Communication in Games

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Cheap Talk

In cheap talk, players can communicate before taking actions.

- Communication is costless
- Communication does not need to be truthful
- Communication does not imply commitment

Cheap talk can be seen as a two-stage game.

- First stage: Players communicate
- Second stage: Players decide actions

	NotConfess	Confess
NotConfess	2, 2	0, 3
Confess	3, 0	1, 1

Let players be able to communicate before the game, e.g., row player says he will not confess. Does this change the game's outcome?

Cheap Talk

How about this game? Does the game's outcome changes if the Row player declares to play U?

	L	R
U	1, 1	0, 0
D	0, 0	1, 1

Cheap Talk

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	L	R
U	1, 1	0, 0
D	0, 0	1, 1

Cheap talk is not Worthless. It can affect the outcome of a game by changing one player's beliefs about another player's actions, and so selecting one equilibrium out of multiple equilibria.

Cheap Talk

In signaling game, Sender has a fixed type.

A practical example:

- ▶ Anna has a company with a Demanding and an Undemanding position
- ▶ Bob is seeking for a job and his ability may be High or Low
- ▶ Anna and Bob benefit if Bob gets the appropriate job

Bob\Anna	Demanding	Undemanding
High	2, 1	0, 0
Low	0, 0	1, 3

If Bob tells Anna that he has low ability, Anna can believe him since Bob has no incentive to lie.

Cheap Talk: Credibility

Under which condition does a cheap talk influence the outcome of a game? I.e., when does a cheap talk conveys information and is credible?

Note that:

- Players may not tell the truth.

- Players' messages may not be believed.

Cheap Talk: Credibility

Under which condition does a cheap talk influence the outcome of a game? I.e., when does a cheap talk conveys information and is credible?

A declared type (action) is

- Self-Committing: if Sender believes that Receiver believes that Sender has (is going to do) the declared type (action), then the declared type (action) is optimal.

  Or alternatively, once uttered, and assuming it is believed, the declared action is the optimal one.

- Self-Revealing: Sender wants Receiver to believe that he has (is going to do) the declared type (action) if and only if the Sender has (is going to do) the declared type (action).

  Or alternatively, assuming it is uttered with the expectation that it will be believed, it is uttered only when it was the intention to act that way.

Cheap Talk in Signaling Games

Under which condition does a cheap talk influence the outcome of a game? I.e., when does a cheap talk is credible and conveys information?

	Demanding	Undemanding
High	2, 1	0, 0
Low	0, 0	1, 3

Is the utterance "I have high ability" by Bob self-committing and self-revealing?

Cheap Talk in Signaling Games

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when does a cheap talk is credible and conveys information?

	Demanding	Undemanding
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Is the utterance "I have high ability" by Bob self-committing and self-revealing?
Yes, it is self-committing.

Cheap Talk in Signaling Games

Under which condition does a cheap talk influence the outcome of a game? I.e., when does a cheap talk is credible and conveys information?

	Demanding	Undemanding
High	2, 1	0, 0
Low	0, 0	1, 3

Is the utterance "I have high ability" by Bob self-committing and self-revealing?
Yes, it is self-committing.
Yes, it is self-revealing.

Cheap Talk in Signaling Games

Suppose now that Bob wants to have the Demanding position regardless of its ability.

	Demanding	Undemanding
High	2, 1	0, 0
Low	2, 0	1, 3

Exercise 1: Is the utterance "I have high ability" by Bob self-committing and self-revealing? why?

Exercise 2: Is the utterance "I have low ability" by Bob self-committing and self-revealing? why?

Cheap Talk in Games

What if Sender has no fixed type?

	L	R
U	1, 1	0, 0
D	0, 0	1, 1

Exercise 3: Is the utterance "I play U" by the row player self-committing and self-revealing? why?

Self-Commitment and Self-revelation

- ▶ Self-Committing Utterance: if Sender believes that Receiver believes that Sender is going to do the declared action, then the declared action is optimal.

- ▶ Self-Revealing Utterance: Sender wants Receiver to believe that he is going to do the declared action if and only if the Sender is going to do the declared action.

	Hunt	*Gather*
Hunt	$9, 9$	$0, 8$
Gather	$8, 0$	$7, 7$

The row player declares to play Hunt. Is this self-revealing utterance? Is it a self-committing utterance?

Self-Commitment and Self-revelation

	Hunt	*Gather*
Hunt	9, 9	0, 8
Gather	8, 0	7, 7

The row player's utterance to play Hunt is not self-revealing because row player would like column player to believe the utterance no matter what row player is going to play. This is because if the column player plays Hunt, then the row player receives more payoff no matter what he plays. Note that in addition to the two pure Nash equilibria, there exists a mixed strategy equilibrium (playing Hunt with probability 7/8) with expected utility 7.875. If column player believes the utterance, the expected utility increases to 8.875. Thus, row player has an incentive to make the column player to believe the utterance even if he has no plan to play Hunt before announcing it.

Self-Commitment and Self-revelation

	Hunt	*Gather*
Hunt	9, 9	0, 8
Gather	8, 0	7, 7

The utterance is self-committing because if row player thinks the column player
believes it will plays Hunt, then row player prefers to play Hunt.

Self-Commitment and Self-revelation

	Hunt	*Gather*
Hunt	9, 9	0, 8
Gather	8, 0	7, 7

Self-revelation plus self-commitment is certainly credible. However, self-commitment alone is not credible.

Payoff & Risk Dominance

(9,9) payoff dominates (7,7)

	Hunt	Gather
Hunt	9, 9	0, 8
Gather	8, 0	7, 7

(Hunt , Hunt) payoff dominates (Gather , Gather) if $A \geq D$, $a \geq d$, and at least one of the two is a strict inequality: $A > D$ or $a > d$

	Hunt	Gather
Hunt	A, a	C, b
Gather	B, c	D, d

Payoff & Risk Dominance

(9,9) payoff dominates (7,7)

(7,7) risk dominates (9,9)

	Hunt	Gather
Hunt	9, 9	0, 8
Gather	8, 0	7, 7

(Gather , Gather) risk dominates (Hunt , Hunt)   if
$(C - D)(c - d) \geq (B - A)(b - a)$

	Hunt	Gather
Hunt	A, a	C, b
Gather	B, c	D, d

Payoff & Risk Dominance

(9,9) payoff dominates (7,7)

(7,7) risk dominates (9,9)

	Hunt	*Gather*
Hunt	9, 9	0, 8
Gather	8, 0	7, 7

**An agreement is effective only if it changes the payoffs or the players'
information (Aumann, 1990).**

Self-Commitment and Self-revelation

	Hunt	*Gather*
Hunt	100, 100	0, 8
Gather	8, 0	7, 7

The row player declares to play Hunt. Is this self-revealing utterance? Is it a self-committing utterance?

Self-Commitment and Self-revelation

	Hunt	*Gather*
Hunt	100, 100	0, 8
Gather	8, 0	7, 7

The row player declares to play Hunt. Is this self-revealing utterance? Is it a self-committing utterance?

The strategy profile (Hunt,hunt) is both payoff and risk dominant strategy profile. Players will therefore chose this outcome.

Self-Commitment and Self-revelation

	Hunt	*Gather*
Hunt	100, 100	0, 8
Gather	8, 0	7, 7

The row player declares to play Hunt. Is this self-revealing utterance? Is it a self-committing utterance?

The strategy profile (Hunt,hunt) is both payoff and risk dominant strategy profile. Players will therefore chose this outcome.

Therefore, a signal to play Hunt does not change the players' information.

Self-Commitment and Self-revelation

	Hunt	*Gather*
Hunt	9, 9	0, 8
Gather	8, 0	7, 7

Self-revelation plus self-commitment is certainly credible. However, self-commitment alone is not credible.