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Economics 404W
Lecture 4
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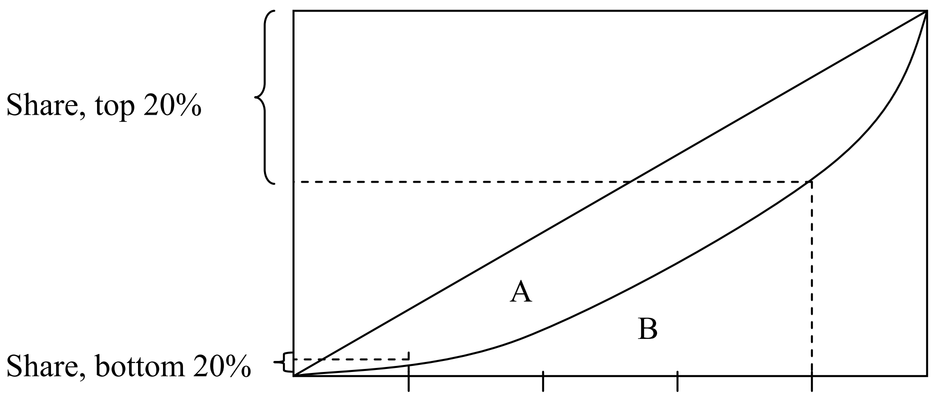
C. Findings for "typical" case

4) Income distribution

b) Income distribution can be measured two basic ways: functional distribution (how much does each productive factor earn?) and size distribution (how unevenly is income distributed across individuals, households, or other classes of people.) For welfare purposes we are more interested in the latter.

Measures of size distribution:

- Quintiles or similar measures
- Lorenz curves and Gini coefficients



Studying percentiles, many studies using data from the 60s and 70s found that income distribution gets less equal as income rises from very low levels to moderate levels. Let Y_i be per capita income in country i, and let S_i be the share of a particular income class—say the top 20 percent in this country. Then the regression model is: $S_i = \beta_0 + \beta_1 \ln Y_i + \beta_2 \ln(Y_i)^2$. Ahluwalia (1976) reports:

income shares of	const.	ln(Y)	$\ln(Y)^2$	share ag.	socialist
top 20%	-8.71	49.62	-7.97	-.258	-9.44
	(.26)	(2.24)	(2.10)	(2.15)	(3.27)
middle 40%	34.27	-5.81	.977	.226	.751
	(1.57)	(.40)	(.39)	(2.86)	(.40)
lowest 40%	74.5	-43.8	7.00	.032	8.70
	(4.01)	(3.54)	(3.30)	(.48)	(5.40)

Graphs confirm this pattern.

But
Different measures of inequality have been used in different countries. In particular, Latin American studies have tended to be income-based, while others have been consumption based. Income measures show more variation because of consumption smoothing. Hence LA, when it falls in the middle income bracket creates the illusion of an inverted U. (Bruno et al):

Interestingly, in the 1960s, the countries at the low-income, low-inequality end of the curve were largely E. Asian. Since that time these super success countries have increased their per-capita income dramatically, while not changing much in terms of inequality. This has weakened the cross-sectional inverted-U picture. (see scatterplot).

A basic problem with these studies is that they presume all countries are at different points on the same path. But conditions (and prospects) for a country with $200 in 1900 aren't the same as today, because rest of world changes, as do internal circumstances.

> -exp DC were once at the LDC income levels, but as they developed pop. growth slowed much more rapidly than it has for LDCs.

Countries differ in terms of initial wealth distributions, land tenure polices, etc. in ways that persist through time. Bruno et al find that 92 percent of the total variation in a panel of 45 countries is due to persistent country effects, while only 7 percent is due to temporal variation. (Error component specification: $G_{it} = \mu_i + \varepsilon_{it}$.)
Fields and Jakubson (1992) recently re-visited the issue of temporal patterns with a better data base and got very different results:

$$G_{it} = \beta_1 + \beta_2(Y/P)_{it} + \beta_3(Y/P)_{it}^2 + \alpha_i + \varepsilon_{it}$$

Using a fixed effect estimator, they find that inequality falls in the early stages of development, then may or may not get better, depending upon whether logs are taken. For the above specification, they estimate (std. errors in parentheses):

> $\beta_2 = .030$ (.013); $\beta_3 = -.011$ (.005) without country fixed effects
>
> $\beta_2 = -.050$ (.015); $\beta_3 = -.010$ (.004) *with* country fixed effects

Bruno et al trace individual countries through time and find no systematic tendancy for income inequality to decline or improve (Table 1 and figure 1).

Other more recent studies (e.g., Deininger and Squire, 1998) confirm this finding. So in light of the more recent evidence, most people don't believe in the Kuznets inverted U.

Nonetheless, our understanding of dispersion in material well-being remains limited (Berry, 1985):

- often based on hhds; difficult to get back to per capita measures (joint consumption; large families have lower income per capita, this not picked up. Moreover, demographics change through time.)

- not obvious how to treat public goods

- Satisfaction of basic needs hard to measure; not closely related to income (e.g., Sen, 1984)

- lifetime income most relevant; by looking at cross section get spurious inequality due to age dispersion. Again this demographic effect can be expected to change with development

- The data used are of varying quality, and not strictly comparable across countries (e.g., sometimes looking at inequality across hhds., sometimes across employees, etc.) The most recent studies (Bruno et al, Deininger and Squire) are probably the best in this respect.

5. What about poverty *levels*?

<u>Measures of absolute poverty (recall first lecture)</u>:

The headcount, poverty gap. Can also look at per capita consumption of the poorest fifth of the population. These both clearly improve with increases in per capita income, looking across countries.

Further, within countries, they are correlated with growth. The elasticity of growth in the fraction of the population below $1 a day with respect to growth in per capita income is about -2 and highly significant (Bruno et al, 1996).

So, *on average*, the poor do <u>*not*</u> get left behind as a country develops. Growth isn't everything (policies directed at education, land reform, social safety nets certainly matter) it is definitely a big factor in lifting the extreme poor. There is no obvious trade-off between growth and inequality. This is the most compelling argument for focusing on economy-wide growth.

(Soon, when we consider the correlates of growth, we'll ask whether initial income or wealth distributions might influence subsequent growth.

6. Productivity growth

We can think of growth as tracing to two proximate causes: factor accumulation, and productivity improvements. More formally, suppose an aggregate production function, and for simplicity let it be Cobb-Douglas:

$$Y = AF(K,L) = AK^{\alpha}L^{1-\alpha}$$

Here *A* is a productivity index that reflects:

- technical progress
- learning by doing
- changes in input quality
- resource reallocation

To say something quantitative about the role of *A* in per capita GDP growth, it is useful to transform the production function equation using logs:

$$\ln(Y) = \ln(A) + \alpha\ln(K) + (1-\alpha)\ln(L)$$

$$\ln(Y)-\ln(L) = \ln(A) + \alpha[\ln(K)-\ln(L)]$$

$$\ln(Y/L) = \ln(A) + \alpha\ln(K/L)$$

or in terms of changes,

$$\Delta\ln(Y/L) = \Delta\ln(A) + \alpha\,\Delta\ln(K/L)$$

For any variable X, recall that $\Delta\ln(X)$ represents a growth rate. So this expression implies that growth in output per worker can be expressed as the sum of productivity growth, and growth in capital per worker.

We could calculate these individual components if we had sufficient data. Output per worker and capital per worker are not too hard to approximate. But what is α?

Returning to our expression $\ln(Y) = \ln(A) + \alpha\ln(K) + (1-\alpha)\ln(L)$, and taking differences, we obtain: $\Delta\ln(Y) = \Delta\ln(A) + \alpha\Delta\ln(K) + (1-\alpha)\,\Delta\ln(L)$. So α tells how much output will grow per unit growth in capital, holding productivity and labor fixed: $\alpha = \left.\frac{\Delta\ln Y}{\Delta\ln K}\right|_{L,A\ \mathit{fixed}}$. That is, α is the percentage change in output per unit percent change in *K*, holding everything else fixed—the elasticity of output with respect to capital. Rearranging, we can express this elasticity in terms of the increment to output per unit increment in capital (i.e., the marginal product of capital) weighted by the ratio of capital to output:

$$\alpha = \frac{\Delta \ln Y}{\Delta \ln K} = \frac{\Delta Y / Y}{\Delta K / K} = \left(\frac{\Delta Y}{\Delta K}\right)\frac{K}{Y} = MP_k \frac{K}{Y}$$

And since profit-maximization implies that firms pay each factor the value of its marginal product, we also know that the cost of capital (r) is related to the marginal product of capital and the price of output by: $r = VMP_k = P \cdot MP_k$. Finally, since this implies $MP_k = r / P$, we can express α as: $\alpha = \frac{rK}{PY}$. That is, α can be measured as the share of capital in the total value of production.

Given that capital's share in the total value of output can be calculated from national accounts data, and given that growth in output per worker and growth in capital per worker can also be calculated, it is possible to calculate productivity growth as a residual:

$$\Delta\ln(A) = \Delta\ln(Y/L) - \alpha\, \Delta\ln(K/L)$$

When productivity growth is calculated this way, it is sometimes called the "Solow residual" after Robert Solow, who got the Nobel prize for developing this approach to inference (as well as some related growth theories).

Are these forces a major determinant of output growth? Does their importance depend upon sector of activity? Upon the level of development?

Basic findings:

1. Overall, TFP growth accounts for about 1/2 of total output growth.

2. There is lots of diversity in experiences (Chenery, Robinson, Syrquin, table 2.2). LDCs divide into 2 clusters. Suggests either severe measurement problems, or that there is nothing automatic about productivity gains.

3. Countries that have already industrialized exhibit relatively low L', high A' and moderate K'. In constrast, LDCs overall have high L', low A', moderate K'.

4. Syrquin (HDE1, 1988, table 7.8) finds rel. rapid TFP growth in manufacturing, especially during mid-transition years.