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Human capital development in Africa
since the late 19th century

ERSA/FRESH Conference
on “Lessons from history for development”
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- most African countries belong to the group of the least developed countries in the world today
- focus on the educational situation in Africa
- a glance at Africa's educational situation reveals underdevelopment in comparison to other world regions but also a big diversity among the countries

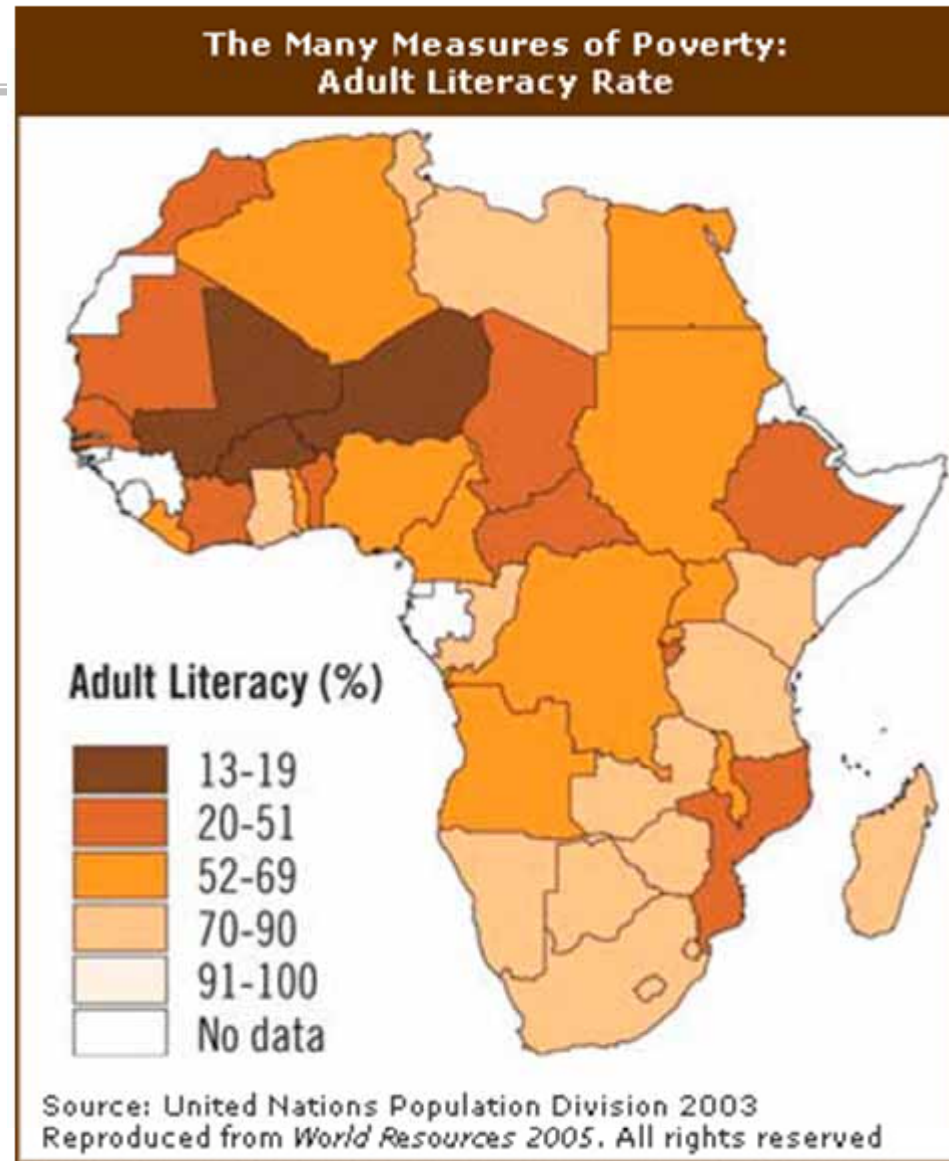


The Many Measures of Poverty:
Adult Literacy Rate

South Africa,
Namibia,
Zimbabwe
(>80%)

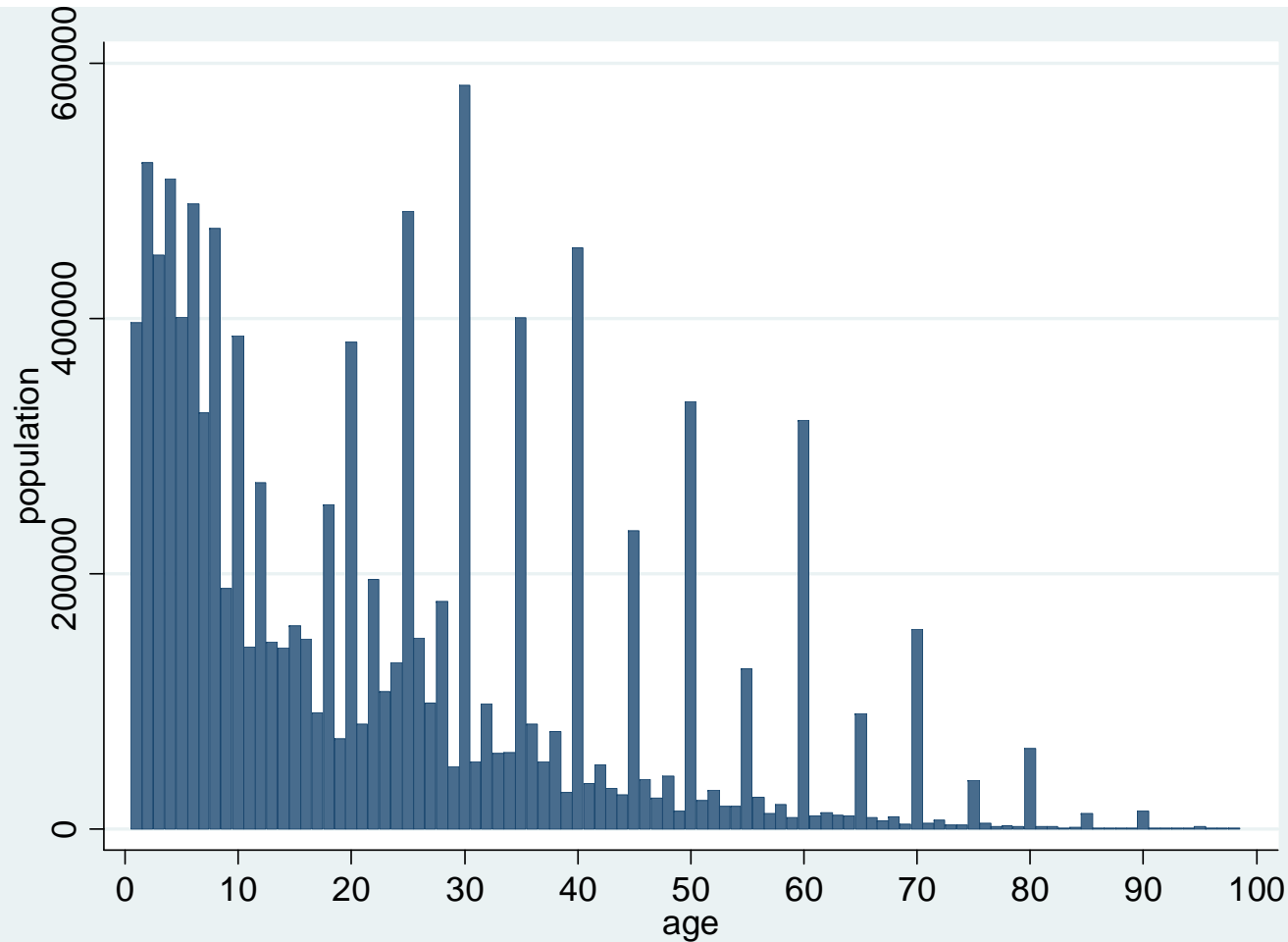
vs.

Mali, Niger
and Burkina
Faso (<20%)



- Interested in the human capital development since the 19th century
- **Were the big differences in educational levels already visible during the colonial period?**
- Before 1950s data are scarce, rarely available for the whole population
- Benavot & Riddle (1988): enrolment rates 1880s to 1930s
- Recent studies like Bolt & Bezemer (2009): pupil/population ratio
- **Introducing age-heaping data for the period 1880s to 1950s → new estimates for basic numeracy**

Age-heaping method



Source:
Morocco
census
1960

Age-heaping method

- Approach developed around the phenomenon of „Age-heaping“, i.e. the tendency of poorly educated people to round their age erroneously
- calculate the share of people who report an exact age rather than a rounded age („40“ instead of true 39 or 41)
- shows a high correlation with other human capital indicators
- some caveats like 12-heaping Middle Ages, numeracy of census-taker, birth year heaping, counterchecking with birth registers
- employed in a number of recent studies:
- Pioneer: Mokyr 1983 (and Duncan-Jones 1990)
- recent studies by A’Hearn, Baten, and Crayen 2009; de Moor and van Zanden 2008; Clark 2007; Baten, Crayen, and Voth 2008; Humphries and Leunig 2009; Baten, Reis and Stolz 2009; Baten, Crayen, and Manzel 2008; Crayen and Baten 2009; Manzel and Baten 2009, see also the applications in Cinnirella 2008; Mironov 2006; O’Grada 2006

Age-heaping method

Construction of the Whipple-Index:

$$WI = \left(\frac{n_{25} + n_{30} + \dots + n_{65} + n_{70}}{1/5 \times (n_{23} + n_{24} + n_{25} + \dots + n_{72})} \right) \times 100$$

Whipple-Index ranges between 500 and 100.

A linear transformation yields the ABCC-index:

$$ABCC = \left(1 - \frac{(WI - 100)}{400} \right) \times 100$$

ABCC-Index ranges between 0 and 100.

- Sources: data from official censuses conducted between 1940s and 1990s
- covers the age-heaping levels of the birth decades 1880s to 1950s
- census data for most African countries
- this study presents ONLY ABCC values based on data of the whole population, dropping census reports based on sample returns
- Age distributions showing heaping patterns other than on multiples of 5 are dropped consequently
→ **consistent basic numeracy data for 34 countries!**

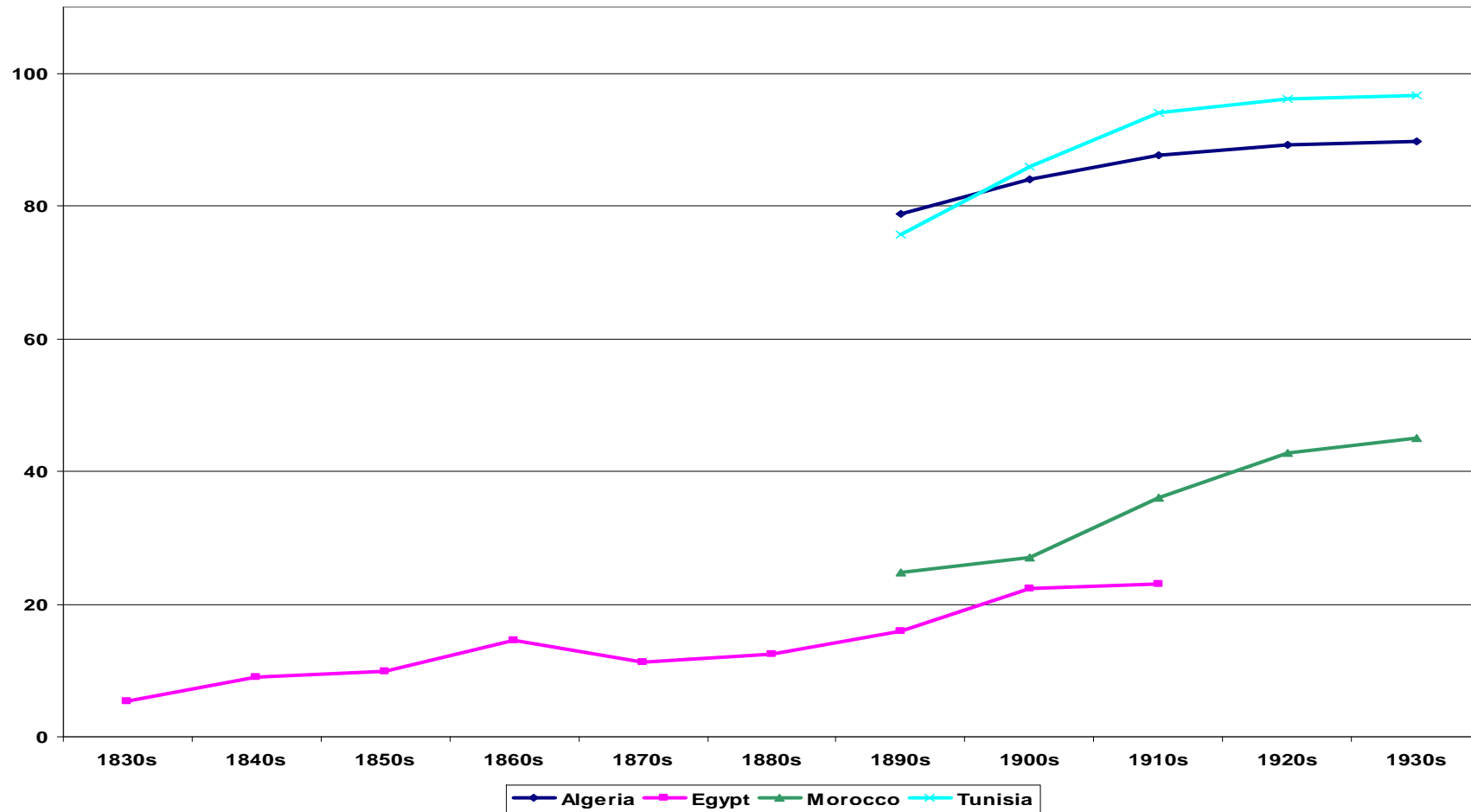
Advantages of numeracy as an estimate for basic human capital:

- enables to cover most African countries during the colonial period
- consistent construction of the index (census data of whole population)
- output measure (vs input like schooling)

ABCC trends



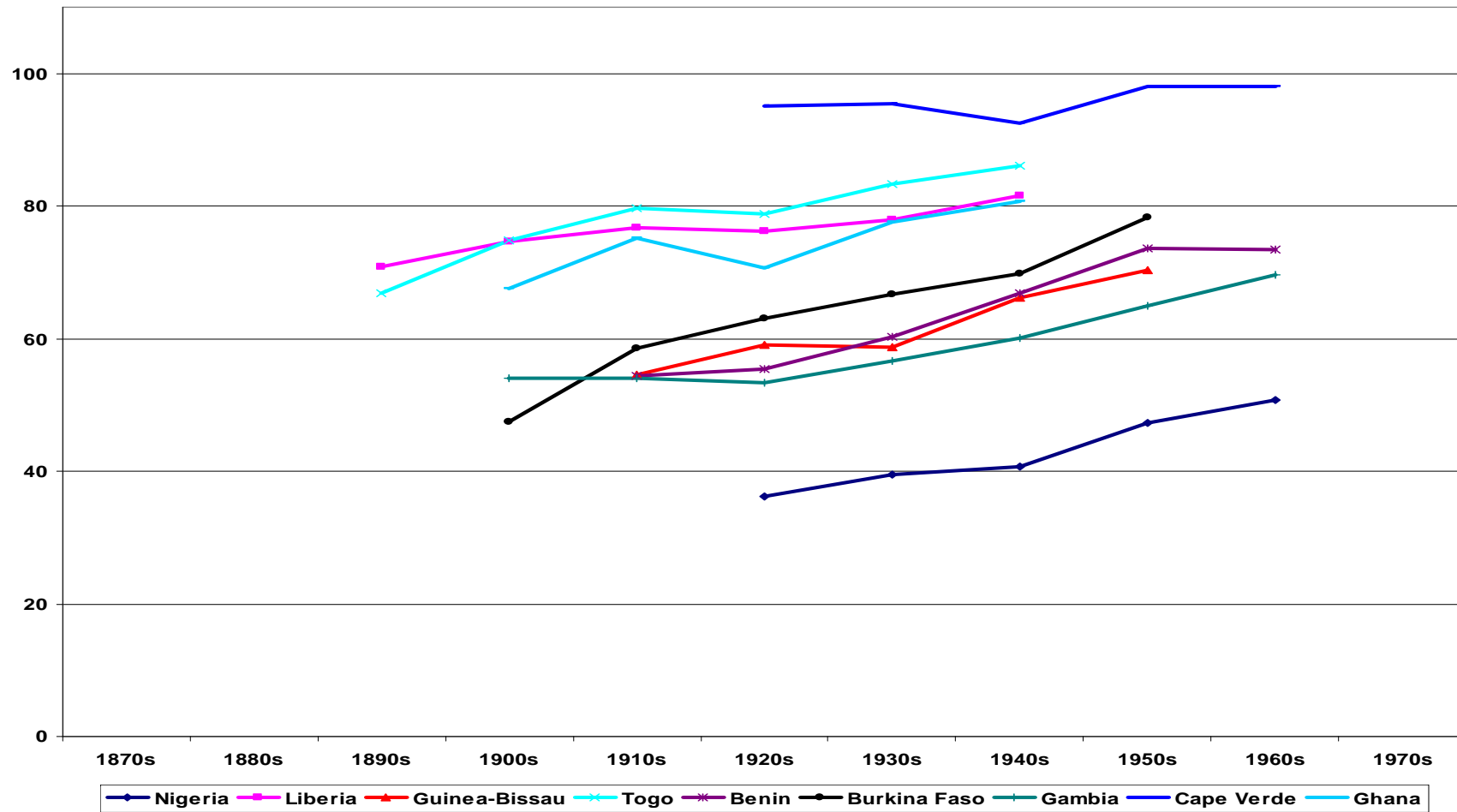
North Africa



ABCC trends



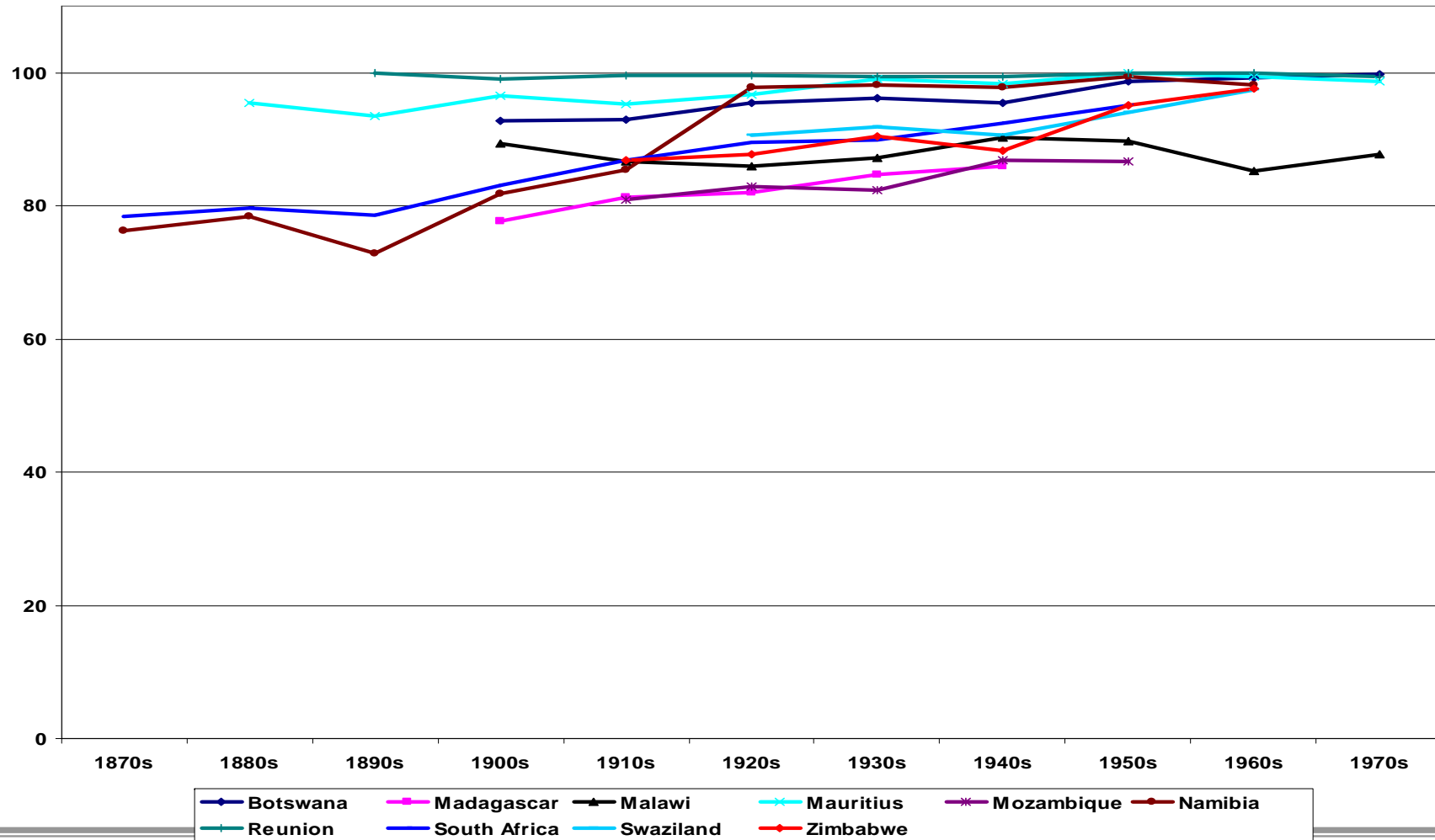
West Africa



ABCC trends



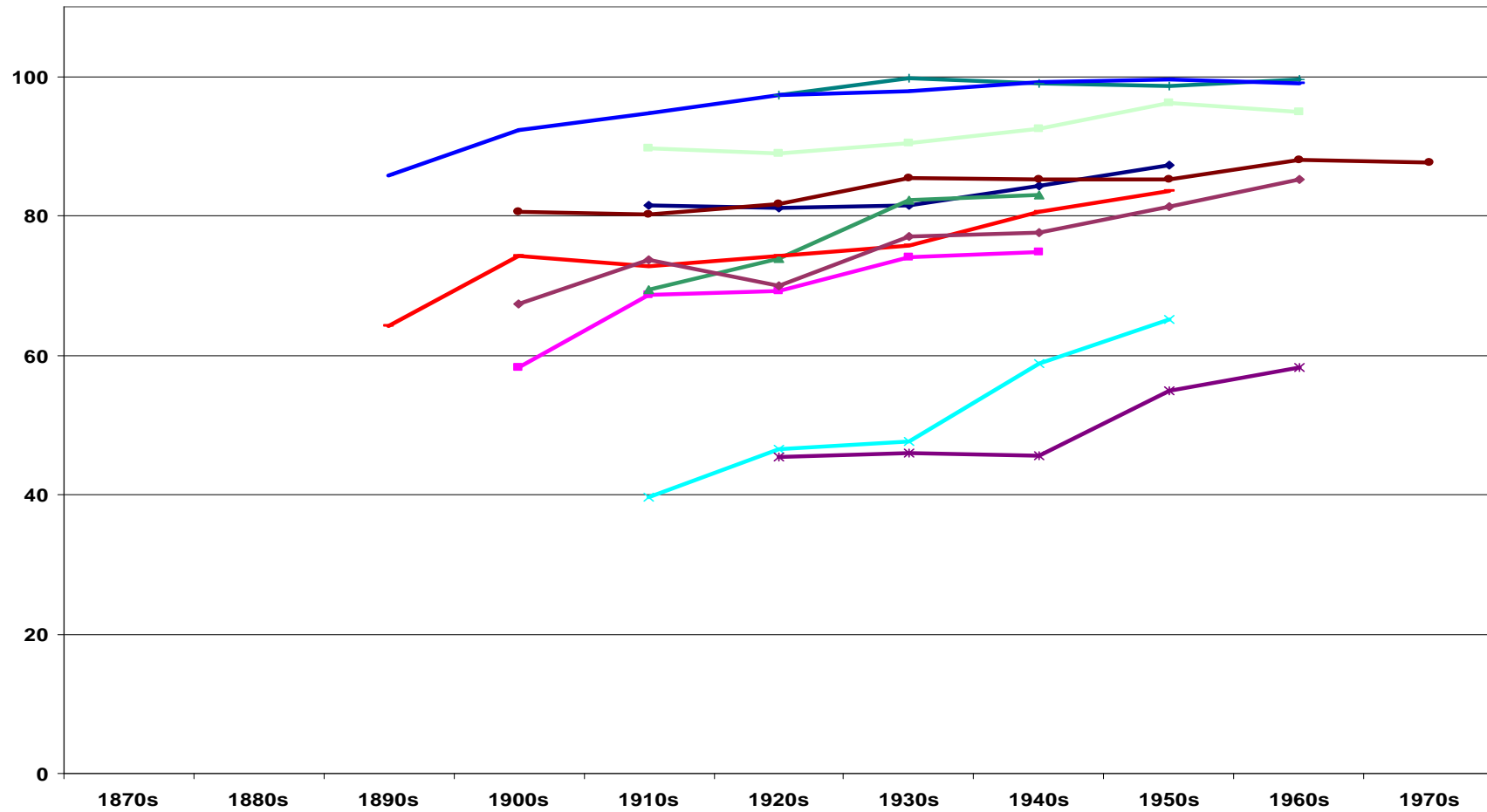
Southern Africa



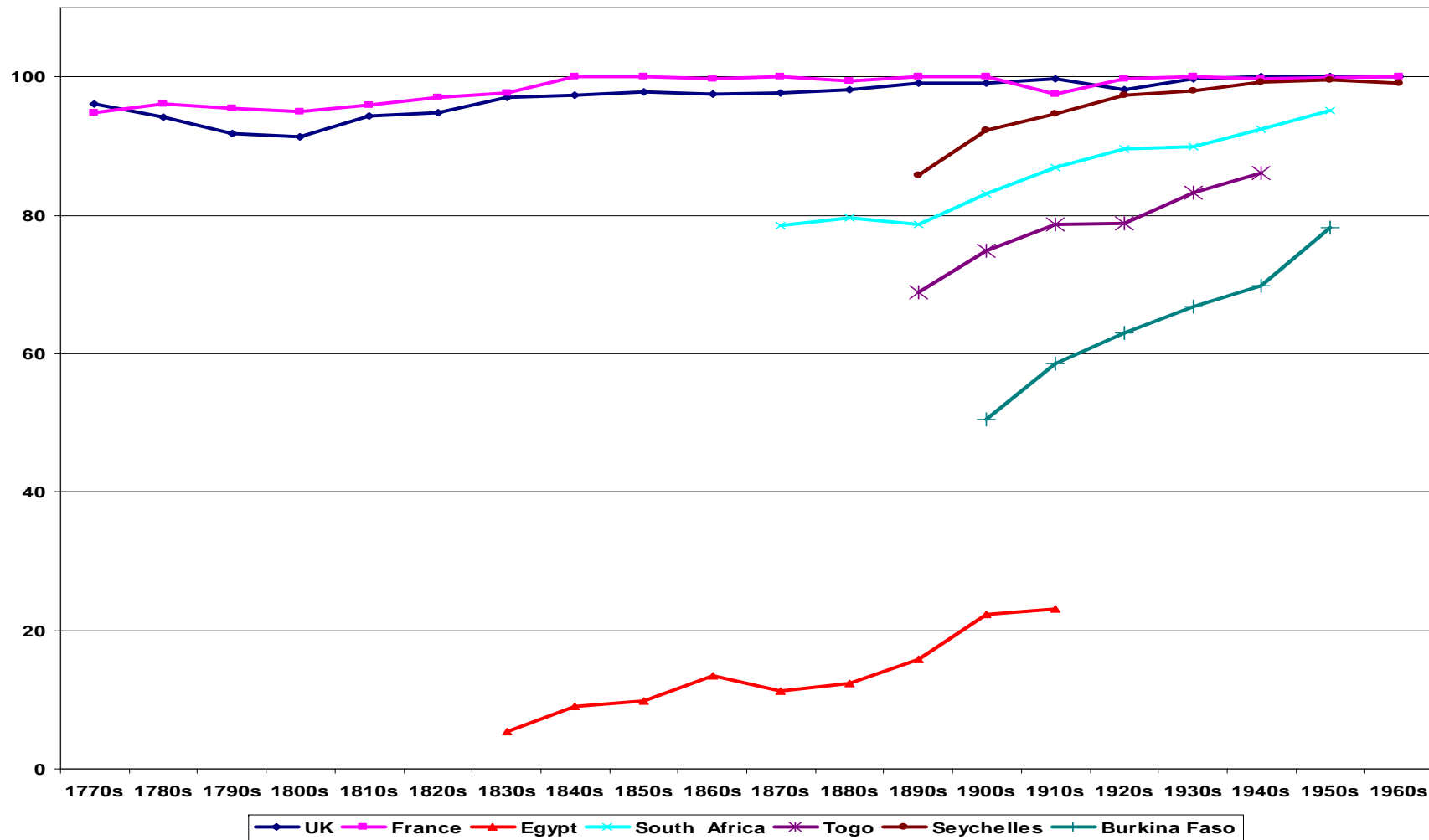
ABCC trends



East and Central Africa



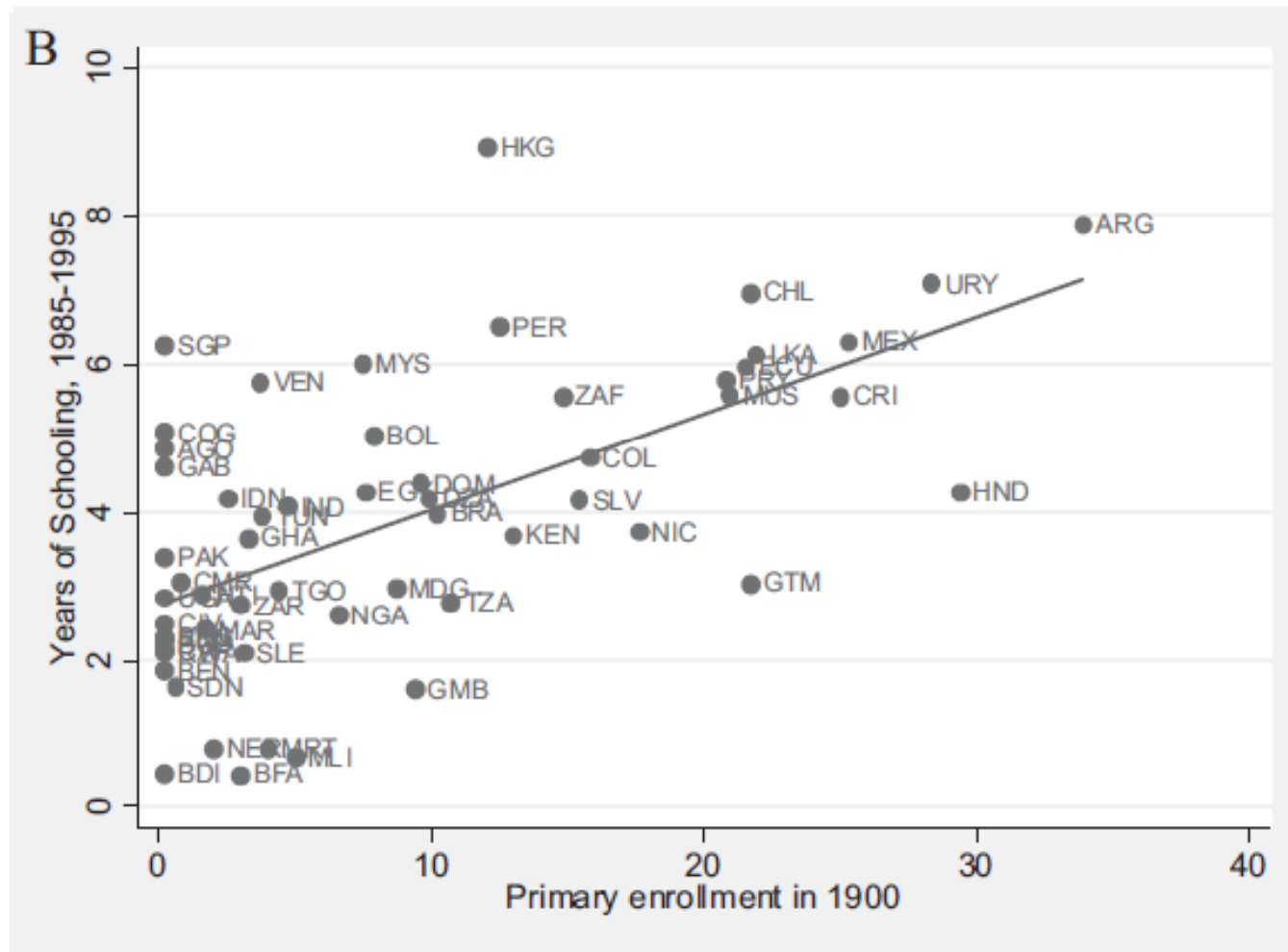
ABCC trends



Results:

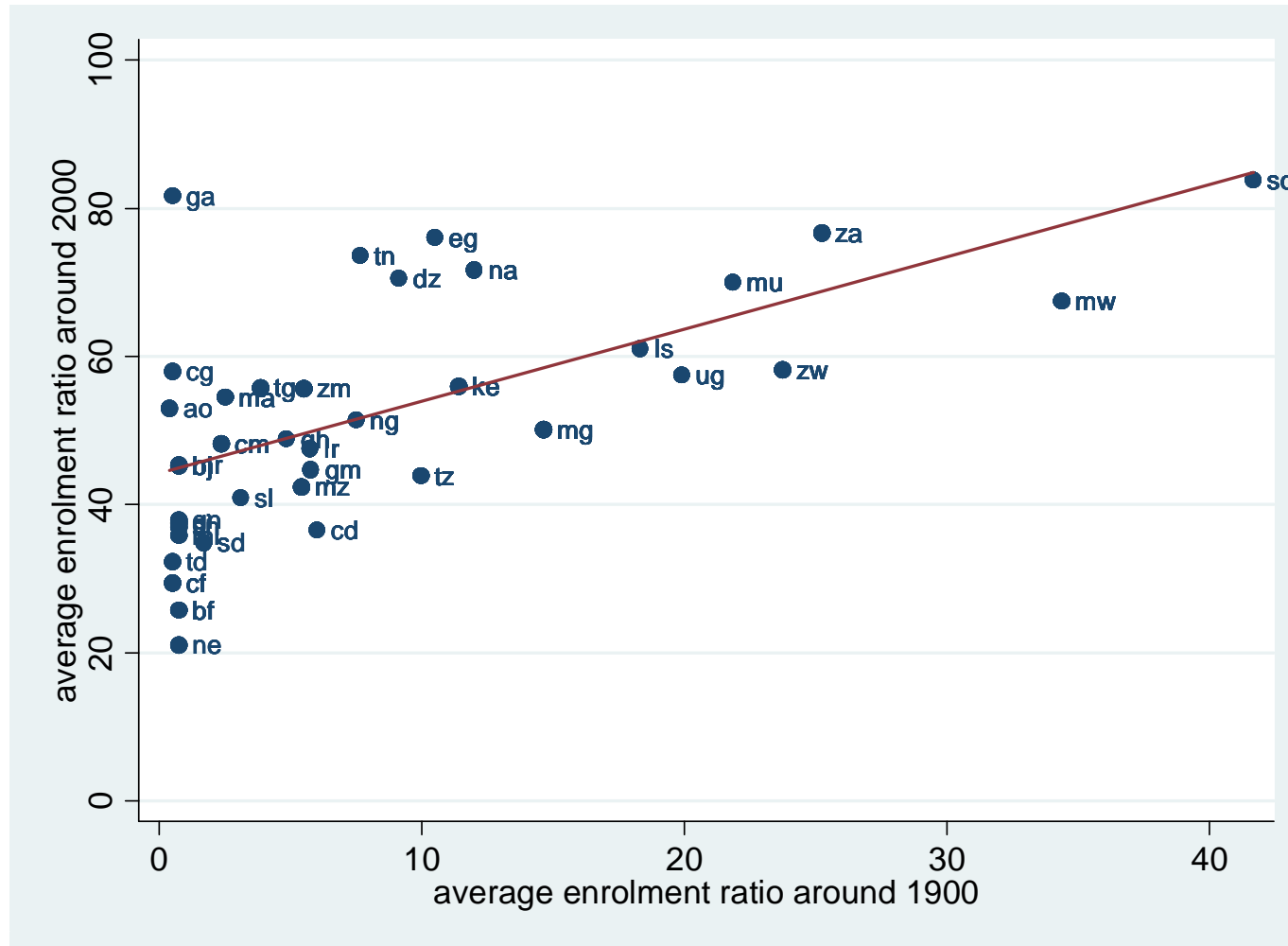
- numeracy levels reveal big inequalities between countries and within regions
→ around 1900: Tunisia, Cape Verdian Islands ABCC>80, Egypt, Nigeria: ABCC<40
- the whole South African region reached much higher numeracy levels than most Western and Central African countries
- development over time: all countries show an improvement
→ only few countries (e.g. Malawi, Burundi) stagnate throughout several decades

Persistence



Source:
Gallego
(2010)

Persistence

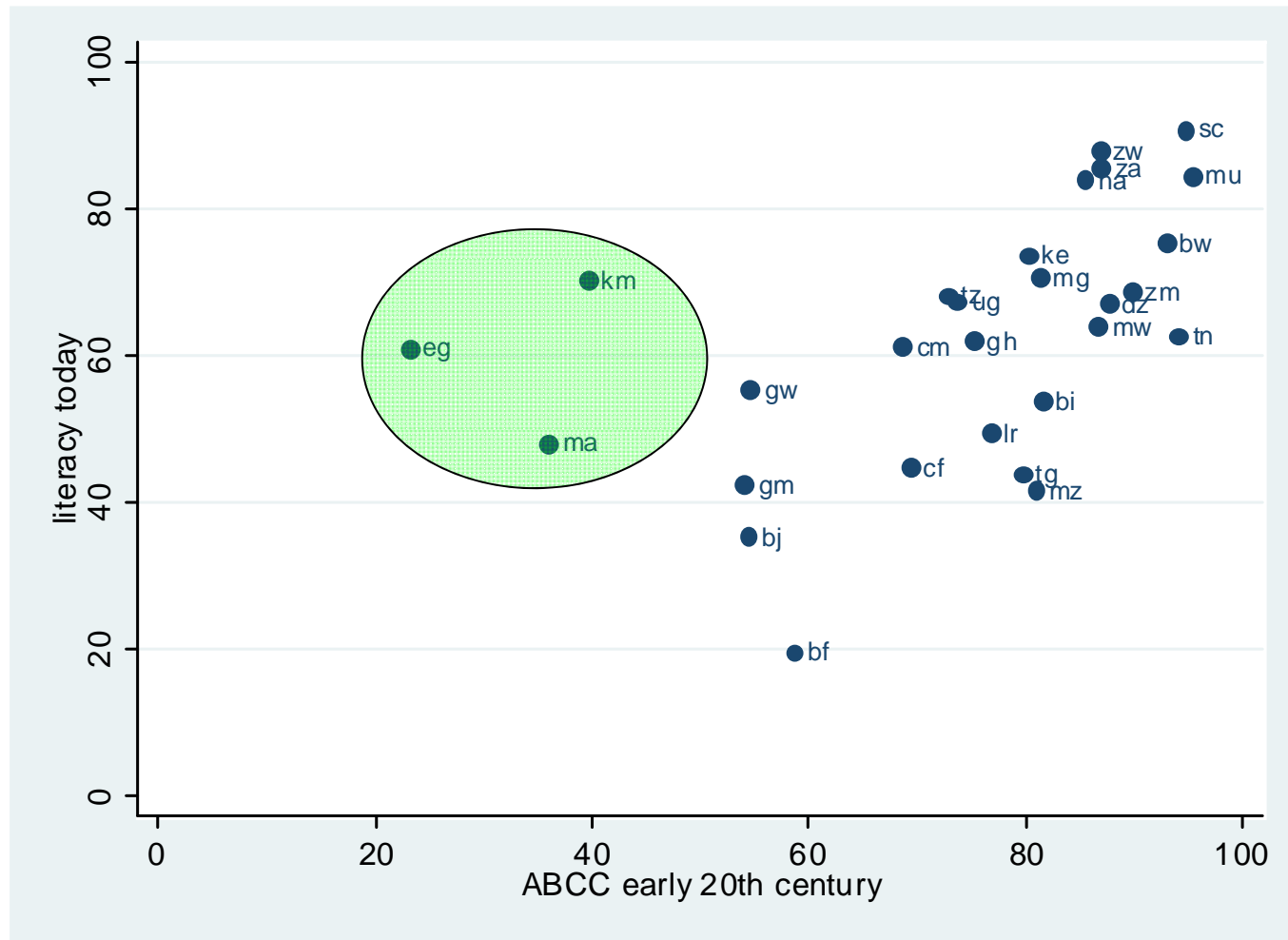


Gallego (2010): Historical Origins of Schooling: The role of Political Decentralization. *The Review of Economics and Statistics*.

Reasons why institutional persistence is plausible in the case of education:

- setting up institutions is costly: educational policies, as part of a long lasting and multidimensional cluster of institutions, are persistent
- accumulation of human capital is endogenous: increase in the supply of education makes investment in human capital-related technologies more profitable which, in turn, encourages schooling
- intergenerational inertia: persistence of educational levels among several cohorts
- peer effects: can explain low levels of education over several generations even though there are policies aiming to expand schooling

Persistence



Numeracy levels around 1900 are reflected by the literacy levels today!

→ countries that belonged to the group with the lowest numeracy levels still belong to the group of countries with the lowest literacy rates today (and vice versa)

However:

Egypt, Marocco and the Comoros deviate from this pattern!

- Schooling: +
- Colonizer's identity: + (uk)/ - (fr)
- European settlers: +
- Infrastructure: +
- Population density: +
- Mortality rates: -
- Islam: - / +
- Pre-colonial state structure: +
- Ethnic fractionalization: -

Regression results



VARIABLES	(1) ABCC	(2) ABCC	(3) ABCC	(4) ABCC	(5) ABCC	(6) ABCC	(7) ABCC	(8) ABCC
Enrolment ratio (ln)	7.638** (3.527)	4.615** (1.876)	3.124*** (1.105)	5.433*** (1.045)	2.542** (1.082)	2.474** (1.058)	2.662** (1.081)	2.328** (1.088)
UK colony	-10.88* (5.964)							
Settler colony	21.51*** (5.942)		11.66*** (2.404)		16.78*** (2.820)	13.28*** (3.345)	13.09*** (4.044)	15.10*** (3.721)
Railway per qkm (ln)	1.491 (1.894)		2.095*** (0.763)					
Islam		-0.249*** (0.0584)		-0.0453 (0.0381)	-0.0302 (0.0297)	-0.0730* (0.0372)	-0.0648 (0.0389)	-0.0551 (0.0401)
Malaria		-0.275*** (0.0826)		-0.210*** (0.0463)	-0.0635* (0.0372)	-0.0724* (0.0367)	-0.0517 (0.0604)	-0.0768 (0.0787)
Population density (ln)		-3.532** (1.659)		-2.494*** (0.927)				
Egypt, Morocco, Nigeria			-43.78*** (2.882)	-41.62*** (4.080)	-38.00*** (3.734)	-40.60*** (3.912)	-39.68*** (4.201)	-38.65*** (4.134)
Ethnic fractionalization						-12.32* (6.674)	-11.36 (7.746)	-14.22 (9.575)
Pre-colonial settlement pattern							-2.441 (2.846)	
Pre-colonial state structure								-1.950 (2.554)
Constant	46.34*** (15.67)	81.37*** (12.88)	71.16*** (6.620)	80.27*** (7.156)	54.08*** (8.131)	67.35*** (10.71)	76.45*** (20.16)	73.61*** (18.82)
Observations	54	56	54	56	62	62	57	57
R-squared	0.577	0.602	0.927	0.880	0.899	0.905	0.905	0.905

Standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Note: The coefficients for time fixed effects are not reported in this table.
All variables are defined in the Appendix. ABCC is lagged by one decade.

- new estimates to assess basic human capital in colonial Africa
- Differences observed today were already visible during the colonial period
- Further investigation is needed to understand why some countries deviate
- Main determinants for numeracy in Africa are school enrolment and the presence of European settlers
- These factors seem to have had a very strong impact on the further human capital formation
- Data before the European arrived would be very interesting, but hardly available....

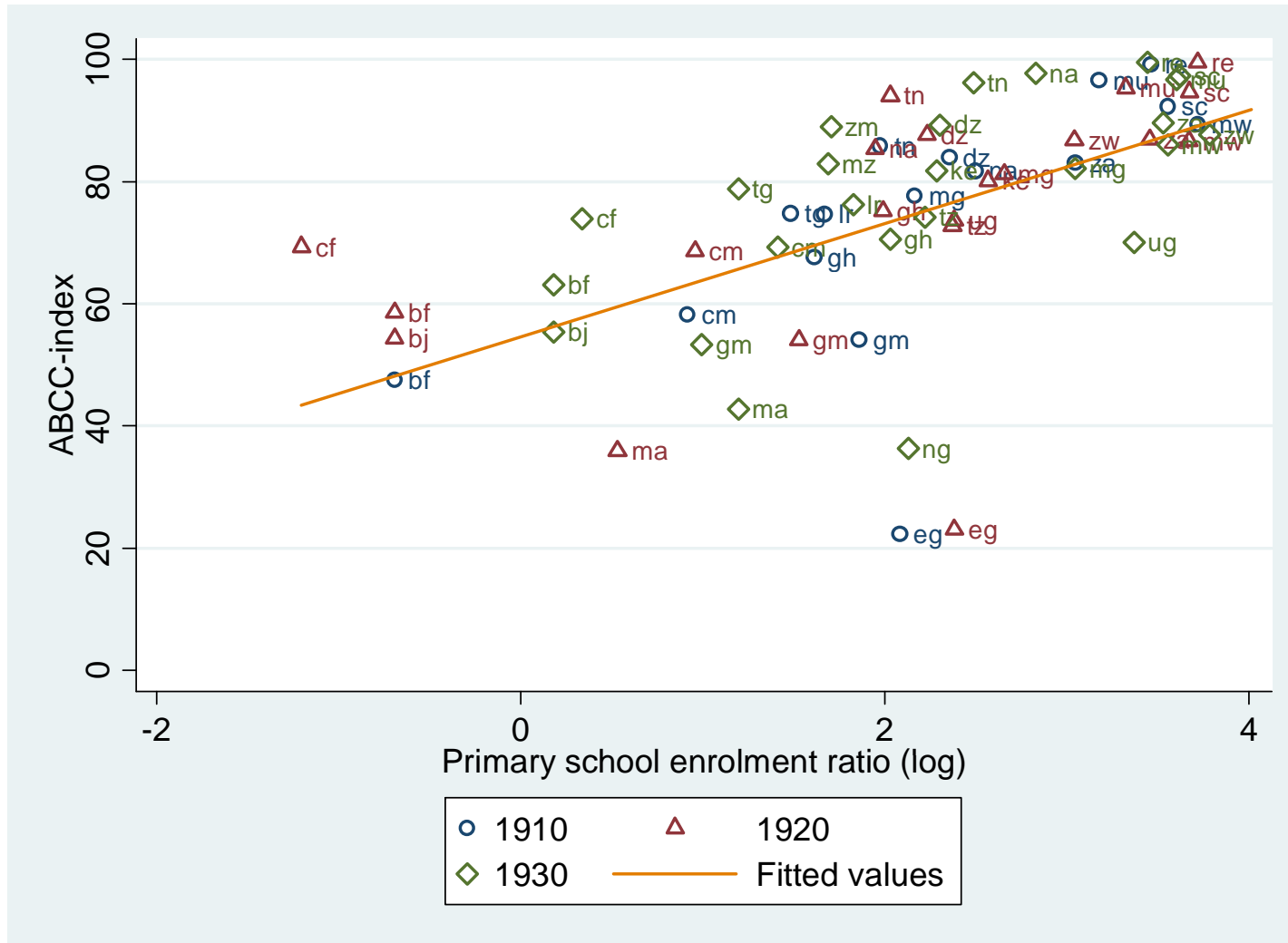


**Thank you
for your attention!**



Questions? Suggestions?

ABCC vs Schooling



ABCC

List of the underlying census data:

Burkina Faso: 1975, 1985, 1996; Burundi: 1979; Benin: 1979, 1992;
Botswana: 1971, 1981, 1991, 2001; Central African Republic: 1975;
Cameroon: 1976; Cape Verde: 1990; Algeria: 1966; Egypt: 1907, 1947;
Ethiopia: 1994; Gabon: 1993; Ghana: 1970; Gambia: 1973, 1983, 1993;
Guinea-Bissau: 1979; Kenya: 1969, 1989, 1999; Comoros: 1980; Liberia:
1962, 1974; Morocco: 1960; Madagascar: 1975; Mali: 1976; Mauritius:
1952, 1962, 1972, 1990, 2000; Malawi: 1977, 1987, 1998; Mozambique:
1980; Namibia: 1946, 1991, Nigeria: 1991; Reunion: 1967, 1982, 1990,
1999; Seychelles: 1960, 1971, 1977, 1987, 1994, 1997; Sao Tome and
Principe: 1991; Swaziland: 1997; Togo: 1958, 1970; Tunisia: 1966, 1984,
1994; Tanzania: 1967, 1978; Uganda: 1969, 1991; South Africa: 1946,
1970, 1980, 1985; Zambia: 1980, 1990; Zimbabwe: 1982, 1992, 1997.

Settler colony

Dummy variable: 1 if share of Europeans in 1900 is more than 1 percent.

Source: Acemoglu et al. (2001) supplemented with data from *Hübners Geographisch-Statistische Tabellen aller Länder der Erde, 71. Ausgabe, 1932*.

Malaria

Share of 1995 population living in areas with malaria, 1946.

Source: Gallup et al. (1999).

British colony

Dummy variable: 1 if Britain was the colonial power during most of the period between 1885 and independence.

Railway (log)

Length of railway lines open in kilometres (average over decade) per land area in square kilometres.

Source: Mitchell (1982).

Enrolment ratio (log)

Primary school enrolment ratios 1870 to 1940.

Source: Benavot and Riddle (1988).

Ethnic fractionalization

Measure of ethnic fractionalization constructed as 1 minus Herfindahl-Index.

Source: Alesina et al. (2003).

Literacy

Defined as the proportion of the adult population aged 15 years and above which is literate, expressed as a percentage of the corresponding population (total or for a given sex) in a given country, territory, or geographic area, at a specific point in time, usually mid-year. For statistical purposes, a person is literate who can, with understanding, both read and write a short simple statement on their everyday life.

Source: Human Development Report 2009, United Nations.

Islam

Share of Muslim population.

Source: Parker (1997) as cited by Nunn (2008).

Population density (log)

People per square kilometres. Varying base years: 1920-1931.

Source: *Hübners Geographisch-Statistische Tabellen aller Länder der Erde, 71. Ausgabe, 1932*, a compilation of national statistical reports, including protectorates and colonies.

Pre-colonial state structure

Pre-colonial data on hierarchy beyond local community.

Ranked by complexity: 1=no level (no political authority beyond community), 2=one level (e.g., petty chiefdoms), 3= two levels (e.g. larger chiefdoms), 4= three levels (e.g. states), 5= four levels (e.g. large states).

Source: Müller (1999).

Pre-colonial settlement patterns

Pre-colonial data on settlement patterns of the indigenous population.

Ranked by complexity: 1= nomadic or fully migratory, 2= seminomadic, 3= semisedentary, 4= compact but impermanent settlements, 5= compact and relatively permanent settlements to complex settlements.

Source: Müller (1999).

Appendix

