

Blood, Education and Economic Development:

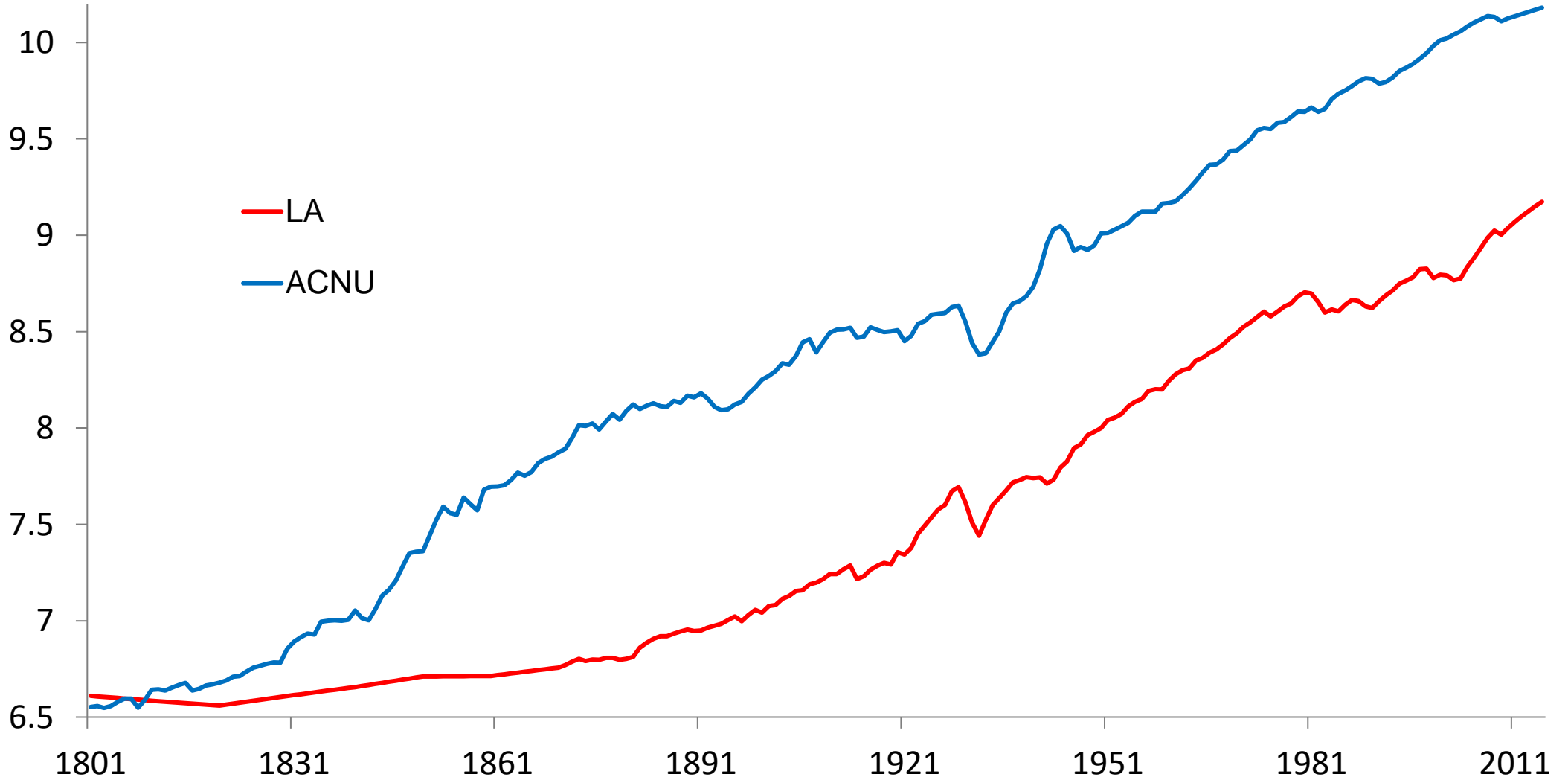
How the 19th Century Wars in Latin America Foiled its Economic Development

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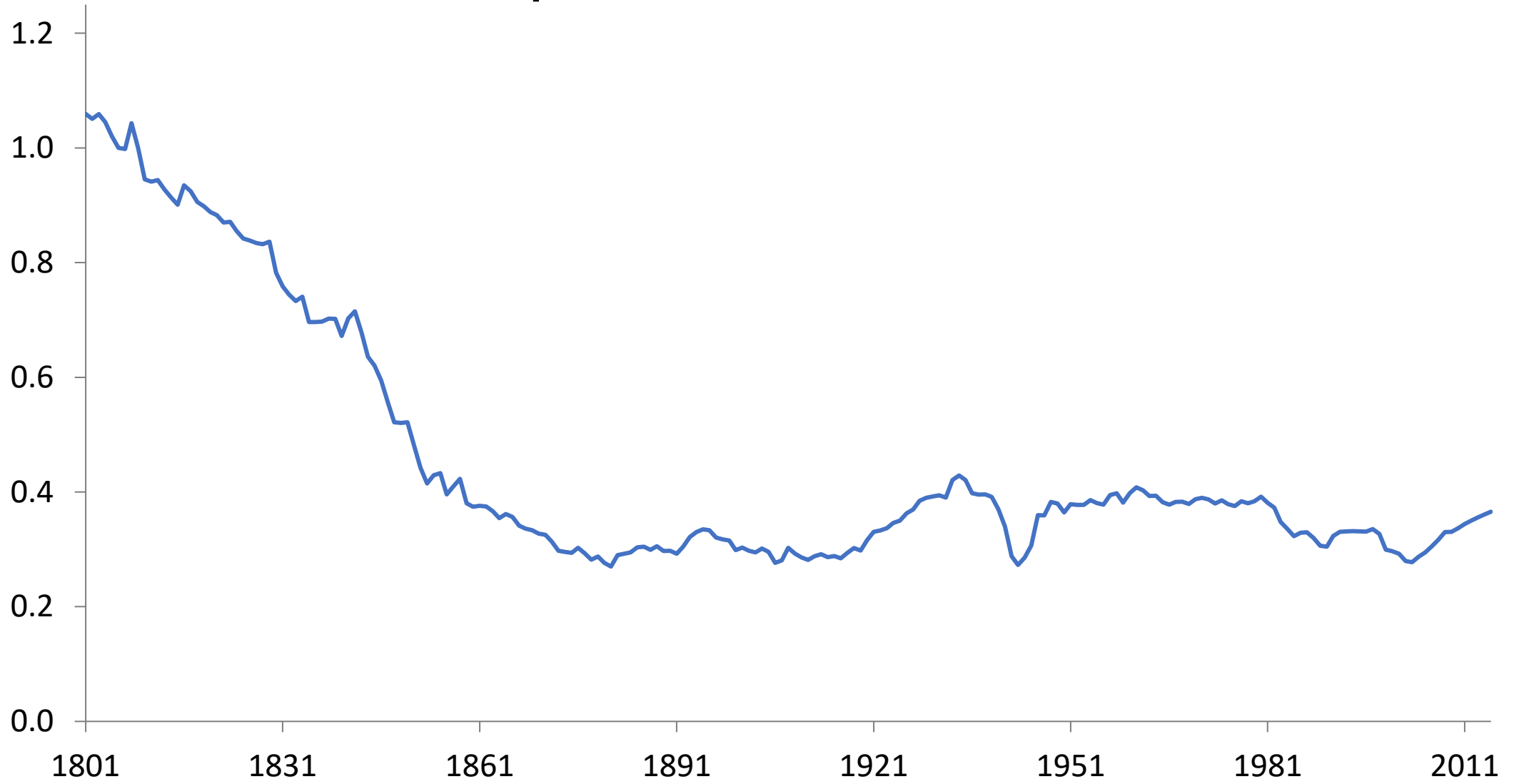
Per Capita Income, Logs



ACNU: Australia, Canada, NZ, USA

LA: Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Venezuela

Per Capita GDP, LA share of ACNU



Established Paradigm

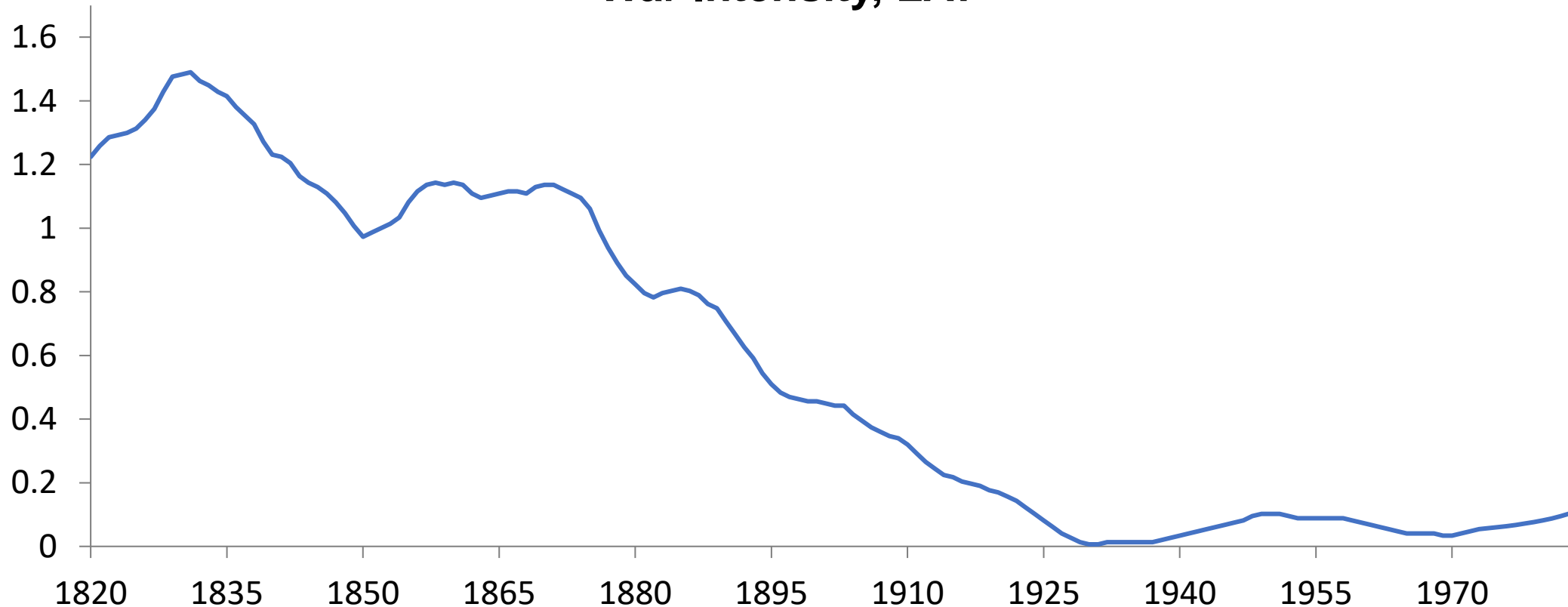
Bad **extractive institutions** left by the Iberian countries after independence around 1820 lead to:

- High and increasing inequality (Williamson: A myth)
- Low investment in education, R&D, and fixed capital
- Inward looking policies. (May rather have been a plus)

This Paper Hypothesizes

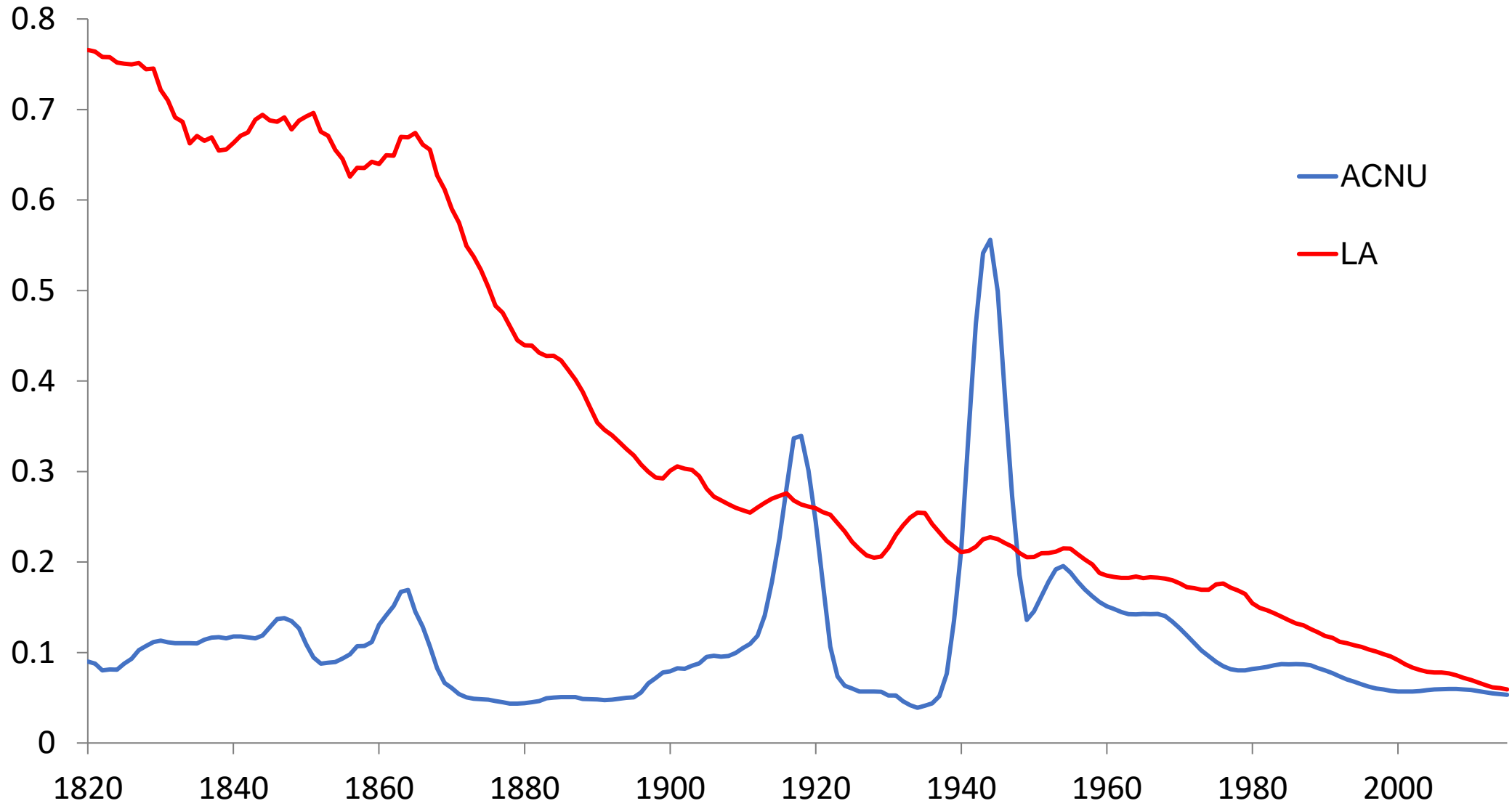
The post-independence **military campaigns** in the LA7 delayed the rise of mass education and R&D.

War Intensity, LA7



Notes: War intensity is the average number of major war engagements in LA7. 10-year centered moving average of the data is taken.
Source, Table 3.1, Centeno (1997).

Military Budget Share



Wars and Education

Besley and Persson (2010, *Econometrica*): Wars result in:

- 'Common-Interest State' with high investment in human capital.
(Europe post-1815)

OR

- 'Weak State' with low investment in human capital.
(Developing countries generally)

Thus far, the empirical focus has been on Europe.

Analytical Framework

We focus on education and innovations as the key determinants of growth.

Innovations

$$\dot{A} = \lambda \left(\frac{X}{Q} \right)^\sigma A^\phi \Rightarrow$$

$$g_A = \left(\frac{\dot{A}}{A} \right) = \lambda \left(\frac{R\&D}{Prod\ Variety} \right)^\sigma A^{\phi-1}$$

σ = duplication parameter (0 if all innovations are duplications and 1 if there are no duplicating innovations).

Incorporating military spending (MS) and educational attainment at secondary and tertiary levels (h^{ST}) yields and its interaction with the distance to the technology frontier (DTF):

$$\dot{A} = \lambda e^{\varphi \cdot h^{ST}} e^{\tau \cdot h^{ST} DTF} MS^\pi A^\phi.$$

We estimate a log-linear version of this model.

Education

Optimal years of education, S^* is given by:

$$S^* = T - \frac{1}{r-g} \ln \left[\frac{r^{Edu}}{r^{Edu} - \mu(r-g)} \right].$$

T = retirement age

g = productivity growth in steady state

μ = schooling tuition fees and the opportunity cost of student time.

r^{Edu} = returns to education

Note: S^* is independent of A because A affects the marginal cost and benefit of education equally.

Stochastic Models, for LA7 Countries, 1826-2015

$$\ln GER_{it}^X = \beta_0 + \beta_1 \ln MS_{it} + \beta_2 \ln e_{it}^{10} + \beta_3 \ln h_{it}^{Par} + \beta_4 \ln Inst_{it} + \gamma_t + \mu_i + \varepsilon_{1,it},$$

$$\ln Pat_{it} = \gamma_0 + \gamma_1 \ln MS_{it} + \gamma_2 \ln Pat_{it}^S + \gamma_3 h_{it}^{ST} + \gamma_4 DTF_{it} h_{it}^{ST} + \gamma_5 \ln Inst_{it} + \gamma_t + \mu_i + \varepsilon_{2,it}.$$

GER = Gross enrollment rates

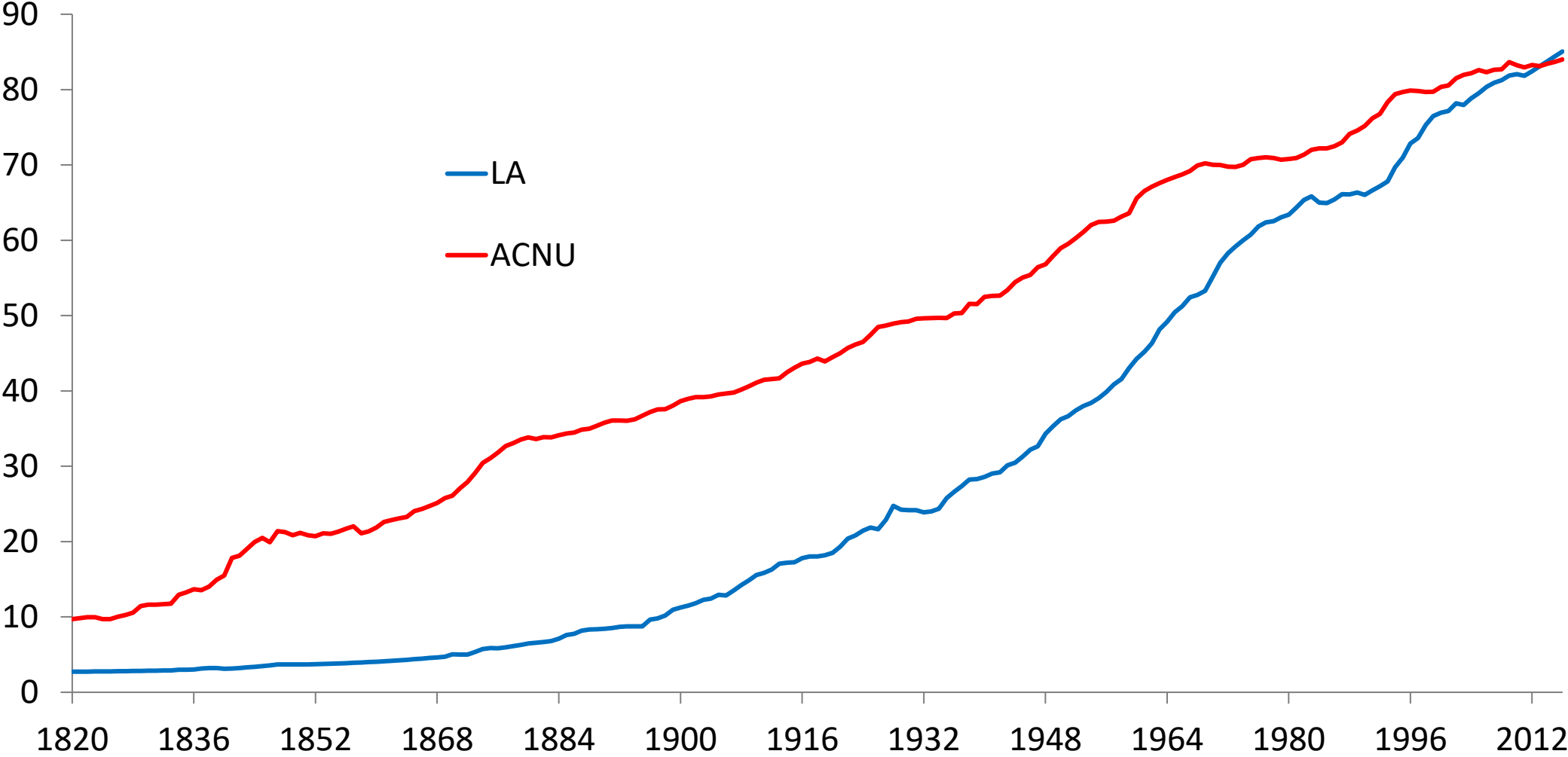
h_{it}^{Par} = Educational attainment of parents

Note that the models suggest slow adjustment towards SS.

Thus, estimating a reduced per capita income model is unlikely to capture the long-run effects of the military campaigns.

Graphical Presentation

GERs, LA7 and ACNU



Results

Education

VARIABLES	(1) OLS $\ln GER_{it}^P$	(2) OLS $\ln GER_{it}^S$	(3) OLS $\ln GER_{it}^T$
$\ln ME_{it}$	-0.12**	-0.28***	-0.12***
$\ln e_{it}^{10}$	0.54***	0.30***	0.35***
$\ln Parent_edu_{it}$	0.42***	0.17***	0.46***
$Institutions1_{it}$	0.07***	0.20***	0.01*

Patents

VARIABLES	(1) OLS Pat	(2) OLS Pat	(3) OLS Pat
$\ln MS_{it}$	-0.133*** (-5.232)	-0.1243** (-2.190)	-0.1912*** (-3.899)
$\ln Pat_{it}^S$	0.799*** (15.9)	0.540*** (14.7)	0.573*** (10.28)
$Skilled.edu_{it}$		0.347*** (3.866)	0.381*** (4.708)
$Skilled.edu_{it}DTF_{it}$		0.340*** (3.858)	0.426*** (3.274)
$Institutions1_{it}$		0.00450* (1.756)	0.00821** (2.331)

Discussion

The 37-percentage point (55%) reduction in the military budget share for our LA7 sample over the period 1866-1900 resulted in:

- A 29% increase in GERs by 29%
- A 39% increase in the patenting propensity

A 100% improvement in institutions in the year 1900 would have increased GERs (patent intensity) by 10% (5%).