The Sir Richard Stone Lectures:
Growth and Distribution, 2

by

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Key Propositions

1. The poor: They are out there, and they are truly wretched.
2. Growth is good—for everyone, and especially for the poor.
3. To aid the poor, whether growth raises or lowers inequality is second-order. Similarly, whether inequality within society helps or hinders economic growth.
4. There isn't a question of growth and a question of distribution: Growth and distribution are functionally the same. There is only ONE question.

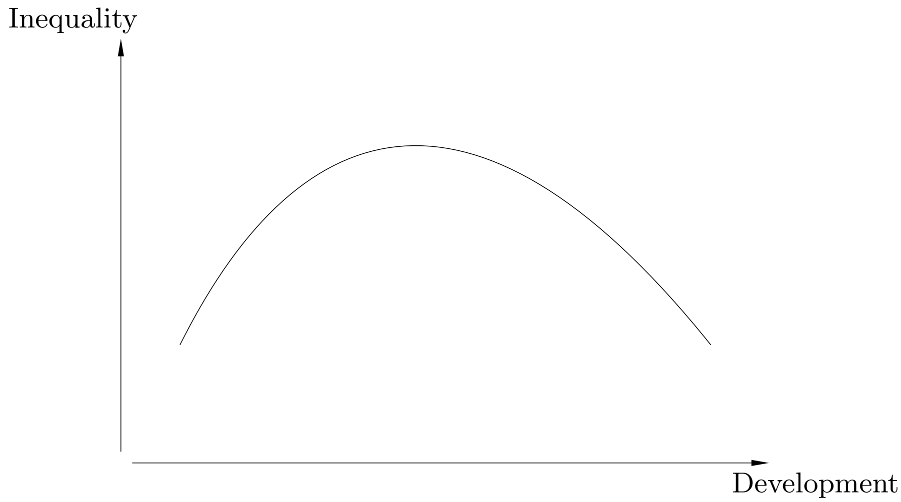


Fig.: The Kuznets curve, stylized

OUTLINE

1. Why inequality matters
2. Why, ultimately, inequality matters not
   (a) Aggregate growth
   (b) Inequalities
   (c) . . . together
   (d) The very poor
3. **HOW** Causality: Globalization, Technology, Aid

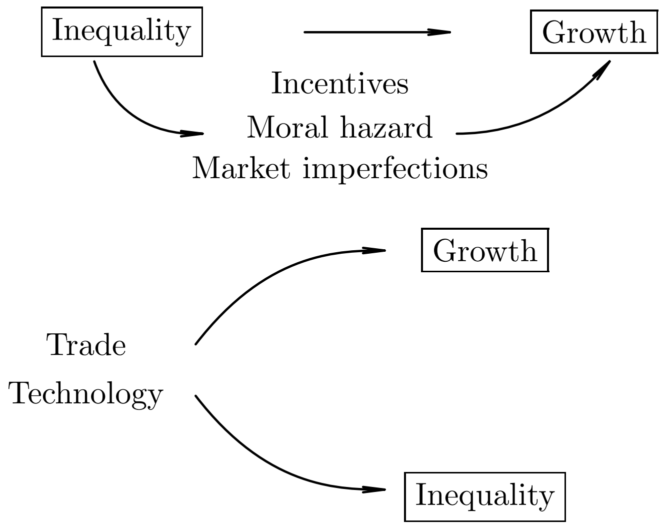
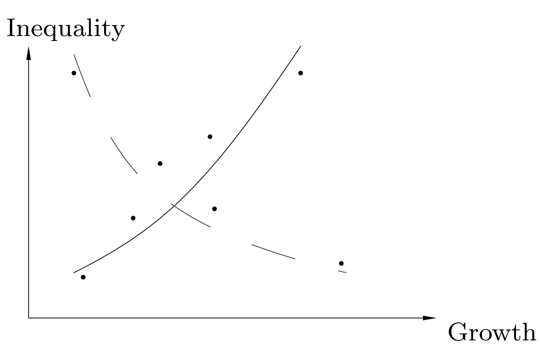


Fig.: Growth and Distribution/Inequality — Mechanism

1 MODEL



Traditional perspective

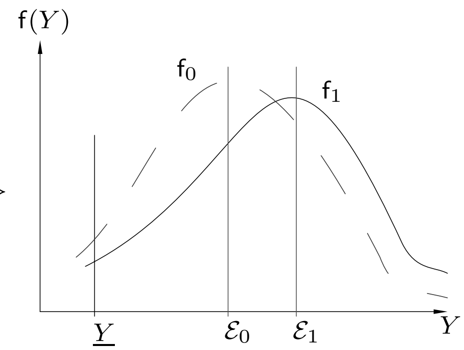
Fig. 1: Inequality and growth Does one systematically co-move with the other? Does one cause the other?

$$\frac{\dot{\mathcal{E}}}{\mathcal{E}} = \phi(\mathcal{I})? \quad \ldots \text{ or } \left(\mathcal{I}\right) = \psi\left(\dot{\mathcal{E}}/\mathcal{E}\right)?$$

By contrast

$$\mathsf{F} \Longrightarrow \mathcal{E}, \mathcal{I}, \ldots \Longrightarrow \frac{\dot{\mathcal{E}}}{\mathcal{E}} \quad \text{and} \quad Z \stackrel{\text{def}}{=} \left(\dot{\mathcal{E}}/\mathcal{E} \quad \mathcal{I}' \quad Z_0' \right)'$$

$$\{Z(t) : t \geq 0\} \quad \Longleftrightarrow$$



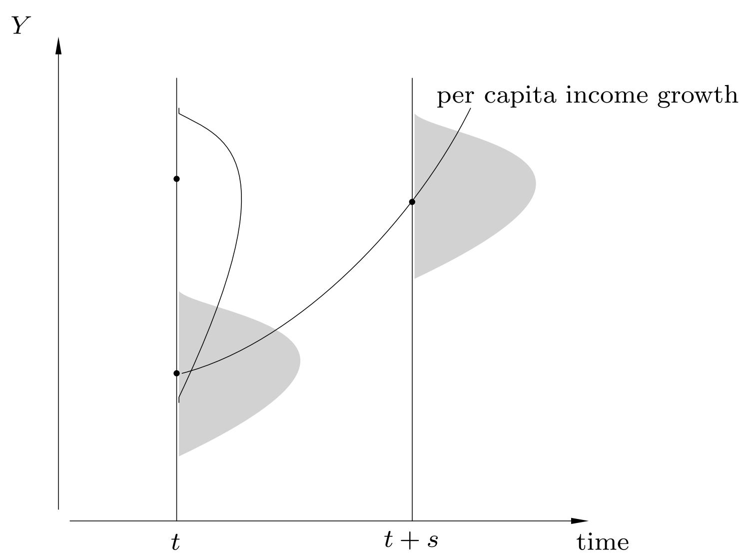


Fig.: Growth and inequality as uncertainty

2 Interview with Andrea — Inequality matters

Representative person on earth:

$$\boxed{E_0 \sum_{t=0}^{\infty} \beta^t U(c_{jt}), \quad \beta \in (0,1)}$$

$$\boxed{U(c) = \frac{c^{1-\rho} - 1}{1-\rho}, \quad \rho \geq 1}$$

$$\boxed{c_{jt} = \Gamma_j \times g^t \times \epsilon_{jt}}$$

$$\boxed{\Gamma_j > 0,\ g > 0}$$

$$\log \epsilon_{jt} = (1-\lambda_j)(-\theta_j/2) + \lambda_j \log \epsilon_{j,t-1} + \eta_{jt}$$

$$|\lambda_j| \leq 1,\ \eta_{\cdot t} \sim \text{iid } \mathsf{N}(0, \sigma_{\cdot}^2)$$

$$\theta_j = (1-\lambda_j^2)^{-1}\sigma_j^2 > 0$$

$$\boxed{\implies \epsilon \sim \text{log normal},\ E\,\epsilon = 1,\ \text{Var}\,\epsilon = e^{\theta_j - 1},\ \text{persistence } \lambda_j}$$

Experiments: $\implies \Gamma$

1. Fix $(\lambda = 0, \theta)$; $g \uparrow\downarrow$
2. Fix $(\lambda = 0, g)$; $\text{Var}\,\epsilon \uparrow\downarrow$
3. Fix (g, θ); $\lambda \uparrow\downarrow$

$\bar{g} = 1.02$	Compensating percent change in Γ	
g	$\beta = 0.95$	$\beta = 0.98$
1.005	32/25/16/9	107/58/24/12
1.01	21/16/9/5	62/32/13/6
1.03	-17/-12/-6/-3	-38/-19/-8/-4
1.04	-31/-21/-10/-5	-61/-32/-13/-6
1.05	-42/-28/-14/-7	-76/-41/-16/-8
1.06	-52/-34/-16/-8	-85/-48/-19/-9
1.07	-60/-39/-18/-9	-90/-53/-22/-10

Table 1: **Growth matters.** Var $\epsilon = 0$, $\rho = 1/2/5/10$: For small rises in underlying growth rates, people will sacrifice relatively large cuts in consumption levels

		Compensating percent change in Γ			
ρ	$\text{Var}^{1/2}\epsilon \times$	1	2	4	10
1		-0.008	-0.034	-0.135	-0.834
2		-0.017	-0.068	-0.270	-1.662
5		-0.042	-0.169	-0.673	-4.103
10		-0.084	-0.337	-1.341	-8.038
20		-0.169	-0.674	-2.664	-15.430

Table 2: **Distribution doesn't matter?** For significant reductions in underlying uncertainty, people will sacrifice only insignificant cuts in consumption levels

Persistence and mobility matter

$$\lambda \nearrow 1 \implies \Gamma/\bar{\Gamma} - 1 \to \boxed{\epsilon^{-1} - 1}, \text{ i.e., proportionally 1-1}$$

$$\lambda \searrow -1 \implies \Gamma/\bar{\Gamma} - 1 \to \boxed{\left[\frac{1 + \beta g^{1-\rho} e^{-\theta} \epsilon^{(\rho-1)2}}{1 + \beta g^{1-\rho}}\right]^{\frac{1}{\rho-1}} \epsilon^{-1} - 1}$$

It is the dynamics that are critical.

3 Dynamic empirical regularities — Ultimately, inequality doesn't matter

1. Supertankers adrift and grass growing
2. Inequality can dramatically differ across societies . . .
3. . . . but over time it hardly ever changes by much
4. Aggregate growth rates vary — all over the map

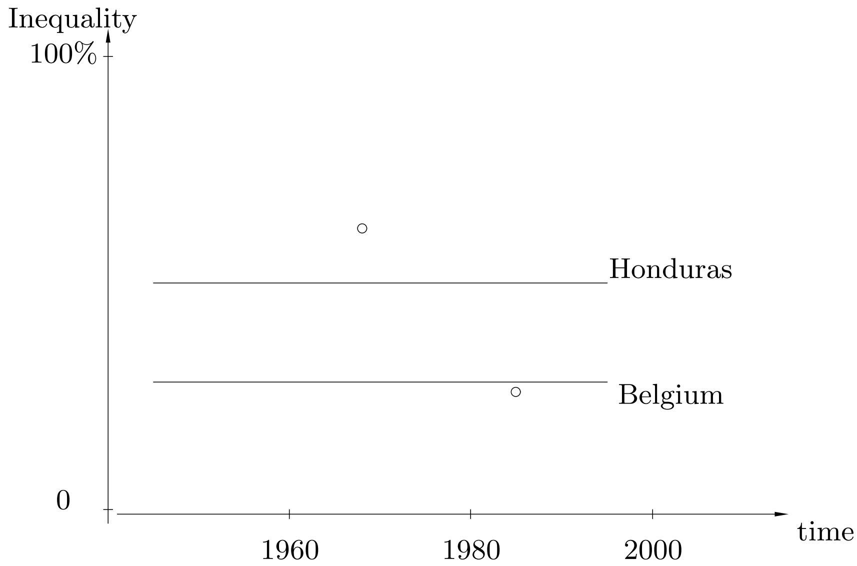


Fig.: Inequality through time and across societies. Maximum and minimum, Honduras and Belgium

	Variance decomposition (%)	
	Across countries	Over time
(575) Gini coeff. $\mathcal{I}_G$	91.2	8.8
(1750) Per capita $\mathcal{E}$	72.8	27.2
(1732) Growth $\dot{\mathcal{E}}/\mathcal{E}$	8.6	91.4
(1702) Smoothed [5 yr.] $\dot{\mathcal{E}}/\mathcal{E}$	22.1	77.9
(1750) Population P	95.2	4.8

Table 3: Cross-country dynamics in inequality and growth

Per capita income in national economies	times world per capita income: 1960–64	times world per capita income: 1985–89
10th %-ile	0.22 ×	0.15 ×
	(26.0% world popn.)	(3.3% world popn.)
90th %-ile	2.70 ×	3.08 ×
	(12.5% world popn.)	(9.3% world popn.)
(25th-15th) %-iles	0.13 ×	0.06 ×
(95th-85th) %-iles	0.98 ×	0.59 ×

Table 4: Cross-country distribution dynamics in per capita incomes

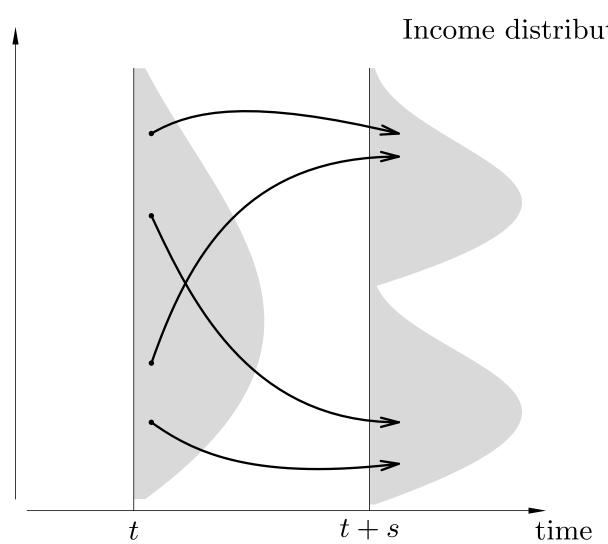


Fig.: Countries in the world, emerging twin peaks. Arrows show country per capita incomes transiting across different parts of the cross-section distribution

Fig.: People within countries in the world. Distribution dynamics within the emerging twin-peaks law

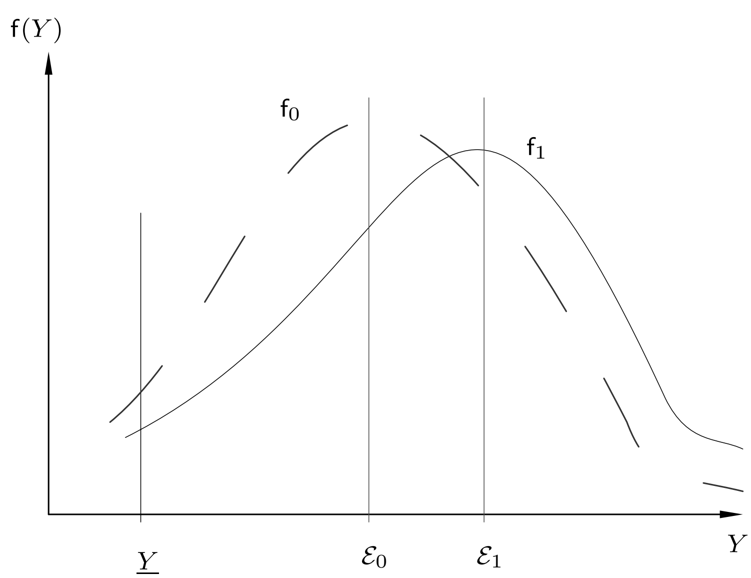


Fig.: Income distribution dynamics. Growth, inequality, and poverty

Example

$$\mathsf{F}(y) = 1 - (\theta_1 y^{-1})^{\theta_2}, \quad \theta_1 > 0,\ y \geq \theta_1,\ \theta_2 > 1,$$

Then

$$\mathcal{E} \stackrel{\text{def}}{=} \int_{-\infty}^{\infty} y\, d\mathsf{F}(y) = (\theta_2 - 1)^{-1}\theta_2\theta_1,$$

$$\mathcal{I}_G \stackrel{\text{def}}{=} \left[2^{-1}\mathcal{E}(\mathsf{F})\right]^{-1} \int_{-\infty}^{\infty} \left(\mathsf{F}(y) - \frac{1}{2}\right) y\, d\mathsf{F}(y) = (2\theta_2 - 1)^{-1},$$

$$\implies \hat{\theta}_2 = (1 + \mathcal{I}_G{}^{-1})/2,$$
$$\hat{\theta}_1 = (1 - \hat{\theta}_2^{-1})\mathcal{E}.$$

Estimation: From (hyper-)parametrized F_θ and P, induce functionals $\mathbf{T}(\mathsf{F}_\theta, P)$. Then match to observations:

$$\hat{\theta}_t \stackrel{\text{def}}{=} \arg\min_{\theta \in \mathbb{R}^p}\ Q_{X_t}(\theta)$$
$$= \arg\min_{\theta \in \mathbb{R}^p}\ (\mathbf{T}(\mathsf{F}_\theta, P_t) - X_t)'\, \Omega\, (\mathbf{T}(\mathsf{F}_\theta, P_t) - X_t)\,,$$

Ω $d \times d$ positive definite

Limit distribution for inference from:

$$\hat{\theta}_t - \theta_{t,0} = -\left(\left.\frac{d^2 Q}{d\theta d\theta'}\right|_{\theta_{t,0}}\right)^{-1} \left.\frac{dQ}{d\theta}\right|_{\theta_{t,0}}$$

If the world were just China and India:

1. Faster-growing countries have inequality rise more ...
2. ... but despite this, the world's poor benefited:
   - Half a billion, out of 1.6–1.9 billion people, exited poverty
   - Smooth increase across all parts of the distribution
3. World inequality

	Per capita incomes (US$)			Population ($\times 10^6$)	
	1980	1992	$\dot{\mathcal{E}}/\mathcal{E}$	1980	1992
China	972	1493	3.58%	981	1162
India	882	1282	3.12%	687	884
US	15295	17945	1.33%	228	255

	Gini coefficient $\mathcal{I}_G$		
	1980	1992	Min. (year)
China	0.32	0.38	0.26 (1984)
India	0.32	0.32	0.30 (1990)
US	0.35	0.38	0.35 (1982)

Consequences:

	$\underline{Y}=2;\ HC_{\underline{Y}}\ (P_{\underline{Y}}, 10^6)$	
	1980	1992
China	0.37–0.54 (360–530)	0.14–0.17 (158–192)
India	0.48–0.62 (326–426)	0.12–0.19 (110–166)

From 1980 perspective:

	$\mathcal{I}_G$, P constant: $-\dot{P}_{\underline{Y}}$	$HC_{\underline{Y}}$ constant: $\dot{\mathcal{I}}_G/\mathcal{I}_G$
China	33m/year	8.3%/year
India	17m/year	8.8%/year

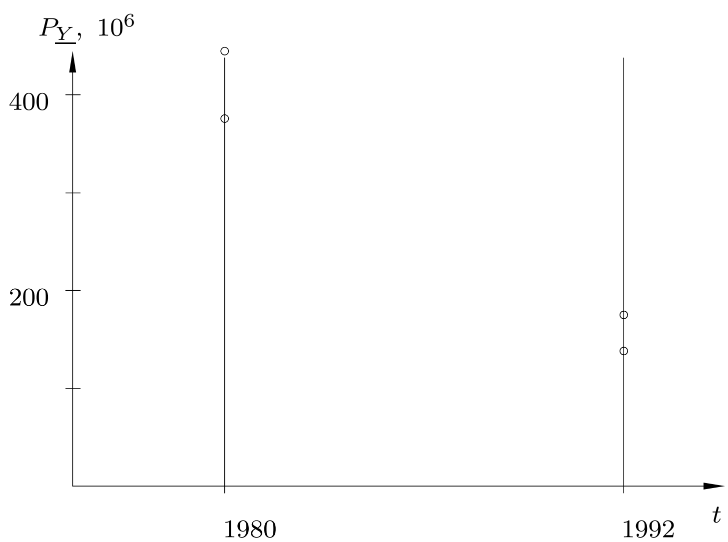


Fig.: China and India. $2-poverty reduction

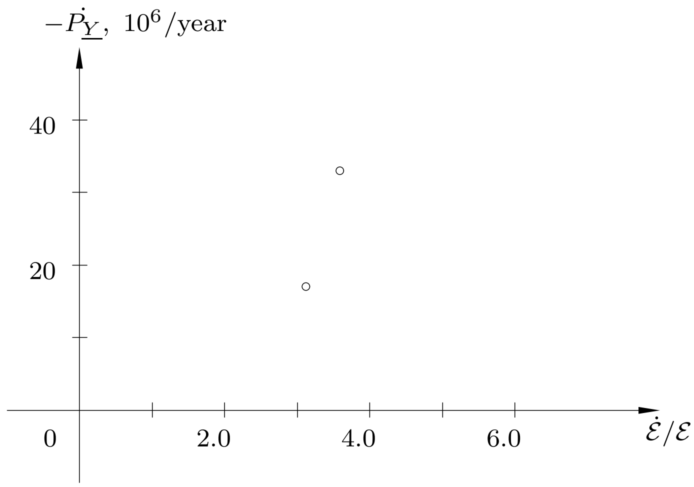


Fig.: China and India. Annual rate of \$2-poverty reduction from growth alone

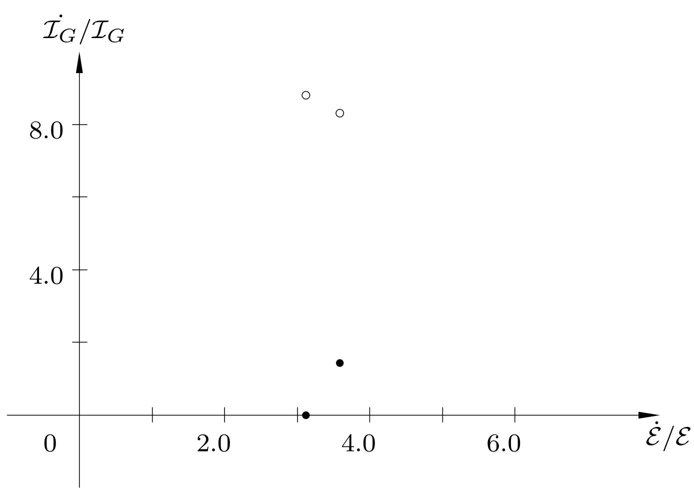


Fig.: China and India. Inequality increases needed to nullify growth, relative to actual increases

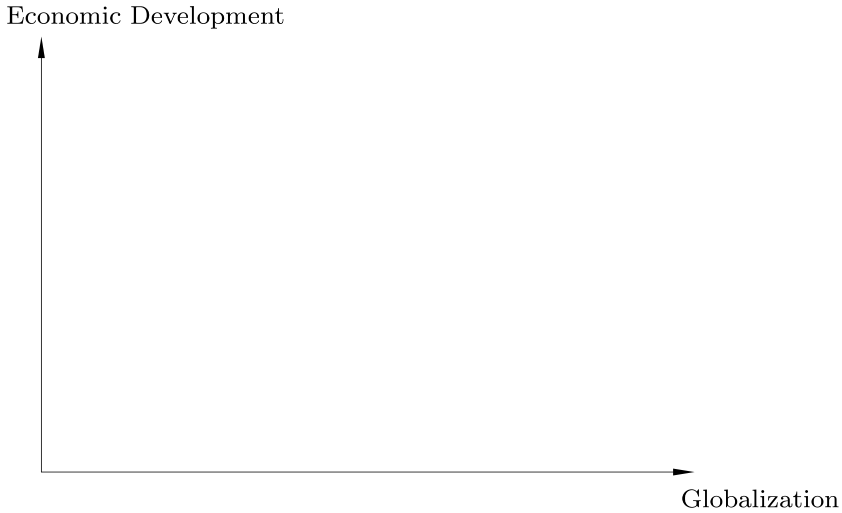


Fig.: Globalization and Economic Growth

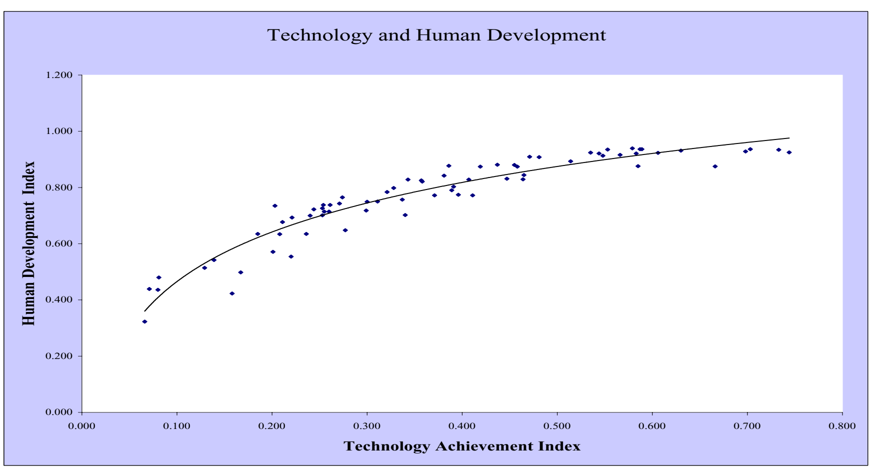


Fig.: Technology and human development, 2001

4 Conclusion

1. Why growth and distribution matter, and why they do not
2. Not a problem of growth and a problem distribution: One and the same
3. The historical record: Growth is good — for everyone, and especially for the poor