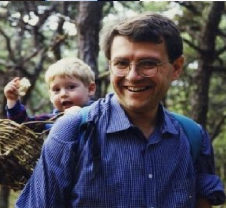


# Institutions, Human Capital and Time Preferences Acemoglu et al. (2014)

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- Why are some countries richer than others?
- Natural experiment during Colonization
- Instrument: Settler Mortality
- Settler Mortality  $\Rightarrow$  Settling decision  $\Rightarrow$ 
  - ① Acemoglu et al. 2001: Institutions!
  - ② Glaeser et al. 2004: Human capital!



## Which framework is closer to the truth?

$$\text{institutions} \Rightarrow \left. \begin{array}{c} \text{TFP} \\ \text{human capital} \\ \text{physical capital} \end{array} \right\} \Rightarrow \text{economic development}$$

(a) Acemoglu et al. (2001)

$$\left. \begin{array}{c} \text{human capital} \\ \text{physical capital} \end{array} \right\} \Rightarrow \text{TFP} \Rightarrow \text{economic development} \Rightarrow \text{institutions}$$

(b) Glaeser et al. (2004)

	Observations	Mean	SD
Cross-country sample			
Log GDP per capita	62	8.291	1.213
Years of schooling	62	6.179	2.878
Rule of law	62	−0.33	0.90
Primary school enrollment in 1900	62	16.66	23.05
Protestant missionaries in the early twentieth century	62	0.458	0.547
Log capped potential settler mortality	62	4.445	0.961
Log population density in 1500	62	0.545	1.727
Dummy for different source of Protestant missions	62	0.081	0.275
Latitude	62	0.181	0.134
British colony	62	0.387	0.491
French colony	62	0.242	0.432
Africa	62	0.419	0.497
Asia	62	0.145	0.355
America	62	0.387	0.491

Cross-region sample			
Log GDP per capita	684	8.359	1.213
Years of schooling	684	5.683	3.053
Temperature	684	21.436	5.794
Inverse distance to coast	684	0.858	0.137
Landlocked region	684	0.519	0.500
Presence of Protestant missionaries in early twentieth century	684	0.526	0.500
Capital city	684	0.0746	0.263
Log population density before colonization	642	0.867	2.386

- Focus on the effect of human capital on GDP
- Protestant missionaries
  - (Woodberry 2011)
  - Increase literacy s.t. people could read bible
- Primary school enrollment in 1900
  - Idea: Partly driven by historical accidents like taste of leaders
  - Control for systematic differences

$$\hat{S}_i = \alpha_0 + \sum_{v1} \alpha_{v1} \cdot Z_{v1,i} + \sum_{v2} \theta_{v2} \cdot X_{v2,i} + \sum_{v3} \gamma_{v3} \cdot X_{v3,i} + \epsilon_i \quad (1)$$

$$\log(GDP.2005)_i = \beta_0 + \beta_1 \cdot \hat{S}_i + \sum_{v2} \theta_{v2} \cdot X_{v2,i} + \sum_{v3} \gamma_{v3} \cdot X_{v3,i} + \eta_i \quad (2)$$

- $\hat{S}_i$  = Instrumented Years of schooling
- Instruments for S (v1): Number missionaries; Primary school enrollment in 1900
- Institution-Controls (v2): Settler Mortality; Population density in 1500
- Other Controls (v3): Latitude, Colonial Origin, Continents, Source for Missionary-data



- $D \in [0, S_{max}]$ : possible treatments, years of schooling
- $[0, Y_{max}]$ : corresponding GDP's
- Essential heterogeneity if years of schooling for country depends on effect of schooling on GDP
  - True if missionaries went to regions where they had larger impact on GDP
- Not discussed
- If true cant learn mean effect of treatment but LATE

- 2 Assumptions must hold for both instruments

① Exclusion Restriction;  $cov(Z, \epsilon) = 0$

- Missionaries
  - No (first order) effect of missionaries on GDP other than through education
  - Medical care, Kinship-tightness  $\Rightarrow$  Upward bias
  - No OVB - Controls
  - No self-selection - next slide
- Primary school enrollment in 1900
  - Idiosyncratic factors
  - Systematic factors: persistent  $\Rightarrow$  Upward bias

② Relevance Condition

- $cov(Z, S) \neq 0$

# Self-Selection?

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Dependent variable: primary school enrollment in 1870				Dependent variable: primary school enrollment in 1940				Dependent variable: years of schooling in 2005			
Protestant missionaries in the early twentieth century	1.694 (4.124)	5.370 (4.180)	1.833 (2.608)	2.589 (3.446)	10.649 (11.917)	13.624 (12.735)	8.076 (6.830)	11.050 (5.949)	2.172 (1.298)	2.924 (1.312)	2.329 (0.754)	2.483 (0.791)
Latitude		31.174 (22.810)	26.926 (14.399)	38.032 (16.044)		25.226 (39.748)	18.368 (28.301)	36.689 (26.537)		6.371 (4.054)	5.589 (3.051)	5.576 (3.412)
Africa			0.649 (1.159)	-2.105 (2.188)			-5.781 (3.710)	-10.862 (3.587)			-2.262 (0.559)	-2.307 (0.831)
America			13.623 (2.860)	7.524 (3.894)			17.991 (4.279)	13.184 (5.327)			1.112 (0.631)	1.589 (1.115)
French colony				-6.481 (3.568)				-4.122 (5.079)				0.596 (0.848)
British colony				-1.602 (3.077)				13.413 (12.801)				1.440 (0.937)
Observations	24	24	24	24	24	24	24	24	24	24	24	24
R <sup>2</sup>	0.004	0.107	0.562	0.611	0.056	0.078	0.568	0.629	0.063	0.089	0.776	0.795

# Effect on GDP - First Stage

## First-stage regressions

	Dependent variable: years of schooling							
Estimation method	2SLS							
Primary school enrollment in 1900	0.088 (0.016)	0.088 (0.016)	0.051 (0.017)	0.051 (0.018)	0.069 (0.016)	0.072 (0.017)	0.046 (0.018)	0.047 (0.021)
Protestant missionaries in the early twentieth century	0.938 (0.423)	0.958 (0.425)	1.173 (0.318)	1.168 (0.362)	0.657 (0.444)	0.577 (0.462)	0.935 (0.406)	0.938 (0.431)
Log capped potential settler mortality					-1.042 (0.359)	-1.104 (0.403)	-0.602 (0.461)	-0.629 (0.502)
Log population density in 1500					-0.131 (0.139)	-0.120 (0.145)	-0.067 (0.148)	-0.061 (0.180)
R <sup>2</sup>	0.599	0.599	0.718	0.718	0.677	0.68	0.734	0.734

## Effect on GDP - Second Stage

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Second-stage regressions								
	Dependent variable: log GDP per capita in 2005							
Estimation method	2SLS							
Years of schooling	0.314 (0.054)	0.305 (0.054)	0.274 (0.101)	0.317 (0.116)	0.177 (0.106)	0.171 (0.106)	0.131 (0.128)	0.178 (0.134)
AR confidence intervals	[0.17, 0.44]	[0.16, 0.44]	[−0.00, 0.48]	[−0.01, 0.56]	[−0.15, 0.41]	[−0.16, 0.40]	[−0.34, 0.43]	[−∞, 0.55]
Log capped potential settler mortality					−0.475 (0.181)	−0.450 (0.189)	−0.427 (0.209)	−0.449 (0.199)
Log population density in 1500					−0.114 (0.062)	−0.121 (0.062)	−0.107 (0.060)	−0.085 (0.065)
Kleibergen & Paap (2006) test ( <i>p</i> value)	0.00	0.00	0.00	0.00	0.03	0.03	0.02	0.01

# Effect on Institutions - Second Stage

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent variable: rule of law							
Estimation method	2SLS							
Years of schooling	0.081 (0.034)	0.073 (0.034)	0.173 (0.062)	0.163 (0.077)	-0.021 (0.072)	-0.028 (0.072)	0.086 (0.062)	0.039 (0.087)
AR confidence intervals	[-0.01, 0.16]	[-0.02, 0.15]	[-0.05, 0.32]	[-0.02, 0.34]	[-0.27, 0.13]	[-0.28, 0.12]	[-0.09, 0.25]	$[-\infty, 0.23]$
Log capped potential settler mortality					-0.425 (0.163)	-0.406 (0.179)	-0.180 (0.093)	-0.197 (0.103)
Log population density in 1500					-0.065 (0.061)	-0.072 (0.061)	-0.105 (0.049)	-0.124 (0.052)
Kleibergen & Paap (2006) test ( <i>p</i> value)	0.0	0.0	0.0	0.0	0.030	0.030	0.020	0.010
Overidentification test ( <i>p</i> value)	0.810	0.570	0.930	0.930	0.840	0.630	0.810	0.80

# Instrumenting Institutions - Second Stage

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Second-stage regressions								
	Dependent variable: log GDP per capita in 2005							
Estimation method	2SLS							
Rule of law	1.413 (0.177)	1.634 (0.274)	1.346 (0.194)	1.361 (0.212)	1.705 (0.378)	1.791 (0.450)	1.519 (0.298)	1.424 (0.275)
AR confidence intervals	[1.15, 1.92]	[1.21, 2.66]	[0.86, 1.86]	[0.88, 1.84]	[1.06, ∞]	[1.06, ∞]	[0.75, ∞]	[0.67, ∞]
Primary school enrollment in 1900					0.018 (0.009)	0.020 (0.009)	-0.009 (0.010)	-0.005 (0.010)
Protestant missionaries in the early twentieth century					0.059 (0.212)	-0.001 (0.222)	0.184 (0.170)	0.261 (0.180)
Kleibergen & Paap (2006) test ( <i>p</i> value)	0.0	0.030	0.020	0.020	0.030	0.120	0.060	0.060
Overidentification test ( <i>p</i> value)	0.230	0.390	0.250	0.140	0.690	0.810	0.340	0.170

## Effect on GDP - First Stage

First-stage regressions					
	Dependent variable: years of schooling				
Protestant missionaries in early twentieth century	0.484 (0.087)	0.334 (0.077)	0.317 (0.074)	0.314 (0.073)	0.280 (0.075)
Capital city		1.675 (0.145)	1.570 (0.144)	1.563 (0.144)	1.613 (0.149)
Inverse distance to coast			-20.352 (3.779)	-21.649 (4.245)	-20.617 (4.272)
Squared inverse distance to coast			14.424 (2.428)	15.231 (2.694)	14.520 (2.715)
State without a sea coastline dummy			0.120 (0.105)	0.122 (0.112)	0.119 (0.120)
Average yearly temperature (Celsius)				0.046 (0.042)	0.046 (0.042)
Squared average yearly temperature (Celsius)				-0.001 (0.001)	-0.001 (0.001)



## Effect on GDP - Second Stage

	(1)	(2)	(3)	(4)	(5)
IV regressions, cross region					
	Dependent variable: log GDP per capita				
Years of schooling	0.203 (0.063)	0.132 (0.093)	0.119 (0.099)	0.123 (0.100)	0.143 (0.110)
Capital city		0.383 (0.168)	0.382 (0.168)	0.379 (0.169)	0.350 (0.189)
Inverse distance to coast			-3.604 (2.389)	-2.779 (2.616)	-2.689 (2.695)
Squared inverse distance to coast			2.503 (1.648)	1.980 (1.785)	1.950 (1.841)
State without a sea coastline dummy			-0.047 (0.035)	-0.051 (0.038)	-0.037 (0.037)
Average yearly temperature (Celsius)				-0.025 (0.018)	-0.018 (0.018)
Squared average yearly temperature (Celsius)				0.001 (0.000)	0.000 (0.000)
Log population density in 1500					-0.030 (0.010)
Kleibergen & Paap (2006) test	0.0000	0.0000	0.0000	0.0000	0.0003

- Without instruments for institutions: estimates of human capital significant
- With them
  - Significance vanishes
  - Coefficients closer to micro-estimates (0.06 - 0.1)
- Does NOT imply human capital is unimportant
- Institutions win the horse race, but ...

- Bad controls! Settler mortality is instrument for human capital
- False falsification exercise
- Large standard errors



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## Cross-Country First-Stage LIML

	(9)	(10)	(11)	(12)
Second-stage regressions				
	Dependent variable: log GDP per capita in 2005			
Estimation method	LIML			
Years of schooling	0.177 (0.106)	0.171 (0.106)	0.122 (0.135)	0.170 (0.144)
AR confidence intervals	[−0.16, 0.41]	[−0.16, 0.40]	[−0.35, 0.43]	[−0.36, 0.54]
Log capped potential settler mortality	−0.475 (0.181)	−0.450 (0.189)	−0.435 (0.217)	−0.454 (0.204)

## Cross-Country Second-Stage LIML

	(9)	(10)	(11)	(12)
Second-stage regressions				
	Dependent variable: log GDP per capita in 2005			
Estimation method	LIML			
Years of schooling	0.177 (0.106)	0.171 (0.106)	0.122 (0.135)	0.170 (0.144)
AR confidence intervals	[−0.16, 0.41]	[−0.16, 0.40]	[−0.35, 0.43]	[−0.36, 0.54]
Log capped potential settler mortality	−0.475 (0.181)	−0.450 (0.189)	−0.435 (0.217)	−0.454 (0.204)

# Effect on Institutions? LIML

	(9)	(10)	(11)	(12)
Second-stage regressions				
	Dependent variable: log GDP per capita in 2005			
Estimation method	LIML			
Years of schooling	0.177 (0.106)	0.171 (0.106)	0.122 (0.135)	0.170 (0.144)
AR confidence intervals	[-0.16, 0.41]	[-0.16, 0.40]	[-0.35, 0.43]	[-0.36, 0.54]
Log capped potential settler mortality	-0.475 (0.181)	-0.450 (0.189)	-0.435 (0.217)	-0.454 (0.204)
Log population density in 1500	-0.114 (0.062)	-0.121 (0.062)	-0.109 (0.061)	-0.087 (0.067)
Kleibergen & Paap	0.03	0.03	0.02	0.01

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Second-stage regressions								
	Dependent variable: log GDP per capita in 2005							
Estimation method	2SLS				LIML			
Years of schooling	0.223 (0.073)	0.224 (0.074)	0.069 (0.129)	0.186 (0.142)	0.217 (0.077)	0.218 (0.078)	-0.019 (0.194)	0.094 (0.244)
Rule of law	1.126 (0.355)	1.123 (0.378)	1.324 (0.390)	1.062 (0.374)	1.168 (0.387)	1.170 (0.415)	1.701 (0.674)	1.464 (0.730)
Kleibergen & Paap (2006) test ( $p$ value)	0.10	0.260	0.110	0.070	0.10	0.260	0.110	0.070
Overidentification test ( $p$ value)	0.620	0.60	0.20	0.120	0.630	0.620	0.340	0.220
First-stage regressions								
	Dependent variable: years of schooling				Dependent variable: rule of law			
Primary school enrollment in 1870	0.069 (0.016)	0.072 (0.017)	0.046 (0.018)	0.047 (0.021)	-0.002 (0.007)	-0.004 (0.007)	0.006 (0.008)	0.003 (0.009)
Protestant missionaries in the early twentieth century	0.657 (0.444)	0.577 (0.462)	0.935 (0.406)	0.938 (0.431)	0.021 (0.171)	0.066 (0.173)	0.049 (0.165)	0.004 (0.176)
Log capped potential settler mortality	-1.042 (0.359)	-1.104 (0.403)	-0.602 (0.461)	-0.629 (0.502)	-0.402 (0.113)	-0.366 (0.122)	-0.235 (0.103)	-0.226 (0.107)
Log population density in 1500	-0.131 (0.139)	-0.120 (0.145)	-0.067 (0.148)	-0.061 (0.180)	-0.062 (0.056)	-0.069 (0.057)	-0.111 (0.057)	-0.126 (0.060)
$R^2$	0.677	0.68	0.734	0.734	0.603	0.612	0.664	0.669
Observations	62	62	62	62	62	62	62	62



- To which regions did Europeans bring more social capital?
- North-America:
  - Most settlers were indentured laborers (Galenson 1996)
  - Literacy rate of about 40 % (Galenson 1981).
- South-America:
  - Conquistadors mostly came from urban areas
  - many were hidalgos.
  - Literacy rate between 50% and 80% (Lockhart (1972), Avellaneda (1995))