

Econ 301: Microeconomic Analysis

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Externalities

Introduction

- ▶ Last time, saw that if all interaction between agents happened in a market, would obtain Pareto efficient outcome
- ▶ However, in general we have *externalities*, where agents have preferences for things that are not sold on the market
- ▶ Question for today: Will we still get Pareto efficient outcomes if there are goods with no market?

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Consumption Externality Example: Smoking Roommate

- ▶ Let A and B be two people sharing a room
- ▶ A prefers to smoke while B prefers clean air
- ▶ A and B each endowed with some money: m_A, m_B
- ▶ Note that we can represent this situation with Edgeworth box:

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- ▶ Note that we can represent this situation with Edgeworth box:
 - ▶ Money on horizontal dimension, eg
 - ▶ Then vertical axis represents percent of smoky air for A, or conversely clean air for B
 - ▶ Total amount of air is fixed
 - ▶ Preferences for A increasing in money and in smoky air
 - ▶ Preferences for B increasing in money and in clean air

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 - ▶ B willing to away some clean air for money to reach PE allocation
- ▶ These are just two extremes; a whole continuum of possible property rights
- ▶ As long as property rights are clear and agreed upon, Pareto efficient allocation will be obtained

Smoking Roommate Edgeworth Box

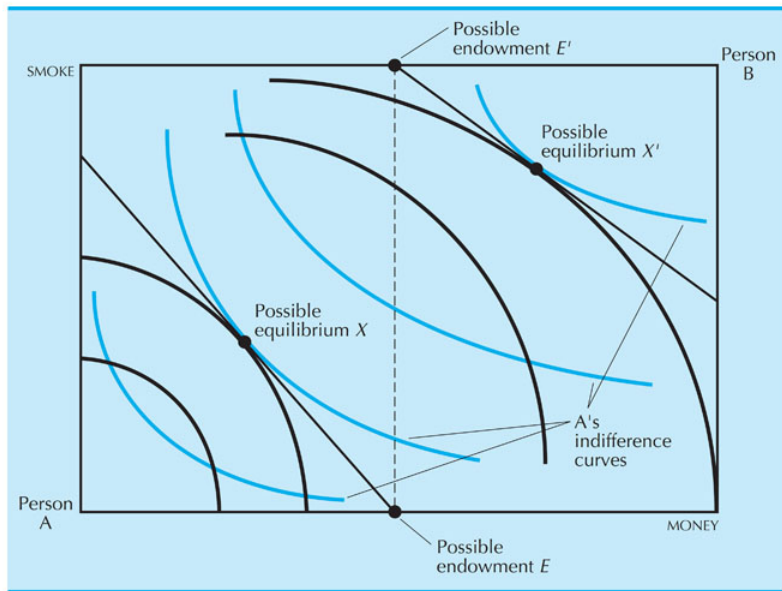


Figure
35.1

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 - ▶ Tangency points will also be horizontal translations of each other
 - ▶ So contract curve will be a straight horizontal line
- ▶ Whatever the initial endowment, agents end up consuming same amount of clean air
 - ▶ This is called *The Coase Theorem*
 - ▶ Big implication (if assumptions hold): initial property rights do not affect final allocations of clean/smoky air

Coase Theorem Graphically

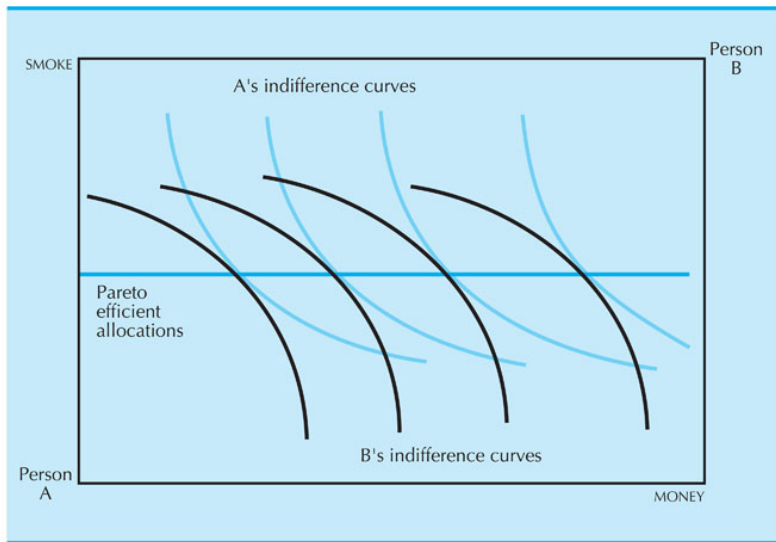


Figure
35.2

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 - ▶ Assume $\frac{dc_s}{dx} \leq 0$
- ▶ Fishery downstream produces fish f at cost $c_f(f, x)$
 - ▶ Fish sells at price p_f
 - ▶ Note the steel mill can choose pollution amount x but fishery must take it as given
 - ▶ Assume $\frac{dc_f}{dx} \geq 0$

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- ▶ FOC: just one (with respect to f):

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- ▶ Note that first two FOC are same, but third FOC implies a lower level of pollution x that if firms were separate

Terminology

- ▶ When the firms are acting independently, they are trying to minimize *private cost*
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- ▶ The steel firm, which creates the pollution, does not pay *social cost* of steel production
- ▶ However, by combining the firms they *internalize* the externality by minimizing social cost
- ▶ Note that if all costs are fully internalized, market equilibrium should give Pareto efficient outcome, as we expect from last lecture

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- ▶ Note: government has to know cost structures to set correct tax

Market for Pollution

- ▶ Rather than government imposing pollution price through tax, we can add a market for pollution
- ▶ Then government just has to set property rights
- ▶ Assume fishery has right to clean water
- ▶ Then steel mill has to pay price q to fishery to pollute
- ▶ Fishery can sell pollution rights for price q

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- ▶ If fishery has the property right, we get the socially optimal solution
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- ▶ Get same FOC as before, regardless of property rights!

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 - ▶ FOC: $f'(c) = a$, ie marginal product = marginal cost
- ▶ Villagers' individual decisions
 - ▶ Suppose each villager can choose to buy a cow or not
 - ▶ Since number of villagers is relatively small, Nash Equilibrium is an appropriate tool here

Tragedy of the Commons (cont)

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 - ▶ Thus private equilibrium number of cows is higher than socially optimal number of cows, leading to overgrazing
- ▶ What happened?
 - ▶ Unclear property rights lead villagers to graze more than their share
 - ▶ Solution: formalize property rights through regulation or ownership of commons

Tragedy of the Commons Graphically

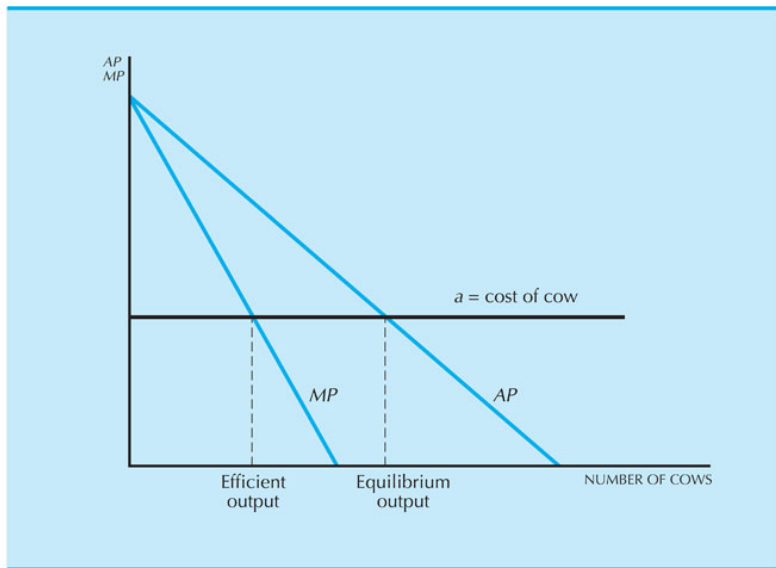


Figure
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