Intergenerational Cooperation: An Experimental Study of Ageism in Trust and Exploitation

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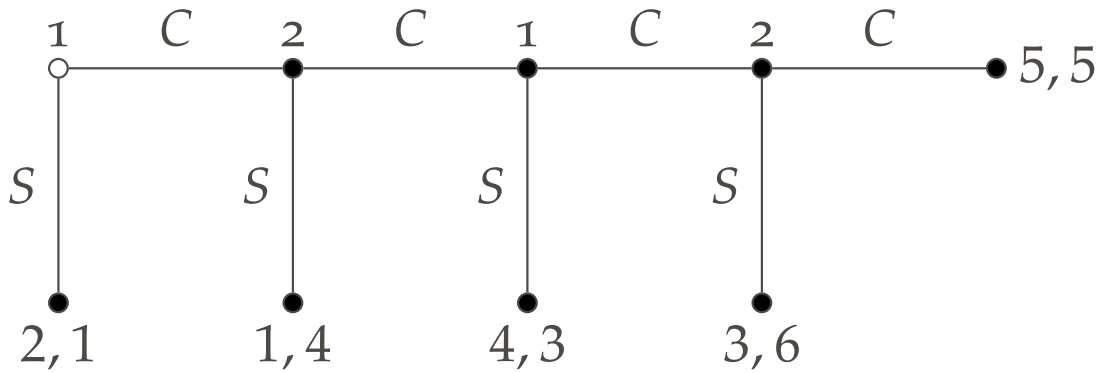
Some Background and Motivation

- changing demographic is increasing opportunities for interpersonal cooperation and exploitation between younger and older adults (Coall and Hertwig, 2010; Burke, 2015)
- financial exploitation of older adults is the most prevalent and frequent form of elder abuse (Peterson et al., 2015).
- attempted financial exploitation of older adults (believed to be relatively trusting) by younger adults has also been demonstrated in the laboratory (Schniter and Shields, 2014)

We use centipede games — why?



sequential interaction allows to identify

- initial trust
- unconditional cooperation
- instrumental cooperation and exploitation

The Centipede Game

- few players choose to stop the CG at their very first chance (McKelvey and Palfrey, 1992; Fey et al., 1996; Nagel and Tang, 1997; Rapoport et al., 2003)
- non-equilibrium behavior may be explained by
  - trust and cooperation
    Kreps et al., 1982; Petit & Sudgen, 1989; McKelvey & Palfrey, 1992; Rand & Nowak, 2012
    with trust the return may be greater; Berg et al., 1995; Cochard et al., 2004; Houser et al., 2010
  - other regarding preferences, efficiency concerns
    Cooper and Kagel, 2013; Dufwenberg and Kirchsteiger, 2004; Gamba, 2013
  - backwards induction reasoning ability
    Levitt et al., 2011

A little more background...

- trust increasing with age

  Poulin & Silver, 2008; Li & Fung, 2013; Kocher, 2015; Poulin & Haase, 2015
- older adults showing extra age-discriminant benevolence when interacting with younger adults

  Charness and Villeval 2009, Schniter & Shields, 2014
- cooperation and exploitation may be better understood by examining the role of other regarding preferences, age-based beliefs about others' cooperativeness

  Rabin, 1993; Fehr and Schmidt, 1999; Dufwenberg and Kirchsteiger, 2004, McKelvey and Palfrey, 1992
- and backward induction reasoning abilities

  Gneezy et al., 2010; Levitt et al., 2011

Hypothesis 1 (Game theoretic null).

Participants who use backward induction choose non-cooperation.

- P1.1. Regardless of age attributes, players will stop the game at their first chance.
- P1.2. Regardless of age attributes of other player, stop will be chosen at first chance.
- P1.3. Regardless of experience, players will continue to stop the game at their first chance.
- P1.4. The measure of backwards induction derived from the Race to 20 Game will explain variance in the effects predicted by P1.1, 1.2, and 1.3

Hypothesis 2 (Age effects).

Some participants prefer to cooperate (unconditionally, conditionally, or instrumentally), with average rates of initial trust and cooperation increasing with age.

- P2.1 *Initial trust* (choosing "continue" at node 1) should be more frequent among older adults.
- P2.2 *Unconditional cooperation* (choosing "continue" at nodes 1, 2, 3, 4 in the CG and NOT choosing "stop" at subsequent nodes in the same game) should be more frequent among older adults.
- P2.3 *Exploitation* behavior (choosing "stop", at nodes 3 or 4) and the *instrumental cooperation* preceding it should be less frequent among older adults.

Hypothesis 3 (Age interaction effects).

Older adults act more benevolently (demonstrating trust and trustworthiness) when interacting with younger adults.

- P3.1 *Initial trust* (independent of target) should be more frequent among older adults when they are partnered with younger adults.
- P3.2 *Trustworthy* behavior of older adults should be more frequent when partnered with younger adults.
- P3.3 *Exploitation* behavior by older adults should be less frequent when they are partnered with younger adults.

Hypothesis 4.

People believe that older adults have the age-related trust propensities posited in Hypotheses 2 & 3.

- P4.1 Whether for purpose of later exploitation or cooperation, younger adults should show greater *initial trust* when they are partnered with older adults.
- P4.2 Among younger adults seeking relationships with repeated cooperation, trustworthiness will be more frequent when partnered with older adults.
- P4.3 Among younger adults who seek personal gain over a fair endgame, *exploitation* should be more common when paired with older adults.

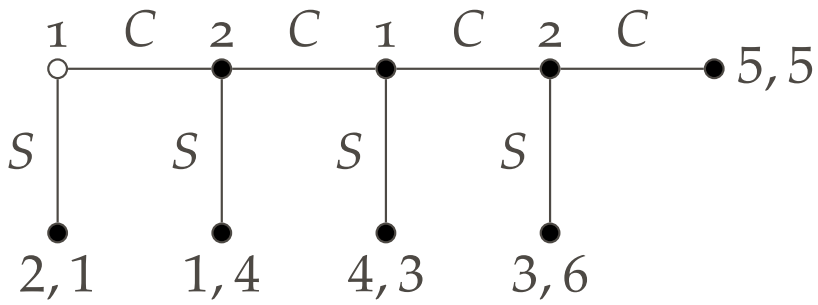
The Experiment

1. 4 centipede games
   - 1st mover is always 1st mover, 2nd mover is always 2nd mover; partners stay with each other
   - Age group of the other player is always known
   - played against either against an Older or Younger other player
2. 4 centipede games repeated
   - the partner and the Age group of the partner changes
   - leads to a balanced 2x2 design with respect to the Age group of the players
3. Revealed social preference measure

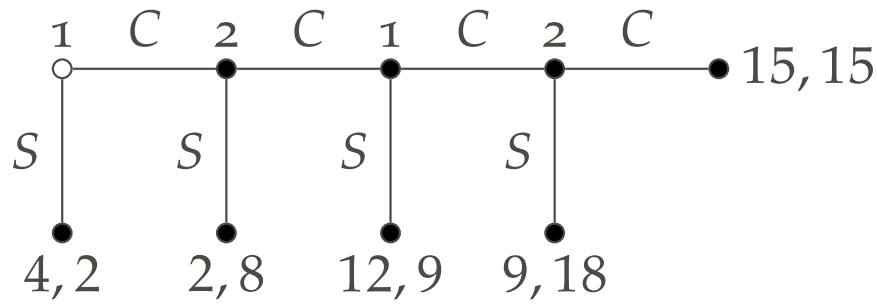
   Kerschbamer, 2015: series of binary choices, non-parametric approach allows to identify several distinct types
4. Measure of backwards induction reasoning ability

   Gneezy et al., 2010: Race to 20, against the computer
5. Questionnaire

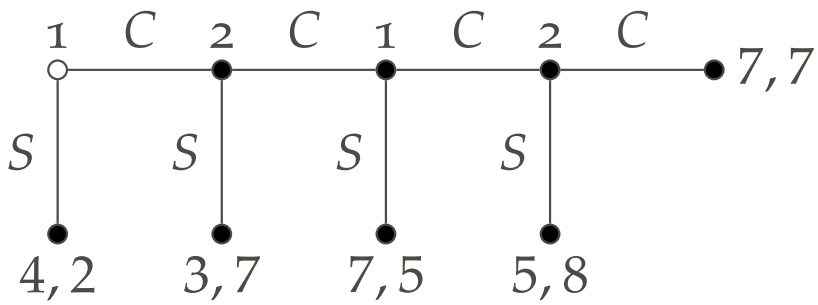
The Centipede Games



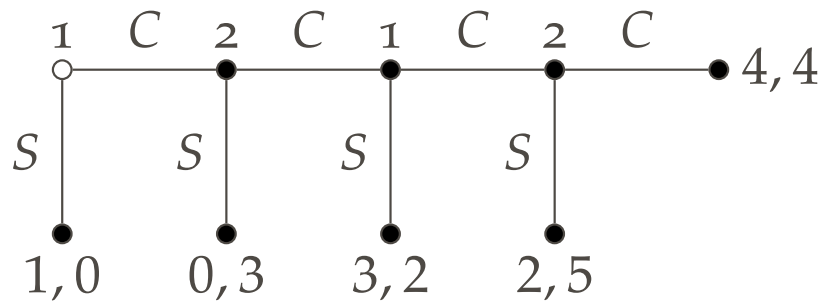
(a) Game 1



(b) Game 2



(c) Game 3



(d) Game 4

Figure: Payoff Specifications

Participants

- None of the subjects participated in an experiment before
- Subjects in a session are not related
- Younger: 18 to 26 years old
- Older: more than 55 years old

	Older Participants	Younger Participants	p-value
Number	82	79	
Number Man	38	34	
Number Women	45	44	
Mean Age	63.9	21.6	
SD Age	6.9	2.1	
Backward Induction Success	33	46	0.027
Other regarding preferences			0.795

Note: Reported p-values are for Fisher's exact test for count data.

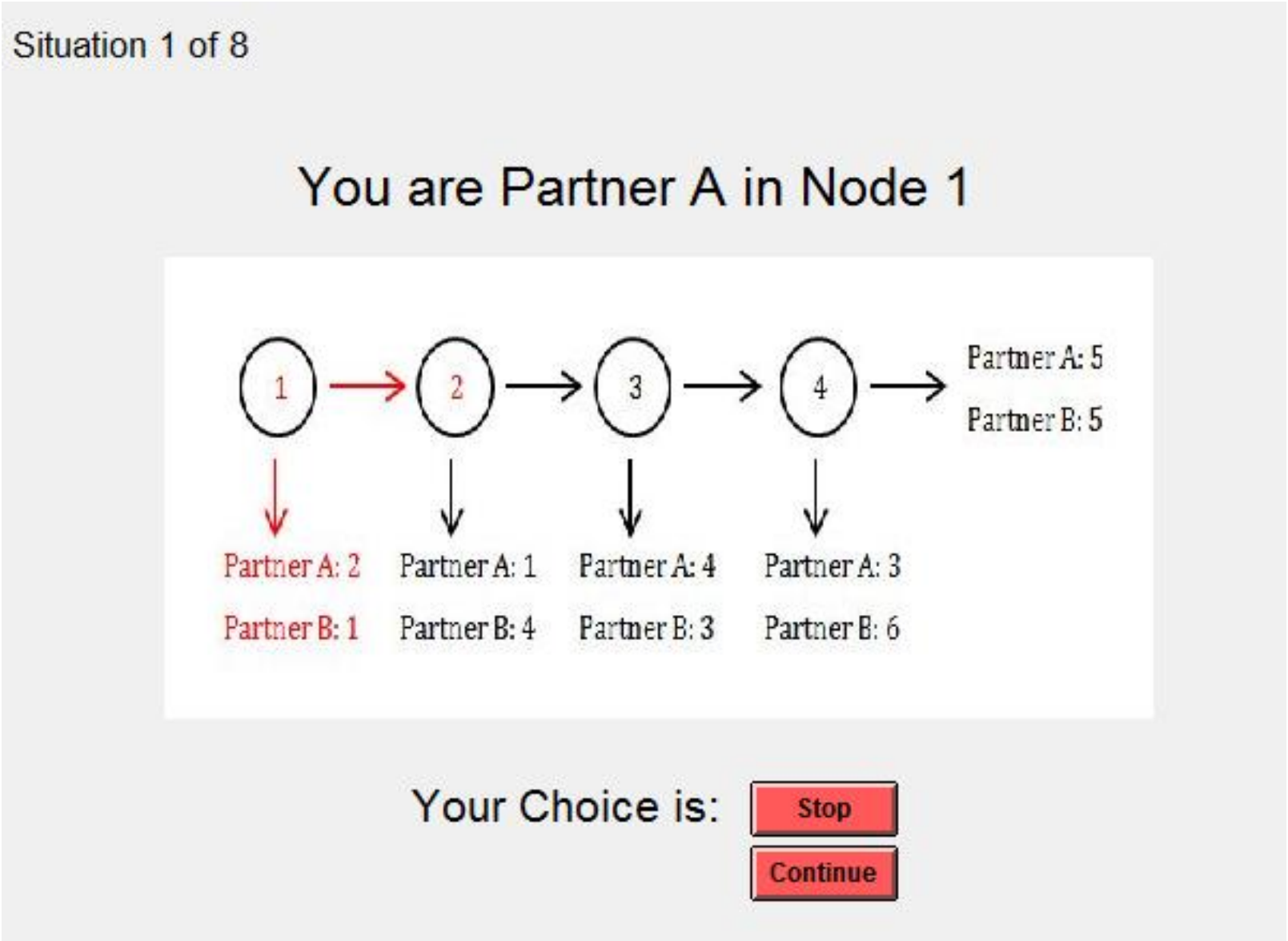
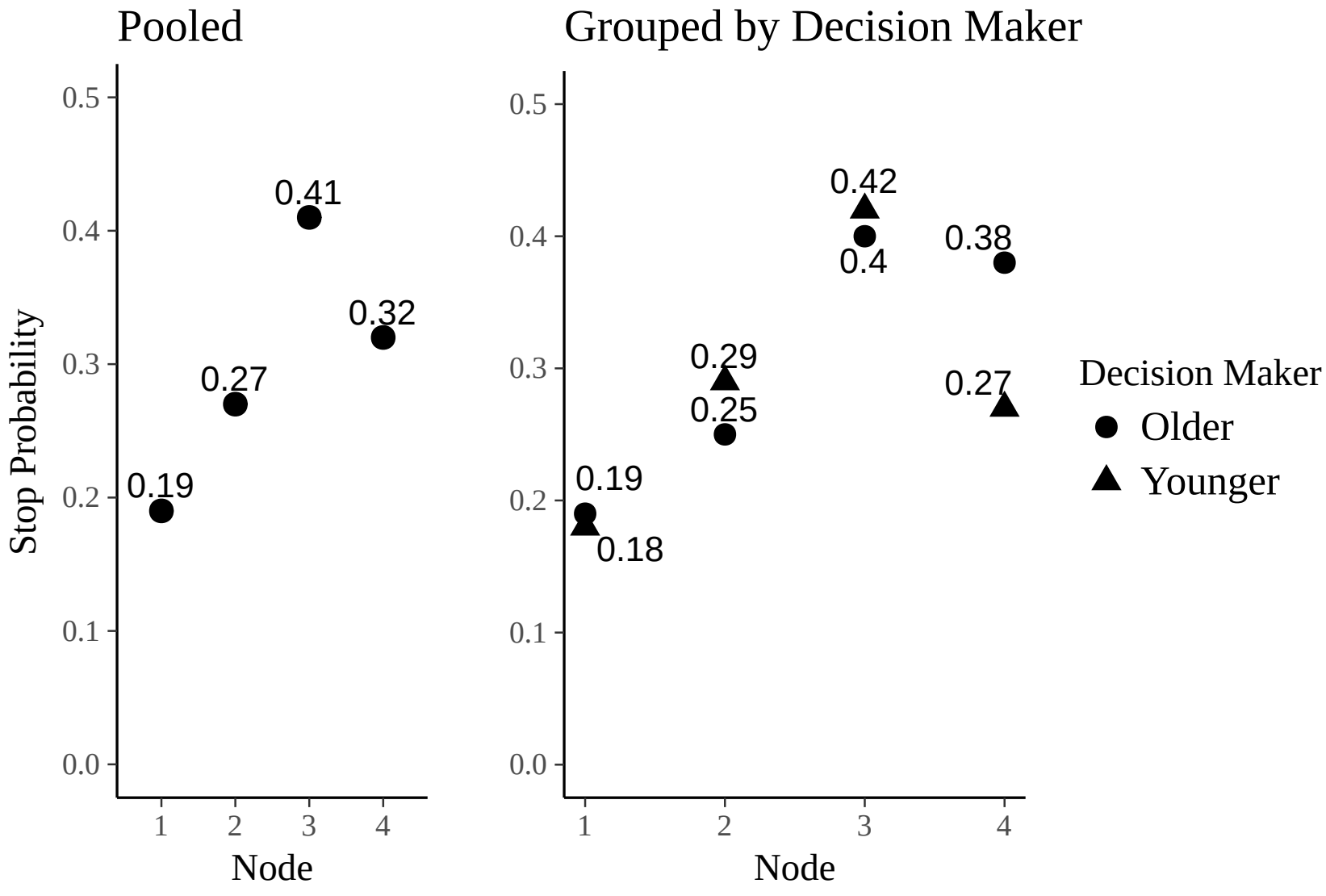


Figure: Centipede Game: Decision Screen

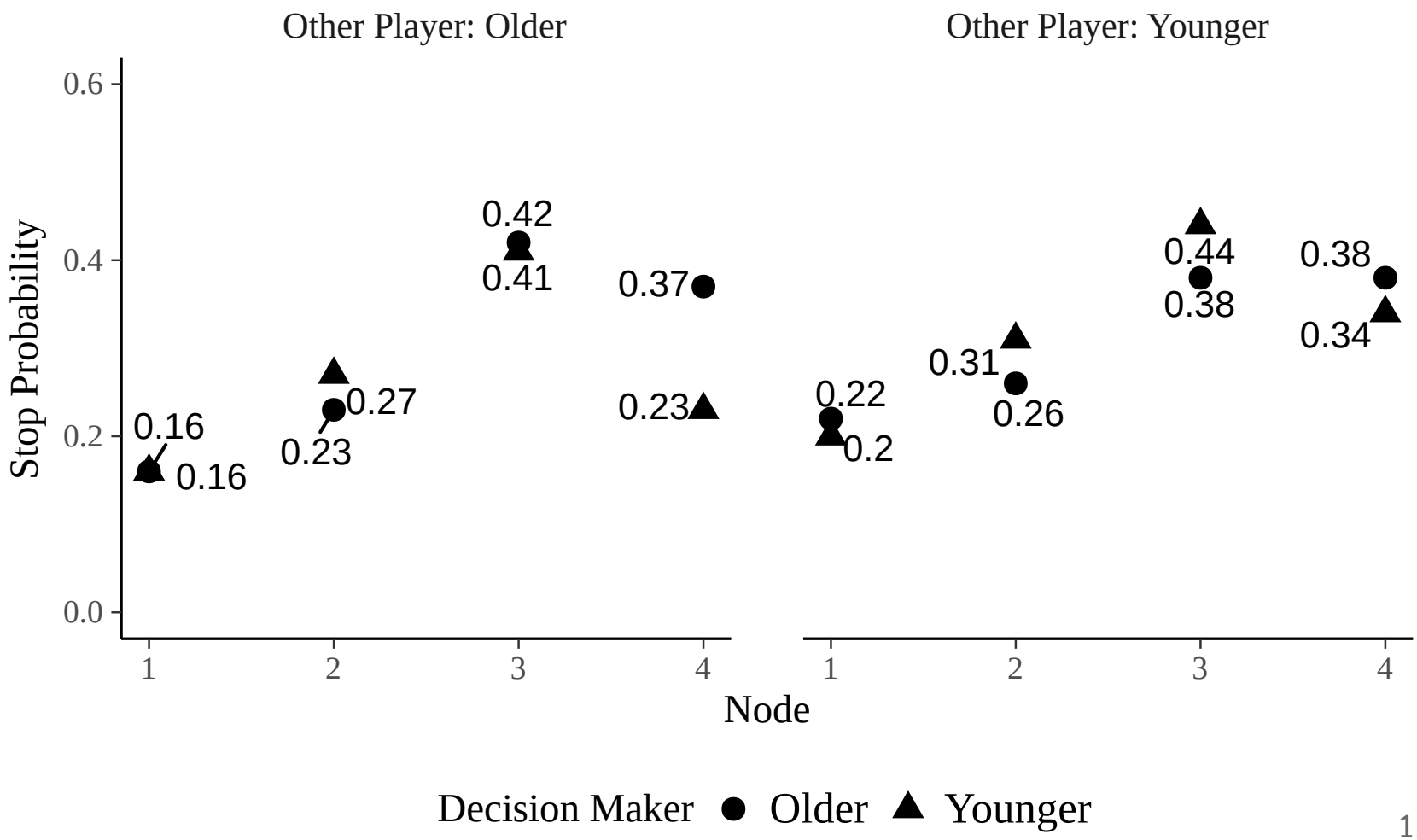
Older decision maker exploit more often

Observed Probability of Stopping the Game



Younger decision maker seem more cooperative with Older other player

Observed Probability of Stopping the Game



Tally of Predictions

Game Theoretic Null

1. ~~P1.1~~, ~~P1.2~~, P1.3, P1.4

Age Effects

2. ~~P2.1~~, P2.2, P2.3

Age Interaction Effects

3. P3.1, P3.2, P3.3
4. P4.1, P4.2, P4.3

Table: How often did the decision maker consistently show unconditional cooperation or instrumental cooperation and exploitation of his partner's trust?

				Other Player:		Other Player:		Other Player:	
				Older	Young	Older		Younger	
DM	All	Older	Young	All	All	Older	Young	Older	Young
Cooperation	41	20	21	54	48	32	22	21	27
Inconsistent	92	50	44	75	74	35	40	36	38
Exploitation	28	12	14	32	39	15	17	25	14
Fisher's test p-value		0.569		0.580		0.337		0.144	
Fisher's exact test p-value, Older vs Younger Other						0.093	0.692		

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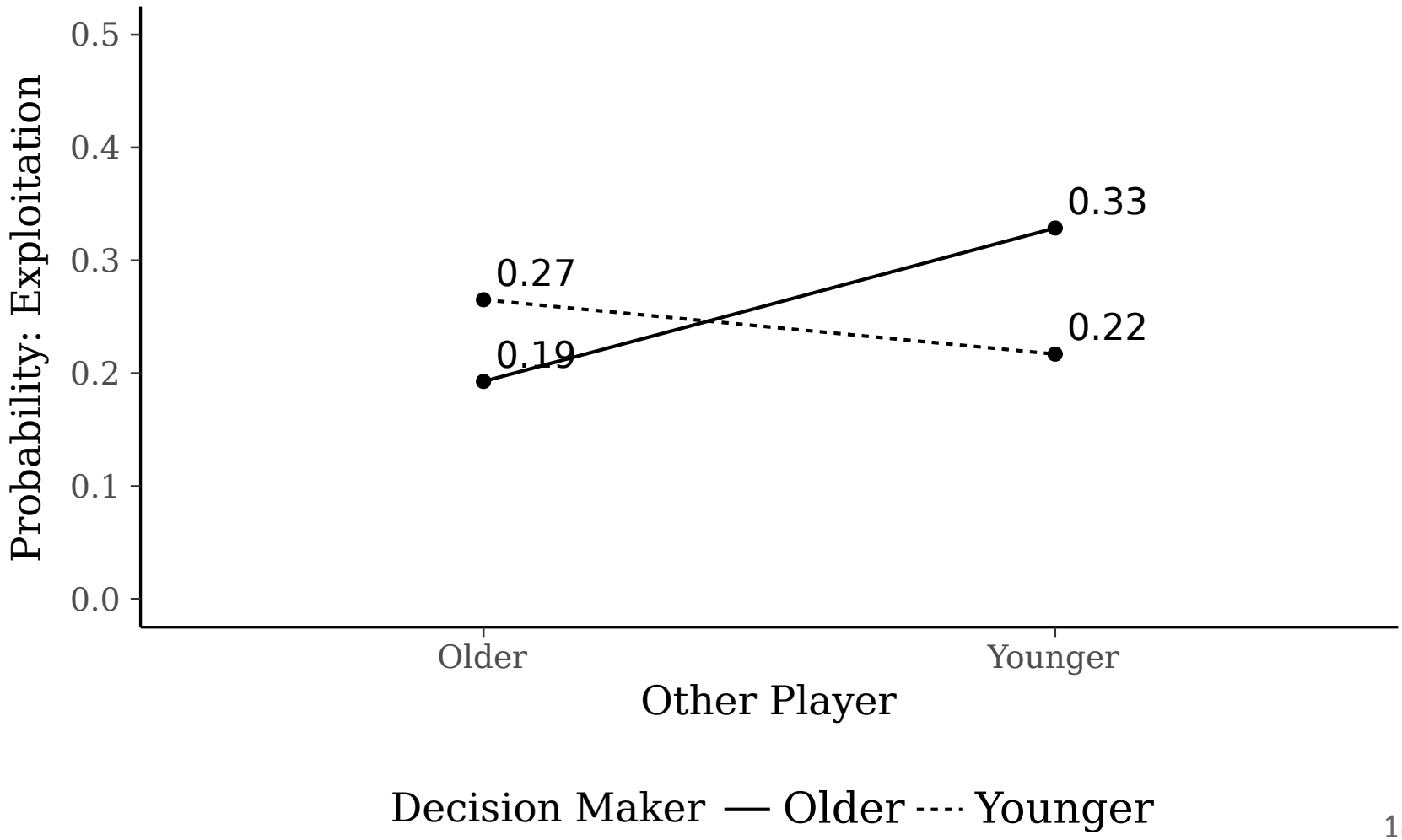
Fisher's exact test p-value, Older vs Younger Other						0.093	0.692		

Older decision maker are more likely to exploit younger interaction partners

Expected Probability of Consistent Exploitation



...and it's worse if they won the Race Game

Expected Probability of Consistent Exploitation

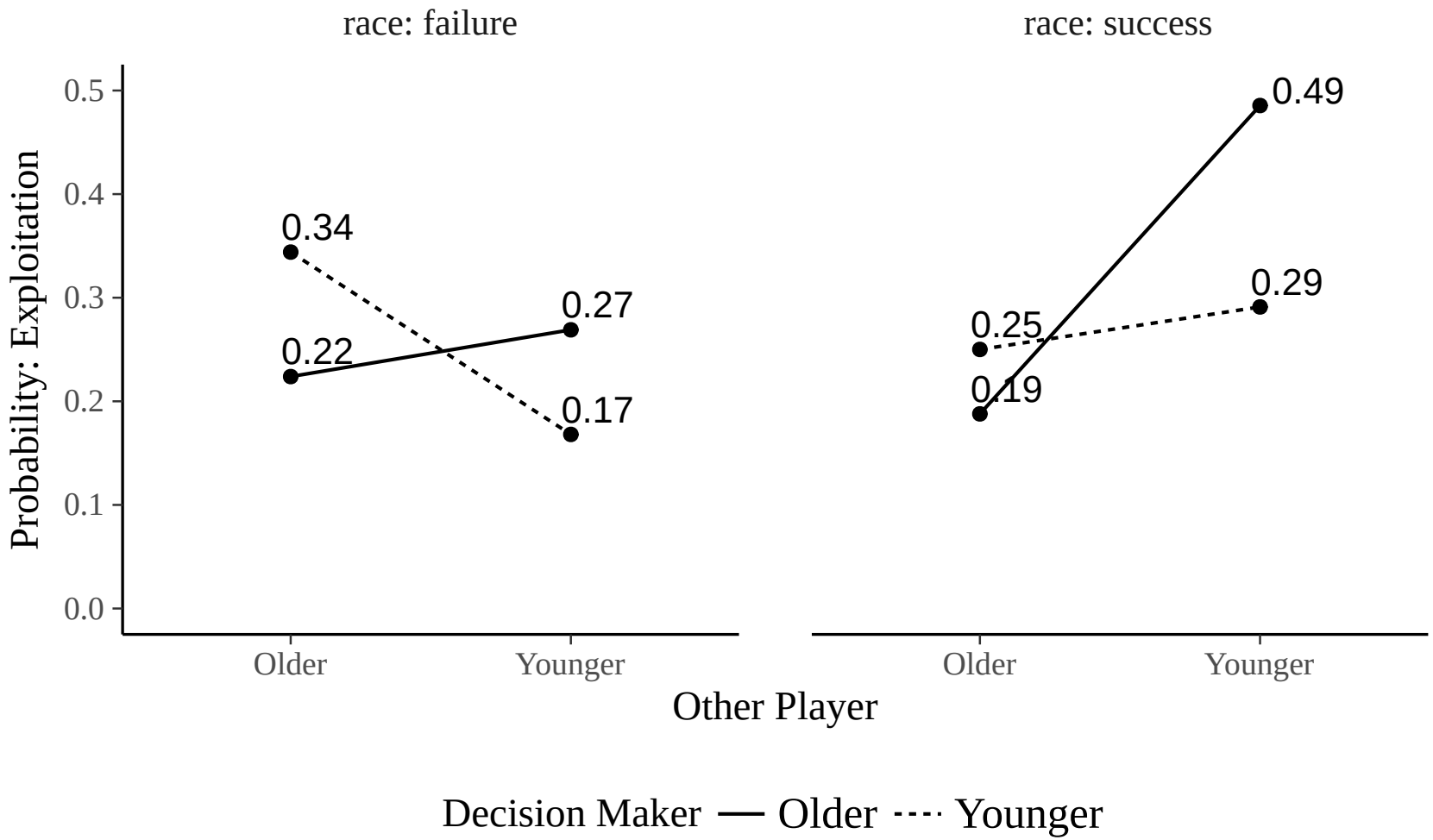


Table: Random Effects Ordinal Probit Regression: Is consistent behavior conditional on own and other player's age?

$Y = \{-1, 0, 1\}$: instrumental cooperation, inconsistent behavior, unconditional coop.

Coefficients	Model 1	Model 2	Model 3
Decision Maker is Younger	-0.258	-0.233	-0.355
	(0.180)	(0.181)	(0.229)
Other Player is Younger	-0.425*	-0.426*	-0.148
	(0.178)	(0.178)	(0.206)
Decision Maker and Other Player is Younger	0.592*	0.593*	0.723**
	(0.254)	(0.254)	(0.259)
Success in Race Game		-0.146	0.139
		(0.139)	(0.237)
DM is Younger and Success in Race Game			0.122
			(0.280)
Other Player is Younger and Success in Race Game			-0.696**
			(0.259)
AIC	677	678	675
SD Random Effects			
Matching Groups [45]	0.394	0.389	0.393
Subjects [161]	<0.001	<0.001	<0.001

Tally of Predictions

Game Theoretic Null

1. ~~P1.1~~, ~~P1.2~~, P1.3, P1.4

Age Effects

2. ~~P2.1~~, ~~P2.2~~, ~~P2.3~~

Age Interaction Effects

3. P3.1, P3.2, ~~P3.3~~
4. P4.1, P4.2, P4.3

Node 1: RG winners are more likely to stop facing a Younger other player

Expected Probability of Continuation

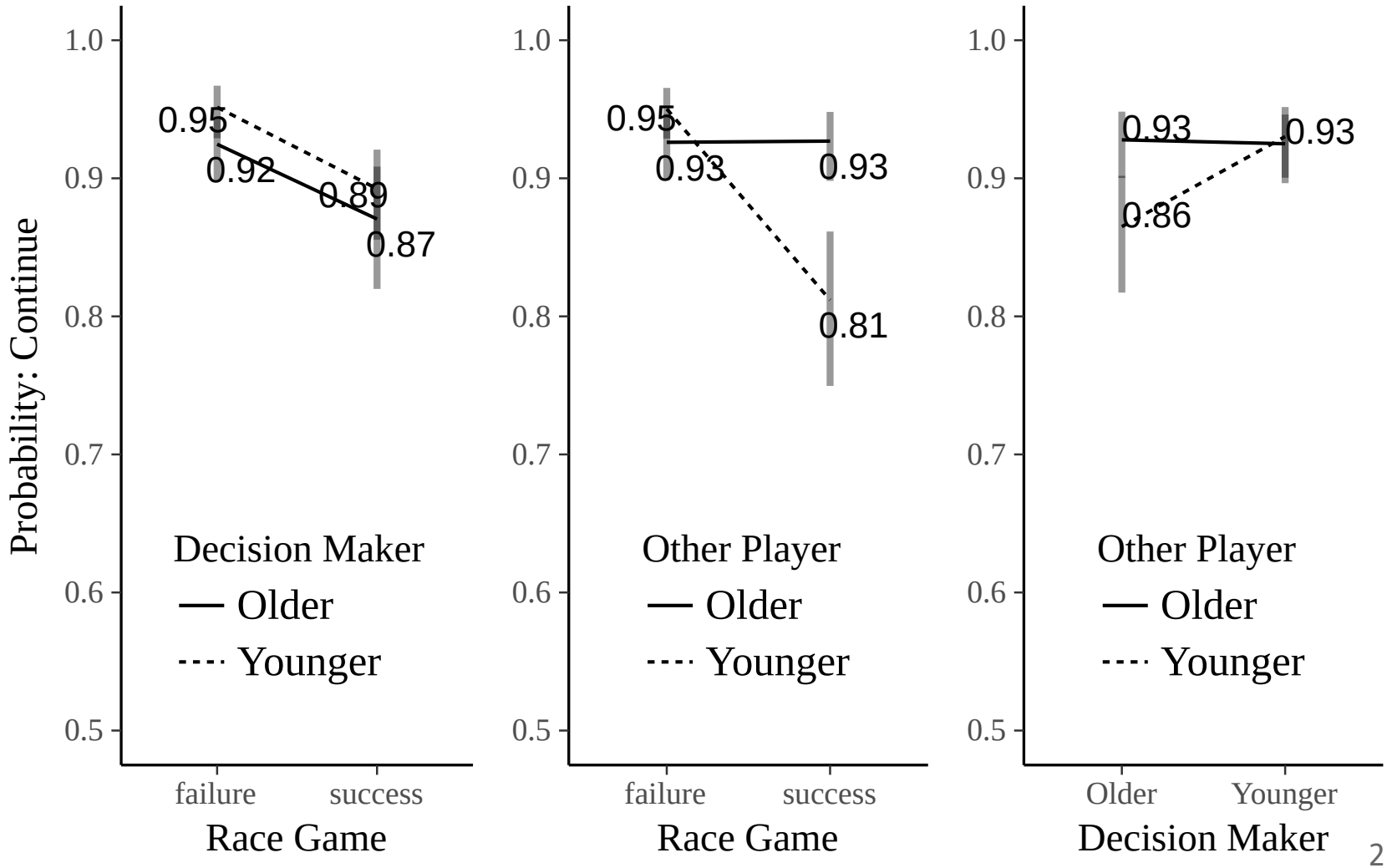


Table: Random Effects Probit Regression: Continuing in Node 1

Coefficients	Model 1	Model2
Intercept	4.910***	4.458***
	(0.827)	(0.842)
Decision Maker is Younger	-0.060	0.086
	(0.473)	(0.594)
Other Player is Younger	-0.681	0.044
	(0.455)	(0.577)
Success in Race Game	-0.672	0.139
	(0.372)	(0.623)
Later Rounds	-2.401***	-2.407***
	(0.687)	(0.688)
Decision Maker and Other Player are Younger	0.516	0.775
	(0.676)	(0.707)
DM is Younger and Success in Race Game		-0.258
		(0.765)
Other Player is Younger and Success in Race Game		-1.500*
		(0.758)
Controls for Centipede Games	✓*	✓*
AIC	570.9	570.6
SD Random Effects [648 Obs.]		

Tally of Predictions

Game Theoretic Null

1. ~~P1.1~~, ~~P1.2~~, P1.3, P1.4

Age Effects

2. ~~P2.1~~, ~~P2.2~~, ~~P2.3~~

Age Interaction Effects

3. ~~P3.1~~ looks more like the opposite (n.s.), P3.2, ~~P3.3~~
4. ~~P4.1~~, P4.2, P4.3

Node 2: Younger RG winners continue, Older RG winners stop

Expected Probability of Continuation

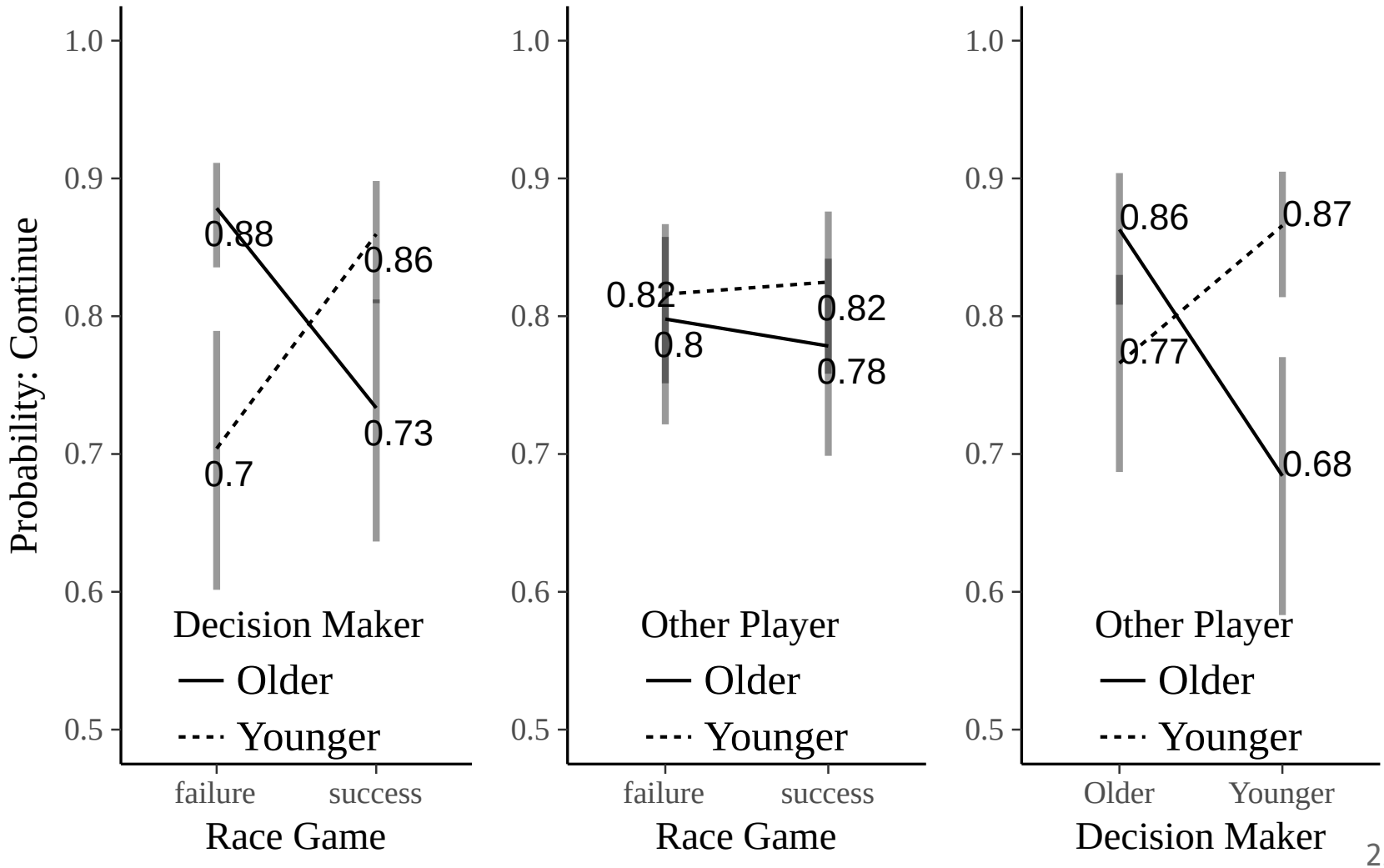


Table: Random Effects Probit Regression: Continuing in Node 2

Coefficients	Model 1	Model2
Intercept	2.071***	2.453***
	(0.509)	(0.571)
Decision Maker is Younger	-0.995	-1.994**
	(0.541)	(0.699)
Other Player is Younger	-0.726	-0.740
	(0.515)	(0.602)
Success in Race Game	-0.055	-1.054
	(0.378)	(0.659)
Later Rounds	-0.411	-0.427
	(0.252)	(0.253)
Decision Maker and Other Player are Younger	1.644*	1.746*
	(0.754)	(0.760)
DM is Younger and Success in Race Game		1.910*
		(0.768)
Other Player is Younger and Success in Race Game		0.177
		(0.746)
Controls for Centipede Games	✓*	✓*
AIC	558.5	555.9
SD Random Effects [528 Obs.]		

Tally of Predictions

Game Theoretic Null

1. ~~P1.1~~, ~~P1.2~~, ~~P1.3~~, P1.4

Age Effects

2. ~~P2.1~~, ~~P2.2~~, ~~P2.3~~

Age Interaction Effects

3. ~~P3.1~~
   looks more like the opposite (node 1: n.s., node 2: sig.), P3.2, ~~P3.3~~
4. ~~P4.1~~, P4.2, P4.3

Node 3: RG winners are nice to Older and nasty to Younger other players

Expected Probability of Continuation

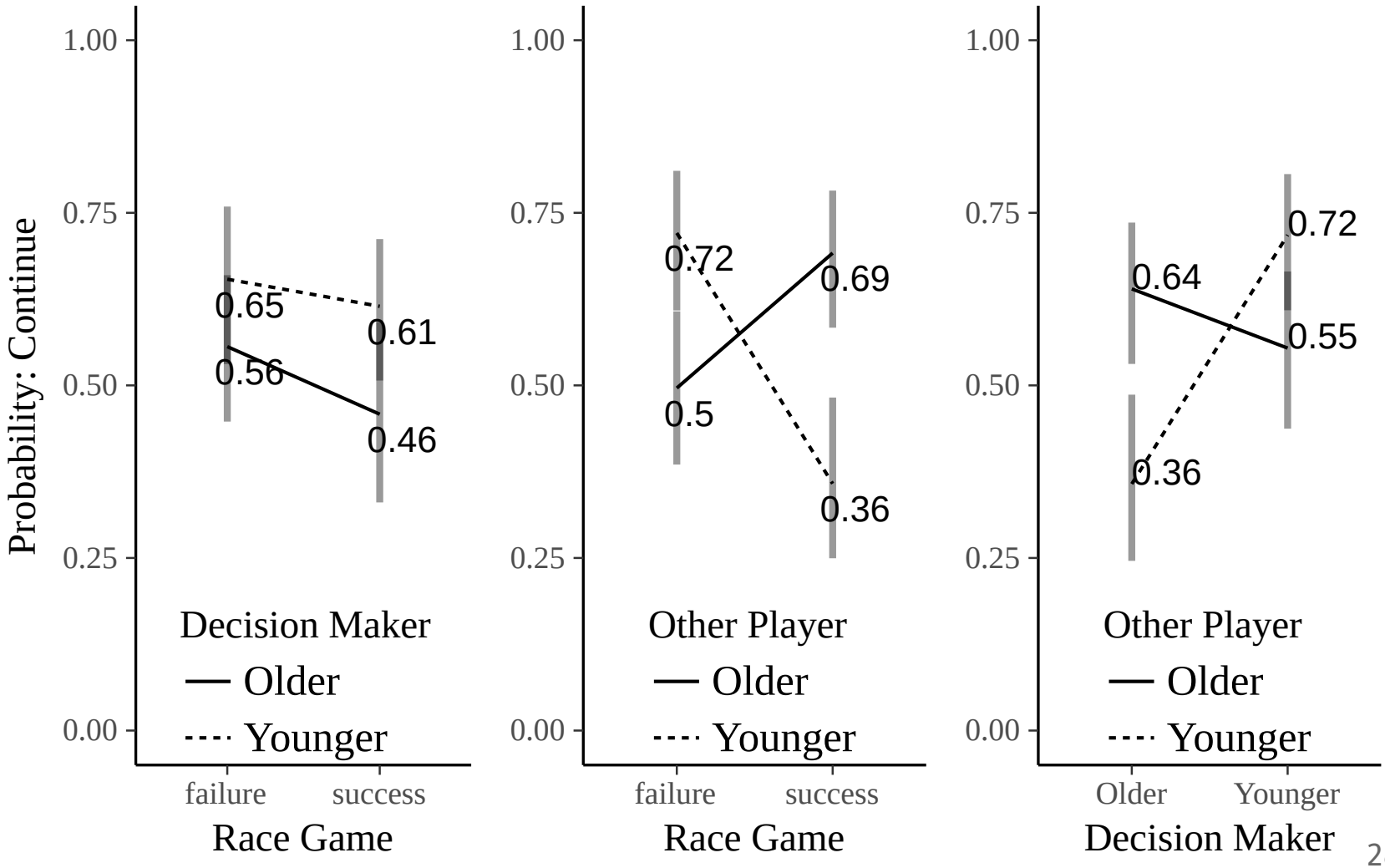


Table: Random Effects Probit Regression: Continuing in Node 3

Coefficients	Model 1	Model 2
Intercept	0.967	0.530
	(0.605)	(0.672)
Decision Maker is Younger	-0.308	-0.337
	(0.619)	(0.775)
Other Player is Younger	-0.769	0.043
	(0.685)	(0.784)
Success in Race Game	-0.142	0.672
	(0.486)	(0.796)
Later Rounds	-0.137	-0.129
	(0.300)	(0.300)
Decision Maker and Other Player are Younger	1.545	1.865
	(0.959)	(0.980)
DM is Younger and Success in Race Game		0.038
		(0.977)
Other Player is Younger and Success in Race Game		-1.956
		(1.002)
Controls for Centipede Games	✓	✓
AIC	463.1	463.1
SD Random Effects [370 Obs.]		

Tally of Predictions

Game Theoretic Null

1. ~~P1.1~~, ~~P1.2~~, ~~P1.3~~, P1.4

Age Effects

2. ~~P2.1~~, ~~P2.2~~, ~~P2.3~~

Age Interaction Effects

3. ~~P3.1~~
   looks more like the opposite (node 1: n.s., node 2: sig.), P3.2 opposite (node 3: n.s.), ~~P3.3~~
4. ~~P4.1~~, P4.2 looks more like the opposite: n.s., P4.3 ✓?

Node 4: Older decision maker and RG winners stop early

Expected Probability of Continuation

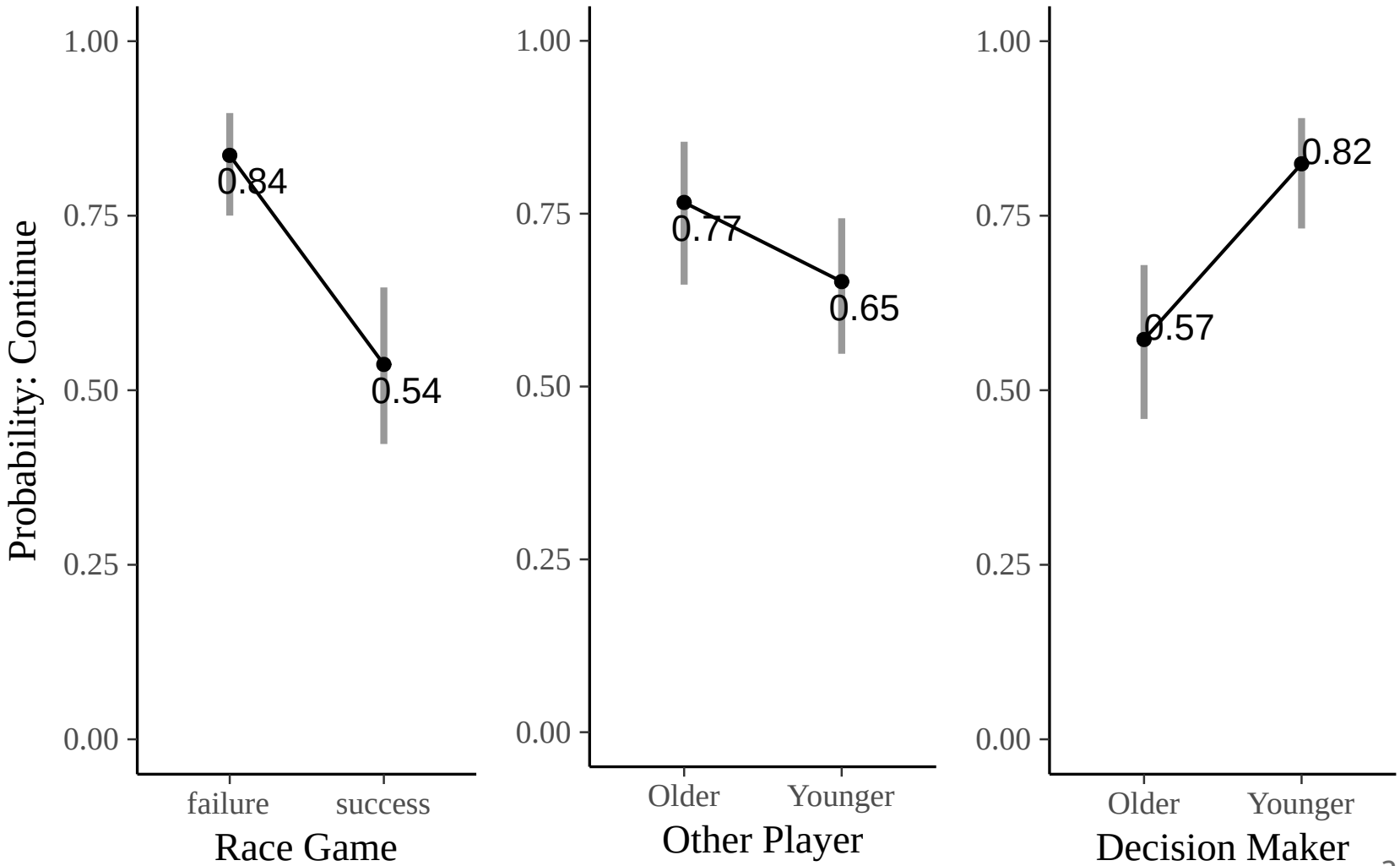


Table: Random Effects Probit Regression: Continuing in Node 4

Coefficients	Model 1	Model 2	Model 3
Intercept	1.995**	2.034**	1.771*
	(0.742)	(0.782)	(0.815)
Decision Maker is Younger	1.590*	1.482	1.091
	(0.625)	(0.910)	(1.313)
Other Player is Younger	-0.883	-0.963	-0.555
	(0.581)	(0.765)	(0.896)
Success in Race Game	-1.782**	-1.764*	-1.112
	(0.682)	(0.689)	(1.030)
Later Rounds	0.486	0.483	0.476
	(0.403)	(0.403)	(0.403)
Decision Maker and Other Player are Younger		0.188	0.601
		(1.160)	(1.263)
DM is Younger and Success in Race Game			0.047
			(1.125)
Other Player is Younger and Success in Race Game			-1.109
			(1.292)
Controls for Centipede Games	✓	✓	✓
AIC	261.0	262.9	266.1
SD Random Effects [222 Obs.]			

Tally of Predictions

Game Theoretic Null

1. ~~P1.1~~, ~~P1.2~~, ~~P1.3~~, P1.4 ✓

Age Effects

2. ~~P2.1~~, ~~P2.2~~, ~~P2.3~~

Age Interaction Effects

3. ~~P3.1~~
   looks more like the opposite (node 1: n.s., node 2: sig.), P3.2 opposite (node 3: n.s.), ~~P3.3~~
4. ~~P4.1~~, P4.2 looks more like the opposite in node 3: n.s., P4.3 ✓?

- The Game theoretic Null is rejected (as expected).
- Backward induction ability helps to explain some of the observed variance.
- Older decision maker are less cooperative than expected. In fact, they are more likely to exploit Younger other players.
- Both Age groups favor their own age group (opposite to our prediction).

The paper will be available on my webpage soon

`https://economicscience.net`

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