

Measurement

How do we measure economic development?

Standard measures:

- ▶ Income (GDP) per capita: *proxy measure of welfare*
- ▶ Income (GDP) per worker: *measure of productivity*

how well society

Can you think of additional statistics that capture relevant aspects of welfare?

use resources

- ▶ Distribution of income
- ▶ Consumption of certain non-market goods like:
 - ▶ environment
 - ▶ health
 - ▶ leisure

$$\frac{Y}{N} = \frac{Y}{L} \frac{L}{N}$$

GDP/capita Labor productivity labor participation.

matter. age distribution. labor law. or norm.

GDP and Welfare

1. Jones, C.I. and P. Klenow (2011), “Beyond GDP? Welfare Across Countries and Time”, Working Paper

Key idea: lottery over countries for individual behind the veil of ignorance

2. Becker, G., T. Philipson and R. Soares (2005). “The Quantity and Quality of Life and the Evolution of World Inequality”, American Economic Review, Vol. 95 (March): 277-291.

Key idea: hypothetical life-cycle individual

Becker, Philipson, and Soares (2005)

1. measure inside country

2. inequality between countries.

use longevity:

converge inequality.

(without / no converge).

↑ growth in longevity.

TABLE 2—VALUE OF LIFE EXPECTANCY GAINS BY REGION OF THE WORLD AND GROUPS OF COUNTRIES, 1960–2000

	1960		2000		Value of life exp. gains in annual income	Lifetime present value of life exp. gains	Yearly growth rate of full income (percentage)
	Life exp.	GDP p.c.	Life exp.	GDP p.c.			
Europe & Central Asia	68	6,810	76	18,281	1,809	51,706	2.7
East Asia & Pacific	42	1,317	71	5,866	2,600	60,957	4.8
Latin Am. & the Carib.	56	3,459	70	7,161	1,365	36,935	2.3
Middle East & N. Africa	48	1,935	69	5,525	1,817	46,076	3.4
North America	70	12,380	77	32,880	2,804	81,993	2.7
South Asia	44	892	63	2,346	635	15,504	3.1
Sub-Saharan Africa	41	1,470	46	1,573	72	1,612	0.3
Poorest 50% countries in 1960	41	896	64	3,092	1,456	33,673	4.1
Richest 50% countries in 1960	65	7,195	74	18,162	2,076	58,957	2.6
World	49	2,983	67	7,236	1,627	40,626	2.8

← large percentage gain

Notes: Income per capita is GDP per capita in 1996 international prices, adjusted for terms of trade (Penn World Tables 6.1). Life expectancy is life expectancy at birth (World Development Indicators, World Bank). Regional averages weighted by country population. Sample includes 96 countries, comprising more than 82 percent of the world population. Value of life expectancy gains based on the authors' calculations.

Becker, Philipson, and Soares (2005)

TABLE 3—EVOLUTION OF CROSS-COUNTRY INEQUALITY IN FULL INCOME, 1960–2000

	Income per capita			Full income	
	1960	1990	2000	1990	2000
Relative mean dev.	0.4751	0.4733	0.4215	0.4397	0.3760
Coeff. of variation	1.2344	1.2529	1.1662	1.1664	1.0463
Std. dev. of logs	1.0178	1.0300	0.9620	0.9758	0.9476
Gini coeff.	0.5104	0.5187	0.4873	0.4935	0.4561
Regression to the mean over 1960		−0.0069 (<i>p</i> -value = 0.86)	−0.1338 (<i>p</i> -value = 0.01)	−0.1006 (<i>p</i> -value = 0.02)	−0.2638 (<i>p</i> -value = 0.00)

Notes: Income per capita is GDP per capita in 1996 international prices, adjusted for terms of trade (Penn World Tables 6.1). Full income calculated by the authors with 1960 as base year, incorporating gains in life expectancy at birth (World Development Indicators, World Bank). Inequality measures weighted by country population (abstracting from within country inequality). Sample includes 96 countries, comprising more than 82 percent of the world population. Regression to the mean is the coefficient of a regression of the change in the natural log of income over the period on its initial level (weighted regressions).

Jones & Klenow (2016)

What fraction λ of US consumption makes an individual indifferent between the US and any other country (equivalent variation)?

Country	Welfare λ	Per capita income	Log difference	Life expectancy	C/Y	Leisure	Inequality
USA	1.000	1.000		0.000 77.0	0.000 0.762	0.000	0.000
France	0.941	0.701	0.295	0.084 78.9	-0.055 0.721	0.140	0.125
Singapore	0.426	0.829	-0.667	0.036 78.1	-0.581 0.426	-0.106	-0.016
Botswana	0.074	0.179	-0.887	-0.577 48.9	-0.171 0.642	0.028	-0.167

utility function

$$U = E \sum_{a=1}^{100} \beta^a u(C_a, l_a) S(a)$$

utility

a: age.

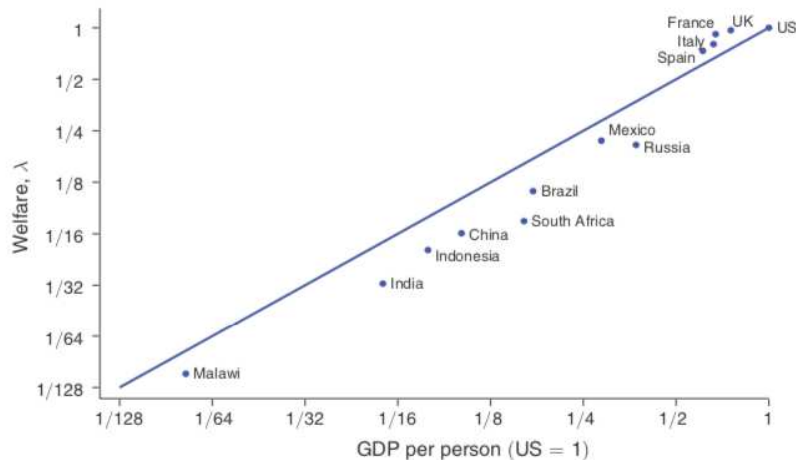
l: leisure

$S(a)$: probability to

survive at a.

C : consumption.

Jones & Klenow (2016)



How much difference between 2 countries.

$$U(\lambda) = \frac{1}{L} \sum_{a=1}^L \beta^a u(\lambda C_{ai}, h_i) S_i(\omega)$$

$$U_{us}(\lambda) = U_i(1)$$

↑

> 0

mostly $0 < \lambda < 1$

might > 1

λ : compress.

Correlation coefficient between λ and GDP per capita: 0.98!

How do we compare income per-capita across countries?

Consider two countries (India and US) producing two goods (cars and haircuts)

$$\begin{aligned} income^{IN} &= p_1^{IN} c_1^{IN} + p_2^{IN} c_2^{IN} \\ &= 67286 \text{ Rupees per capita} \end{aligned}$$

where

$$\begin{aligned} p_1^{IN} &= \text{Rupees/car} \\ p_2^{IN} &= \text{Rupees/haircut} \end{aligned}$$

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$$\begin{aligned} income^{US} &= p_1^{US} c_1^{US} + p_2^{US} c_2^{US} \\ &= 46569 \text{ Dollars per-capita} \end{aligned}$$

where

$$\begin{aligned} p_1^{US} &= \text{Dollars/car} \\ p_2^{US} &= \text{Dollars/haircut} \end{aligned}$$

At nominal exchange rates ...

$$R \cdot \frac{E\$}{ER} = \$$$

At exchange rate = $E = 46$ Rupees/Dollars

$$\begin{aligned} \widetilde{income}^{IN} &= income^{IN} / E \\ &= \frac{67286}{46} = 1472 \text{ Dollars per capita} \end{aligned}$$

The average American earns $\frac{46569}{1472} = 32$ times more than the average Indian!

...but this raises some issues.

- ▶ **Relative prices** are not constant across countries.
Why is this a problem?
- ▶ Some goods, like haircuts, are **not traded** across countries and tend to be relatively cheaper in poor countries.

Can you think of other examples of non-traded goods and services?

Solution: Purchasing Power Parity and International Prices

Use a common set of prices, so-called *International Prices*, to calculate income in each country. It is a simple idea:

$$\begin{aligned}p_1^{INT} &= \frac{1}{2}p_1^{US} + \frac{1}{2}\frac{p_1^{IN}}{E} \\p_2^{INT} &= \frac{1}{2}p_2^{US} + \frac{1}{2}\frac{p_2^{IN}}{E}\end{aligned}$$

At international prices, Indian income per capita is USD 3996 (instead of USD 1472).

...still, the average American earns 12 times more than the average Indian!

Next...

For our next lecture, please read:

- ▶ Jones & Vollrath, Sections 8.1 and 8.2 (except 8.2.4)
- ▶ Lecture note on “The Malthus Model” (available on Tuesday afternoon)