

Macroeconomics: Principles & Applications

CHAPTER 9

Economic Growth and Rising Living Standards

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Meaning and Importance of Economic Growth

- **Economic growth**
 - A rise in living standards
- **Average standard of living**
 - Total output (real GDP) per person
- **High real GDP per capita**
 - Associated with a higher quality of life
- **Very low GDP per capita**
 - Lower quality of life for most people

Table 1: Some indicators of economic well-being in rich & poor countries, 2006

| Country | GDP per Capita (U.S. Dollars) | Under-5 Mortality (per 1,000 live births) | Life Expectancy at Birth | Adult Literacy Rate | Percent of Population living on <\$2 per day |
|-----------------------|----------------------------------|--|--------------------------|---------------------|--|
| Rich Countries | | | | | |
| United States | \$43,986 | 7 | 78.0 | >99% | ... |
| United Kingdom | \$32,654 | 6 | 79.2 | >99% | ... |
| France | \$31,980 | 5 | 80.4 | >99% | ... |
| Japan | \$31,951 | 4 | 82.4 | >99% | ... |
| Germany | \$31,766 | 5 | 79.3 | >99% | ... |
| Italy | \$28,828 | 4 | 80.4 | 98.8% | ... |
| Poor Countries | | | | | |
| Pakistan | \$2,361 | 99 | 64.9 | 54.2% | 60.3% |
| Cambodia | \$1,619 | 143 | 58.6 | 75.6% | 68.2% |
| Ghana | \$1,247 | 59 | 59.4 | 64.2% | 53.6% |
| Sierra Leone | \$ 630 | 282 | 42.1 | 37.1% | 76.1% |
| Niger | \$ 612 | 256 | 56.2 | 29.8% | 85.6% |
| DR-Congo | \$ 281 | 205 | 46.1 | 67.2% | 79.5% |

Meaning and Importance of Economic Growth

- Small growth rates in GDP
 - Matter over time
- Small differences in GDP growth rate
 - Matter over time
- The rule of 70
 - If a variable is growing by X percent per year
 - It will double in approximately $70/X$ years

Meaning and Importance of Economic Growth

- **Growth prospects**
 - A country that was once poor can become rich
 - 1970s - South Korea and Singapore began growing rapidly
 - 1980s – China, India, Vietnam started experiencing economic growth
 - 1990s – Ghana, Uganda began growing steadily

Figure 1: Real GDP per Capita, Selected Countries

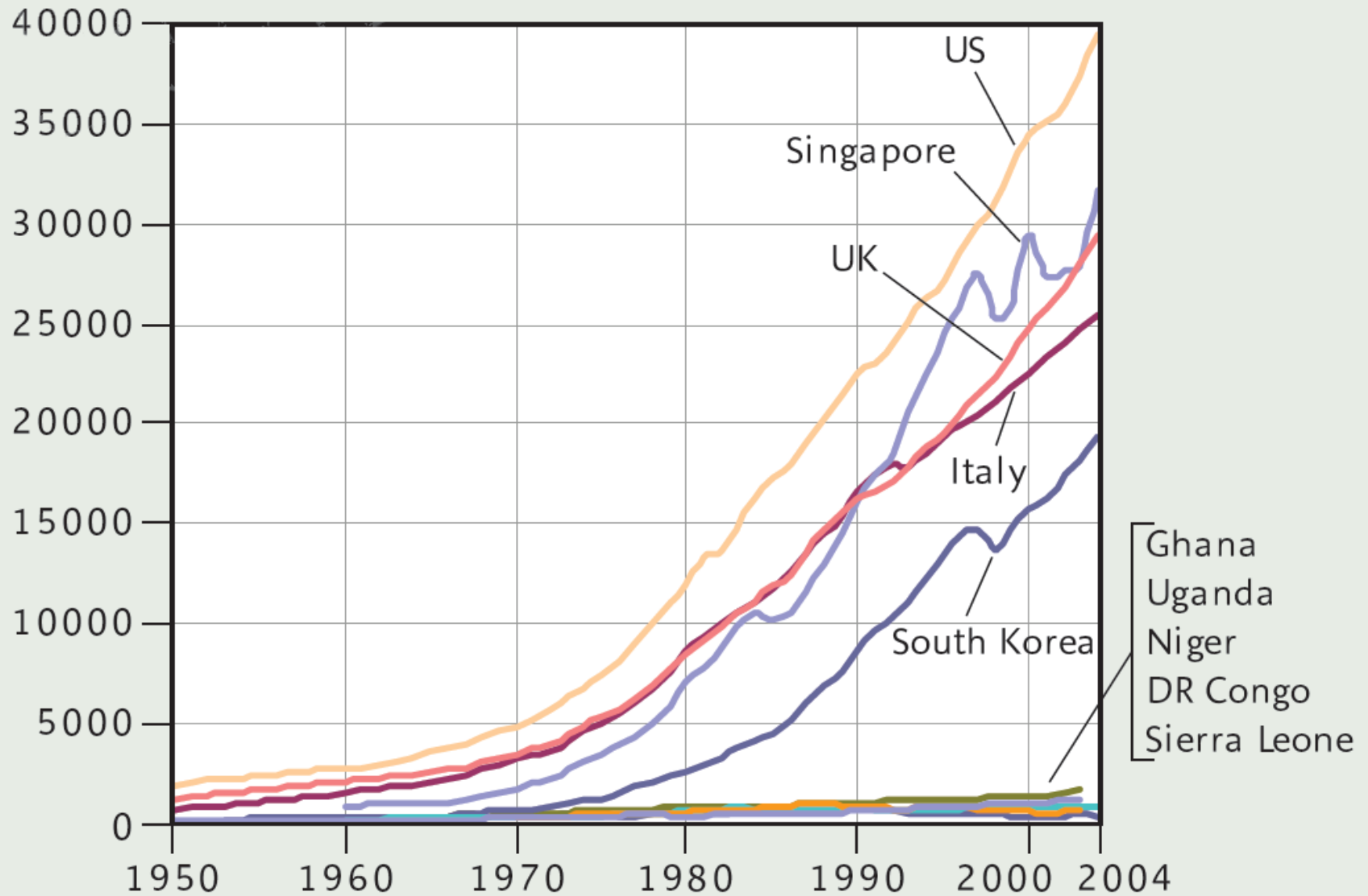
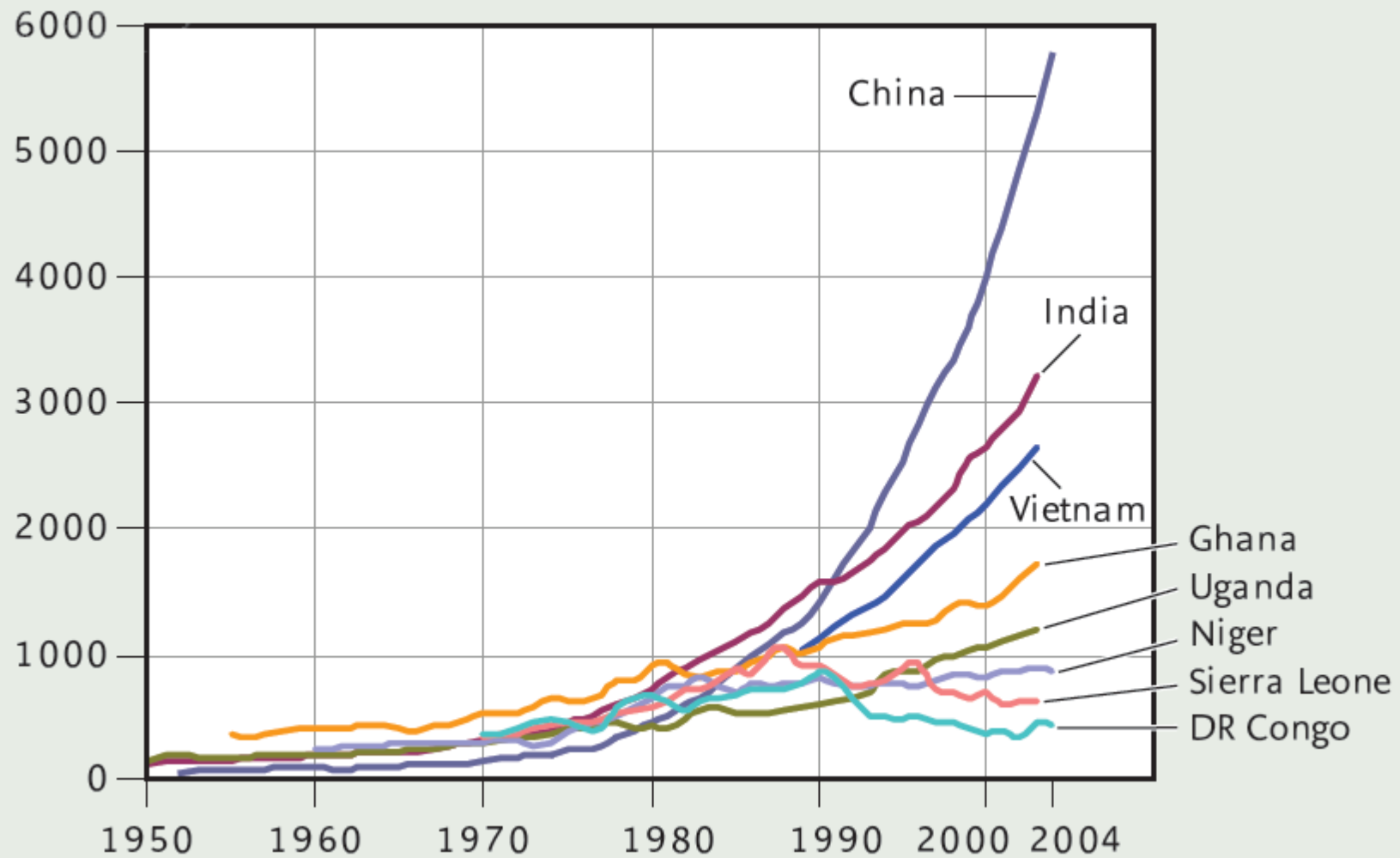


Figure 2: Growth in Real GDP per Capita: Another Perspective



What Makes Economies Grow?

- **Determinants of real GDP**
 - Labor productivity
 - Average hours
 - Employment population ratio
 - Size of the population

What Makes Economies Grow?

- **Labor productivity**
 - Output produced by the average worker in an hour
 - Output per hour = total output / total hours worked
- **Average hours**
 - Total hours / total employment

What Makes Economies Grow?

- Employment–population ratio (EPR)
 - Percentage of the population that is working
 - Total employment / Population
- Real GDP = Productivity × Average Hours × EPR × Population

$$\begin{aligned} & \frac{\text{Total output}}{\text{Total hours}} \times \frac{\text{Total hours}}{\text{Total employment}} \times \frac{\text{Total employment}}{\text{Population}} \times \text{Population} \\ &= \frac{\text{Total output}}{\text{Total hours}} \times \frac{\text{Total hours}}{\text{Total employment}} \times \frac{\text{Total employment}}{\text{Population}} \times \text{Population} \\ &= \text{Total output (Real GDP)} \end{aligned}$$

What Makes Economies Grow?

- **Growth equation**
 - Percentage growth rate of real GDP per capita = the sum of the growth rates of productivity, average hours, and the employment-population ratio

$$\% \Delta \text{ Real GDP per capita} \approx \% \Delta \text{ Productivity} + \% \Delta \text{ Average Hours} + \% \Delta \text{ EPR}$$

Table 2: Factors Contributing to Growth in U.S. Real GDP

| Annual Percentage Growth in Real GDP Due to Growth in: | 1953 to 1973 | 1973 to 1995 | 1995 to 2008 | 2008 to 2014 (projected) |
|---|---------------------|---------------------|---------------------|---------------------------------|
| EPR | 0.2 | 0.4 | 0.0 | -0.3 |
| Average Hours | -0.3 | -0.3 | -0.2 | 0.1 |
| Productivity | 2.1 | 1.3 | 2.3 | 2.1 |
| Total | 2.0 | 1.4 | 2.1 | 1.9 |

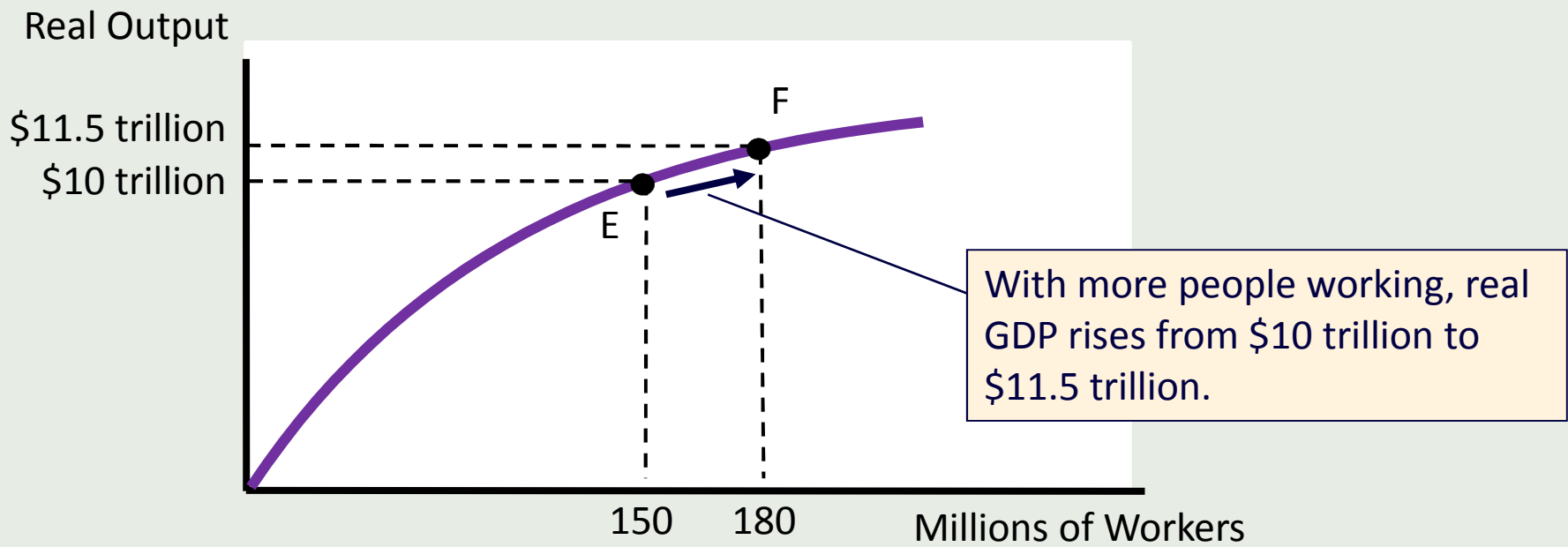
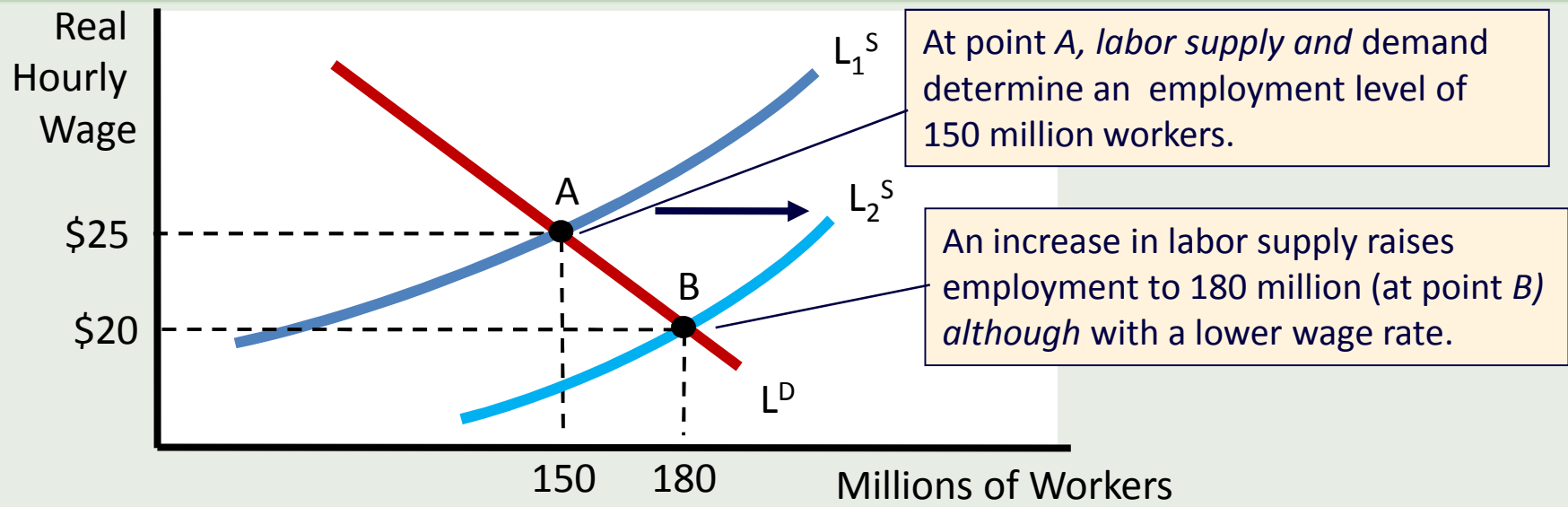
Growth in Employment Population Ratio (EPR)

- **Employment-population ratio**
 - Increases only when total employment rises at a faster rate than the population
- **Greater total employment**
 - With a given population
 - Increase in the EPR
 - Rise in real GDP per capita

Growth in Employment Population Ratio (EPR)

- Causes for total employment to rise
 - Higher labor demand
 - Higher labor demand
- Higher labor supply
 - Higher employment
 - Lower market wage
 - Higher GDP

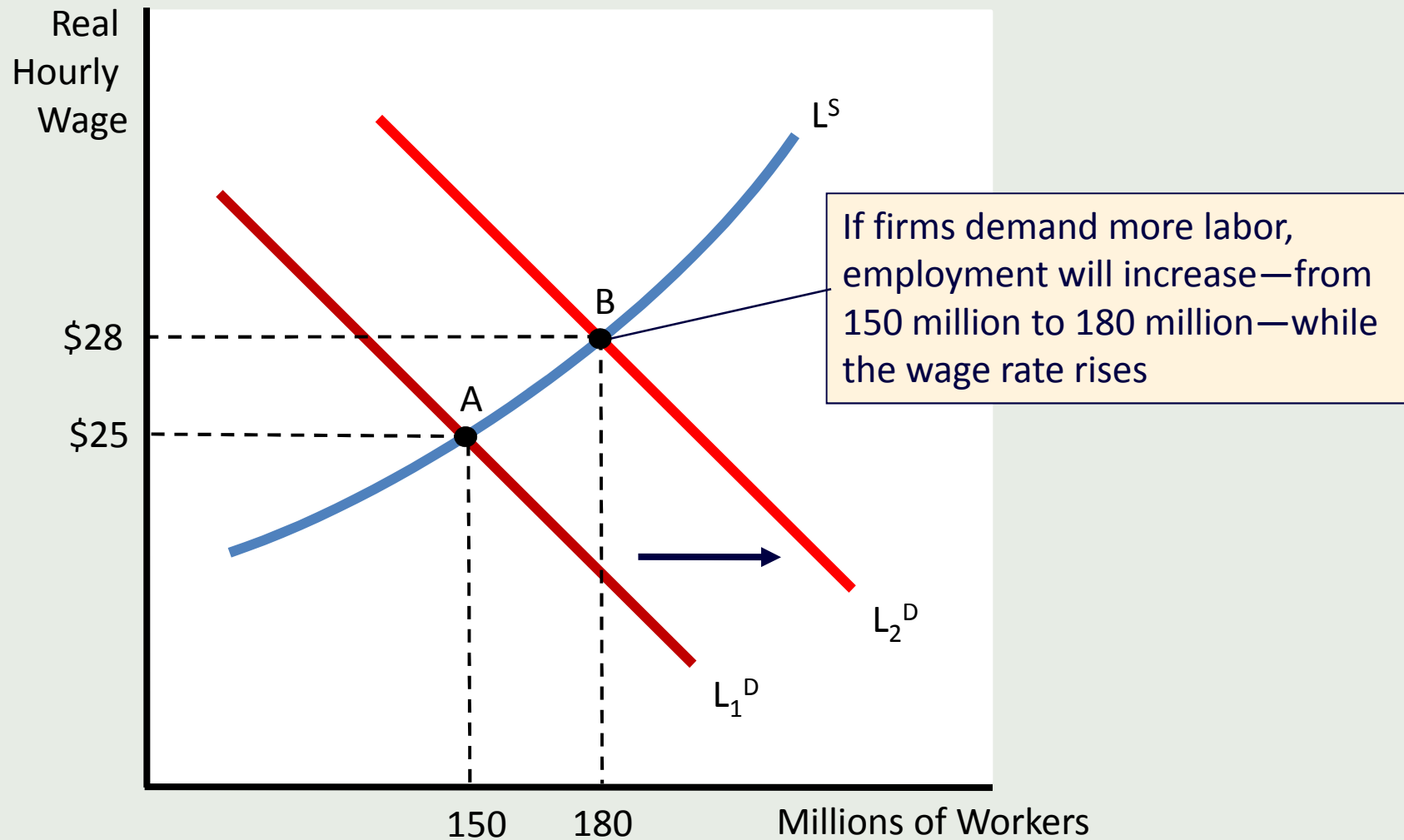
Figure 3: An Increase in Labor Supply



Growth in Employment Population Ratio (EPR)

- **Higher labor demand**
 - Higher employment and
 - Higher market wage
 - Higher GDP
- **Countries experienced increases in the EPR**
 - Simultaneous increase in labor demand and supply
 - Labor demand increasing faster than labor supply
 - Wage rate – increase
 - Employment – increase

Figure 4: An Increase in Labor Demand



Growth in Employment Population Ratio (EPR)

- **Government policy and the EPR**
 - Increase the growth of labor supply
 - Cut in income tax rates
 - Increase the reward for working
 - Cut in certain benefit programs
 - Increase the hardship of not working
 - Increase the growth of labor demand
 - Increase the skills of the workforce
 - Subsidize employment more directly

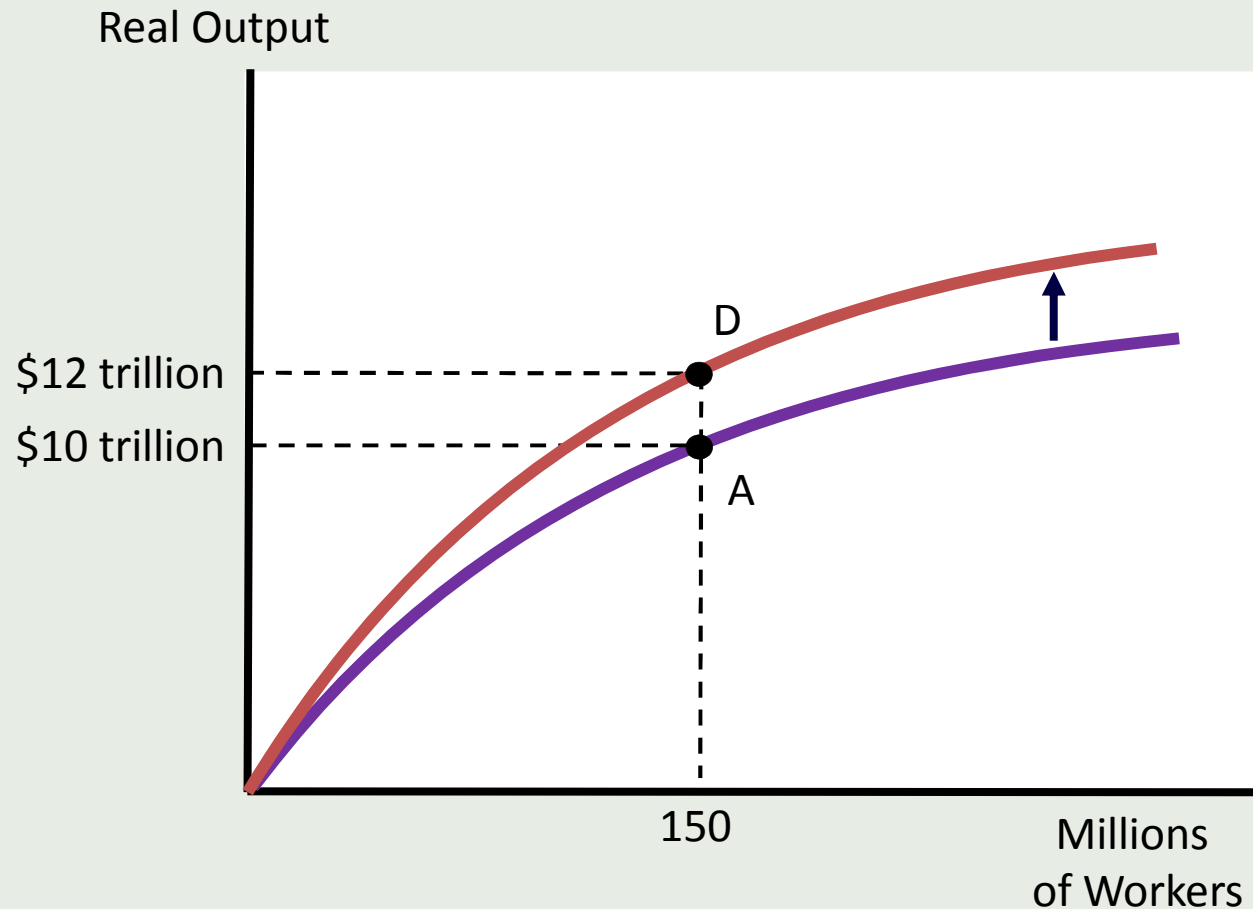
Growth in Employment Population Ratio (EPR)

- **Government policy**
 - Can increase EPR (create economic growth) temporarily
 - While EPR is rising
 - But significant, sustained economic growth
 - Would require significant, sustained growth in the EPR, which is not realistic

Productivity Growth: Increases in Capital Stock

- **Rising productivity**
 - The most important determinant of long-run economic growth
 - By increasing the capital stock
- **Capital per worker**
 - Total capital stock divided by total employment
- **A rise in capital per worker**
 - Causes labor productivity to rise

Figure 5: Capital Accumulation and the Production Function



An increase in the capital stock shifts the production function upward. At point A, 150 million workers could produce \$10 trillion of real GDP. With more capital, those same workers could produce \$12 trillion of real GDP.

Productivity Growth: Increases in Capital Stock

- **How fast the capital stock rises?**
 - Rate of planned investment spending in the economy
- **Capital stock - Stock variable**
 - A variable measuring a quantity at a moment in time
- **Planned investment - Flow variable**
 - A variable measuring a process over some period of time

Productivity Growth: Increases in Capital Stock

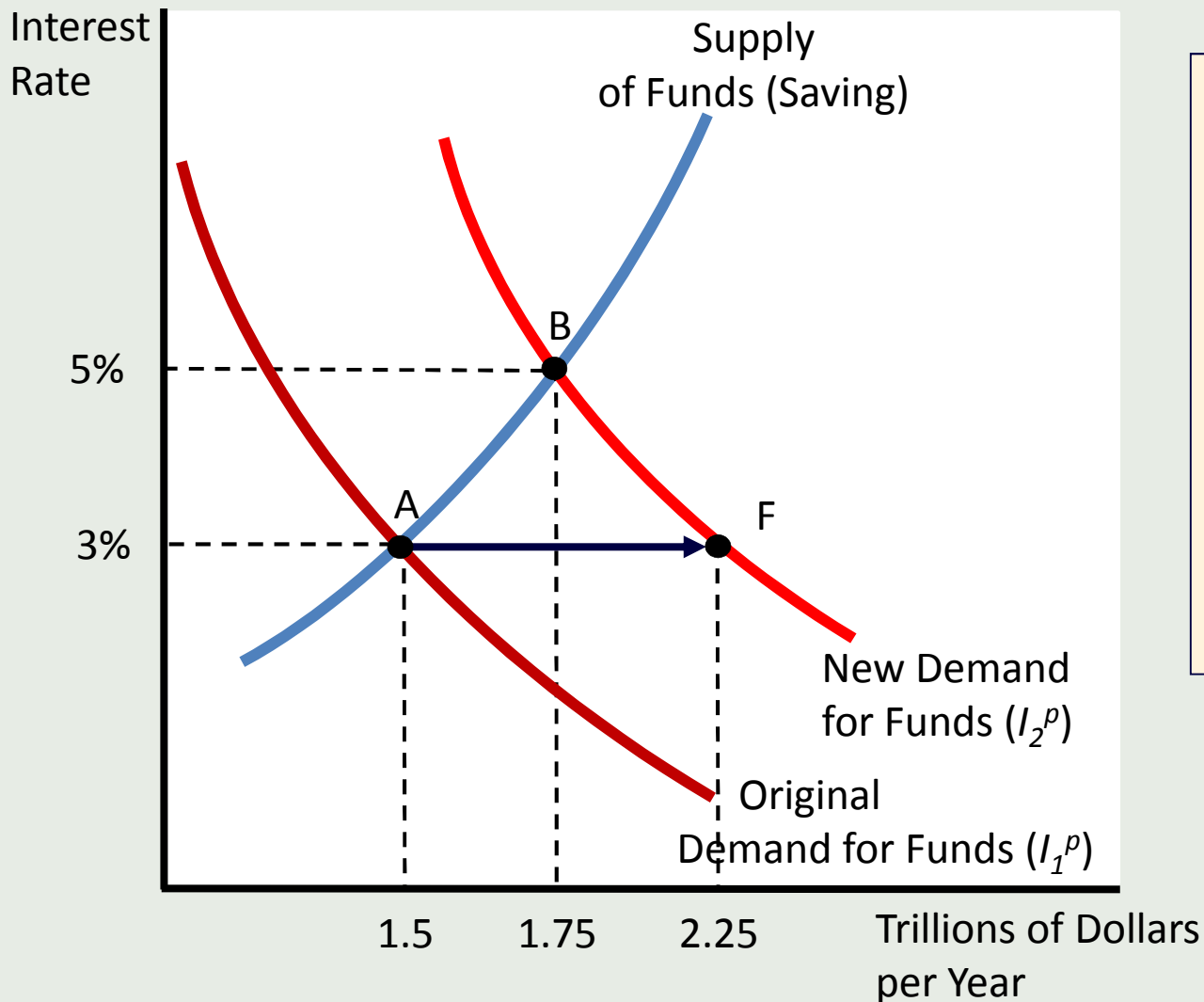
- **A higher rate of investment spending**
 - Faster growth in capital per worker
 - Faster growth in productivity
 - Faster growth in the average standard of living
 - For a given rate of depreciation and given total employment

Government – seeking to increase investment

1. Target businesses: Increase incentive to invest

- Lower corporate profit tax
- Investment tax credit
- **Corporate profits tax**
 - A tax on the profits earned by corporations
- **Investment tax credit**
 - A reduction in taxes for firms that invest in new capital

Figure 6: An Increase in Investment Spending



Government policies that make investment more profitable will increase investment spending at each interest rate. The resulting rightward shift of the investment demand curve (by the distance AF) leads to a higher level of investment spending, at point B.

Government – seeking to increase investment

2. Target households: Increase incentive to save

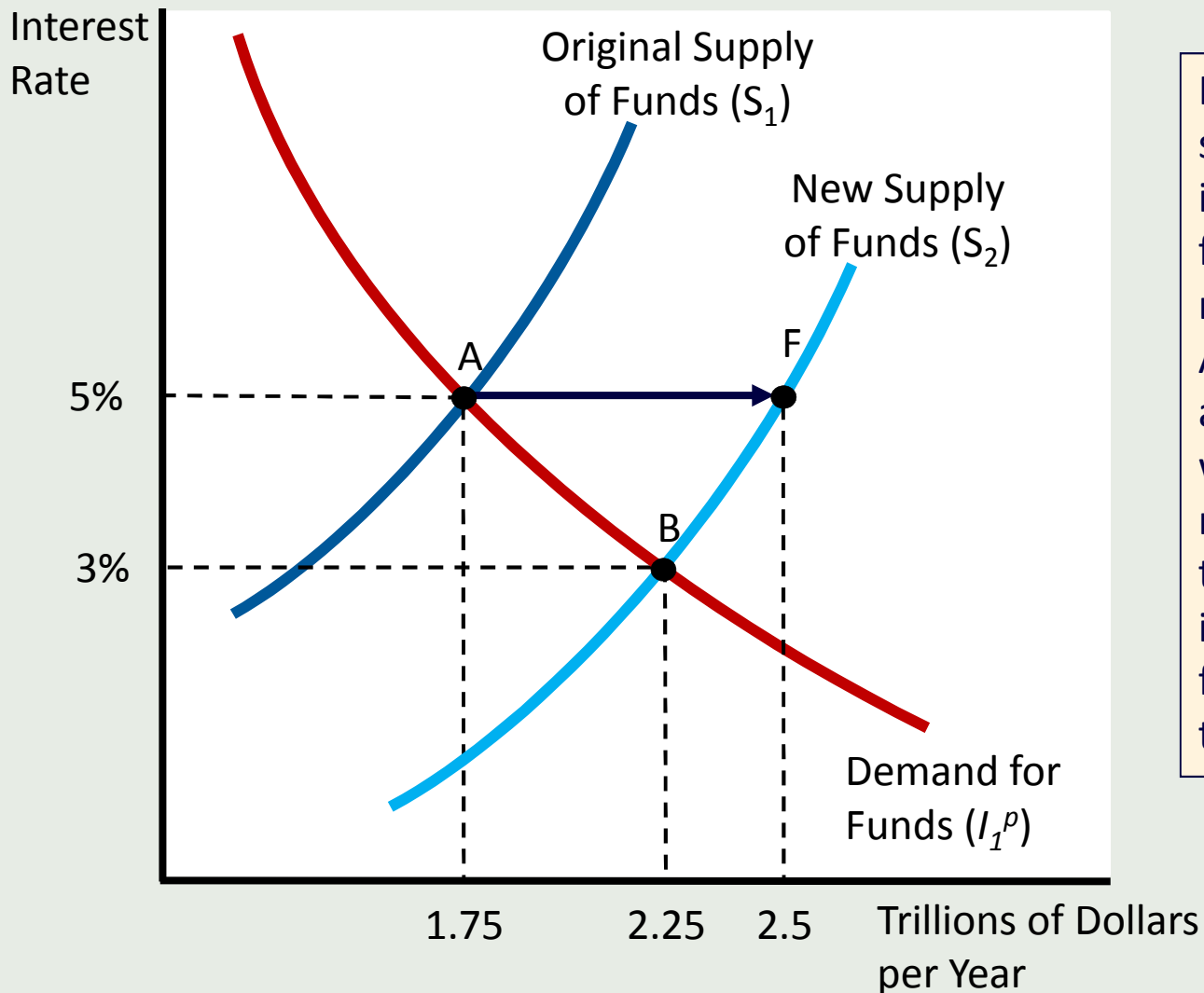
- Decrease capital gains tax rate
- Switch to a consumption tax
- Alter transfer system (social safety net)

- More funds available for investment

Government – seeking to increase investment

- **Capital gains tax**
 - Tax on profits earned when a financial asset is sold at more than its acquisition price
- **Consumption tax**
 - Tax on the part of their income that households spend

Figure 7: An Increase in Saving



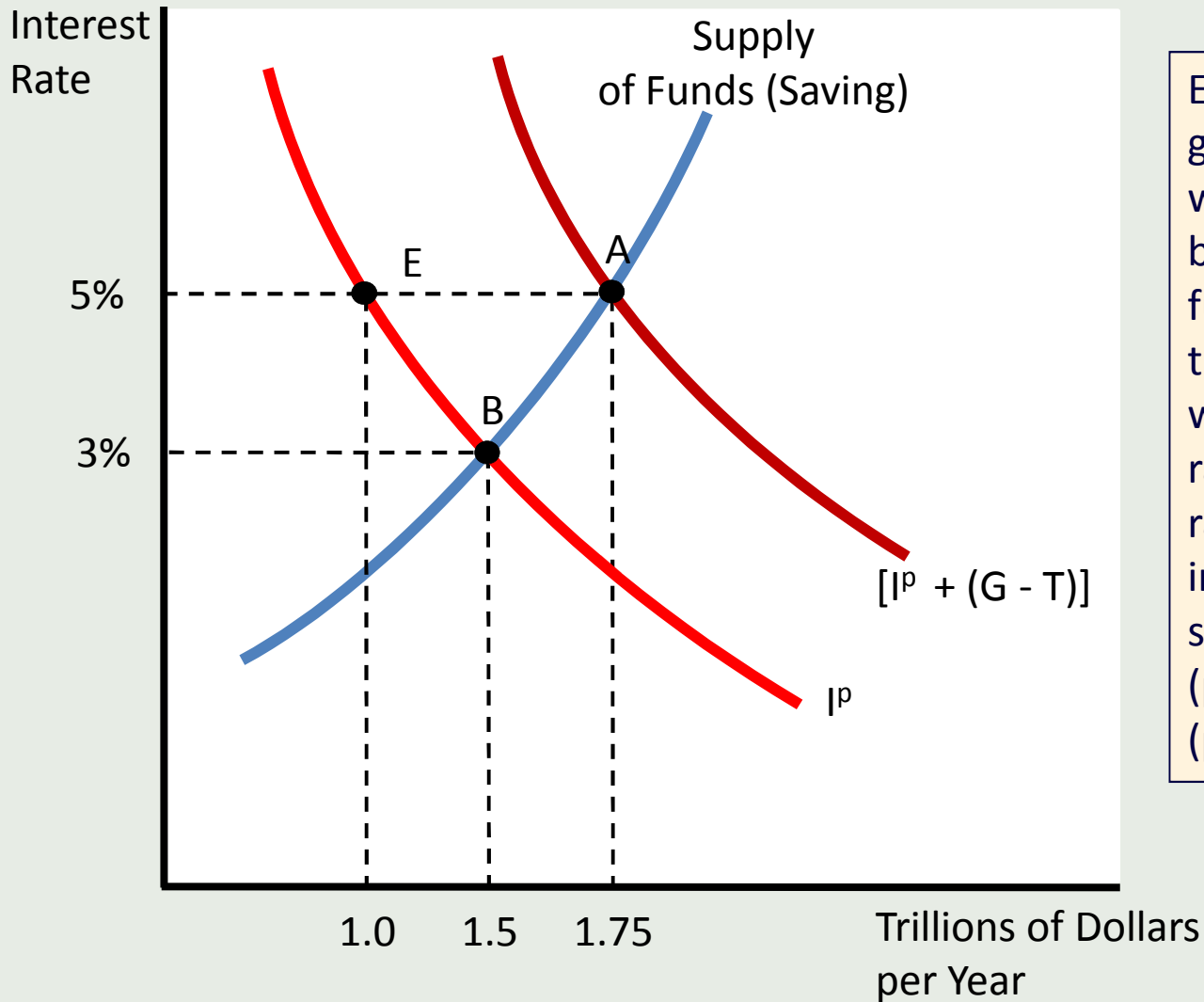
If households decide to save more of their incomes, the supply of funds curve will shift rightward (by the distance AF). With more funds available, the interest rate will fall. Businesses will respond by increasing their borrowing, and investment will increase from \$1.75 trillion to \$2.25 trillion.

Government – seeking to increase investment

3. Decrease in the budget deficit

- Tends to reduce interest rates and increase investment
- Thus speeding the growth in the capital stock
- **Impact of deficit reduction on economic growth**
 - Depends on which government programs are cut

Figure 8: Deficit Reduction and Investment Spending



Eliminating the government's budget deficit will reduce government borrowing in the loanable funds market. As a result, the total demand for funds will fall, as will the interest rate. At a lower interest rate, businesses will increase their investment spending from \$1.0 trillion (point E) to \$1.5 trillion (point B).

Productivity Growth: Increases in Capital Stock

- **An increase in human capital**
 - Increases output
 - Causes production function to shift upward
 - Can raise productivity and living standards
- **Increase rate of investment in human capital**
 - Decrease budget deficit
 - Lower interest rates
 - Cheaper for households to borrow for college loans and training programs

Productivity Growth: Increases in Capital Stock

- **Increase rate of investment in human capital**
 - Change in the tax system
 - Increases the incentive for households to save
 - Cheaper for households to borrow for college loans and training programs
 - Income tax reductions
 - Increase the profitability of human capital to households
 - Increase households rate of investment in their own skills and training

Productivity Growth: Increases in Capital Stock

- Limits to growth from new capital
 - Diminishing returns
 - Depreciation
 - Harder and harder to increase capital per worker out of ongoing investment spending
 - Thus, increases in the capital stock alone cannot create permanent high rates of economic growth

Productivity Growth: Technological Change

- **Technological change**
 - Invention or discovery of new inputs, new outputs, or new production methods
- **Produce capital embodying a new technology**
 - Increase in production
 - From increasing the amount of capital, holding technology constant
 - From the new, productivity-enhancing technology that comes with that capital

Productivity Growth: Technological Change

- The faster the rate of technological change
 - The greater the growth rate of productivity
 - The faster the rise in living standards
- **Discovery-based growth**
 - Economic growth
 - Primarily in advanced countries
 - Based on technological change from new discoveries

Productivity Growth: Technological Change

- In rich countries
 - Sustained growth in productivity & living standards
 - Arises from discovery-based growth
 - Without a continual supply of new ideas
 - Growth in living standards would soon slow and ultimately come to a halt

Productivity Growth: Technological Change

- **New ideas**
 - Are not subject to diminishing returns
 - Do not depreciate over time
 - There are no logical or mathematical limits to productivity growth from new discoveries
- **Government and discovery-based growth**
 - Research and developing spending
 - Institutional infrastructure and innovation

Productivity Growth: Technological Change

- **Economic growth in poor countries**
 - Very low capital per worker
 - Little implementation of new technology
- **Catch-up growth**
 - Economic growth, primarily in less-advanced countries
 - Based on increasing capital per worker from low levels
 - And adopting technologies already used in more advanced countries

Productivity Growth: Technological Change

- **Poor countries**
 - Sustained growth in productivity and living standards
 - Is largely catch-up growth
 - Start with very low capital per worker
 - Catching up to the higher levels of rich countries yields large productivity gains
 - Technological change can occur rapidly
 - By copying and adapting technologies already in use in richer countries

Productivity Growth: Technological Change

- **China: remarkable economic growth**
 - **Government**
 - Increasingly well-defined property rights
 - Encouraged competition in the marketplace
 - Root out corrupt bureaucrats and judges
 - Invested in education
 - Specialization and export
 - Encouraged multinational corporations to come
 - Enabled and encouraged its young people to study abroad and come back with new skills and ideas

Growth Policies: A Summary

- **Fiscal policies**
 - Changes in government purchases or net taxes
 - In the long run
 - Cannot change total output through a change in total spending
 - Demand-side effects
 - Can change total output by altering the quantity of resources available for production
 - Supply-side effects

Growth Policies: A Summary

- **Supply-side effects**
 - Macroeconomic policy effects on total output
 - That work by changing the quantities of resources available
- **A single policy**
 - Can have competing effects on growth

Table 3: A Summary of Policies That Affect Economic Growth

| Example of Growth Policies | Method of Impact | Impact in Classical Model | Possible Effect through Growth Equation | Possible Impact on Growth |
|---|---|---------------------------------------|---|--|
| <ul style="list-style-type: none"> Decreases in tax rates or changes in benefit programs | Increase in Labor Supply | Total Employment | EPR Growth Rate \uparrow | Temporary increase in economic growth rate (while EPR growth rate is rising) |
| <ul style="list-style-type: none"> Policies that raise labor productivity (see entries below) | Increase in Labor Demand | | | |
| <ul style="list-style-type: none"> Tax or direct incentives to increase investment ($\Rightarrow I^P \uparrow$) Tax incentives to increase saving ($r \downarrow \Rightarrow I^P \uparrow$) | Greater investment in physical and human capital \Rightarrow Faster rise in Capital Stock | Production function shifts \uparrow | Productivity Growth Rate \uparrow | <p>Poor countries: Increase in catch-up growth rate (under right conditions);</p> <p>Rich countries: Limited impact (except for capital using new discoveries)</p> |

Table 3: A Summary of Policies That Affect Economic Growth

| Example of Growth Policies | Method of Impact | Impact in Classical Model | Possible Effect through Growth Equation | Possible Impact on Growth |
|---|--|---------------------------------------|---|--|
| <ul style="list-style-type: none"> Reduction in budget deficit ($r \downarrow \Rightarrow I^p \uparrow$) | More Investment in R&D \Rightarrow More-rapid technological change | Production function shifts \uparrow | Productivity Growth Rate \uparrow | Rich countries: Increase in discovery-based growth rate |
| <ul style="list-style-type: none"> Establish and maintain institutions that promote discovery & implementation of new technologies | More-rapid technological change | Production function shifts \uparrow | Productivity Growth Rate \uparrow | <p>Poor countries: Increase in catch-up growth rate;</p> <p>Rich countries: Maintenance or increase in discovery-based growth rate</p> |

The Costs of Economic Growth

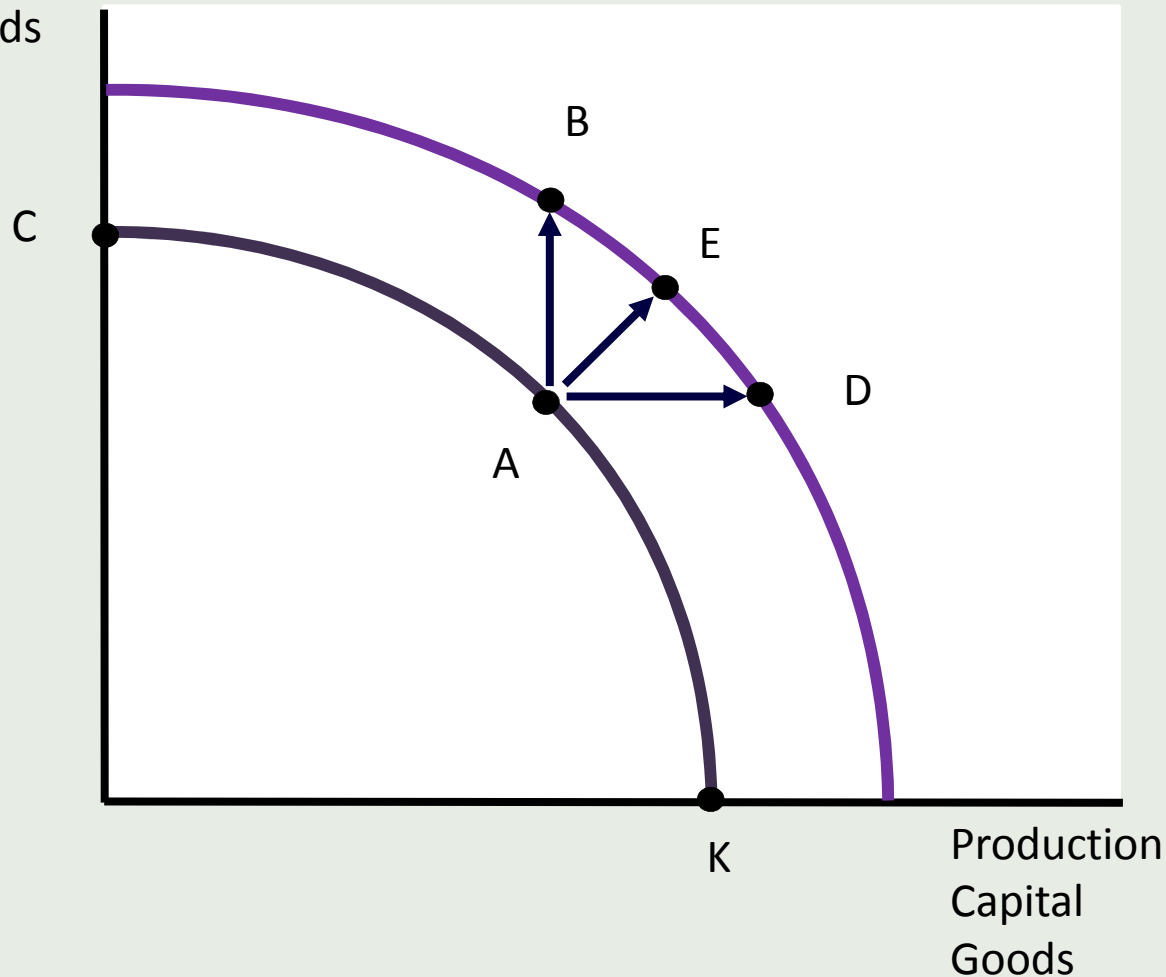
- **Promoting economic growth**
 - Unavoidable tradeoffs: It requires some groups, or the nation as a whole, to give up something else that is valued
- **Properly targeted tax cuts**
 - Increase the rate of economic growth
 - Force us to either redistribute the tax burden or cut government programs

The Costs of Economic Growth

- **Greater investment**
 - In physical capital, human capital, and R&D
 - Faster economic growth and higher living standards in the future
 - Fewer consumer goods to enjoy in the present

Figure 9: Consumption, Investment, and Economic Growth

Production
of Consumption
Goods



In the current period, a nation can choose to produce only consumer goods (point C), or it can produce some capital goods by sacrificing some current consumption, as at point A. If investment at point A exceeds capital depreciation, the capital stock will grow, and the production possibilities frontier will shift outward. After it does, the nation can produce more consumption goods (point B), more capital goods (point D), or more of both (point E).

The Costs of Economic Growth

- **Achieving social goals**
 - Sacrifice of some economic growth along the way
- **Achieving faster economic growth**
 - Some compromise on other things we care about

Barriers to catch-up growth in poorest countries

- Why aren't all poor countries enjoying rapid catch-up growth?
 - Extremely low output per capita
 - High population growth rates
 - Poor institutions poor infrastructure
 - Interact to create a vicious circle of continuing poverty

Table 4: Growth in Selected Poor Countries

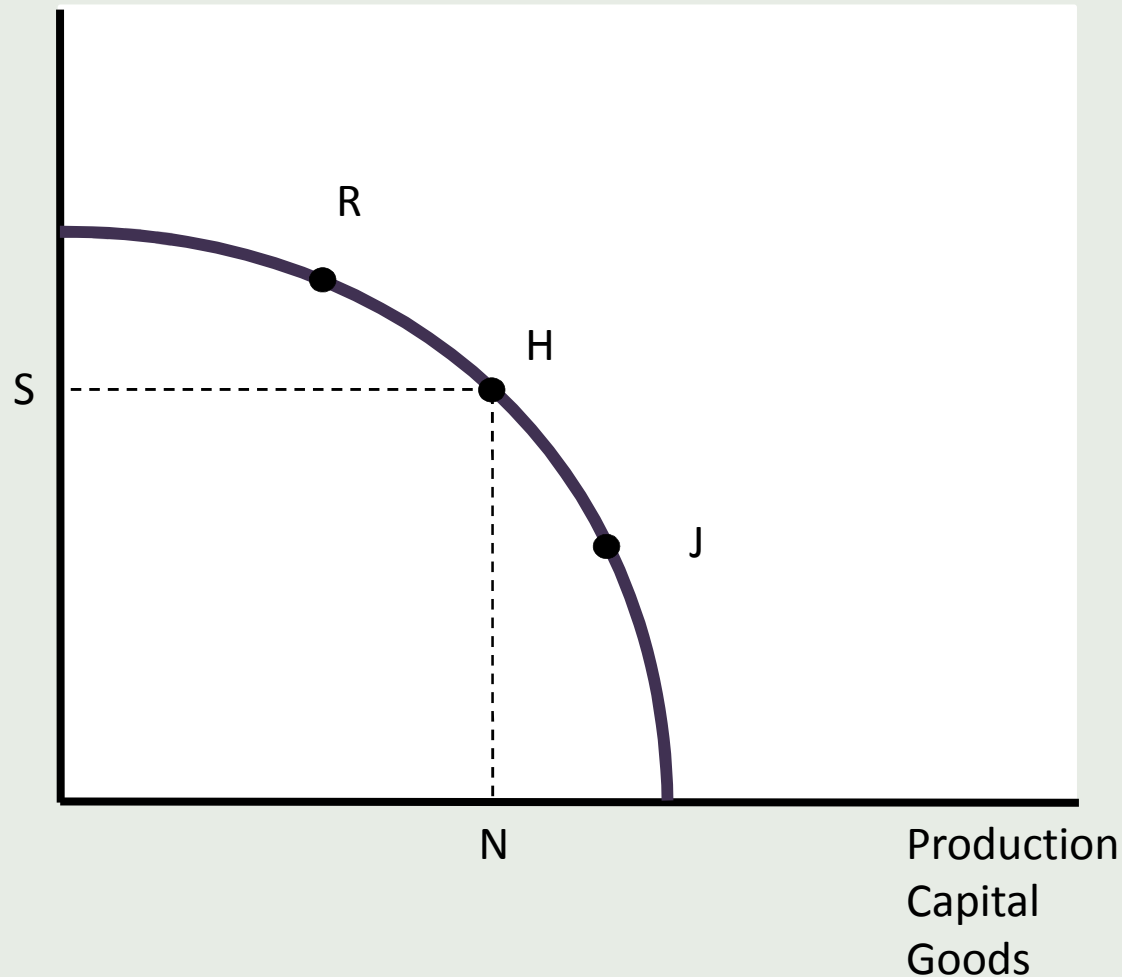
| Selected Poor Countries Where Living Standards Are: | Average Annual Growth Rate of Output per Capita | |
|---|---|-----------|
| | 1975–1990 | 1990–2005 |
| Growing | | |
| Ghana | −0.6% | 2.0% |
| Uganda | 1.6% | 3.2% |
| Bangladesh | 1.1% | 2.9% |
| Stagnating or Deteriorating | | |
| Niger | −2.8% | −0.5% |
| Sierra Leone | −2.8% | −1.4% |
| DR-Congo | −4.6% | −5.2% |

Barriers to catch-up growth in poorest countries

- **Poorest countries**
 - Are too poor to increase living standards by exploiting the normal tradeoff between consumption and capital production
 - If they cannot reduce consumption below current levels
 - They cannot raise capital production enough to increase productivity over time

Figure 10: LDC Growth and Living Standards

Production
of Consumption
Goods



In order to increase productivity when population is growing, yearly investment spending must exceed some minimum level N. In any year, there is a minimum level of consumption, S, needed to support the population. If output is currently at point H, capital per worker and living standards are stagnant. But movement to a point like J would require an unacceptably low level of consumption.

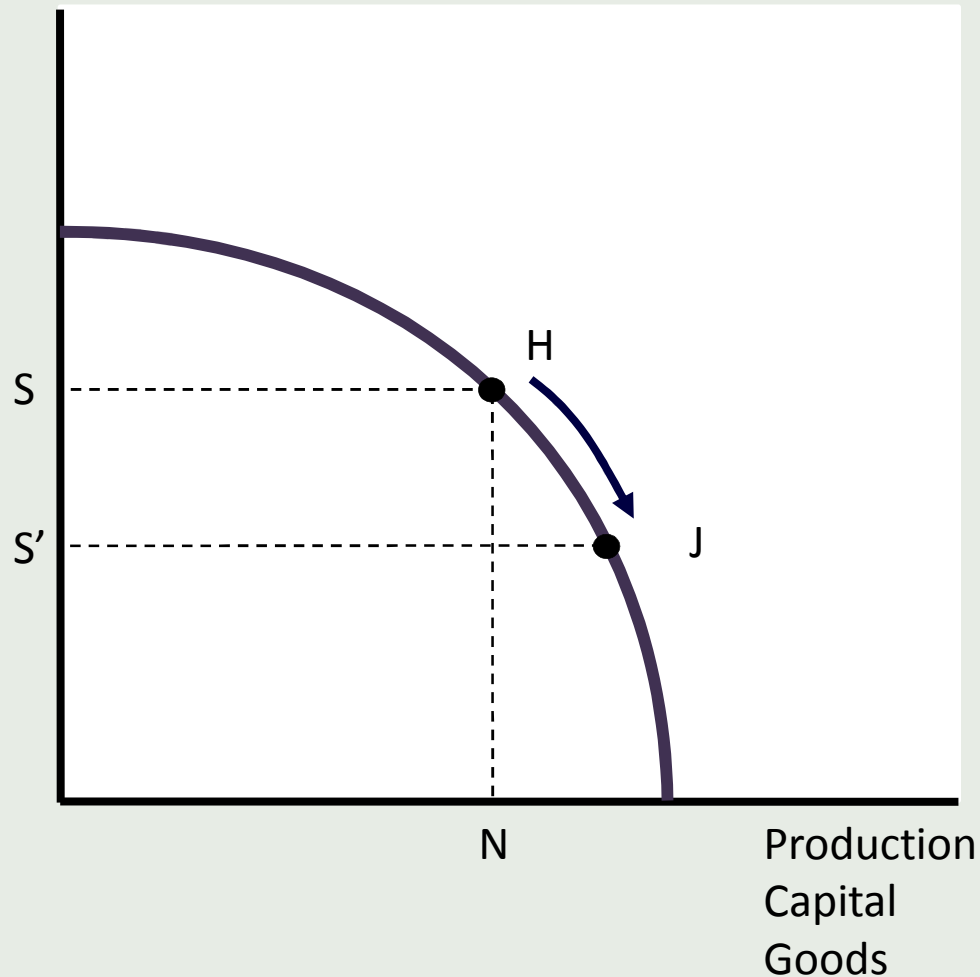
Barriers to catch-up growth in poorest countries

- Break out of the vicious circle of poverty
 - Brute force
 - Target the wealthy
 - Decrease population growth
 - Foreign assistance

Figure 11a: Some Growth Options for LDCs

Production
of Consumption
Goods

(a) Target the Wealthy

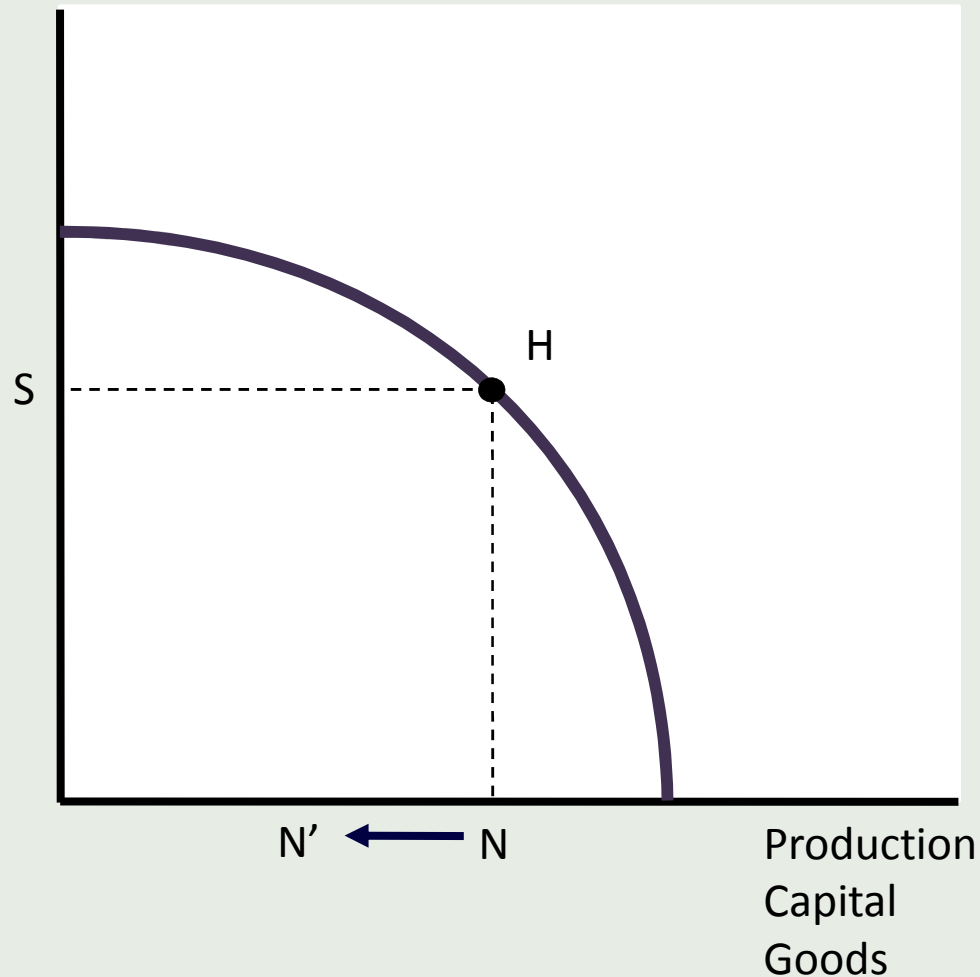


A poor country is initially producing at point H, with consumption just equal to the amount needed for survival (S), and capital production just enough to maintain productivity with a rising population (N). In panel (a), resources are shifted from producing consumer goods to producing capital goods. But because the decrease in consumption is limited to the wealthy, the minimum survival level of total consumption decreases from S to S'. At point J, the poor country can produce more capital—enough to raise productivity and living standards over time while still meeting survival needs for consumption.

Figure 11b: Some Growth Options for LDCs

Production
of Consumption
Goods

(b) Reduce Population Growth

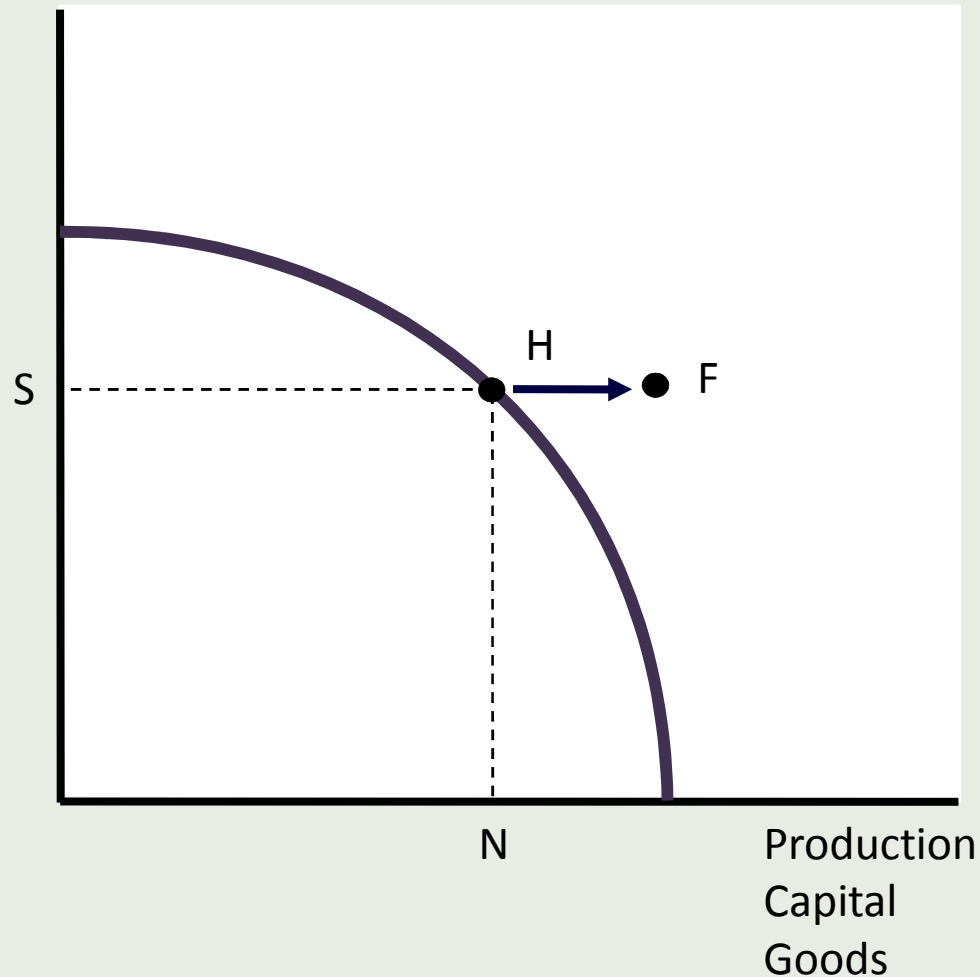


A poor country is initially producing at point H, with consumption just equal to the amount needed for survival (S), and capital production just enough to maintain productivity with a rising population (N). In panel (b), the country reduces the population growth rate, so that the capital production needed to keep up with a rising population decreases from N to N'. Although capital production remains at point H, productivity now rises each year, raising living standards over time.

Figure 11c: Some Growth Options for LDCs

Production
of Consumption
Goods

(c) Foreign Assistance



A poor country is initially producing at point H, with consumption just equal to the amount needed for survival (S), and capital production just enough to maintain productivity with a rising population (N). In panel (c), capital goods are obtained externally, through foreign investment or foreign assistance. The economy continues to produce at point H, but with the total amount of capital added each period greater than N (at point F), productivity and living standards rise over time.