

FACTORS OF HEALTH SERVICE PRODUCTION – PART II

EE 474 Health Economics

Semester 2/2021

- LABOR
- PHARMACEUTICAL IND.

LABOR MARKETS — NURSES

Topics

- Review: Demand for and Supply of Health Care Labor
- ✓ • Shortages of Health Professionals
- Licensure and Monopoly Rents

input market.

I. Demand for and Supply of Labor & producer

- Health care labor is an important input in the production of health care. But how many of each labor input should the firm (e.g. hospital) demand?

$$MFC = MRP$$

- The firm hires workers as long as the cost of the additional worker is less than what the firm is able to sell the output that the input produces for.

- Example:

- It costs the firm \$100 to hire another worker (L) for a day

- The worker produced 10 more units of output: $MP_L = 10 = \frac{\Delta TP}{\Delta L}$

- Marginal product the firm was able to sell for \$20 each: $MR = \$20$

- Additional profits: $(10 * \$20) - \$100 = \$200 - \$100 = \$100$.

$$\frac{d(TR)}{dL} - \frac{d(C)}{dL}$$

$$w = MFC$$

$$= \frac{dQ}{dL}$$

$$\frac{d(TR)}{dQ}$$

Demand for Labor

$$TR = f(Q(L)) = P \times Q(L)$$

$$MRP = \frac{d(TR)}{dL} = \underbrace{P}_{MR} \times \frac{dQ}{dL}$$

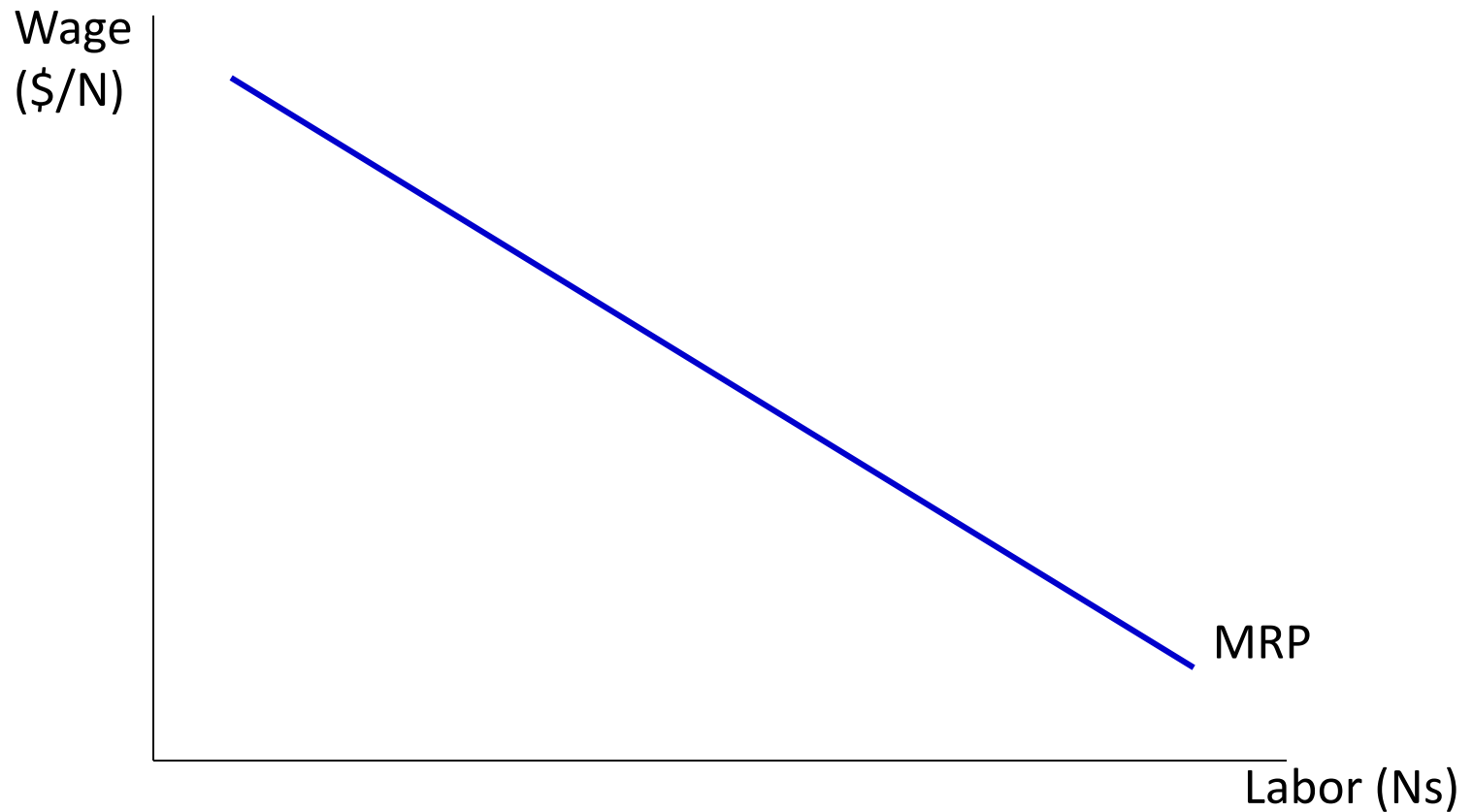
- Thus, the firm's demand for labor (or any other input) is related to:
 - The input's **marginal product** (what output the input can produce)
 - The output's **marginal revenue** (what the firm can sell the additional output for on the market)
- Specifically, the firm's demand for an input is its **marginal revenue product (MRP) curve**, where MRP is the additional revenue that results from employing one additional worker.

$$MRP = MP_L * MR$$

In perfectly comp've output mkt, $MRP = \bar{P} * MP_L$.

- It is assumed that the MP_L is decreasing with labor, so the **MRP curve is also decreasing with labor**.

The Firm's **Marginal Revenue Product (MRP)** Curve for Labor



MRP as the Firm's Demand for Labor

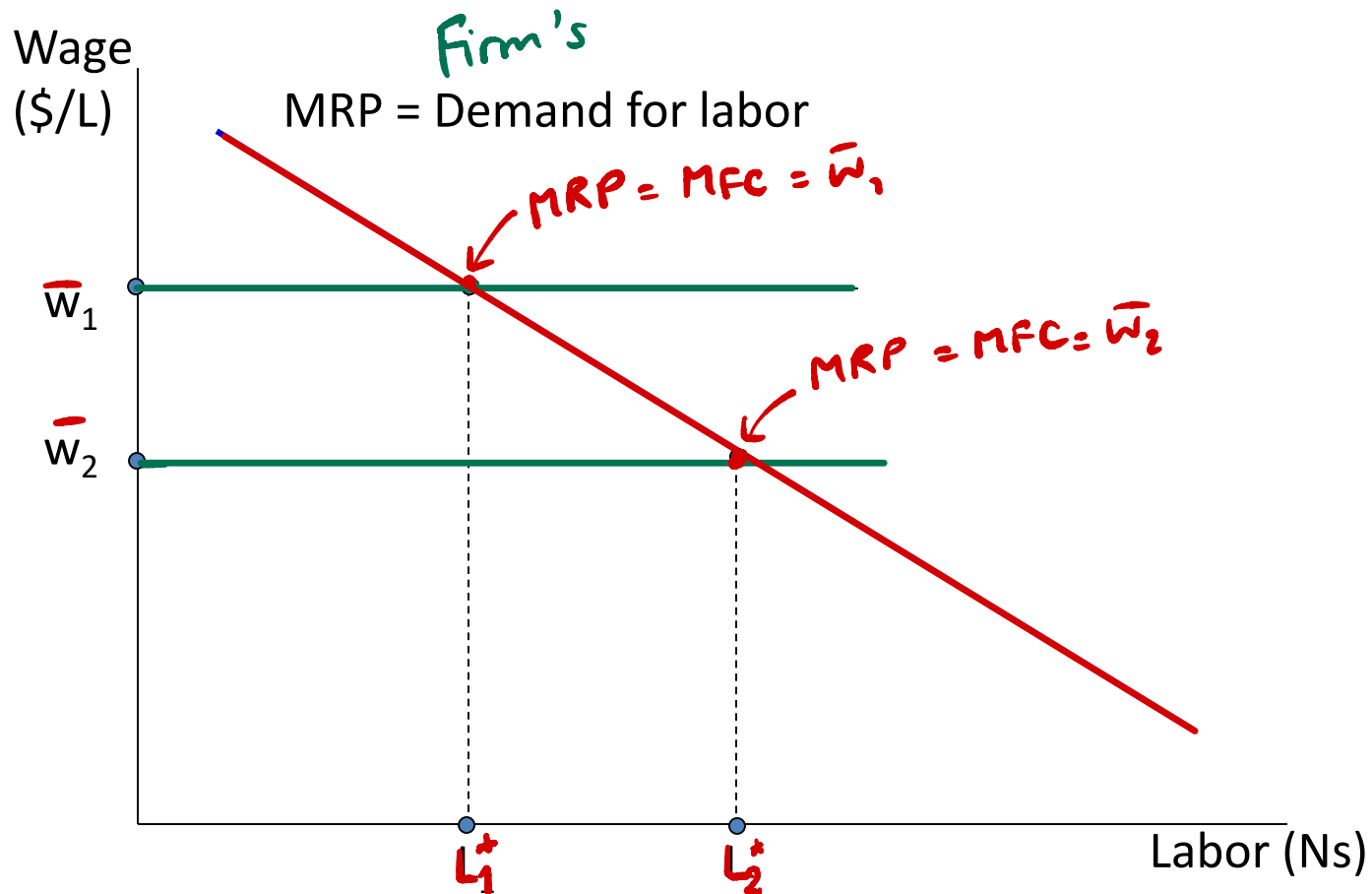
- The **firm's demand for labor** is the relationship between the **wage rate** and the **quantity of labor demanded**.
- The **wage rate** represents the **cost to the firm of purchasing a unit of labor**.
- As long as the wage rate is less than the MRP, the firm will continue to hire workers.
- The **firm will hire workers up to** the point where:

$$\text{MRP} = w. = \text{MFC}$$

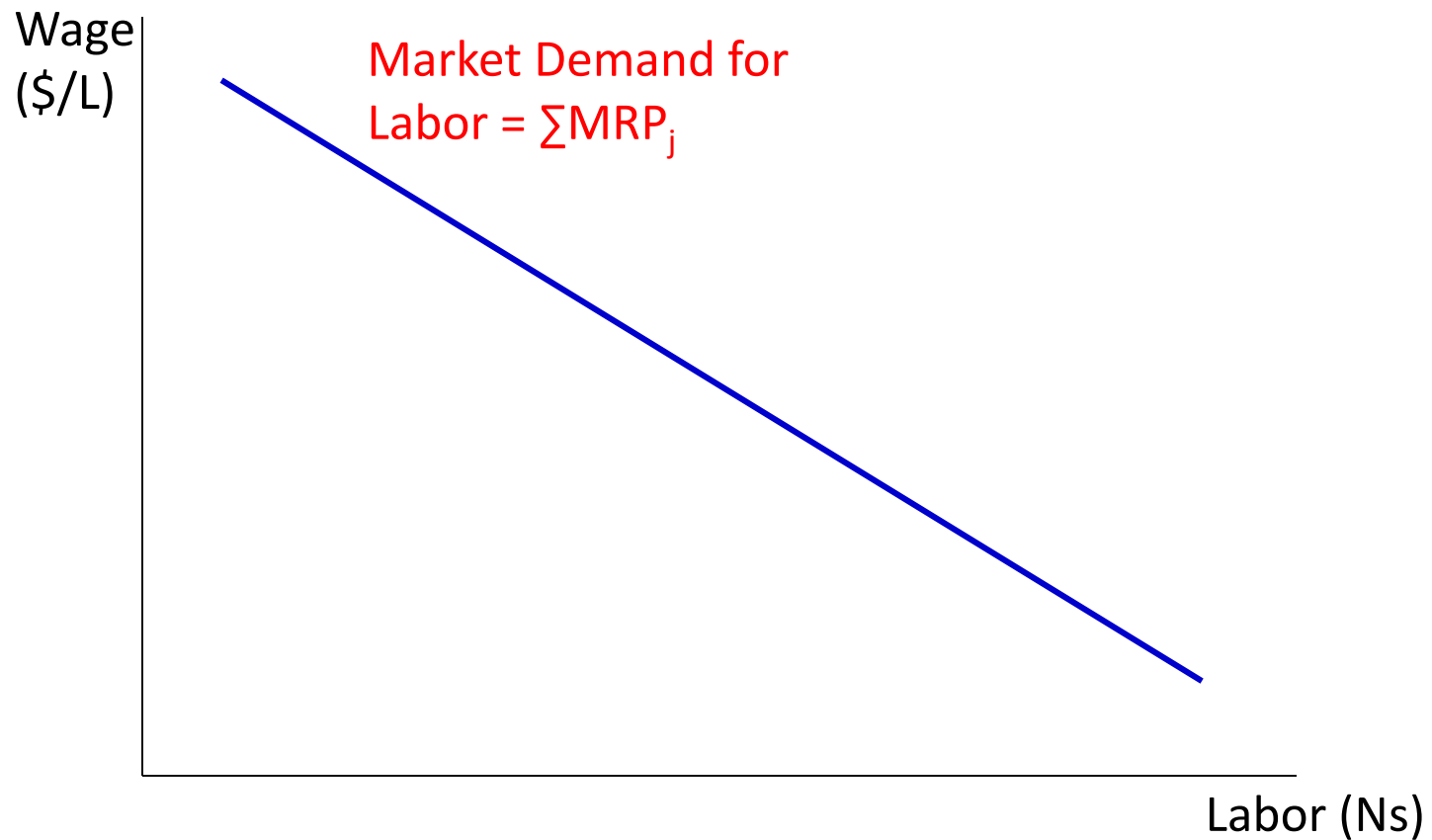
(w is constant in perfectly competitive input market).

- The relationship between wages and quantity of labor is therefore the MRP curve.

Firm Demand for Labor



Market Demand for Labor With Many Firms

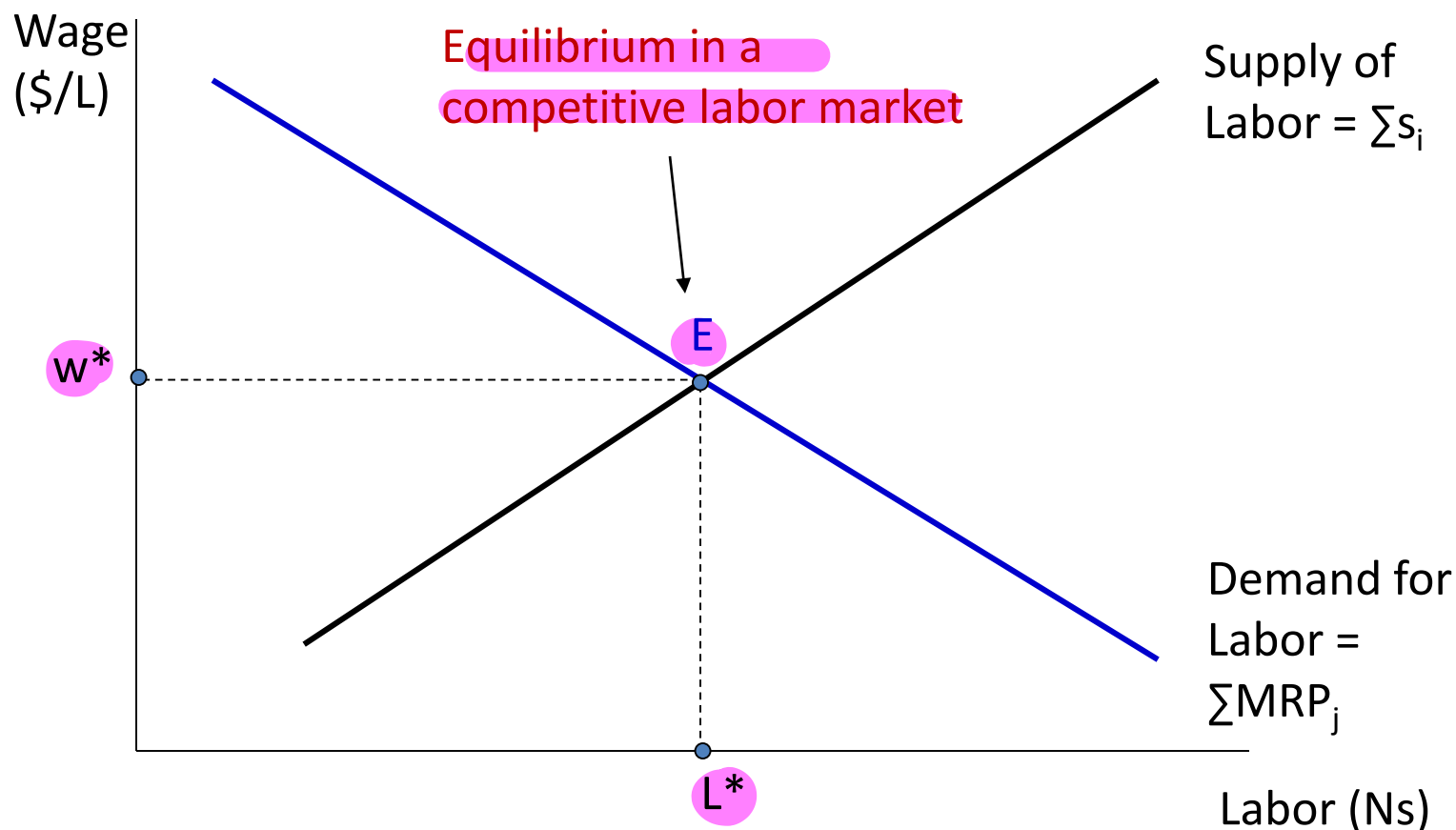


The Supply of Labor

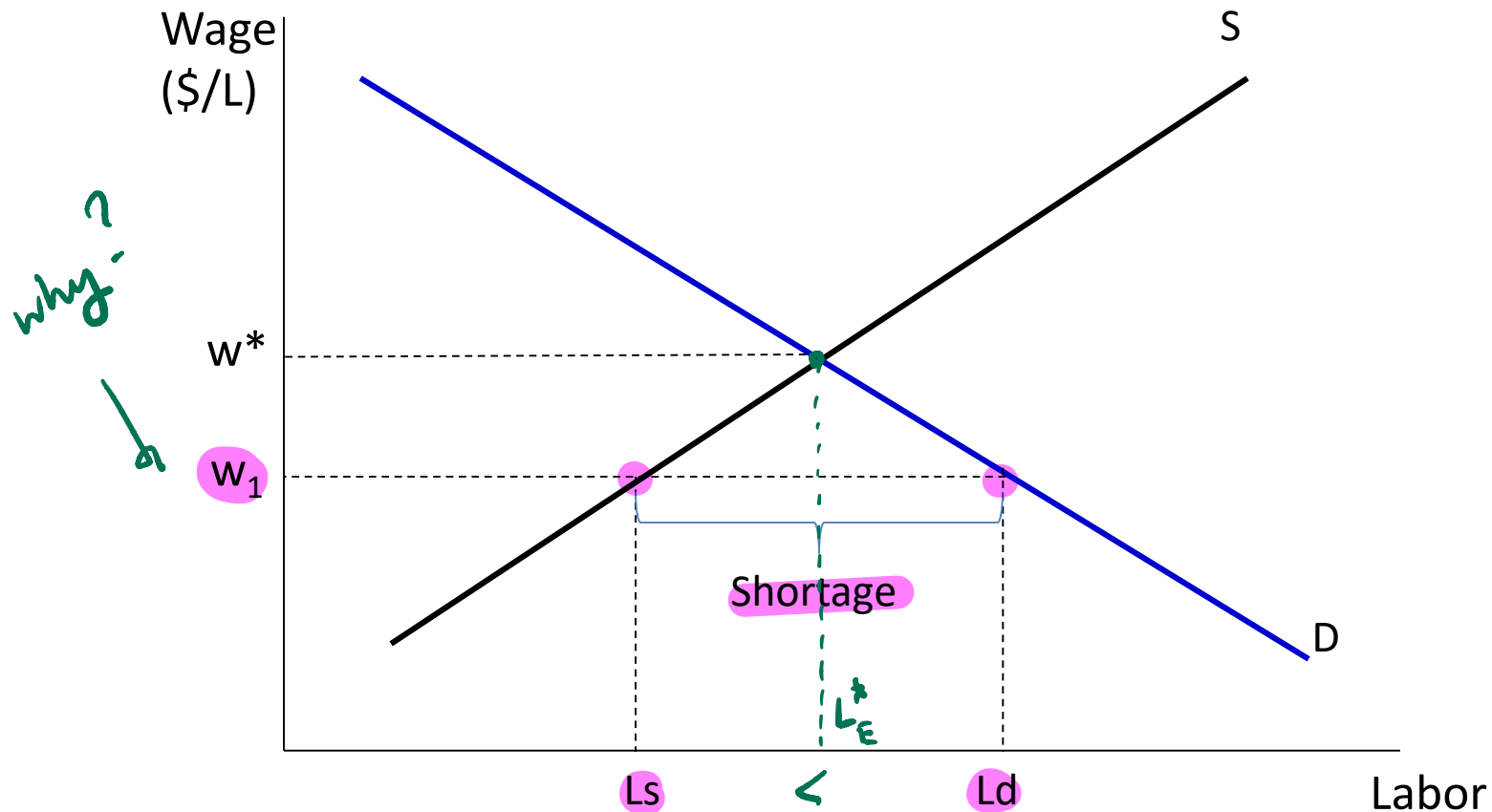
- The higher the wage rate, the greater the quantity of work that will be supplied by the existing workers in the labor force. (ie. Upward-sloping curve)
 - Some workers who are already working will work longer hours.
 - Similar workers maybe attracted into the market from elsewhere.
 - Movement along labor supply curve
- New workers that have recently joined the labor force would add more workers at each wage rate (add another s_i to the Σ).
 - Labor supply curve shift

Equilibrium in Competitive Market for Labor

Firms & workers take wage as given.



II. Shortages of Health Professionals



Role of Monopsony Power: Shortages of Labor

Purchaser has market power.

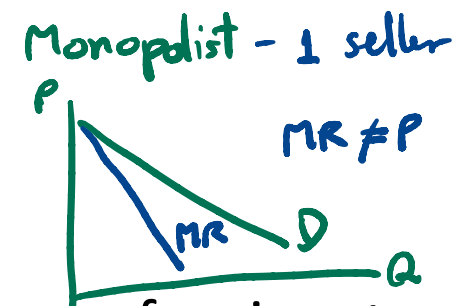
- A **monopolist** is a **single seller** of a **product** in a market.
- A **monopsonist** is a **single buyer** of an **input** in the market.
- The monopsonist is able to use its market power to reduce the prices it pays for inputs.

• Examples:

NHSO in Thailand ; most hospitals are owned by ministry of public health

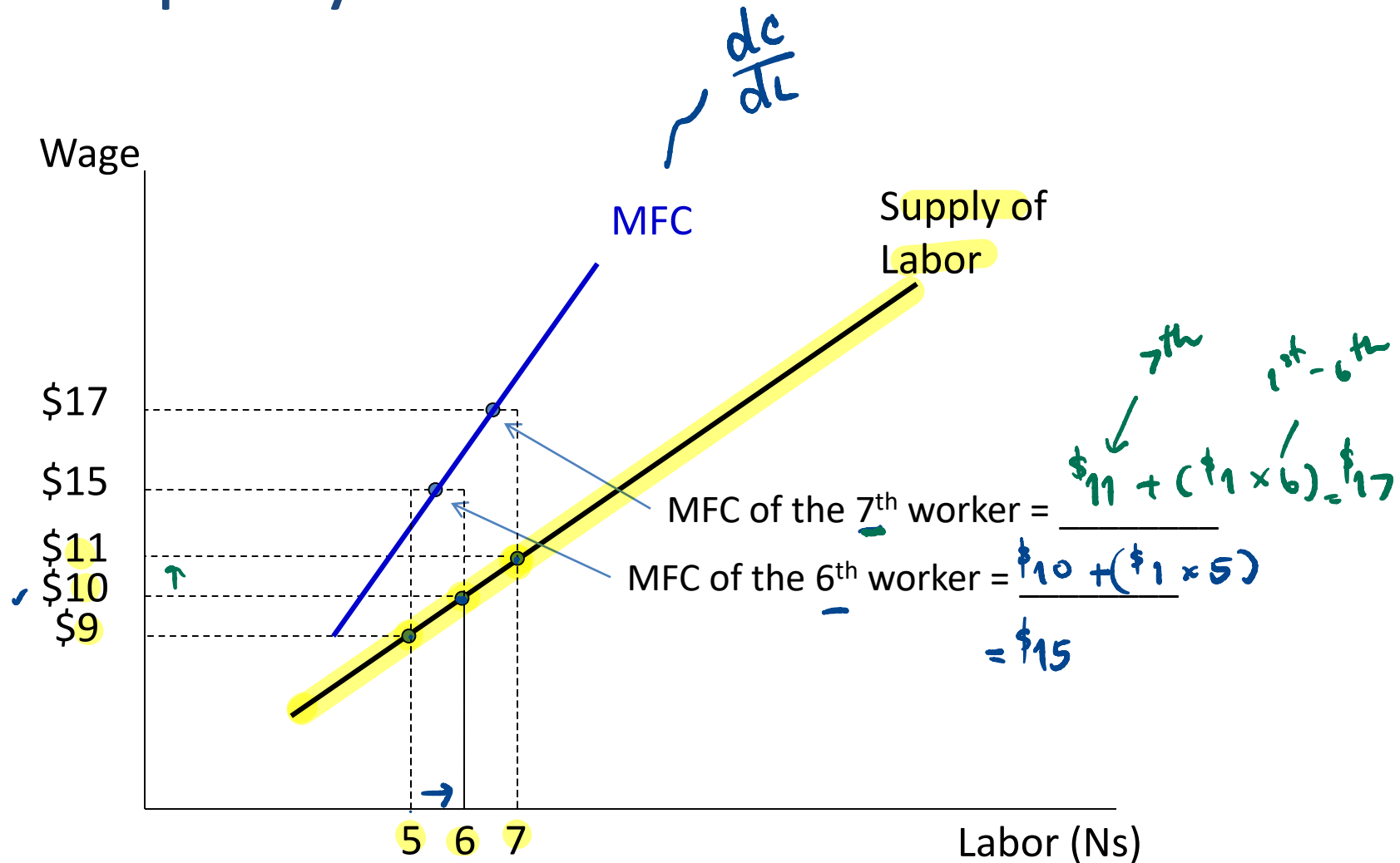
- **Hospitals** are **monopsonists** in the market for nurses.
- Health plans are monopsonists in the market for physicians and hospitals – e.g. Canada's **single-payer health system**

Monopsonistic Labor Market

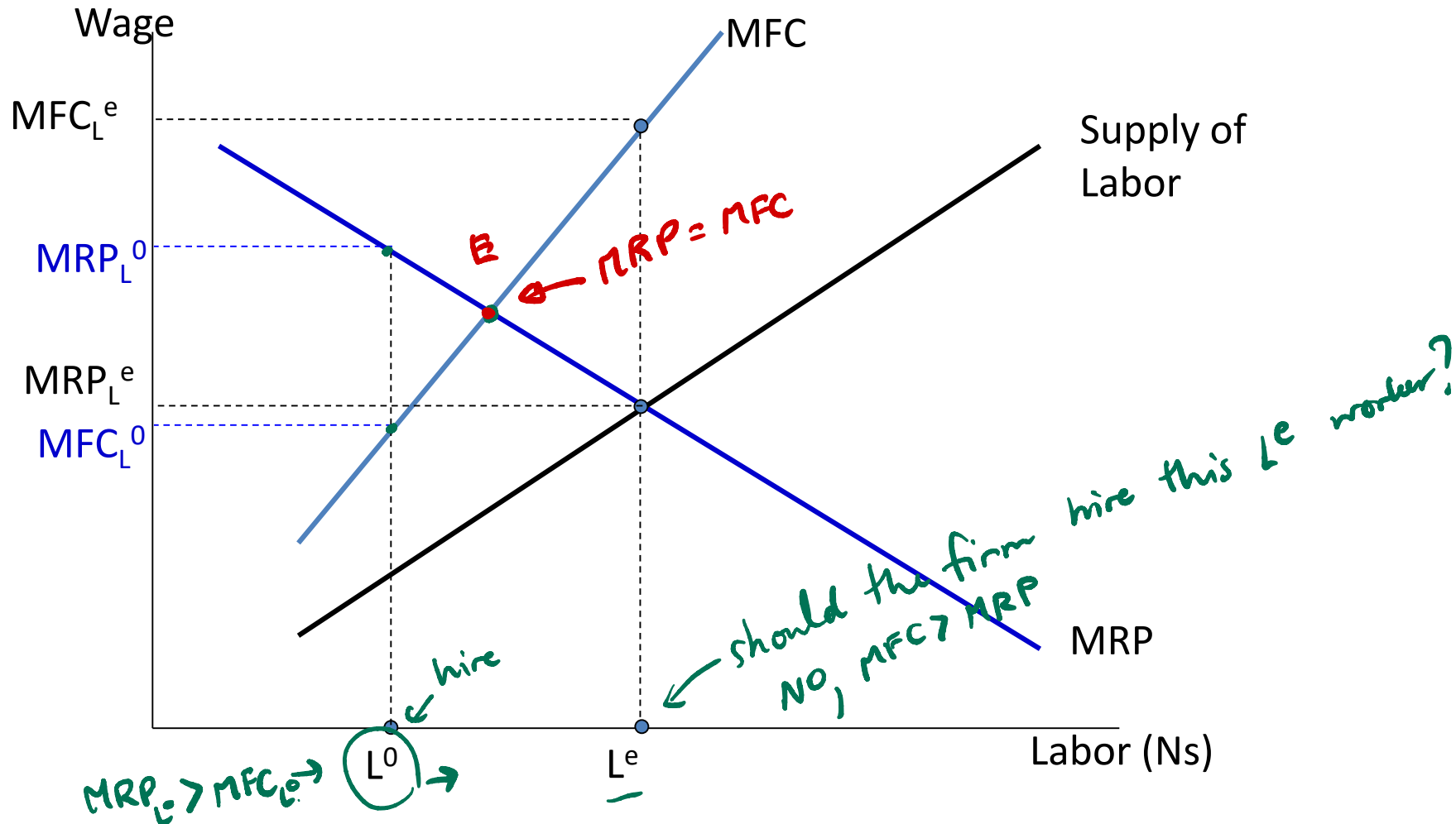


- A monopsony exists if there is a single purchaser of an input in the market.
- The market then has a **single MRP curve** that represents the demand for a factor or input.
- The **monopsonist faces the entire supply of labor.**
 - Just like the monopolist faces the entire demand for its output
- Because the monopsonist faces the entire supply curve, it recognizes that **if it wants to hire another worker, it must pay that worker a higher wage rate and also a higher wage rate to all those who would have worked for less.**

Monopsony Model



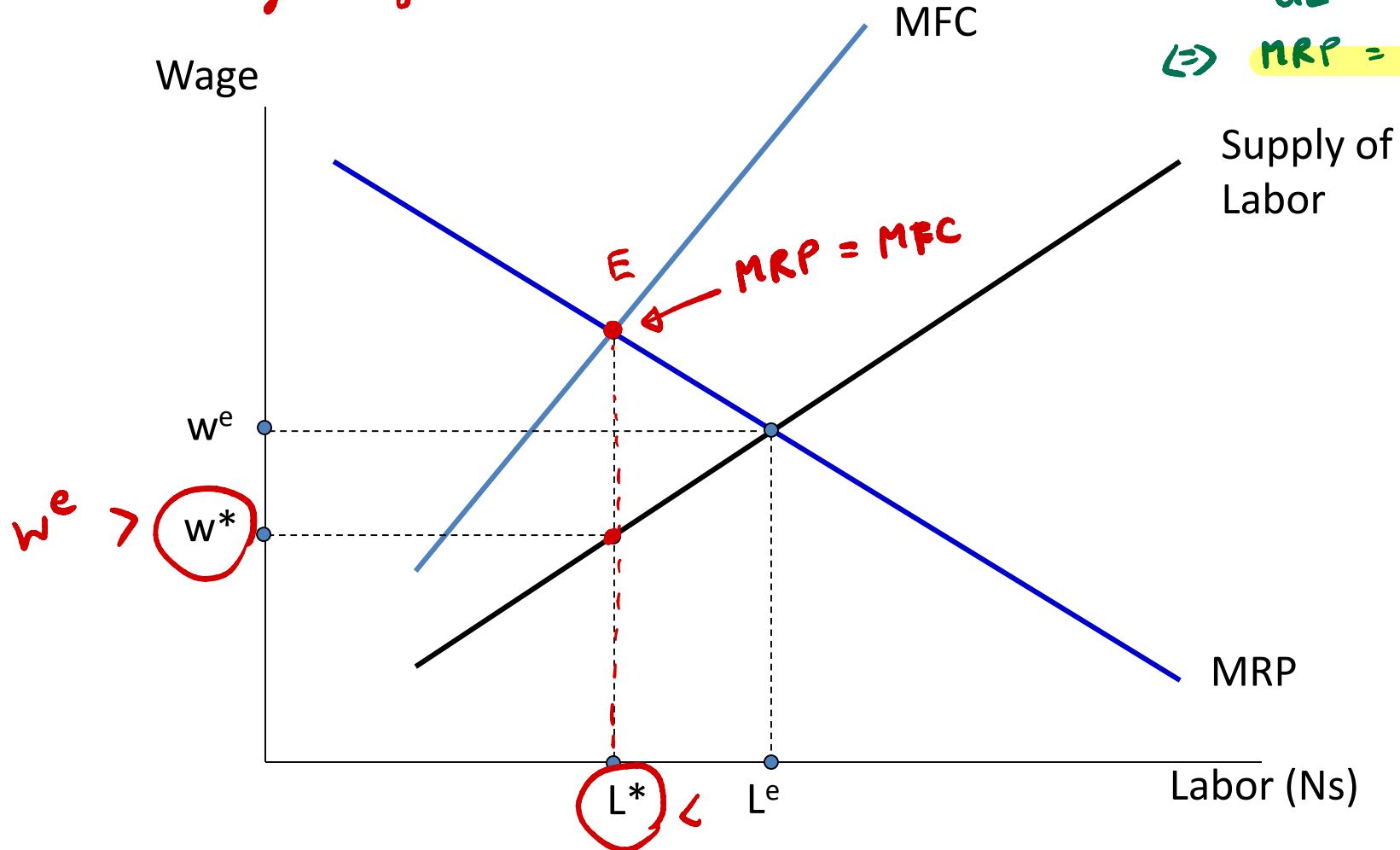
Monopsony Model



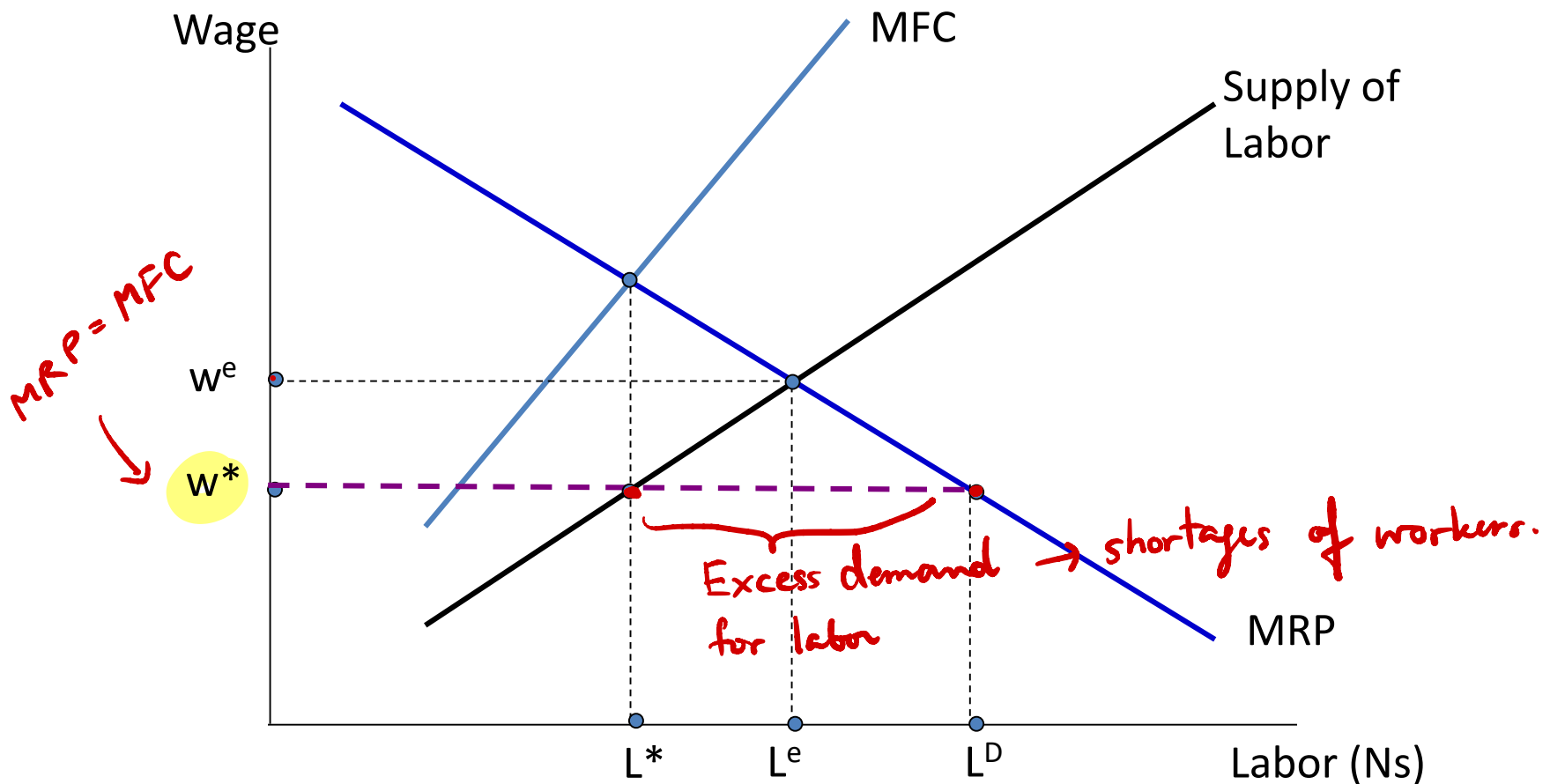
Monopsony Model

single buyer

Monopsonist's obj :
 $\text{Max } \Pi = TR - TC$
 FOC: $\frac{d(TR)}{dL} - \frac{d(TC)}{dL} = 0$
 $\Rightarrow \text{MRP} = \text{MFC} \neq w$



Monopsony Model: Reported Shortages



There is not enough nurses willing to at the low wage rate that monopsonist hospitals are willing to pay.

— License for health care workers.

III. Licensure and Monopoly Rent

- Controversies on the role of health professional licensure:
 - **Self-interest** theory: Organized medicine has used control of licensure for self-interest by **limiting entry**.
 - **Public-interest** theory: Regulatory measures, such as "signaling" licensure, are demanded as a result of the **limited information** patients have about quality and the relatively high costs of **reduce asym. info.** obtaining information.
- Some economists argue that licensure and professional control over medical education creates "economic rents" for physicians.
 - Payment to factors over and above those necessary to induce them to provide their services.

PHARMACEUTICAL INDUSTRY

Topics

- The Production of Health and Substitutability
- Structure and Regulations in Pharmaceutical Industry
- Drug Pricing and Profits
 - Monopoly pricing → price control.
 - Price discrimination
 - R&D and Innovation "patent"
 - Cost Containment → keep the HC cost affordable.

Overview

- Types of drugs:
 - Over-the-counter (OTC) drugs vs. prescription drugs
 - Original drugs vs. generic drugs
- Main characteristics of the pharmaceutical industry:
 - Significant barriers to entry and regulations
 - Substantial opportunities for price discrimination
 - Higher-than-normal profits for pharmaceutical firms
 - Large research and development spending
 - Large spending on drugs requires 'cost containment' strategies

buy in pharmacy.

eg antibiotic drug

eg tylenols vs. "Sana"

I. The Production of Health and Substitutability

- Consider the following health production function:

$$✓ HS = f(D, M)$$

where HS is health status, D is drugs and M is other health inputs.

- Three possibilities of the relationship between drugs and other medical inputs:

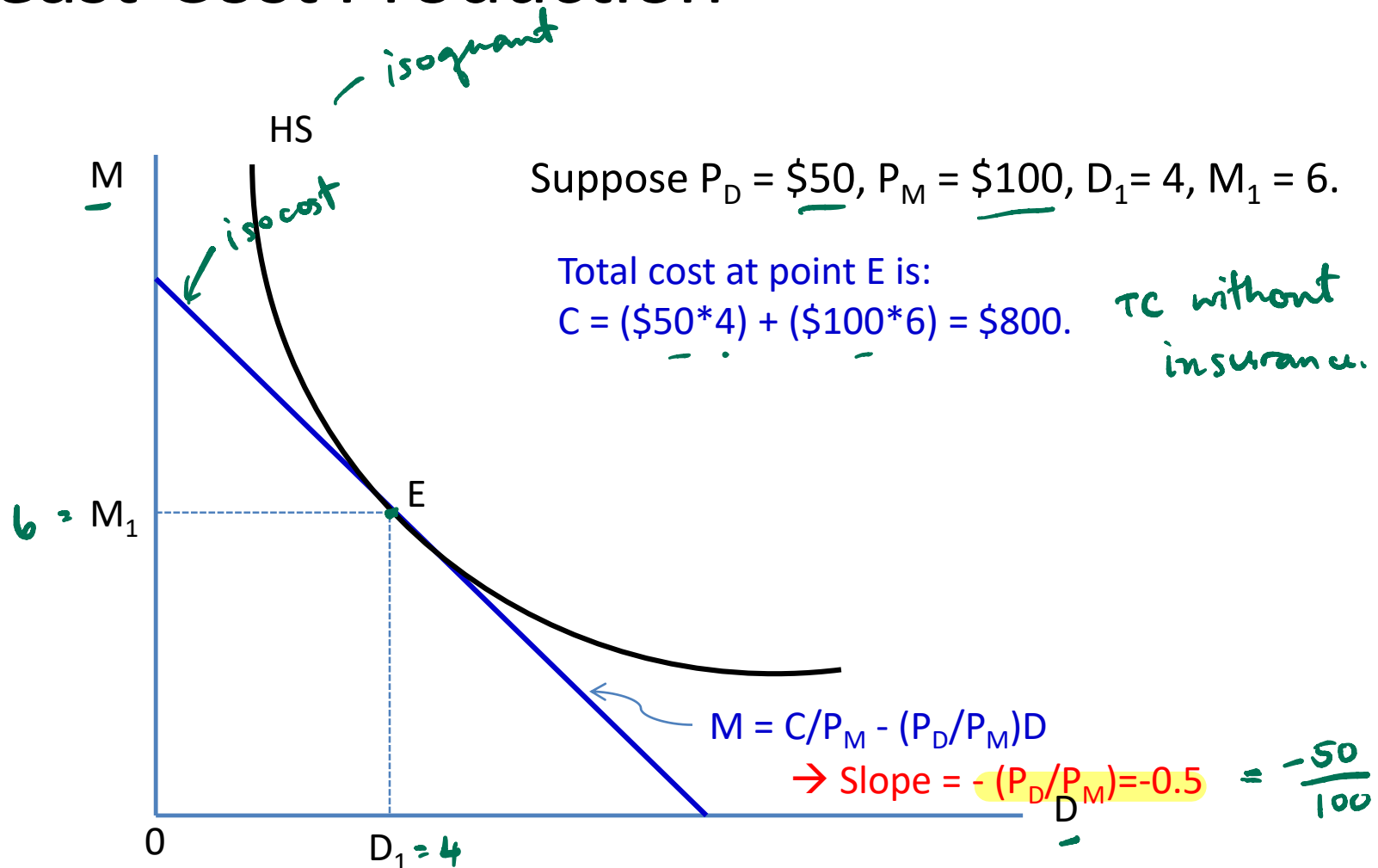
➤ They may have to be used in fixed proportions. ✓

Perfect complement

➤ They may be perfect substitutes for one another. ✓

➤ They may be able to be substituted for one another but ✓
subject to diminishing marginal rate of technical substitution (MRTS).

Least-Cost Production



Insurance and Substitutability

$$P_D = \$50, P_M = \$100$$

- $TC = \$800$
 $\rightarrow 20\% \times \$800 = 160 \rightarrow \text{cons}$
 $\rightarrow 80\% \times \$800 = 640 \rightarrow \text{insurance Co.}$
- Consider 2 different insurance policies:

patients pay 20% of P_D & P_M

1. 20% coinsurance on both D and M

- Out-of-pocket payment for 1 unit of D = $0.2 \times \$50 = \$10 = P'_D$
- Out-of-pocket payment for 1 unit of M = $0.2 \times \$100 = \$20 = P'_M$
- Slope of the new budget line = $-\frac{P'_D}{P'_M} = -\frac{10}{20} = -0.5 \rightarrow \text{same!}$
isocost

2. 20% coinsurance on M only and a deductible of \$5 (fixed copayment) for each D

- Out-of-pocket payment for 1 unit of D = $\$5 = P''_D$
- Out-of-pocket payment for 1 unit of M = $0.2 \times \$100 = \$20 = P''_M$
- Slope of the new budget line = $-\frac{P''_D}{P''_M} = -\frac{5}{20} = -0.25$
isocost
- If insurance policies more generously cover D than they do for M, consumers will replace D for M in the production process.

Insurance and Substitutability

$$P_D = 50, P_M = 100$$

given

Insurance II:

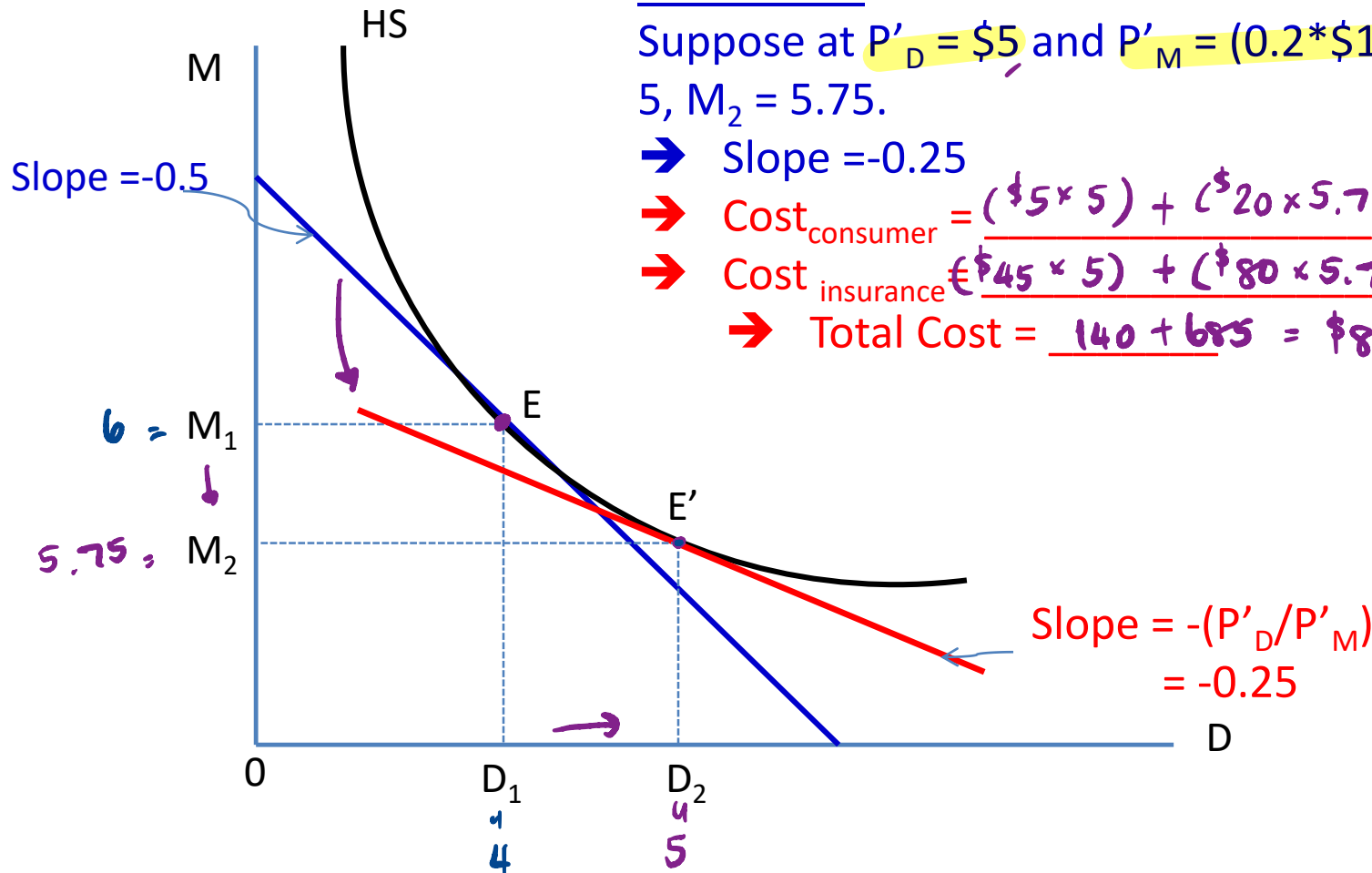
Suppose at $P'_D = \$5$ and $P'_M = (0.2 * \$100) = \20 , $D_2 = 5$, $M_2 = 5.75$.

→ Slope = -0.25

→ Cost_{consumer} = $(\$5 \times 5) + (\$20 \times 5.75) = \$140$

→ Cost_{insurance} = $(\$45 \times 5) + (\$80 \times 5.75) = \$685$

→ Total Cost = $140 + 685 = \$825 > \600
w/o ins.



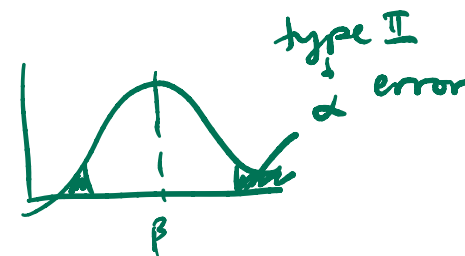
II. Structure and Regulation

- Pharmaceutical industry is dominated by significant *barriers to entry*. *incumbant (has barry to entry)*
- A **barrier to entry** is any factor that impedes the entry of new firms into an industry or product market. *, new entrant.*
- 3 major types of barriers to entry:
 1. **Patent protection:**
 - Patent gives firm **exclusive rights** to produce a drug for up to 20 years
 2. **Brand loyalty (or first mover) advantage:**
 - Patent creates name recognition and prescribing.
 - This makes it harder for a generic to penetrate a market.
 3. **Drug regulation:**
 - FDA approval process for a new drug is costly and time consuming.

Drug Regulation

- The pharmaceutical industry is one of the most heavily regulated of all industries.
- The Thai Food and Drug Administration (FDA) was originated to control the widespread counterfeit and contaminated products.
- In other countries, e.g. USA, the FDA plays a very important role in the pharmaceutical industry, as it is responsible for the approvals of new drugs (which could take ~14 years). This process involves trade-offs:
 - Consumer protection: Gain in safety and efficacy
 - Rapid innovation: Cost of delaying patients from utilizing useful drugs.

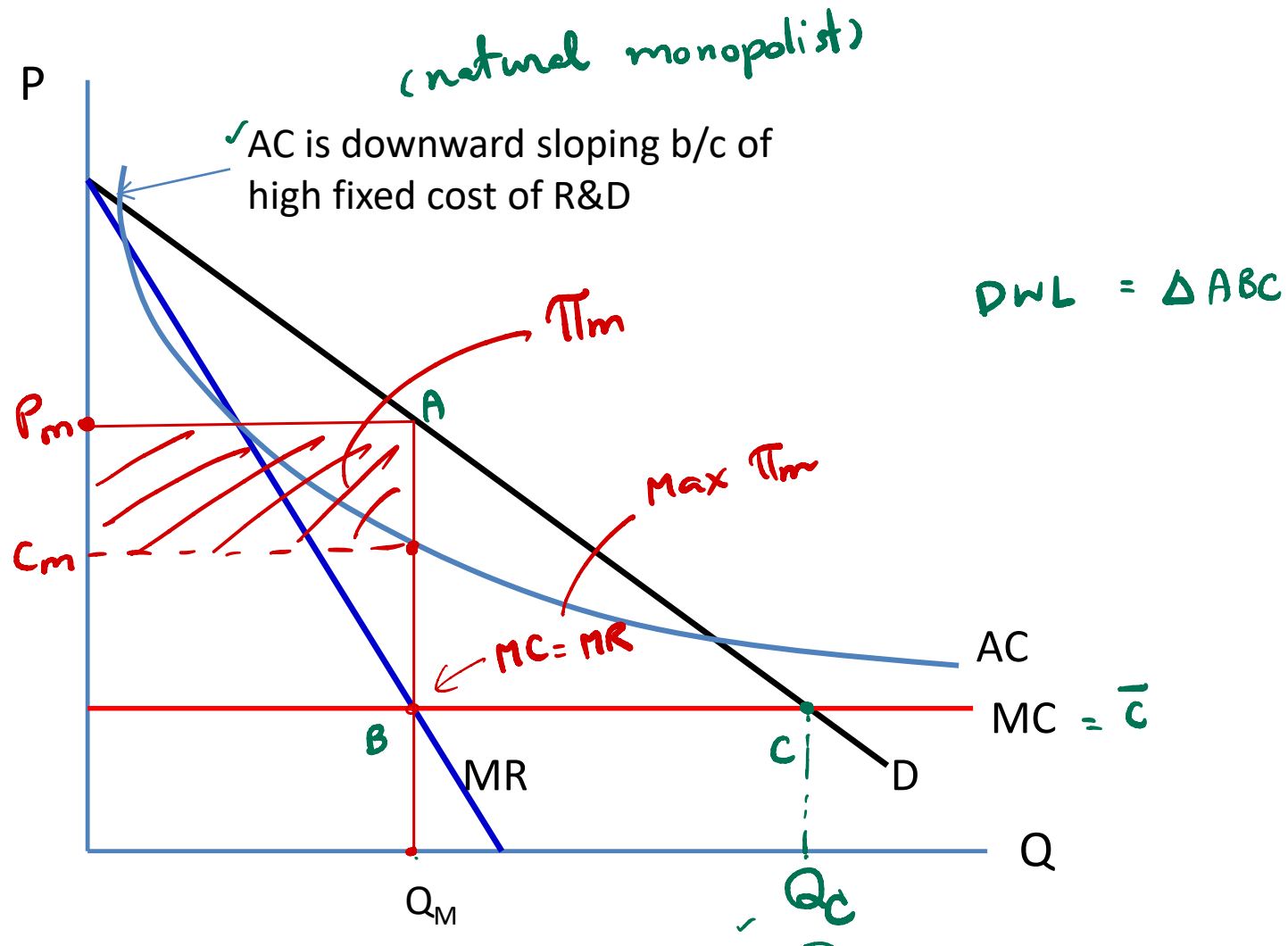
Drug Regulation



- Two types of drug approval errors:
 - Type I errors: FDA rejects drug that is actually safe and effective
 - Type II errors: FDA approves unsafe, ineffective drug
- What are the incentives?
 - FDA has incentive to commit Type I error because all costs are external to the FDA from a Type I error.
 - Pharmaceutical firms may have had an incentive to commit Type II error, as long as the costs remain external to the firm.
- So, the major unanswered question is whether the government (FDA) side or the private side (pharmaceutical firms) make the fewest and least costly errors.

*Corona-19
vaccines*

III. Monopoly Pricing

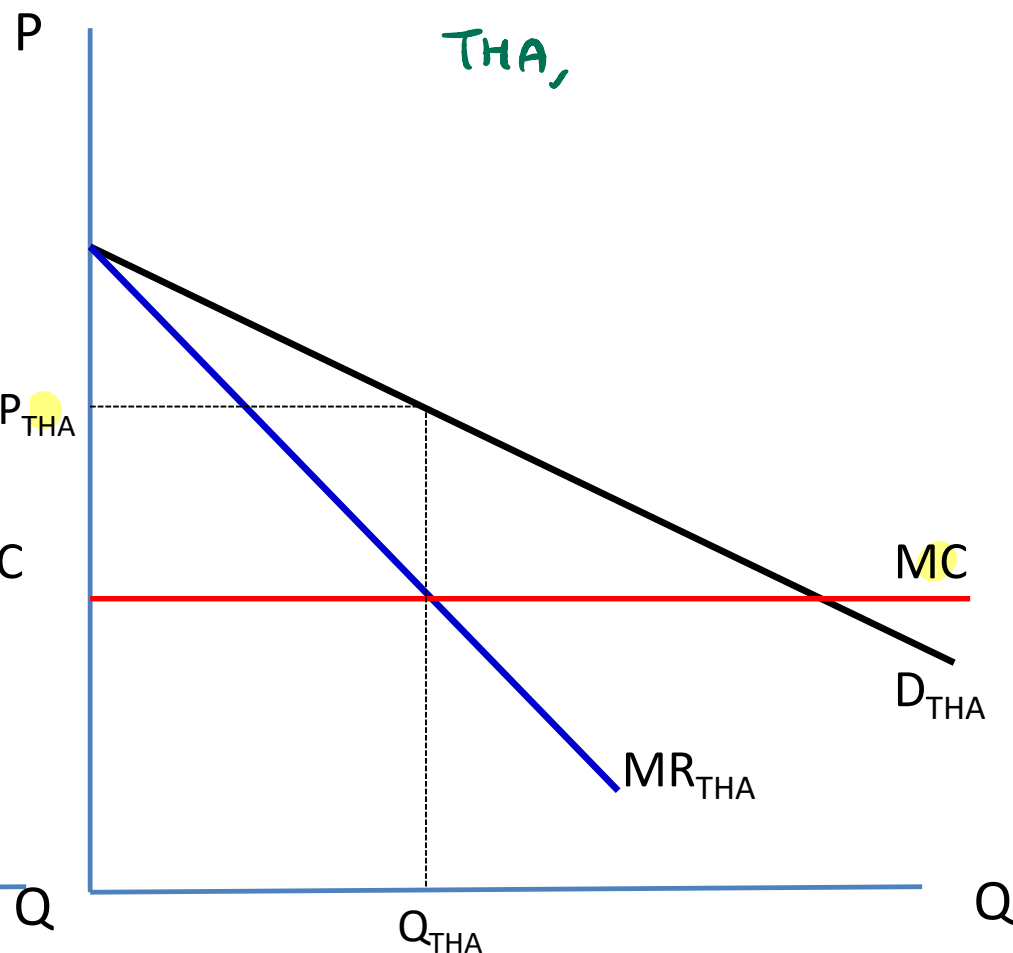
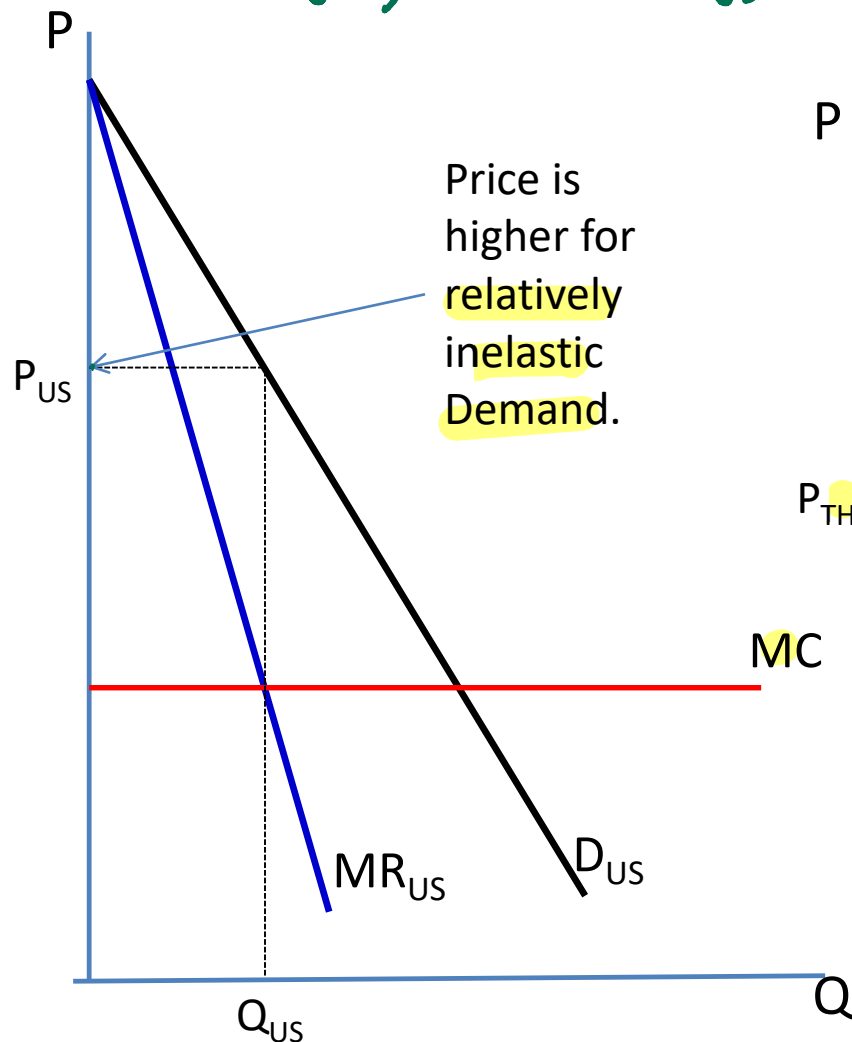


3rd Degree Price Discrimination

→ Firms are able to segment the market.

US,

$P_{US} > P_{THA}$



Monopsony Pricing and Price Controls

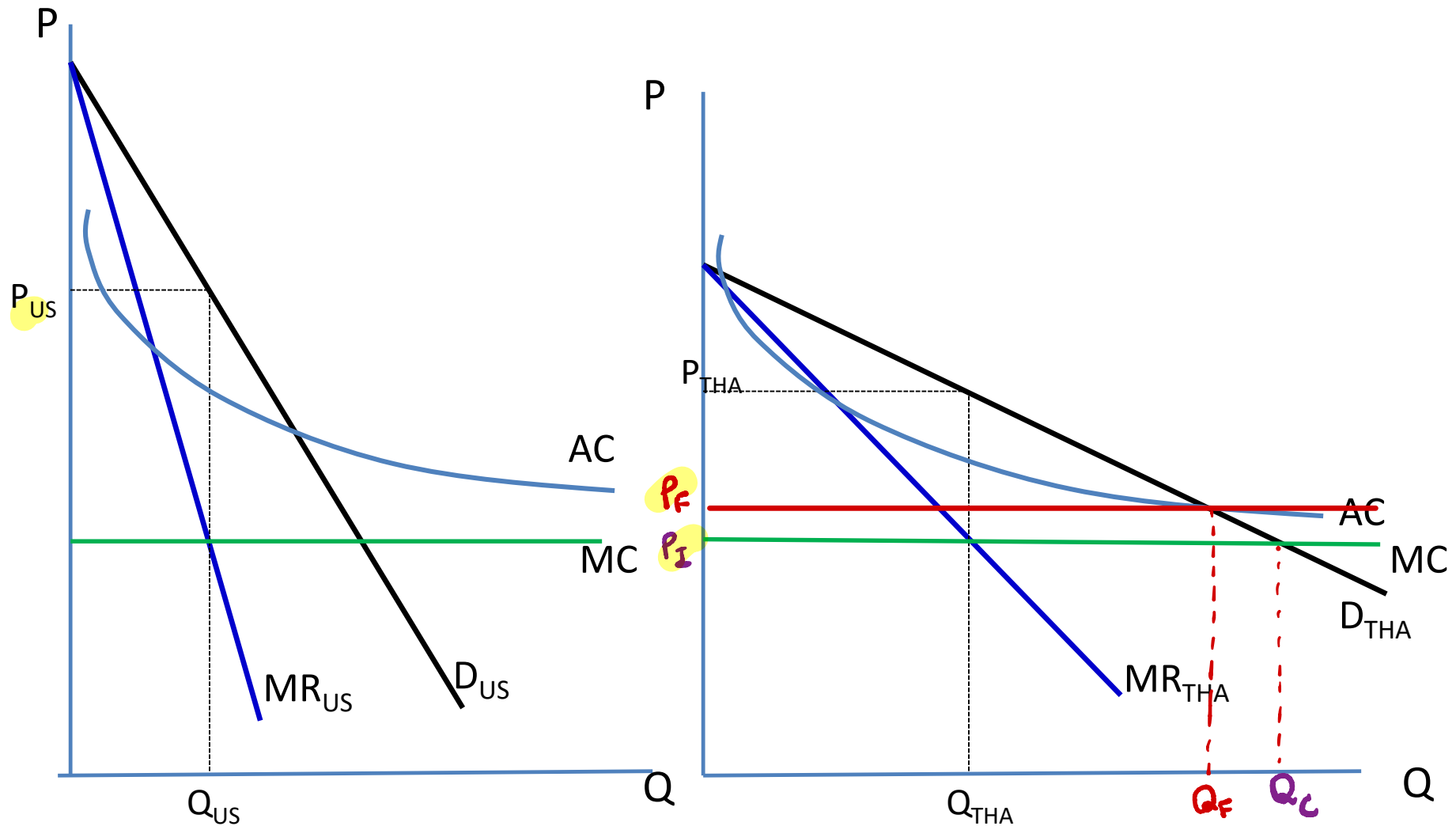
- Price discrimination is not the only possible explanation for price differentials.
- Prices in some countries can be lower because their governments regulate prices or their national health plan serves as a monopsony buyer.
- In the previous example, if the Thai government imposes price controls but the US government fails to do so, consumers in the US will be worse off.

Possible price controls :

① $P_1 = LRMC$: Ideal price (to reduce DWL).

② $P_F = LRAC$: Fair price ($\pi = 0$)

Price Discrimination & Price Regulation



Competition and Generic Entry

- Once a patent expires, other firms (generic drug companies) can enter the market.
- We would expect to see lower prices and smaller market share for the branded-drug companies after generic entry. But this is often not the case. Why?
- Branded producers can still **retain some monopoly power** by taking advantage of the **market segmentation** between the **brand-loyalty customers** and other customers.
 - Brand-loyalty customers don't see generic drugs as close substitutes of branded drugs.
 - **Relatively inelastic demand.**

IV. R&D and Innovation

- **Product innovation** is an important issue in the pharmaceutical industry.
 - New drugs can be very effective in improving quality of life and extending lives → improve society's welfare
 - Drug companies use the costs of innovation (R&D) to justify the large profits that pharmaceutical firms have earned.
- **Patents** provide **protection** for pharmaceutical companies so they are able to **recover these R&D expenditures**.
- The decision to develop a new drug depends on the **expected revenues of the drug minus the expected costs of the drug innovation process**.

Investment Decisions

- Net present value is:

$$NPV = \sum_{t=1}^T \frac{(R_t - C_t)}{(1+r)^t}$$

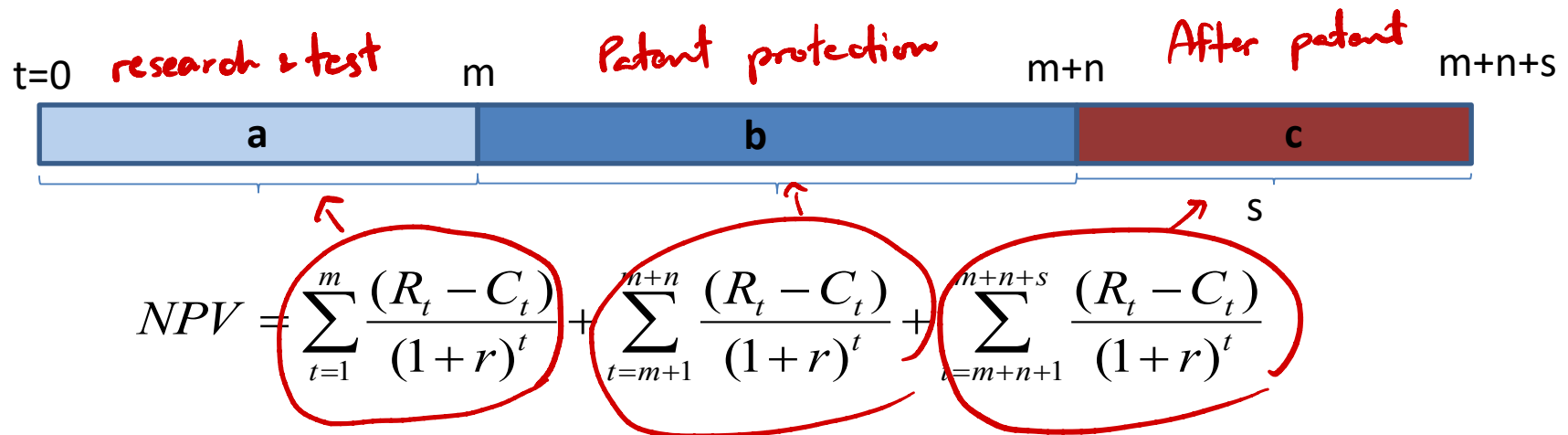


When to invest?
 $NPV > 0$

where R_t and C_t represent the revenue and costs in time t , r is the cost of capital and T is the life of the project

- Pharmaceutical R&D projects can be broken into 3 parts:
 - ✓ a. The research, testing, and review period
 - ➔ No revenue & large costs
 - ✓ b. The effective period of patent protection
 - ➔ Highest revenue & moderate cost
 - ✓ c. The post-patent period
 - ➔ Diminishing revenue & increasing costs

Investment Decisions



- Firms' decision to investment in R&D depends on:
 - Regulations and testing procedures
 - The length of the research, testing, and review period
 - Firms' ability to charge high price in period b *
 - Firms' ability to create 'brand recognition' after patent expiration → First-mover advantage!
 - Risk of the projects

Prices, Price Regulation, and Innovation

- Most important issue related to drug policy is the effects of prices on innovation.
 - Higher drug prices and potential markets encourage more R&D and innovation. *not affordable.*
 - But if prices are too high, there's a need for regulation.
- Drug price regulation effects innovation and the availability of drugs.
 - Price regulations reduces investment in R&D, the rate of innovation, and the number of new drugs.
- Thus, drug policy maker needs to address the trade-offs between controlling price and stimulating innovation.

V. Cost Containment

- The rapid growth in drug expenditures has led to great policy interest in **cost containment** (i.e. to **restrain expenditure**).
- One solution is to exercise **monopsony** power.
- Three cost-containment strategies:
 - **Higher copayments**: Shift a larger share of the cost burden to the patient and to decrease consumption of marginally beneficial drugs.
 - **Use of generic drugs**: Lower prices for the equivalent therapeutic components.
 - **Adoption of drug formularies**: Use drug-utilization review program, or develop a list of approved drugs.

Thai Pharmaceutical Industry

- Is there any monopoly?
 - Government Pharmaceutical Organization (GPO)
 - Gov't requires public hospitals to use to give GPO preferences in purchasing medicine.
- Cost-containment strategies?
 - Encourage the use of generic drugs
 - Use of drug formularies: Under certain health schemes (UCS and SSS), hospitals are required to prescribe drugs based on the National List of Essential Drugs (NLED)