Intermediate Microeconomics
Spring 2025

Week 16: Final Review

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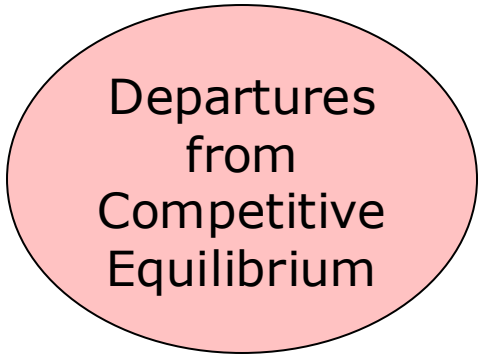
Final exam is cumulative.

- All topics before and after midterm could appear in the final.
  - Preference, utility maximization
  - Demand analysis
  - Profit maximization
  - Competitive market
  - Externality
  - Monopoly and market power
  - Imperfect competition
  - Risk and uncertainty
  - Asymmetric information
  - Game theory

Big Picture



1. Violation of the “private good” assumption -- Externality

2. Violation of the “price-taking” assumption -- Monopoly

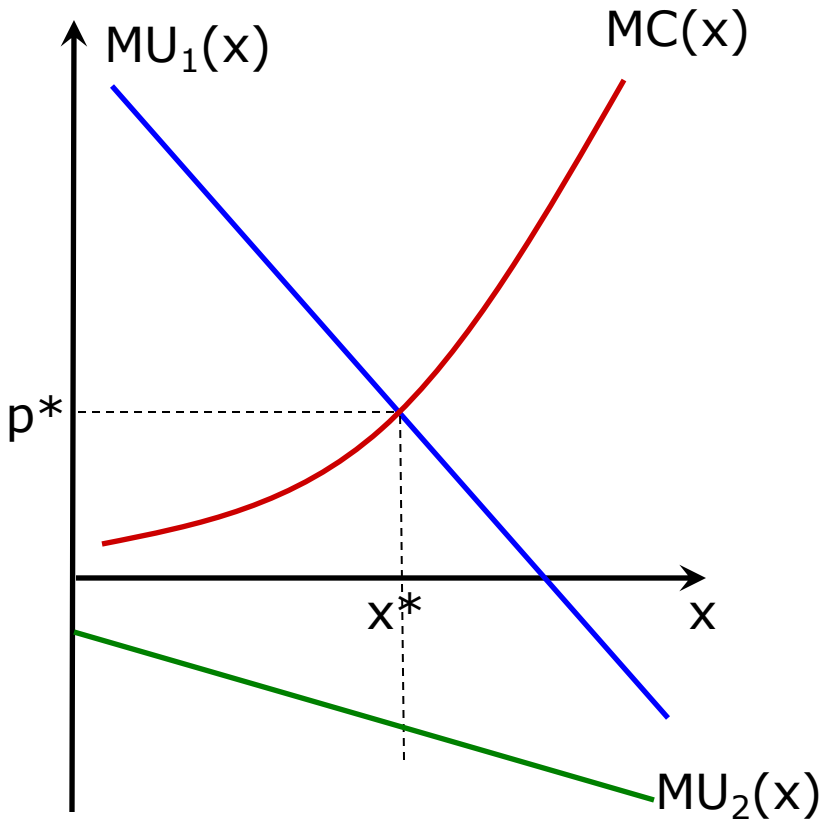
3. Violation of the “complete market” assumption -- Asymmetric information

(Negative) Externalities

- **Marginal Social Benefit (MSB):**
  - $MSB(x) = MU_1(x) + MU_2(x)$
- If $MU_2(x) < 0$, then

$MC(x^*) = MU_1(x^*) > MU_1(x^*) + MU_2(x^*)$.

- So, the market equilibrium results in an allocation where MC > MSB.



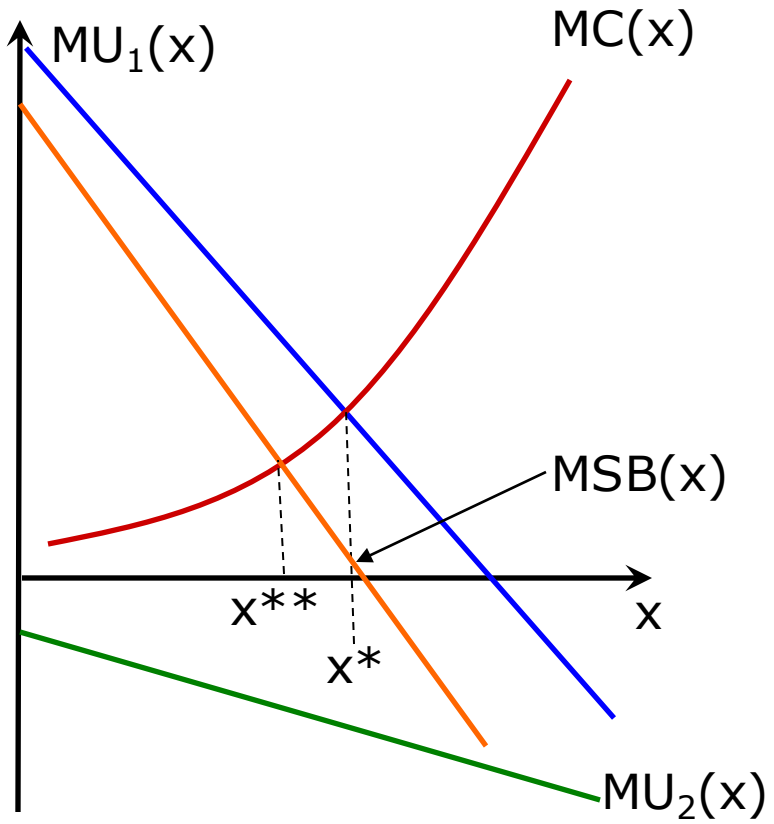
Negative Externalities

- What allocation maximizes total surplus?

- Total Surplus is maximized at x** where:

$MSB(x^{**}) = MU_1(x^{**}) + MU_2(x^{**}) = MC(x^{**})$.

- In the case of a negative externality, $x^{**} < x^*$.



Solutions to the externalities problem.

- We will consider four types of solutions to the externalities problem.
  - Centralized: require gov. to know consumers' preferences and enforce policies.
    - Quotas: command-and-control
    - Taxes: Pigouvian taxation
  - Decentralized: require gov. to create institutions and/or laws that lay out the rules, enforce policies only if violations occur.
    - Bargaining: Coase theorem
    - Market Making: carbon emission trading system

FIGURE 19.1 Production Externalities

- Two newsprint producers
  - Are located along a river
  - The upstream firm has a production function:

$$x = f(l_x) = 2{,}000\sqrt{l_x}$$

  - The downstream firm - similar production function
    - Its output may be affected by chemicals that firm *x* pours in the river

$$y = g(l_y, x) = 2{,}000\sqrt{l_y} \cdot (1 + \alpha x)$$

FIGURE 19.1 Production Externalities

- Assume
  - Newsprint sells for P = $1 per foot
  - Workers earn w = $100 per day
- Firm *x* will maximize profits
  - Setting this wage equal to the labor's marginal revenue product

$$100 = P \cdot \frac{\partial f}{\partial l_x} = 1{,}000 l_x^{-0.5}$$

- $l_x = 100$
- If $\alpha = 0$ (no externalities), $l_y = 100$
- $x = y = 20{,}000$

FIGURE 19.1 Production Externalities

- Effects of a negative externality ($\alpha < 0$)
  - The upstream firm's profit-maximizing decision will be unaffected
  - (l_x = 100 and produces x = 20,000)
  - But the marginal product of labor will be lower in firm y because of the externality
  - If α = -1/40,000,
  - l_y = ?
  - y = ?

Monopoly

- The monopolist chooses q to maximize profit $p(q)\,q - c(q)$.
- Take derivative with respect to q, set equal to zero:

$$p'(q)\,q + p(q) - c'(q) = 0$$

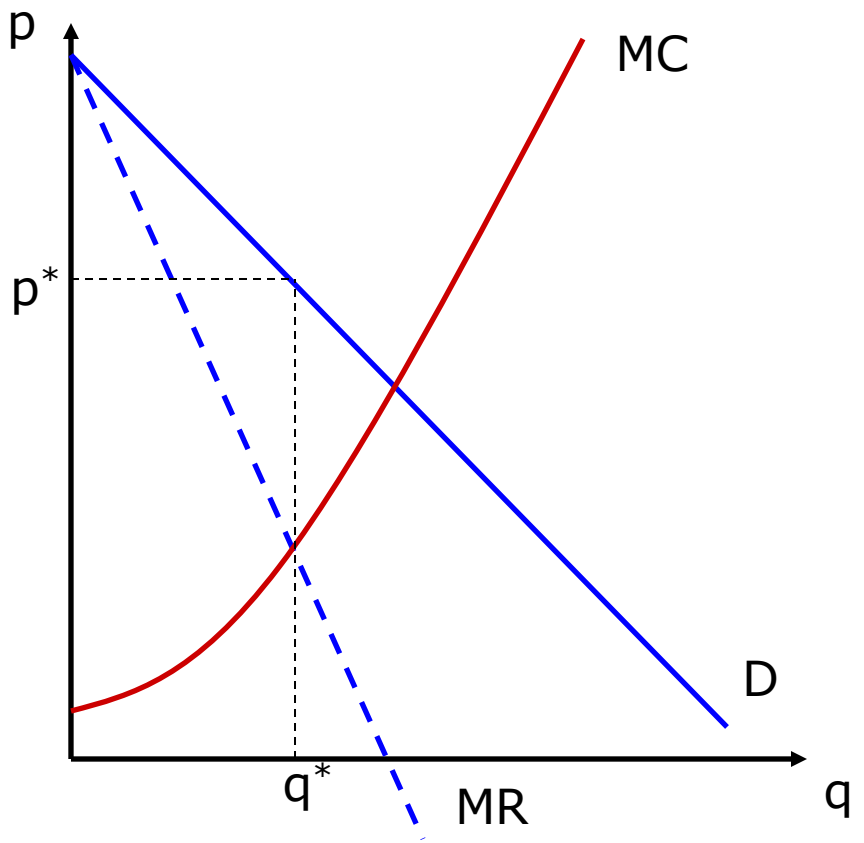
- Rearrange:

Marginal revenue → $p'(q)\,q + p(q) = c'(q)$ ← Marginal cost

- **Marginal Revenue:** the rate at which revenue changes when you increase q by a small amount.
- Also need to consider whether it's better to produce $q^* = 0$

Optimal choice of q^*

- Monopolist chooses q^* where MR = MC.
- Optimal price p^* is found by evaluating p(q) at q^*.
- Frequent mistake: don't plug q^* into MR by mistake!



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Regulation of Monopoly

- An enforced policy of marginal cost pricing will cause a natural monopoly to operate at a loss
- Rate of return regulation
- Per-unit subsidy

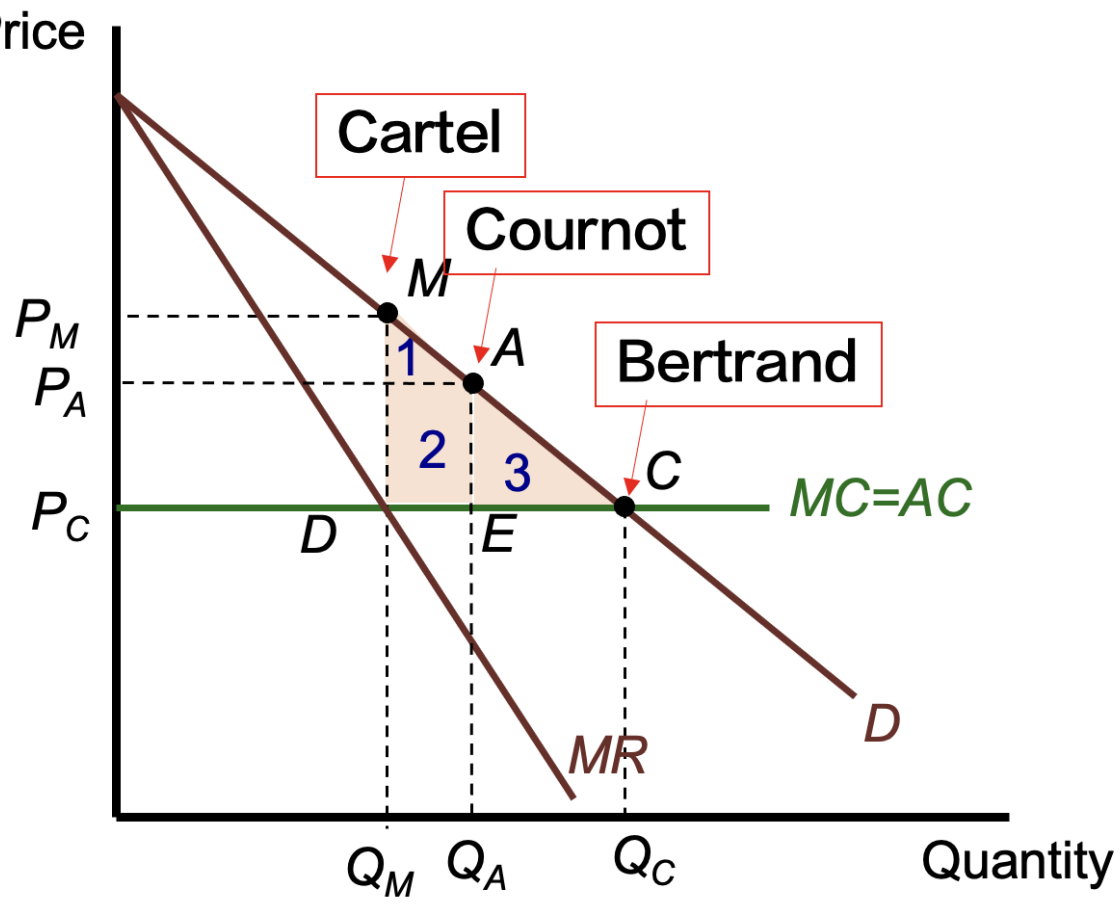
Example

- Suppose a perfectly competitive industry can produce widgets at a constant marginal cost of $10 per unit. Monopolized marginal costs increase to $12 per unit because $2 per unit must be paid to lobbyists to retain the widget producers' favored position.
- Suppose the market demand for widgets is given by

$$Q_D = 1000 - 50P$$

1. Calculate the perfectly competitive and monopoly outputs and prices.
2. Calculate the total loss of consumer surplus from monopolization of widget production.
3. Graph your results and explain how they differ from the usual analysis.

Bertrand vs. Cournot vs. Cartel



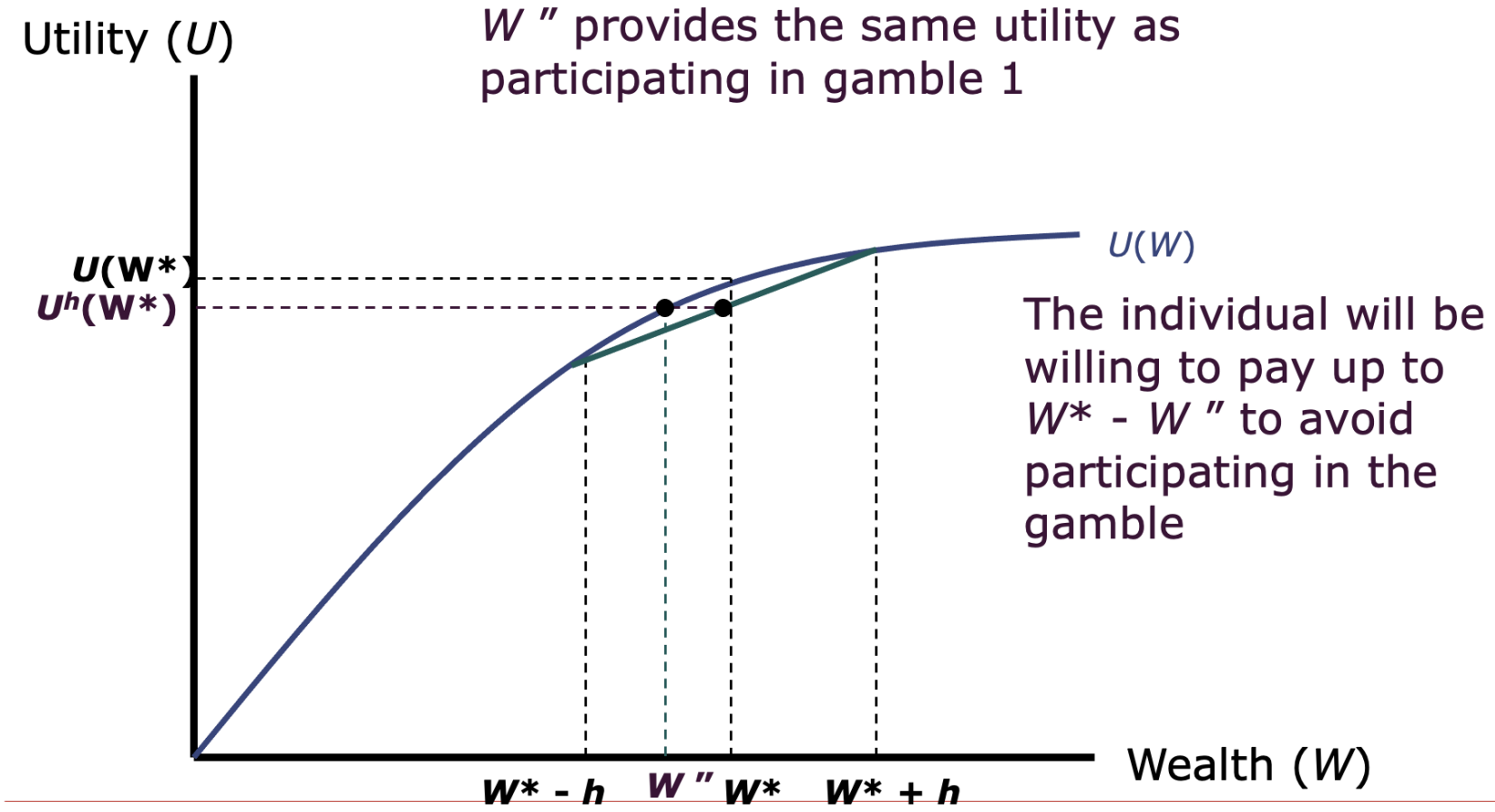
- In Cournot game, industry profits
  - Lower than in the cartel model ($P_AAEP_C < P_MMDP_C$)
- DWL
  - Smaller in the Cournot model (3) than in the cartel situation (1+2+3)

Risk and Uncertainty

Risk Aversion and Insurance

- An individual who always refuses fair bets is said to be risk averse
  - will exhibit diminishing marginal utility of income
  - will be willing to pay to avoid taking fair bets

Risk Aversion and Insurance



State-preference model

- The expected utility associated with these two contingent goods is

$$V(W_g, W_b) = \pi U(W_g) + (1 - \pi)U(W_b)$$

- This is the value that the individual wants to maximize given his initial wealth (W)

Example

- A farmer believes there is a 50–50 chance that the next growing season will be abnormally rainy. His expected utility function has the form

$$E[U(Y)] = \frac{1}{2}\ln Y_{NR} + \frac{1}{2}\ln Y_R\,,$$

where Y_{NR} and Y_R represent the farmer's income in the states of "normal rain" and "rainy"

- a. Suppose the farmer must choose between two crops that promise the following income prospects:

Crop	Y_{NR}	Y_R
Wheat	$28,000	$10,000
Corn	$19,000	$15,000

Which of the crops will he plant?

- b. Suppose the farmer can plant half his field with each crop. Would he choose to do so? Explain your result.

- c. What mix of wheat and corn would provide maximum expected utility to this farmer?

- d. Would wheat crop insurance – which is available to farmers who grow only wheat and which costs $4,000 and pays off $8,000 in the event of a rainy growing season—cause this farmer to change what he plants?

Asymmetric information

- Two Leading Models
  - Moral hazard model
    - The agent's actions affect the principal, but the principal does not observe the actions directly
    - Hidden-action model
    - Eg. Owner-manager relationship
    - Eg. Moral hazard in insurance

Asymmetric information

- Two Leading Models
  - Adverse selection model
    - The agent has private information before signing the contract (his type)
    - Hidden-type model
    - Eg. Adverse selection in car insurance
    - Eg. Akerlof's Lemon Model

First-, Second-best contracts

- First-best contract
  - Full-information environment
  - The principal could propose a contract that maximizes joint surplus
    - Could capture all of the surplus for himself
    - Leaving the agent just enough to make him indifferent between agreeing to the contract or not

- Second-best contract
  - The contract that maximizes the principal’s surplus
  - Subject to the constraint that he is less well informed than the agent

Example

- Suppose there is a 50–50 chance that an individual with logarithmic utility from wealth and with a current wealth of $20,000 will suffer a loss of $10,000 from a car accident. Insurance is competitively provided at actuarially fair rates.

- A. Compute the outcome if the individual buys full insurance.

- B. Compute the outcome if the individual buys only partial insurance covering half the loss. Show that the outcome in part (a) is preferred.

- C. Now suppose that individuals who buy the partial rather than the full insurance policy take more care when driving, reducing the damage from loss from $10,000 to $7,000. What would be the actuarially fair price of the partial policy? Does the individual now prefer the full or the partial policy?

Game theory

- Tragedy of the commons
- Bayesian-Nash Equilibrium with incomplete information