Last Time

- Prisoners Dilemma
- Best response and strict best response
- Dominant strategy and strictly dominant strategy
- A New Product (partly)

A New Product

- Two firms are planning to produce a new product.
- Choice between an up-scale (US) and low-priced (LP) version of the product.
- 60% of population prefers the low-priced version and 40% prefers the upscale version.
- Firm 1 is more popular, so it gets 80% of sales when competing for same market segment as Firm 2, and Firm 2 gets 20%.

		Firm 2	
		LP	**US**
Firm 1	**LP**	.6*.8, .6*.2	.6, .4
	US	.4, .6	.4*.8, .4*.2

A New Product

- Two firms are planning to produce a new product.
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		Firm 2	
		LP	**US**
Firm 1	**LP**	.48, .12	.6, .4
	US	.4, .6	.32, .08

A New Product

Does Firm 1 have a strictly dominant strategy?

		Firm 2	
		LP	**US**
Firm 1	**LP**	.48, .12	.6, .4
	US	.4, .6	.32, .08

A New Product

Does Firm 1 have a strictly dominant strategy?

Find the best response of Firm 1 to every strategy of Firm 2.

		Firm 2	
		LP	**US**
Firm 1	**LP**	.48, .12	.6, .4
	US	.4, .6	.32, .08

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Best response of Firm 1 if Firm 2 chooses LP?

A New Product

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Firm 1	**LP**	.48, .12	.6, .4
	US	.4, .6	.32, .08

Best response of Firm 1 if Firm 2 chooses LP?

$P_1(LP, LP) = .48$, $P_1(US, LP) = .4$, So <u>LP is the strict best response</u>

A New Product

Does Firm 1 have a strictly dominant strategy?

Find the best response of Firm 1 to every strategy of Firm 2.

		Firm 2	
		LP	**US**
Firm 1	**LP**	.48, .12	.6, .4
	US	.4, .6	.32, .08

Best response of Firm 1 if Firm 2 chooses LP?

$P_1(LP, LP) = .48$, $P_1(US, LP) = .4$, So LP is the strict best response

Best response of Firm 1 if Firm 2 chooses US?

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Find the best response of Firm 1 to every strategy of Firm 2.

		Firm 2	
		LP	**US**
Firm 1	**LP**	.48, .12	.6, .4
	US	.4, .6	.32, .08

Best response of Firm 1 if Firm 2 chooses LP?

P_1(LP, LP) = .48, P_1(US, LP) = .4, So LP is the strict best response

Best response of Firm 1 if Firm 2 chooses US?

P_1(LP, US) = .6, P_1(US, US) = .32, So LP is the strict best response

A New Product

Does Firm 1 have a strictly dominant strategy?

Find the best response of Firm 1 to every strategy of Firm 2.

		Firm 2	
		LP	**US**
Firm 1	**LP**	.48, .12	.6, .4
	US	.4, .6	.32, .08

Best response of Firm 1 if Firm 2 chooses LP?
P_1(LP, LP) = .48, P_1(US, LP) = .4, So LP is the strict best response

Best response of Firm 1 if Firm 2 chooses US?
P_1(LP, US) = .6, P_1(US, US) = .32, So LP is the strict best response

LP is the strictly dominant strategy of Firm 1.

A New Product

Does Firm 2 have a strictly dominant strategy?

		Firm 2	
		LP	**US**
Firm 1	**LP**	.48, .12	.6, .4
	US	.4, .6	.32, .08

A New Product

Does Firm 2 have a strictly dominant strategy?

Find the best response of Firm 2 to every strategy of Firm 1.

		Firm 2	
		LP	**US**
Firm 1	**LP**	.48, .12	.6, .4
	US	.4, .6	.32, .08

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Does Firm 2 have a strictly dominant strategy?

Find the best response of Firm 2 to every strategy of Firm 1.

		Firm 2	
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Best response of Firm 2 if Firm 1 chooses LP?

A New Product

Does Firm 2 have a strictly dominant strategy?

Find the best response of Firm 2 to every strategy of Firm 1.

		Firm 2	
		LP	**US**
Firm 1	**LP**	.48, .12	.6, .4
	US	.4, .6	.32, .08

Best response of Firm 2 if Firm 1 chooses LP?

$P_2(LP, LP) = .12$, $P_2(LP, US) = .4$, So <u>US is the strict best response</u>

A New Product

Does Firm 2 have a strictly dominant strategy?

Find the best response of Firm 2 to every strategy of Firm 1.

		Firm 2	
		LP	**US**
Firm 1	**LP**	.48, .12	.6, .4
	US	.4, .6	.32, .08

Best response of Firm 2 if Firm 1 chooses LP?

P_2(LP, LP) = .12, P_2(LP, US) = .4, So <u>US is the strict best response</u>

Best response of Firm 2 if Firm 1 chooses US?

A New Product

Does Firm 2 have a strictly dominant strategy?

Find the best response of Firm 2 to every strategy of Firm 1.

		Firm 2	
		LP	**US**
Firm 1	**LP**	.48, .12	.6, .4
	US	.4, .6	.32, .08

Best response of Firm 2 if Firm 1 chooses LP?

P_2(LP, LP) = .12, P_2(LP, US) = .4, So US is the strict best response

Best response of Firm 2 if Firm 1 chooses US?

P_2(US, LP) = .6, P_2(US, US) = .08, So LP is the strict best response

A New Product

Does Firm 2 have a strictly dominant strategy?

Find the best response of Firm 2 to every strategy of Firm 1.

		Firm 2	
		LP	**US**
Firm 1	**LP**	.48, .12	.6, .4
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Best response of Firm 2 if Firm 1 chooses LP?
P_2(LP, LP) = .12, P_2(LP, US) = .4, So <u>US is the strict best response</u>

Best response of Firm 2 if Firm 1 chooses US?
P_2(US, LP) = .6, P_2(US, US) = .08, So <u>LP is the strict best response</u>

Firm 2 has no dominant strategy. The best strategy changes depending on Firm 1's choice.

A New Product

How would you expect the firms to play?

		Firm 2	
		LP	**US**
Firm 1	**LP**	.48, .12	.6, .4
	US	.4, .6	.32, .08

A New Product

How would you expect the firms to play?

Firm 1 has a strictly dominant strategy: no matter what Firm 2 does, Firm 1 does better with LP.

		Firm 2	
		LP	**US**
Firm 1	**LP**	.48, .12	.6, .4
	US	.4, .6	.32, .08

A New Product

How would you expect the firms to play?

Firm 1 has a strictly dominant strategy: no matter what Firm 2 does, Firm 1 does better with LP.

We predict Firm 1 will choose LP.

		Firm 2	
		LP	**US**
Firm 1	**LP**	.48, .12	.6, .4
	US	.4, .6	.32, .08

A New Product

How would you expect the firms to play?

Firm 1 has a strictly dominant strategy: no matter what Firm 2 does, Firm 1 does better with LP.

We predict Firm 1 will choose LP.

What about Firm 2?

		Firm 2	
		LP	**US**
Firm 1	**LP**	.48, .12	.6, .4
	US	.4, .6	.32, .08

A New Product

How would you expect the firms to play?

		Firm 2	
		LP	**US**
Firm 1	**LP**	.48, .12	.6, .4
	US	.4, .6	.32, .08

Firm 1 has a strictly dominant strategy: no matter what Firm 2 does, Firm 1 does better with LP.

We predict Firm 1 will choose LP.

What about Firm 2?
Firm 2 knows Firm 1's payoffs and it knows Firm 1 wants to maximize payoff, so Firm 2 assumes Firm 1 will choose LP.

A New Product

How would you expect the firms to play?

		Firm 2	
		LP	**US**
Firm 1	**LP**	.48, .12	.6, .4
	US	.4, .6	.32, .08

Firm 1 has a strictly dominant strategy: no matter what Firm 2 does, Firm 1 does better with LP.

We predict Firm 1 will choose LP.

What about Firm 2?
Firm 2 knows Firm 1's payoffs and it knows Firm 1 wants to maximize payoff, so Firm 2 assumes Firm 1 will choose LP.

We predict Firm 2 will choose UP.

Exercise

1. What is the best response by player 1 to player 2's S1 strategy? Is it a strict best response?

2. Does player 1 have a dominant strategy? If so, is it a strictly dominant strategy?

3. Does player 2 have a dominant strategy? If so, is it a strictly dominant strategy?

4. What strategies do you expect the players to choose?

		Player 2	
		S1	**S2**
Player 1	**S1**	1, 4	2, 3
	S2	3, 2	3, 4

Exercise

1. What is the best response by player 1 to player 2's S1 strategy?

   A. S1
   B. S2
   C. Both S1 and S2
   D. It's best if player 1 doesn't play the game
   E. None of the above

		Player 2	
		S1	**S2**
Player 1	**S1**	1, 4	2, 3
	S2	3, 2	3, 4

Exercise

1. What is the best response by player 1 to player 2's S1 strategy?

   A. S1
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   C. Both S1 and S2
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   E. None of the above

		Player 2	
		S1	**S2**
Player 1	**S1**	1, 4	2, 3
	S2	3, 2	3, 4

Exercise

2. What is player 1's dominant strategy?

   A. S1
   B. S2
   C. Both S1 and S2
   D. Player 1 does not have a dominant strategy.
   E. None of the above

		Player 2	
		S1	**S2**
Player 1	**S1**	1, 4	2, 3
	S2	3, 2	3, 4

Exercise

2. What is player 1's dominant strategy?

   A. S1
   B. S2
   C. Both S1 and S2
   D. Player 1 does not have a dominant strategy.
   E. None of the above

		Player 2	
		S1	**S2**
Player 1	**S1**	1, 4	2, 3
	S2	3, 2	3, 4

Exercise

3. What is player 2's dominant strategy?

   A. S1
   B. S2
   C. Both S1 and S2
   D. Player 2 does not have a dominant strategy.
   E. None of the above

		Player 2	
		S1	**S2**
Player 1	**S1**	1, 4	2, 3
	S2	3, 2	3, 4

Exercise

3. What is player 2's dominant strategy?

   A. S1
   B. S2
   C. Both S1 and S2
   D. Player 2 does not have a dominant strategy.
   E. None of the above

		Player 2	
		S1	**S2**
Player 1	**S1**	1, 4	2, 3
	S2	3, 2	3, 4

Player 2's best response to S1 is S1.
Player 2's best response to S2 is S2.

Exercise

4. What strategies do you expect the players to choose?

   A. (S1, S1)
   B. (S1, S2)
   C. (S2, S1)
   D. (S2, S2)
   E. None of the above

		Player 2	
		S1	**S2**
Player 1	**S1**	1, 4	2, 3
	S2	3, 2	3, 4

Exercise

4. What strategies do you expect the players to choose?

   A. (S1, S1)
   B. (S1, S2)
   C. (S2, S1)
   D. (S2, S2)
   E. None of the above

		Player 2	
		S1	**S2**
Player 1	**S1**	1, 4	2, 3
	S2	3, 2	3, 4

Player 1 is expected to choose S2 (dominant strategy).
Player 2 realizes Player 1 will choose S2 and go with S2.

So Far…

- **Exam-Presentation Game.** Both players have a strictly dominant strategy: *Study for exam*.
- **Prisoner's Dilemma**. Both players have a strictly dominant strategy: *Confess*.
- **A New Product Game.**
  - Firm 1 has a strictly dominant strategy: Produce a low-cost product
  - Firm 2 has no strictly dominant strategy. The best response of Firm 2 to the low-cost strategy of Firm 1 is to produce an up-scale product.
- **Next: Three-Client Game**

Three-Client Game

- Firm 1 and Firm 2 want to do business with one if three clients A, B, and C.

Three-Client Game

- Firm 1 and Firm 2 want to do business with one if three clients A, B, and C.
- Each firm can approach one of the three clients.

Three-Client Game

- Firm 1 and Firm 2 want to do business with one if three clients A, B, and C.
- Each firm can approach one of the three clients.

Firm 1 \ Firm 2	A	B	C
A			
B			
C			

Three-Client Game

- Firm 1 and Firm 2 want to do business with one if three clients A, B, and C.
- Each firm can approach one of the three clients.
- Clients B and C are worth 2 and client A is worth 8.

		Firm 2		
		A	**B**	**C**
Firm 1	**A**			
	B			
	C			

Three-Client Game

- Firm 1 and Firm 2 want to do business with one if three clients A, B, and C.
- Each firm can approach one of the three clients.
- Clients B and C are worth 2 and client A is worth 8.
- If the two firms approach the same client, they will split the business from the client in half.

Firm 1 \ Firm 2	A	B	C
A			
B			
C			

Three-Client Game

- Firm 1 and Firm 2 want to do business with one if three clients A, B, and C.
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- If the two firms approach the same client, they will split the business from the client in half.

		Firm 2		
		A	**B**	**C**
Firm 1	**A**	4, 4		
	B		1, 1	
	C			1, 1

Three-Client Game

- Firm 1 and Firm 2 want to do business with one if three clients A, B, and C.
- Each firm can approach one of the three clients.
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Firm 1 \ Firm 2	A	B	C
A	4, 4		
B		1, 1	
C			1, 1

- If the two firms approach the same client, they will split the business from the client in half.
- Firm 1 is too small, so if it approaches any client and Firm 2 does not, Firm 1 gets no business.

Three-Client Game

- Firm 1 and Firm 2 want to do business with one if three clients A, B, and C.
- Each firm can approach one of the three clients.
- Clients B and C are worth 2 and client A is worth 8.

		Firm 2		
		A	**B**	**C**
Firm 1	**A**	4, 4	0,	0,
	B	0,	1, 1	0,
	C	0,	0,	1, 1

- If the two firms approach the same client, they will split the business from the client in half.
- Firm 1 is too small, so if it approaches any client and Firm 2 does not, Firm 1 gets no business.

Three-Client Game

- Firm 1 and Firm 2 want to do business with one if three clients A, B, and C.
- Each firm can approach one of the three clients.
- Clients B and C are worth 2 and client A is worth 8.

		Firm 2		
		A	**B**	**C**
Firm 1	**A**	4, 4	0, 2	0, 2
	B	0,	1, 1	0, 2
	C	0,	0, 2	1, 1

- If the two firms approach the same client, they will split the business from the client in half.
- Firm 1 is too small, so if it approaches any client and Firm 2 does not, Firm 1 gets no business.
- If Firm 2 approaches clients B or C on its own, it will get their full business.

Three-Client Game

- Firm 1 and Firm 2 want to do business with one if three clients A, B, and C.
- Each firm can approach one of the three clients.
- Clients B and C are worth 2 and client A is worth 8.

Firm 1 \ Firm 2	A	B	C
A	4, 4	0, 2	0, 2
B	0,	1, 1	0, 2
C	0,	0, 2	1, 1

- If the two firms approach the same client, they will split the business from the client in half.
- Firm 1 is too small, so if it approaches any client and Firm 2 does not, Firm 1 gets no business.
- If Firm 2 approaches clients B or C on its own, it will get their full business.
- Client A will only do business is both firms approach her.

Three-Client Game

- Firm 1 and Firm 2 want to do business with one if three clients A, B, and C.
- Each firm can approach one of the three clients.
- Clients B and C are worth 2 and client A is worth 8.

Firm 1 \ Firm 2	A	B	C
A	4, 4	0, 2	0, 2
B	0, 0	1, 1	0, 2
C	0, 0	0, 2	1, 1

- If the two firms approach the same client, they will split the business from the client in half.
- Firm 1 is too small, so if it approaches any client and Firm 2 does not, Firm 1 gets no business.
- If Firm 2 approaches clients B or C on its own, it will get their full business.
- Client A will only do business is both firms approach her.

Three-Client Game

Does Firm 1 have a strictly dominant strategy?

		Firm 2		
		A	**B**	**C**
Firm 1	**A**	4, 4	0, 2	0, 2
	B	0, 0	1, 1	0, 2
	C	0, 0	0, 2	1, 1

Three-Client Game

Does Firm 1 have a strictly dominant strategy?

Find the best response of Firm 1 to every strategy of Firm 2.

		Firm 2		
		A	**B**	**C**
Firm 1	**A**	4, 4	0, 2	0, 2
	B	0, 0	1, 1	0, 2
	C	0, 0	0, 2	1, 1

Best response of Firm 1 if Firm 2 chooses A?

Three-Client Game

Does Firm 1 have a strictly dominant strategy?

Find the best response of Firm 1 to every strategy of Firm 2.

		Firm 2		
		A	**B**	**C**
Firm 1	**A**	4, 4	0, 2	0, 2
	B	0, 0	1, 1	0, 2
	C	0, 0	0, 2	1, 1

Best response of Firm 1 if Firm 2 chooses A? A

Three-Client Game

Does Firm 1 have a strictly dominant strategy?

Find the best response of Firm 1 to every strategy of Firm 2.

		Firm 2		
		A	**B**	**C**
Firm 1	**A**	4, 4	0, 2	0, 2
	B	0, 0	1, 1	0, 2
	C	0, 0	0, 2	1, 1

Best response of Firm 1 if Firm 2 chooses A? A
Best response of Firm 1 if Firm 2 chooses B?

Three-Client Game

Does Firm 1 have a strictly dominant strategy?

Find the best response of Firm 1 to every strategy of Firm 2.

		Firm 2		
		A	**B**	**C**
Firm 1	**A**	4, 4	0, 2	0, 2
	B	0, 0	1, 1	0, 2
	C	0, 0	0, 2	1, 1

Best response of Firm 1 if Firm 2 chooses A? A
Best response of Firm 1 if Firm 2 chooses B? B

Three-Client Game

Does Firm 1 have a strictly dominant strategy?

Find the best response of Firm 1 to every strategy of Firm 2.

		Firm 2		
		A	**B**	**C**
Firm 1	**A**	4, 4	0, 2	0, 2
	B	0, 0	1, 1	0, 2
	C	0, 0	0, 2	1, 1

Best response of Firm 1 if Firm 2 chooses A? A
Best response of Firm 1 if Firm 2 chooses B? B
Best response of Firm 1 if Firm 2 chooses C?

Three-Client Game

Does Firm 1 have a strictly dominant strategy?

Find the best response of Firm 1 to every strategy of Firm 2.

Firm 1 \ Firm 2	A	B	C
A	4, 4	0, 2	0, 2
B	0, 0	1, 1	0, 2
C	0, 0	0, 2	1, 1

Best response of Firm 1 if Firm 2 chooses A? A
Best response of Firm 1 if Firm 2 chooses B? B
Best response of Firm 1 if Firm 2 chooses C? C

Three-Client Game

Does Firm 1 have a strictly dominant strategy?

Find the best response of Firm 1 to every strategy of Firm 2.

		Firm 2		
		A	**B**	**C**
Firm 1	**A**	4, 4	0, 2	0, 2
	B	0, 0	1, 1	0, 2
	C	0, 0	0, 2	1, 1

Best response of Firm 1 if Firm 2 chooses A? A
Best response of Firm 1 if Firm 2 chooses B? B
Best response of Firm 1 if Firm 2 chooses C? C

Firm 1 has no dominant strategy. The best strategy changes depending on Firm 2's choice. Firm 1 wants to match Firm 2.

Three-Client Game

Does Firm 2 have a strictly dominant strategy?

		Firm 2		
		A	**B**	**C**
Firm 1	**A**	4, 4	0, 2	0, 2
	B	0, 0	1, 1	0, 2
	C	0, 0	0, 2	1, 1

Three-Client Game

Does Firm 2 have a strictly dominant strategy?

Find the best response of Firm 2 to every strategy of Firm 1.

		Firm 2		
		A	**B**	**C**
Firm 1	**A**	4, 4	0, 2	0, 2
	B	0, 0	1, 1	0, 2
	C	0, 0	0, 2	1, 1

Best response of Firm 2 if Firm 1 chooses A?

Three-Client Game

Does Firm 2 have a strictly dominant strategy?

Find the best response of Firm 2 to every strategy of Firm 1.

		Firm 2		
		A	**B**	**C**
Firm 1	**A**	4, 4	0, 2	0, 2
	B	0, 0	1, 1	0, 2
	C	0, 0	0, 2	1, 1

Best response of Firm 2 if Firm 1 chooses A? A

Three-Client Game

Does Firm 2 have a strictly dominant strategy?

Find the best response of Firm 2 to every strategy of Firm 1.

		Firm 2		
		A	**B**	**C**
Firm 1	**A**	4, 4	0, 2	0, 2
	B	0, 0	1, 1	0, 2
	C	0, 0	0, 2	1, 1

Best response of Firm 2 if Firm 1 chooses A? A
Best response of Firm 2 if Firm 1 chooses B?

Three-Client Game

Does Firm 2 have a strictly dominant strategy?

Find the best response of Firm 2 to every strategy of Firm 1.

Firm 1 \ Firm 2	A	B	C
A	4, 4	0, 2	0, 2
B	0, 0	1, 1	0, 2
C	0, 0	0, 2	1, 1

Best response of Firm 2 if Firm 1 chooses A? A
Best response of Firm 2 if Firm 1 chooses B? C

Three-Client Game

Does Firm 2 have a strictly dominant strategy?

Find the best response of Firm 2 to every strategy of Firm 1.

Firm 1 \ Firm 2	A	B	C
A	4, 4	0, 2	0, 2
B	0, 0	1, 1	0, 2
C	0, 0	0, 2	1, 1

Best response of Firm 2 if Firm 1 chooses A? A
Best response of Firm 2 if Firm 1 chooses B? C
Best response of Firm 2 if Firm 1 chooses C?

Three-Client Game

Does Firm 2 have a strictly dominant strategy?

Find the best response of Firm 2 to every strategy of Firm 1.

Firm 1 \ Firm 2	A	B	C
A	4, 4	0, 2	0, 2
B	0, 0	1, 1	0, 2
C	0, 0	0, 2	1, 1

Best response of Firm 2 if Firm 1 chooses A? A
Best response of Firm 2 if Firm 1 chooses B? C
Best response of Firm 2 if Firm 1 chooses C? B

Three-Client Game

Does Firm 2 have a strictly dominant strategy?

Find the best response of Firm 2 to every strategy of Firm 1.

Firm 1 \ Firm 2	A	B	C
A	4, 4	0, 2	0, 2
B	0, 0	1, 1	0, 2
C	0, 0	0, 2	1, 1

Best response of Firm 2 if Firm 1 chooses A? A
Best response of Firm 2 if Firm 1 chooses B? C
Best response of Firm 2 if Firm 1 chooses C? B

Firm 2 has no dominant strategy. The best strategy changes depending on Firm 1's choice. Firm 2 only wants to match Firm 1 on client A, but wants to mismatch on clients B and C.

Three-Client Game

Neither player has a dominant strategy.

Best responses of Firm 1:

- If Firm 2 chooses A: A
- If Firm 2 chooses B: B
- If Firm 2 chooses C: C

Best responses of Firm 2:

- If Firm 1 chooses A: A
- If Firm 1 chooses B: C
- If Firm 1 chooses C: B

		Firm 2		
		A	**B**	**C**
Firm 1	**A**	4, 4	0, 2	0, 2
	B	0, 0	1, 1	0, 2
	C	0, 0	0, 2	1, 1

What strategy would Firm 1 and Firm 2 choose?

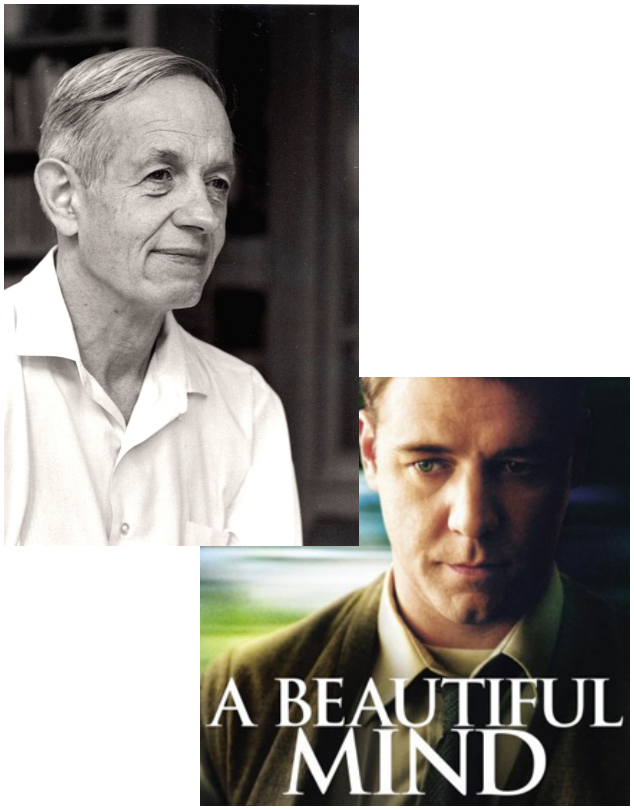
Nash Equilibrium

Suppose Player 1 chooses strategy S and Player 2 chooses strategy T.

Then (S,T) is a ***Nash equilibrium*** if S is a best response to T and T is a best response to S.

Why is Nash equilibrium and "equilibrium"?

Because when players choose strategies that are best responses to each other, no player has an incentive to change.

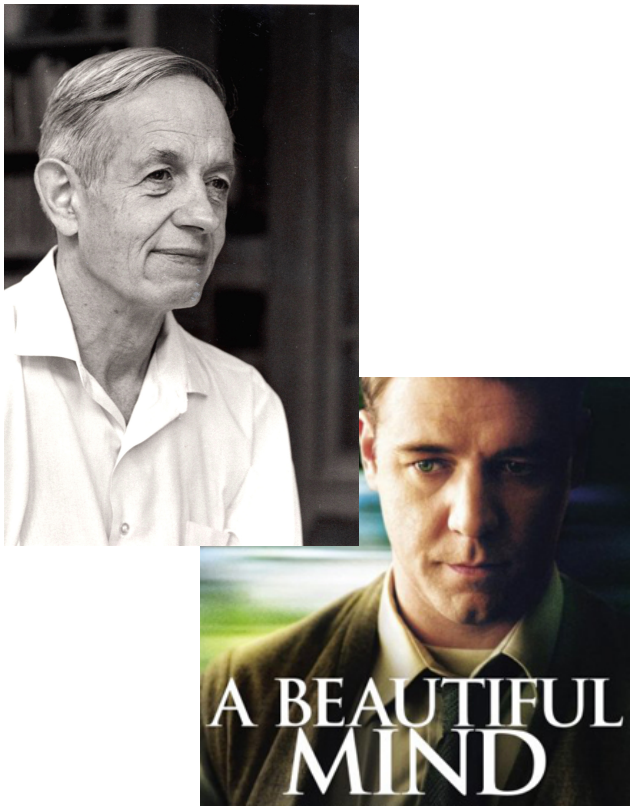


Nash Equilibrium

Suppose Player 1 chooses strategy S and Player 2 chooses strategy T.

Then (S,T) is a ***Nash equilibrium*** if S is a best response to T and T is a best response to S.

Nash proved that **every game with a finite number of player and a finite number of strategies has at least one Nash equilibrium**.



Three-Client Game

Neither player has a dominant strategy.

Best responses of Firm 1:

- If Firm 2 chooses A: A
- If Firm 2 chooses B: B
- If Firm 2 chooses C: C

Best responses of Firm 2:

- If Firm 1 chooses A: A
- If Firm 1 chooses B: C
- If Firm 1 chooses C: B

		Firm 2		
		A	**B**	**C**
Firm 1	**A**	4, 4	0, 2	0, 2
	B	0, 0	1, 1	0, 2
	C	0, 0	0, 2	1, 1

Is (B,C) a Nash equilibrium?

No:

- C is the best response of Firm 2 if Firm 1 chooses B.
- But B is not the best response of Firm 1 if Firm 2 chooses C.

Three-Client Game

Neither player has a dominant strategy.

Best responses of Firm 1:

- If Firm 2 chooses A: A
- If Firm 2 chooses B: B
- If Firm 2 chooses C: C

Best responses of Firm 2:

- If Firm 1 chooses A: A
- If Firm 1 chooses B: C
- If Firm 1 chooses C: B

		Firm 2		
		A	**B**	**C**
Firm 1	**A**	4, 4	0, 2	0, 2
	B	0, 0	1, 1	0, 2
	C	0, 0	0, 2	1, 1

Is there a Nash equilibrium?

Yes, (A,A) is a Nash equilibrium:

- A is the best response of Firm 1 if Firm 2 chooses A
- A is the best response of Firm 2 if Firm 1 chooses A.

Three-Client Game

Neither player has a dominant strategy.

Best responses of Firm 1:

- If Firm 2 chooses A: A
- If Firm 2 chooses B: B
- If Firm 2 chooses C: C

Best responses of Firm 2:

- If Firm 1 chooses A: A
- If Firm 1 chooses B: C
- If Firm 1 chooses C: B

		Firm 2		
		A	**B**	**C**
Firm 1	**A**	4, 4	0, 2	0, 2
	B	0, 0	1, 1	0, 2
	C	0, 0	0, 2	1, 1

No other pair of strategies is a Nash equilibrium.

We predict that the outcome of the game will be (A,A).

A Coordination Game

- You and your partner have a joint presentation tomorrow.
- It's late at night and you can't reach your partner. You need to decide whether to use PowerPoint or Keynote to make the slides.
- Your partner is having the same dilemma.
- You and your partner have no preference between PP and KN, but want to choose the same software.

		Your Partner: PP	Your Partner: KN
You	PP	1,1	0, 0
You	KN	0, 0	1, 1

Write the payoff matrix for this game and find all Nash equilibria.

I-Clicker Question

What are the Nash equilibria of this game?

A. (PP, PP) and (KN, KN)
B. (PP, KN) and (KN, PP)
C. (PP, KN) and (KN, KN)
D. None

		Your Partner	
		PP	**KN**
You	**PP**	1,1	0, 0
	KN	0, 0	1, 1

I-Clicker Question

What are the Nash equilibria of this game?

A. (PP, PP) and (KN, KN)
B. (PP, KN) and (KN, PP)
C. (PP, KN) and (KN, KN)
D. None

		Your Partner	
		PP	**KN**
You	**PP**	1,1	0, 0
	KN	0, 0	1, 1

A Coordination Game

- You and your partner have a joint presentation tomorrow.
- It's late at night and you can't reach your partner. You need to decide whether to use PowerPoint or Keynote to make the slides.
- Your partner is having the same dilemma.
- You and your partner have no preference between PP and KN, but want to choose the same software.

		Your Partner	
		PP	**KN**
You	**PP**	1,1	0, 0
	KN	0, 0	1, 1

Write the payoff matrix for this game and find all Nash equilibria.

Nash equilibria: (PP, PP) and (KN, KN)

A Coordination Game

- You and your partner have a joint presentation tomorrow.
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		Your Partner	
		PP	**KN**
You	**PP**	1,1	0, 0
	KN	0, 0	1, 1

Write the payoff matrix for this game and find all Nash equilibria.

Nash equilibria: (PP, PP) and (KN, KN)

Is there a dominant strategy for either player?

A Coordination Game

- You and your partner have a joint presentation tomorrow.
- It's late at night and you can't reach your partner. You need to decide whether to use PowerPoint or Keynote to make the slides.
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- You and your partner have no preference between PP and KN, but want to choose the same software.

		Your Partner	
		PP	**KN**
You	**PP**	1,1	0, 0
	KN	0, 0	1, 1

Write the payoff matrix for this game and find all Nash equilibria.

Nash equilibria: (PP, PP) and (KN, KN)

Is there a dominant strategy for either player? No

A Coordination Game

- You and your partner have a joint presentation tomorrow.
- It's late at night and you can't reach your partner. You need to decide whether to use PowerPoint or Keynote to make the slides.
- Your partner is having the same dilemma.
- You and your partner have no preference between PP and KN, but want to choose the same software.

		Your Partner: PP	Your Partner: KN
You	PP	1,1	0, 0
You	KN	0, 0	1, 1

Write the payoff matrix for this game and find all Nash equilibria.

Nash equilibria: (PP, PP) and (KN, KN)

Is there a dominant strategy for either player? No

What would be the outcome of the game?

Focal Point

In games with multiple Nash equilibria, there is often a **focal point,** which is external to the game**,** that determines which Nash equilibria players will choose:

Examples:

- Cars approaching each other decide to move left or right. Focal point changes by country.
- Lost people in crowded area. Focal point: people sometimes prearrange a meeting point.
- Handing objects. Focal point?

Unbalanced Coordination Game

Now, you are you partner still want to coordinate, but you both prefer to user PowerPoint instead of Keynote.

Find all Nash equilibria:

(PP, PP) and (KN, KN) are still Nash equilibria.

		Your Partner	
		PP	**KN**
You	**PP**	2, 2	0, 0
	KN	0, 0	1, 1

However, we expect that the outcome will be (PP, PP) since it gives a higher payoff to both players.

No need for social convention. The focal point is intrinsic to the game itself.