Factors of Health Service Production:
Pharmaceutical Industry

EE 474 Health Economics
Semester 1/2012

Topics

- Structure and Regulation:
  - Barrier to entry
  - Drug regulation
- The Production of Health and Substitutability
- Drug Pricing and Profits
  - Monopoly pricing
  - Price discrimination
  - Monopsony 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

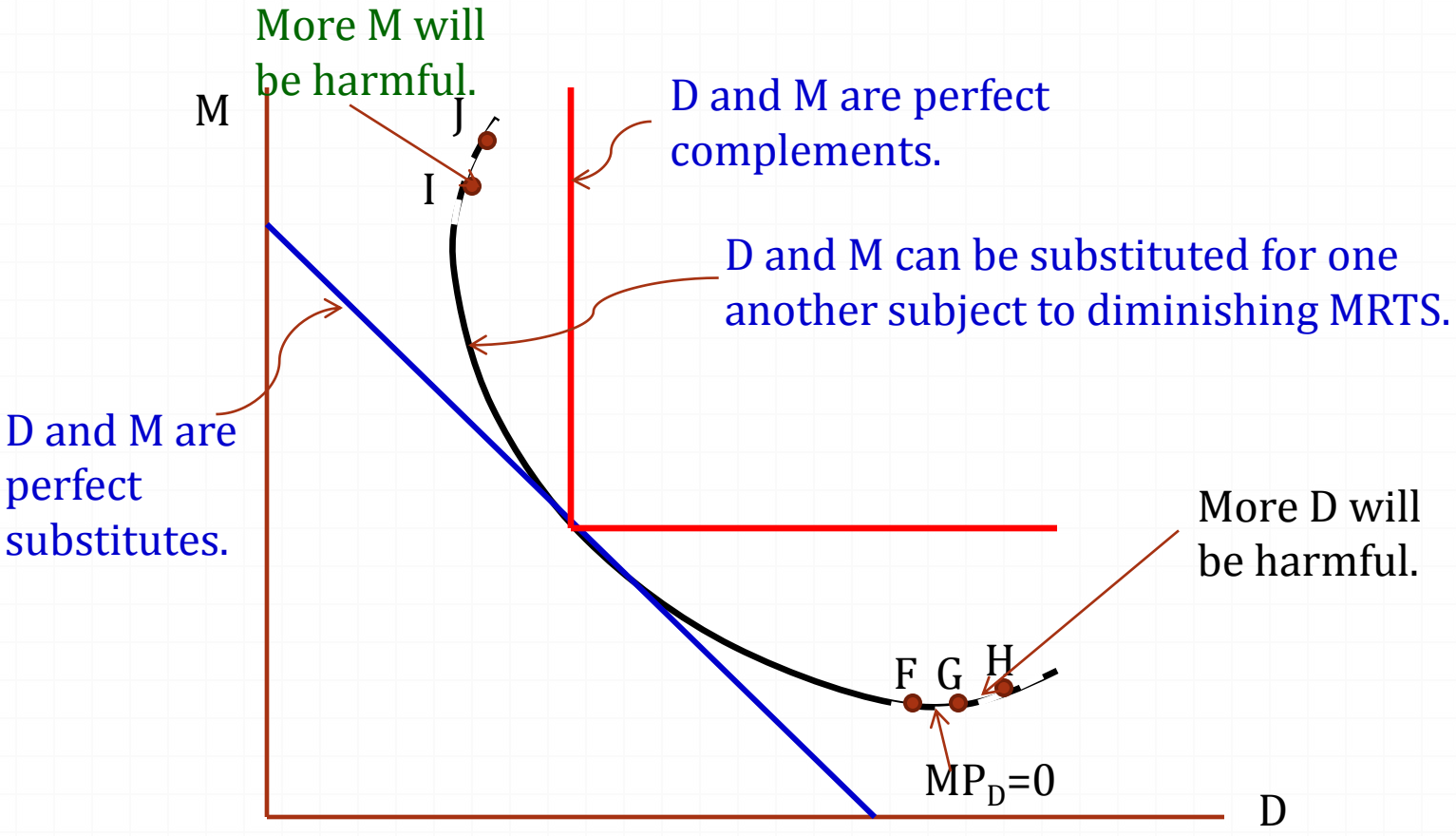
- Consider the following health production function:

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

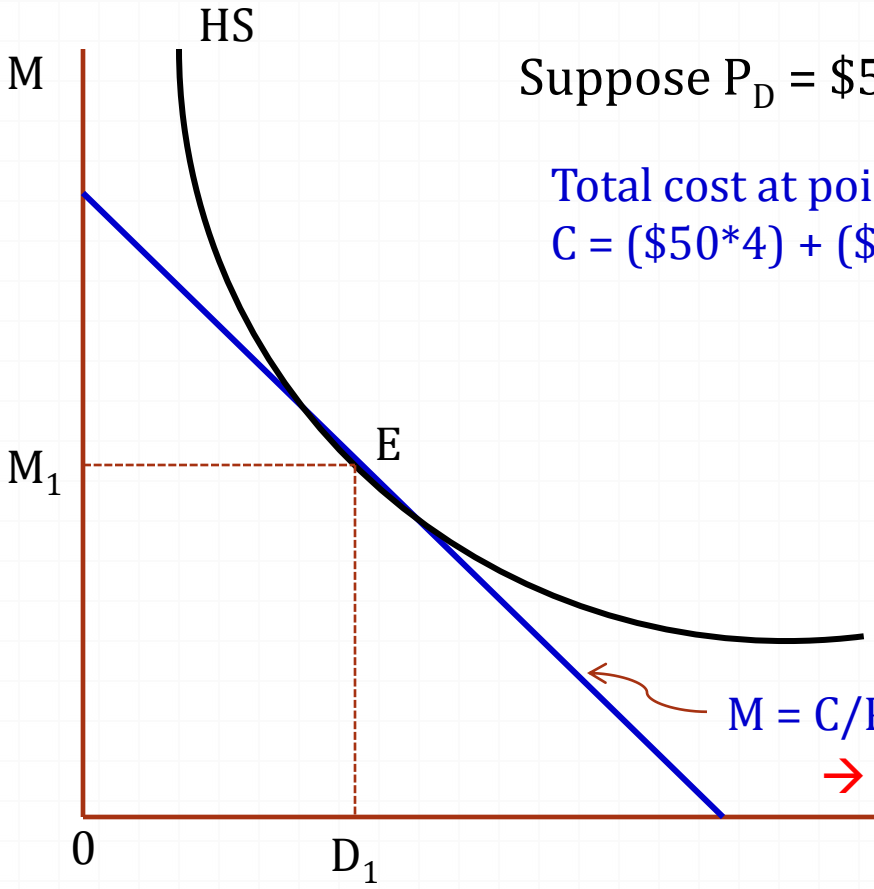
where HS is health status, D is drugs and M is other health inputs.

- 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 and Other Medical Inputs



Least-Cost Production



Suppose P_D = \$50, P_M = \$100, D_1= 4, M_1 = 6.

Total cost at point E is:
C = (\$50*4) + (\$100*6) = \$800.

$M = C/P_M - (P_D/P_M)D$

→ Slope = $- (P_D/P_M) = -0.5$

Insurance and Substitutability

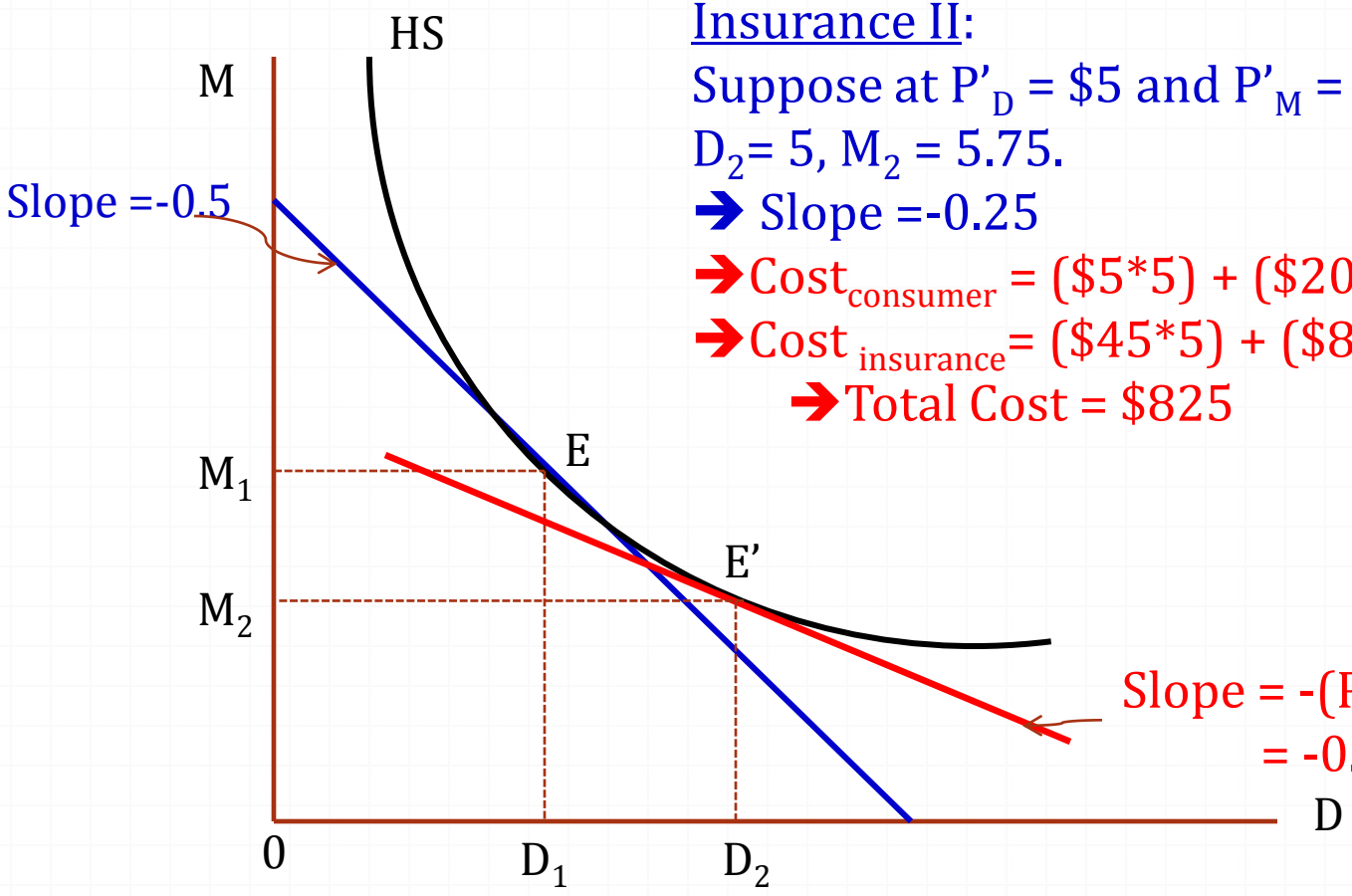
- Consider 2 different insurance policies:

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
     - Slope remains the same. → Same optimal D and M but 80% of the cost ($640) is transferred to the insurer.

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



Insurance II:

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

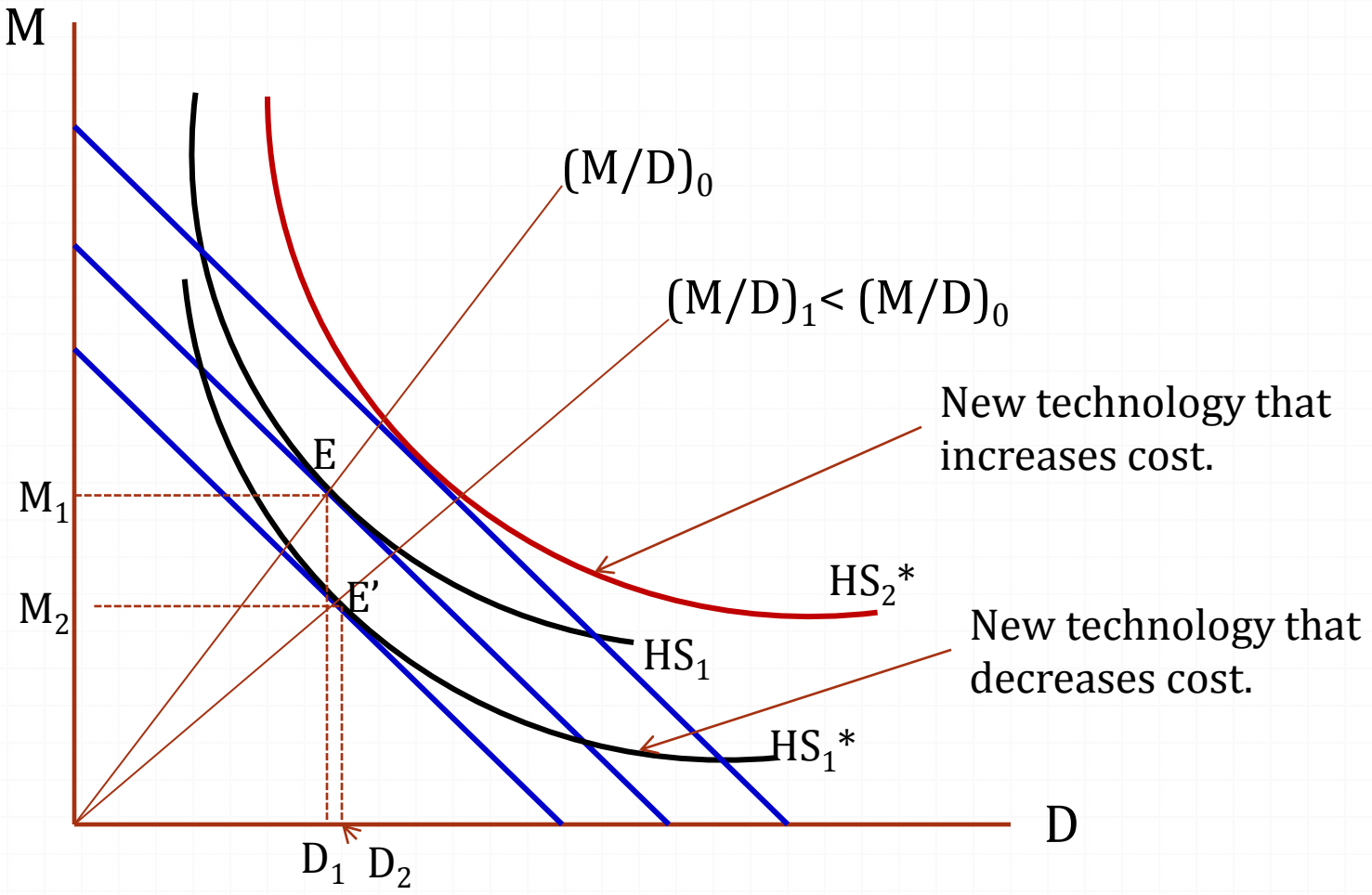
➔ Slope =-0.25

➔$Cost_{consumer}$ = (\$5*5) + (\$20*5.75) = \$140.

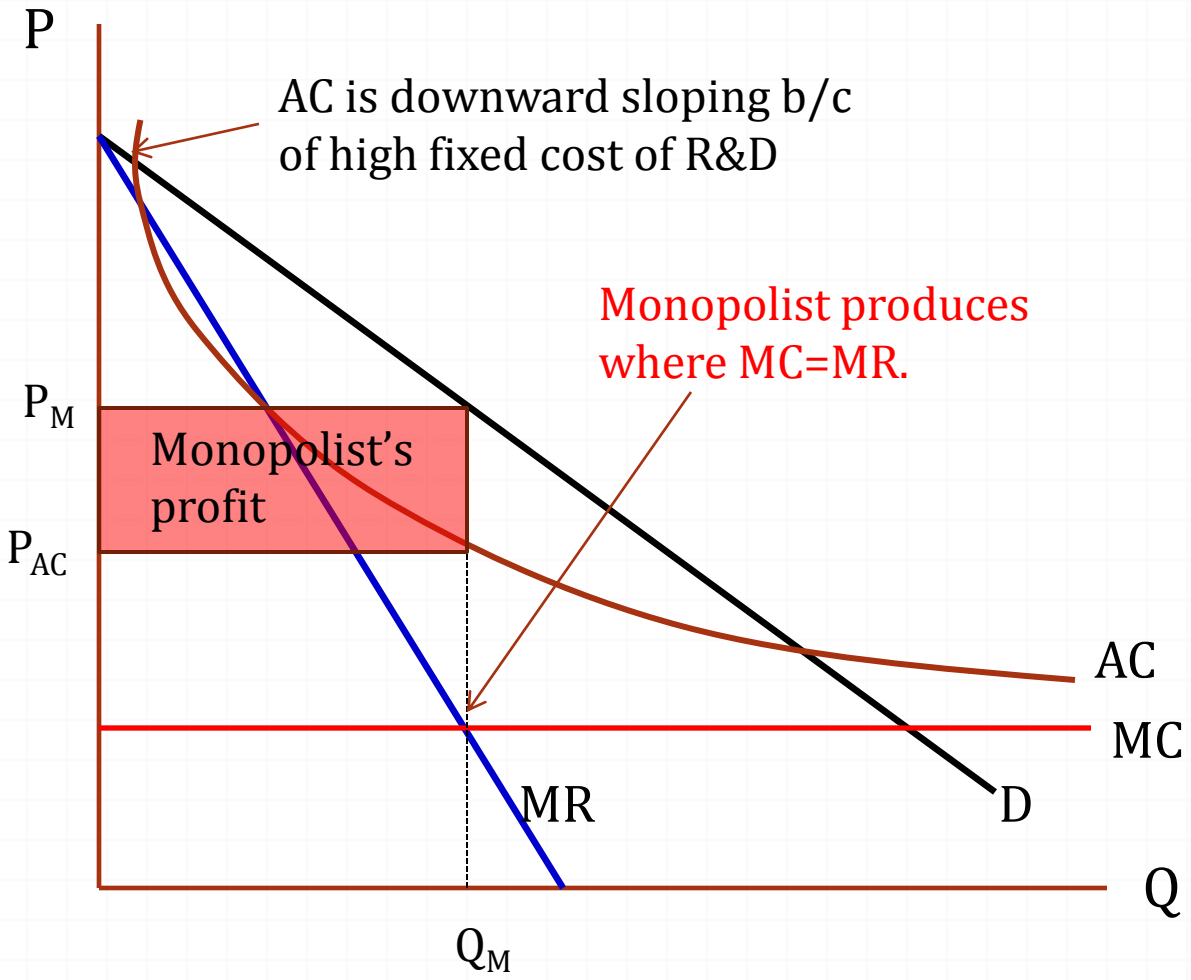
➔$Cost_{insurance}$= (\$45*5) + (\$80*5.75) = \$685.

➔Total Cost = \$825

Technological Change

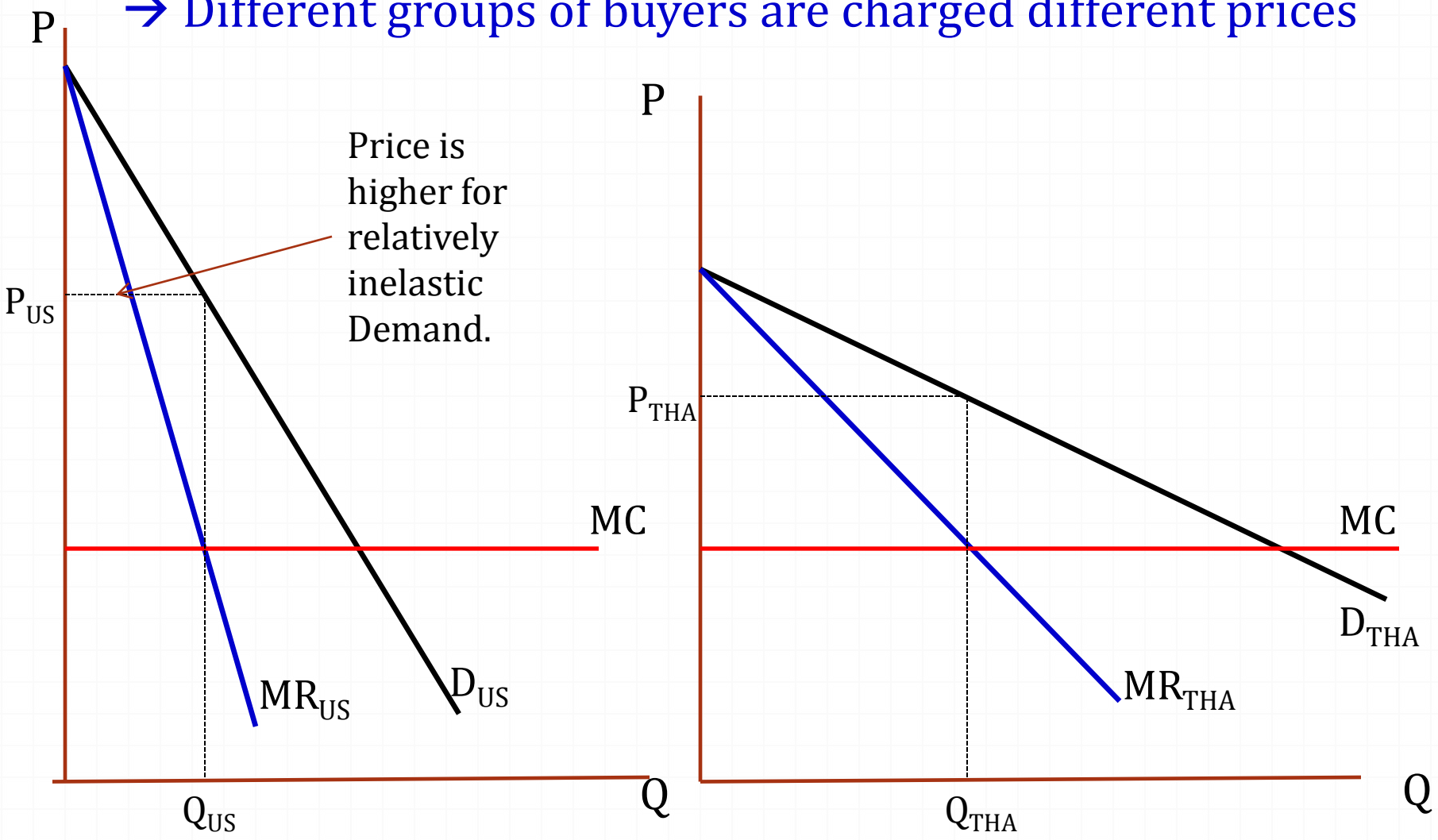


Monopoly Pricing



3rd Degree Price Discrimination

→ Different groups of buyers are charged different prices



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.

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

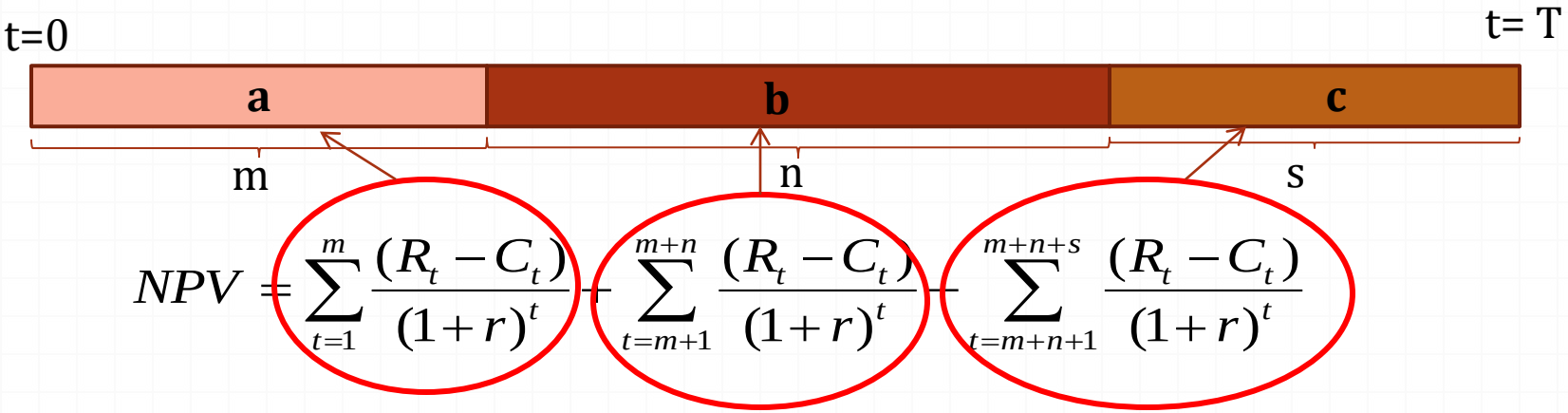
- Net present value is:

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

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)