Multigame Contact:
A Double-Edged Sword for Cooperation

Vincent Laferrière UNIL
Joao Montez UNIL
Catherine Roux Uni Basel
Christian Thöni UNIL

Cooperation in prisoner's dilemmas

Cooperation in indefinitely repeated prisoner's dilemmas has received a lot of attention in recent years.

What are the determinants of cooperation?

- ▶ Continuation probability (Dal Bó, 2005)
- ▶ Communication (Cooper/Kühn, 2014)
- ▶ Information and monitoring (Aoyagi/Bhaskar/Fréchette, 2019)
- ▶ Costly punishment (Dreber/Rand/Fudenberg/Nowak, 2008)
- ▶ Continuous time (Bigoni/Casari/Skrzypacz/Spagnolo, 2015)
- ▶ Realized duration (Mengel/Orlandi/Weidenholzer, 2022)
- ▶ Matching scheme (Duffy/Ochs, 2009)
- ▶ Behavioral spillovers (Bednar/Chen/Liu/Page, 2012)
- ▶ Literature review: Dal Bó/Fréchette (2018)

Strategic importance of multigame contact

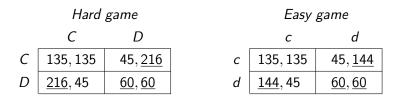Agents often interact across multiple games:

- ▶ Coworkers may be neighbours.
- ▶ Spouses may be business partners.
- ▶ Nations may link negotiations on political and economic fronts.

$\rightarrow$ We know what to expect!

Multimarket contact (Bernheim/Whinston, 1990):

- ▶ Enhances a firm's ability to punish deviations (link the markets).
- ▶ It can help collusion, and never hurts.
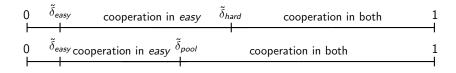- ▶ It always helps when objective functions are concave (Spagnolo, 1999).

Experimental evidence

Experimental setup and predictions

	Hard game				*Easy game*	
	C	D			c	d
C	135, 135	45, <u>216</u>		c	135, 135	45, <u>144</u>
D	<u>216</u>, 45	<u>60</u>, <u>60</u>		d	<u>144</u>, 45	<u>60</u>, <u>60</u>

$$\frac{135}{1-\delta} \geq 216 + \frac{\delta 60}{1-\delta} \Leftrightarrow \delta \geq 0.52 \equiv \tilde{\delta}_{hard} \qquad \delta \geq 0.11 \equiv \tilde{\delta}_{easy}$$

$$\frac{2 \cdot 135}{1-\delta} \geq 216 + 144 + \frac{2 \cdot \delta 60}{1-\delta} \Leftrightarrow \delta \geq 0.38 \equiv \tilde{\delta}_{pool}$$
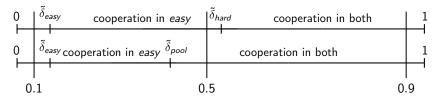
Treatment variations

Multigame contact (between subjects)

- ▶ *2Partner*: play each of the two games with a different partner
- ▶ *1Partner*: play both games with a single partner

`Decision Screen`

Continuation probability (between subjects)

- ▶ $\delta = 0.1$
- ▶ $\delta = 0.5$
- ▶ $\delta = 0.9$

Experimental procedures

▶ Laboratory experiment in the LABEX, University of Lausanne
▶ Pilot in May 2020, (preregistered) experiments in Sept/Oct
▶ Experimental software: oTree (Chen et al., 2016)
▶ 23 sessions with a total of 436 participants, student subjects

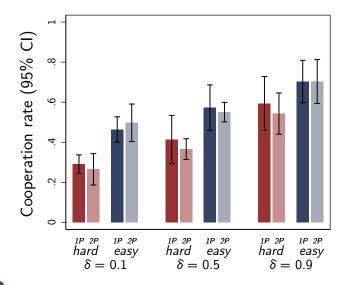|	$\delta = 0.1$		$\delta = 0.5$		$\delta = 0.9$	
# partners	1	2	1	2	1	2
# sessions	3	6	3	6	2	3
# matching groups	6	6	6	6	5	5
# subjects	60	116	58	114	34	54
# decisions	6,030	11,754	5,924	11,574	3,752	5,800

Session details

Matching procedure:

- ▶ All subjects in one session play the same treatment.
- ▶ Interaction with subjects of the same matching group only
- ▶ Random allocation to matching groups of varying sizes (6 to 20 subjects)
  - ▶ Idea: keep # interactions with another subject comparable
  - ▶ Consequence: smaller group size for *1Partner* and high δ

Stopping procedure and supergame duration:
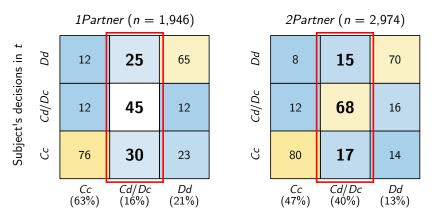
- ▶ Each supergame lasts at least three rounds
- ▶ Computerized stopping rule with probability $1 - \delta$ after round 3
- ▶ Predrawn sequences of supergames up to 100 rounds
  - ▶ Independent sequences across matching groups within a session
  - ▶ Same sequence within matching groups

Does multigame contact increase cooperation?

Do subjects link the games (I)?

1Partner (n = 1,946)

		Cc (63%)	Cd/Dc (16%)	Dd (21%)
Subject's decisions in t	Dd	12	**25**	65
	Cd/Dc	12	**45**	12
	Cc	76	**30**	23

2Partner (n = 2,974)

		Cc (47%)	Cd/Dc (40%)	Dd (13%)
	Dd	8	**15**	70
	Cd/Dc	12	**68**	16
	Cc	80	**17**	14

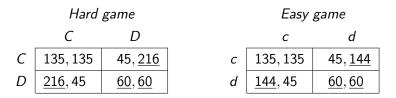Partner's or partners' decisions in t − 1

Does multigame contact lead to more extreme outcomes?

Study 2: Powering multigame contact

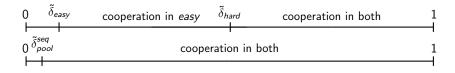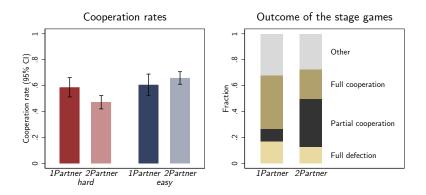|	Hard game			Easy game	
	C	*D*		*c*	*d*
C	135, 135	45, $\underline{216}$	*c*	135, 135	45, $\underline{144}$
D	$\underline{216}$, 45	$\underline{60}, \underline{60}$	*d*	$\underline{144}$, 45	$\underline{60}, \underline{60}$

Sequential: Subjects play the *hard* game first, learn the outcome, proceed with the *easy* game.

$$\frac{2 \cdot 135}{1 - \delta} \geq 135 + 144 + \frac{2 \cdot \delta 60}{1 - \delta} \Leftrightarrow \delta \geq 0.06 \equiv \tilde{\delta}^{seq}_{pool}$$

Study 2: Results

Predictions: unchanged in *2Partner*; $\tilde{\delta}^{seq}_{pool} = 0.06$ in *1Partner*

Parameters: $\delta = 0.5$, $n = 128$

Cooperation rates

Outcome of the stage games

Do subjects link the games (II)?

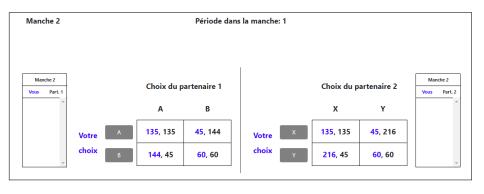|	Dep. var.: cooperation in *easy* (c_t)		
	(1)	(2)	(3)
2Partner	0.052	0.073**	0.010
	(0.044)	(0.018)	(0.037)
$(C, C)_t$ [coop. outcome in *hard*]		0.205**	0.519**
		(0.046)	(0.046)
$(C, C)_t \times$ *2Partner*			−0.408**
			(0.046)
$(c, c)_{t-1}$ [coop. outcome in *easy*]		0.492**	0.186**
		(0.048)	(0.054)
$(c, c)_{t-1} \times$ *2Partner*			0.383**
			(0.066)
Constant	0.487**	0.140**	0.196**
	(0.057)	(0.023)	(0.028)
Time controls	Yes	Yes	Yes

Conclusion

- Experimental evidence on the effect of multigame contact on cooperation is incomplete.
- In theory, cooperation should increase. But we find that multigame contact is a double-edged sword: full cooperation becomes more frequent, but so does full defection.
- As a result, the effect of multigame contact averages out.
- We find evidence for strategic linkage under multigame contact. And the adverse effect of linkage materializes as players sometimes resort to uncooperative behavior in one game.
- Our findings challenge the idea that linking independent policy issues cannot harm global cooperation.
- Interesting variations: imperfect monitoring, information that allows for reputation-building, pairing with other games
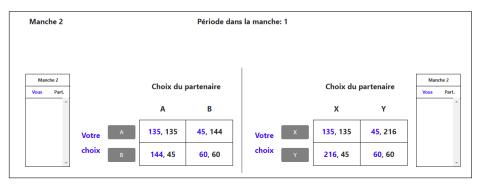
Experimental evidence

- ▶ Market games: does multimarket contact between firms increase collusion?
  - ▶ Phillips/Mason (1992, 1996) – infinitely repeated Cournot; Cason/Davis (1995) – infinitely repeated Bertrand; Güth/Häger/Kirchkamp/Schwalbach (2016) – finitely repeated Bertrand; Freitag/Roux/Thöni (2021) – finitely repeated Cournot; Feinberg/Sherman (1985, 1988) – one shot Bertrand

- ▶ Prisoner's dilemma games: do multiple contacts increase cooperation?
  - ▶ Yang/Kawamura/Ogawa (2016) – playing one versus playing two games and $\delta = 0.75$; Modak (2022) – $\delta = 0.75$ and asymmetric games

- ▶ Our experiment: playing two games with the same versus with a different partner in each with varying continuation probability.

Decision Screen

Manche 2		Période dans la manche: 1			

Choix du partenaire 1

		A	B
Votre choix	A	**135**, 135	**45**, 144
	B	**144**, 45	**60**, 60

Choix du partenaire 2

		X	Y
Votre choix	X	**135**, 135	**45**, 216
	Y	**216**, 45	**60**, 60

Manche 2 — Vous — Part. 1

Manche 2 — Vous — Part. 2

Decision Screen

Manche 2   Période dans la manche: 1

Manche 2	
Vous	**Part.**

Choix du partenaire

	A	B
A	**135**, 135	**45**, 144
B	**144**, 45	**60**, 60

Votre choix

Choix du partenaire

	X	Y
X	**135**, 135	**45**, 216
Y	**216**, 45	**60**, 60

Votre choix

Manche 2	
Vous	**Part.**

Back

Cooperation rates over time