Development Economics

Slides 3

Debraj Ray

Warwick, Summer 2014

- Development traps and the role of history
- Some introductory examples
- Institutions:
- Sokoloff-Engerman
- Acemoglu-Johnson-Robinson
- Banerjee-Iyer

Introduction: History-Dependence Versus Multiplicity

Different, but related.

Multiple equilibria: same society in two different configurations under the same fundamentals.

 History-dependence: typically unique equilibrium, but paths going to different steady states.

That said:

 Multiple equilibrium models turn into stories of history-dependence when confronted with questions of transition.

(Think about the lagged externalities example studied earlier.)

Development Traps and History

- Increasing returns
- Norms and culture
- Status quo bias
- Legal systems
- Inequality
- Politics
- Behavioral traps

Example: The Growth Model With Increasing Returns

- y = f(k), but f has two techniques built in.
- $f_1(k) = Ak^{\alpha}$ and $f_2(k) = Bk^{\beta} C$. $B \gg A$ and C is a fixed cost.



Occupational-choice or nutrition-productivity traps

Example: Status Quo Bias

- based on Fernández and Rodrik (1991).
- Consider a society of 100 people.
- Proposed project pays off +1 to a beneficiary and -1 to a loser.
- It is known that 70 individuals will be beneficiaries.
- Under symmetry, expected payoff is $\left[\frac{7}{10}(1) + \frac{3}{10}(-1)\right] > 0$.
- So all vote yes.
- But if 45 people are commonly known to benefit, then the remaining 55 vote no! (Why?)

The project (once in) wouldn't be voted out. But if not there, not voted in.

 \Rightarrow History-dependence.

Example: Increasing Returns in a New Business

(a) IRS (b) gradual switching, and (b) imperfect capital markets



Example: Milestone Utility and the Distribution of Wealth

- Utility depends on "goal achievement"; e.g., people overtaken.
- Simple example: utility equals rank in the wealth distribution.
- Then high inequality associated with low rates of growth.
- Model: utility given by

$$A(w-x)^{\alpha} + F\left(\frac{x[1+r]}{1+g}\right),$$

- where everyone grows at rate g and F is the cdf of wealth today.
- Steady state notion
- Both F and g are endogenous.

$$A(w-x)^{\alpha} + F\left(\frac{x[1+r]}{1+g}\right)$$

For steady state, this must be maxed at x(1+r) = (1+g)w, or

$$x = \frac{(1+g)w}{1+r}$$

Writing first-order conditions and substituting,

$$F'(w) = \frac{A\alpha(1+g)}{(r-g)^{1-\alpha}(1+r)^{\alpha}} w^{\alpha-1}.$$

- This solves out for F for various values of g.
- Example of history dependence (initial distribution matters).
- Inequality and growth negatively correlated.

- Three topics to be covered in more detail
- Range from broad politics to the individual
- Institutions
- Occupational choice and imperfect credit markets
- Behavioral poverty traps

Political Economy, Institutions and History Dependence

Institutions:

Ambient rules (formal or informal) for conducting economic, social and political transactions.

- E.g., institutions that protect property rights (law enforcement)
- Or provide old age pensions (social security)
- Or provide insurance against a banking crisis (FDIC)
- Or enable financial holdings in companies (the stock market)
- Or guarantee that contracts will be upheld (courts)
- Or oversee safe and fair elections (Electoral Commissions)
- Or norms of reciprocity and sanctions (informal).

- Good economic institutions promote investment and growth
- But institution creation is deeply conditioned by history

Indeed, bad institutions (such as autocracies) may self-generate or generate worse institutions (dictatorships) as the beneficiaries struggle to keep their benefits.

Sokoloff and Engerman (JEP 2000) argue that this lies at the difference between North and South America:

Initially: "Voltaire, for example, considered the conflict in North America between the French and the British during the Seven Years War (1756-63) to be madness and characterized the two countries as 'fighting over a few acres of snow.' The victorious British were later to engage in a lively public debate over which territory should be taken from the French as reparations — the Caribbean island of Guadeloupe (with a land area of 563 square miles) or Canada."

- South America: Huge mineral riches, lots of native labor
- Extractive economies (mine rights, tribute-taking, etc.).
- Or plantation economies which used slave labor; again, relatively few large landowners.
- Rights assigned in controlled, restricted way.
- E.g. strict restrictions on migration to the New World.
- \Rightarrow unequally situated elite, which tried to hold on to power.
- Restrictions on commerce and political participation; e.g., need to own substantial land in order to vote.

- North America: US and Canada
- No large amounts of native labor

No appropriate climate for sugar except in the South (but even here, size of sugar plantations relatively small)

- Laborers of European descent, equality in human capital
- Relatively small landholdings, open immigration
- Hard to create institutions with unequal political power.

Even though voting restricted at the beginning, franchise was rapidly extended. Sokoloff and Engermann conclude:

"These early differences in the extent of inequality across New World economies may have been preserved by the types of economic institutions that evolved and by the effects of those institutions on how broadly access to economic opportunities was shared. This path of institutional development may in turn have affected growth. Where there was extreme inequality, and institutions advantaged elites and limited the access of much of the population to economic opportunities, members of elites were better able to maintain their elite status over time, but at the cost of society not realizing the full economic potential of disadvantaged groups ... [S]uch biases in the paths of institutional development likely go far in explaining the persistence of inequality over the long run in Latin America and elsewhere in the New World."

Testing for the Long Shadow of Institutions

- Acemoglu, Johnson and Robinson (2000) [AJR]
- Main point: institutions are endogenous to development.
- So how to establish causality?
- Classic endogeneity problem bedevils a lot of regressions.
- Instrument. Exclusion restriction.



Standard regression $y_i = C + \beta R_i + \mathbf{X}'_i \mathbf{b} + \epsilon_i$

• where R is "protection against expropriation".

	Whole world (1)	Base sample (2)	Whole world (3)	Whole world (4)	Base sample (5)	Base sample (6)	Whole world (7)	Base sample (8)
]	Dependent v	variable is lo	og GDP per	capita in 199	95	Depender is log ou worker	nt variable utput per in 1988
Average protection against expropriation risk, 1985–1995	0.54 (0.04)	0.52 (0.06)	0.47 (0.06)	0.43 (0.05)	0.47 (0.06)	0.41 (0.06)	0.45 (0.04)	0.46 (0.06)
Latitude			0.89 (0.49)	0.37 (0.51)	1.60 (0.70)	0.92 (0.63)		
Asia dummy				-0.62 (0.19)		-0.60 (0.23)		
Africa dummy				-1.00 (0.15)		-0.90 (0.17)		
"Other" continent dummy				-0.25 (0.20)		-0.04 (0.32)		
R^2	0.62	0.54	0.63	0.73	0.56	0.69	0.55	0.49
Number of observations	110	64	110	110	64	64	108	61

TABLE 2-OLS REGRESSIONS

Notes: Dependent variable: columns (1)–(6), log GDP per capita (PPP basis) in 1995, current prices (from the World Bank's World Development Indicators 1999); columns (7)–(8), log output per worker in 1988 from Hall and Jones (1999). Average protection against expropriation risk is measured on a scale from 0 to 10, where a higher score means more protection against expropriation, averaged over 1985 to 1995, from Political Risk Services. Standard errors are in parentheses. In regressions with continent dummies, the dummy for America is omitted. See Appendix Table A1 for more detailed variable definitions and sources. Of the countries in our base sample, Hall and Jones do not report output per worker in the Bahamas, Ethiopia, and Vietnam.



- Three severe problems of endogeneity:
- Richer countries can afford better institutions
- Omitted variables
- Bias in dataset: perceiving better institutions in richer countries

 Instrument: mortality rates of soldiers, bishops, and sailors stationed in the colonies (Curtin 1989)

- Malaria and yellow fever accounted for 80% of deaths.
- Gastrointestinal another 15%.



FIGURE 3. FIRST-STAGE RELATIONSHIP BETWEEN SETTLER MORTALITY AND EXPROPRIATION RISK (Protection Against)

Basic IV: Regressions of log GDP per capita

	Base sample (1)	Base sample (2)	Basc sample without Neo-Europes (3)	Basc sample without Neo-Europes (4)	Base samplc without Africa (5)	Base samplc without Africa (6)	Base sample with continent dummies (7)	Base sample with continent dummies (8)	Base sample, dependent variable is log output per worker (9)
			Panel A: Two-S	Stage Least Squ	ares				
Average protection against expropriation risk 1985–1995 Latitude	0.94 (0.16)	1.00 (0.22) -0.65 (1.34)	1.28 (0.36)	1.21 (0.35) 0.94 (1.46)	0.58 (0.10)	0.58 (0.12) 0.04 (0.84)	0.98 (0.30)	1.10 (0.46) -1.20 (1.8)	0.98 (0.17)
Asia dummy							-0.92	-1.10	
Africa dummy							-0.46	-0.44	
"Other" continent dummy							(0.36) -0.94 (0.85)	(0.42) -0.99 (1.0)	
Panel	B: First S	tage for A	Average Protecti	on Against Exp	ropriation	Risk in 19	985–1995		
Log European settler mortality	-0.61 (0.13)	-0.51 (0.14)	-0.39 (0.13)	-0.39 (0.14)	-1.20 (0.22)	-1.10 (0.24)	-0.43 (0.17)	-0.34 (0.18)	-0.63 (0.13)
Latitude		2.00		-0.11		0.99		2.00	
Asia dummy		(1.54)		(1.50)		(1.43)	0.33 (0.49)	(1.40) 0.47 (0.50)	
Africa dummy							-0.27	-0.26	
"Other" continent dummy							1.24	(0.41)	
R ²	0.27	0.30	0.13	0.13	0.47	0.47	(0.84) 0.30	(0.84) 0.33	0.28
			Panel C: Ordin	nary Least Squa	res				
Average protection against expropriation risk 1985–1995 Number of observations	0.52 (0.06) 64	0.47 (0.06) 64	0.49 (0.08) 60	0.47 (0.07) 60	0.48 (0.07) 37	0.47 (0.07) 37	0.42 (0.06) 64	0.40 (0.06) 64	0.46 (0.06) 61

What sort of magnitude are we talking about?

 Compare two "typical countries with high and low expropriation risk, Nigeria and Chile.

The 2SLS estimate, 0.94, translates the 2.24 difference in expropriation risk into 206 log points, a 7-times. So large, but not implausible.

Is the instrument believable?

Exclusion restriction will fail if the instrument has a separate effect on GDP per capita today through another channel.

- One obvious culprit is the disease environment.
- Malaria comes particularly to mind.

IV: Geography and health variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
		Instr	umenting ion agains	only for a st expropri	average ation risk		Instru right-ha	imenting f and-side v	for all ariables	Yellow instrum aver protection expropria	fever ent for age n against ation risk
			Panel A:	Two-Stag	e Least Squ	uares					
Average protection against expropriation risk, 1985–1995 Latitude	0.69 (0.25)	0.72 (0.30) -0.57 (1.04)	0.63 (0.28)	0.68 (0.34) -0.53 (0.07)	0.55 (0.24)	0.56 (0.31) -0.1 (0.05)	0.69 (0.26)	0.74 (0.24)	0.68 (0.23)	0.91 (0.24)	0.90 (0.32)
Malaria in 1994	-0.57	-0.60 (0.47)		(0.97)		(0.95)	-0.62				
Life expectancy	(0117)	(0117)	0.03	0.03			(0.00)	0.02			
Infant mortality			(0.02)	(0.02)	-0.01 (0.005)	-0.01 (0.006)		(0.02)	-0.01 (0.01)		
Panel 1	B: First S	tage for A	verage P	rotection A	Against Ex	propriation	Risk in 1	1985–1995	5		
Log European settler mortality	-0.42	-0.38	-0.34	-0.30	-0.36	-0.29	-0.41	-0.40	-0.40		
Latitude	(0.19)	(0.19) 1.70 (1.40)	(0.17)	(0.18) 1.10 (1.40)	(0.18)	(0.19) 1.60 (1.40)	(0.17) -0.81 (1.80)	(0.17) -0.84 (1.80)	(0.17) -0.84 (1.80)		
Malaria in 1994	-0.79	-0.65		(1.40)		(1.40)	(1.80)	(1.80)	(1.80)		
Life expectancy	(0.51)	(0.00)	0.05	0.04							
Infant mortality			(0.02)	(0.02)	-0.01	-0.01					
Mean temperature					(0.01)	(0.01)	-0.12 (0.05)	-0.12 (0.05)	-0.12 (0.05)		
Distance from coast							0.57 (0.51)	0.55 (0.52)	0.55 (0.52)		
Yellow fever dummy										-1.10 (0.41)	-0.81
R ²	0.3	0.31	0.34	0.35	0.32	0.34	0.37	0.36	0.36	0.10	0.32
			Panel C:	Ordinary	Least Squ	ares					
Average protection against expropriation risk, 1985–1995 Number of observations	0.35 (0.06) 62	0.35 (0.06) 62	0.28 (0.05) 60	0.28 (0.05) 60	0.29 (0.05) 60	0.28 (0.05) 60	0.35 (0.06) 60	0.29 (0.05) 59	0.29 (0.05) 59	0.48 (0.06) 64	0.39 (0.06) 64

IV: Controls for legal origins

	Base	Base	British	British	Base	Base	Base	Base	Base
	sample (1)	sample (2)	only (3)	only (4)	sample (5)	sample (6)	sample (7)	sample (8)	sample (9)
		Panel A:	Two-Stage	E Least Squ	ares				
Average protection against	1.10	1.16	1.07	1.00	1.10	1.20	0.92	1.00	1.10
expropriation risk, 1985–1995	(0.22)	(0.34)	(0.24)	(0.22)	(0.19)	(0.29)	(0.15)	(0.25)	(0.29)
Lanuc		(1.70)				(1.56)		(1.50)	(1.6)
British colonial dummy	-0.78	-0.80							
Erench colonial dymmy	(0.35)	(0.39)							0.02
French colonial dummy	-0.12 (0.35)	-0.06							(0.69)
French legal origin dummy	(0.55)	(0.42)			0.89	0.96			0.51
					(0.32)	(0.39)			(0.69)
<i>p</i> -value for religion variables							[0.001]	[0.004]	[0.42]
Panel B: First S	Stage for A	Average P	rotection A	gainst Exp	propriation	Risk in 1	1985–1995	5	
Log European settler mortality	-0.53	-0.43	-0.59	-0.51	-0.54	-0.44	-0.58	-0.44	-0.48
	(0.14)	(0.16)	(0.19)	(0.14)	(0.13)	(0.14)	(0.13)	(0.15)	(0.18)
Latitude		1.97				2.10		2.50	2.30
British colonial dummy	0.63	(1.40)				(1.30)		(1.50)	(1.00)
Diffici colonia aunity	(0.37)	(0.37)							
French colonial dummy	0.05	-0.12							-0.25
Deepek laast seisis	(0.43)	(0.44)			0.77	0.7			(0.89)
French legal origin					-0.67	-0.7			-0.05
R^2	0.31	0.33	0.30	0.30	0.32	0.35	0.32	0.35	0.45
		Danel C	Ordinary	Least Squa	rac				
Average protection against	0.53	0.47	0.61	0.47	0.56	0.56	0.53	0.47	0.47
expropriation risk, 1985–1995	(0.19)	(0.07)	(0.09)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Number of observations	64	64	25	25	64	64	64	64	64

Testing for the Long Shadow of Colonization

Banerjee and Iyer, AER (2005) [BI]

 Different in that it studies one historical institution (land revenue collection) in a specific country (India).

British set up rent collection systems starting in the late 18th century and continuing through the 19th century.

Claim: districts with landlord-based rent collection systems underperform in the present:

Criteria: agricultural yields, agricultural investments, public investment in education, health and educational outcomes.

E.g.: wheat yields 23% higher and infant mortality 40% lower in "non-LL" districts.

Channels

- Two possibilities:
- LL-collection created inequalities that persist to the present day.
- LL-districts created social antagonism that has limited collective action to redistribution and not to lobbying for fresh investment.
- BI go for the latter channel, for two reasons:
- Land reforms have created convergence in land inequalities, and
- The gap between LL and non-LL districts widened in 1965–80, precisely when there was extensive public investment in rural areas.
- It seems that LL districts failed to claim their "fair share" of public investment.

Revenue collection:

The British started in Bengal and Bihar (1765), and then radiated out from there.

Conquests: Orissa (1803), Assam (1824–26), Madras Presidency (1765, 1792–1801), Gujarat (1803), Bombay Presidency (1817-18), Central Provinces (up to 1860), Oudh (1856).

Different revenue systems installed.

Land taxes 60% of British government revenue in 1841.

Fell thereafter.

 Mainly fixed rent systems of different kinds (rent adjusted periodically). Zamindari: Landlords pay fixed rent to British, collect freely from peasants.

Bengal, Bihar, Orissa, Central Provinces (MP), some parts of Madras Presidency (now Tamil Nadu + Andhra Pradesh).

Some of these subject to Permanent Revenue Settlement Act of 1793.

- **Ryotwari**: Individual cultivators pay directly.
- Most areas of Madras or Bombay Presidency.
- Mahalwari: Village-based revenue collection.
- North-West Provinces, Punjab.

			Classification of revenue systems					
	Mean	Landlord	Individual	Villa	ge bodies			
State	proportion	based	based	Landlord	Non-landlord	Total districts		
Andhra Pradesh	0.66	2	8	0	0	10		
Bihar	0.00	12	0	0	0	12		
Gujarat	1.00	0	7	0	0	7		
Haryana	0.85	0	0	0	5	5		
Karnataka	1.00	0	15	0	0	15		
Madhya Pradesh	0.10	14	1	0	0	15		
Maharashtra	0.78	4	14	0	0	18		
Orissa	0.32	6	2	0	0	8		
Punjab	0.87	0	0	0	6	6		
Rajasthan	0.00	1	0	0	0	1		
Tamil Nadu	0.75	2	9	0	0	11		
Uttar Pradesh	0.42	0	0	12	35	47		
West Bengal	0.00	11	0	0	0	11		
Total	0.51	52	56	12	46	166		

TABLE 1-STATE-WISE DISTRIBUTION OF LANDLORD AND NON-LANDLORD DISTRICTS

Notes: This table lists only districts that used to be part of British India. Areas where the British did not set up the land revenue system are excluded. Districts of British India currently in Pakistan, Bangladesh, or Burma are excluded. The table also excludes the states of Assam and Kerala, for which agricultural data are not available in the World Bank dataset. The table lists 1960 districts, some of which were split into two or more districts over time. We use unsplit districts in all our analyses.



			Standard		Standard error
		Mean	deviation	Difference ^a	of difference
Geography					
Latitude		22.19	5.60	-4.35***	(0.961)
Altitude		366.41	148.14	93.64***	(25.98)
Mean annual rainfall (mm)		1263.09	471.64	373.99***	(80.83)
Coastal dummy		0.1497	0.3579	0.084	(0.065)
Top 2 soil types	Black soil	0.2096	0.4082	0.244***	(0.072)
	Alluvial soil	0.1677	0.3747	-0.135 **	(0.067)
	Red soil	0.5689	0.4967	0.075	(0.090)
Top-soil depth	<25 cm	0.0181	0.1336	0.016	(0.024)
	25–50 cm	0.1145	0.3193	-0.076	(0.058)
	50–100 cm	0.2289	0.4214	0.193	(0.075)
	100–300 cm	0.0904	0.2876	0.135***	(0.051)
	>300 cm	0.5482	0.4991	-0.268***	(0.088)
Area share of various crops: 19	56–1987				
Area share of rice		0.366	0.298	-0.194^{***}	(0.054)
Area share of wheat		0.149	0.157	-0.058**	(0.026)
Area share of other cereals		0.205	0.172	0.128***	(0.031)
Area share of oilseeds		0.067	0.088	0.065***	(0.013)
Area share of cotton		0.041	0.096	0.066***	(0.018)
Area share of tobacco		0.003	0.015	0.005**	(0.002)
Area share of sugarcane		0.031	0.053	0.005	(0.008)
Cash crops-to-cereals ratio		0.149	0.257	0.152***	(0.048)
Demographics: 1961, 1971, 198	1, 1991				
Log (Population)		14.26	0.634	-0.088	(0.109)
Population density		36.44	85.92	-11.22**	(4.02)
Proportion of scheduled castes		0.1598	0.0733	-0.034 * *	(0.014)
Proportion of scheduled tribes		0.0980	0.1630	-0.010	(0.031)
Proportion rural		0.8102	0.1237	-0.066***	(0.023)
Proportion of working		0.7119	0.1352	-0.050*	(0.027)
population in farming					

TABLE 2-DIFFERENCES IN GEOGRAPHY AND DEMOGRAPHICS

Notes: LL better soil (typo rainfall sign negative), more rice and wheat, less cash crops, higher population density.

The Identification Problem

- What determined the rental system? BI emphasize:
- Individual influence: Munro (Madras), Elphinstone (Bombay).
- Political events: Like NW, Oudh was slated to be village-based, but 1857 Mutiny breaks out, British resort to landlord system.
- Date of conquest: More ryotwari later. Direct dealings with cultivators easier once administrative systems had expanded
- Worrisome (but a good paper has to go out on a limb):
- Existing presence of landlord class could have informed choices.
- High-inequality landlord-based areas conquered initially, recalcitrant non-LL areas later.
- Why did Oudh go LL, no reversal elsewhere in NWP?

Specification:

• $y_{it} = A + \alpha_t + \beta NL_i + \gamma X_{it} + \epsilon_{it}$, where:

• i = district, but errors ϵ_{it} clustered at the regional level.

• y_{it} : % irrigated area, fertilizer/hectare, % under HYV, crop yields, schools and health centers,

• α_t is year effect, no state-level fixed effect (in base spec) because within-state variation in NL is low.

 NL is measure of non-landlord system, both continuous and binary versions.

• X_{it} : controls (latitude, altitude, soil, rainfall, time under British rule).

Endogeneity concerns: (a) neighboring districts, (b) IV: conquest between 1820–1856.

OLS with non-LL proportions by district, and non-LL dummies

		Coefficient	t on non-landlord	Coefficient on non-landlord dummy	
Dependent variable	Mean of dependent variable	OLS Full sample (1)	OLS Excluding Bengal and Bihar (2)	OLS Full sample (3)	OLS Excluding village-based districts (4)
Agricultural investments					
Proportion of gross cropped area irrigated	0.276	0.065* (0.034)	0.066* (0.035)	0.077*** (0.027)	0.005 (0.032)
Fertilizer use (kg/ha)	24.64	10.708*** (3.345)	10.992*** (3.406)	9.988*** (2.301)	10.695*** (3.040)
Proportion of rice area under HYV	0.298	0.079*	0.094**	0.016	0.074*
Proportion of wheat area under HYV	0.518	0.092**	0.119***	(0.031)	0.107**
Proportion of other cereals area under HYV	0.196	0.057*	0.084*** (0.024)	-0.035 (0.025)	0.109***
Agricultural productivity		(01001)	(0.02.)	(0.020)	(01011)
log (yield of 15 major crops)		0.157** (0.071)	0.152** (0.074)	0.173*** (0.053)	0.089 (0.085)
log (rice yield)		0.171** (0.081)	0.195** (0.081)	0.099 (0.062)	0.173**
log (wheat yield)		0.229*** (0.067)	0.228*** (0.070)	0.188*** (0.054)	0.143 (0.098)
No. of districts		166	143	166	109
Year fixed effects		YES	YES	YES	YES
Geographic controls		YES	YES	YES	YES
Date of British land revenue control		YES	YES	YES	YES

TABLE 3—DIFFERENCES IN AGRICULTURAL INVESTMENTS AND YIELDS (Mean non-landlord proportion = 0.5051 (s.d. = 0.4274))

Notes: Standard errors in parentheses, corrected for district-level clustering. * Significant at 10-percent level; ** significant at 5-percent level; *** significant at 1-percent level. Each cell represents the coefficient from a regression of the dependent variable on the measure of non-landlord control. Data are from 1956 to 1987. Data for area under high-yielding varieties (HYV) is after 1965. Geographic controls are altitude, latitude, mean annual rainfall, and dummies for soil type and coastal regions. The non-landlord dummy is assigned as follows: the dummy equals one for all individual-based districts and all village-based districts except those in Oudh. For landlord-based districts and the village-based districts of Oudh, the dummy is zero.

Robustness with neighboring districts, and IV

	Coefficient on non-lar	ndlord proportion
Dependent variable	OLS Neighbors only (1)	IV Full sample (2)
Agricultural investments		
Proportion of gross cropped area irrigated	0.101**	0.216
	(0.041)	(0.137)
Fertilizer use (kg/ha)	10.589**	26.198**
	(4.979)	(13.244)
Proportion of rice area under HYV	-0.015	0.411**
1	(0.083)	(0.163)
Proportion of wheat area under HYV	0.078**	0.584***
1	(0.034)	(0.163)
Proportion of other cereals area under HYV	-0.025	0.526***
r	(0.024)	(0.129)
Agricultural productivity		
log (vield of 15 major crops)	0.145**	0.409
	(0.061)	(0.261)
log (rice yield)	0.126	0.554*
	(0.098)	(0.285)
log (wheat yield)	0.253***	0.706***
	(0.084)	(0.214)
No. of districts	35	166
Year fixed effects	YES	YES
Geographic controls	YES	YES
Date of British land revenue control	YES	YES

Coefficient on	(1)	(2)	(3)
Instrument (=1 if date of British revenue control is between 1820 and 1856)	0.331***	0.430***	0.419***
	(0.086)	(0.092)	(0.087)
R-squared	0.40	0.43	0.63
No. of observations	166	166	166
Geographic controls	YES	YES	YES
Date of British land revenue control	YES	YES	YES
Date of British land revenue control squared	NO	YES	NO
State fixed effects	NO	NO	YES

Results: main channel appears to be agricultural investment.

 Controlling for irrigation, adoption of HYV and fertilizer use, NL has no further impact on yields.

		Dependent variabl	es
	Log total yield OLS (1)	Log rice yield OLS (2)	Log wheat yield OLS (3)
Proportion non-landlord	0.035 (0.053)	0.070 (0.063)	0.109 (0.063)
Proportion of gross cropped area irrigated	0.693** (0.112)	0.439** (0.096)	0.435** (0.117)
Fertilizer use (kg/ha)	0.007**	0.004**	0.001
Percent area under HYV	4.274**	0.580**	0.618**
Adjusted R-squared	0.60	0.52	0.56
No. of districts	166	166	166
Year fixed effects	YES	YES	YES
Geographic controls	YES	YES	YES
Date of British land revenue control	YES	YES	YES

TABLE 5—ARE YIELDS EXPLAINED BY INVESTMENTS?

Main investments appear after 1965, and in non-LL districts.



Main investments appear after 1965, and in non-LL districts.

Panel A: Full sample			
	Coefficient or prope	n non-landlord	
Dependent variable	1956–1965 (1)	After 1965 (2)	Difference (3)
Agricultural investments			
Proportion of gross cropped area irrigated	0.046 (0.033)	0.079** (0.036)	0.033**
Fertilizer use (kg/ha)	1.026**	15.581***	14.55***
Agricultural productivity	(01.20)	(11.00)	()
log (yield of 15 major crops)	0.066 (0.065)	0.201*** (0.076)	0.135*** (0.033)
log (rice yield)	0.108 (0.069)	0.196**	0.088**
log (wheat yield)	0.146**	0.268***	0.122*
No. of districts	166	166	166
Year fixed effects	YES	YES	YES
Geographic controls	YES	YES	YES
Date of British land revenue control	YES	YES	YES

TABLE 6—WHEN DO THE DIFFERENCES APPEAR?

A lot of these investments made under Intensive Rural Development Programs

HYV in rice and wheat

public infrastructure (including fertilizer delivery)

BI argue that former LL districts were worse at collective action to get public investment:

"[O]ne way to characterize the difference in the nature of public action is to say that landlord-dominated states were busy carrying out land reform exactly when the non-landlord states started focusing on development."

Next table argues that once we control for state development expenditure per capita, the non-LL diffs become insignificant or come down in magnitude.

		Coefficie	ent on non-landlord pro	portion
Dependent variables	Mean of dependent variable	OLS Base specification (1)	OLS Control for state dev exp per capita (2)	OLS State FE (3)
Panel A: Agricultural investments				
Proportion of gross cropped area irrigated	0.276	0.065*	0.074**	0.028
rioportion of gross eropped alou migated	0.270	(0.034)	(0.035)	(0.036)
Fertilizer use (kg/ha)	24.64	10.708***	10.805***	4.297
	2.1.01	(3.345)	(3.717)	(3.308)
Proportion of rice area under HYV	0.298	0.079*	0.007	0.000
		(0.044)	(0.040)	(0.042)
Proportion of wheat area under HYV	0.518	0.092**	0.061	0.028
		(0.046)	(0.047)	(0.039)
Proportion of other cereals area under HYV	0.196	0.057*	0.025	0.043*
r		(0.031)	(0.030)	(0.026)
Panel B: Agricultural productivity				
log (yield of 15 major crops)		0.157**	0.174**	0.059
		(0.071)	(0.076)	(0.072)
log (rice yield)		0.171**	0.083	0.016
		(0.081)	(0.082)	(0.078)
log (wheat yield)		0.229***	0.243***	0.150***
		(0.067)	(0.072)	(0.045)
Panel C: Education and health investments, 1981 Proportion of villages having:				
Primary school	0.745	0.154***	0.062*	0.102***
		(0.036)	(0.037)	(0.039)
Middle school	0.204	0.125***	0.093***	0.064***
		(0.023)	(0.021)	(0.018)
High school	0.082	0.052***	0.019	0.030**
C		(0.018)	(0.014)	(0.013)
Primary health center	0.023	0.011***	0.002	0.012***
-		(0.004)	(0.004)	(0.004)
Primary health subcenter	0.031	0.033***	0.011	0.006
		(0.011)	(0.009)	(0.006)
Panel D: Education and health outcomes				
Literacy rate (1961, 1971, 1981, 1991)	0.2945	0.0524**	0.0290*	0.0241
		(0.0190)	(0.0171)	(0.0176)
Infant mortality rate (1991)	82.17	-32.71***	-25.43***	-15.81***
		(5.38)	(5.28)	(5.40)
State fixed effects		NO	NO	YES
Year fixed effects		YES	YES	YES
Geographic controls		YES	YES	YES
Date of British land revenue control		YES	YES	YES

Summary

- Initial history conditions subsequent development.
- That happens when history affects behavior in persistent ways.
- Diminishing returns is one leading example in which this does not happen.
- But it is about the only example.
- Not only does increasing returns resurrect history . . .
- So do institutions, colonial history, the status quo, and the social determinants of preferences.
- History-dependence is the rule rather than the exception.
- Understanding this in specific contexts is key to understanding underdevelopment.