IPB University
Bogor Indonesia

Teori Pertumbuhan Ekonomi
(Neo Klasik, Endogen, Inklusif, Berkelanjutan)

oleh

Bambang Juanda

Departemen Ilmu Ekonomi

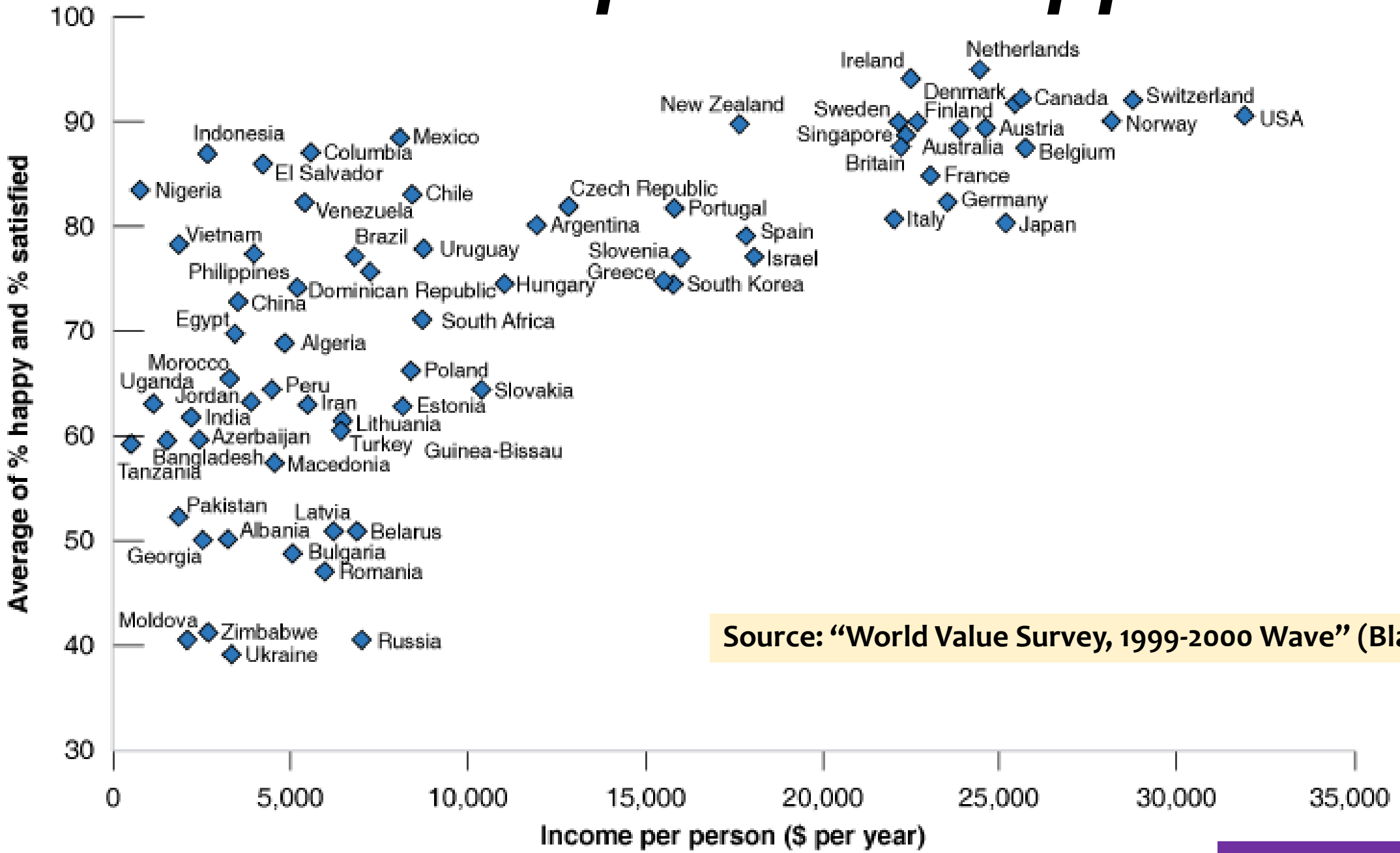
Fakultas Ekonomi dan Manajemen IPB

https://bambangjuanda.com/

The Facts of Growth

- The determination of output in the *short* and *medium run*—where fluctuations dominate
- The **determination of output in the *long run***—where growth dominates.
- Growth is the steady increase in aggregate output over time.
- The variable we want to focus on and compare either over time or across countries is **output per person** rather than *output* itself.

Income/Capita and Happiness



Source: "World Value Survey, 1999-2000 Wave" (Blanchard, 2017)

Income and Happiness

Economists take for granted that higher output per capita means higher utility and increased happiness. The evidence on direct measures of happiness, however, points to a more complex picture.

Table 1 Distribution of Happiness in the United States Over Time (Percent)

	1975	1996
Very happy	32	31 ↓
Pretty happy	55	58
Not too happy	13	11 ↓

Table 2 Distribution of Happiness in the United States Across Income Groups (Percent)

Income Level	Top Quarter	Bottom Quarter
Very happy	37	16
Pretty happy	57	53
Not too happy	6	31

Source: Blanchard (2006)

Income/Capita and Happiness

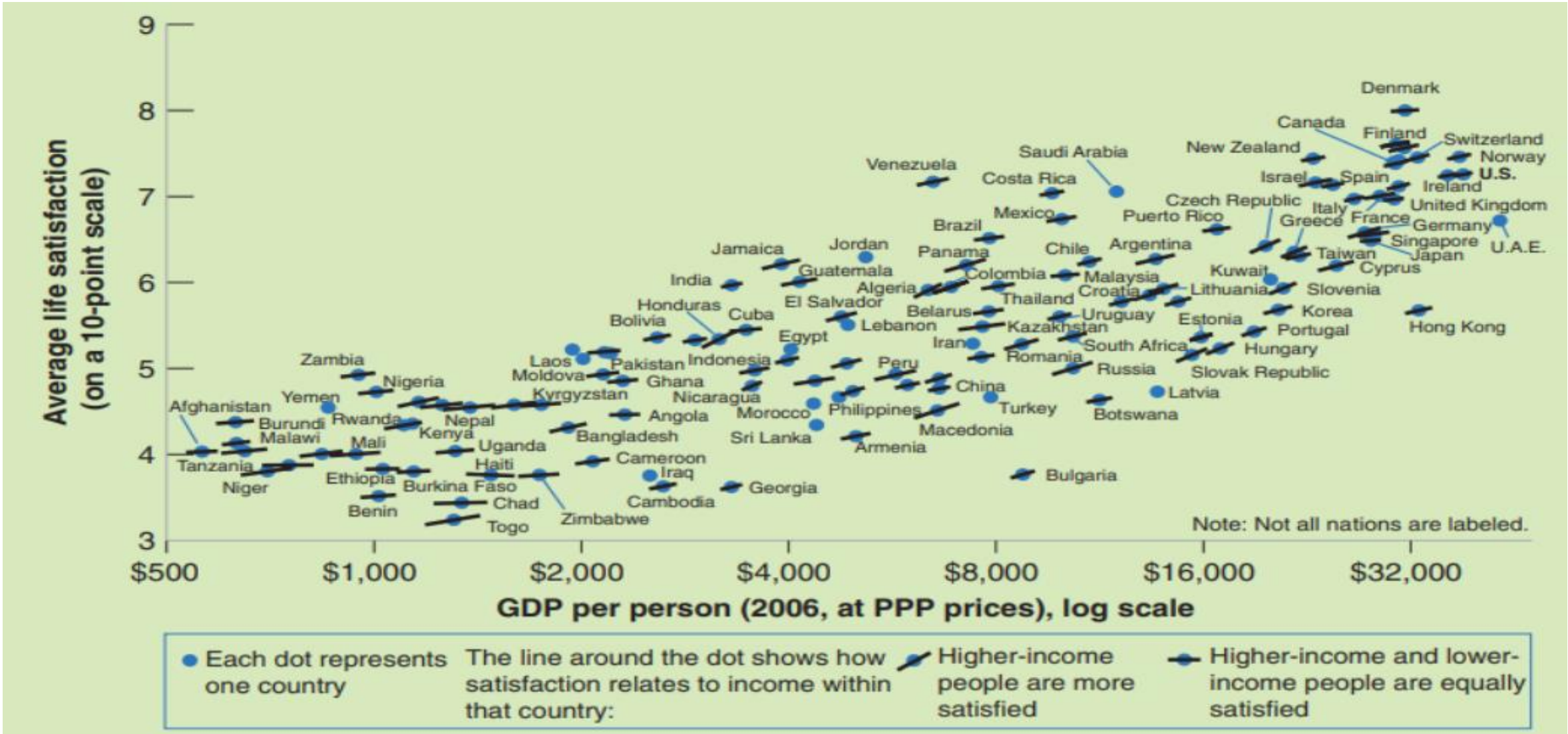


Figure 1 *Life Satisfaction and Income per Person*

Source: Betsey Stevenson and Justin Wolfers, Wharton School at the University of Pennsylvania.

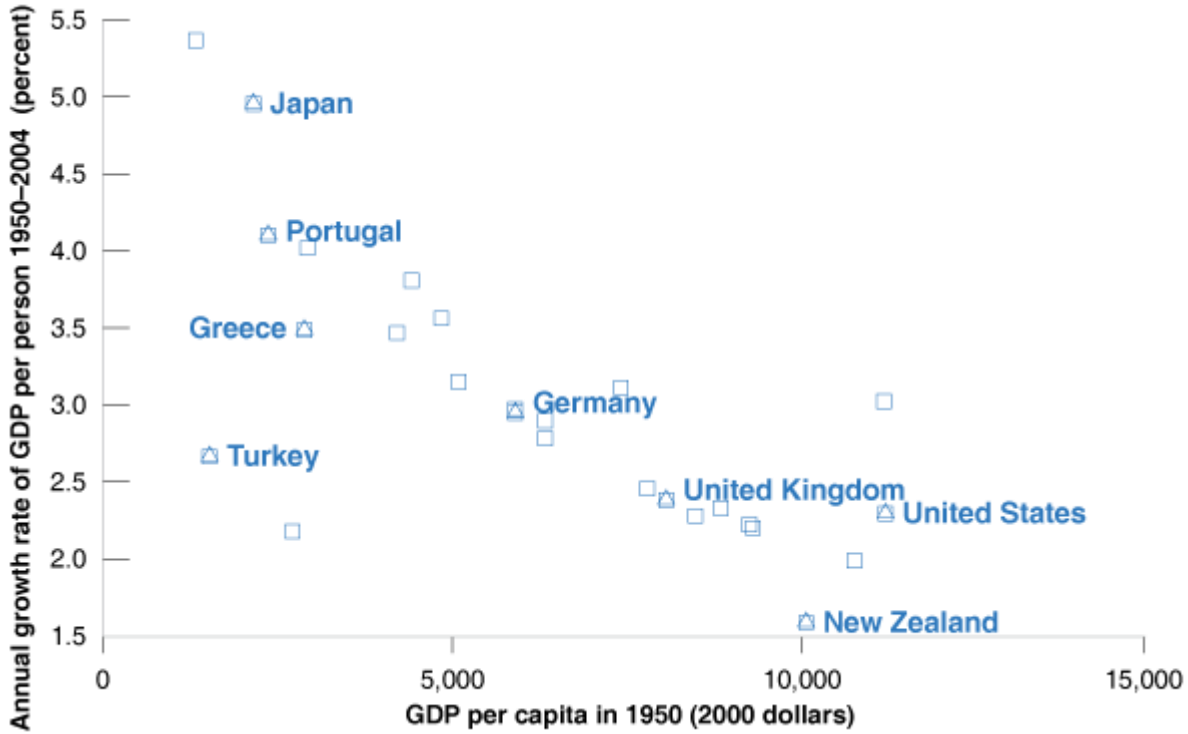
(Blanchard, 2017)

The Convergence of Output per Person since 1950

Figure 10 - 2

Growth Rate of GDP per Person since 1950 versus GDP per Person in 1950, OECD Countries

Countries with lower levels of output per person in 1950 have typically grown faster.



Sumber: Blanchard (2017)

The **convergence** of levels of output per capita across countries is not specific to the four countries we are looking at, it also extends to the set of OECD countries.

Table 10-1 The Evolution of Output per Person in Four Rich Countries since 1950

	Annual Growth Rate Output per Person (%)	Real Output per Person (2005 dollars)		
	1950–2011	1950	2011	2011/1950
France	2.5	6,499	29,586	4.6
Japan	4.1	2,832	31,867	11.3
United Kingdom	2.0	9,673	32,093	3.3
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Notes: The data stop in 2011, the latest year (at this point) available in the Penn tables.
The average in the last line is a simple unweighted average.

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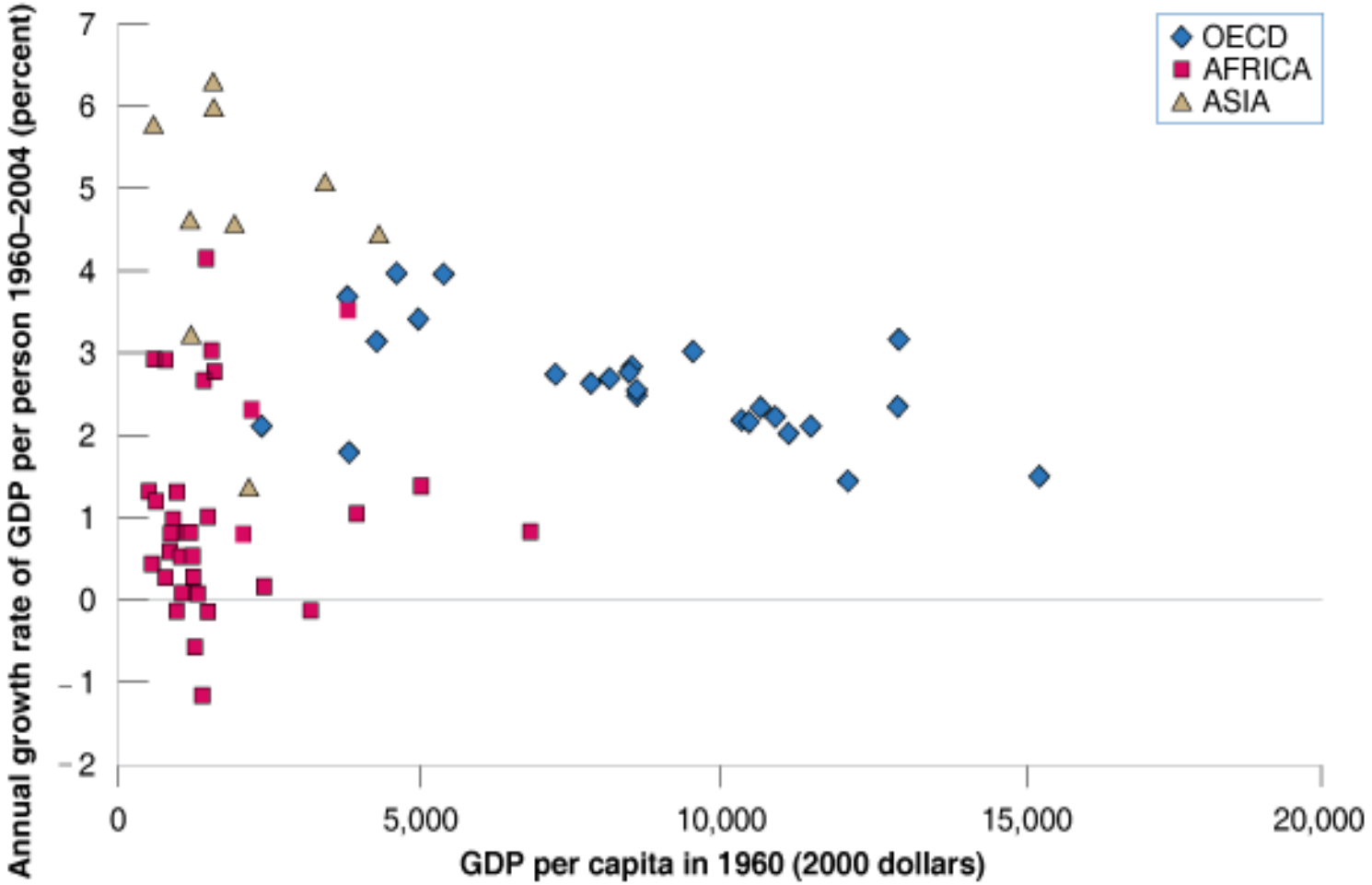
Sumber: Blanchard (2017)

- There has been a large increase in output per person.
- There has been convergence of output per person across countries.

Looking at Growth Across Many Countries

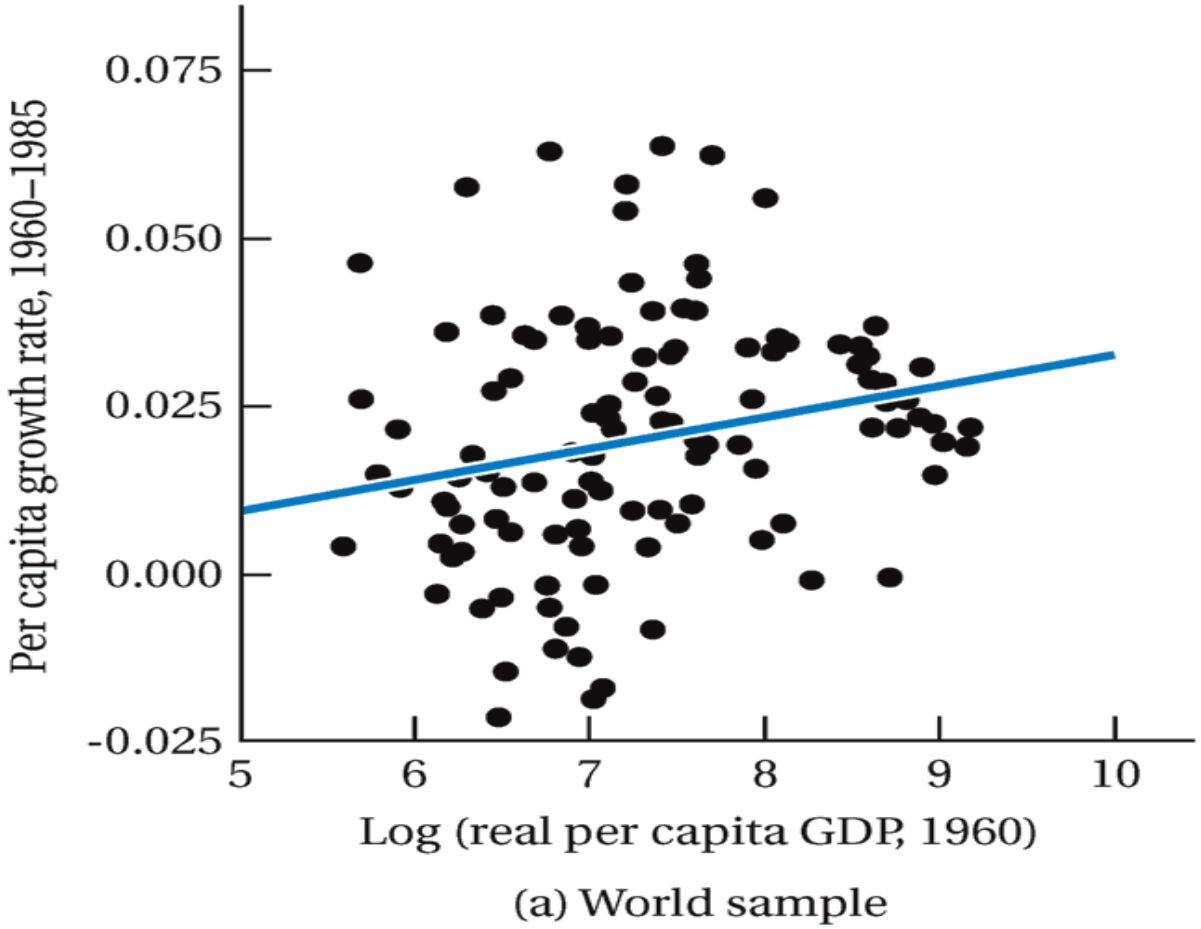
Growth Rate of GDP per Person since 1960 versus GDP per Person in 1960 (2000 dollars) for 70 Countries



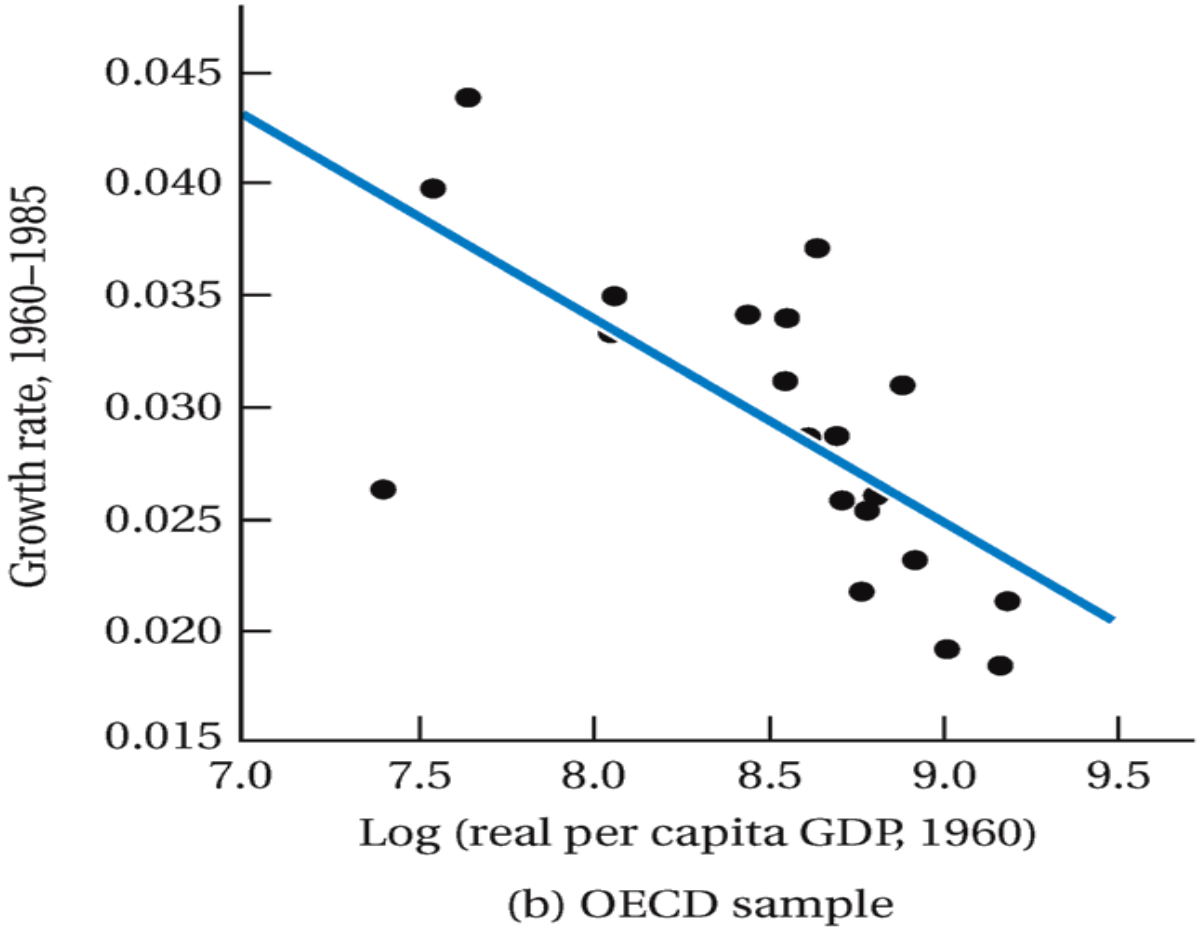
There is no clear relation between per person the growth rate of output since 1960 and the level of output per person in 1960.

Sumber: Blanchard (2017)

Convergence among OECD Countries but Divergence in the World as a Whole



(a) World sample



(b) OECD sample

Source: Robert Barro and Xavier Sala-i-Martin, *Economic Growth* (New York: McGraw-Hill, 1995), p. 27. Reprinted with permission.

Source: Todaro & Smith (2009)

Model Neoklasik (A Primer from Solow, MIT-1956: Y = A *F*(K ,L)

$$\frac{\Delta Y}{Y} = \frac{F(K,L)\Delta A}{Y} + \frac{MP_K \cdot \Delta K}{Y} + \frac{MP_L \cdot \Delta L}{Y}$$

Since $Y = AF(K, L)$ we have

$$\frac{\Delta Y}{Y} = \frac{F(K,L)\Delta A}{AF(K,L)} + \frac{MP_K \cdot \Delta K}{Y} + \frac{MP_L \cdot \Delta L}{Y}$$

or

$$\frac{\Delta Y}{Y} = \frac{\Delta A}{A} + \frac{MP_K}{Y} \cdot \Delta K + \frac{MP_L}{Y} \cdot \Delta L$$

$$\frac{\Delta Y}{Y} = \frac{\Delta A}{A} + \frac{K.MP_K}{Y} \cdot \frac{\Delta K}{K} + \frac{L.MP_L}{Y} \cdot \frac{\Delta L}{L}$$

or

$$\frac{\Delta Y}{Y} = \left(\theta \times \frac{\Delta K}{K}\right) + \left(1-\theta \times \frac{\Delta L}{L}\right) + \frac{\Delta A}{A}$$

Solow residual.

or Growth of Output = (Share of Capital × Growth in Capital) + (Shar of Labour × Growth in Labour) + Technical Progress

Growth Accounting

Technological progress is the **residual growth**. Without technological progress, the equation wouldn't balance. With technological progress, the equation shows how technology is influencing production.

Source: Todaro & Smith (2009)

Model Neoklasik (lebih detail)

- What determines growth?
- What is the role of capital accumulation?
- What is the role of technological progress?

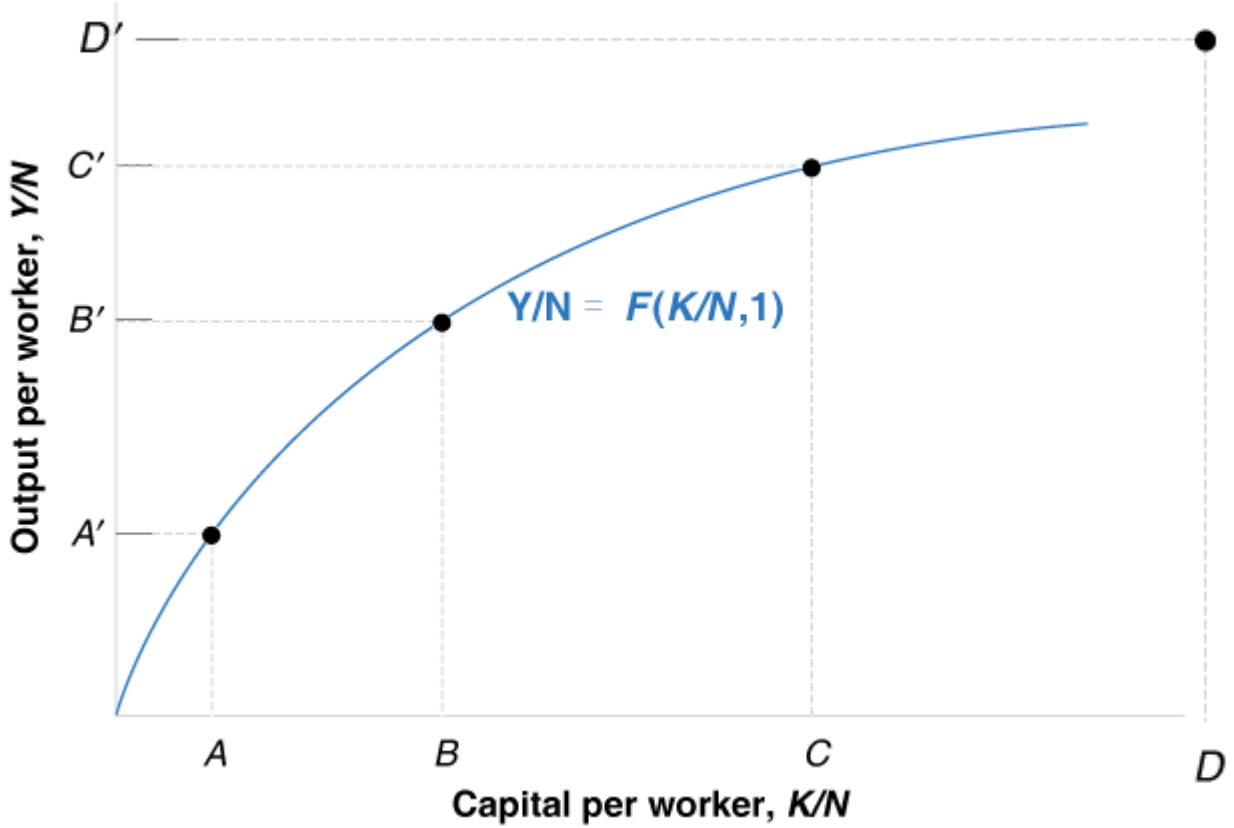
$$Y = F(K, N)$$

Constant returns to scale

$$\frac{Y}{N} = F\left(\frac{K}{N}, \frac{N}{N}\right) = F\left(\frac{K}{N}, 1\right)$$

Increases in K/N lead to smaller and smaller increases in Y/N.

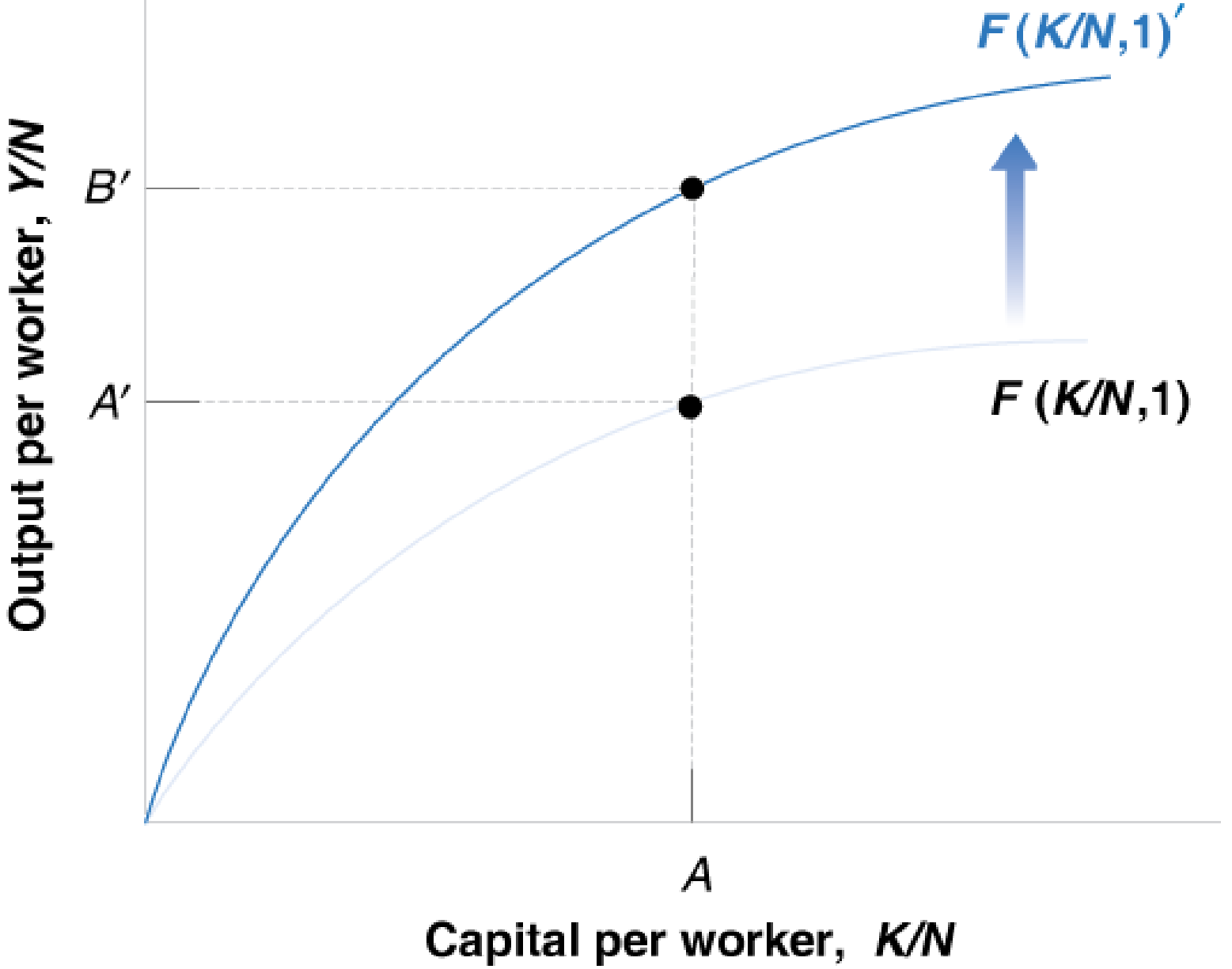
- Increases in *Y/N* can come **from increases in *K/N***.
- Or **from improvements in the state of technology** that shift the production function, *F*, and lead to more output per worker given capital per worker.



The Sources of Growth

An improvement in technology shifts the production function up, leading to an increase in output per worker for a given level of capital per worker.

- **Capital accumulation *by itself* cannot sustain growth.**
- **Sustained growth requires sustained technological progress**



Interactions between Output and Capital

$$\frac{Y_t}{N} = f\left(\frac{K_t}{N}\right)$$

Capital determines output

$$I = S + (T - G)$$

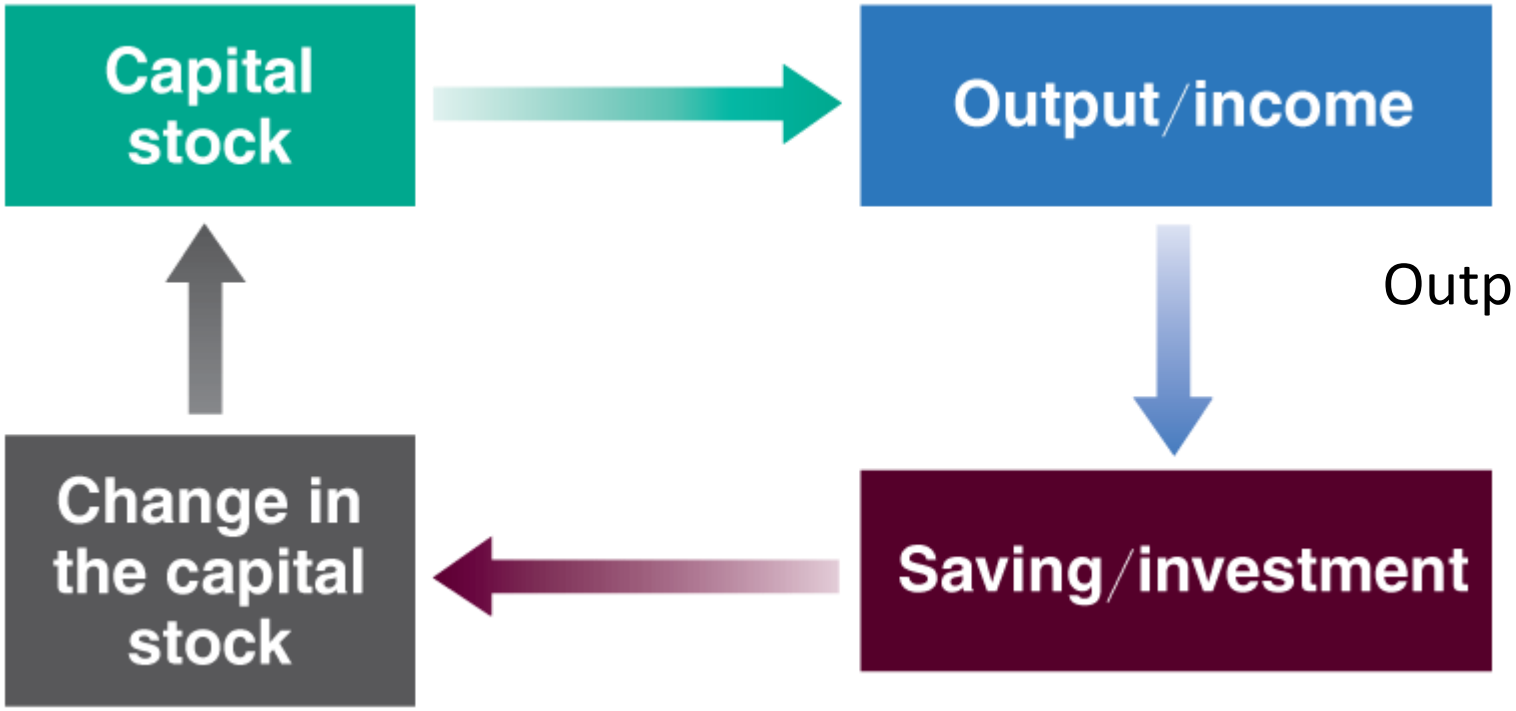
$$I = S$$

$$S = sY$$

Asumsi: ***Closed economy & zero public saving***

$$K_{t+1} = (1-\delta)K_t + I_t$$

$$\frac{K_{t+1}}{N} = (1-\delta)\frac{K_t}{N} + s\frac{Y_t}{N}$$



$$\frac{K_{t+1}}{N} - \frac{K_t}{N} = s\frac{Y_t}{N} - \delta\frac{K_t}{N}$$

Output determines capital accumulation

the change in the capital stock per worker (left side) is equal to ***saving (investment) per worker minus depreciation*** (right side).

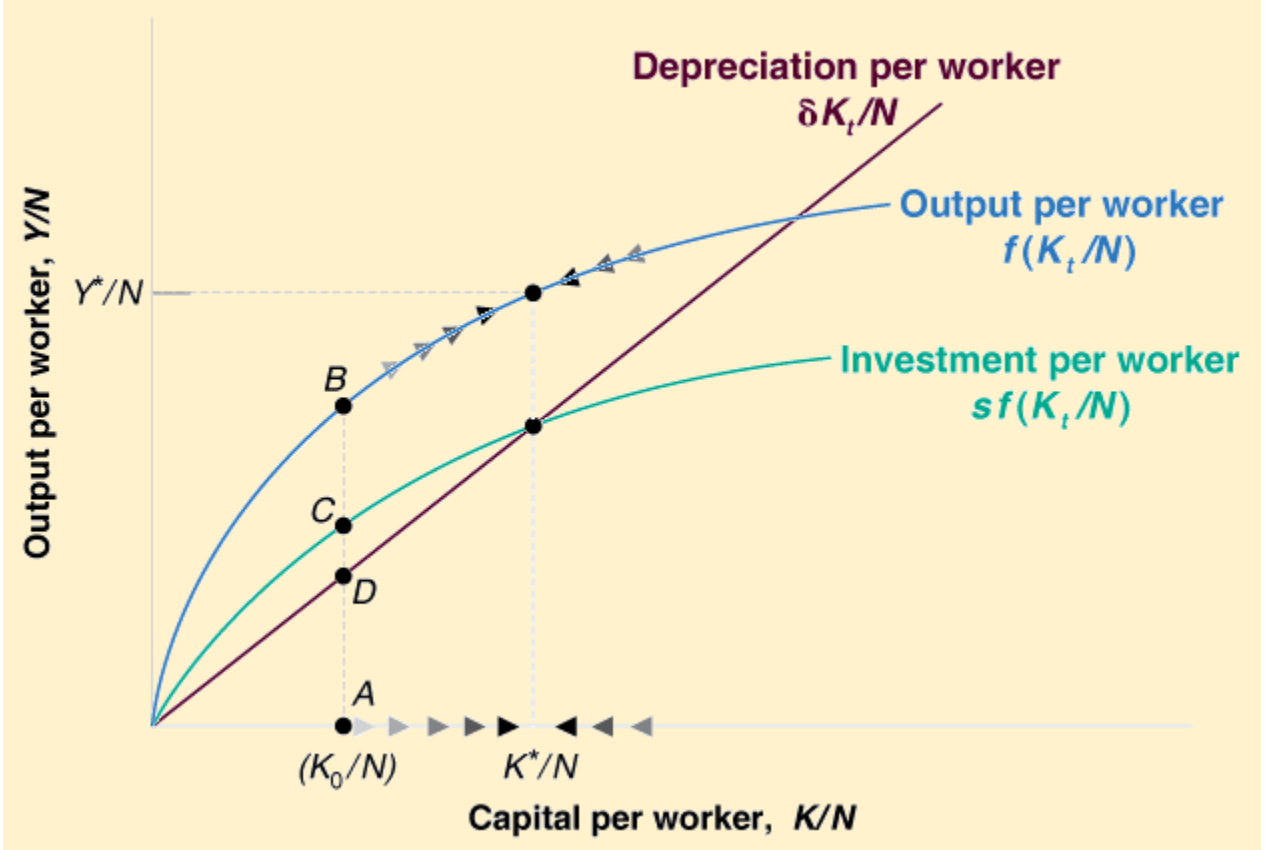
The Implications of Alternative Saving Rates

$$\frac{K_{t+1}}{N} - \frac{K_t}{N} = sf\left(\frac{K_t}{N}\right) - \delta\frac{K_t}{N}$$

Dynamics of Capital and Output

At K*/N, output per worker and capital per worker remain constant at their long-run equilibrium levels.

When capital and output are low, investment exceeds depreciation, and capital increases. When capital and output are high, investment is less than depreciation, and capital decreases.



- **Investment** per worker increases with capital per worker, but by less and less as capital per worker increases.
- **Depreciation** per worker increases in proportion to capital per worker.

The state in which output per worker and capital per worker are no longer changing is called the **steady state of the economy**:

$$sf\left(\frac{K^*}{N}\right) = \delta\frac{K^*}{N}$$

Given the steady state of capital per worker (K^*/N), **the steady-state value of output per worker (Y^*/N)**, is given by the production function:

$$\frac{Y^*}{N} = f\left(\frac{K^*}{N}\right)$$

The Saving Rate and Output

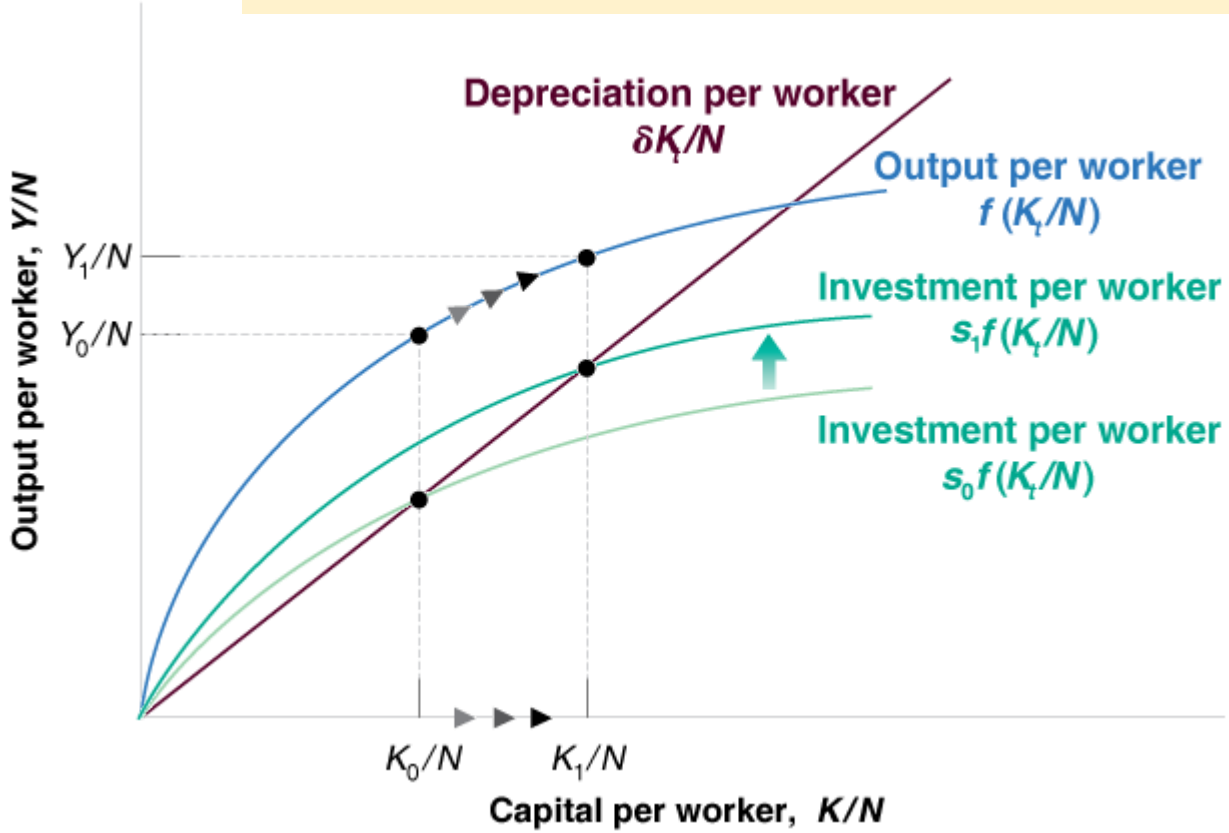
Asumsi:

- The **population size**, the **participation rate**, and the **unemployment rate** are all **constant**.
- There is **no technological progress**

The Effects of Different Saving Rates

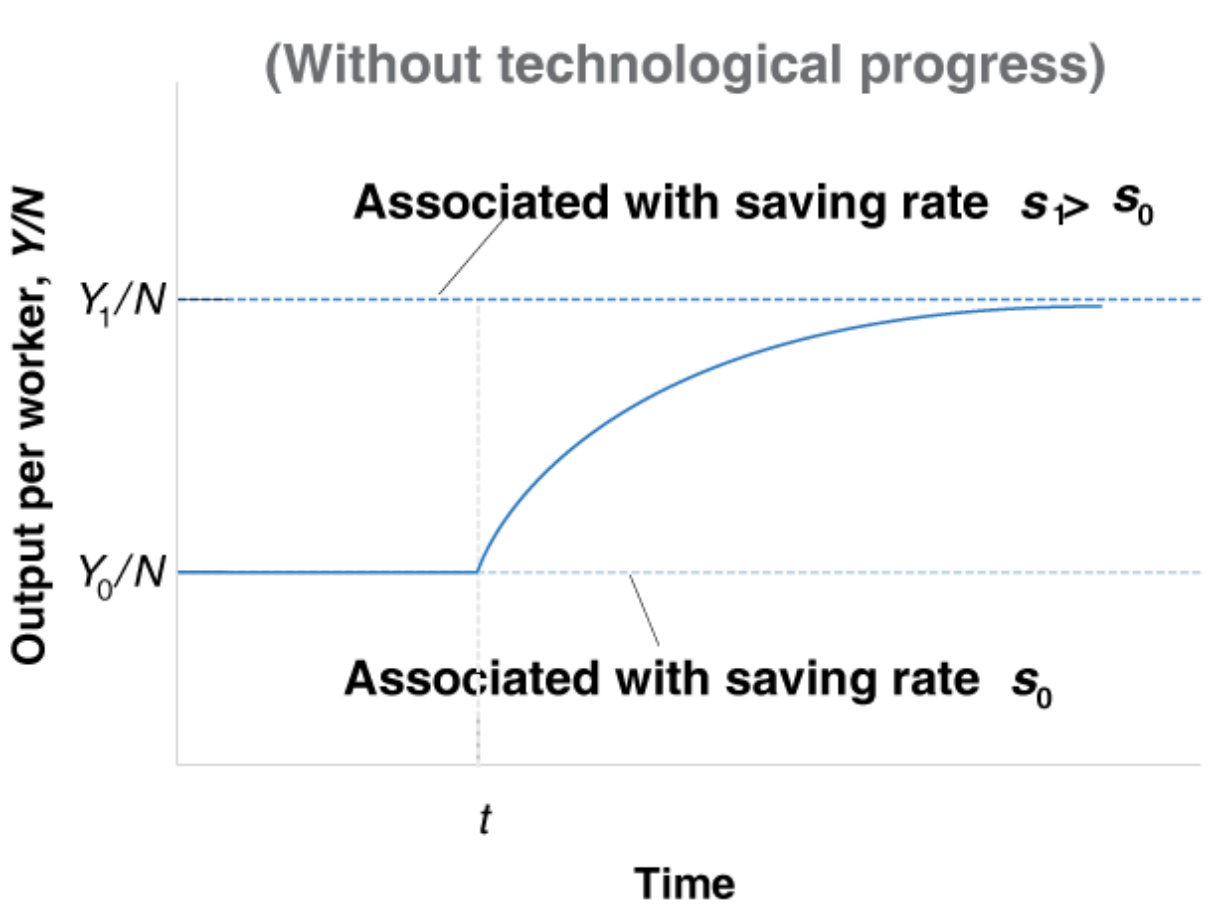
1. *The saving rate has no effect **on the long run growth rate of output per worker, which is equal to zero**.*

2. *Nonetheless, the saving rate determines the level of output per worker in the long run. Other things equal, **countries with a higher saving rate will achieve higher output per worker in the long run.***

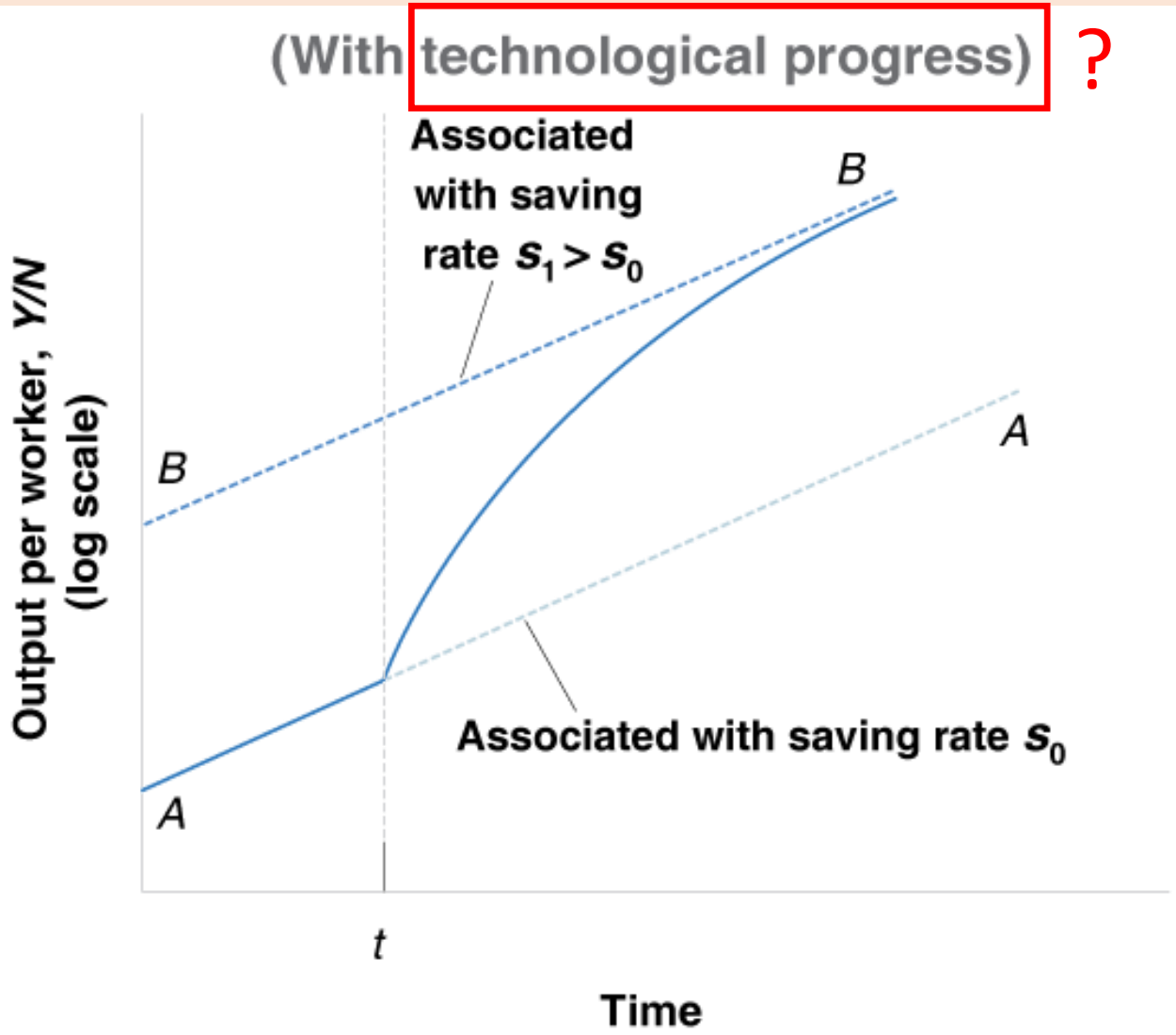


3. *An increase in the saving rate will **lead to higher growth of output per worker for some time, but not forever***

The Effects of an Increase in the Saving Rate on Output per Worker



An increase in the saving rate leads to a period of higher growth until output reaches its new, higher steady-state level.

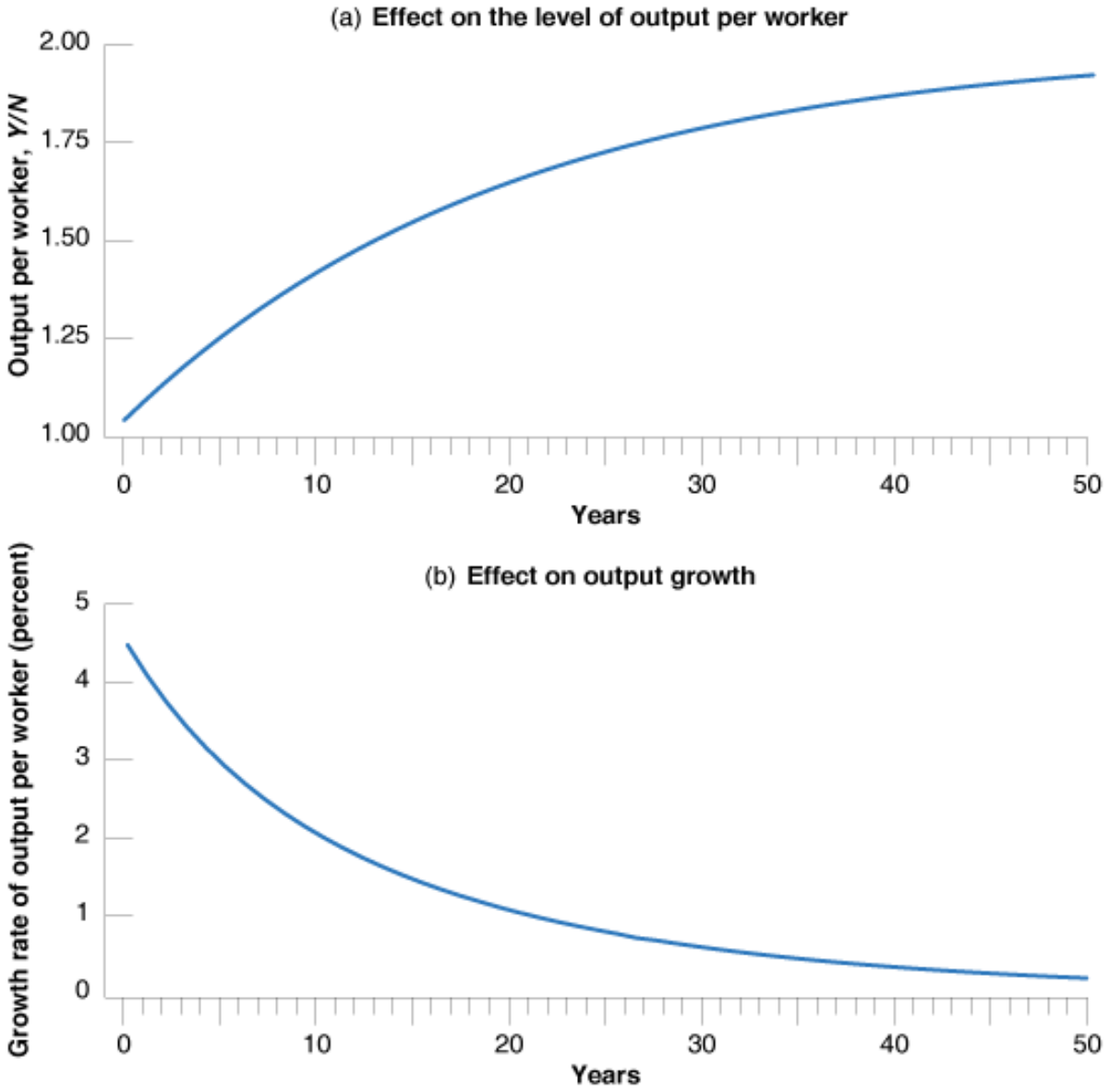


An increase in the saving rate leads to a period of higher growth until output reaches a new, higher path.

The Dynamic Effects of an Increase in the Saving Rate

The Dynamic Effects of an Increase in the Saving Rate from 10% to 20% on the Level and the Growth Rate of Output per Worker

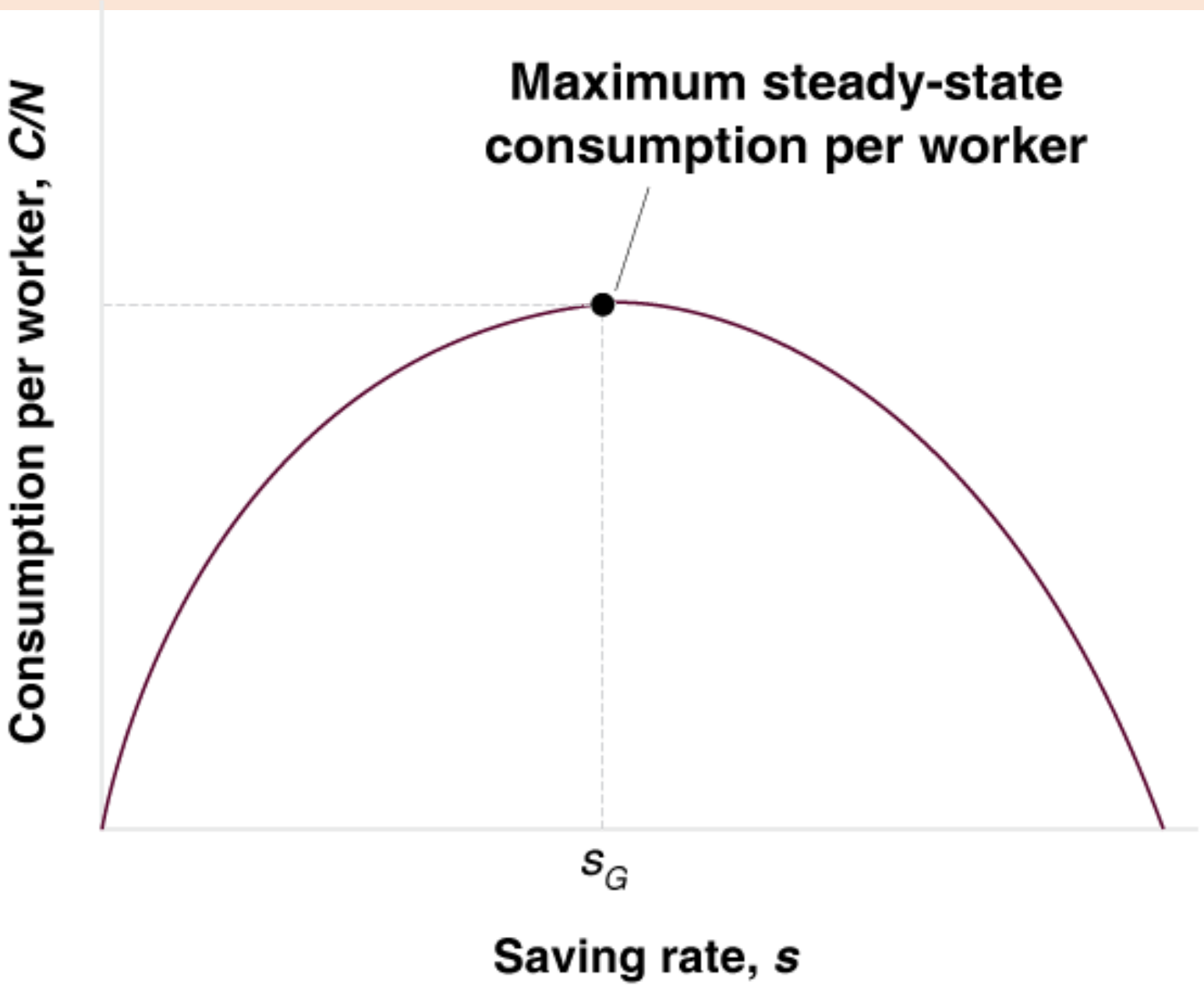
It takes a long time for output to adjust to its new, higher level after an increase in the saving rate. Put another way, an increase in the saving rate leads to a long period of higher growth.



The Effects of the Saving Rate on Steady-State Consumption per Worker

The level of capital associated with the value of the saving rate that yields the highest level of consumption in steady state is known as the **golden-rule level of capital**.

An increase in the saving rate leads to an increase and then to a decrease in steady-state consumption per worker.



Physical versus Human Capital

- The set of skills of the workers in the economy is called human capital.
- An economy with **many highly skilled workers is likely to be much more productive** than an economy in which most workers cannot read or write.
- The conclusions drawn about physical capital accumulation **remain valid after the introduction of human capital in the analysis**.

Extending the Production Function

- When the level of output per workers depends on both the level of physical capital per worker, *K/N*, and the level of human capital per worker, *H/N*, the production function may be written as:

$$\frac{Y}{N} = f\left(\frac{K}{N}, \frac{H}{N}\right)$$
$$(+, +)$$

Example:

Suppose an economy has 100 workers, half of them unskilled and half of them skilled. The relative wage of skilled workers is twice that of unskilled workers.

$$H = [(50 \times 1) + (50 \times 2)] = 150 \Rightarrow \frac{H}{N} = \frac{150}{100} = 1.5$$

Pendekatan praktis:

$Y_t = f(K_t , L_{SD} , L_{SL} , L_{PT} , t)$

Human Capital, Physical Capital, and Output

An increase in how much society "saves" in the form of human capital—through **education and on-the-job-training**—increases steady-state human capital per worker, which leads to an increase in output per worker.

In the long run, output per worker depends not only on how much society saves but also how much it spends on **education**.

Endogenous Growth

- Suatu studi baru-baru ini menyimpulkan bahwa output per pekerja **tergantung kira-kira sama pada jumlah modal fisik dan jumlah sumber daya manusia dalam perekonomian.**

Pendekatan praktis: $Y_t = f(K_t , L_{SD} , L_{SL} , L_{PT} , t)$

- Model yang menghasilkan pertumbuhan yang mapan, bahkan tanpa kemajuan teknologi, disebut model pertumbuhan endogen, di mana pertumbuhan tergantung pada variabel seperti **tingkat tabungan dan tingkat pengeluaran pendidikan**.

  - Output per pekerja tergantung pada tingkat **modal fisik** per pekerja dan **modal manusia** per pekerja.

  - Apakah kemajuan teknologi tidak terkait dengan tingkat modal manusia dalam perekonomian? **Bukankah tenaga kerja yang berpendidikan lebih baik dapat menyebabkan tingkat yang lebih tinggi dalam kemajuan teknologi?** Pertanyaan-pertanyaan ini dibahas dalam topik berikutnya: sumber dan efek kemajuan teknologi.

Technological Progress and the Rate of Growth

- Technological progress has many dimensions: *Larger quantities of output, Better products, New products, A larger variety of products*.
- Technological progress leads to increases in output for given amounts of capital and labor.
- Let's **denote the state of technology by *A*** and rewrite the production function as:

$$Y = F(K, N, A)$$
$$(+\ +\ +)$$

- A **more restrictive but more convenient form** is: $Y = F(K, AN)$
- Output depends on both capital and labor (*K* and *N*), and on the state of technology (*A*). Technological progress *increases AN*, the amount of **effective labor**, or labor in **"efficiency units"**

Technological progress *reduces* the number of workers needed to achieve a given output Y.

Constant returns to scale

$$xY = F(xK,\ xAN)$$

Output per effective worker is a function of ***capital per effective worker***:

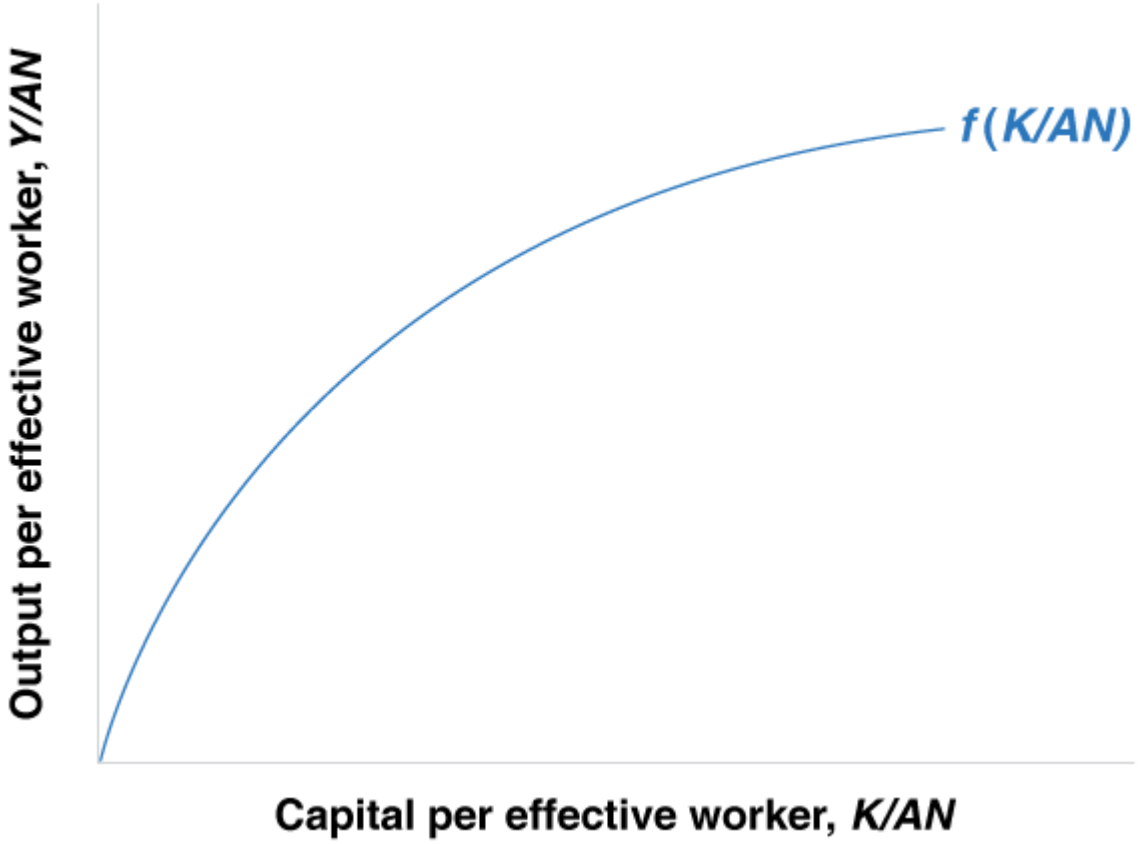
$$\frac{Y}{AN} = f\left(\frac{K}{AN}\right)$$

Because of decreasing returns to capital, increases in capital per effective worker lead to smaller and smaller increases in output per effective worker.

The relation between investment per worker and capital per worker:

$$I = S = sY$$

$$\frac{I}{AN} = sf\left(\frac{K}{AN}\right)$$



Technological Progress and the Rate of Growth

Dynamics of Capital and Output per effective worker

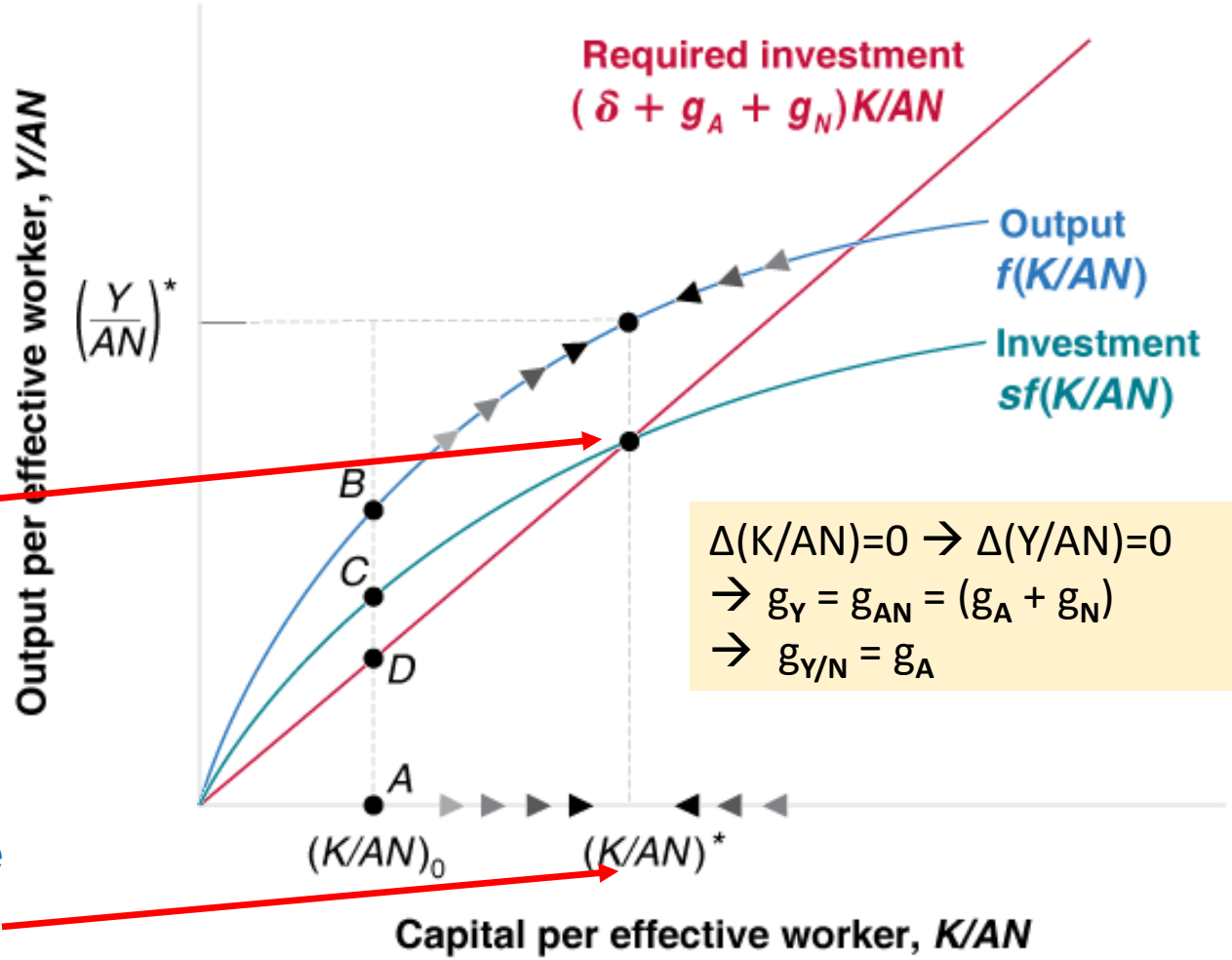
the investment needed to maintain a given level of capital per effective worker:

$$I = \delta K + (g_A + g_N)K$$

$$I = (\delta + g_A + g_N)K$$

The amount of **investment per effective worker** needed to maintain a constant level of capital per effective worker is:

$$(\delta + g_A + g_N)\frac{K}{AN}$$



$\Delta(K/AN)=0 \rightarrow \Delta(Y/AN)=0$
$\rightarrow g_Y = g_{AN} = (g_A + g_N)$
$\rightarrow g_{Y/N} = g_A$

- Output per effective worker increases with capital per effective worker, but at a decreasing rate.
- **Capital per effective worker and output per effective worker converge to constant values in the long run.**

- *A* increases over time, the number of effective workers (*AN*) increases over time.

Technological Progress and the Rate of Growth

Because output, capital, and effective labor all grow at the same rate, (g_A+g_N), the steady state of the economy is also called a state of **balanced growth**.

1. growth since 1950 has been a **result of rapid technological progress**, not unusually high capital accumulation.
2. **convergence** of output per worker across countries has come **from higher technological progress**, rather than from faster capital accumulation, **in the countries that started behind**.

Table 12-1: The Characteristics of Balanced Growth`

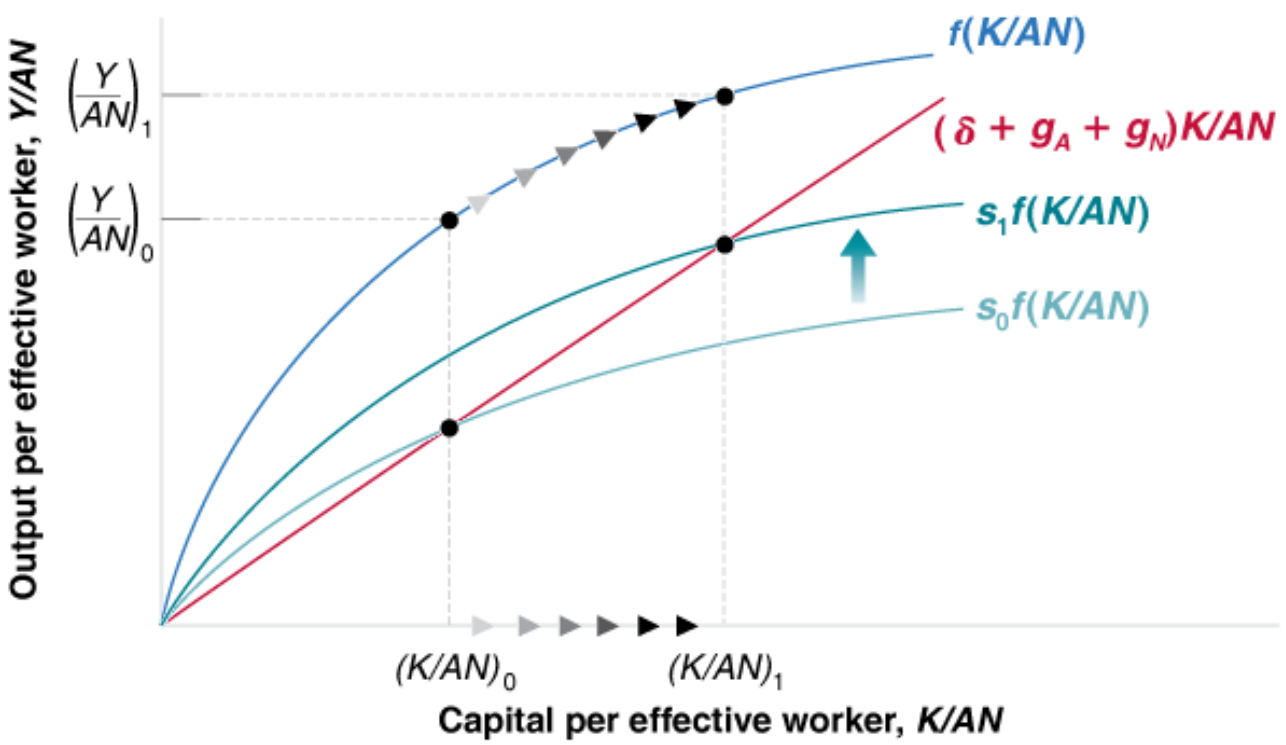
		Rate of growth of:
1	Capital per effective worker	0
2	Output per effective worker	0
3	Capital per worker	g_A
4	Output per worker	g_A
5	Labor	g_N
6	Capital	$g_A + g_N$
7	Output	$g_A{}^W + g_N$

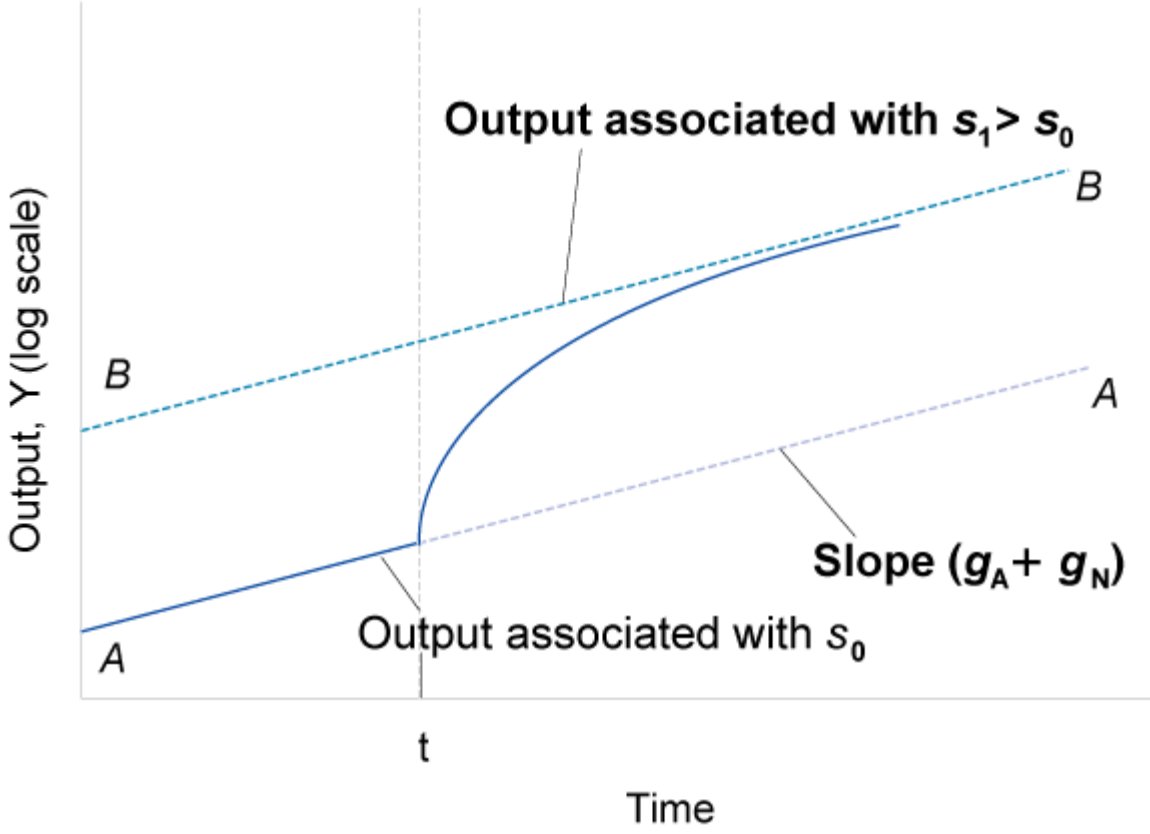
Table 12-2 Average Annual Rates of Growth of Output per Capita and Technological Progress in Four Rich Countries since 1950

	Rate of Growth of Output per Worker (%) 1950 to 2004	Rate of Technological Progress (%) 1950 to 2004
France	3.2	3.1
Japan	4.2	3.8
United Kingdom	2.4	2.6
United States	1.8	2.0
Average	2.9	2.9

Sumber: Blanchard (2017)

The Effects of an Increase in the Saving Rate



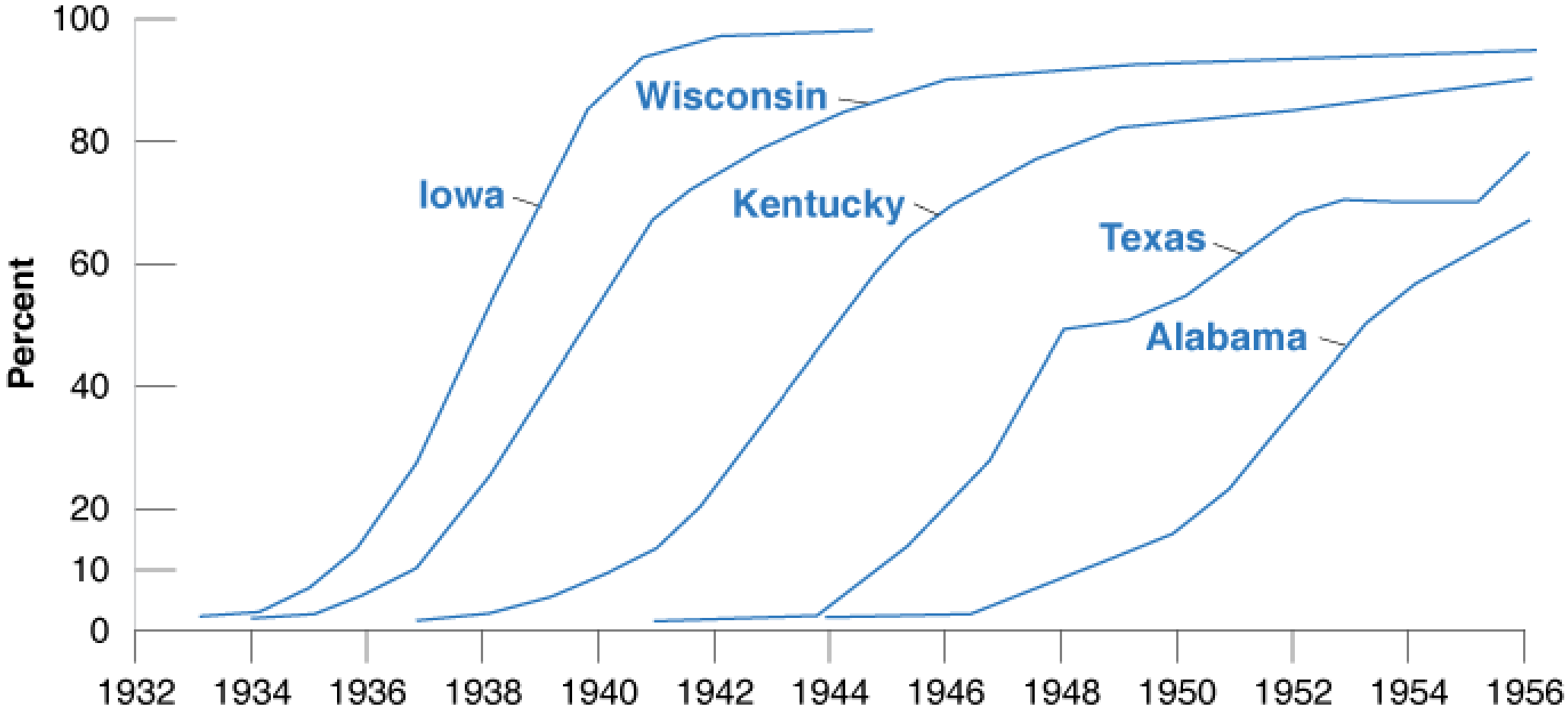


An increase in the saving rate leads to an increase in the levels of output per effective worker and capital per effective worker.

The increase in the saving rate leads to higher growth until the economy reaches its new, higher, *balanced growth path*.

Sumber: Blanchard (2017)

The Diffusion of New Technology: Hybrid Corn



Persentase Total Area Jagung dengan Benih Hibrida di Beberapa Negara Bagian AS, 1932-1956

Sumber: Blanchard (2017)

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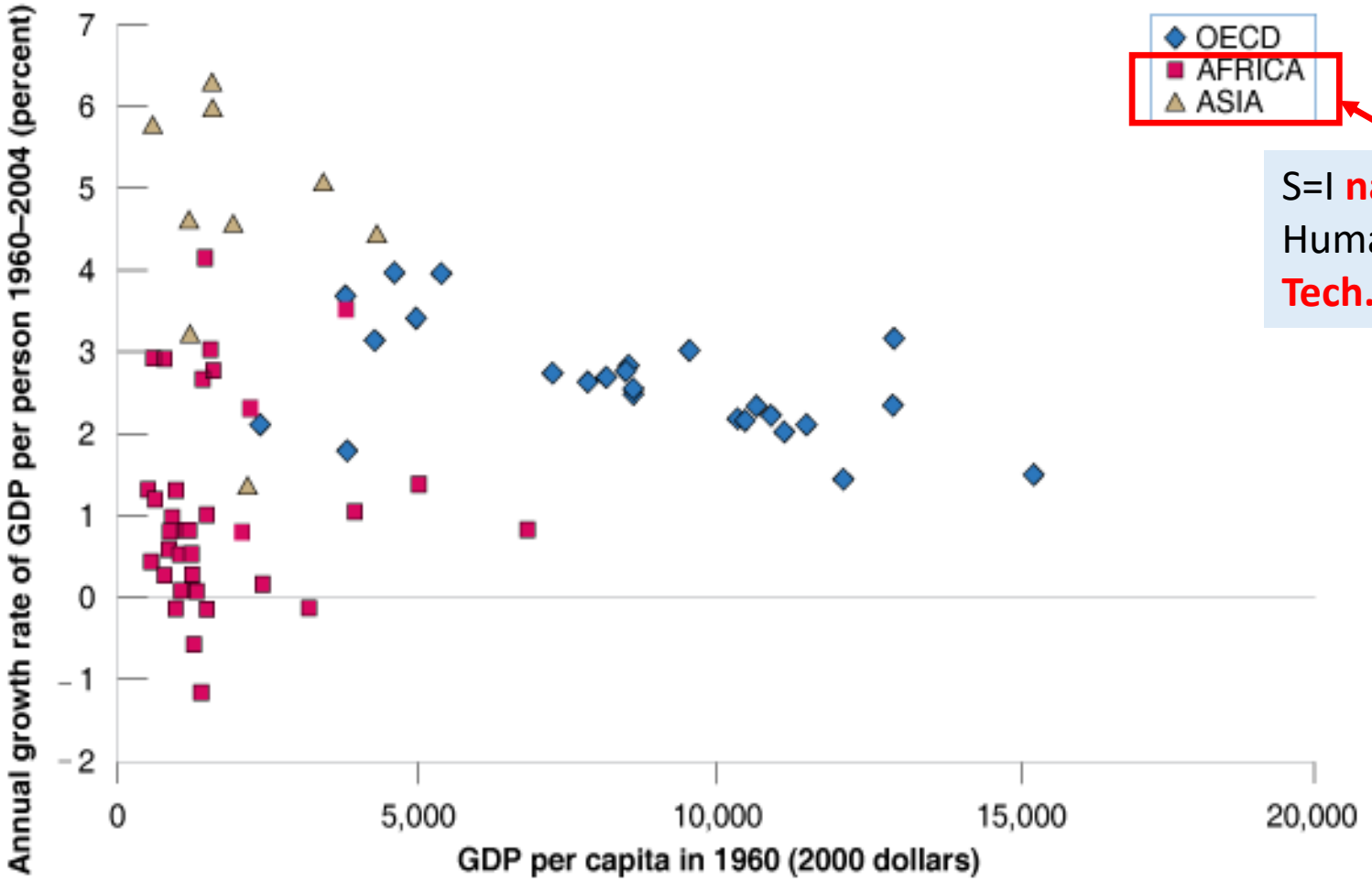
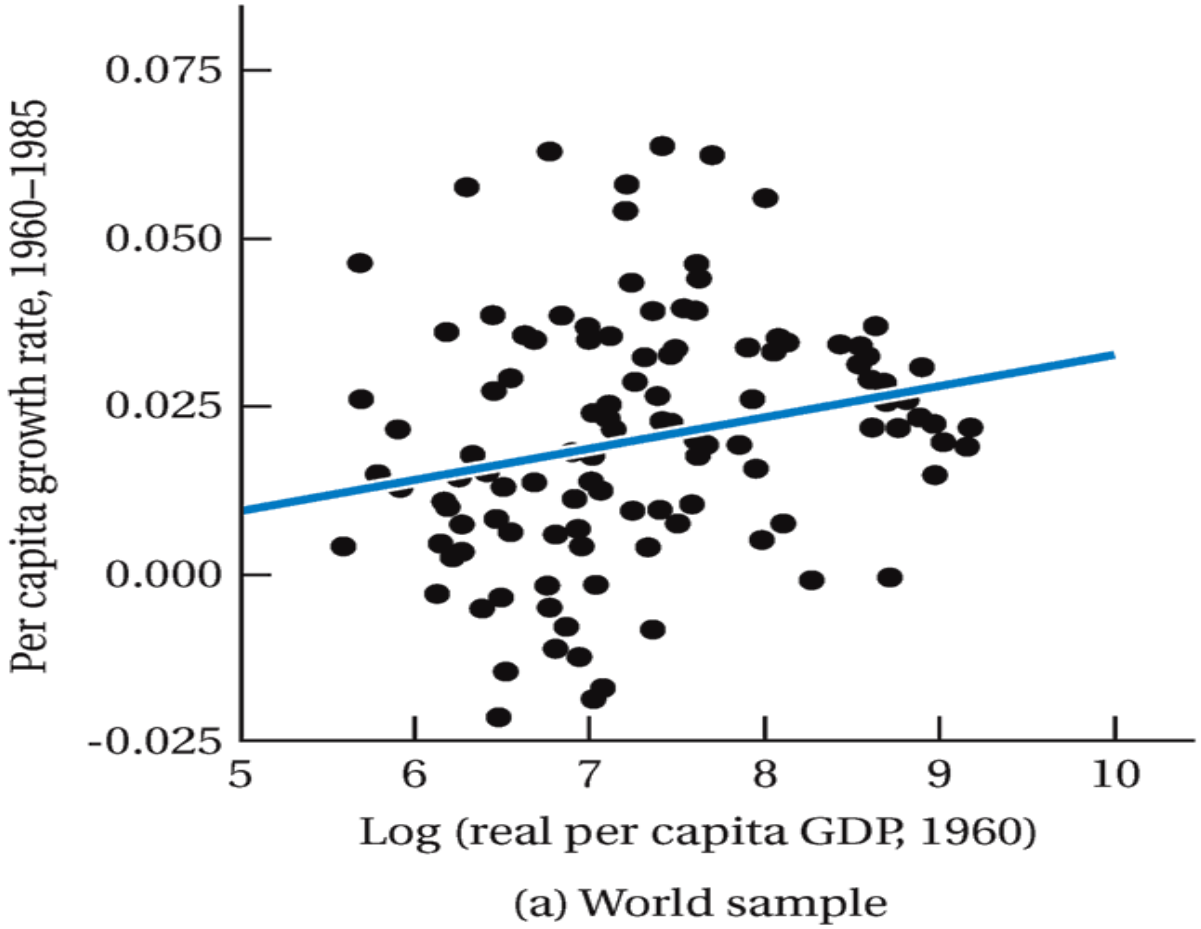


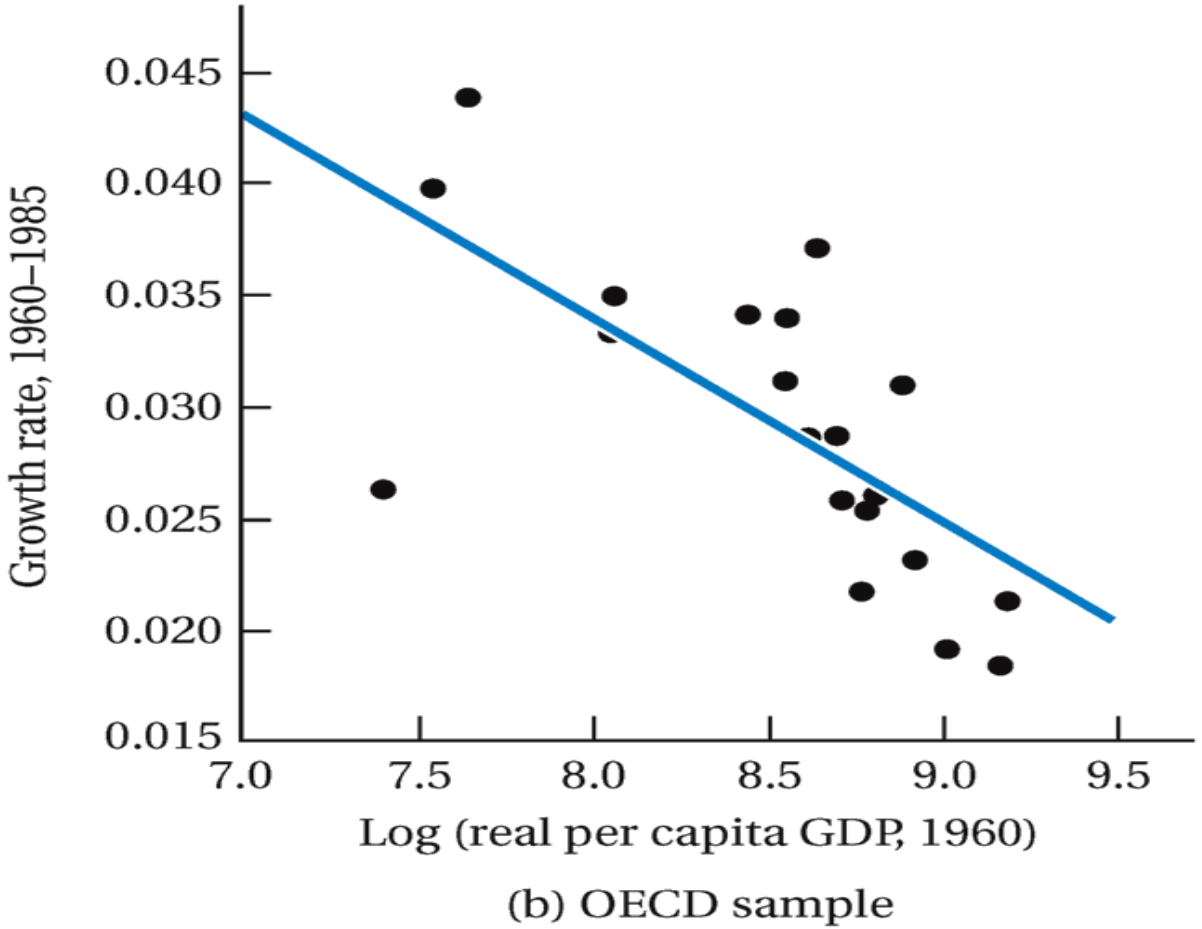
S=I **naik?**
Human Capital**?**
Tech. improvement?

Sumber: Blanchard (2017)

Convergence among OECD Countries but Divergence in the World as a Whole



(a) World sample



(b) OECD sample

Source: Robert Barro and Xavier Sala-i-Martin, *Economic Growth* (New York: McGraw-Hill, 1995), p. 27. Reprinted with permission.

Source: Todaro & Smith (2009)

The Determinants of Technological Progress

- "Technological progress" in modern economies is the **result of firms' research and development (R&D) activities**. The outcome of R&D is fundamentally *ideas*.
- Spending on R&D depends on:
  1. The **fertility** of the research process, or how spending on R&D translates into new ideas and new products, and
  2. the **appropriability of research** results, or the extent to which firms benefit from the results of their own R&D.

- The **determinants of fertility** include:
  1. The interaction between basic research (the search for general principles and results) and applied research (the application of results to specific uses).
  2. The country: some countries are more successful at basic research; others are more successful at applied research and development.
  3. Time: It takes many years, and often many decades, for the full potential of major discoveries to be realized.

The Appropriability of Research Results

If firms cannot appropriate the profits from the development of new products, they will not engage in R&D. Factors at work include:

1. The nature of the research process. **Is there a payoff in being first at developing a new product**?
2. Legal protection. **Patents** give a firm that has discovered a new product the right to exclude anyone else from the production or use of the new product for a period of time.

Capital Accumulation versus Technological Progress in China since 1980

- Going beyond growth in OECD countries, one of the striking facts was the high growth rates achieved by a number of Asian countries. This raises again the same questions we just discussed: Do these high growth rates **reflect fast technological progress**, or do they reflect **unusually high capital accumulation**?

- To answer the questions, we shall focus on China because of its **size** and because of the astonishingly high output **growth** rate, nearly 10%, it has achieved since the early 1980s.

Table 12-3 Average Annual Rate of Growth of Output per Worker and Technological Progress in China, 1983 to 2003

Rate of Growth of Output (%)	Rate of Growth of Output per Worker (%)	Rate of Technological Progress (%)
9.7	8.0	8.2

The nature of technological progress is likely to be different in more and less advanced economies. The more advanced economies, being by definition at the **technological frontier**, need to develop new ideas, new processes, and new products.

It is easier for the less advanced economies to imitate rather than innovate new technologies. This can explain why convergence, both within the OECD and in the case of China and other countries, typically takes the form of **technological catch-up**.

Sumber: Blanchard (2017)

Exogenous Growth (Solow-Swan, 1950s)	**Endogenous Growth (1980s)**
• growth is the result of three factors—limited **labor & capital**, and (unlimited contribution from) **technology**. • growth is fueled by technological progress, from **outside the economic system**; such as the rate of technological advancement or the savings rate. • modeled by Solow, Ramsey, and Harrod-Domar. • growth will cease at some point as ongoing production reaches a state of equilibrium based on internal demand factors. Once this equilibrium is reached, **exogenous factors are then needed to stoke growth**.	• growth is generated from within a system as a direct result of internal processes. • the **enhancement of a nation's human capital will lead to economic growth** by means of the development of new forms of technology and efficient and effective means of production. • **knowledge-based industries** play a particularly important role — especially telecommunications, software and other high tech industries — as they are becoming ever more influential in developed and emerging economies. • There are increasing returns to scale from capital investment especially in infrastructure and investment in education and health and telecommunications. • encourage entrepreneurship as a means of creating new businesses and ultimately as an important source of new jobs, investment and further innovation

Endogenous Growth Theory (The Romer model)

- Motivation for the new growth theory (simplified version)
- **Asumsi**: Growth processes derive from the firm (industry) level.

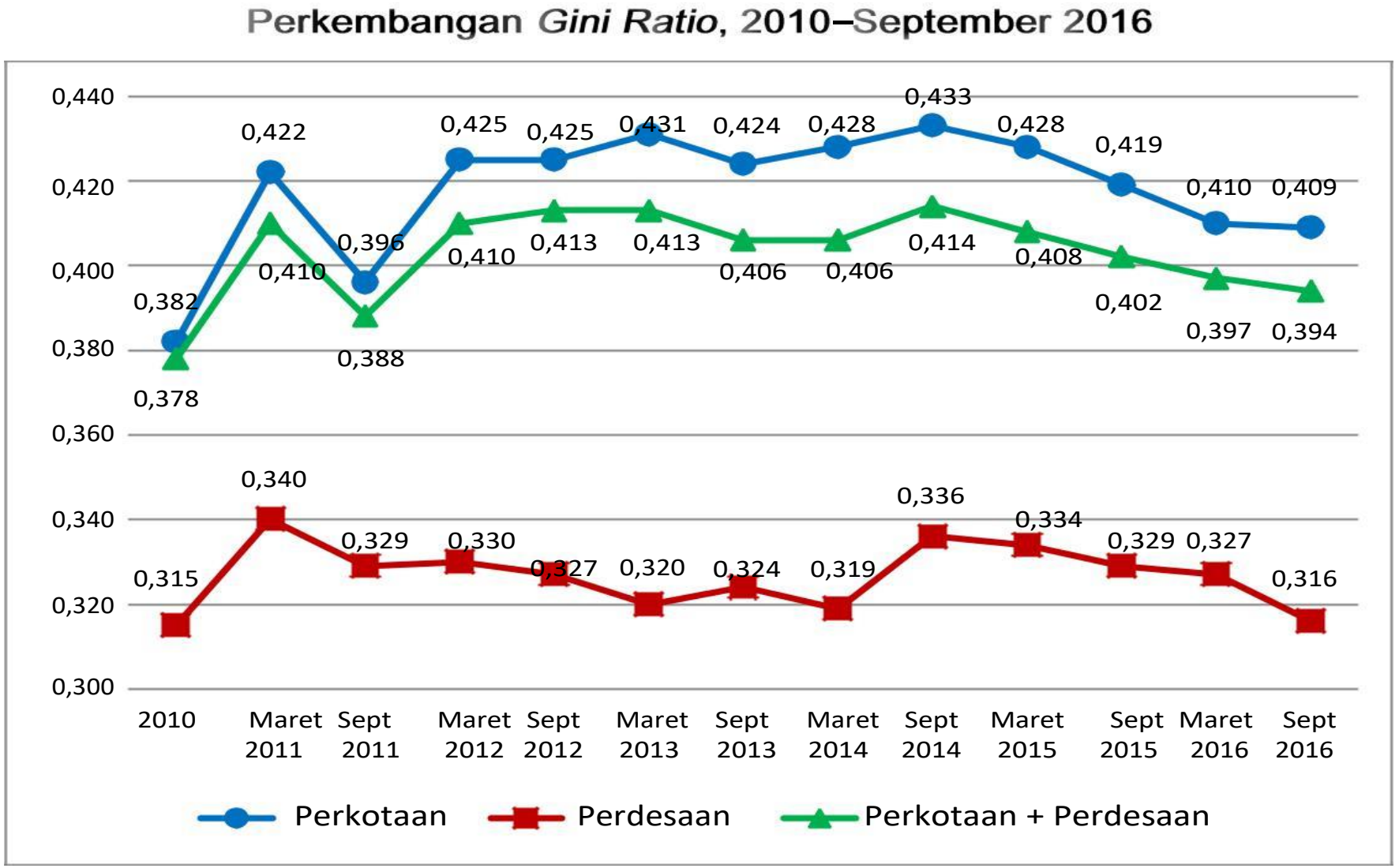
$$Y_i = AK_i^{\alpha} L_i^{1-\alpha} \overline{K}^{\beta}$$

$$Y = AK^{\alpha+\beta} L^{1-\alpha}$$

$$g - n = \frac{\beta N}{[1 - \alpha - \beta]}$$

i : firm
β: elasticity of economywide capital stock or capital externality or technolgy spillovers (public good: knowledge part of K_i)

Growth for inome/capita



Ketimpangan Memburuk sejak OTDA? (Kompas, 20 Juli 2017)

Pertumbuhan merupkan syarat perlu (bukan syarat cukup) bagi pembangunan. Bagaimana distribusi hasil pertumbuhan itu? Apakaha distribusinya terlihat "fair"? Apakah ketimpangan dapat diperbaiki? Bagaimana sebaiknya kebijakan pemerintah terkait ini?

Model Makro (Keyness) Sederhana

- AS *(Aggregate Supply)* = AD (*Aggregate Demand*)
- Y = C + I + G + (EX-IM)
- Misal: C= co + c1 (Y-T) dan EX-IM=0

- **Y = co + c1 (Y-T) + I + G**

Pdptn APBN

$$Y = \frac{1}{1 - c_1}[c_0 + \bar{I} + \bar{G} - c_1 T]$$

Multiplier Effect & Trickle Down Effect?

Pertumbuhan Inklusif:
Y↗ → ↘ inequality, unemployment & Poverty

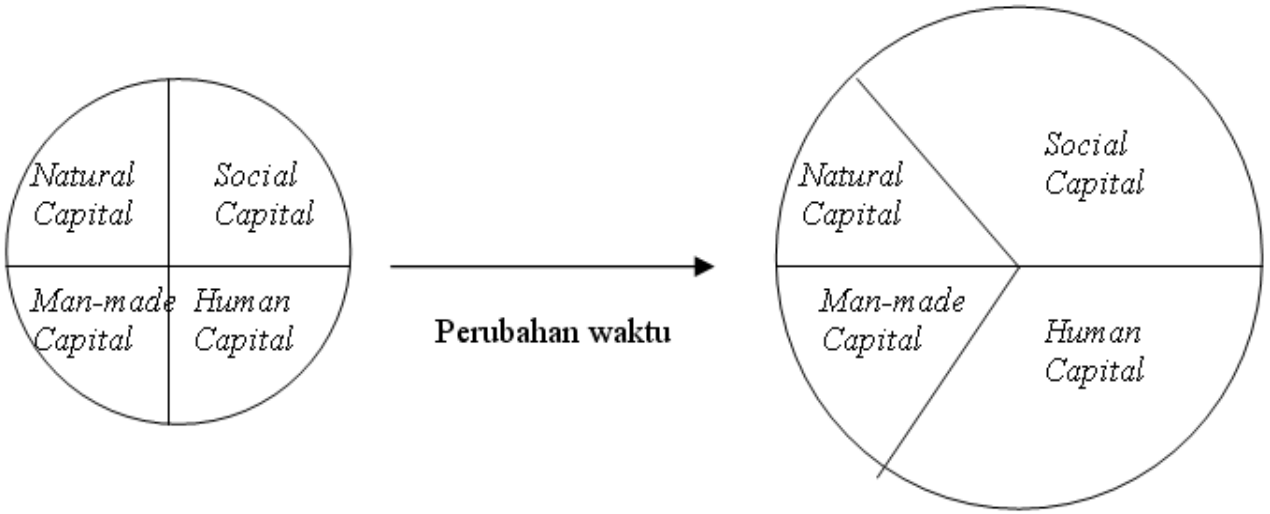
1) Membangun infrastruktur Perdesaan dibandingkan Reaktor Nuklir?
2) Reaktor Nuklir (Listrik) Ke depan?

Modal Sosial (*Social Capital*)

Modal sosial adalah **kemampuan masyarakat untuk bekerja sama**, demi mencapai tujuan bersama, di dalam berbagai kelompok dan organisasi (Coleman,1999).

Tiga komponen penting modal sosial yaitu **kepercayaan (*trust*), nilai atau norma (*norms*) dan jaringan (*networks*).**

Fukuyama (1999) menyatakan bahwa modal sosial memegang peranan yang sangat penting dalam memfungsikan dan memperkuat kehidupan masyarakat modern. *Modal sosial yang lemah akan meredupkan semangat gotong royong, memperparah kemiskinan, dan menghalangi upaya untuk meningkatkan kesejahteraan penduduk*.



Pengembangan dan **Komposisi Kapital dalam Pembangunan Berkelanjutan**

Human Capital: **kuantitas, kualitas** (pendidikan & ketrampilan)

Tugas Tiap Kelompok:

1. Bagaimana Hubungan (*Income/Capita*) dengan Kebahagiaan?
2. Jelaskan Model Pertumbuhan Neoklasik dari Robert Solow
3. Jelaskan, apakah dalam model tersebut dijelaskan bagaimana peranan *Human Capital*?
4. Jelaskan sumber-sumber (determinan) pertumbuhan Ekonomi.
5. Bagaimana peranan modal fisik dan modal manusia & bagaimana perbedaannya?
6. Jelaskan bagaimana peranan dari kemajuan teknologi.
7. Faktor apa saja yang menentukan anggaran untuk R&D?
8. Jelaskan tentang Pertumbuhan endogen
9. Jelaskan tentang Pertumbuhan inklusif