Inequality in Landownership, the Emergence of Human Capital Promoting Institutions and the Great Divergence

Oded Galor, Omer Moav and Dietrich Vollrath

Inequality and Sources of Under-Investment in Human Capital Formation

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  - Income inequality (in the presence of CMI) $\Longrightarrow$ Limits the financial ability of segments of society to optimally invest in education
  - Inequality in Landownership $\Longrightarrow$ Delays the implementation of human capital promoting institution (e.g., public education)

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- Complementarity between [human capital & land] $<$ Complementarity between [human & physical capita]
    - Capitalists, who were striving for an educated labor force, supported policies that promoted the education of the masses (Galor and Moav (RES, 2006))
    - Landowners, whose interests lay in the reduction of the mobility of the rural labor force, favored policies that deprived the masses from education (Galor, Moav and Vollrath (RES, 2009))

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    - Industrialization: Conflict between the entrenched landed elite and the emerging capitalist elite

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- Delayed the implementation of human capital promoting institutions
- Generated a sub-optimal level of investment in human capital
- Lowered the skill intensity of the industrial sector
- Slowed pace of economic development

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Demand for labor and land

$$\begin{aligned} w_t^A &= F_L(X_t, L_t) \\ \rho_t &= F_X(X_t, L_t) \end{aligned}$$

- w_t^A - wage per worker
- ρ_t - rental rate on land

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Demand for physical and human capital:

$$\begin{aligned} R_t &= \alpha k_t^{\alpha-1} \equiv R(k_t) \\ w_t^M &= (1-\alpha) k_t^\alpha \equiv w^M(k_t) \end{aligned} \qquad k_t \equiv K_t / H_t$$

- R_t - return to physical capital
- w_t^M - wage per unit of human capital

Wages

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Labor is mobile across sectors:

$$w^A_{t+1} = h_{t+1} w^M_{t+1} \equiv w_{t+1}$$

- w^M_{t+1} - wage per efficiency unit of labor in M
- w^A_{t+1} - wage per worker in A
- w_{t+1} - equilibrium wage per worker in the economy

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    - Endowments of: land & capital

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  - Allocate income between:
    - Consumption & Transfers to offspring
    - Transfer land to offspring

Individual i in period t: Income

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$$I_{t+1}^{i} = w_{t+1} + [(1 - \tau_t) b_t^i] R_{t+1} + x^i \rho_{t+1}$$

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- $\tau_t \equiv$ tax rate on initial capital inheritance

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- Optimization: Intergenerational transfers

$$b_{t+1}^i = \beta I_{t+1}^i$$

Physical Capital Accumulation

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The capital stock in period $t+1$

$$K_{t+1} = (1-\tau_t)\beta y_t$$

$\beta y_t \equiv$ Aggregate intergenerational transfers

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- Education expenditure in period t

$$e_t = \tau_t \beta y_t$$

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- The level of expenditure on public schooling (and hence the level of taxation) that maximizes aggregate output is optimal from the viewpoint of all individuals except for landowners who own a large fraction of the land in the economy

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- Optimal capital transfer to offspring

$$b_{t+1}^L = \beta I_{t+1}^L \equiv b^L(y_t, b_t^L, \tau_t; X/\lambda)$$

The Emergence of Public Education

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Lemma

(i) There exists a critical level of the aggregate capital holdings of all young landowner, $\hat{B}_t^L$, above which their income under the efficient tax policy τ_t^* is higher than under $\tau_t = 0$, and the economy switches to τ_t^*

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$$\hat{B}_t^L \equiv \hat{B}^L(y_t; X, \lambda).$$

(ii) $\hat{B}_t^L$ *increases with the degree of land inequality in the economy, i.e.,*

$$\partial \hat{B}^L(y_t; X, \lambda)/\partial \lambda < 0;$$

The Process of Development

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The evolution of output per capita

$$y_{t+1} = \begin{cases} \psi^0(y_t) & \text{for} \quad t < \hat{t} \\ \psi^*(y_t) & \text{for} \quad t \geq \hat{t} \end{cases}$$

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$\hat{t} \equiv$ time the switch to the efficient tax rate regime occurs:

$$t \geq \hat{t} \quad \Leftrightarrow \quad B_t^L \geq \hat{B}_t$$

The Process of Development: Overtaking

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  - Unequal distribution of wealth induce the elite to block reforms that may lead to redistribution (ES)

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    - distribution of political power changes (ES, AJR)
    - inequality significantly diminishes
    - reforms diminish instability and the risk of revolution (Marx) (extension of the franchise is a commitment device to ensure future redistribution from the elite to the masses (Acemoglu and Robinson (2000)))

Voting Rights and School Enrolment: England 1820-1925

Workers gain majority in the ballots only in 1883 and hence, unlike AR (2000), education reforms cannot be viewed as an outcome of the extension of the franchise that permits workers to redistribute resources to themselves

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- Land reforms diminish the economic incentives of landowners to block education reforms
  - The feasibility of land reforms is indicative of the political weakness of the landed aristocracy that prevents them from blocking growth enhancing education reforms

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- North vs. South Mexico (After the Revolution of 1910)
- Argentina, Chile & Uruguay vs. rest of South American
- Costa Rica vs. Honduras & El Salvador (small vs. large plantations)

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  - Education as % of GNP: 8% (1948), 15% (1960)
  - Years of Schooling 3 (1948), 6 (1960)
  - GDP/GDP_{US} : 8% (1948), 12% (1960)

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- Education Reforms: 1872, 1879, 1886
  - % of 6-14 in schools: 28% (1873), 51% (1883), 94% (1903)

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  - Large landowners: 40% (1860), 17% (1917)
- Education Reforms: 1908-1912
  - % government's budget devoted to education: 1.4% (1906) 4.9% (1915)
  - % of the population in schools: 1.7% (1897) 5.7% (1915)

Evidence: The High School Movement

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- Graduation rates:

	South	Midwest	Northeast	West	US
1910	3%	11%	10%	11%	5%
1950	39%	58%	56%	61%	57%

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- Changes in the concentration of land ownership

	South	Midwest	Northeast	West
1980	20%	20%	20%	20%
1900	12%	16%	22%	9%
1920	8%	13%	24%	6%

Hypothesis and Identification Strategy

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- Identification Strategy
  - Exploit variations in distribution of land ownership and in education expenditures across and within states during the high school movement in the US, controlling for state fixed effects

The Statistical Model

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$$\ln e_{it} = \beta_0 + \beta_1 S_{i,t-1} + \beta_2 \ln y_{i,t-1} + \beta_3 U_{i,t-1} + \beta_4 B_{i,t-1} + v_{it}$$

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- e_{it} - Expenditure per child in state i in period t
- $S_{i,t-1}$ - Share of land held by large landowners
- $U_{i,t-1}$ - percentage of the urban population
- $B_{i,t-1}$ - percentage of the black population
- v_{it} - error term of state i in period t

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Hypothesis: $\beta_1 < 0$

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The specification allows for unobserved heterogeneity between states:

- (a) Time invariant unobserved heterogeneity across states in the level of log expenditure per child
  - η_i - time invariant level of log expenditure per child in state i

The Statistical Model: Unobserved Heterogeneity

$$v_{it} = \eta_i + \delta_t + \theta_i t + \varepsilon_{it}$$

The specification allows for unobserved heterogeneity between states:

- (a) Time invariant unobserved heterogeneity across states in the level of log expenditure per child
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- (b) Linear unobserved heterogeneity across states in the time trend of log expenditure per child
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- (c) Common time trend δ_t

Estimating Strategy

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- Heterogeneity across state in the level of log expenditure per child: Accounted for by estimating the difference equation

$$\begin{aligned} \Delta \ln e_{it} &= \beta_1 \Delta S_{i,t-1} + \beta_2 \Delta \ln y_{i,t-1} + \beta_3 \Delta U_{i,t-1} + \beta_4 \Delta B_{i,t-1} \\ &\quad + \Delta \delta_{t-1} + \theta_i + \Delta \varepsilon_{it} \end{aligned}$$

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  - $\Delta \ln e_{it} \equiv \ln e_{it+1} - \ln e_{it}$ (1920 vs. 1900 & 1940 vs.1920)
  - $\Delta S_{i,t-1} \equiv S_{i,t} - S_{i,t-1}$ (1900 vs. 1880 & 1920 vs.1900)

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  - $\{(t-1,\ t)\} = \{(1880, 1900), (1900, 1920), (1920, 1940)\}$

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  - $\{(t-1,\ t)\} = \{(1880, 1900), (1900, 1920), (1920, 1940)\}$
- Total observations: 79
  - 41 states (2 observations for 38 states & 1 observation for 3 states)

Land Inequality and Education Expenditure

Controls

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- Income per capita

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  - Capturing urbanization's contrasting effects on education expenditure:

    (i) Negative (economies of scale in education)

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  - Capturing urbanization's contrasting effects on education expenditure:
    - (i) Negative (economies of scale in education)
    - (ii) Positive (industrial (urban) demand for education)
- Percentage of the black population
  - Capturing the adverse effect of the discrimination in the South (where land inequality is more pronounced) on educational expenditure

Effect of Land Concentration on Educational Expenditure

Change in log educational expend per child $(\Delta \ln e_{it})$

	OLS	OLS	OLS	OLS	OLS	OLS
	(1)	(2)	(3)	(4)	(5)	(6)
Change in land concentration	-2.71***	-2.67***	-2.16***	-2.12***	-2.34***	-3.68*
$(\Delta S_{i,t-1})$	(0.99)	(0.86)	(0.75)	(0.78)	(0.80)	(2.17)
change in income per capita		0.84***	0.72***	0.72***	0.72***	0.71*
$(\Delta \ln y_{i,t-1})$		(0.15)	(0.13)	(0.13)	(0.17)	(0.41)
change in % of the black pop.			-3.74***	-3.78***	-2.90***	-5.13**
$(\Delta B_{i,t-1})$			(0.59)	(0.73)	(0.96)	(2.17)
change in % of the urban pop.				-0.05	-0.66*	-0.12
$(\Delta U_{i,t-1})$				(0.32)	(0.40)	(0.69)
National time fixed effects	No	No	No	No	Yes	No
State fixed effects (linear time trend)	No	No	No	No	No	Yes
Observations	79	79	79	79	79	79
R-squared	0.11	0.27	0.39	0.39	0.48	0.38
Hausman Statistic						2·16
Hausman p-value						0.71

Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Interpretation

- A 10 percentage point decline in Si,t-1 would have increased expenditure per child at the following period by 21–27%

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- In 1920 California S1920 $=$ 0.096 (25th percentile of the distribution of S across states in the U.S.) and in Vermont S1920 $=$ 0.215 (75th percentile). Vermont's expenditure per child in 1920 would have been 25% higher if it had a land share of large farms as small as California's. That difference would have eliminated more than a $1/3$ of the actual gap in expenditure per child that existed between California ($68 per child) and Vermont ($41 per child) in 1940

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- In regions that were climatically more receptive to cotton production, the concentration of land ownership held by the largest farms declined
- In 29 states that produced no cotton in 1860 the average change in land concentration was just -0.2% over period 1880-1940
- Among states that produced some cotton in 1860, the average change in the land concentration of the largest landowners was -2.6%
- Cotton production was most prevalent in the South, accounting for over 40% of the value of agricultural production & Land ownership by the largest farms declined

Instrumental Variable

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- These instruments appear to satisfy the exclusion restriction, since there is no evidence that the human capital intensity in the production of cotton over this period differs from the average in all other agricultural crops, and changes in the relative price of cotton, therefore, would not have a direct effect on education expenditure, but only indirectly through their effect on concentration of landownership, and possibly via changes in income, that are controlled for in the regressions

Instrumental Variable Regression

Change in log educational expend per child $(\Delta \ln e_{it})$

	OLS	2SLS
	(1)	(2)
Change in land concentration	-2.34***	-3.23***
$(\Delta S_{i,t-1})$	(0.80)	(0.91)
change in income per capita	0.72***	0.72***
$(\Delta \ln y_{i,t-1})$	(0.17)	(0.17)
change in % of the black pop.	-2.90***	-2.58***
$(\Delta B_{i,t-1})$	(0.96)	(0.92)
change in % of the urban pop.	-0.66*	-0.51
$(\Delta U_{i,t-1})$	(0.40)	(0.37)
National time fixed effects	Yes	Yes
Observations	79	79
R-squared	0.48	
First stage F-statistic		13.49
First stage p-value		<0.001
Sargan test statistic		1.20
Sargan test p-value		0.27

Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

References

References

Main Source:

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- Galor, Oded and Omer Moav, and Dietrich Vollrath, 2009, "Inequality in Landownership, Human Capital Promoting Institutions and the Great Divergence" Review of Economic Studies, 76(1), 143-179.

Related Papers:

- Galor, Oded and Omer Moav, 2004, "From Physical to Human Capital Accumulation: Inequality and the Process of Development," Review of Economic Studies, 71(4), 1001-1026.