	OLS (3)	OLS (4)	IV-2SLS (5)	IV-2SLS (6)	IV-2SLS (7)
Economic growth rate, t	−.37	−.33	−.21	−.21	−.41	−1.13	−1.48*
	(.26)	(.26)	(.20)	(.16)	(1.48)	(1.40)	(.82)
Economic growth rate, $t-1$	−.14	−.08	.01	.07	−2.25**	−2.55**	−.77
	(.23)	(.24)	(.20)	(.16)	(1.07)	(1.10)	(.70)
Log(GDP per capita), 1979	−.067	−.041	.085		.053		
	(.061)	(.050)	(.084)		(.098)		
Democracy (Polity IV), $t-1$	.001	.001	.003		.004		
	(.005)	(.005)	(.006)		(.006)		
Ethnolinguistic fractionalization	.24	.23	.51		.51		
	(.26)	(.27)	(.40)		(.39)		
Religious fractionalization	−.29	−.24	.10		.22		
	(.26)	(.24)	(.42)		(.44)		
Oil-exporting country	.02	.05	−.16		−.10		
	(.21)	(.21)	(.20)		(.22)		
Log(mountainous)	.077**	.076*	.057		.060		
	(.041)	(.039)	(.060)		(.058)		
Log(national population), $t-1$	.080	.068	.182*		.159*		
	(.051)	(.051)	(.086)		(.093)		
Country fixed effects	no	no	no	yes	no	yes	yes
Country-specific time trends	no	no	yes	yes	yes	yes	yes
R^2	…	.13	.53	.71	…	…	…
Root mean square error	…	.42	.34	.29	.36	.32	.24
Observations	743	743	743	743	743	743	743

(2) Miguel, Satyanath, Sergenti (2004, *JPE*)

- **A large effect of income growth on civil conflict**: a 5 percentage point drop in growth (a large negative shock) increases conflict risk by over 10 percentage points, or by roughly half (on a base of 20%)

(2) Miguel, Satyanath, Sergenti (2004, *JPE*)

- Ciccone (2011) on functional form assumptions: is rainfall *growth* the right measure to use? Or rainfall *deviations* from the mean? His claim: lagged t-2 rainfall has a *positive* coefficient estimate in some cases
- Our perspective: he ignores the fact that rainfall is an IV for economic growth in MSS 2004, and that the main IV results continue to hold even using preferred IV
- Plus the "growth" specification is not rejected in his data.

- Most subsequent work (including our own) focuses on weather deviations as the key explanatory variable

(2) Miguel, Satyanath, Sergenti (2004, *JPE*)

- A different point: weaker first stage since c. 2000 (due to faster African economic growth, democratization?) but only using PWT 7 data. The relationship remains as strong using PWT 6 and WDI data. Why the difference?

- Refer to recent Johnson et al. (2012, *J. of Monetary Economics*) article "Is newer better? Penn World Table revisions and their impact on growth estimates"
- They note that the different PWT versions are highly divergent despite a similar methodology, with greater differences for smaller economies (including many in Africa); that many well-known results change in moving to PWT 7; and find inconsistencies and problems in their PPP adjustment (their main goal).

In the second main result, we find that the impact of economic growth shocks on the incidence of major conflicts is remarkably—and perhaps surprisingly—similar for African countries with a wide range of institutional, political, social, and economic characteristics. There are compelling theoretical reasons to expect to find strong effects; for instance, given an adverse economic growth shock, countries with stronger democratic institutions (and, similarly, wealthier countries) may be better able to negotiate compromises among social groups to avert unrest, whereas such negotiations may more often break down in ethnically or religiously fragmented societies (Benhabib and Rustichini 1996; Easterly and Levine 1997). However, the interactions between economic growth (current and lagged) and a measure of democracy (regression 1 of table 5) and between growth and per capita income levels in 1979 (regression 2) are not significantly related to civil conflict; nor are the two interaction terms jointly significant in either case.[24]

TABLE 5

INTERACTIONS BETWEEN ECONOMIC GROWTH AND COUNTRY CHARACTERISTICS

Dependent Variable: Civil Conflict ≥25 Deaths

	IV-2SLS				
EXPLANATORY VARIABLE	(1)	(2)	(3)	(4)	(5)
Economic growth rate, t	−1.20	.92	−9.9	−.99	−1.85
	(1.43)	(2.62)	(22.9)	(1.26)	(1.81)
Economic growth rate, $t-1$	−2.86*	−3.01*	−6.4	−2.37**	−2.97**
	(1.46)	(1.70)	(6.1)	(1.04)	(1.39)
Economic growth rate, t × democracy (Polity IV), $t-1$	.01				
	(.21)				
Economic growth rate, $t-1$ × democracy (Polity IV), $t-1$	−.10				
	(.16)				
Economic growth rate, t × log(per capita income, 1979)		−1.98			
		(2.70)			
Economic growth rate, $t-1$ × log(per capita income, 1979)		.58			
		(1.09)			
Economic growth rate, t × ethnolinguistic fractionalization			12.1		
			(30.1)		
Economic growth rate, $t-1$ × ethnolinguistic fractionalization			5.1		
			(8.1)		
Economic growth rate, t × oil-exporting country				−2.8	
				(6.9)	
Economic growth rate, $t-1$ × oil-exporting country				3.2	
				(3.1)	
Economic growth rate, t × log(mountainous)					.39
					(.83)
Economic growth rate, $t-1$ × log(mountainous)					.23
					(.62)
Country fixed effects	yes	yes	yes	yes	yes
Country-specific time trends	yes	yes	yes	yes	yes
Root mean square error	.33	.34	.41	.32	.32
Observations	743	743	743	743	743

Whiteboard


CANADA
U.S.A.
MEXICO
RUSSIA
KAZAKSTAN
MONGOLIA
CHINA
JAPAN
TURKEY
IRAN
IRAQ
ALGERIA
LIBYA
EGYPT
SAUDI ARABIA
INDIA
MALI
NIGER
CHAD
SUDAN
ETHIOPIA
SOMALIA
NIGERIA
COLOMBIA
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URUGUAY
ANGOLA
ZAMBIA
NAMIBIA
SOUTH AFRICA
INDONESIA
PAPUA NEW GUINEA
AUSTRALIA
NEW ZEALAND
KIRIBATI
PACIFIC OCEAN
ATLANTIC OCEAN
INDIAN OCEAN
SOUTHERN OCEAN
ANTARCTICA
The Hobo-Dyer Equal Area Projection
Cities
Scale at the Equator