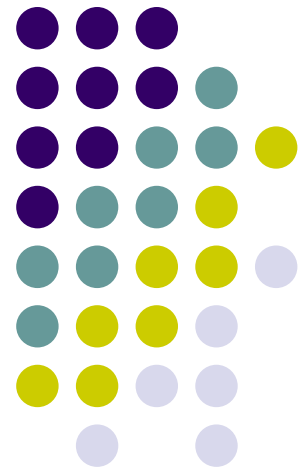


Introduction to Economics of Development

Basic Growth Models:
Harrod-Domar (HD) Model

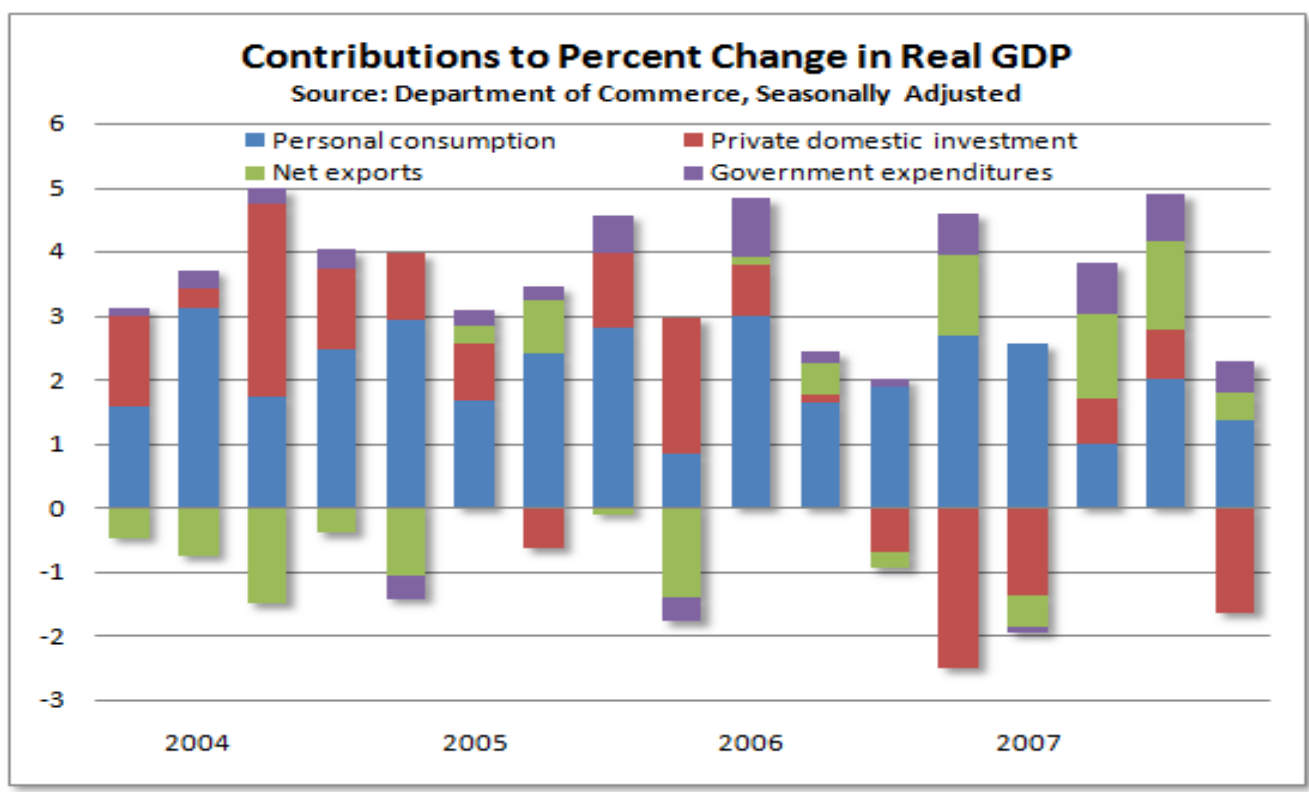


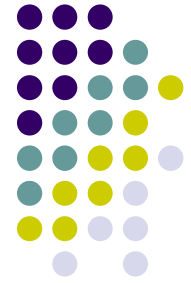


What's Happening 01/31/08

4Q Real GDP Growth 0.6%

Reminder: $GDP=C+I+G+NX$





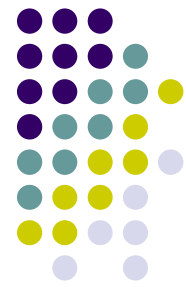
Harrod-Domar (HD) Model

- Background
- Model derivations
- Policy implications
- Empirical Evidence
- Criticisms



Quest for Growth Theory

- Background
 - The quest for a theory of growth and development has tormented economists as long as there have been economists
 - Adam Smith (1776) asked what determined the “*wealth of nations*”
 - Alfred Marshall (1890): the quest for growth “gives to economic studies *their chief and their highest interest*”.
 - Robert Lucas (1988): once one starts to think about economic growth, “*it is hard to think about anything else*”.
 - After WWII, with a lot of developing countries becoming independent, policy experts, having ignored poor countries for centuries, called for “urgent attention” to the development problems.



Quest for Growth Theory

- Background
 - Two historical events greatly influenced the first-generation development economists
 - The Great Depression
 - Sharp rise of unemployment, as a result, labor supply seemed to be “limitless”
 - Fast rise of Soviet Union through forced saving and investment
 - Fear spread of communism to other countries, especially those newly independent ones, so rushed to give aid
 - Soviet growth model seemed to be working quite well



Quest for Growth Theory

● Background

● Rostow's five stages of economic growth

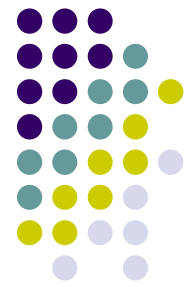
- Stage 1: The traditional society
- Stage 2: Preconditions for takeoff
- Stage 3: Takeoff

“During the take-off, the rate of effective investment and savings may rise from, say, 5 % of the national income to 10% or more”

- Stage 4: The drive to maturity
- Stage 5: The age of high mass-consumption

● Economists' dream of “take-off”

Easterly, “takeoff” just reasserted economists with vivid images of planes swooping off runways.



Model Derivations (1)

Target: $g = \Delta Y / Y = ?$

Assume output is proportional to capital input, i.e. K/Y is a constant,
Let $v = K/Y$ (v is called capital-output ratio)

Rearrange above, we have $Y = \frac{1}{v} \cdot K$ ①

① is essentially the production function assumed in HD model.

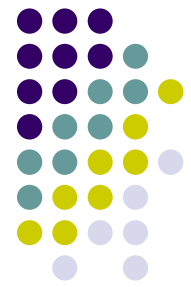
Notice this is a quite strange production function: where is the labor?

Since v is a constant, we have $\Delta Y = \Delta K / v$

So, we have arrived: $g = \Delta Y / Y = (\Delta K / v) / (K / v) = \boxed{\Delta K / K}$

This simply means output growth equals exactly the capital growth.

In other words, there is a 1-to-1 relationship between capital and output. If you increase your capital investment by 10%, you get exactly 10% increase in output.



Model Derivations (2)

Target: $g = \Delta Y / Y = ?$

Assume output is proportional to capital input, i.e. K/Y is a constant,

Let $v = K/Y$ (v is called capital-output ratio) ①

From ①, we have $Y = K/v$, since v is constant, $\rightarrow \Delta Y = \Delta K/v$ ②

By definition, net change of capital input (ΔK) equals investment (I) minus capital depreciation $d \cdot K$ (d : depreciation rate), thus we have

$$\Delta K = I - d \cdot K \quad \text{③}$$

Since all savings eventually finds its way to investment, we have $S = I$, and assume savings is a fixed proportion of income, we have $S = s \cdot Y$.

Plug these two equations into equation ③, we get:

$$\Delta K = I - d \cdot K = s \cdot Y - d \cdot K = s \cdot Y - d \cdot v \cdot Y = (s - dv) \cdot Y \quad \text{④}$$

To get growth rate g , combine ② ④ \rightarrow

$$g = \Delta Y / Y = (\Delta K / v) / Y = \Delta K / (v \cdot Y) = (s - dv) \cdot Y / (v \cdot Y) = (s - dv) \cdot v = \boxed{s/v - d}$$



Harrod-Domar (HD) Model

- Policy Implications

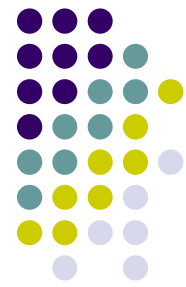
$$g = \Delta Y / Y = \Delta K / K$$

- GDP growth will be proportional to the share of investment spending in GDP. What a “wonderfully” simple prediction!
- Where does capital come from?
 - If savings are available, savings \rightarrow (capital) investment
 - If without savings, naturally we resort to foreign aid (or sovereign debt).

$$g = s / v - d$$

(s: savings rate v: capital output ratio d: depreciation rate)

- Since both **v** and **d** are assumed to be constant, **s** is the only variable we can change.
- From the equation above, we have the following conclusion: the higher the savings rate or bigger the savings, the faster the rate of growth.



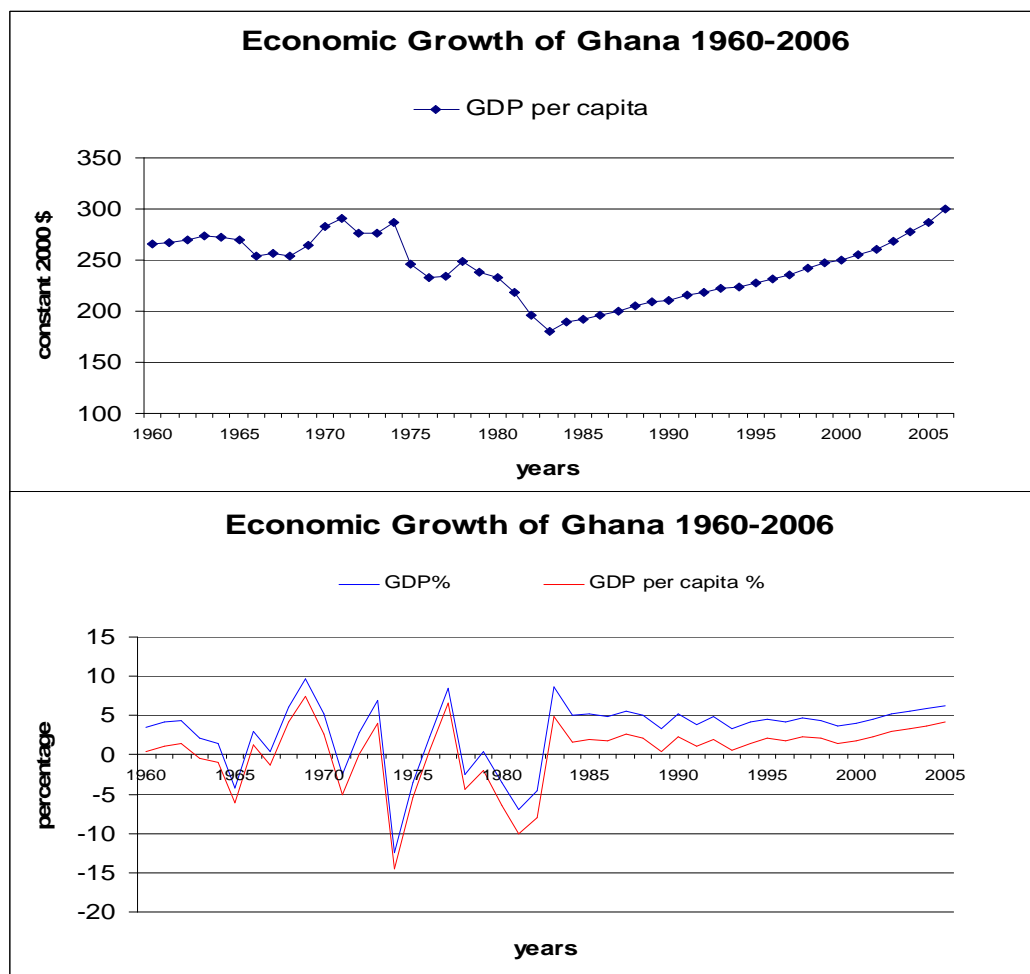
Harrod-Domar (HD) Model

- Aid-to-investment-to-growth: theory and evidence
 - Aid to investment
 - Various factors may break this link:
 - Corruptions: money was embezzled
 - Incentives to spend money right way (we have already talked about it)
 - Or simply no good investment opportunities
 - In fact, research shows only 17 out of 88 countries show a positive statistical association between aid and investment
 - Among those 17 countries, only 6 passed the test that aims to establish to 1-to-1 relationship between investment with aid (Easterly p.37-38)
 - Investment to growth
 - Even weaker link
 - Only 1 out of 138 countries passed the test (Easterly)
 - Investment is necessary but not sufficient condition for growth



Harrod-Domar (HD) Model

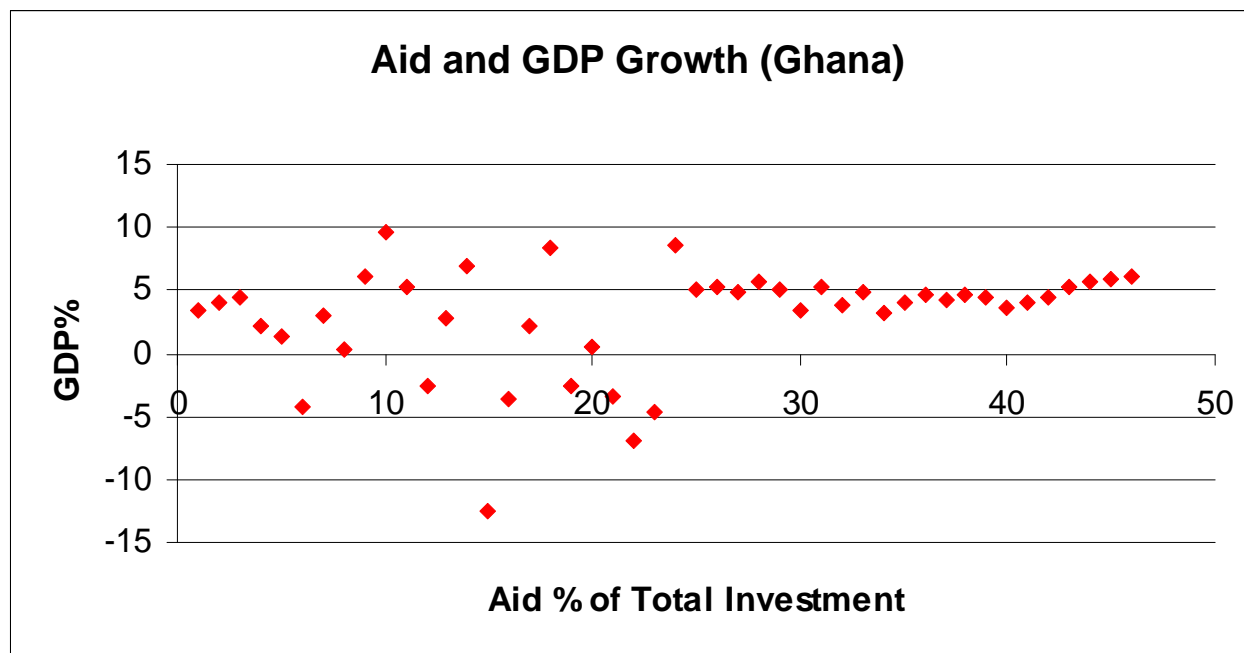
- Empirical Evidence: Ghana (Easterly Chapter 2)





Harrod-Domar (HD) Model

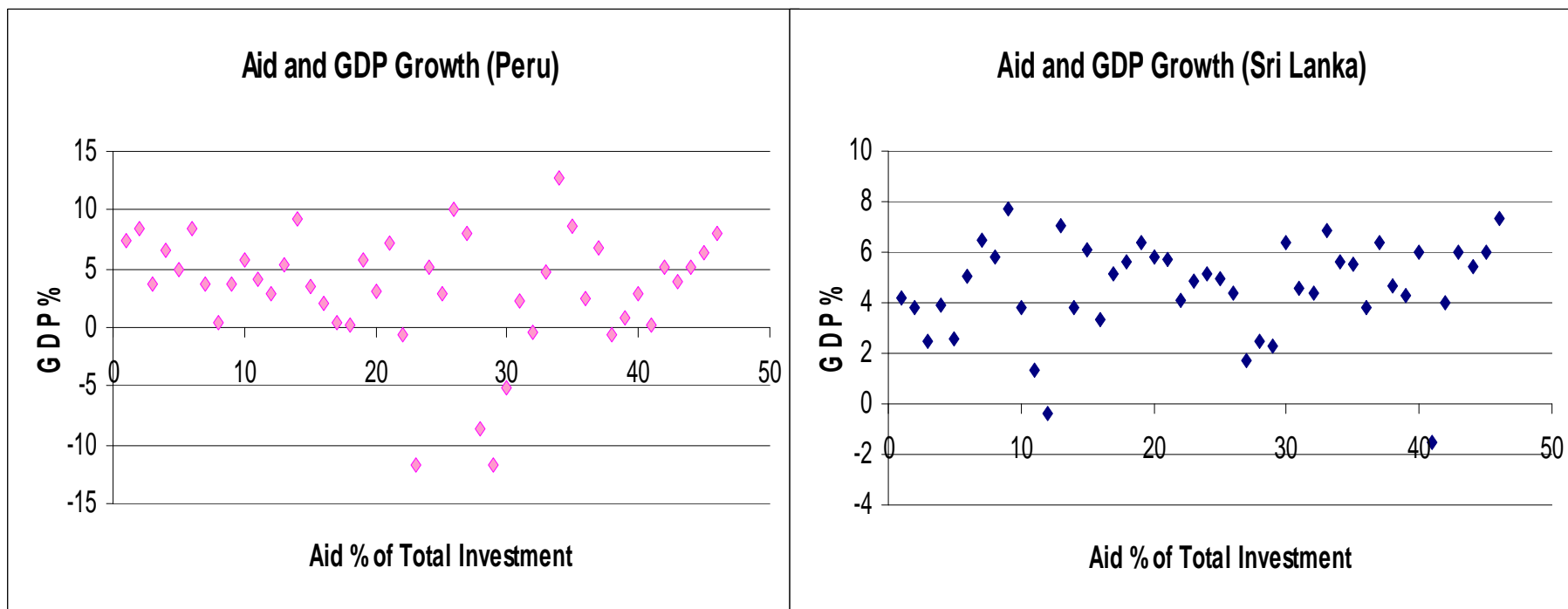
- Empirical Evidence

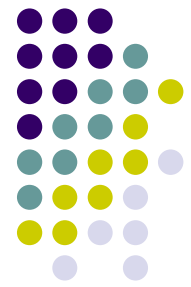




Harrod-Domar (HD) Model

- Empirical Evidence





Harrod-Domar (HD) Model

- Criticisms

- Domar himself admitted:

- “My model was intended to comment on an esoteric debate on business cycles, not to derive an empirically meaningful rate of growth”. It is not a growth model.

- No labor in the production function. Why?

- U.S. economy was just out of the Great Depression, unemployment rate was high, unlimited labor supply was always assumed.

- The capital-output ratio is assumed to be constant. Why?

- The HD model just does not predict (but it is still being used)