

Economics 404W  
Lecture 3  
January 17, 2006

C. Findings for "typical" case

1. Accumulation Variables

- a) **Capital accumulation:** As per capita income (in 1980 dollars) increases 400 to 5,000 (i.e., as  $\log(\text{GDP per capita})$  increases from 6 to 8.5), the typical I/GDP ratio increases from .17 to about .24. Savings rates behave similarly.

The relationship isn't that strong—note the  $R^2 = .11$

Do cross-country patterns reflect temporal patterns within countries? Crudely speaking, this one does. In time series regressions with 106 separate countries, negative slopes in only 20 cases; 56 cases had positive slopes greater than .10. Also find slope declines with per capita income, suggesting a leveling off of I and S rates.

rising I/Y and S/Y suggests:

- rising income allows everyone to save more (APS shifts)
- changing demographics
- changing returns to savings
- note causality can go investment to income, too

- b) As GDP per capita increases 400 to 5,000, (G, T) goes from .10 to .21. This is a tighter relationship than the one with savings, but still substantial heterogeneity across countries. ( $R^2 = .395$ )

suggests:

- increasing ability to pay
- redistribution among taxable groups; perhaps toward the corporate sector
- active gov't might "cause" development advances with provision of infrastructure, for example.

- c) As income increases 400 to 5,000, public spending on education as a ratio to GDP go from (3% to 4%). Can think of this as another dimension of investment. (Note that the fraction of the population that is school age actually

falls as GDP per capita rises.) Also, enrollment rates go from 60% to 90% and illiteracy rates drop from 80% to 10%.

suggests:

- Education is a luxury good.
- As GDP rises, the return to education increases, either because of more government subsidies (as government sector expands), or because of changes in the endowment of other factors such as fixed capital, or changes in the mix of demand for goods (especially services) and size of govt. This greater return causes an increased demand for schooling.
- Increasing school enrollments may *cause* development. People with more education are more productive.

## 2. Resource Allocation

- a) As income goes from 300 to 4,000, **nonfood consumption** goes from 60% to 80% (Engel's law)
- b) Since trade not strongly offsetting to domestic consumption changes, **domestic production** likewise increasingly non-food (i.e., services and industrial). Agriculture drops from 60-70% of GDP to about 10% of GDP over the income range \$400 to \$5000.

Similar patterns occur within manufacturing. Food tobacco and beverages go from 70-80% of production to 20-30% over the same income range.

Suggests:

- Demand-side Engel effects.
- As capabilities improve (human capital accumulation), move toward more sophisticated manufactured products.
- Once a minimum scale of operations is reached, it may be possible to initiate modern factory production of relatively sophisticated products and/or products that require upstream suppliers

Similar patterns are discerned from time series, within-country regressions. Here we can confirm that the transformation levels off in the higher income ranges (Syrquin, HDE1, fig. 7.2). De-industrialization eventually occurs.

- c) Within manufacturing, another clear trend is toward more intensive **use of intermediate inputs**. Overall, from 33% up to 45% of output is intermediate input use as income goes \$575 to \$7,600. Reflects partly shift toward

manufacturing out of primary; also, however, changing I-O relationships within sectors. Latter estimated to account for well over 1/2 of total increase. Within-sector effects concentrated in agriculture, although light industry gives way to heavy industry too.

- d) **Labor** follows production shifts, and dramatic urbanization occurs. These responses are not only large, they are relatively predictable (refer to  $R^2$ 's). Migration to cities has outpaced demand for labor in urban areas, but I have no explicit figures on this

Suggests:

- Pull to the city reflects job shift.
- Other agglomeration economies (infrastructure, commerce)

- e) both **exports and imports** rise with development (over the 400 to 5000 income range). (From about 20% to about 25% of GDP)

suggests

- Globalization induces development (embodied technology transfers, diversified input menus, heightened incentives to innovate, learning by exporting)?
- Induced need for capital imports?
- Diversifying tastes toward foreign goods?

Aside: trade flows are strongly negatively correlated with N, population size. (why?)

Typical pattern is an increase in **primary exports** associated with early stages of intensive growth.

As development progresses, primary products fall in importance, tend to be replaced by **simple manufactured** goods. All the while, total exports are growing as a proportion of GDP

**Imports** are at first primarily **consumer goods**, then as domestic industry emerges with import substitutes of light manufactures, get more emphasis on **capital goods** and **intermediates** goods to service these industries. (About 40% of capital formation is machinery and equipment; most of this --e.g., 90% -- is imported.)

### 3) Demographic transition

income-related fall in **birth rate** exceeded by fall in **death rate** until reach \$600; then switches. (45/1000, 18/1000) to (25/1000, 10/1000). (refer to xerox of WDR 1985 graphs)

Noteworthy that population growth rates are much higher for LDCs than industrialized world experience when it began intensive growth. Reason: advances in medical science have dramatically reduced death rates -- first in 1920s, and again after 1945. Contributed to surplus labor problem. Note also that demographics vary a lot across countries at given per capita income levels.

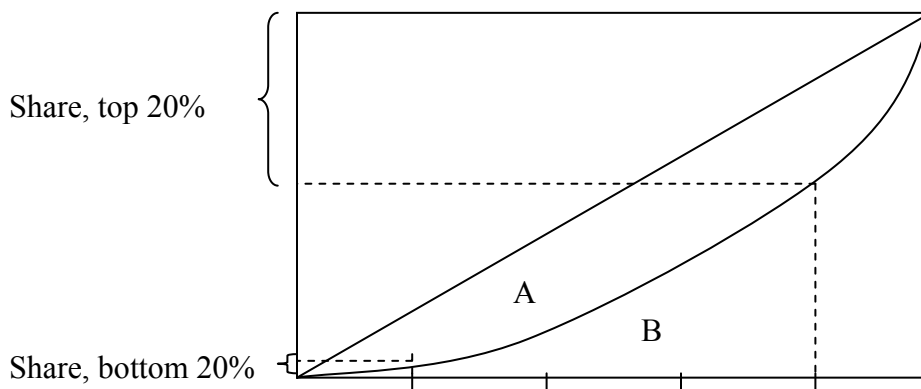
When birth rates and death rates are high, the population is skewed toward the young; development shift the distribution toward older people. One issue is the dependency ratio.

### 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.

For example, Ahluwalia (1976) reports:

One can regression the income share of, say, the richest 20 percent of the population on per capita GDP and per GDP squared. Letting  $i$  index countries, the model would be:

$$share_{top20_i} = \beta_0 + \beta_1 \ln(GDP / pop) + \beta_2 \ln(GDP / pop)^2$$

The resulting coefficients would then indicate whether the rich get a larger or smaller share as countries per capita income goes up. Below are the results of this exercise based on data from the 1960s. (t-statistics are in parentheses):

<u>income shares of</u>	$\beta_0$ const.	$\beta_1$ $\ln(Y)$	$\beta_2$ $\ln(Y)^2$	<u>share ag.</u>	<u>socialist</u>
top 20%	-8.71 (.26)	49.62 (2.24)	-7.97 (2.10)	-.258 (2.15)	-9.44 (3.27)
middle 40%	34.27 (1.57)	-5.81 (.40)	.977 (.39)	.226 (2.86)	.751 (.40)
lowest 40%	74.5 (4.01)	-43.8 (3.54)	7.00 (3.30)	.032 (.48)	8.70 (5.40)

The estimates imply that income inequality increases during the early stages of development; then at higher levels of income it begins to fall. (The Kuznets inverted-U pattern.)

Graphs confirm this pattern.