

International Business and Finance

Week 3 Seminar 1

Dr. Cholwoo Kim

Exercise

- ▶ Firms A and B are simultaneously planning an advertising campaign for the launch of a new product that will have similar characteristics when produced by either firm. **Firm A** is an **established company**, and is well known to consumers.
- ▶ **Firm B** is a relatively unknown **recent entrant**. Both firms have to decide whether to focus their advertising campaigns primarily on **traditional media** (TV and print), or on **social media**.
- ▶ If both firms decide to advertise using the same media, A's reputational advantage will tend to dominate the campaign, and B will struggle to establish a foothold in the market.
- ▶ If both firms decide to advertise using different media, B's campaign will succeed in enabling B to establish a foothold. The payoff matrix, expressed in terms of expected market share after the campaign, is as follows:

		B's campaign focused on:	
		<i>Traditional media</i>	<i>Social media</i>
A's campaign focused on:	Traditional media	90, 10	60, 40
	Social media	50, 50	80, 20

Exercise

		B's campaign focused on:	
		<i>Traditional media</i>	<i>Social media</i>
A's campaign focused on:	Traditional media	90, 10	60, 40
	Social media	50, 50	80, 20

- 1) Does this game have any Pure Strategy Nash Equilibria?
- 2) Identify the Mixed Strategy Nash Equilibrium in the simultaneous game.
- 3) Suppose B can observe A's decision before B decides how to focus its own campaign. Write down the extensive form representation of the sequential game.
- 4) What is the likely outcome of the sequential game? Is there a first-mover advantage or a second-mover advantage?

Exercise

		B's campaign focused on:	
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1) Does this game have any Pure Strategy Nash Equilibria?

- ▶ To determine pure strategy Nash equilibria, analyze the payoff matrix:
- ▶ Best responses:
 - ▶ Firm B: Traditional if A: Social; Social if A: Traditional
 - ▶ Firm A: Traditional if B: Traditional; Social if B: Social
- ▶ No pure strategy Nash equilibria.

Exercise

		B's campaign focused on:	
		<i>Traditional media</i>	<i>Social media</i>
A's campaign focused on:	Traditional media	90, 10	60, 40
	Social media	50, 50	80, 20

2) Identify the Mixed Strategy Nash Equilibrium in the simultaneous game.

- ▶ Let Firm A chooses T with probability p , S with probability $1 - p$.
Firm B chooses T with probability q , S with probability $1 - q$.

- ▶ Firm A's Expected Payoffs

- ▶ If Firm A chooses Traditional Media:

$$E_A(T) = 90q + 60(1 - q) = 60 + 30q$$

- ▶ If Firm A chooses Social Media:

$$E_A(S) = 50q + 80(1 - q) = 80 - 30q$$

- ▶ For indifference:

$$60 + 30q = 80 - 30q \rightarrow q = \frac{1}{3}$$

Exercise

		B's campaign focused on:	
		<i>Traditional media</i>	<i>Social media</i>
A's campaign focused on:	Traditional media	90, 10	60, 40
	Social media	50, 50	80, 20

2) Identify the Mixed Strategy Nash Equilibrium in the simultaneous game.

▶ Firm B's Expected Payoffs

▶ If Firm B chooses Traditional Media:

$$E_B(T) = 10p + 50(1 - p) = 50 - 40p$$

▶ If Firm B chooses Social Media:

$$E_B(S) = 40p + 20(1 - p) = 20 + 20p$$

▶ For indifference:

$$50 - 40p = 20 + 20p \rightarrow p = \frac{1}{2}$$

Exercise

Firm A's Expected Payoff

- ▶ Using the mixed strategy probabilities:
 - ▶ $p = 1/2$ for Traditional Media
 - ▶ $1 - p = 1/2$ for Social Media
- ▶ Firm A's expected payoff when Firm B uses $q = 1/3$ for Traditional Media and $1 - q = 2/3$ for Social Media:

$$E_A = p[10p + 50(1 - p)] + (1 - p)[50q + 80(1 - q)]$$

- ▶ Substituting the values:

$$E_A = \frac{1}{2} \left[90 \cdot \frac{1}{3} + 60 \cdot \frac{2}{3} \right] + \frac{1}{2} \left[50 \cdot \frac{1}{3} + 80 \cdot \frac{2}{3} \right]$$

- ▶ Thus, we have

$$E_A = 70$$

Exercise

Firm B's Expected Payoff

- ▶ Using the mixed strategy probabilities:
 - ▶ $q = 1/3$ for Traditional Media
 - ▶ $1 - q = 2/3$ for Social Media
- ▶ Firm B's expected payoff when Firm A uses $p = 1/2$ for Traditional Media and $1 - p = 1/2$ for Social Media:

$$E_B = q[10p + 50(1 - p)] + (1 - q)[40p + 20(1 - p)]$$

- ▶ Substituting the values:

$$E_B = \frac{1}{3} \left[10 \cdot \frac{1}{2} + 50 \cdot \frac{1}{2} \right] + \frac{2}{3} \left[40 \cdot \frac{1}{2} + 20 \cdot \frac{1}{2} \right]$$

- ▶ Thus, we have

$$E_B = 30$$

Exercise

Summary

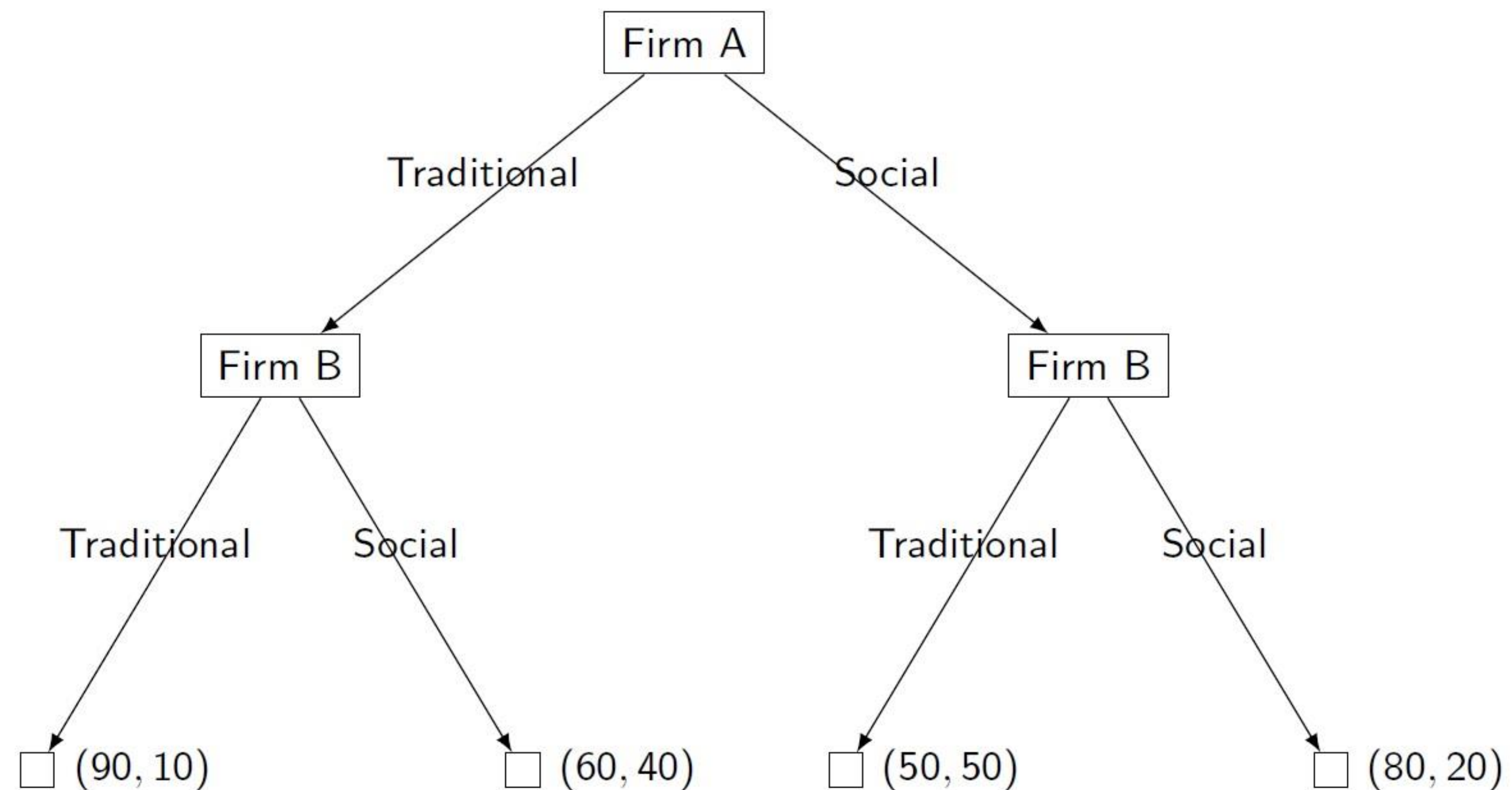
- ▶ The mixed strategy Nash equilibrium is:
 - ▶ Firm A chooses the Traditional Media with probability $\frac{1}{2}$, the Social Media with probability $\frac{1}{2}$.
 - ▶ Firm B chooses the Traditional Media with probability $\frac{1}{3}$, the Social Media with probability $\frac{2}{3}$.
- ▶ The Mixed Strategy Nash Equilibrium expected payoffs are $(E_A; E_B) = (70; 30)$.

Exercise

		B's campaign focused on:	
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A's campaign focused on:	Traditional media	90, 10	60, 40
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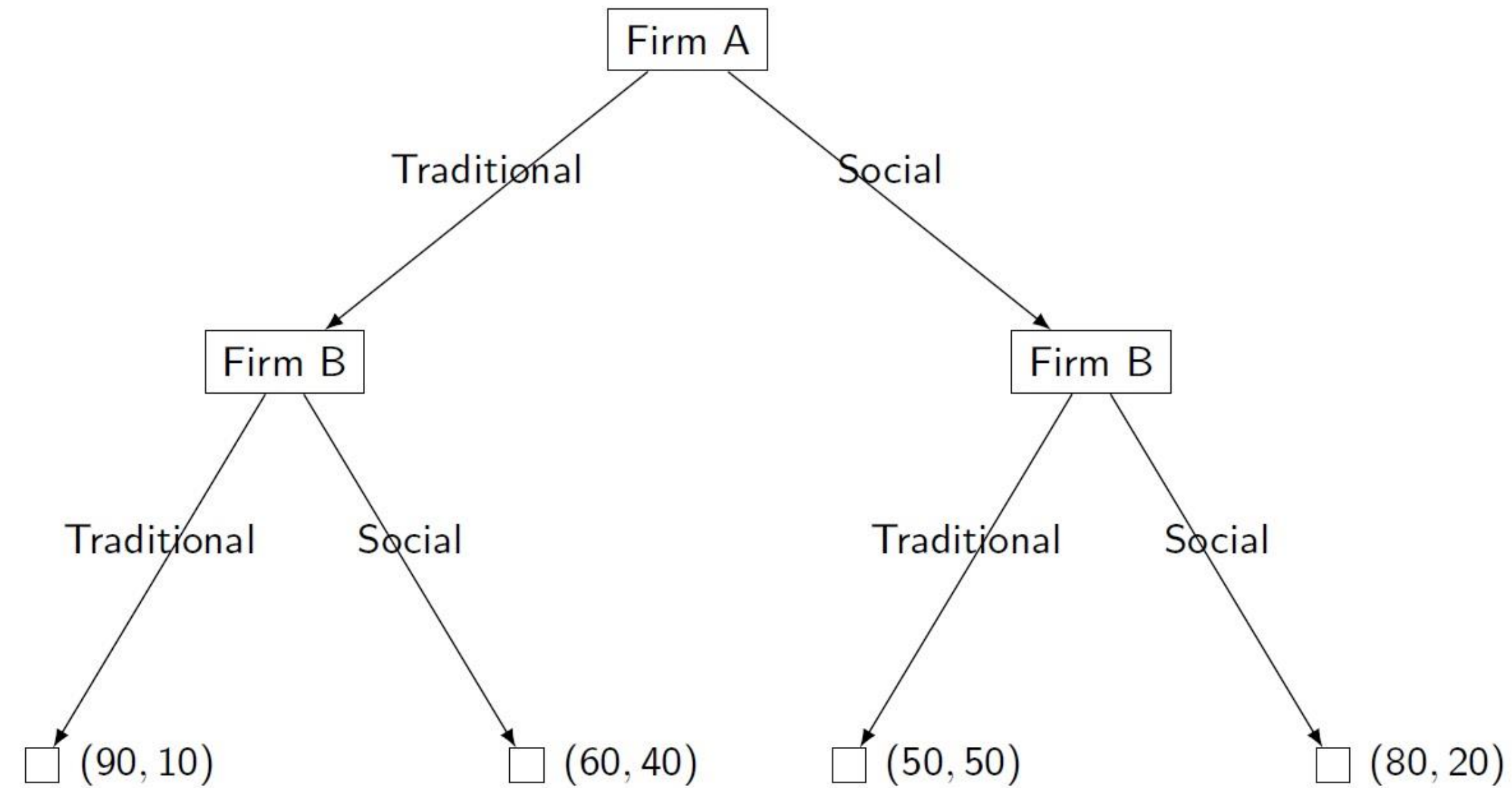
3) Suppose B can observe A's decision before B decides how to focus its own campaign. Write down the extensive form representation of the sequential game.

If Firm B observes Firm A's decision, the game tree is:



Exercise

If Firm B observes Firm A's decision, the game tree is:



4) What is the likely outcome of the sequential game? Is there a first-mover advantage or a second-mover advantage?

- ▶ Backward induction:
 - ▶ If Firm A chooses Traditional Media, Firm B chooses Social Media ($40 > 10$).
 - ▶ If Firm A chooses Social Media, Firm B chooses Traditional Media ($50 > 20$).
- ▶ Firm A's best response is Traditional Media, leading to (60, 40).
- ▶ First-mover advantage lies with Firm A.

Questions

Q1. Two rival cosmetics brands are considering launching a new product. If Firm 1 launches a product for older women while Firm 2 targets college students, Firm 1 will earn \$40,000, while Firm 2 will earn \$50,000. If both the firms launch a product for older women, Firm 1 will earn \$20,000, while Firm 2 will earn \$15,000. If Firm 1 launches a product for college students while Firm 2 targets older women, Firm 1 will earn \$60,000, while Firm 2 will earn \$40,000. If both firms target college students, both firms will earn \$30,000. However, Firm 2 will choose its target consumers after Firm 1 has chosen its target consumers.

- Draw a game tree to represent this situation.
- What is the equilibrium outcome of this game?
- Will there be a change in the equilibrium outcome if the firms make decisions simultaneously?

Q2. Player 1 is a potential entrant to an industry that has a monopolistic incumbent, player 2. If player 1 stays out (O) then the incumbent earns a profit of 2, while the potential entrant gets 0. The entrant's other option is to enter (E), which gives the incumbent a chance to respond. If the incumbent chooses to accommodate entry (A), then both the entrant and the incumbent receive a payoff of 1. The incumbent's other option is to fight entry (F), in which case the payoff for each player is -1.

- Draw a game tree to represent this situation.
- What is the equilibrium outcome of this game?
- Suppose the incumbent (Player 2) makes a threat to fight (F) if Player 1 enters, before Player 1 chooses whether to enter or stay out. Is this threat credible?

Q3. Mitchell Electronics makes a popular home video game system. The company believes that Wright Televideo Company might enter the market with a competing product. Mitchell must decide whether to set a high price, which would allow Wright to enter the market, or a low price to try to keep Wright out. The table below shows the possible profits (in millions of dollars) for each company based on their decisions. Mitchell's profit is listed first, followed by Wright's.

		Wright Televideo	
		Enter	Don't Enter
Mitchell Electronics	High Price	60, 25	85, 0
	Low Price	30, -20	60, 0

- Does Mitchell have a dominant strategy?
- Does Wright have a dominant strategy?
- Mitchell's managers have vaguely suggested a willingness to lower price in order to deter entry. Is this threat credible in light of the payoff matrix above?
- If the threat is not credible, what changes in the payoff matrix would be necessary to make the threat credible? What business strategies could Mitchell use to alter the payoff matrix so that the threat is credible?

Questions

1. Two rival cosmetics brands are considering launching a new product. If Firm 1 launches a product for older women while Firm 2 targets college students, Firm 1 will earn \$40,000, while Firm 2 will earn \$50,000. If both the firms launch a product for older women, Firm 1 will earn \$20,000, while Firm 2 will earn \$15,000. If Firm 1 launches a product for college students while Firm 2 targets older women, Firm 1 will earn \$60,000, while Firm 2 will earn \$40,000. If both firms target college students, both firms will earn \$30,000.

However, Firm 2 will choose its target consumers after Firm 1 has chosen its target consumers.

a) Draw a game tree to represent this situation.

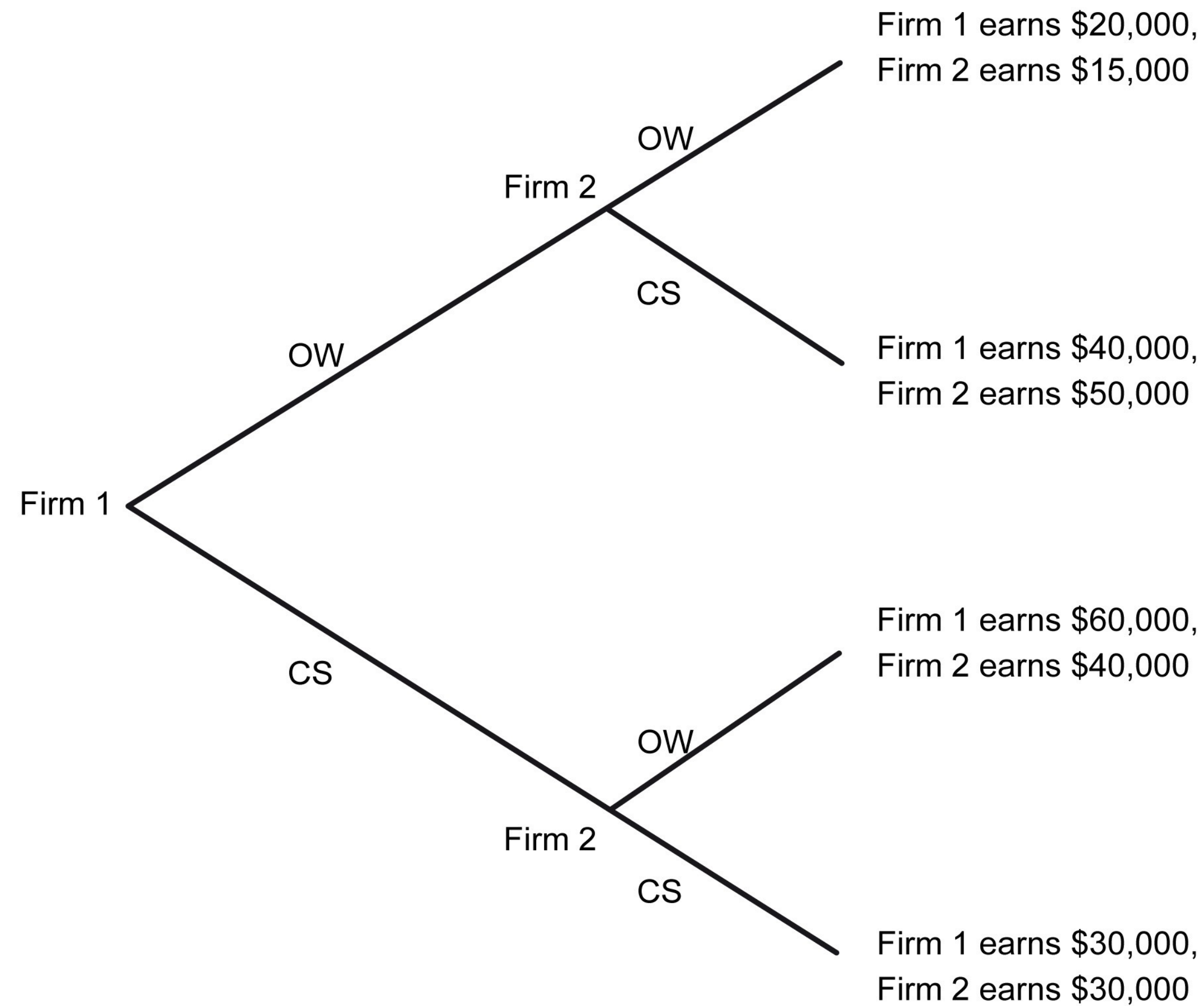
b) What is the equilibrium outcome of this game?

c) Will there be a change in the equilibrium outcome if the firms make decisions simultaneously?

Questions

a) Draw a game tree to represent this situation.

- ▶ The game tree for this game is shown below (OW denotes older women, while CS denotes college students).



Questions

b) What is the equilibrium outcome of this game?

- ▶ Backward induction:
 - ▶ If Firm 1 targets older women, Firm 2 will target college students, because by doing so it will earn \$50,000, while it will earn only \$15,000 if it targets older women.
 - ▶ If Firm 1 targets college students, Firm 2 will target older women, because it will then earn \$40,000, while it will earn only \$30,000 if it targets college students.
- ▶ Given this information, Firm 1's best response is launching a product for college students, leading to (\$60,000, \$40,000).

Questions

c) Will there be a change in the equilibrium outcome if the firms make decisions simultaneously?

► Payoff table is:

		Firm 2	
		Older women (OW)	College students (CS)
Firm 1	Older women (OW)	(\$20,000, \$15,000)	(\$40,000, \$50,000)
	College students (CS)	(\$60,000, \$40,000)	(\$30,000, \$30,000)

- The has two Pure Strategy Nash Equilibria: (OW, CS) and (CS, OW)
- (OW, CS) is a Nash Equilibrium:
 - If Firm 2 selects CS, Firm 1's payoff would drop from \$40,000 to \$20,000 if Firm 1 switches to CS
 - If Firm 1 selects OW, Firm 2's payoff would drop from \$50,000 to \$15,000 if Firm 2 switches to OW.
- There is no incentive to deviate from the NE. (Neither firm can improve its payoff, assuming the current strategy of the other firm is fixed.)
- Likewise (CS, OW) is another Nash Equilibrium.

Questions

2. Player 1 is a potential entrant to an industry that has a monopolistic incumbent, player 2. If player 1 stays out (O) then the incumbent earns a profit of 2, while the potential entrant gets 0. The entrant's other option is to enter (E), which gives the incumbent a chance to respond. If the incumbent chooses to accommodate entry (A), then both the entrant and the incumbent receive a payoff of 1. The incumbent's other option is to fight entry (F), in which case the payoff for each player is -1 .

a) Draw a game tree to represent this situation.

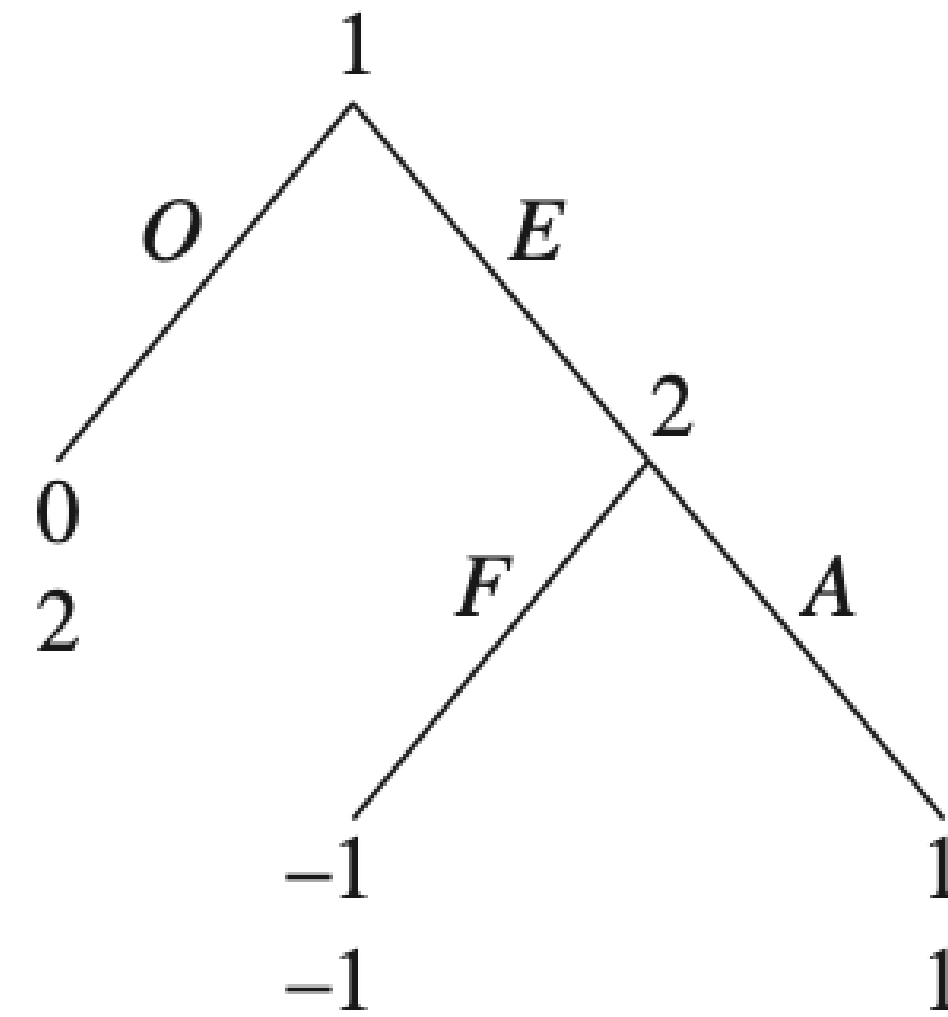
b) What is the equilibrium outcome of this game?

c) Suppose the incumbent (Player 2) makes a threat to fight (F) if Player 1 enters, before Player 1 chooses whether to enter or stay out. Is this threat credible?

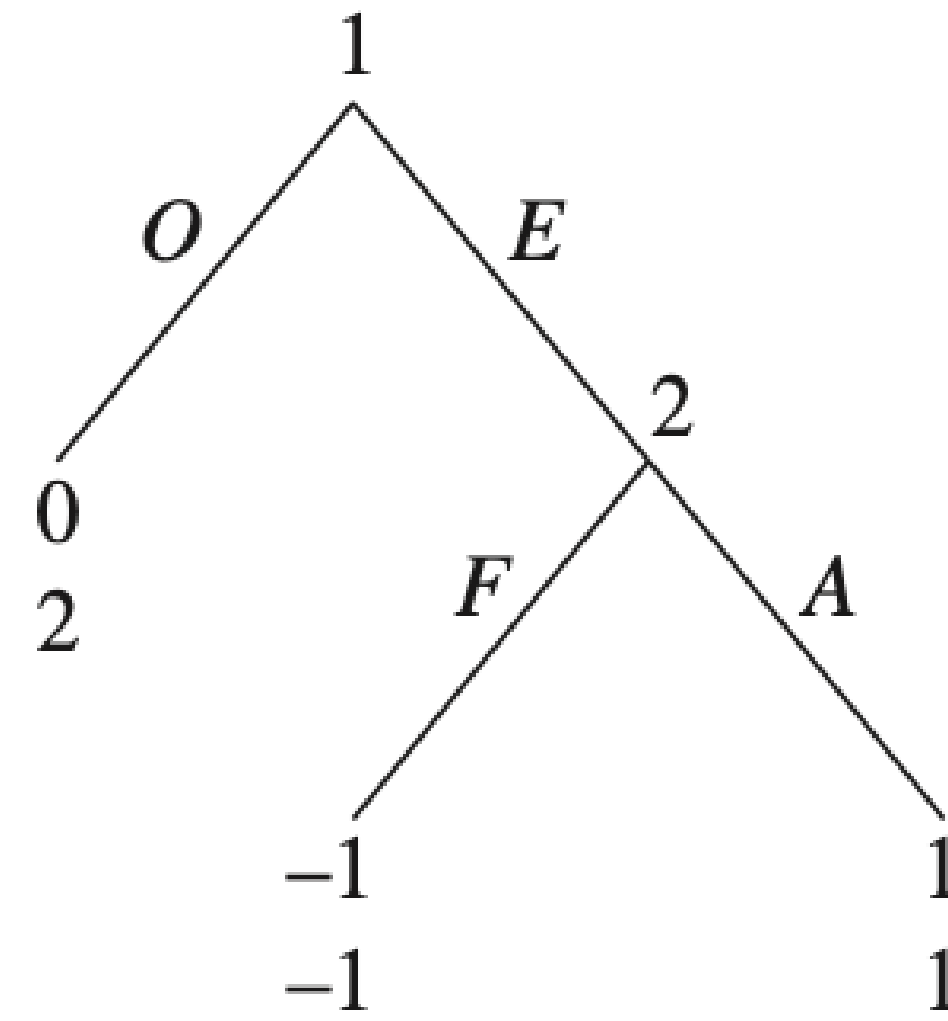
Questions

a) What is the equilibrium outcome of this game?

► The game tree for this game is shown below:



Exercise



b) What is the equilibrium outcome of this game?

- ▶ According to the backward induction, we find (E, A) is the equilibrium.

Questions

c) Suppose the incumbent (Player 2) makes a threat to fight (F) if Player 1 enters, before Player 1 chooses whether to enter or stay out. Is this threat credible?

Let's test if the threat is credible:

- ▶ If Player 1 **does** enter, what is Player 2's **best response**?
 - ▶ Accommodating yields **1**
 - ▶ Fighting yields **-1**
- ▶ So, Player 2 would **never actually fight**, because it's worse off doing so.

- ▶ In game theory terms, it is a **non-credible threat**, because in the **subgame** where Player 1 enters, the rational choice for Player 2 is to accommodate, not fight.

Questions

3. **Mitchell Electronics** makes a popular home video game system. The company believes that **Wright Televideo Company** might enter the market with a competing product. Mitchell must decide whether to set a **high price**, which would allow Wright to enter the market, or a **low price** to try to keep Wright out.

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Questions

		Wright Televideo	
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a) Does Mitchell have a dominant strategy?

- ▶ **Mitchell's** dominant strategy is the **high price**. Regardless of Wright's decision to enter, Mitchell earns a larger profit with a high price.

b) Does Wright have a dominant strategy?

- ▶ **Wright** does not have a dominant strategy. Wright's best choice depends upon the decision made by Mitchell. When Mitchell sets a high price, Wright should enter, whereas a low Mitchell price leads to no entry.

c) Mitchell's managers have vaguely suggested a willingness to lower price in order to deter entry. Is this threat credible in light of the payoff matrix above?

- ▶ **Mitchell's threat is not credible**. It is obvious that Mitchell's best strategy is to set a high price, regardless of the decision Wright makes regarding entry.

d) If the threat is not credible, what changes in the payoff matrix would be necessary to make the threat credible? What business strategies could Mitchell use to alter the payoff matrix so that the threat is credible?

- ▶ To make the threat credible, Mitchell's best strategy must be the low price, at least for the case where Wright enters. A possible business strategy would be for Mitchell to **expand capacity**. By expanding production capacity or investing in aggressive pricing infrastructure, Mitchell lowers the cost of setting low prices, which makes low pricing more profitable.