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# Know thy neighbor: costly information can hurt cooperation in dynamic networks

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#### Cooperation: Prisoner's Dilemma



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#### Cooperation: Prisoner's Dilemma



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D: defector (confess) C: cooperator (remain silent)

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#### Cooperation: nuclear arms race



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#### Cooperation: nuclear arms race results



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#### Cooperation: free snacks race



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#### Main question

Why do people cooperate with others?



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#### Why do people cooperate with others?



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#### Network reciprocity in humans



#### Static networks do not promote the spread of cooperation



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#### Network reciprocity in humans



Static networks do not promote the spread of cooperation

Dynamic networks sustain cooperation if

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#### Network reciprocity in humans



Static networks do not promote the spread of cooperation

Dynamic networks sustain cooperation if

• I know whom I play with

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#### Network reciprocity in humans



Static networks do not promote the spread of cooperation

Dynamic networks sustain cooperation if

- I know whom I play with
- I can break or make connections by myself

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## Network reciprocity in humans



Static networks do not promote the spread of cooperation

Dynamic networks sustain cooperation if

- I know whom I play with
- I can break or make connections by myself
- I know who are my potential neighbors

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#### Experimental laboratory

We ask

Does making information on my potential neighbor's actions costly affect cooperation?

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#### Experimental laboratory

We ask

Does making information on my potential neighbor's actions costly affect cooperation?



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Setting the stag	je		

• We study cooperation in the Prisoner's Dilemma game on dynamic networks

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#### Setting the stage

- We study cooperation in the Prisoner's Dilemma game on dynamic networks
- Our game payoffs:

	Cooperate	Defect
Cooperate	10, 10	-10, 20
Defect	20, -10	0,0

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Setting the stage

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• 20 participants are initially placed on a regular random network of degree 4

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#### Experimental settings

Participants play a series of at least 10 rounds:

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#### Experimental settings

Participants play a series of at least 10 rounds:



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## Varying the cost

- Baseline
  - No cost *c* = 0
  - All players acquire information for free

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#### Varying the cost

- Baseline
  - No cost *c* = 0
  - All players acquire information for free
- New treatments
  - Low cost: *c* = 4
  - High cost: c = 8

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#### Varying the cost

- Baseline
  - No cost *c* = 0
  - All players acquire information for free
- New treatments
  - Low cost: *c* = 4
  - High cost: c = 8
- How does cost affect cooperation?

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#### Laboratory results



Average proportion of cooperators in the last 5 periods, by treatment.

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#### Laboratory results



Average proportion of cooperators in the last 5 periods, by treatment.



Proportion of cooperators by period and treatment.

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#### Laboratory results



Average number of neighbors by period and treatment.

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#### Laboratory results



Average number of neighbors by period and treatment.



Average accumulated payoff by period and treatment.

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#### Laboratory results



(a) *c* = 0



(c) *c* = 8

Link evolution by type at cost 0, 4, and 8.

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#### Laboratory results









Link evolution by type at cost 0, 4, and 8.



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• No cost: almost full cooperation



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#### Discussion

- No cost: almost full cooperation
- Low cost
  - Cooperation decreases somewhat
  - · High- and low-cooperation equilibria co-exist

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#### Discussion

- No cost: almost full cooperation
- Low cost
  - Cooperation decreases somewhat
  - · High- and low-cooperation equilibria co-exist
- High cost
  - Dramatic decrease in cooperation
  - Individuals get to know their neighbors somewhat less

More players "defect"

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#### Discussion

- No cost: almost full cooperation
- Low cost
  - Cooperation decreases somewhat
  - · High- and low-cooperation equilibria co-exist
- High cost
  - Dramatic decrease in cooperation
  - Individuals get to know their neighbors somewhat less

- More players "defect"
- Costly information harms cooperation

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#### Thank you for your kind attention



Know Thy Neighbor: Costly Information Can Hurt Cooperation in Dynamic Networks Antonioni, Cacault, Lalive, Tomassini (2014), PLOS ONE 9(10): e110788.

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