- Instructor：王辉，应用经济系 (jackie_pku@163.com)
- Chapter 7-18; Notes as guidance; Textbook as reference
- Structure
  1. Market Structure and Firm behavior
     - Firm's production (Ch. 6) and cost (Ch. 7)
     - Firm's (output) decision rules under perfect competition (Ch. 8) and monopoly (Ch. 9)
     - Firm's input decision and factor market (Ch. 12, 13, 15)
     - Strategic Behaviors (monopolistic competition), Game Theory (Ch. 10)
  2. Market imperfection
     - Uncertainty and Information (Ch. 11)
     - Externality (Ch. 14)
  3. Other topics:
     - Government Budgeting (Ch. 16)
     - Poverty and Inequality (Ch. 17)
     - International Trade (Ch. 18)
- Keep in mind:
  - Concepts
  - Economic ways of thinking
  - Economic principles
  - Problems solving in the real life

光华管理学院
Guanghua School of Management

Chapter 7

Analysis of Costs

Hui Wang, Dept. of Applied Economics, GSM, Peking University

Outline

0. Review: Production (Ch. 6)
1. Economic Analysis of Costs (Ch. 7 A)
   - 1.1 Total Cost: Fixed and Variable
   - 1.2 Average Cost
   - 1.3 Marginal Cost
   - 1.4 Link between Production and Cost
2. Opportunity Cost (Ch. 7 C)

Outline

0. **Review: Production (Ch. 6)**
1. Economic Analysis of Costs (Ch. 7 A)
   - 1.1 Total Cost: Fixed and Variable
   - 1.2 Average Cost
   - 1.3 Marginal Cost
   - 1.4 Link between Production and Cost
2. Opportunity Cost (Ch. 7 C)

Case: Assembly line of Ford in 1913

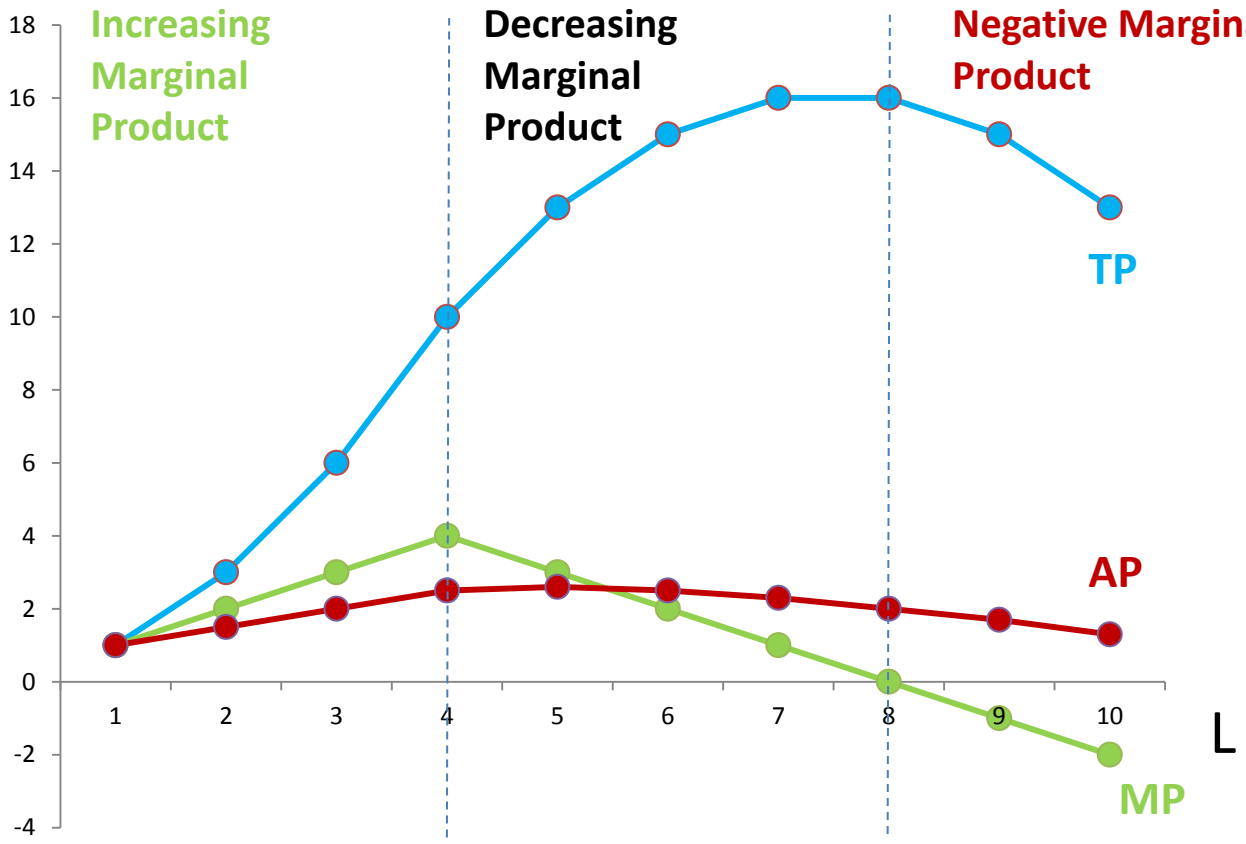
4 Machines: wheels, chassis, interior, body shell

Measures of Productivity

# Worker (L)	Total Production (TP,Q)	Average Production (AP)	Marginal Production （MP）
1	1	1	1
2	3	1.5	2
3	6	2	3
4	10	2.5	4
5	13	2.6	3
6	15	2.5	2
7	16	2.3	1
8	16	2	0
9	15	1.7	-1
10	13	1.3	-2

- Review of Chapter 6, part A
- AP = Q/L
- MP = ΔQ/ ΔL

TP,AP,MP



Remarks:

1. Trend of TP
2. Trend of MP: 3 regions
3. Trend of AP
4. MP and AP

MP pass AP at AP's maximum point

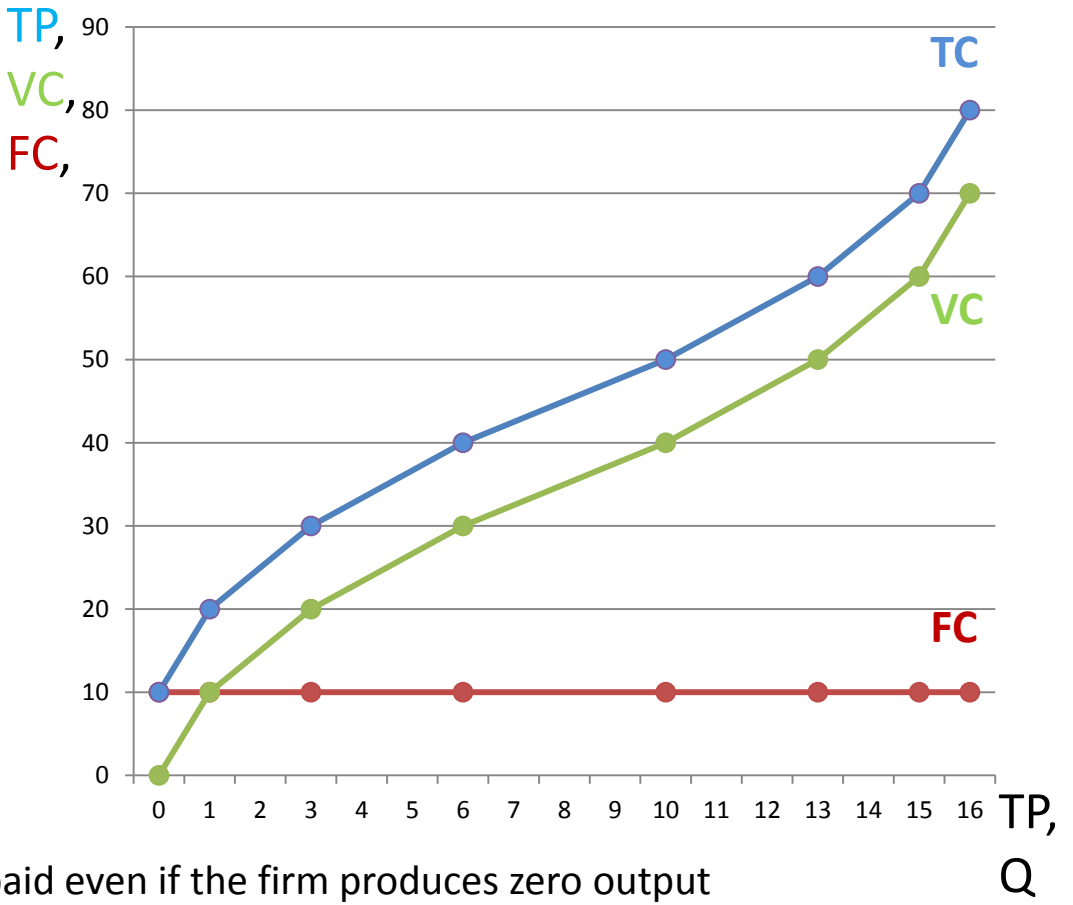
- When MP>AP, L↑ => AP↑
- When MP<AP, L↑ => AP↓
- When MP=AP, AP reaches its maximum

Outline

0. Review: Production (Ch. 6)
1. **Economic Analysis of Costs (Ch. 7 A)**
   - **1.1 Total Cost: Fixed and Variable**
   - 1.2 Average Cost
   - 1.3 Marginal Cost
   - 1.4 Link between Production and Cost
2. Opportunity Cost (Ch. 7 C)

Total Cost: Fixed and Variable

L	TP	FC	VC	TC
0	0	10	0	10
1	1	10	10	20
2	3	10	20	30
3	6	10	30	40
4	10	10	40	50
5	13	10	50	60
6	15	10	60	70
7	16	10	70	80



- Fixed Cost (FC): Expenses that must be paid even if the firm produces zero output
- Variable Cost (VC): Costs that vary as output changes
- Total Cost (TC): TC=FC+VC

Outline

0. Review: Production (Ch. 6)
1. **Economic Analysis of Costs (Ch. 7 A)**
   - 1.1 Total Cost: Fixed and Variable
   - **1.2 Average Cost**
   - **1.3 Marginal Cost**
   - 1.4 Link between Production and Cost
2. Opportunity Cost (Ch. 7 C)

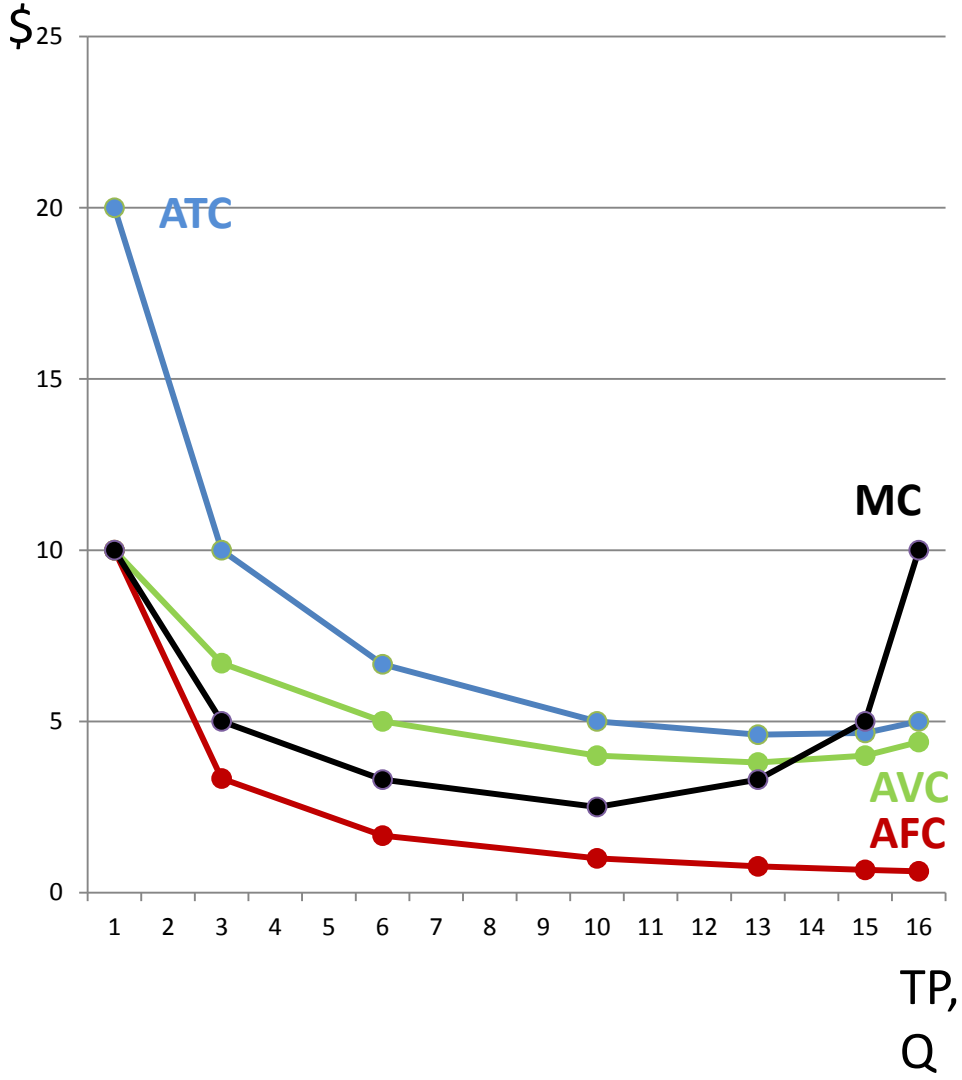
Average Cost and Marginal Cost

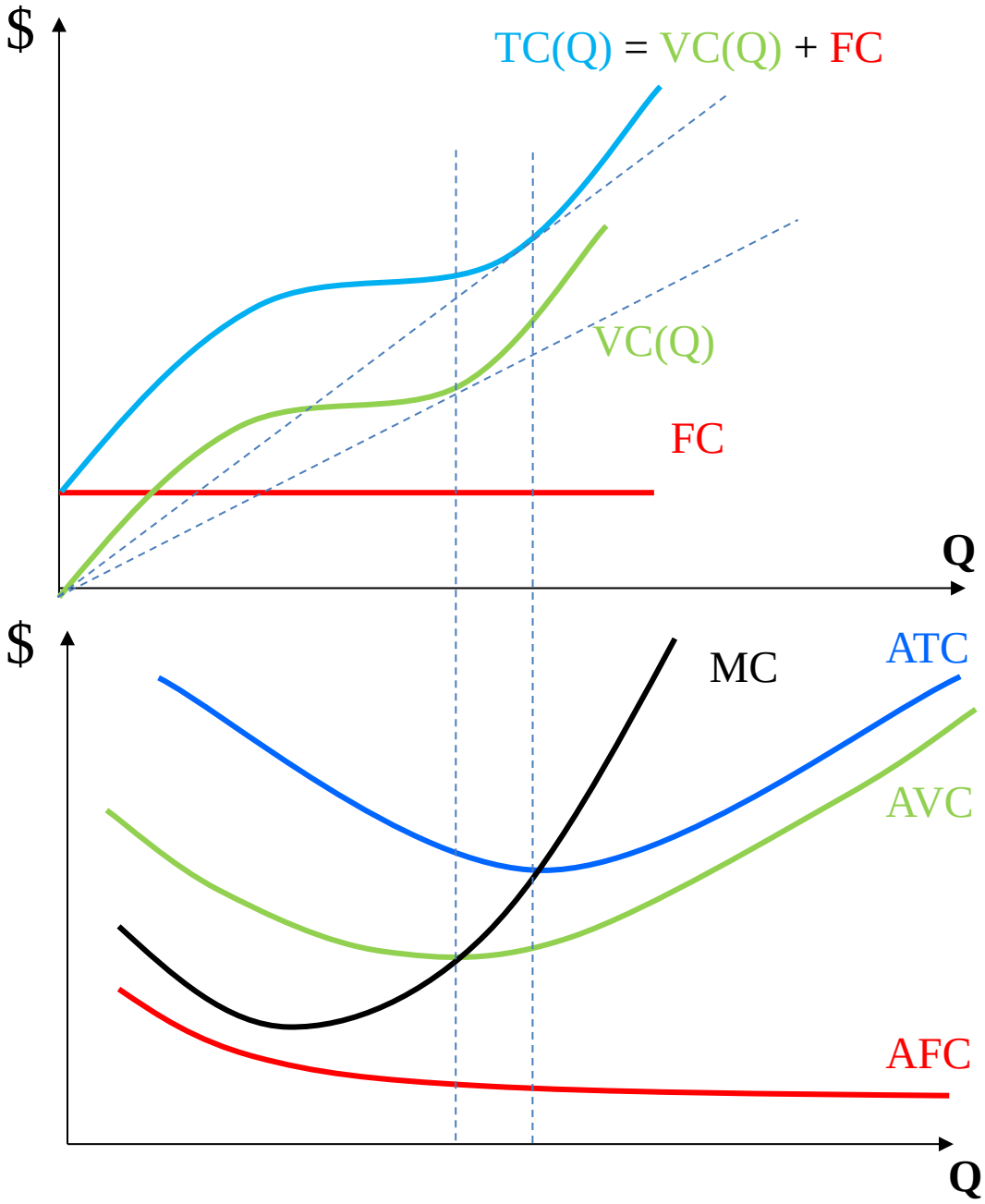
L	TP	FC	VC	TC	AFC	AVC	ATC	ΔVC	ΔTP	MC
1	1	10	10	20	10.0	10.0	20.0	10	1	10.0
2	3	10	20	30	3.3	6.7	10.0	10	2	5.0
3	6	10	30	40	1.7	5.0	6.7	10	3	3.3
4	10	10	40	50	1.0	4.0	5.0	10	4	2.5
5	13	10	50	60	0.8	3.8	4.6	10	3	3.3
6	15	10	60	70	0.7	4.0	4.7	10	2	5.0
7	16	10	70	80	0.6	4.4	5.0	10	1	10.0

- Average Fixed Cost (AFC) = FC/TP
- Average Variable Cost (AVC) = VC/TP
- Average Total Cost (ATC) = ATC/TP = AFC + AVC
- Marginal Cost (MC) = ΔVC/ΔTP

Graphical Representation

L	TP	AFC	AVC	ATC	MC
1	1	10	10	20	10
2	3	3.3	6.7	10.	5
3	6	1.7	5.0	6.7	3.3
4	10	1	4	5	2.5
5	13	0.8	3.8	4.6	3.3
6	15	0.7	4.0	4.7	5
7	16	0.6	4.4	5	10





- A more smooth and general graph
- Trends in different cost curves (U-shaped)

MC and ATC/AVC

- MC cross AVC at AVC's minimum point
- MC cross ATC at ATC's minimum point

Outline

0. Review: Production (Ch. 6)
1. **Economic Analysis of Costs (Ch. 7 A)**
   - 1.1 Total Cost: Fixed and Variable
   - 1.2 Average Cost
   - 1.3 Marginal Cost
   - **1.4 Link between Production and Cost**
2. Opportunity Cost (Ch. 7 C)

Link between Production and Cost

What do we need to generate the table below?

1. Production Function: TP = F(K,L)
   - K: Fixed (capital, such as machine and factory)
   - L: Variable (labor input)
2. Factor Price: wage for labor (w)

L	TP,Q	MP	VC	ΔVC	ΔTP	MC
1	1	1	10	10	1	10.0
2	3	2	20	10	2	5.0
3	6	3	30	10	3	3.3
4	10	4	40	10	4	2.5
5	13	3	50	10	3	3.3
6	15	2	60	10	2	5.0
7	16	1	70	10	1	10.0
8	16	0	80	10	0	

MC and MP

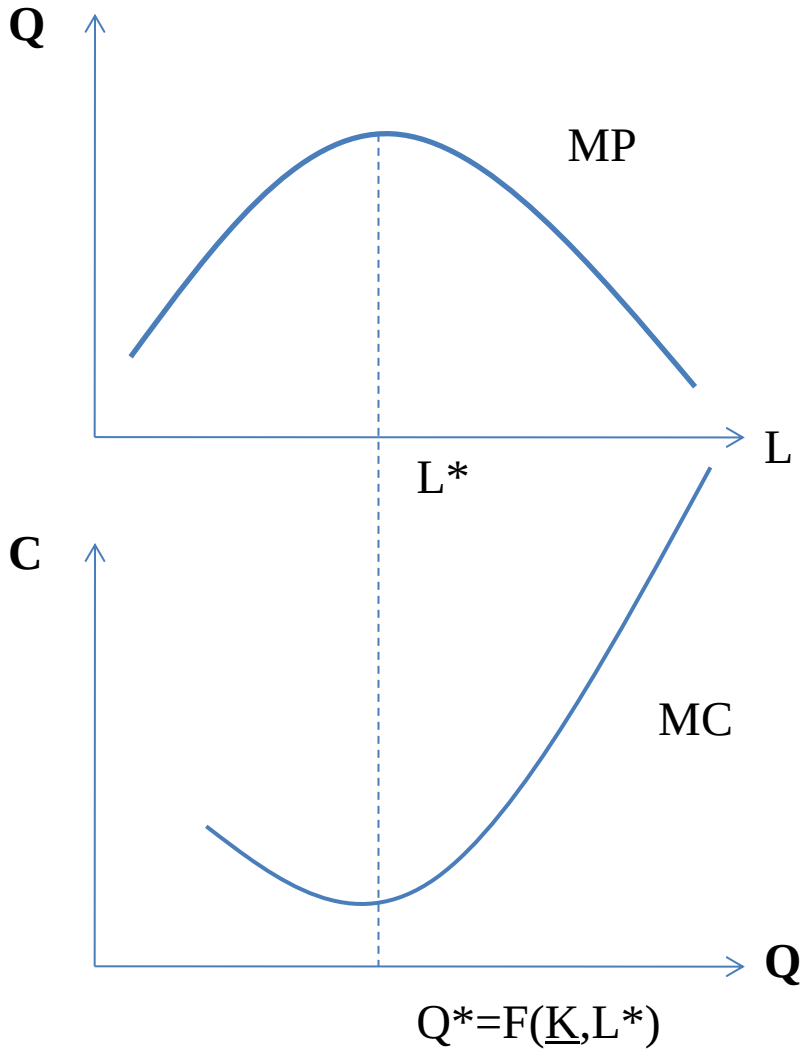
- By definition:

$$MP \cdot MC = \frac{\Delta Q}{\Delta L} \cdot \frac{\Delta C}{\Delta Q} = \frac{\Delta C}{\Delta L} = w$$

- MP's maximum point corresponds to MC's minimum point:
  - Q*: output level at MC's minimum
  - L*: labor input level at MP's maximum
  - Q*=F(K,L*)

- Diminishing returns to variable factor implies an increasing short-run marginal cost

- Short-run v.s. Long-run (p.133)



Short-run v.s. Long-run

- The ***short run*** is a period of time in which the quantity of at least one input is fixed and the quantities of the other inputs can be varied.

- The ***long run*** is a period of time in which the quantities of all inputs can be varied.

- The short run and long run distinction varies from one industry to another.

Outline

0. Review: Production (Ch. 6)
1. Economic Analysis of Costs (Ch. 7 A)
   - 1.1 Total Cost: Fixed and Variable
   - 1.2 Average Cost
   - 1.3 Marginal Cost
   - 1.4 Link between Production and Cost
2. **Opportunity Cost (Ch. 7 C)**

Always Consider Opportunity Cost

- Thinking about a choice as a tradeoff emphasizing cost as an opportunity forgone
- The highest-valued alternative that we give up to get something is the ***opportunity cost*** of the activity chosen.

Why Kobe Bryant, with a score of 1080 in SAT, choose to skip and go straight to the NBA?

Cost-benefit Analysis for Going to College

- Benefit：
  - Knowledge
  - Job opportunity
  - Boy/girl friend

- Cost：
  - Tuition fee
  - Textbook; Dormitory; Dining

- Does these expenses include all costs?

Cost Analysis for Going to College (1)

- The first problem with this answer is that it includes some things that are not really costs of going to college
- Even if you quit school, you would need a place to sleep and food to eat
- Indeed, the cost of room and board at your school might be less than the rent and food expenses that you would pay living on your own
- In this case, the savings on room and board are a benefit of going to college

Cost Analysis for Going to College (2)

- The second problem with this calculation of costs is that it ignores the largest cost of going to college—your time
- When you spend a year listening to lectures, reading textbooks, and writing papers, you cannot spend that time working at a job
- The *opportunity cost* of an item is what you give up to get that item
- For Kobe, the biggest cost of going to college is the earning he has to give up over the four years: 10M.

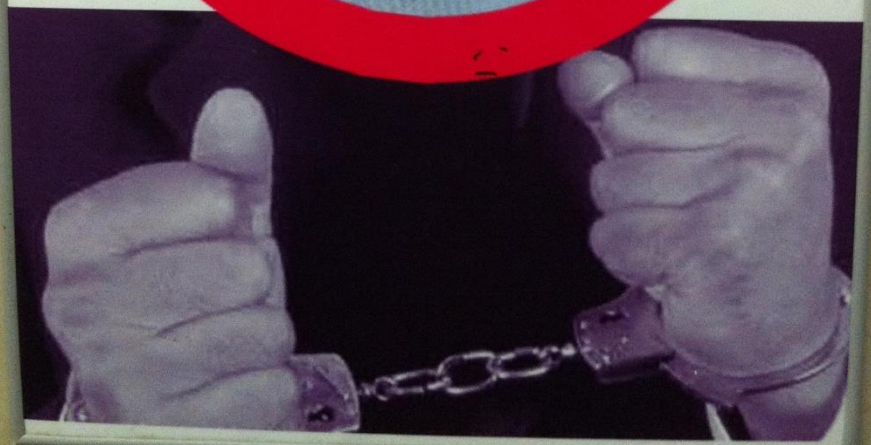
[ ]市公安局[ ]分局提醒您：

平安是福、健康为贵、和谐社会、依法治国

打架先算成本

打架直接成本＝5至15天拘留＋500元至1000元罚款＋至少1000元医药费＋追究刑事责任

打架附加成本＝心情郁闷＋误工误事＋名誉形象受损＋害人害己

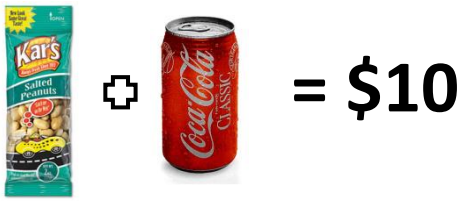


An Example: How to Charge Passengers who Fly Standby

- Suppose that flying a 200-seat plane across the country costs the airline $100,000. In this case, the average cost of each seat is $100,000/200, which is $500

- Imagine that a plane is about to take off with ten empty seats, and a standby passenger is waiting at the gate willing to pay $300 for a seat
- Should the airline sell it to him?

  - One might be tempted to conclude that the airline should never sell a ticket for less than $500
  - However, the plane has to flight due to the committed schedule with other passenger. The average costs spent on the empty seats are forgone anyway (***sunk cost***)
  - What is the cost of adding another passenger?



= $10

  - As long as the standby passenger pays more than the marginal cost, selling him a ticket is profitable

- For more information on "How to Fly Standby on Last-Minute Cheap Flights", refer to http://traveltips.usatoday.com/fly-standby-lastminute-cheap-flights-62367.html

Sunk Cost

- A ***sunk cost*** is a fixed cost that cannot be recovered. (Textbook p127)

- Example 1: You ordered too much food, but you eat it anyway despite being full.
- Example 2: Always want to buy something at the end of a long shopping days with nothing in your hand

- The timing of the decision is very important
  - Before you take the action, the cost is not "sunk" yet
  - You should be careful of the **potential** sunk cost **before** making a decision that might lead to it

Exercise

- A beer brewer and bottling company purchases a glass bottle maker machine for $20,000.

- As a part of the purchase agreement, the machine can be returned WITHIN 30 days for a refund of 50% of the purchase price.

- If the company returns the machine within the 30 day trial period, how much sunk costs does the company incur?

- If the company keeps the machine past the 30 day trial period, how much sunk costs does the company incur?