

History matters: the long-term impact of colonial public investments in French West Africa

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Introduction

- **Motivations**

- Historical determinants of growth and development
- Evidence on path-dependency
- Impact of colonialism on former colonies' development

- **Existing literature**

- Role of *institutions*: La Porta et al. (1998), Acemoglu, Johnson and Robinson (2001), Acemoglu et Johnson (2003), Banerjee et Iyer (2005), Nunn (2008)
- Role of *human capital*: Glaeser et al. (2004), Feyrer et Sacerdote (2008)

- **Caveats / questions in the literature**

- Identification of the causal impact of colonial features
- Interpretation of the observed correlations between colonialism and current development / mechanisms

Introduction

- **Innovations of this paper**

- Underlies the role of *public investments* rather than the more general role of institutions
- Uses a *new database* with original and precise data
- Uses the *geographical discontinuities* in the colonial investment policy to identify the causal impact of early colonial investments
- Gives evidence on the *mechanism* explaining the effect

- **Results**

- Colonial public investments have been a strong determinant of current districts' development.
- The nature of investments matters
- Later investments continued to be located in areas that had many of them already
- The path-dependency of public investments is likely to be due to the lasting nature of physical facilities and positive externalities on local demand for public goods

Historical background: French colonisation

- **French political control on West Africa**
 - Military expansion lasted from 1854 to 1903
 - French West Africa was officially created in 1895
 - Effective occupation lasted from 1904 to 1960
- **Administrative organisation**
 - French colonial administration was structured as a pyramid: General Governor (federation) / Lieutenant-Governors (colonies) / Administrators (districts) / Local chiefs (Subdivisions)
 - The administrators were “the real chiefs of the French empire”
- **Public goods investment policy**
 - Colonial administrators invested in three public goods: education, health and infrastructures.
 - Colonial investments in education, health and infrastructures were not proportional to districts’ taxes (correlation: 0.2)

Data and summary statistics

- **Colonial data**

- Source: local colonial budgets, 1910-1956 (23 years)
- District level data, 110 districts, 1925 as a constant observation unit
- Variables: taxes, administrative expenses, police, public investments in education, health and infrastructures

- **Modern data**

- Source: 7 National Household Surveys, about 1995 (17,300 households)
- I matched households' locality with colonial districts
- Outcomes of interest: school attendance, stunting, access to electricity, water and modern fuels.

- **Other data**

- Geographical data: altitude, longitude, latitude, rainfalls, rivers, coastal areas ,from Falling Rain Genomics and ORSTOM
- Pre-colonial data: political status, population, European trade counter, early commercial activity
- Colonial conquest: year of conquest's beginning, local resistance length, local chiefs indemnities, early European settlement

Colonial data source:
Local budgets

Here is a table giving the number of teachers per district (1923, Ivory Coast).

SERVICE DES TRAVAUX PUBLICS

	INDICATEUR	INDICATEUR	INDICATEUR	INDICATEUR	INDICATEUR	INDICATEUR	INDICATEUR	INDICATEUR
	INDICATEUR	INDICATEUR	INDICATEUR	INDICATEUR	INDICATEUR	INDICATEUR	INDICATEUR	INDICATEUR
Travaux, comptabilité et études (chiffres)	1	1	1	2		1		
Ateliers et magasins du chef-lieu					1		1	
Subventions du Centre						2		
— du Sud			1					
— l'Est				1		1		
— de l'Ouest						1		
TOTAL	1	1	1	2	2	1	6	1
	1	1	1	2	2	1	6	1

SERVICE DE L'AGRICULTURE

	INDICATEUR	INDICATEUR	INDICATEUR	INDICATEUR	INDICATEUR
	INDICATEUR	INDICATEUR	INDICATEUR	INDICATEUR	INDICATEUR
Chiffres	1		1		
Administration agricole du Sud		1			
— de l'Est	1				
— du Centre			1		
— de l'Ouest					
Primes-avances de Bingerville					1
— de Bonaké					1
TOTAL	2	1	2	1	2
	2	1	2	1	2

SERVICE DE L'ENSEIGNEMENT

CERCLES	POSTES	NATURE des postes	PERSONNEL			OBSERVATIONS
			Enseignants	Enseignants adjoints	Maîtres	
Lagunes	Bongerville	Gr. scolaire	1			
	Bongerville	Village	2	3	1	
	Abidjan	Régionale	1	1	1	
	Abidjan	Village			1	
	Daloa				1	
	Jacqueville				1	
Bassam	Grand-Bassam	Régionale	1	1	1	
	Morassou	Village			1	
	Brouma				1	
Lahou	Grand-Lahou	Village			1	
	Divo				1	
	Fréato				1	
Haut-Sassandra	Sassandra	Régionale	1	1	2	
	Soubri	Village			1	
Haut-Cavally	Talou	Village			1	
	Grébo				1	
	San-Pédro				1	
Assinie	Assinie	Village			1	
	Assinie				1	
	Krimabo				1	
Bonaké	Bonaké	Régionale	1	1	1	
	Bonaké	Village			1	
	Tiéhioua				1	
Agoué	Agouéville	Village			1	
	Tissolé				1	
N'Zi-Cossé	Adzopé	Régionale	1	1	1	
	Bonoua	Village			1	
	Bougoussou				1	
	Toumbi				1	
	Yassoussoukati				1	
Boudouhén	Boudouhén	Village			1	
	Boua				1	
Indénié	Abengourou	Village			1	
	Zaranou				1	
	Assalato				1	
H-Sassandra	Daloa	Village			1	
	Isin				1	
	Yavoua				1	
	Gagnoa				1	
Onoedougou	Ségné	Régionale			1	
	Manliou	Village			1	
Haut-Cavally	Lagouassi				1	
	Bonaké				1	
	Doukout				1	
	Duniplou				1	
	Toukpleu				1	
	Tai				1	
	Baye				1	
Udienné	Guiglo	Village			1	
	Okorimé				1	
Tapouanna	Bordadi	Village			1	
	Dabakala				1	
	Indakakou				1	
Touba	Mar	Régionale	1	1	1	
	Touba	Village			1	
Gonou	Bonaké	Village			1	
Kong	Korhogo				1	
	Kong				1	
TOTALS GÉNÉRAUX			7	29	33	
			7	29	33	
			4			
			12	33	36	

- **Summary statistics**

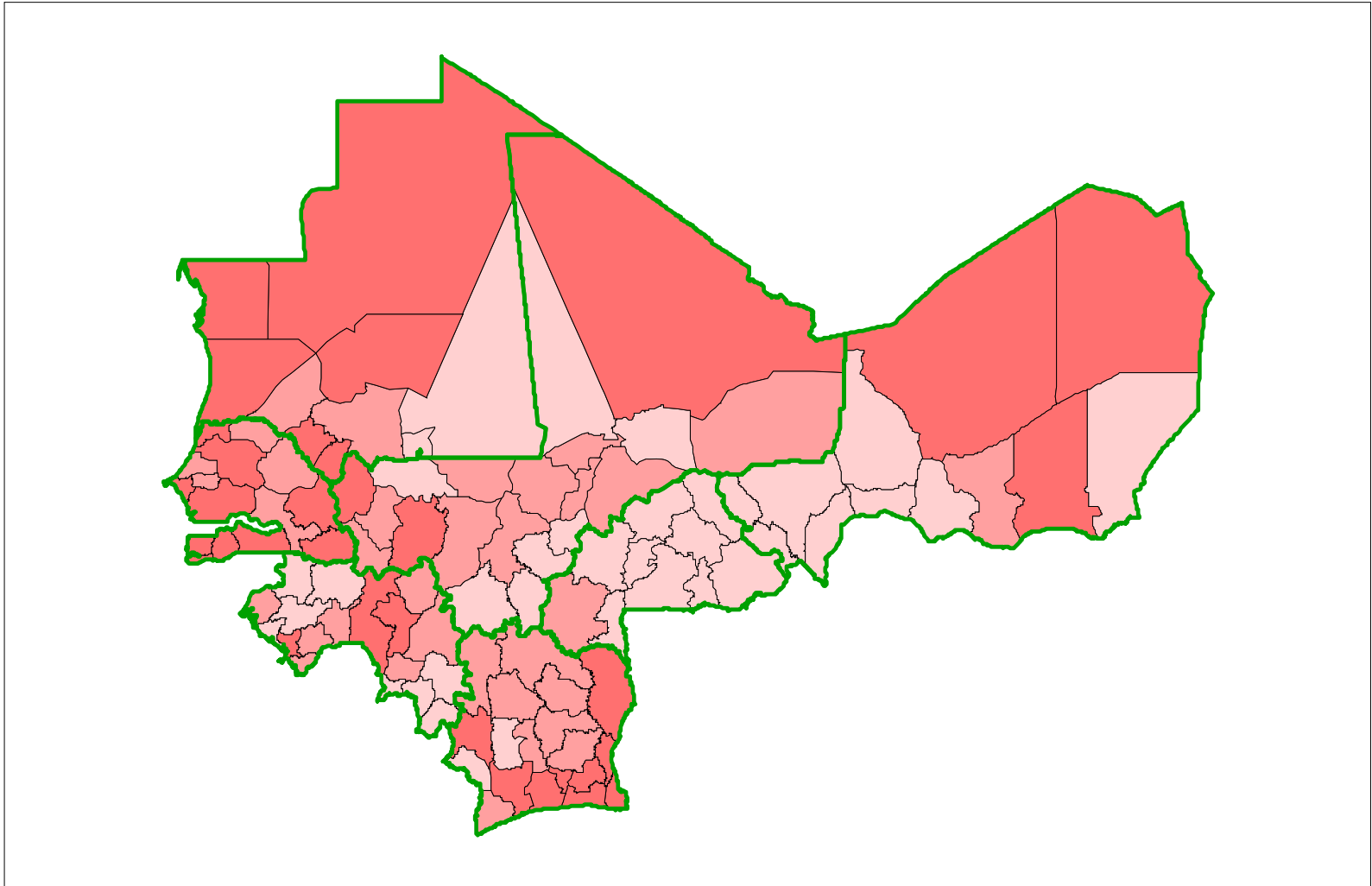
On average per district in 1995:

- 34% of the 7/12-year old children attended school
- 37% of 0-5-year old children suffered from stunting
- 12% of households were connected to electricity
- 10% had access to a private water tap
- 14% used a modern fuel for cooking

On average per district per year over 1910-1928:

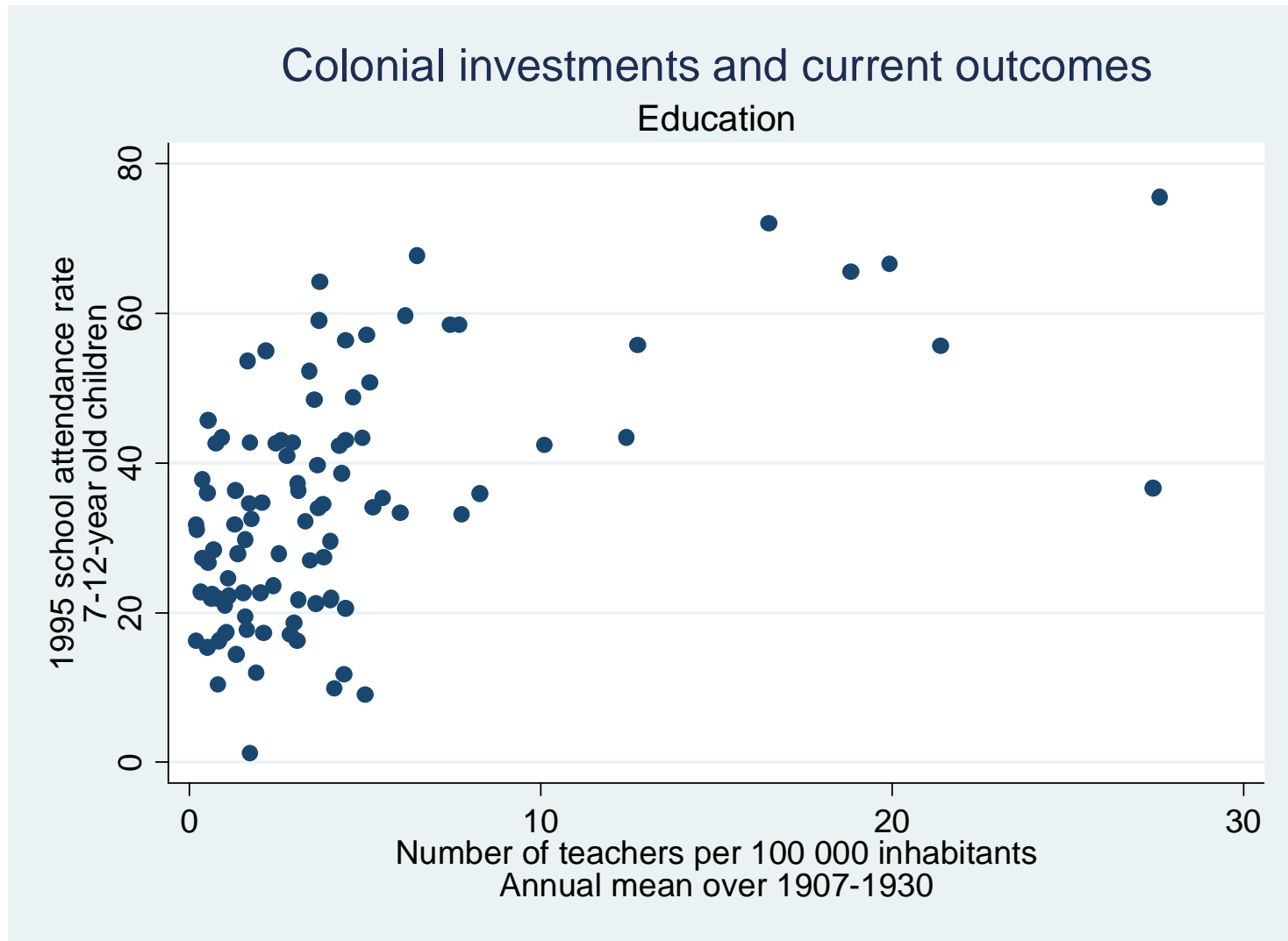
- 4 teachers per 100,000 inhabitants
- 8.5 medical workers per 100,000 inhabitants
- 0.44 1910 Francs per inhabitant for public works

Map 2: Number of teachers per 100,000 inhabitants (annual mean over 1910-1928)



Lecture: bottom tercile in light colour, top tercile in dark colour.

Graph 1: The correlation between colonial investments in education and current educational outcomes



Basic correlations: OLS estimates

Coefficient on colonial investments (annual mean over 1910-1928)	no controls (1)	geographical controls (2)	pre-colonial controls (3)	conquest controls (4)	attractiveness controls (5)	country fixed effects (6)	other investments controls (7)
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Panel A: % 7-12-year old children attending school as dependent variable

Number of teachers per 100,000 hbt	1.66** (0.26)	1.28** (0.31)	1.16** (0.36)	0.93** (0.35)	1.14* (0.48)	0.79+ (0.45)	0.95+ (0.52)
Medical staff per 100,000 hbt							0.07 (0.22)
Public works expenses per 1 hbt							3.18 (3.23)
R2	0.30	0.41	0.42	0.50	0.50	0.56	0.50
Nb Obs	98	98	98	98	98	98	97

Panel B: % 0-5-year old children suffering from stunting as dependent variable

Number of teachers per 100,000 hbt							0.47 (0.46)
Medical staff per 100,000 hbt	-0.43** (0.13)	-0.60** (0.16)	-0.59** (0.17)	-0.60** (0.17)	-0.56** (0.20)	-0.49* (0.20)	-0.56** (0.21)
Public works expenses per 1 hbt							-3.55 (5.85)
R2	0.27	0.30	0.32	0.34	0.34	0.41	0.37
Nb Obs	88	88	88	88	88	88	88

Control variables

Geographical characteristics	NO	YES	YES	YES	YES	YES	YES	YES
Precolonial characteristics	NO	NO	YES	YES	YES	YES	YES	YES
Colonial conquest	NO	NO	NO	YES	YES	YES	YES	YES
Initial attractiveness	NO	NO	NO	NO	YES	YES	YES	YES
Country fixed effects	NO	NO	NO	NO	NO	YES	NO	NO

Standard errors in parentheses. ** significant at the 1% level, * significant at the 5% level, + significant at the 10% level.

Each cell represents the coefficient from an OLS regression of the dependent variable on the independent variable.

In panel A column (8), the number of observations falls to 97 because data on medical staff per 100,000 hbt is missing for Conakry district.

In panel B, the number of observations falls to 88 because data on medical staff per 100,000 hbt is missing for Conakry district and data on % 0-5-year old children suffering from stunting is missing for Mauritanian districts.

Initial attractiveness control variables are: Number of European Settlers per 100,000 population in 1910, Trade taxes per capita collected in 1914

Colonial conquest control variables are: Year of colonial conquest's beginning, Local resistance length, Local resistance length2, Local chiefs indemnities

Precolonial characteristics control variables are: Centralized political power dummy, European trade counter dummy, 1910 population density

Geographical characteristics control variables are: Annual rainfalls average over 1915-1975, Altitude, Longitude, Latitude, Coastal dummy, River dummy

Results:

- Adding one teacher per 100,000 inhabitants over 1910-1928 would lead the percentage of 7-12-year old children attending school in 1995 growing up to about 1 point
- Adding one doctor per 100,000 inhabitants over 1910-1928 would lead the percentage of 0-5-year old children suffering from stunting in 1995 falling down to about 0.5 points
- Adding one franc per capita devoted to public works over 1910-1928 would lead the percentages of households having access to a private water tap and using a modern fuel growing up to about 3 points

Econometric issues:
selection and causality

- Historical Evidence on Selection during colonial times

Dependent variable: colonial investments (annual mean over 1910-1928)

Coefficient on	Number of teachers per 100,000 hbt (1)	Medical staff per 100,000 hbt (2)	Public works expenses per 1 hbt (3)	Number of teachers per 100,000 hbt (4)	Medical staff per 100,000 hbt (5)	Public works expenses per 1 hbt (6)
Population density 1910	-0.13* (0.07)	-0.27 (0.20)	-0.006 (0.017)			
Distance from the coast (km)				-0.004** (0.0001)	-0.005 (0.004)	-0.0009** (0.0003)
R2	0.03	0.02	0.001	0.08	0.02	0.09
Nb Obs	99	99	99	99	99	99

Standard errors in parentheses. ** significant at the 1% level, * significant at the 5% level, + significant at the 10% level.
Each cell represents the coefficient from an OLS regression of the dependent variable on the independent variable.

- Identification strategy: geographical discontinuity
 - Borders separating districts were almost exogenous
 - Unobservable characteristics are therefore likely to be similar on both sides of the borders
 - The issue of omitted variables can therefore be addressed by comparing neighboring districts

• Matching Estimates

	Dependant variables				
	Difference in school attendance rate (1)	Difference in stunting rate (2)	Difference in % of households connected to electricity (3)	Difference in % of households having access to water (4)	Difference in % of households using a modern fuel (5)
Coefficient on					
<u>Difference in colonial investments</u>					
Number of teachers per 100,000 hbt over 1910-1928	0.57+ (0.33)	0.78* (0.34)	0.22 (0.35)	0.02 (0.19)	0.68 (0.52)
Medical staff per 100,000 hbt over 1910-1928	-0.01 (0.17)	-0.52** (0.17)	0.40** (0.09)	0.15* (0.07)	0.17 (0.12)
Public works expenses per capita over 1910-1928	0.88 (2.4)	-1.93 (1.79)	0.75 (1.44)	2.5+ (1.3)	3.1* (1.6)
<u>Control variables</u>					
Difference in the number of European settlers per 100,000 hbt in 1910					
Difference in colonial conquest variables: year of colonial conquest's beginning, length of local resistance to colonial conquest, local chiefs' indemnities.					
Difference in precolonial characteristics: centralized political power dummy, 1910 population density, trade taxes collected in 1914 and former European trade counter dummy.					
Difference in geographical characteristics: altitude, latitude, longitude, annual rainfalls, coastal dummy, river dummy.					
Nb obs	71	62	71	71	71
Nb neighbourhoods	30	27	30	30	30
R ²	0.49	0.64	0.65	0.81	0.66

** significant at 1%, * significant at 5%, + significant at 10%

Dependent and independent variables are the value differences between neighbour districts of the same neighbourhood.

Results come from 50 OLS regressions of the dependent variable on the independent variables using 50 random neighbourhood designs.

Reported coefficient is the mean of the 50 coefficients of the dependent variable on the independent variable.

Standard deviation in parentheses equals to $(50/49)^{1/2}$ the empirical standard deviation of the 50 coefficients of the dependent variable on the independent variable.

Number of observations is the mean of the 50 numbers of observations (neighbour districts differences) resulting from the 50 neighbourhood designs.

Number of neighbourhoods is the mean of the 50 numbers of neighbourhoods resulting from the 50 neighbourhood designs.

R² is the mean of the 50 R² from the 50 OLS regressions.

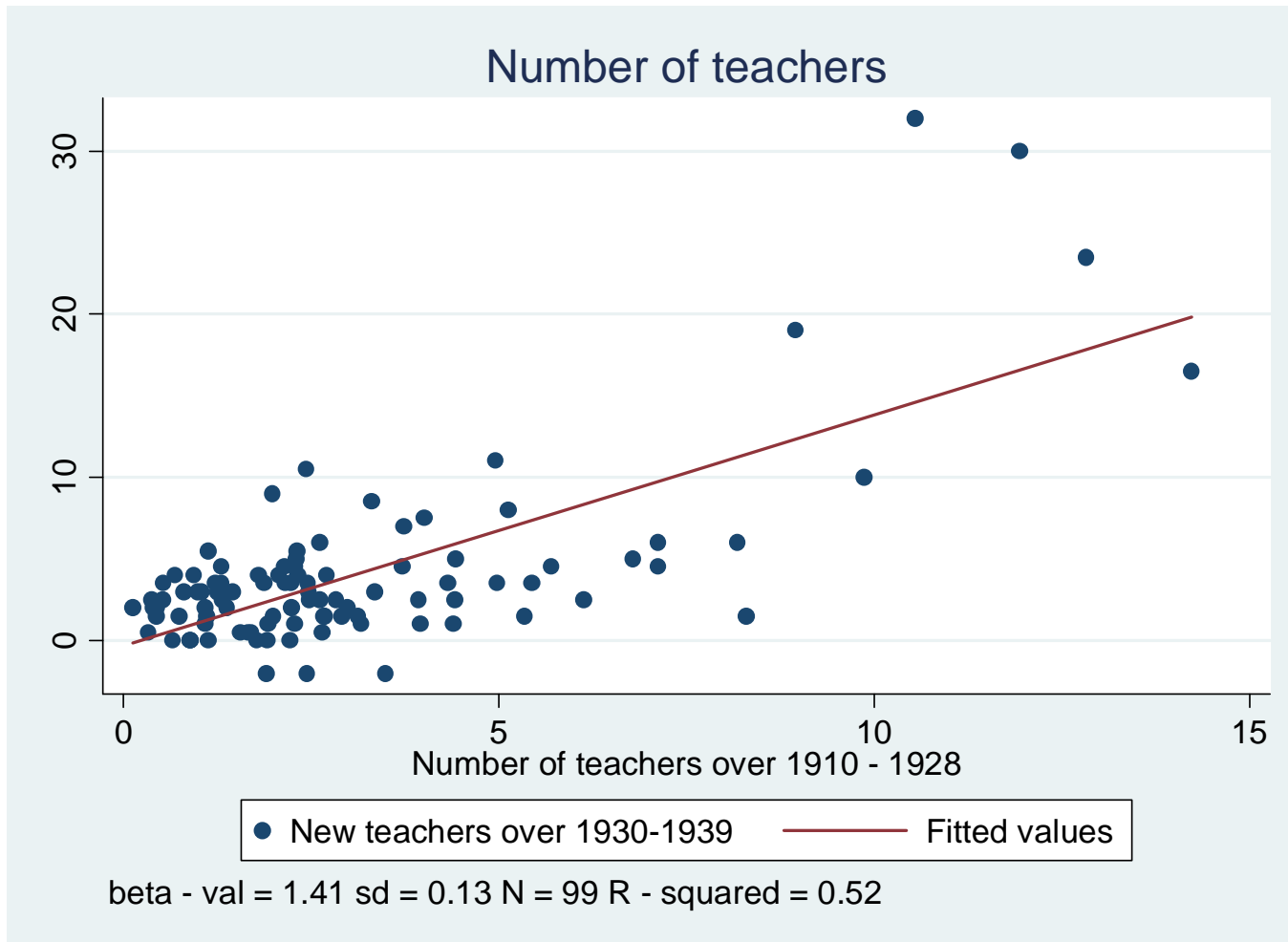
Data on stunting children is missing for the Mauritanian districts.

Data on medical staff per 100 000 hbt is missing for Conakry district.

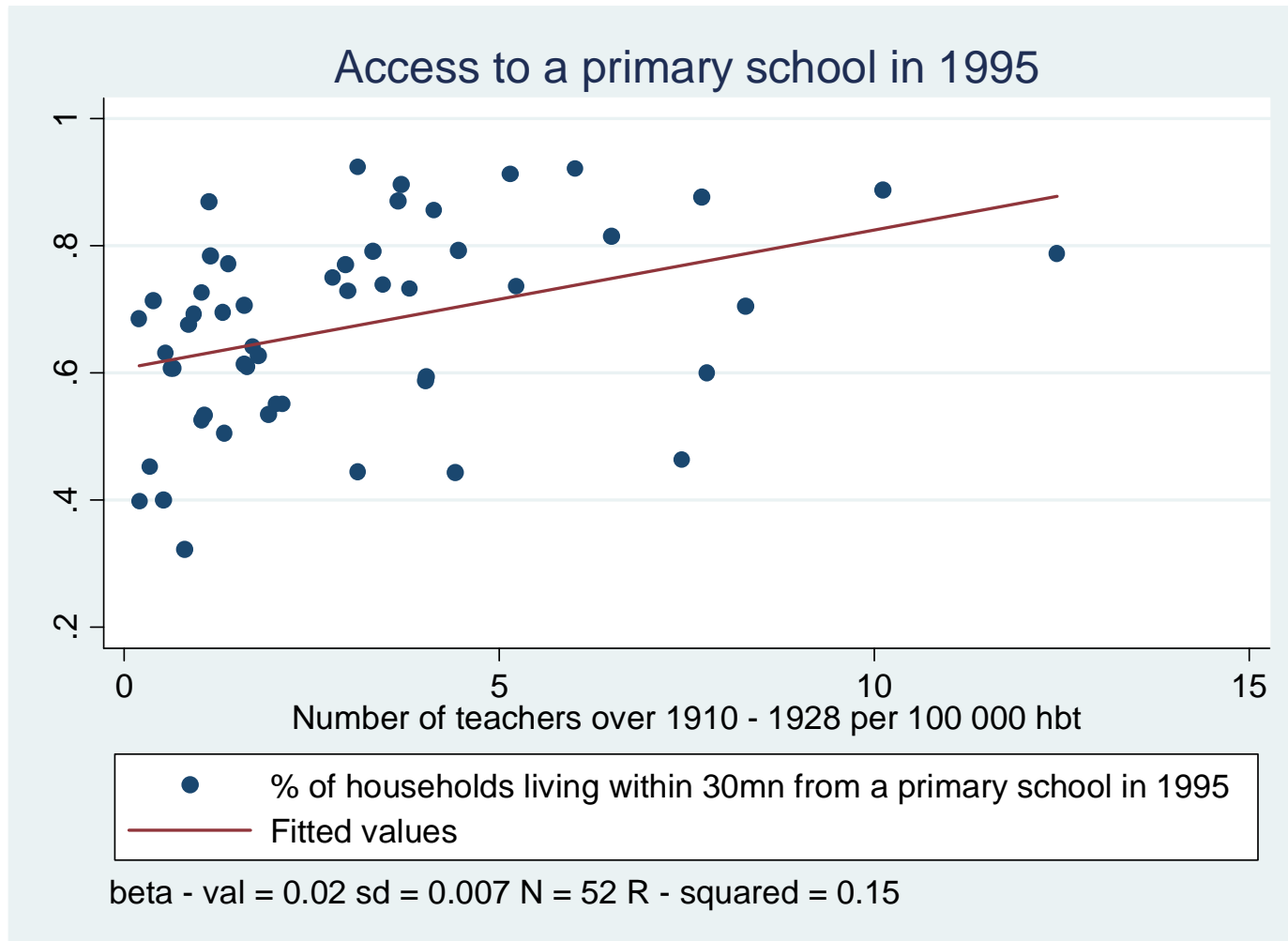
Why do early colonial public investments still matter?

- **Repetition of investment location**
 - Evidence on repetition of investments over 1930-1939
 - Distance to public goods in 1995 is still correlated to early colonial investments
- **Why were more teachers posted in areas that had many of them already?**
 - Increasing returns to the adoption of this practice, due to:
 - a. Positive externalities between investments
 - b. Lower cost of using existing physical facilities
 - Endogenous demand for education (peer/intergenerational effects, endogenous accumulation of human capital)
 - Positive effects on political voice
 - Positive effect on political stability

Graph 2: The relation between later and former investments



Graph 2: The relation between colonial investments and current access to public goods



Testing various mechanisms

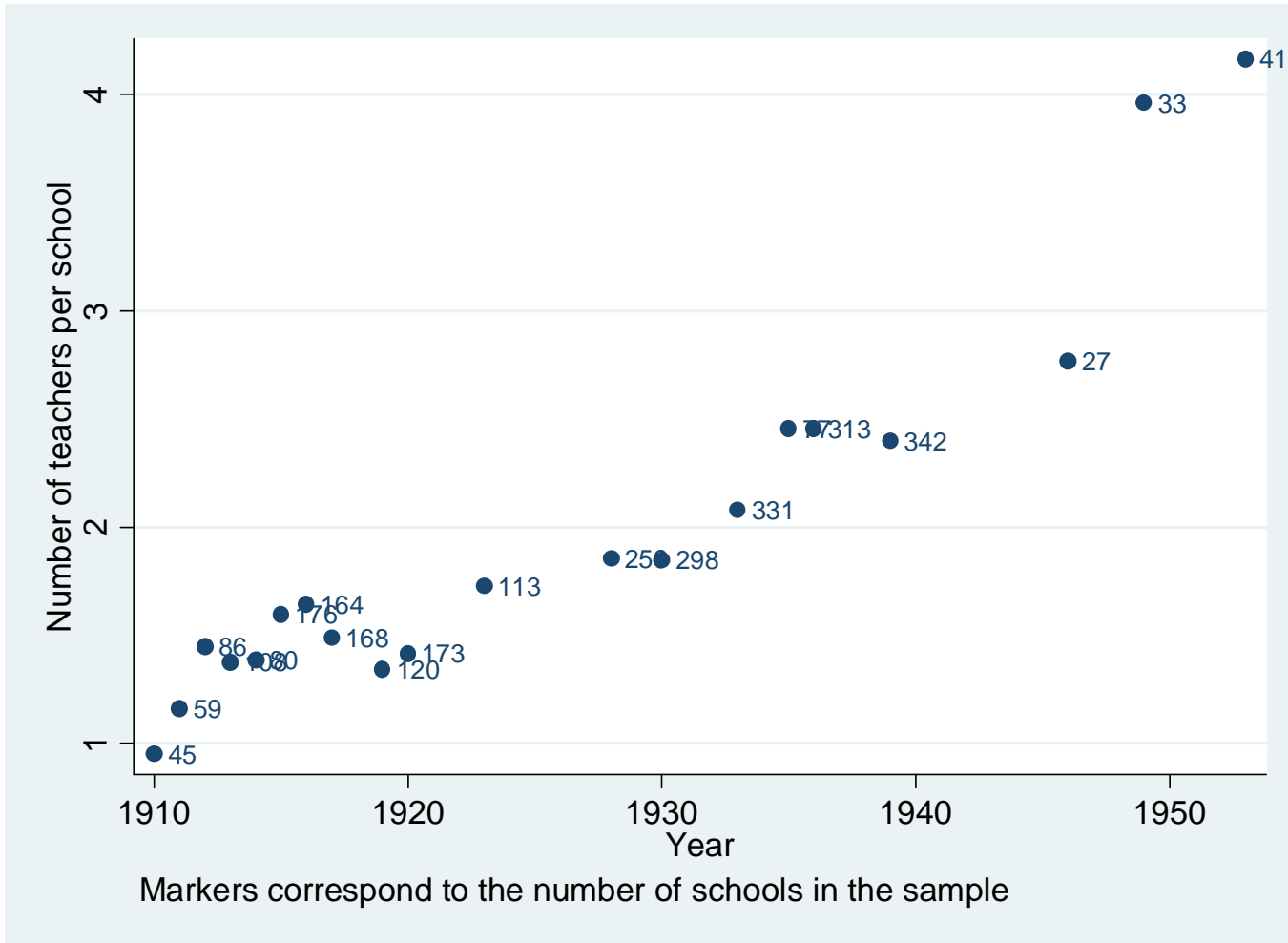
Coefficient on	Dependent variable: New teachers per 100,000 over 1930-1939						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Teachers per 100,000 hbt over 1910-1928	0.47** (0.11)	0.63** (0.11)	0.47** (0.16)	0.92** (0.21)	0.87** (0.24)	0.55** (0.09)	0.67** (0.13)
Medical staff per 100,000 hbt over 1910-1928				-0.15** (0.05)	-0.14+ (0.074)		
Public works exp. per 1 hbt over 1910-1928				-0.07 (1.12)	-0.07 (1.26)		
New schools per 100,000 hbt over 1930-1939						1.66** (0.22)	1.99** (0.27)
Local chiefs wages per 100,000 hbt over 1930-1939							
Hostility towards colonial power over 1920-1940							
R2	0,15	0,25	0,39	0,26	0,38	0,53	0,64
Nb Obs	99	98	98	97	97	98	98
Tabou in the sample	YES	NO	NO	NO	NO	NO	NO
<u>Control variables</u>							
Geographical characteristics	NO	NO	YES	NO	YES	NO	YES
Precolonial characteristics	NO	NO	YES	NO	YES	NO	YES
Colonial conquest	NO	NO	YES	NO	YES	NO	YES
Initial attractiveness	NO	NO	YES	NO	YES	NO	YES
Country fixed effects	NO	NO	YES	NO	YES	NO	YES

Testing various mechanisms –*continued*

Dependent variable: New teachers per 100,000 over 1930-1939

Coefficient on	(8)	(9)	(10)	(11)	(12)
Teachers per 100,000 hbt over 1910-1928	0.62** (0.11)	0.47** (0.16)	0.58** (0.11)	0.53** (0.16)	1.02** (0.16)
Medical staff per 100,000 hbt over 1910-1928					-1.86* (0.9)
Public works exp. per 1 hbt over 1910-1928					-0.0001 (0.0001)
New schools per 100,000 hbt over 1930-1939					0,83 (1.17)
Local chiefs wages per 100,000 hbt over 1930-1939	0,0001 (0.0001)	0,0001 (0.0001)			-0.13** (0.046)
Hostility towards colonial power over 1920-1940			3.65** (1.40)	3.86** (1.69)	1.77** (0.24)
R2	0,27	0,41	0,29	0,43	0,66
Nb Obs	98	98	98	98	97
Tabou in the sample	NO	NO	NO	NO	NO
<u>Control variables</u>					
Geographical characteristics	NO	YES	NO	YES	YES
Precolonial characteristics	NO	YES	NO	YES	YES
Colonial conquest	NO	YES	NO	YES	YES
Initial attractiveness	NO	YES	NO	YES	YES
Country fixed effects	NO	YES	NO	YES	YES

Graph 3: The evolution of the number of teachers per school



Conclusions

- The persistence of colonial experience may be more local than argued by the political economy literature on “institutional overhang”
- Current educational (health, infrastructures) performances are specifically determined by colonial investments in education (health, infrastructures)
- In the long run inequalities do not vanish because there are increasing returns to the adoption of a practice - both starting point and accidental events can have significant effects on the ultimate outcome