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On Persistent Poverty in a Rich Country

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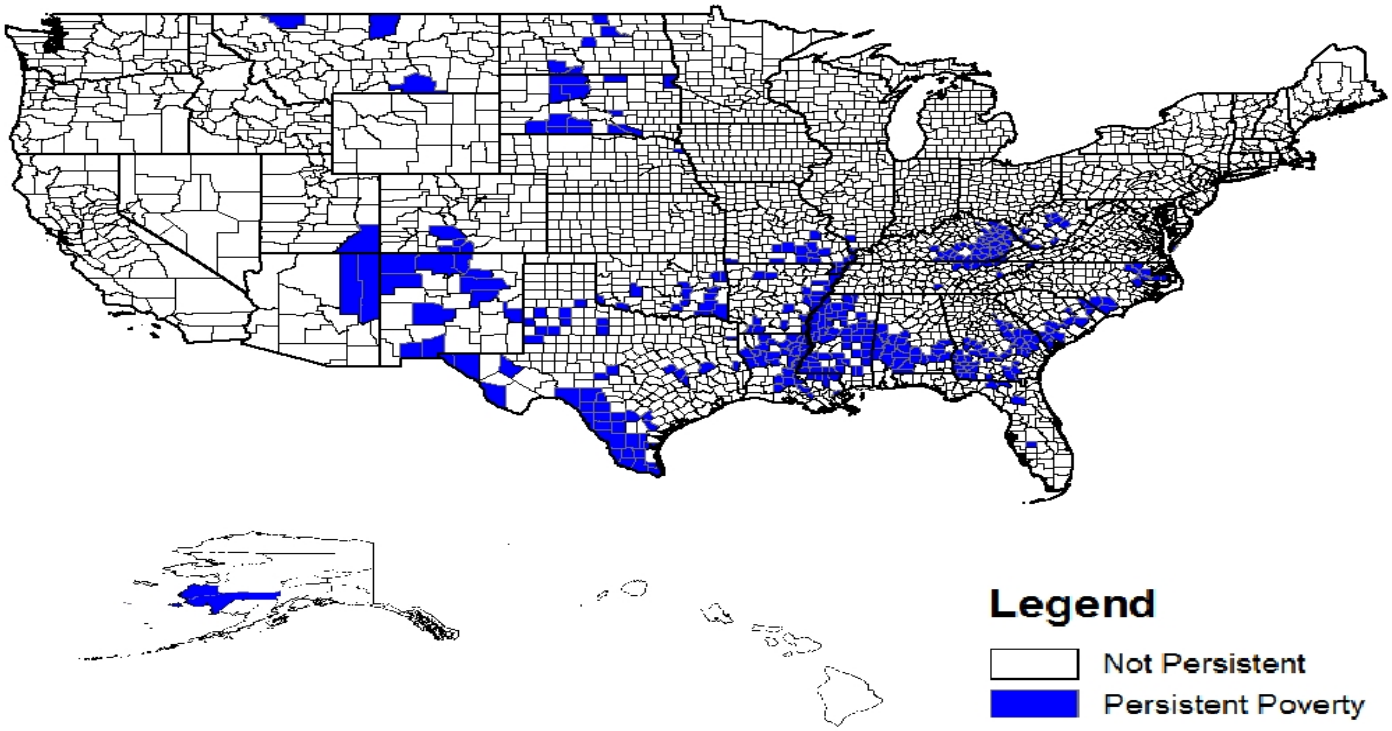
Background

- 1960- 2000: real income per capita in the U.S. grew 175% and poverty rates fell from 22% to 11%.

- In spite of this, poverty remains persistently high in some regions of the country.

Counties with Persistent Poverty

Figure 1: U.S. Counties with Persistent Poverty from 1959 - 1999



Our Questions

- Are persistently poor counties poor because they have lower levels of productive factors (physical and human capital, labor)?
- Because they use those factors less efficiently?
- Or do they have lower levels of initial productivity?
  - How well do historical data on culture, geography, and institutions explain modern differences in incomes?

Contemporaneous Data

- County-Level Data from 1960-2000 Censuses
  - Income per capita
  - Human Capital (% High School Graduates)
  - Physical Capital (Manufacturing Spending)
  - Labor Force Growth
  - Race
  - Urbanicity
  - Culture (% churched,% vote in Presidential elections)

Summary Statistics, 1960-2000

Variable	Not Poor	Persistently Poor
Per Capita Income ($2000)	12,496 (4,879)	8,558 (3.585)
Population	83,831 (275,896)	21,107 (39,192)
Fraction in Labor Force	0.425 (0.065)	0.352 (0.057)
Growth in Labor Force	0.158 (0.234)	0.037 (0.211)
Fraction High School Graduate	0.585 (0.189)	0.418 (0.173)
Capital Expenditure ($1000 per capita)	0.306 (0.554)	0.160 (0.590)
Fraction Living in Urban Area	0.367 (0.288)	0.217 (0.238)
Fraction Black	0.067 (0.114)	0.286 (0.254)
Fraction Churched	0.396 (0.180)	0.388 (0.183)
Fraction voted in Pres. Elections	0.597 (0.124)	0.523 (0.135)
Observations	10,830 (2166 Counties)	1.170 (234 Counties)

Historical Data

- County-Level Data from 1890-1900 Censuses
  - Institutions (Land tenure)
  - Geography (Temperature, Precipitation, Elevation)
  - Human Capital (Illiteracy, % Foreign Born)
  - Physical Capital (Manufacturing Spending)
  - Urbanicity
  - Culture (% Churched)

Summary Statistics, 1890-1900

Variable	Not Poor	Poor
Land Tenure in 1890	0.800 (0.115)	0.768 (0.145)
Share Churched in 1890	0.292 (0.120	0.308 (0.150)
Share Baptist in 1890	0.065 (0.081)	0.134 (0.097)
Share Calvinist in 1890	0.020 (0.022)	0.009 (0.016)
Share Catholic in 1890	0.058 (0.086)	0.035 (0.124)
Average Temperature	52.90 (7.417)	60.293 (6.181)
Average Precipitation	3.073 (0.918)	3.590 (0.746)
Std Dev of Elevation	0.090 (0.132)	0.065 (0.077)
Urban Share in 1890	0.127 (0.210)	0.026 (0.106)
Share Foreign Born in 1900	0.095 (0.103)	0.026 (0.076)
Illiteracy Rate in 1900	0.112 (0.135)	0.362 (0.221)
Historical Capital ($1000 per Capita)	0.400 (0.100)	0.082 (0.200)
Observations	2,166	234

Preliminaries

- How well do data from the dawn of the 20th century explain current persistent poverty?

- Linear probability model of persistent poverty
  - Dependent variable = 1 if persistently poor 1960-2000
  - Independent variables = historical variables

Illiteracy in 1900 Biggest Predictor of Persistent Poverty

Variables	(2)
Land Tenure in 1890	0.050 (0.054)
Average Temperature	-0.0002 (0.001)
Average Precipitation	-0.026 (0.007)
Std. Dev of Elevation	-0.029 (0.029)
Share Foreign-born in 1900	-0.048 (0.081)
Urban Share 1890	-0.052 (0.024)
Capital 1890	-2.845 (4.705)
Illiteracy Rate 1900	0.921 (0.064)
Church Share 1890	-0.181 (0.058)

Formal Model

- Specify a Solow growth model augmented with human capital ala Mankiw, Romer, and Weil (1992)
  - Under standard assumptions the derived model of income per capita is a function of investment in physical and human capital, population growth, technological progress and depreciation, initial income, and initial level of technology
  - Coefficient on initial income is used to infer “speed of convergence” toward steady-state growth

Empirical Representation

- Following Islam (1995), Durlauf, et al. (2005), the empirical model is

$$y_{it} = (1 + \beta) y_{it-1} + X_{it}\varphi + \varepsilon_{it}$$

- *y = log income per capita*
- *X = time-varying factors of production (capital, labor)*

$$\varepsilon_{it} = \mu_i + \delta_t + \xi_{it}$$

- *where μ_i is initial productivity*

Empirical Representation

- By construction y(t-1) is correlated with μ_i
- Standard to assume that *X* is also correlated with μ_i
- Following Hausman and Taylor (1981), we treat μ_i as a 'correlated random effect' and replace μ_i with

$$\mu_i = Z_i\theta + \psi_i$$

Estimating Equation

- Making the substitution

$$y_{it} = (1+\beta)y_{it-1} + X_{it}\varphi + Z_i\theta + \psi_i + \delta_t + \xi_{it}$$

- *y(t-1)*, *X* are predetermined and possibly correlated with ψ

- Identifying assumption is that *Z* (historical factors) is uncorrelated with ψ

Our Estimator

- Correlated random effects GMM estimator of Arellano and Bover (1995)
- Idea: “stack" moment conditions where first (T - 1) equations identified using first-differences transformation to estimate parameters on time-varying regressors (β and φ)
- Tth equation in levels identifies parameter on time-invariant (historical) regressors (θ).

Our Estimator

- Estimate model for whole sample, and separately for nonpoor and poor counties
  - Test for common production technology across counties (Wald test)

- Baseline instruments include (t-2)-(t-4) lags of *y*, (t-1)-(t-4) lags of *X*, and levels of *Z*

Poor-Nonpoor Decomposition

- Decompose income gap between persistently poor and non-poor counties into portions due to differences in factor endowments, and differences in production functions

$$\bar{\hat{y}}^P - \bar{\hat{y}}^N = \left(\bar{d}^P - \bar{d}^N\right)\hat{\Lambda} + \bar{d}^P\left(\hat{\Lambda}^P - \hat{\Lambda}\right) + \bar{d}^N\left(\hat{\Lambda} - \hat{\Lambda}^N\right)$$

Main Results—Current Factors

	(1)	(2)	(3)
Current Factors	Pooled Model	Persistently Poor	Non-Poor
Lag Income per Capita	0.365	0.361	0.355
	(0.023)	(0.064)	(0.023)
Fraction High School	0.822	1.159	0.809
	(0.065)	(0.252)	(0.063)
Capital Spending (per capita)	8.497	7.943	9.530
	(4.054)	(9.517)	(4.294)
Labor Force Growth	0.117	0.142	0.107
	(0.014)	(0.044)	(0.014)
Urban Share	0.333	0.031	0.349
	(0.042)	(0.113)	(0.043)
Black Share	0.603	0.353	0.385
	(0.109)	(0.383)	(0.097)
Fraction Churched	0.071	0.004	0.128
	(0.019)	(0.048)	(0.020)
Fraction Voted in Pres. Election	0.255	0.194	0.227
	(0.044)	(0.115)	(0.045)

Interpretation

- One % point increase in high school graduates leads to 8.2% increase in income levels.
- Urban share, labor force growth also positively correlated with income.
- Black share is positive, but becomes negative without human capital controls.

Main Results—Historical Factors

Historical Factors	Pooled Model	Persistently Poor	Non-Poor
Illiteracy Rate 1900	-0.457 (0.081)	-0.408 (0.255)	-0.152 (0.068)
Capital in 1890	0.014 (4.057)	-25.327 (45.576)	4.113 (3.888)
Proportion Foreign Born 1900	-0.075 (0.037)	0.228 (0.297)	-0.045 (0.037)
Urban Share 1890	-0.241 (0.038)	-0.076 (0.131)	-0.230 (0.038)
Proportion Churched 1890	0.041 (0.020)	-0.074 (0.107)	0.023 (0.021)
Land Tenure 1890	0.013 (0.028)	-0.058 (0.113)	-0.044 (0.027)
Standard Dev. to Area	0.197 (0.021)	0.324 (0.270)	0.179 (0.020)
Average Temperature 1895 (x100)	-0.105 (0.078)	0.206 (0.287)	-0.143 (0.076)
Average Precipitation 1895	0.036 (0.004)	0.052 (0.020)	0.027 (0.003)

Interpretation

- One % point decrease in 1900 illiteracy rate leads 4.5% increase in income levels.
- Historical geography measures matter, but culture and institution variables not so much.

Main Results, continued

	Pooled	Persistently-Poor	Non-Poor
Convergence Rate	0.1007	0.102	0.097
Wald Test of Equal Coef. (df., p-value)			245.73 [20, 0.000]

How Much of Income Gap is due to Differences in Factor Endowments versus How Utilize the Factors

Predicted Gap in Current Income	**-0.397**
Proportion Difference due to	
Factor Endowments	**0.791**
Coefficients	**0.209**
Of Factor Endowments Share, Proportion due to:	
Historical Factors	
Human Capital	**0.346**
Agglomeration	**-0.077**
Culture	**-0.002**
Institutions	**0.001**
Geography	**-0.018**
Capital	**0.00001**
Current Factors	
Lag Log Income	**0.479**
Human Capital	**0.453**
Capital	**0.004**
Labor Force Growth	**0.036**
Urban Share	**0.159**
Black Share	**-0.413**
Culture	**0.029**

Interpretation

- Out of the mean income differences: 21% due to differences in coefficients, 79% due to differences in endowments.

- Mostly due to differences in current factors, but historical human capital very important, explaining about 35% of the total income gap between poor and non-poor samples.

Interpretation

- Current and historical deficits in human capital explains 60% of overall income gap between persistently poor and non-poor counties.

Sensitivity Analysis

- Vary instrument set in several ways.
  - Treat current factors as endogenous
  - Use capital stock instead of current capital flow as a regressor
  - Use county-specific price deflator created using median rent

Sensitivity Analysis

- Vary definition of poor (or non-poor):
  - only non-urban, non-poor counties as comparison;
  - Drop all counties west of the Mississippi
  - poor if poverty rate over 20% in 3 of 5 Census years;
  - poor if poverty rate over 30% in each Census year.

Concluding Remarks

- Significant differences in production functions between persistently poor and non-poor, but decomposition indicates at least 75% of income gap explained by factors of production.

- Much of the difference is explained by contemporaneous factors: recent income, human capital, urban share. Geography, culture, and institutions less important.

Concluding Remarks

- Combined contribution of historical and contemporary human capital is very large, explaining almost 60% of overall income gap between persistently poor and non-poor.

- Urbanicity also matters, explaining over 15% of income gap in most specifications.

Concluding Remarks

- Human capital shortfalls can be addressed
  - early childhood programs
  - improved (high) school quality
  - access to higher education

- Urbanicity more challenging
  - A role for place-based policy?
  - Federal or local?