Lecture 20
Aligning Incentives II:
Pay for performance, principal-agent models, and moral hazard

MITSloan
MANAGEMENT

15.011/0111 Economic Analysis for Business Decisions
Oz Shy

The principal-agent problem
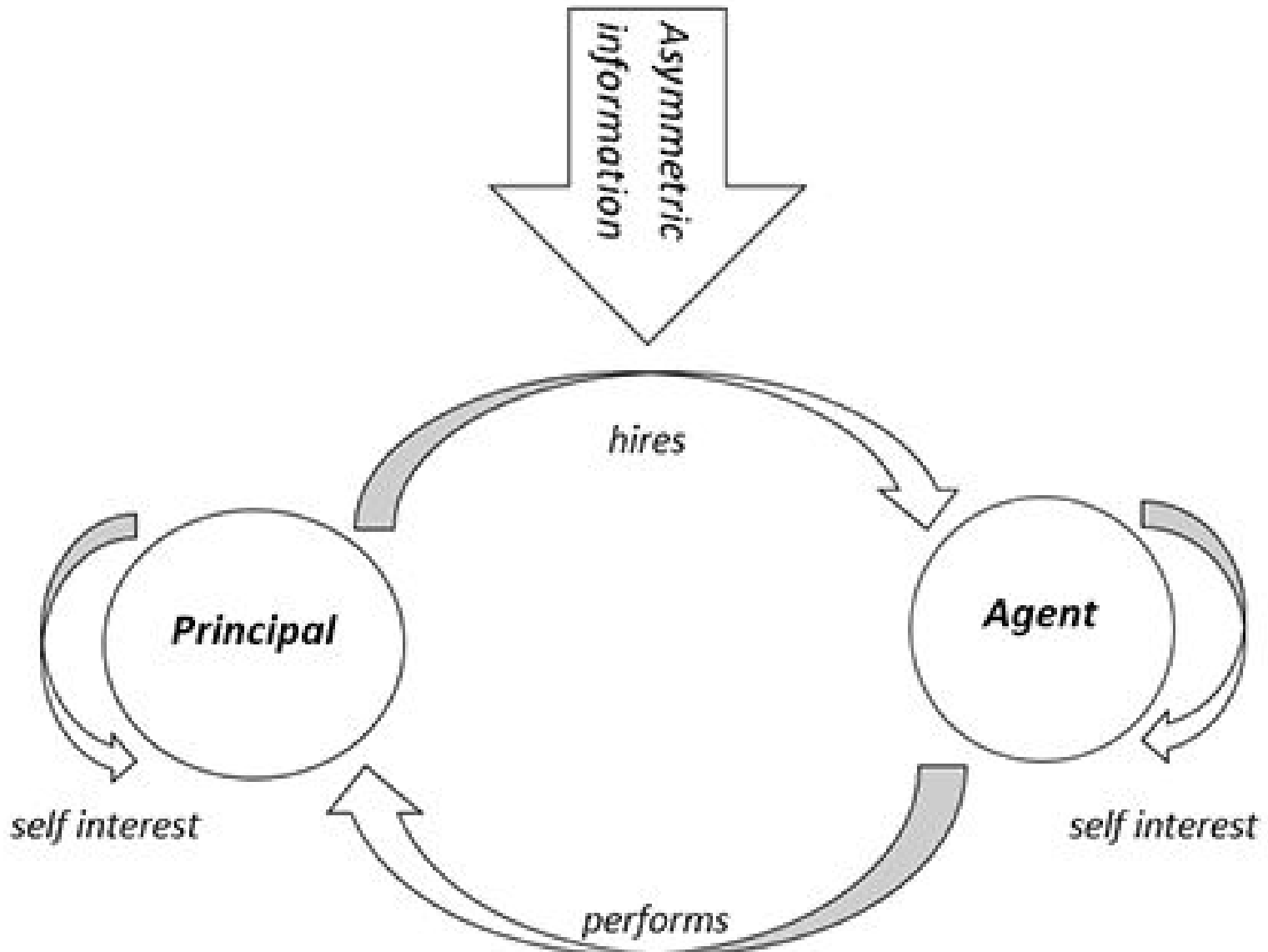
The principal-agent problem: Misaligned incentives between homeowners and realtors (agents)

1. Levitt & Syvverson (*Review of Economics & Statistics*, 2008)
    a. Provide evidence that agents sell their own houses at 4% higher prices than their clients' houses
    b. Leave their own houses on the market 10 days longer than their clients' houses (before accepting an offer)

2. Hendel et al. (*American Economic Review*, 2009) provide evidence that listing with a realtor does not necessarily generate higher sales price compared with selling-by-owner

3. Shy (*Journal Real Estate & Financial Economics*, 2012) demonstrates an inherent conflict of interest between sellers and realtors, showing that realtors will settle for a lower price than the seller's optimal price (to shorten the selling period)
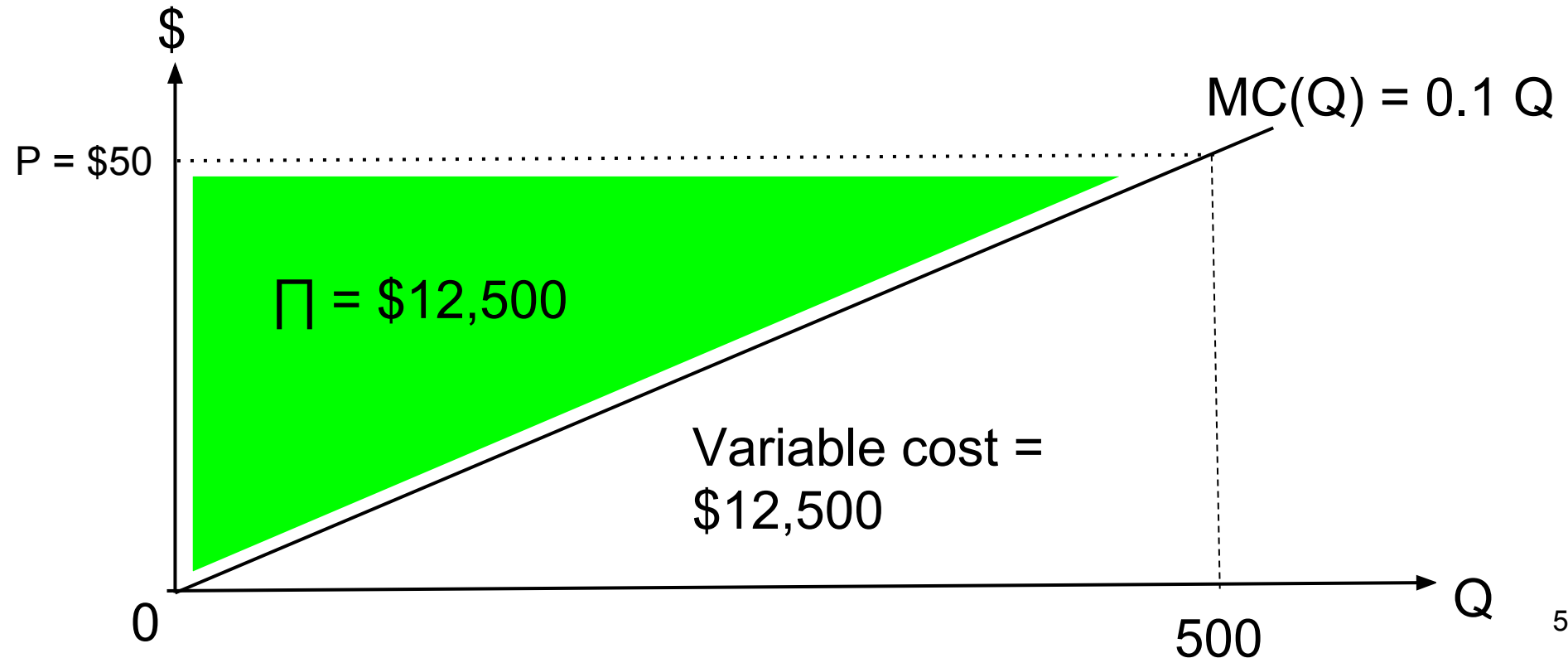
The principal-agent problem: Other examples of misaligned incentives

1. Johnson & Rehavi (NBER Working Paper No. 19242, 2013) When physicians (themselves) give birth, they are 10% less likely to get a C-section [patient (principal) vs. hospital (agent)]

2. Gayer and Shy (*Information Economics & Policy*, 2006) Conflict of interest between artists (principal) and their publishers (agent) regarding the enforcement of copyright protection (artists also benefit from publicity and popularity stemming from a network externality)

Artist   Publisher   Audience
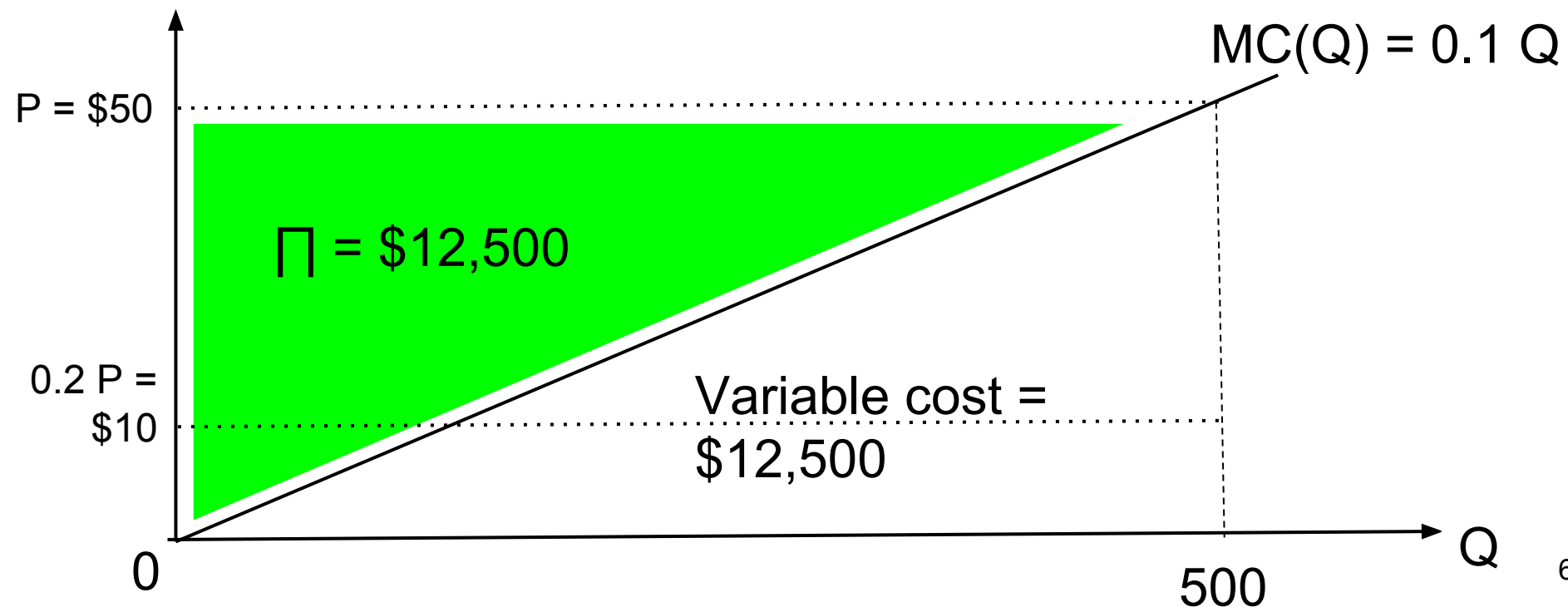
The principal-agent problem: A simple model: The setup

- You are the manager of a newspaper
- You sell ad space for P = $50 per ad
- On average, you sell Q = 500 ads during a year
- Your advertising revenue is $25,000 (profit = $12,500)

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MC(Q) = 0.1 Q

P = $50

∏ = $12,500

Variable cost = $12,500

0

500

Q

The principal-agent problem: A simple model: You received an offer from a sales agency to sell the ads for you

- Sales agency says to you: We are more efficient! Why?
- Because your ratio of cost/revenue is 50%. We offer you
- Pay us 20% of the price/ad (=20% of revenue) and we sell your ads. Would you accept the agency's offer?

MC(Q) = 0.1 Q

P = $50

Π = $12,500

0.2 P = $10

Variable cost = $12,500

0   500   Q

The principal-agent problem:
A simple model: Examining the sales agency incentives

- Assume that the sales agency has the same cost structure
- Agency sets $0.2\ P = \$10 = MC = 0.1\ Q \Rightarrow Q = 100 < 500$ ads!
- Profit $= \$50\ (1 - 0.2)\ 100 = \$4,000 < \$12,500$
- How to fix this contract? Set minimum Q for compensation!
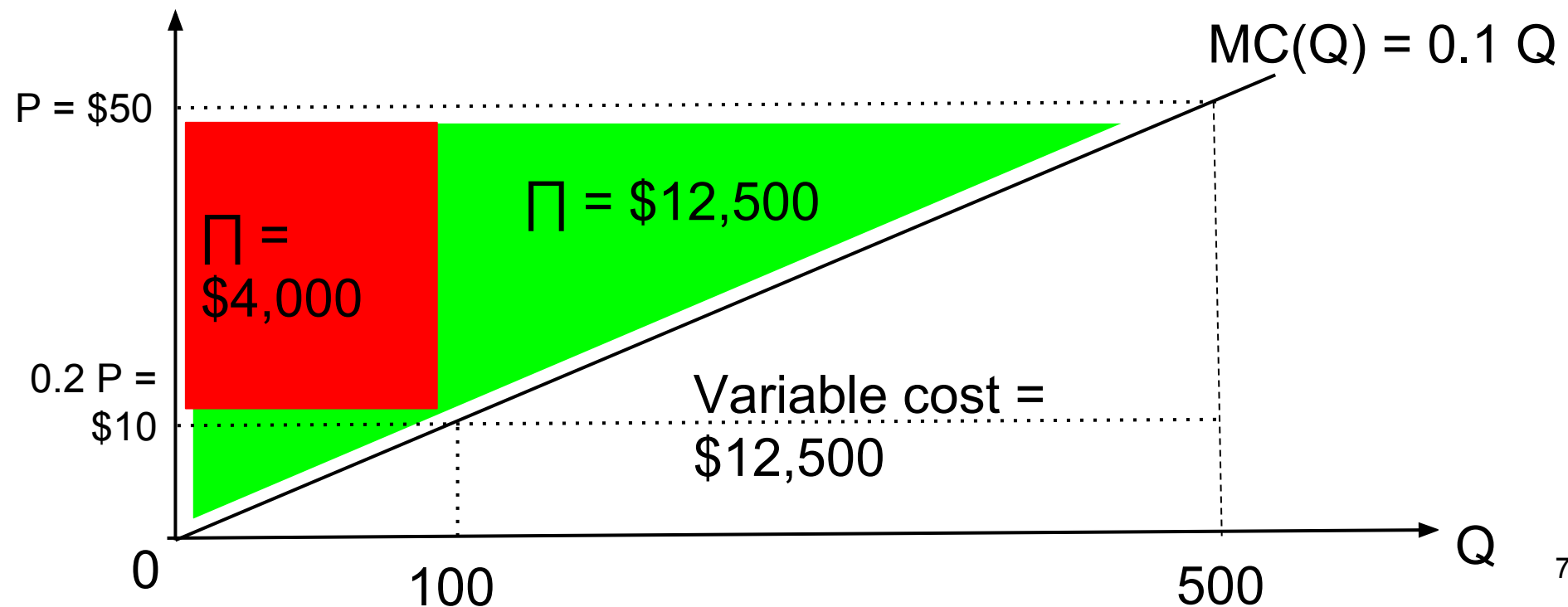
The principal-agent problem: Possible remedies (each has drawbacks!)

1. <u>Motivate</u> your workers.
   Explain why their role is important
   (some recommend that managers socialize after work which
   may be counterproductive because workers may want to go home)

2. <u>Monitoring</u> (input-based)
   a. Carrot and stick via bonuses and promotions
   b. Effective in repeated relationship
   c. Legal problems (can you install cameras
      to spy on your workers?)

3. <u>Incentive</u> schemes (output-based):
   a. Pay commission on sales
   b. Pay per performance (watch <u>Lincoln Electric</u> video)

When pay-per-performance is likely to succeed or fail

- Likely to succeed for mechanical, rule-based tasks that are easy to measure and quantify
- Likely to fail if tasks are complex, require creativity, and cooperation with other team members

Some compensation methods that may fail

1. IBM used to pay programmers by the number of lines, resulting in very long codes with unnecessarily-complicated procedures

2. Teacher's salaries were tied to state test scores (lead some teachers to focus all their teachings on test preparations and, in rare cases, to leak the results to their students)

Moral hazard

- One party to a transaction takes actions that partners cannot directly observe, but the actions affect the payoff of all parties
- Often a consequence of asymmetric information among parties

Examples of distortions caused by moral hazard

1. Comprehensive car insurance reduces incentives to park the car in safe places or to activate an alarm (to prevent theft)

2. Banks take risks with depositors' money knowing that they are always bailed out with taxpayer money (Savings & Loans crisis in the 1980s cost $124b, the 2008 crisis cost > $700b)

3. Health insurance with no copay (increases the number of doctor visits)

Moral hazard caused by health insurance

Estimated occurrence ratios for episodes in outpatient categories.

Type of episode	Pay period				Rest of year			
	Coinsurance			Ind. ded.	Coinsurance			Ind. ded.
	25%	50%	95%		25%	50%	95%	
Acute	0.76 (0.02)	0.61 (0.02)	0.55 (0.01)	0.62 (0.01)	0.84 (0.04)	0.78 (0.06)	0.84 (0.03)	0.85 (0.02)
Chronic	0.71 (0.02)	0.61 (0.04)	0.57 (0.02)	0.64 (0.02)	0.90 (0.06)	0.86 (0.13)	0.88 (0.04)	0.96 (0.04)
Well	0.80 (0.02)	0.75 (0.03)	0.51 (0.02)	0.56 (0.02)	0.92 (0.05)	1.08 (0.10)	0.98 (0.04)	0.98 (0.04)
Dental[a]	0.80 (0.03)	0.70 (0.02)	0.54 (0.02)	0.58 (0.01)	0.91 (0.08)	0.77 (0.05)	0.96 (0.04)	0.89 (0.03)

The ratios approximate expenditure relative to the 100% free plan.
Source: Keeler and Rolph, *Journal of health economics*, 1988

Moral hazard and dishwashing

- Spouse A and B share all their housework (nice couple!)
- A and B signed a contract: A will cook, and B will wash the dishes after dinner
- Is this an optimal contract? If not, how would you modify it?