Economics 270c
Development Economics

Lecture 8 – March 7, 2007

Lecture 1: Global patterns of economic growth and development (1/16)

The political economy of development
Lecture 2: Inequality and growth (1/23)
Lecture 3: Corruption (1/30) – Guest lecture by Ben Olken
Lecture 4: History and institutions (2/6)
Lecture 5: Democracy and development (2/13)
Lecture 6: Ethnic and social divisions (2/20)
Lecture 7: Economic Theories of Conflict (2/27)
☆Lecture 8: War and Economic Development (3/6)

Human resources
Lecture 9: Human capital and income growth (3/13)
Lecture 10: Increasing human capital (3/20)
Lecture 11: Health and nutrition (4/3)
Lecture 12: The Economics of HIV/AIDS (4/10)
Lecture 13: Labor markets and migration (4/17)

Lecture 14: Environment and development (4/24)
Lecture 15: Social Learning and Technology Adoption (5/1)

- Referee report #3 is due next week

Lecture 8 outline

(1) Empirical links between war and economic development

(2) Does civil war have economic causes?

Miguel, Satyanath, and Sergenti (2004)

(3) What are the economic legacies of war?

Davis and Weinstein (2002), and Blattman (2006)

(1) Violence and economic development

- Since 1980 about 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

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

- Are these conflicts largely the cause of their poverty, or the consequence of poverty? (Or both – or neither?)

  -- Endogeneity and omitted variables are key issues in the estimation of these relationships

(1) Violence and economic development

- Today focus on two of the questions from last lecture:

(1) Why do civil wars occur (when they are so destructive)?

(1) Violence and economic development

- Today focus on two of the questions from last lecture:

(1) Why do civil wars occur (when they are so destructive)?

(2) What is war's impact on later economic development?
And how does this vary across countries and conflicts?

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

- What is the impact of income shocks on the likelihood of civil war in Africa during 1981-1999?

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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?

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

- 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 is reasonable in largely agrarian societies where most households rely on rain-fed agriculture

  -- Rainfall is clearly exogenous to civil conflict

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

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- 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*)

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- PRIO/Uppsala conflict database – focus on the lower 25 death conflict threshold. This seems most appropriate for most (small) African countries

- 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

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

	Dependent Variable: Civil Conflict ≥25 Deaths						Dependent Variable: Civil Conflict ≥1,000 Deaths
Explanatory Variable	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	.31	.25	.36	.32	.24
Observations	743	743	743	743	743	743	743

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

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

- Possible implications for public policy: government and foreign aid should react rapidly to the threat of economic downturns in poor countries (e.g., droughts, commodity price falls). Small amounts of aid up front ("prevention") could be much cheaper than the post-war "cure"

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- Should young men be targeted for transfers, since they pose the greatest threat of violence?

(2) Micro-data collection in conflict settings

- An effort to collect data systematically across countries (both “pre”, during, and post conflict”) could have high returns – think of the LSMS or DHS “movements”

  -- Necessary to test theories on conflict causes

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- An effort to collect data systematically across countries (both "pre", during, and post conflict") could have high returns – think of the LSMS or DHS "movements"

  -- Necessary to test theories on conflict causes

- There are many difficulties to doing so:

  (1) Some surveys would rely upon retrospective data that might suffer from bias due to ex post rationalization

  (2) Samples would exclude those killed (or emigrated) during the conflict → "selection bias" / "survivor bias"

  (3) Current ideology / knowledge may reflect political indoctrination received during the war, leading the analysis to overstate the role of ideology

  (4) Data collection may be dangerous

- Would want to survey combatants and civilians

(3) Davis and Weinstein (2002, *AER*)

- Study one of the most notorious cases of war-related destruction: the bombing of Japan (by the U.S.) during WWII, including the two atomic bombs

- How do heavily bombed cities compare to others, in terms of their post-war population growth? 1945-1965

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- How do heavily bombed cities compare to others, in terms of their post-war population growth? 1945-1965

- Why do some cities grow, and not others?

  (1) Increasing returns → temporary population shifts could have permanent effects on population distribution

  (2) Random growth theory

  (3) Locational fundamentals → post-war recovery back to pre-war population patterns

(3) Davis and Weinstein (2002, *AER*)

- Sample of 303 Japanese cities with pre-war population over 30,000. Annual data 1925-1965

- Exceptional city-level data on damage from U.S. bombing: proportion of buildings destroyed, proportion of residents dead / missing

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- Exceptional city-level data on damage from U.S. bombing: proportion of buildings destroyed, proportion of residents dead / missing

  -- Over 300,000 civilians killed, over 40% of population of the 66 cities targeted by the U.S. were made homeless by the bombing, 2.2 million buildings destroyed

- Data on public sector reconstruction expenditures (not a great predictor of recovery, actually, since untouched rural areas got lots of assistance)

(3) Davis and Weinstein (2002, *AER*)

- Econometric identification issues:

  -- Lots of variation across cities: approximately 80% of cities untouched, some for historical reasons (e.g., Kyoto), some to temporarily "save" for atomic weapons (e.g., Niigata), some out of range of U.S. bombers (e.g., Sapporo)

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  -- Bombing is not random – did the U.S. bomb cities with the best population (and economic?) growth prospects?

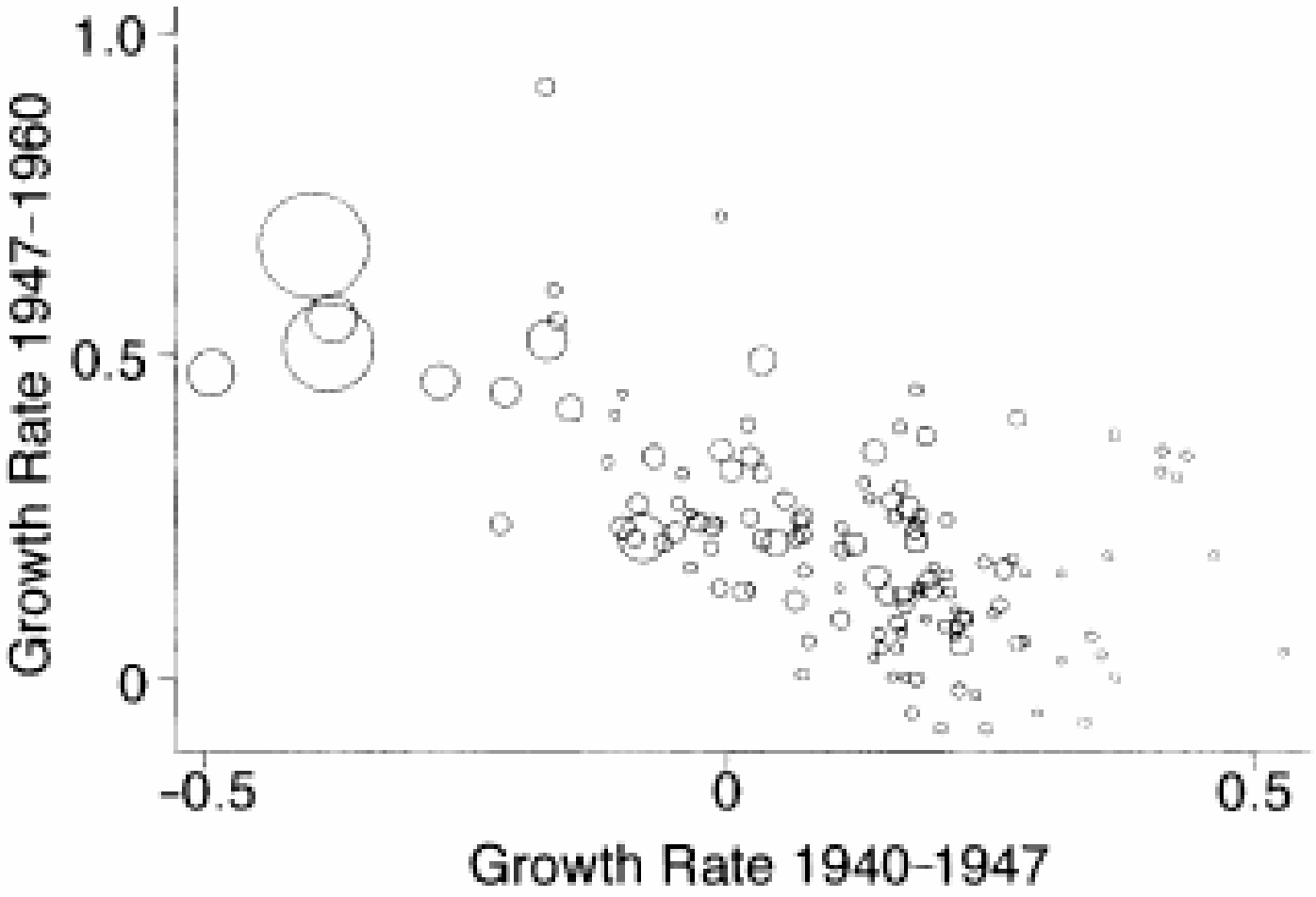

FIGURE 1. EFFECTS OF BOMBING ON CITIES WITH MORE THAN 30,000 INHABITANTS

Note: The figure presents data for cities with positive casualty rates only.

Let S_{it} be city i's share of total population at time t, and let s_{it} be the natural logarithm of this share. Suppose further that each city has an initial size Ω_i and is buffeted by city-specific shocks ε_{it}. In this case we can write the size of any city at any point in time as,

$$s_{it} = \Omega_i + \varepsilon_{it}. \tag{1}$$

We can model the persistence in these shocks to population shares as:

$$\varepsilon_{it+1} = \rho\varepsilon_{it} + \nu_{it+1}. \tag{2}$$

The parameter $\rho \in [0, 1]$, and the innovation, ν_{it}, is an independently and identically distributed error term.

We examine the evolution of this system by first-differencing equation (1). This yields

$$s_{it+1} - s_{it} = \varepsilon_{it+1} - \varepsilon_{it}. \tag{3}$$

If we substitute equation (2) into equation (3), we then obtain

$$s_{it+1} - s_{it} = (\rho - 1)\nu_{it} + [\nu_{it+1} + \rho(1 - \rho)\varepsilon_{it-1}]. \tag{4}$$

The key parameter is ρ, which tells us how much of a temporary shock is dissipated in one period. If $\rho = 1$, then all shocks are permanent and city size follows a random walk.[19] In this

TABLE 3—TWO-STAGE LEAST-SQUARES ESTIMATES OF IMPACT OF BOMBING ON CITIES (INSTRUMENTS: DEATHS PER CAPITA AND BUILDINGS DESTROYED PER CAPITA)

	Dependent variable = growth rate of population between 1947 and 1960		Dependent variable = growth rate of population between 1947 and 1965
Independent variable	(i)	(ii)	(iii)
Growth rate of population between 1940 and 1947	−1.048	−0.759	−1.027
	(0.097)	(0.094)	(0.163)
Government reconstruction expenses	1.024	0.628	0.392
	(0.387)	(0.298)	(0.514)
Growth rate of population between 1925 and 1940		0.444	0.617
		(0.054)	(0.092)
R^2:	0.279	0.566	0.386
Number of observations:	303	303	303

Note: Standard errors are in parentheses.

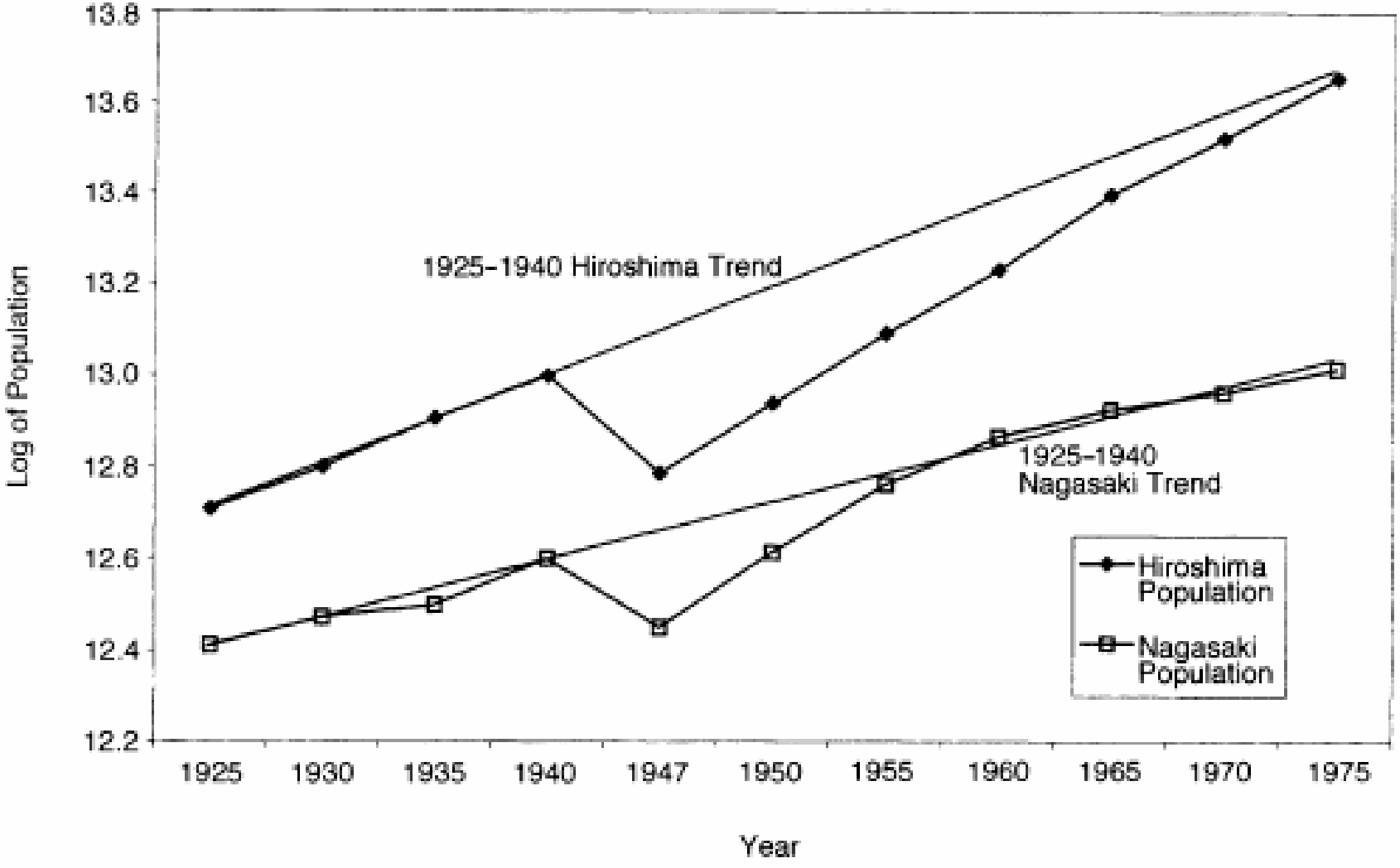

FIGURE 2. POPULATION GROWTH

(3) Davis and Weinstein (2002, *AER*)

- Japan cities recovered rapidly from massive bombing

  -- So did Germany (Brakman et al 2004), and Vietnam (Miguel and Roland 2006). We find recovery also in per capita consumption levels post-war

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- But these are all economic "success stories", with strong central government institutions. What are the economic legacies of war in Africa, where state institutions are weaker? The legacies of civil wars?

  -- These questions are difficult to answer due to data limitations: there are no detailed data on war damage / impacts in Somalia or Congo

(1) Blattman (2006)

- One particular legacy of civil war in Africa relates to the plight of child soldiers, usually abducted from home by armed groups between ages of 9-14

- What impact does abduction have these children's later life outcomes – education, labor market earnings, mental wellbeing?

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- What impact does abduction have these children's later life outcomes – education, labor market earnings, mental wellbeing?

- An amazing data collection effort, while the civil war was still going on in northern Uganda

- The key econometric issue is the possibility of non-random abduction

Table 2: Comparison of means: Abducted versus non-abducted youth

Pre-treatment Covariate	(1)	(2)	(3)	(4)
	Abducted versus non-abducted youth			
	Unconditional mean		Difference in means‡	
	Abducted	Non-Abducted	Unconditional	Conditional
Year of birth†	21.54	20.47	1.08	1.44
	[0.44]	[0.29]	[0.44]**	[0.61]**
Indicator for father a farmer†	0.90	0.90	0.01	-0.03
	[0.01]	[0.03]	[0.02]	[0.03]
Household size in 1996†	8.48	8.81	-0.33	-1.15
	[0.33]	[0.55]	[0.41]	[0.33]***
Landholdings in 1996†	26.78	26.36	0.42	1.00
	[1.48]	[2.44]	[2.10]	[2.41]
Indicator for top 10% of Landholdings†	0.16	0.16	0.00	0.01
	[0.02]	[0.04]	[0.03]	[0.02]
Cattle in 1996†	17.73	12.66	5.07	5.95
	[7.68]	[4.89]	[4.12]	[7.44]
Other livestock in 1996†	14.18	13.23	0.94	1.17
	[2.11]	[3.09]	[2.72]	[0.98]
Indicator for plow ownership in 1996†	0.23	0.19	0.04	0.02
	[0.03]	[0.04]	[0.04]	[0.05]
Indicator for uneducated father	0.12	0.13	-0.02	0.01
	[0.01]	[0.02]	[0.02]	[0.01]
Father's years of schooling	6.11	5.73	0.38	0.22
	[0.19]	[0.27]	[0.34]	[0.25]
Indicator for uneducated mother	0.53	0.55	-0.01	-0.02
	[0.04]	[0.02]	[0.04]	[0.04]
Mother's years of schooling	2.32	2.42	-0.09	-0.10
	[0.23]	[0.16]	[0.28]	[0.28]

Table 4: Estimates of the average treatment effect of abduction

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	**OLS estimate†**		**WLS estimate‡**		**Matching estimate§**	
	ATE	**%Δ**	**ATE**	**%Δ**	**ATE**	**%Δ**
Educational & Labor Market Outcomes						
Years of education	-0.79 [0.14]***	-11%	-0.78 [0.14]***	-11%	-0.73 [0.21]***	-10%
Indicator for functional literacy	-0.15 [0.03]***	-19%	-0.16 [0.03]***	-20%	-0.17 [0.04]***	-22%
Indicator for any employment in past month	0.02 [0.04]	3%	0.02 [0.04]	3%	-0.01 [0.04]	-2%
Indicator for capital- or skill-intensive work	-0.04 [0.02]***	-47%	-0.04 [0.01]***	-47%	-0.04 [0.02]*	-47%
Log (Daily wage)	-0.22 [0.14]	n.a	-0.22 [0.12]*	n.a	-0.32 [0.12]***	n.a.
Health Outcomes						
Indicator for a serious injury	0.09 [0.02]***	103%	0.09 [0.02]***	103%	0.10 [0.03]***	115%
Index of psychological distress	0.56 [0.19]***	14%	0.51 [0.19]***	13%	0.44 [0.20]**	11%

(3) Blattman (2006)

- Abducted individuals have less schooling attainment, lower wages, and more mental health problems after their return home

- But these individuals also who increased involvement in public affairs and community activities

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- Abducted individuals have less schooling attainment, lower wages, and more mental health problems after their return home

- But these individuals also who increased involvement in public affairs and community activities

- This echoes a result from Sierra Leone (Bellows and Miguel 2006). We find that people whose households' were directly affected by violence during the war are more politically knowledgeable, participate more in local public goods provision, and belong to political community groups. "Post-traumatic growth"?

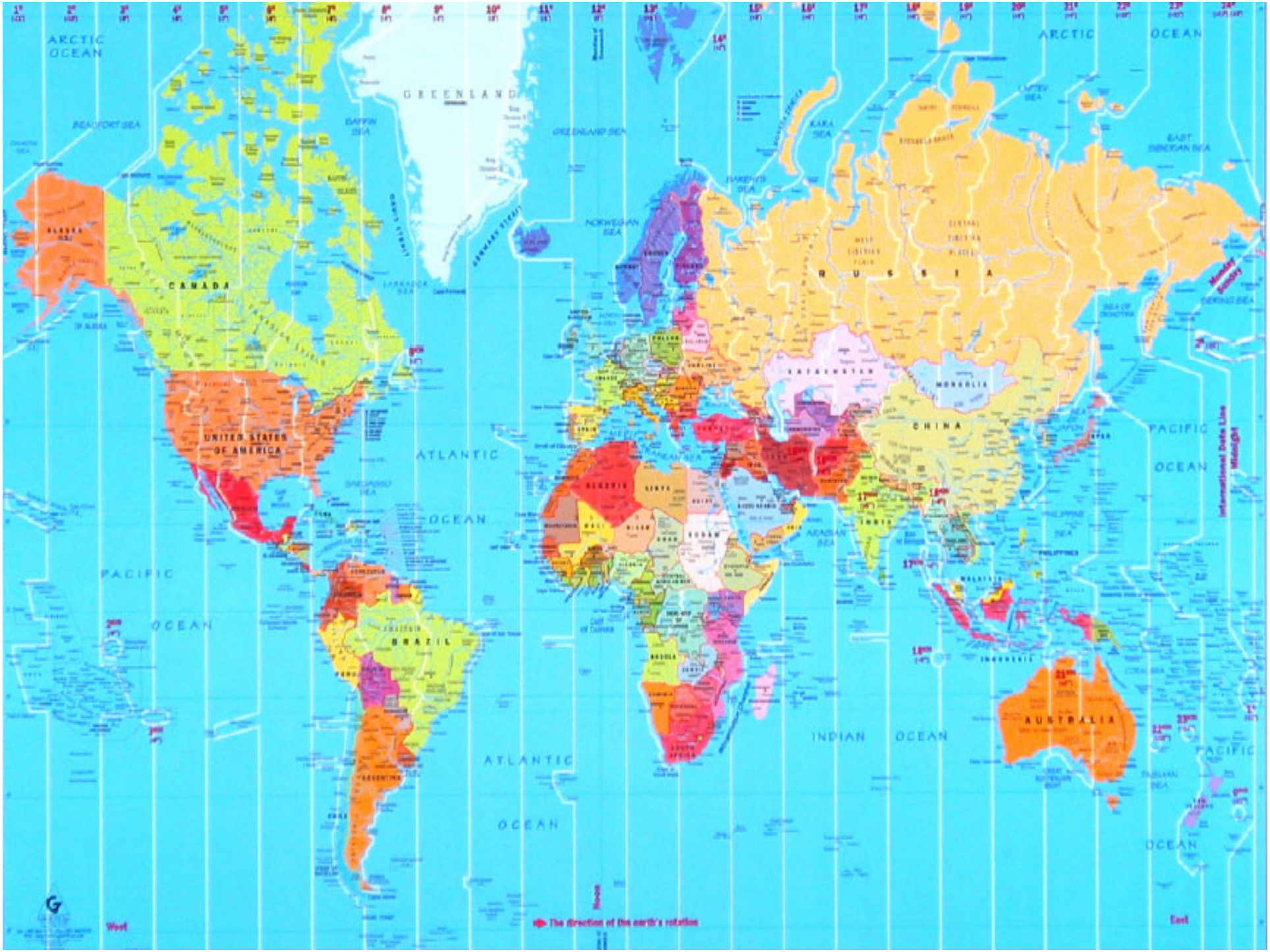
Whiteboard #1

Whiteboard #2

Whiteboard #3

Whiteboard #4

Whiteboard #5


ARCTIC OCEAN
GREENLAND
BEAUFORT SEA
BAFFIN SEA
GREENLAND SEA
NORWEGIAN SEA
BARENTS SEA
KARA SEA
LAPTEV SEA
EAST SIBERIAN SEA
CANADA
RUSSIA
ALASKA
UNITED STATES OF AMERICA
KAZAKHSTAN
MONGOLIA
CHINA
ATLANTIC OCEAN
PACIFIC OCEAN
BRAZIL
INDIA
INDONESIA
AUSTRALIA
INDIAN OCEAN
International Date Line
Midnight
West
East
The direction of the earth's rotation