

FACTORS OF HEALTH SERVICE  
PRODUCTION:  
PHARMACEUTICAL INDUSTRY

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# Topics

- Structure and Regulation:
  - Barrier to entry
  - Drug regulation
- The Production of Health and Substitutability
- Drug Pricing and Profits
  - Monopoly pricing
  - Price discrimination
  - Monopoly pricing and price control
- R&D and Innovation
  - Investment decisions
  - R&D spending
- Cost Containment

# 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

# Barriers to Entry

- A **barrier to entry** is any factor that impedes the entry of new firms into an industry or product market.
- 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.**

# The Production of Health and Substitutability

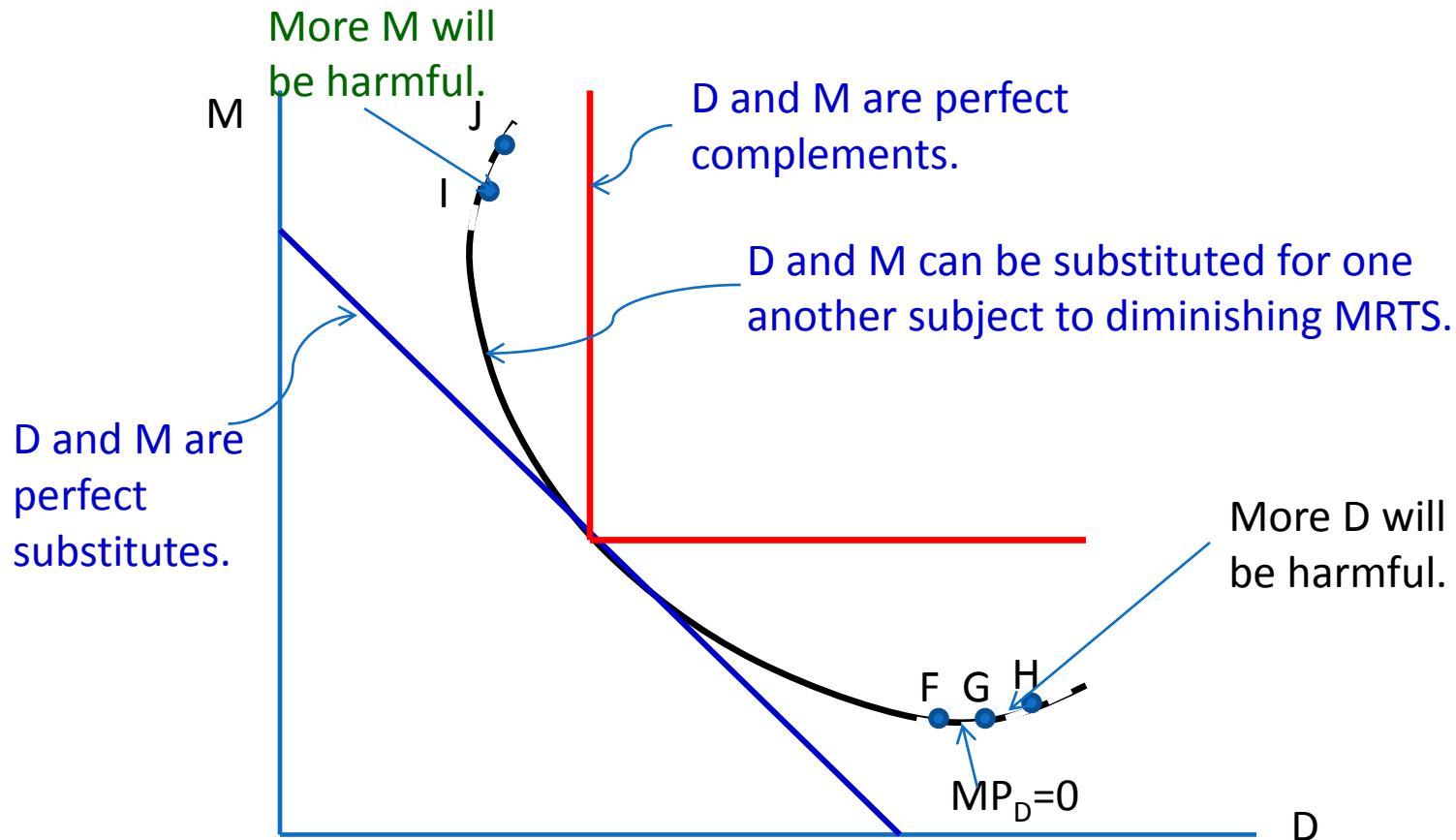
- Consider the following health production function:

$$HS = f(D, M)$$

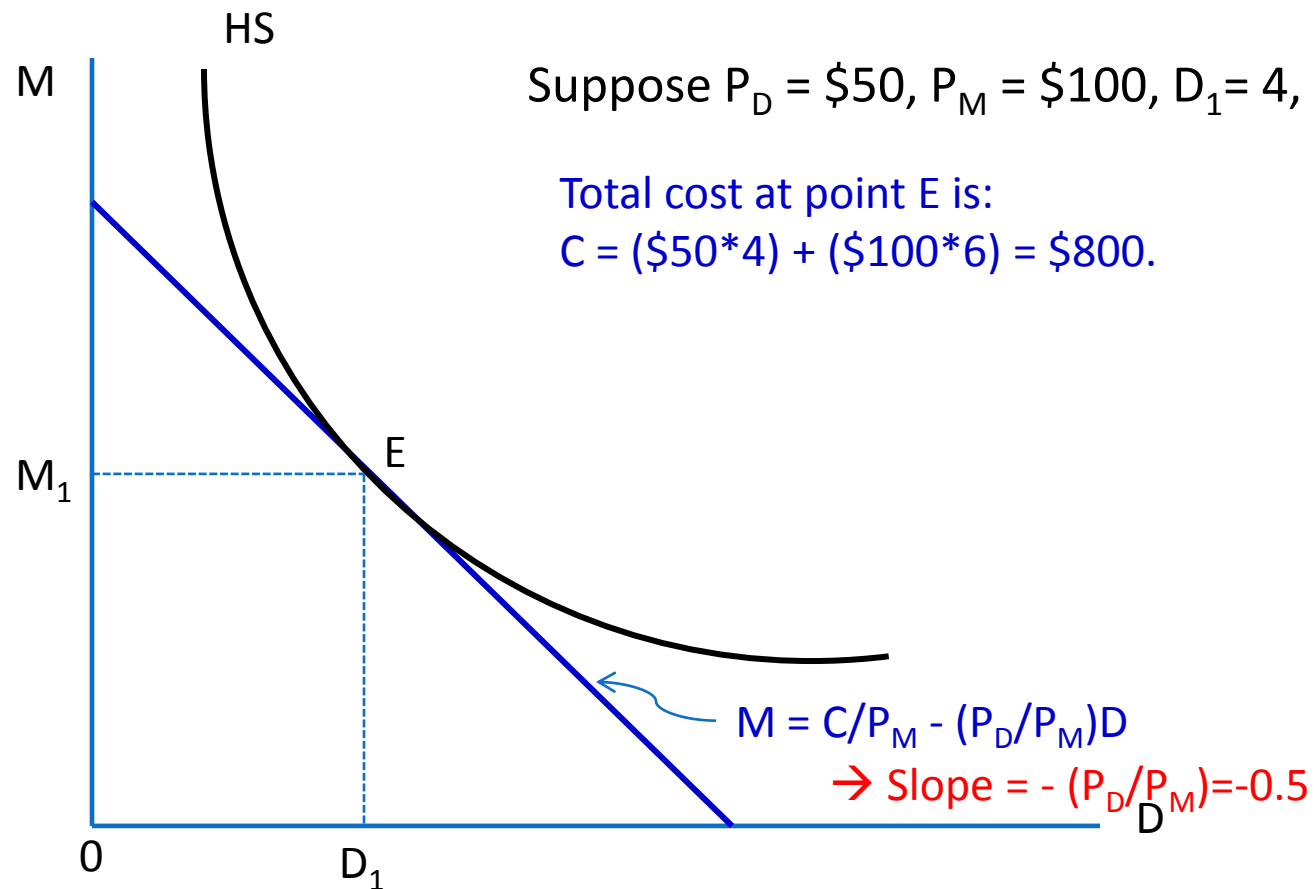
where HS is health status, D is drugs and M is other health inputs.

- Three possibilities of the **relationship between drugs and other medical inputs**:
  - They may have to be **used in fixed proportions**.
  - 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)**.

# Substitution Between Drugs (D) and Other Medical Inputs (M)



# Least-Cost Production



# Insurance and Substitutability

- Consider 2 different insurance policies:

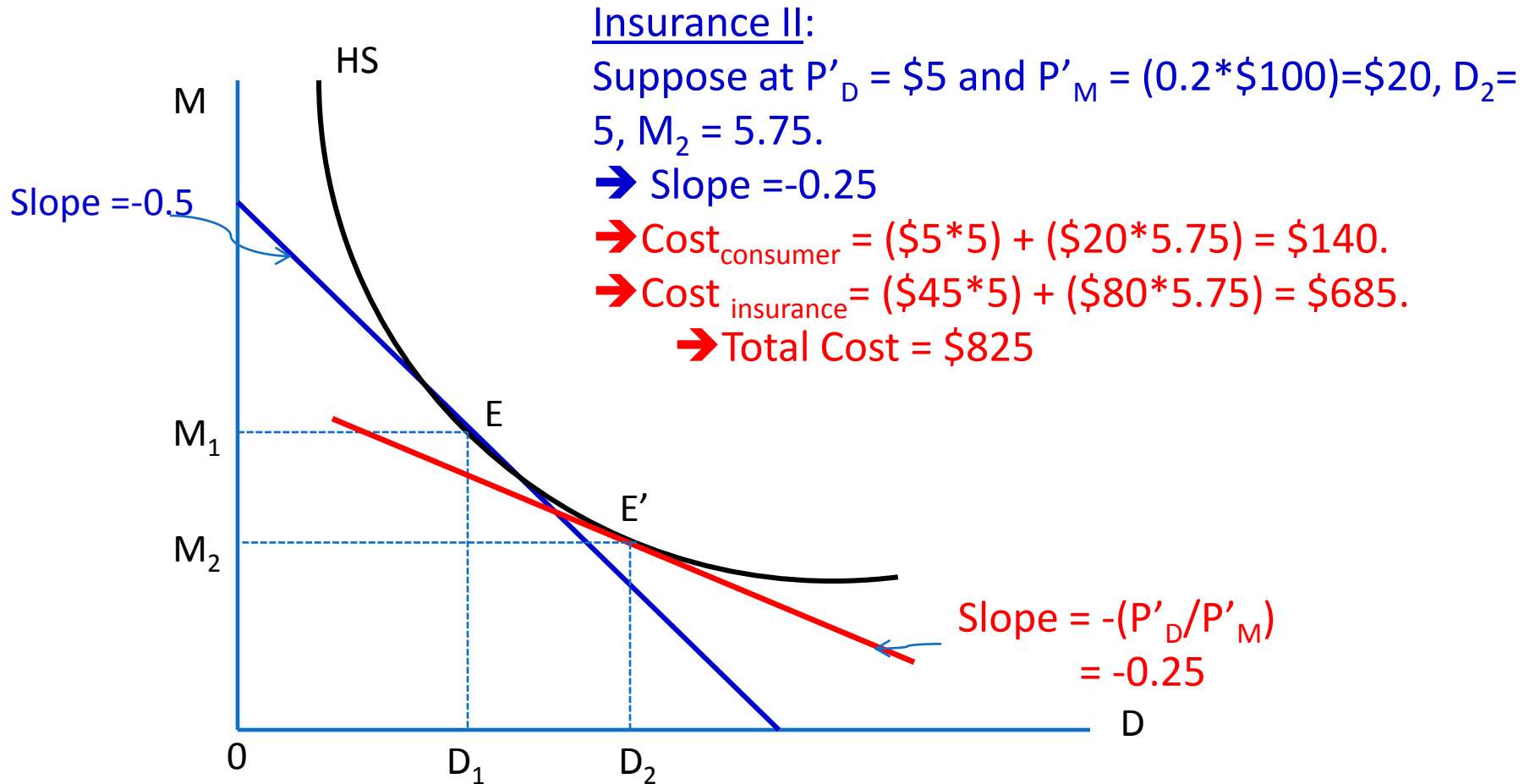
## 1. 20% coinsurance on both D and M

- Out-of-pocket payment for 1 unit of D =  $0.2 * \$50 = \$10$
- Out-of-pocket payment for 1 unit of M =  $0.2 * \$100 = \$20$
- Slope of the new budget line =  $-(10/20) = -0.5 \rightarrow$  same  $D^*$  and  $M^*$

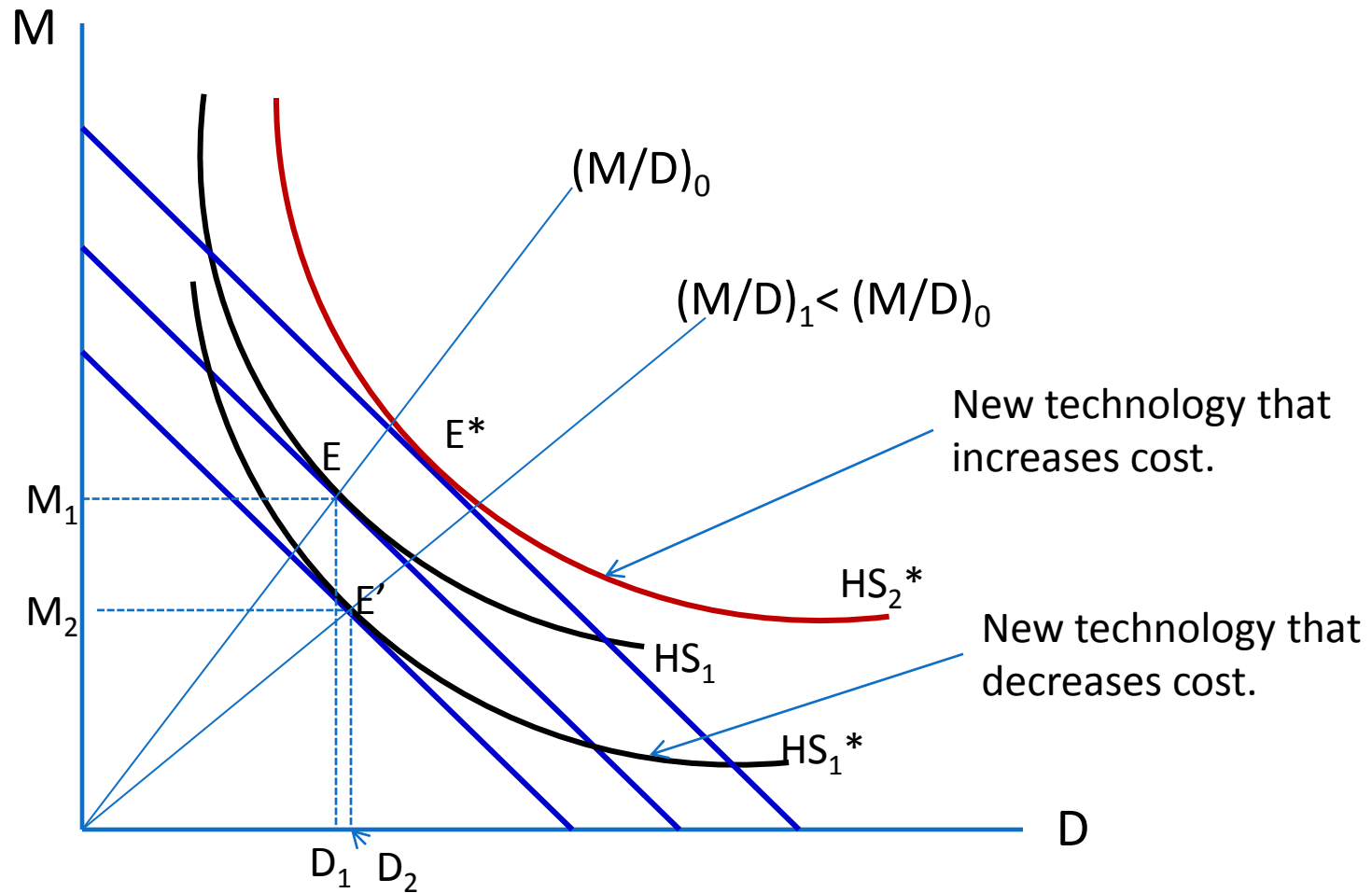
## 2. 20% coinsurance on M only and a deductible of \$5 (fixed copayment) for each D

- Out-of-pocket payment for 1 unit of D = \$5
  - Out-of-pocket payment for 1 unit of M =  $0.2 * \$100 = \$20$
  - Slope of the new budget line =  $-(5/20) = -0.25$
- If insurance policies more generously cover D than they do for M, consumers will replace D for M in the production process.

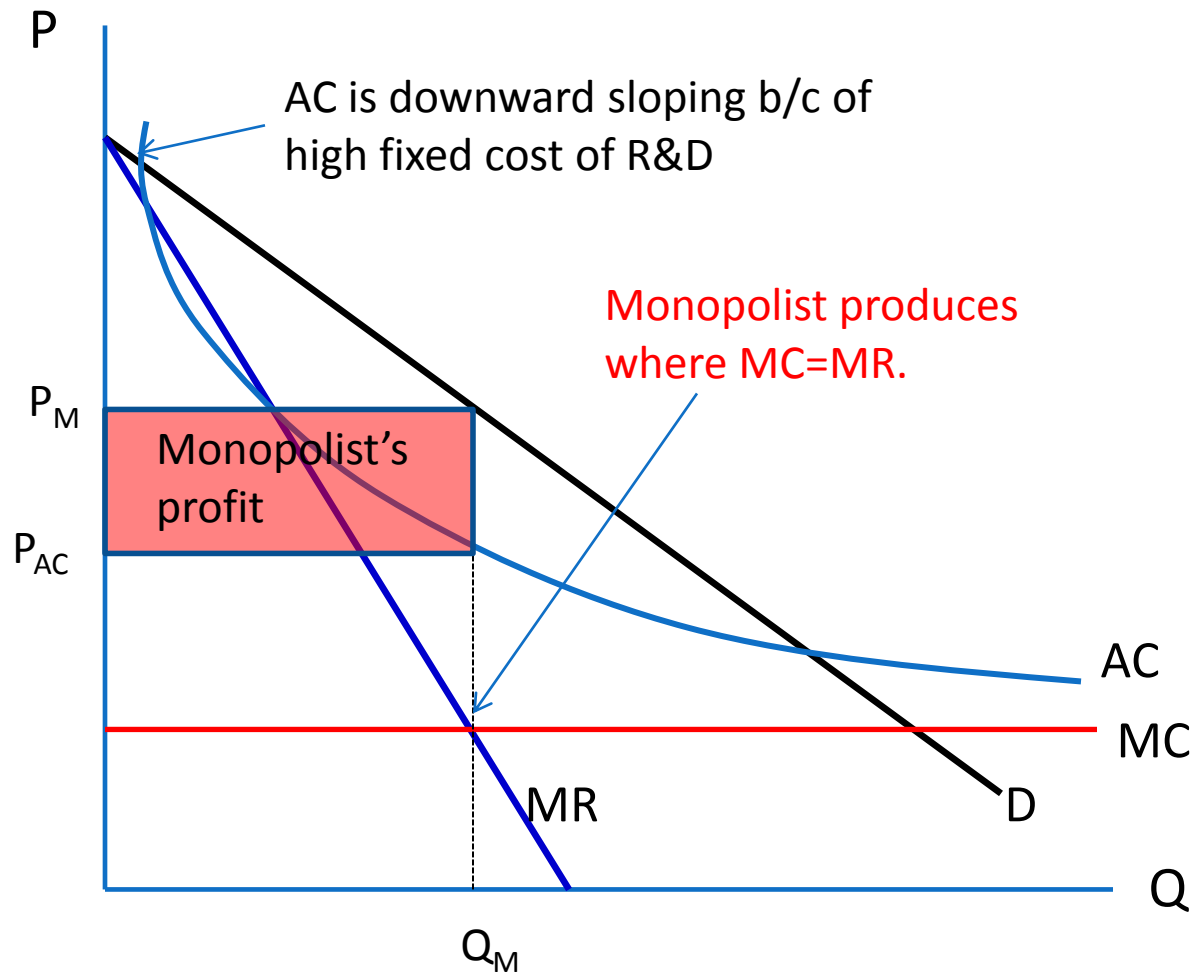
# Insurance and Substitutability



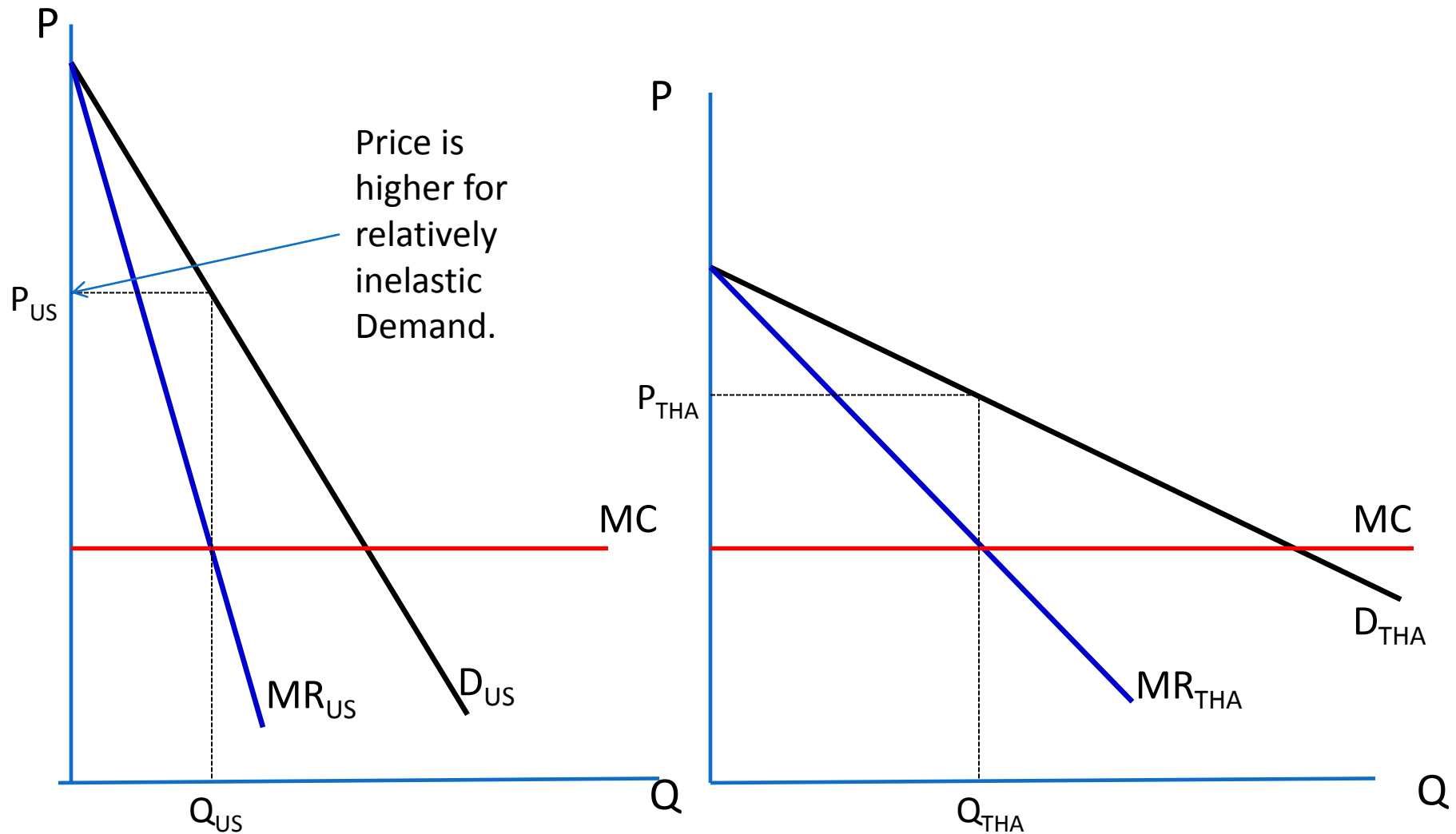
# Technological Change



# Monopoly Pricing



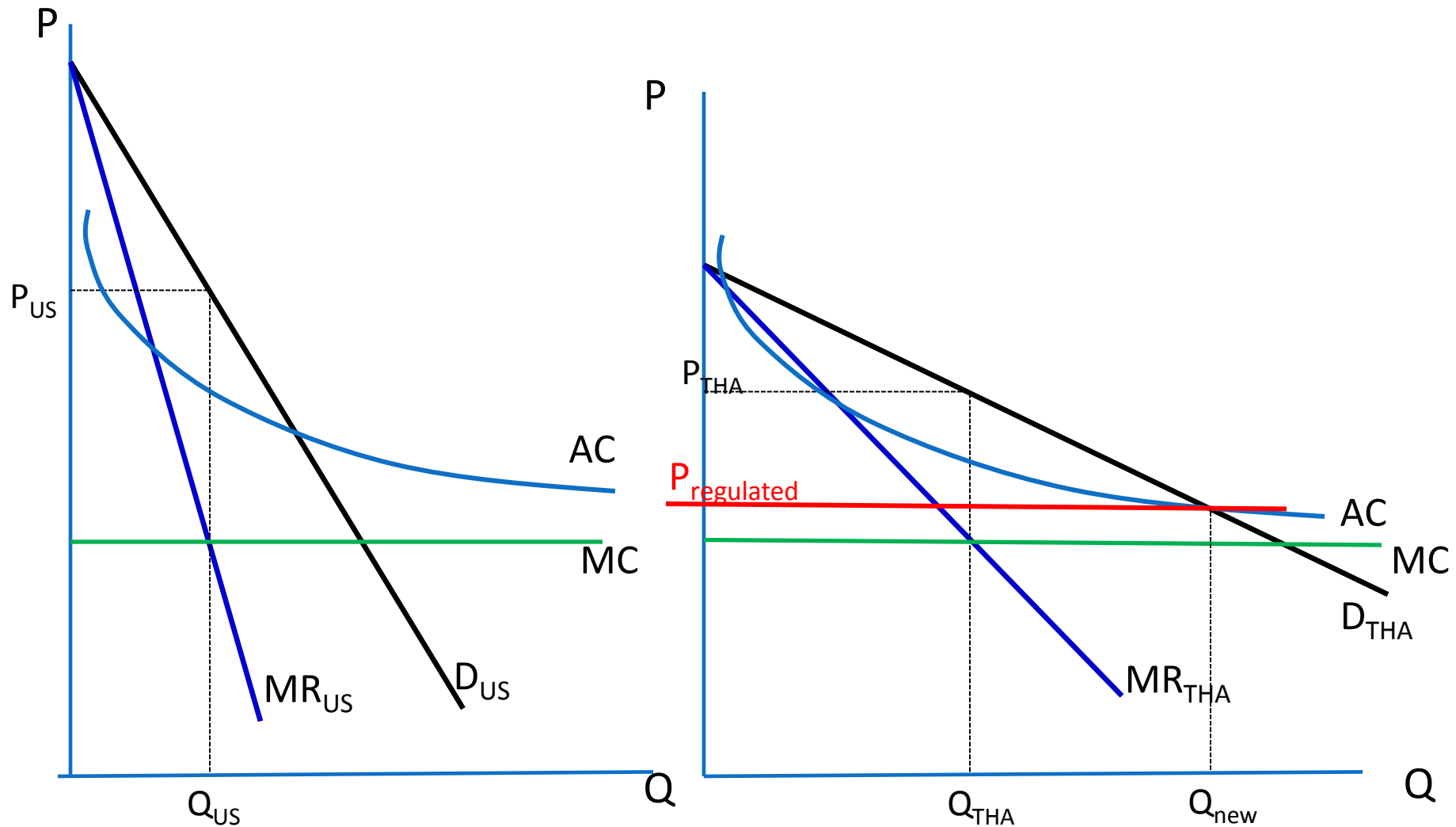
# 3<sup>rd</sup> Degree Price Discrimination



# 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.

# 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.**

# 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

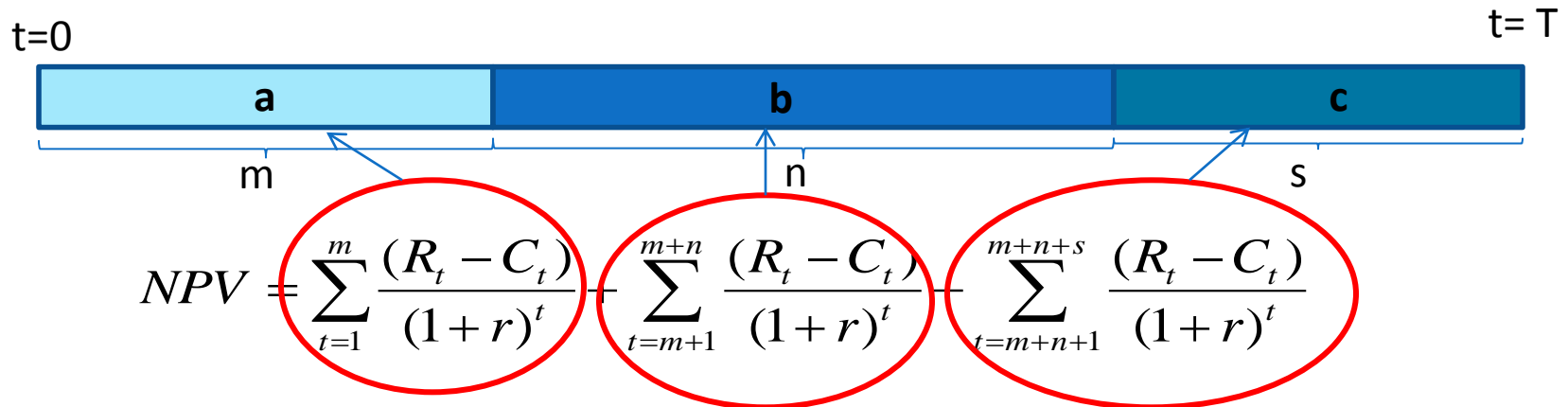
- Net present value is:

$$NPV = \sum_{t=1}^T \frac{(R_t - C_t)}{(1+r)^t} \quad \Rightarrow \quad \text{Invest if } NPV > 0$$

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.
  - But if prices are too high, there's a need for regulation.
- Drug price regulation affects innovation and the availability of drugs.
  - Price regulations reduce 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.

# 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)