

Chapter 10

Efficiency



Economic Growth

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Introduction

- We have seen that the productivity, A , is the key to growth.
- In this chapter we try to make the point that a big part of productivity differences comes from **efficiency** (or inefficiency) differences – **not from technology differences.**

Definition of Efficiency

- **Efficiency** – effectiveness with which factors of production and technology are combined to produce output.
- Can we measure efficiency?
 - We can try 😊

10.1 Decomposing Productivity into Efficiency and Technology

- A – TFP
- T – Technology
- E – Efficiency

$$A = T \times E$$

Analyzing Cross-Country Efficiency

$$\frac{A_i}{A_j} = \frac{T_i}{T_j} \times \frac{E_i}{E_j}$$

Example

- Suppose that productivity in the U.S. is 3 times that of India.
- The technology in the U.S. is growing at annual rate of 1%
- No change in efficiency in the U.S.
- Find the ratio of efficiency in U.S. and India, assuming that India is 10 years behind the U.S. technologically.

Solution of Example

$$T_i = (1 + 0.01)^{10} T_j$$

$$\Rightarrow \frac{T_i}{T_j} = 1.105$$

Thus

$$\frac{A_i}{A_j} = \frac{T_i}{T_j} \times \frac{E_i}{E_j}$$

$$3 = 1.105 \times \frac{E_i}{E_j}$$

$$\frac{E_i}{E_j} = 2.716$$

Challenging question

- How many years should India be behind the U.S. technologically, so that efficiency and technology would be equally important in accounting for the difference in productivity?

Answer

$$\frac{T_i}{T_j} = \frac{E_i}{E_j} = \sqrt{3} = 3^{1/2} = (1.01)^T$$

Taking logs

$$0.5 \ln 3 = T \ln 1.01$$

$$T = \frac{0.5 \ln 3}{\ln 1.01} = 55.205$$

10.2 Case studies

- Cases in which efficiency (or inefficiency) can be directly observed.

1. Chipotle vs. Students Center Burritos.

- Not from the textbook, meant as a joke.

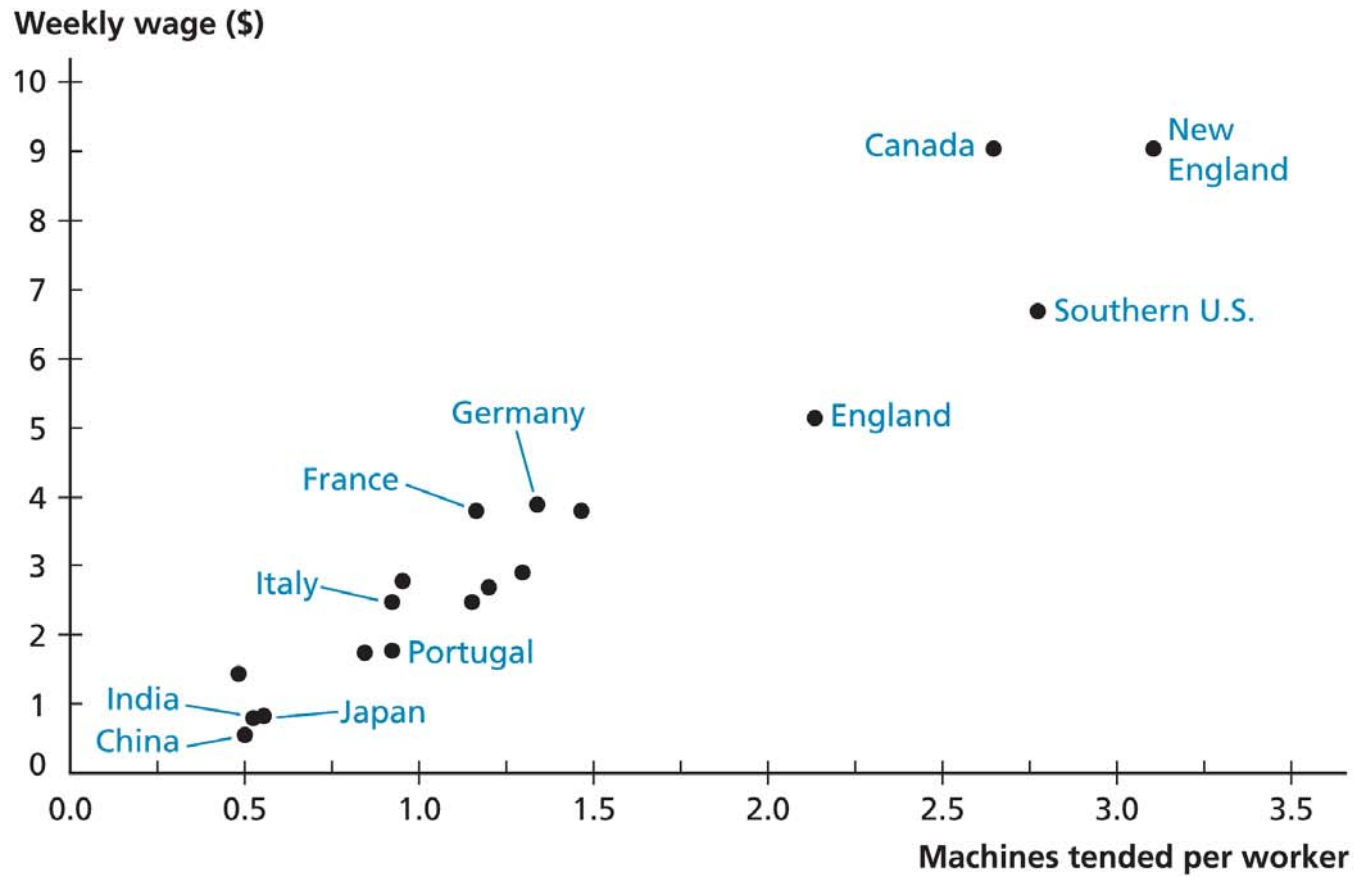
2. Soviet Union

- Technologically Advanced, but low productivity – must be very inefficient.
- Centrally planned economy
 - nail example.
- Lack of incentives
 - No incentives to improve quality
 - No incentives to fire unproductive workers

3. Textiles in 1910

- Textile workers in England earned much more than similar workers in other countries.
- Machines used were the same.
- Raw materials were similar
- What explains the difference in wages?

FIGURE 10.1
Wages and Machines in the Textile Industry, 1910



Source: Clark (1987).

4. Cross-Country Differences in Productivity by Industry

TABLE 10.2

Productivity in Selected Industries in the Early 1990s

	United States	Japan	Germany
Automobiles	100	127	84
Steel	100	110	100
Food Processing	100	42	84
Telecommunications	100	51	42
Aggregate Productivity	100	67	89

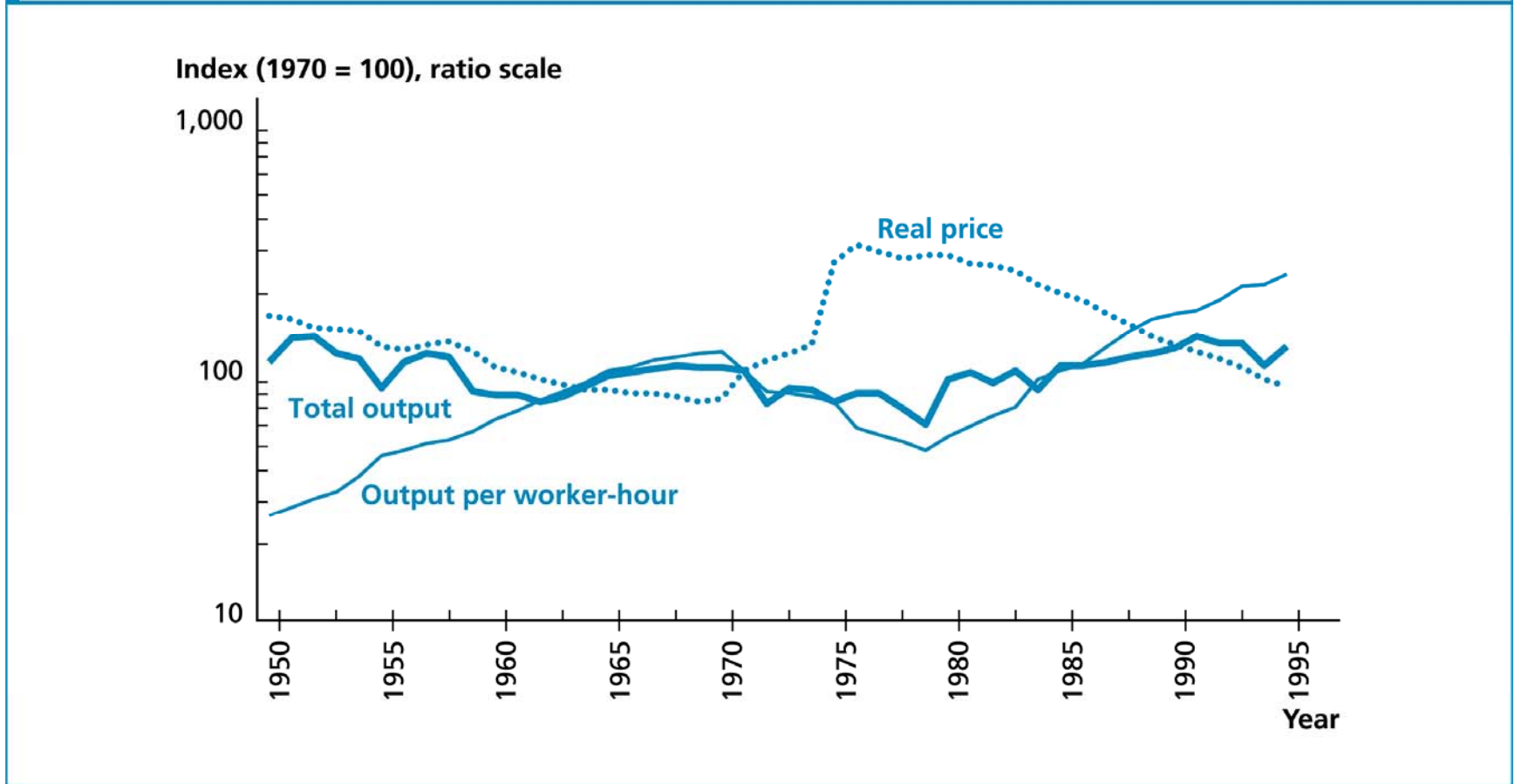
5. Coal Mining in the U.S., 1949-1994

- The coal mining sector had a strong union that dictated the work practices
- 1940-1969, introduction of boring machine, productivity increase by a factor of 3. The machines were used in other industries for many years before that, but the union explicitly prohibited their use. They were introduced because price of coal fell (cheap oil and gas became available), so coal mines had no choice but to introduce the machines.

- 1969-1978, productivity fell by $\frac{1}{2}$. The prices of other energy sources increased, and coal price increased as well. The unions lowered productivity to increase employment.
- 1978-1994, productivity increased by a factor of 3. No new technology was introduced. Oil prices fell, and so the coal prices. In order to stay competitive the miners had to increase productivity.

FIGURE 10.2

U.S. Subsurface Coal Mining: Output, Price, and Output per Worker-Hour, 1949–1994



Source: Parente and Prescott (2000).

10.3 Types of Inefficiency

1. Unproductive Activities

- Theft, smuggling, burglary – use of labor to take output from others, rather than to produce output.
- Indirect cost of defending against the above (Case: in Russia 1992, 20% of retail sales were paid for “protection”).
- Kidnapping for ransom.
- Civil wars (Case: Angola).

1. Unproductive Activities (continued)

- Rent seeking. **Economic rent** – payment to factor of production above its reservation price). Government policies often create artificial rent seeking (Case: import licenses. Import firms engage in traveling to the capitol, bribing officials, etc.). Indirect cost – talented people choose to enter the government for bribes.

2. Idle Resources

- **Idle resources** –not used at all.
- **Unemployment** (During the great depression 25% unemployment).
- **Underemployment** – workers are employed but do not produce (Case: Air Afrique had 500 employees per aircraft. Britain's EasyJet had 66 per aircraft, Case: “fireman” on diesel locomotives).

3. Misallocation of Factors Among Sectors

FIGURE 10.3
Efficient Allocation of Labor Between Sectors

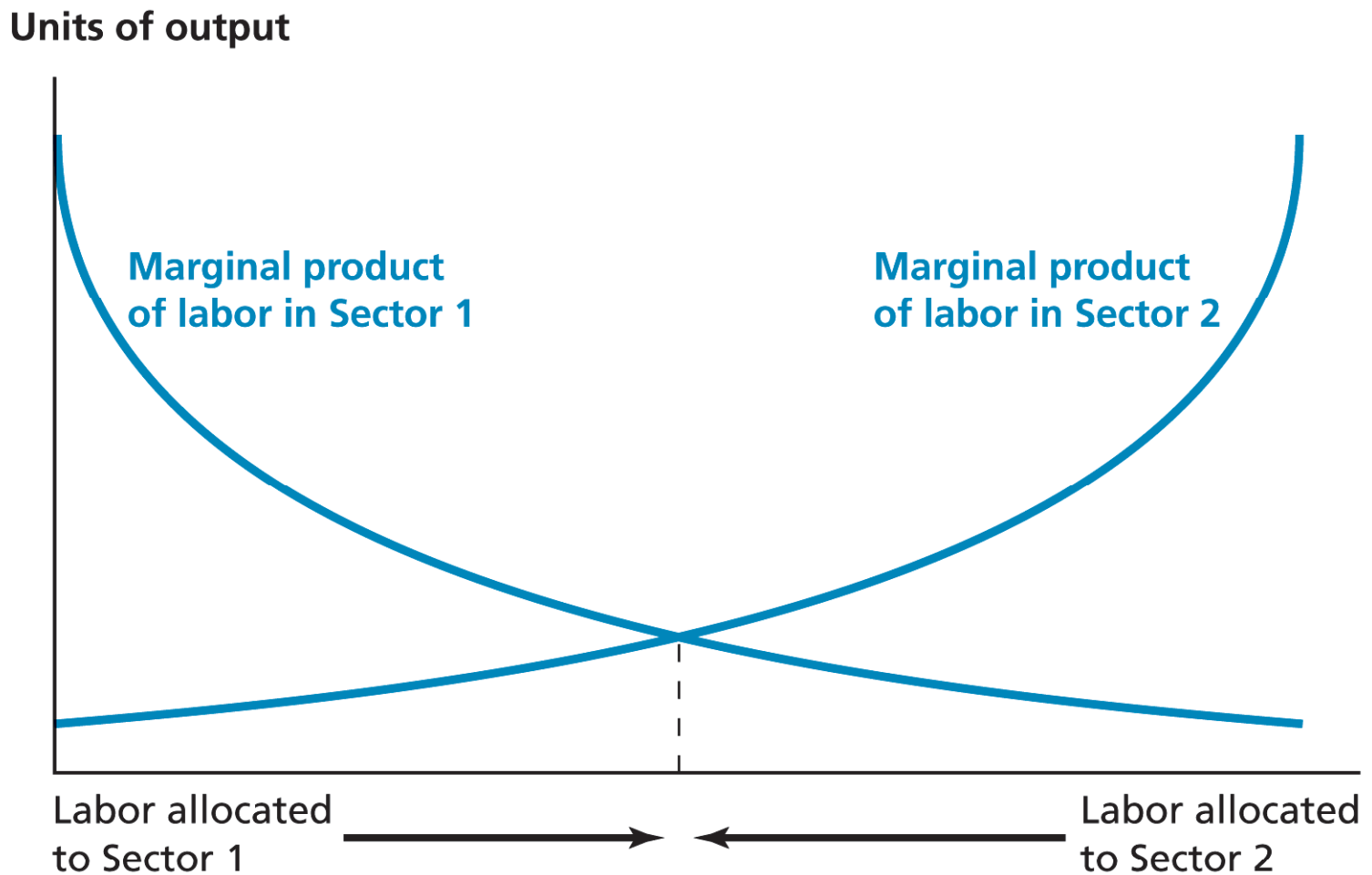
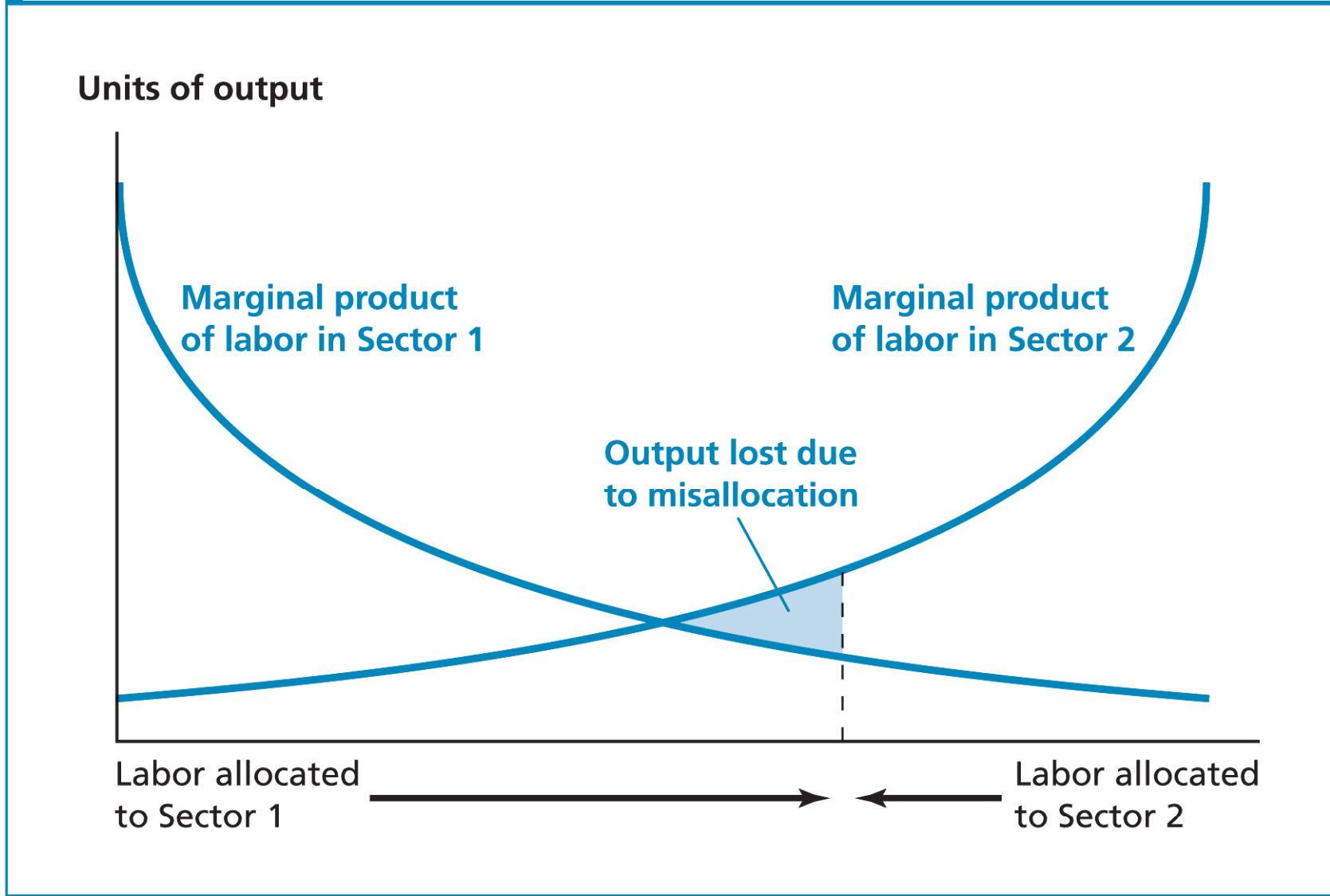


FIGURE 10.4
Overallocation of Labor to Sector 1

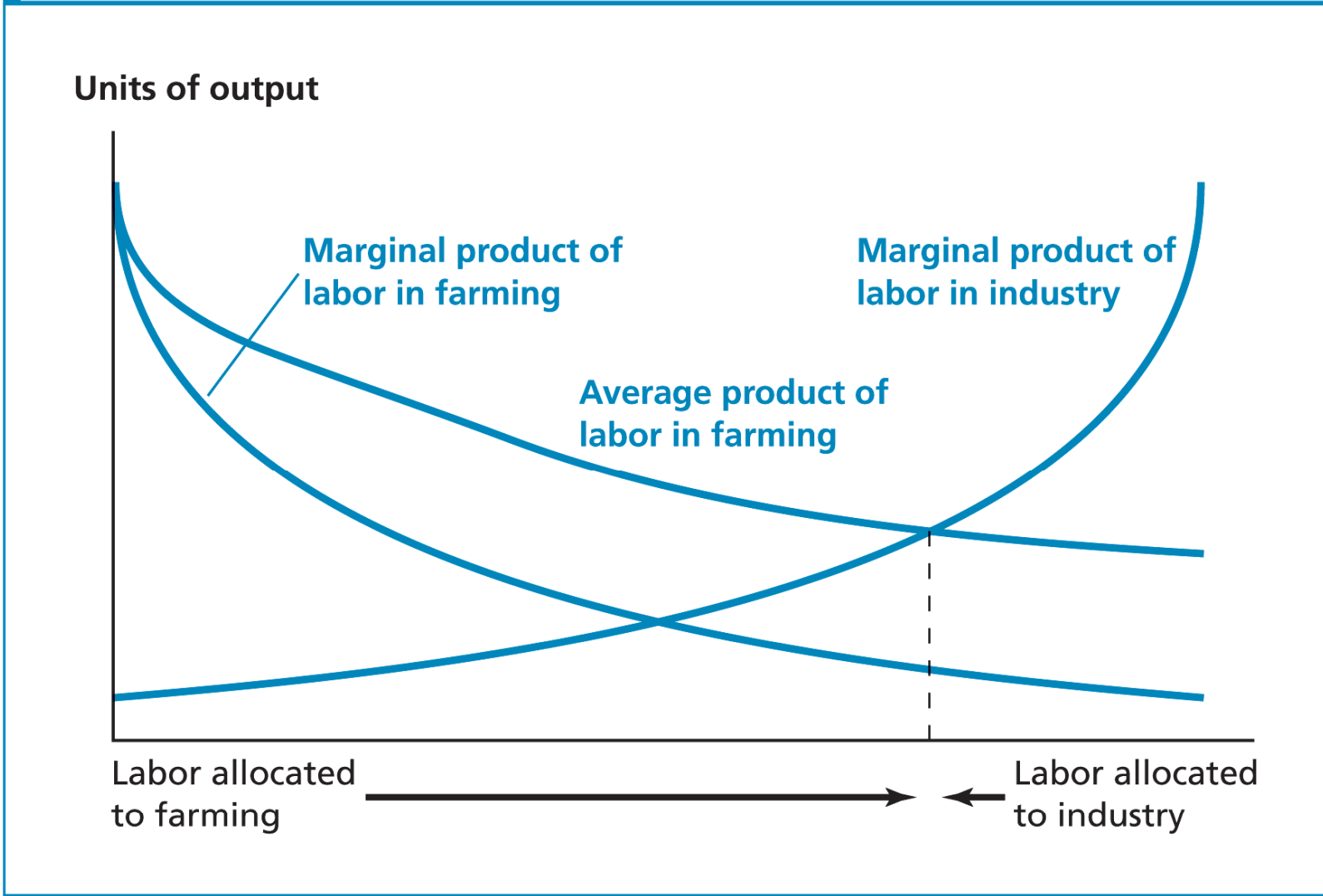


Why Misallocation Occurs?

- Barriers to mobility – (1) geographic isolation, (2) minimum wage in the high-wage sector.
- Wages not equal to marginal product of inputs.

FIGURE 10.5

Overallocation of Labor to Farming When Farmworkers Are Paid Their Average Product



Efficiency Gains from Sectoral Reallocation

- Reallocation from agriculture into manufacturing (Case: South Korea, Taiwan, U.S.).
- The role of geographic mobility (Case: U.S. vs Europe, Migration in China, India).

Misallocation of Factors Among Firms

- In competition, high-productivity firms make profits and drive low-productivity out of business.
- **Collusion** of low and high productivity firms may prevent low-productivity firms from going out of business.
- Governments may help low-productivity firms stay in business by subsidizing them (Case: small food vendors in Russia pay 1% tax, supermarkets pay 8%).

Technology Blocking

- Emperor Tiberius executed a craftsman who invented a new type of glass.
- Printing press was blocked by scribes guild in Paris for 20 years.
- Luddites.
- Edison tried to block the AC electric power.
- Microsoft trying to block Java, Netscape browser.