

On the Determinants of Cooperation in Infinitely Repeated Games: A Survey Robustness Tables

Pedro Dal Bó Guillaume R. Fréchette
Brown University New York University

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1 Description of Robustness Exercise

In this appendix we present the results from a series of robustness exercises. The appendix is divided in a section for each table or figure from the paper. We explore the robustness to: 1) no clustering of standard errors, 2) fixed effects by paper, 3)focusing on sessions with 15 supergames, 4) considering each treatment/paper as only one observation for round 1 behavior, 5) considering each treatment/paper as only one observation for all rounds, and 6) considering only papers from other authors.

Tables A1 and A2 show the number of observations and the number of treatments for each robustness exercise. It is clear that some of the exercises are very demanding, as the drop in the number of observations is significant. In particular, focusing on papers by other authors greatly reduces the number of treatments considered for supergame 15.

Table A1: Number of Observations by Robustness Exercise

	Supergame		
	1	7	15
Basic / No Clustering / paper FE	2415	2305	1030
Sessions with 15 supergames or more	1030	1030	1030
One obs. per treatment and paper - Round 1	38	38	18
One obs. per treatment and paper - All Rounds	38	38	18
No Paper by Authors	653	641	270

Table A2: Number of Treatments (combinations of δ , g and ℓ)

	Supergame		
	1	7	15
Basic / No Clustering / paper FE	32	32	14
Sessions with 15 supergames or more	14	14	14
One obs. per treatment and paper - Round 1	32	32	14
One obs. per treatment and paper - All Rounds	32	32	14
No Paper by Authors	16	16	6

Note that it is not always possible to do all five of the robustness exercises for every table in the paper. For example, it is not possible to study the robustness of Table 9, which focuses on learning inside sessions, to having only one observation per treatment and article.

2 Table 4: The Effect of Repetition on Round 1 Cooperation

As can be seen from tables A4.1 to A4.6 the main results from Table 4 are largely robust to the different robustness exercises. The effect of δ on cooperation increases with experience in all cases except when going from supergame 7 to 15 if only papers by other authors are considered. However, remember that only six treatments are consider in the latter case.

Note that the effect of δ on cooperation in supergame 1 is not significantly different from zero if we focus on sessions with at least 15 supergames on all rounds or we consider only one observation per treatment/paper - see tables A4.3 and A4.5

Table A4.1: No Clustering

	Supergame 1		Supergame 7		Supergame 15	
	Probit (1)	Marginal (2)	Probit (3)	Marginal (4)	Probit (5)	Marginal (6)
g	-0.202*** (0.0367)	-0.0801*** (0.0146)	-0.332*** (0.0420)	-0.122*** (0.0155)	-0.391*** (0.0958)	-0.156*** (0.0381)
ℓ	-0.142*** (0.0297)	-0.0562*** (0.0118)	-0.229*** (0.0369)	-0.0843*** (0.0135)	-0.361** (0.153)	-0.144** (0.0610)
δ	0.439*** (0.0867)	0.174*** (0.0343)	1.296*** (0.104)	0.476*** (0.0380)	2.186*** (0.240)	0.869*** (0.0953)
Constant	0.0895 (0.0713)		-0.385*** (0.0842)		-0.710*** (0.164)	
N	2415		2305		1030	

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A4.2: Article Fixed Effects

	Probit (1)	Marginal (2)	Probit (3)	Marginal (4)	Probit (5)	Marginal (6)
g	-0.193*** (0.0292)	-0.0763*** (0.0116)	-0.256*** (0.0603)	-0.0940*** (0.0221)	-0.353*** (0.0259)	-0.140*** (0.0103)
ℓ	-0.147*** (0.00862)	-0.0581*** (0.00341)	-0.372*** (0.0222)	-0.137*** (0.00804)	-0.618*** (0.0259)	-0.245*** (0.0103)
δ	0.355** (0.166)	0.141** (0.0657)	1.789*** (0.153)	0.658*** (0.0560)	4.148*** (1.042)	1.649*** (0.414)
N	2415		2305		1030	

Custered standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A4.3: Only Sessions 15 Supergames or More

	Supergame 1		Supergame 7		Supergame 15	
	Probit	Marginal	Probit	Marginal	Probit	Marginal
	(1)	(2)	(3)	(4)	(5)	(6)
g	-0.271** (0.124)	-0.108** (0.0493)	-0.294** (0.143)	-0.115** (0.0566)	-0.391*** (0.117)	-0.156*** (0.0464)
ℓ	0.0416 (0.238)	0.0166 (0.0950)	-0.326** (0.151)	-0.127** (0.0583)	-0.361* (0.187)	-0.144* (0.0747)
δ	-0.0312 (0.147)	-0.0124 (0.0586)	1.065*** (0.244)	0.416*** (0.0926)	2.186*** (0.734)	0.869*** (0.289)
Constant	0.313** (0.134)		-0.253 (0.214)		-0.710 (0.496)	
N	1030		1030		1030	

Clustered standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A4.4: One Obs. per Treatment and Paper - OLS
 Supergame 1 Supergame 7 Supergame 15

	(1)	(2)	(3)
g	-0.0523** (0.0225)	-0.0909*** (0.0266)	-0.138 (0.0955)
ℓ	-0.0623*** (0.0132)	-0.0892*** (0.0156)	-0.0906 (0.147)
δ	0.159** (0.0600)	0.445*** (0.0709)	0.551*** (0.159)
Constant	0.528*** (0.0468)	0.347*** (0.0553)	0.375*** (0.114)
N	38	38	18

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A4.5: All Rounds - One Obs. per Treatment and Paper - OLS

	Supergame 1	Supergame 7	Supergame 15
	(1)	(2)	(3)
g	-0.0673** (0.0264)	-0.0746** (0.0292)	-0.109 (0.107)
ℓ	-0.0545*** (0.0155)	-0.0866*** (0.0172)	-0.150 (0.165)
δ	0.0610 (0.0703)	0.331*** (0.0779)	0.462** (0.178)
Constant	0.530*** (0.0548)	0.336*** (0.0608)	0.403*** (0.128)
N	38	38	18

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A4.6: No Papers by the Authors
 Supergame 1 Supergame 7 Supergame 15

	Probit (1)	Marginal (2)	Probit (3)	Marginal (4)	Probit (5)	Marginal (6)
g	0.0306 (0.152)	0.0122 (0.0605)	-0.168 (0.121)	-0.0664 (0.0484)	-1.244*** (0.244)	-0.489*** (0.0883)
ℓ	-0.162*** (0.0205)	-0.0647*** (0.00817)	-0.385*** (0.0461)	-0.152*** (0.0180)	0.277 (0.229)	0.109 (0.0885)
δ	0.406*** (0.0808)	0.162*** (0.0322)	1.242*** (0.269)	0.491*** (0.109)	0.570** (0.265)	0.224** (0.102)
Constant	-0.109 (0.141)		-0.350** (0.176)		1.008*** (0.179)	
N	653		641		270	

Clustered Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

3 Table 5: Cooperation in Old and New Experiments (Round 1)

Table 5 is not robust to focusing only on sessions with 15 supergames - see Table A5.1. The reason is that, as seen in Table A4.3, in supergame 1 there is no effect of δ on round 1 cooperation for this sample. This results in a flat predicted level of cooperation in the first supergame as a function of δ . Regardless of this difference, all tables show that the predicted effect of δ on cooperation for the game used in Roth and Murnighan [1978] is increasing with experience, which was the main point of Table 5 in the paper.

Table A5.1: Sessions with 15 Supergames or More

	Continuation Probability		
	0.105	0.5	0.895
Roth and Murnighan	19.00	29.75	36.36
New Estimates (fitted):			
Supergame 1	57.73	57.25	56.77
Supergame 7	32.59	48.78	65.17
Supergame 15	19.57	50.26	80.78

Table A5.2: One Observation per Treatment and Paper

	Continuation Probability		
	0.105	0.5	0.895
Roth and Murnighan	19.00	29.75	36.36
New Estimates (fitted):			
Supergame 1	48.68	54.97	61.25
Supergame 7	30.35	47.94	65.52
Supergame 15	31.84	53.59	75.33

Table A5.3: No Papers by the Authors

	Continuation Probability		
	0.105	0.5	0.895
Roth and Murnighan	19.00	29.75	36.36
New Estimates (fitted):			
Supergame 1	44.73	51.11	57.46
Supergame 7	31.01	49.80	68.64
Supergame 15	72.06	79.10	84.97

4 Table 6: Equilibrium Condition and Cooperation in Round 1

Table 6 is also largely robust to the different robustness exercises. The main differences are obtained in supergame 1 when we only consider sessions with at least 15 supergames or we consider one observation per treatment and paper and all rounds. In those cases, the difference in cooperation between SPE and Not SPE treatments is not significant for supergame 1. However, this lends support to one of the main messages of the paper which indicates that differences across treatments increase as subjects gain experience.

Table A6.1: No Clustering or Article Fixed Effects

	Not SPE	SPE	Difference
Supergame 1	34.34	51.23	16.89***
Supergame 7	13.86	48.83	34.97***
Supergame 15	16.67	53.05	36.38***

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A6.2: Sessions with 15 Supergames or More

	Not SPE	SPE	Difference
Supergame 1	44.44	52.71	8.26
Supergame 7	22.22	46.50	24.28**
Supergame 15	16.67	53.05	36.38***

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A6.3: One Observation per Treatment and Paper

	Not SPE	SPE	Difference
Supergame 1	39.43	50.26	10.82*
Supergame 7	19.41	45.24	25.83***
Supergame 15	18.59	51.05	32.46**

Significance based on Wald test.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A6.4: One Observation per Treatment and Paper - All Rounds

	Not SPE	SPE	Difference
Supergame 1	37.76	42.40	5.04
Supergame 7	18.66	37.72	19.06**
Supergame 15	17.11	44.73	27.62*

Significance based on Wald test.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A6.5: No Paper by the Authors

	Not SPE	SPE	Difference
Supergame 1	41.79	51.54	9.75**
Supergame 7	25.37	49.30	23.93***
Supergame 15	21.43	58.98	37.55***

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5 Table 7: Risk Dominance and Cooperation in Round 1

Table 7 is also largely robust to the different robustness exercises. The main difference is obtained when only papers by other authors are considered. In that case the difference in cooperation between RD and Not RD treatments is not significant in supergame 1. However, this lends support to one of the main messages of the paper which indicates that differences across treatments increase as subjects gain experience.

Table A7.1: No Clustering or Articles Fixed Effects

	Not RD	RD	Difference
Supergame 1	35.64	54.22	18.57***
Supergame 7	16.10	55.88	39.79***
Supergame 15	20.33	63.06	42.73***

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A7.2: Sessions with 15 Supergames or More

	Not RD	RD	Difference
Supergame 1	43.68	55.86	12.18*
Supergame 7	23.35	53.90	30.55***
Supergame 15	20.33	63.06	42.73***

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A7.3: One Observation per Treatment and Paper

	Not RD	RD	Difference
Supergame 1	40.12	53.21	13.09***
Supergame 7	19.48	53.41	33.93***
Supergame 15	21.94	61.35	39.41***

Significance based on Wald test.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A7.4: One Observation per Treatment and Paper - All Rounds

	Not RD	RD	Difference
Supergame 1	36.09	45.08	8.99*
Supergame 7	17.18	44.86	27.68***
Supergame 15	17.76	55.26	37.50***

Significance based on Wald test.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A7.5: No Papers by the Authors

	Not RD	RD	Difference
Supergame 1	43.42	53.14	9.72
Supergame 7	22.86	55.79	32.93***
Supergame 15	30.95	61.84	30.89***

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

6 Figure 4: The Relation Between Three Indexes and Cooperation (Round 1, Supergame 7)

Figure 4 does not change much when all rounds are considered.

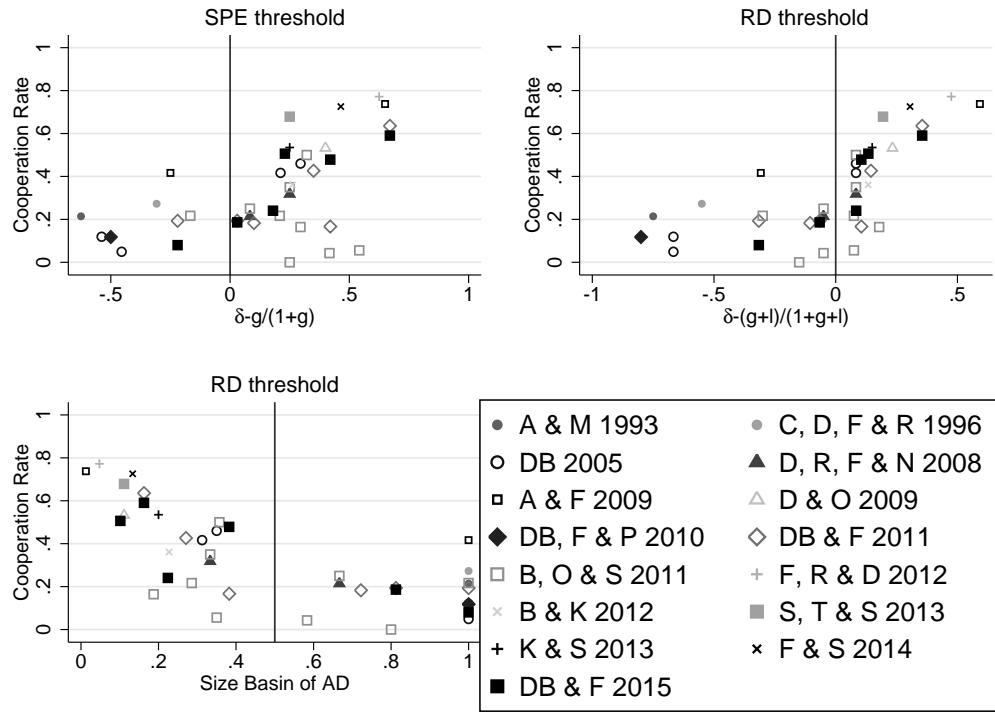


Figure 4: All Rounds

7 Table 8: The Impact of the Indexes on Co-operation (Round 1 - Marginal Effects)

Table 8 is largely robust to the performed exercises with the main differences occurring for supergame 15 when no paper by the authors is considered. This is not surprising as the number of treatments considered then is quite small.

Table A8.1: No Clustering

Supergame

	7 (1)	15 (2)	7 (3)	15 (4)	7 (5)	15 (6)
SPE	-0.0986 (0.0795)	0.195* (0.111)				
$(\delta - \delta^{SPE}) \times SPE$	0.747*** (0.0636)	0.979*** (0.0878)				
$(\delta - \delta^{SPE}) \times \text{Not SPE}$	0.566*** (0.168)	-0.349 (0.391)				
RD		0.113*** (0.0381)	0.121** (0.0604)	0.225* (0.121)	0.420** (0.180)	
$(\delta - \delta^{RD}) \times RD$		1.030*** (0.114)	1.677*** (0.217)			
$(\delta - \delta^{RD}) \times \text{Not RD}$		0.238*** (0.0537)	0.235 (0.191)			
$SizeBAD \times RD$				0.902*** (0.130)	-1.139*** (0.207)	
$SizeBAD \times \text{Not RD}$				0.429*** (0.134)	-0.342 (0.251)	
N	2305	1030	2305	1030	2305	1030
Different Slope p-value	0.3168	0.0009	<0.0001	<0.0001	0.0112	0.0143

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A8.2: Article Fixed Effects
Supergame

	7 (1)	15 (2)	7 (3)	15 (4)	7 (5)	15 (6)
SPE	-0.206 (0.134)	0.254*** (0.0637)				
$(\delta - \delta^{SPE}) \times SPE$	0.668*** (0.0616)	1.137*** (0.0218)				
$(\delta - \delta^{SPE}) \times \text{Not SPE}$	1.190*** (0.294)	-0.539*** (0.128)				
RD		0.0970** (0.0451)	0.0669 (0.0467)	-0.0261 (0.297)	0.477*** (0.160)	
$(\delta - \delta^{RD}) \times RD$		0.802*** (0.170)	1.786*** (0.139)			
$(\delta - \delta^{RD}) \times \text{Not RD}$		0.512*** (0.0985)	0.958*** (0.295)			
$SizeBAD \times RD$				-0.428 (0.359)	-1.755*** (0.428)	
$SizeBAD \times \text{Not RD}$					-0.579* (0.297)	-0.589*** (0.0854)
N	2305	1030	2305	1030	2305	1030
Different Slope p-value	0.1158	<0.0001	0.1385	<0.0001	0.7988	0.0183

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A8.3: Sessions with 15 Supergames or More
Supergame

	7 (1)	15 (2)	7 (3)	15 (4)	7 (5)	15 (6)
SPE	0.0632 (0.145)	0.195 (0.136)				
$(\delta - \delta^{SPE}) \times SPE$		0.709*** (0.0598)	0.979*** (0.0733)			
$(\delta - \delta^{SPE}) \times \text{Not SPE}$	-0.107 (0.280)	-0.349 (0.275)				
RD			0.123* (0.0673)	0.121*** (0.0415)	0.231 (0.328)	0.420* (0.243)
$(\delta - \delta^{RD}) \times RD$			0.988*** (0.225)	1.677*** (0.178)		
$(\delta - \delta^{RD}) \times \text{Not RD}$			0.0818 (0.187)	0.235 (0.273)		
<i>SizeBAD</i> \times RD					-0.581 (0.451)	-1.139*** (0.372)
<i>SizeBAD</i> \times Not RD					-0.264 (0.396)	-0.342 (0.368)
<i>N</i>	1030	1030	1030	1030	1030	1030
Different Slope p-value	0.0128	<0.0001	0.0116	<0.0001	0.6620	0.1046

Clustered Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A8.4: One Observation per Treatment and Paper - OLS

	Supergame					
	7 (1)	15 (2)	7 (3)	15 (4)	7 (5)	15 (6)
SPE	-0.0738 (0.156)	0.113 (0.194)				
$(\delta - \delta^{SPE}) \times SPE$		0.733*** (0.172)	0.913*** (0.220)			
$(\delta - \delta^{SPE}) \times \text{Not SPE}$	0.273 (0.358)	-0.142 (0.480)				
RD			0.112* (0.0585)	0.122 (0.118)	0.578*** (0.196)	0.372 (0.442)
$(\delta - \delta^{RD}) \times RD$			1.046*** (0.168)	1.432*** (0.463)		
$(\delta - \delta^{RD}) \times \text{Not RD}$			0.0959 (0.103)	0.110 (0.228)		
$SizeBAD \times RD$					-1.174*** (0.238)	-0.855 (0.607)
$SizeBAD \times \text{Not RD}$					-0.0345 (0.209)	-0.265 (0.465)
Constant	0.294** (0.142)	0.139 (0.178)	0.226*** (0.0435)	0.247*** (0.0756)	0.225 (0.187)	0.451 (0.412)
<i>N</i>	38	18	38	18	38	18
Different Slope p-value	0.2553	0.0654	<0.0001	0.0226	0.001	0.4527

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A8.5: All Rounds - One Observation per Treatment and Paper - OLS
 Supergame

	7 (1)	15 (2)	7 (3)	15 (4)	7 (5)	15 (6)
SPE	-0.0878 (0.164)	0.0762 (0.225)				
$(\delta - \delta^{SPE}) \times SPE$	0.623*** (0.181)	0.935*** (0.257)				
$(\delta - \delta^{SPE}) \times \text{Not SPE}$	0.221 (0.378)	-0.197 (0.558)				
RD		0.0785 (0.0679)	0.121 (0.141)	0.645*** (0.213)	0.594 (0.508)	
$(\delta - \delta^{RD}) \times RD$		1.015*** (0.194)	1.503** (0.551)			
$(\delta - \delta^{RD}) \times \text{Not RD}$		0.0256 (0.120)	-0.0140 (0.272)			
$SizeBAD \times RD$				-1.191*** (0.258)	-0.932 (0.697)	
$SizeBAD \times \text{Not RD}$				0.109 (0.227)	-0.0114 (0.534)	
Constant	0.267* (0.150)	0.106 (0.207)	0.180*** (0.0505)	0.174* (0.0900)	0.0760 (0.203)	0.188 (0.474)
<i>N</i>	38	18	38	18	38	18
Different Slope p-value	0.3438	0.0866	0.0001	0.0270	0.0006	0.3121

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A8.6: No Paper by the Authors

	Supergame					
	7 (1)	15 (2)	7 (3)	15 (4)	7 (5)	15 (6)
SPE	-0.00639 (0.0719)	0.0689 (0.0622)				
$(\delta - \delta^{SPE}) \times SPE$	0.749** (0.339)	1.424*** (0.407)				
$(\delta - \delta^{SPE}) \times \text{Not SPE}$	0.118* (0.0637)					
RD		0.0885 (0.0765)	0.295 (0.182)	0.554*** (0.134)	-0.111* (0.0616)	
$(\delta - \delta^{RD}) \times RD$		1.529*** (0.228)	-0.319 (1.033)			
$(\delta - \delta^{RD}) \times \text{Not RD}$		-0.0303 (0.166)	0.239*** (0.00432)			
<i>SizeBAD</i> \times RD				-1.417*** (0.267)	0.216 (0.474)	
<i>SizeBAD</i> \times Not RD				0.0678 (0.246)	-0.501*** (0.00905)	
Constant						
<i>N</i>	641	270	641	270	641	270
Different Slope p-value	0.0386	0.0010	<0.0001	0.5909	0.0001	0.1322

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

8 Table 9: Determinants of the Evolution of Behavior (Round 1 Cooperation)

Only two robustness exercises are performed for Table 9, no clustering and no paper by the authors, as the other exercises make it impossible to address the question studied in that section. The results are extremely similar. Note that in one case the turnpike dummy variable is statistically significant. Its effect, however, is positive—the opposite of what one would expect.

Table A9.1: No Clustering

	(1)		(2)	
	Marginal Effects	Standard Errors	Marginal Effects	Standard Errors
g	-0.0215	(0.0144)	-0.0240	(0.0154)
ℓ	-0.0410***	(0.00882)	-0.0379***	(0.00929)
δ	-0.0722	(0.0809)	-0.0567	(0.0874)
SPE	0.0758	(0.0479)	0.0739	(0.0497)
RD	0.398***	(0.0420)	0.391***	(0.0454)
$SizeBAD \times RD$	-0.969***	(0.111)	-0.958***	(0.116)
Supergame \times Not RD	-0.0008***	(0.0001)	-0.0008***	(0.000114)
Supergame \times RD	0.0038***	(0.0003)	0.0038***	(0.0003)
Length of Previous Supergame— $E(Length)$	0.0057***	(0.0007)	0.0057***	(0.0007)
Other's Coop in Previous Supergame	0.120***	(0.0047)	0.120***	(0.0047)
Turnpike			0.0188	(0.0225)
Complete Stranger			-0.0121	(0.0272)
Coop in Supergame 1	0.292***	(0.0130)	0.292***	(0.0130)
N	45,991		45,991	

Clustered Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A9.2: Article Fixed Effects

	Marginal Effects	Standard Errors
g	-0.0309**	(0.0125)
ℓ	-0.0774***	(0.00795)
δ	0.233*	(0.128)
SPE	0.0186	(0.0777)
RD	0.253***	(0.0607)
$SizeBAD \times RD$	-0.656***	
Supergame \times Not RD	-0.0008**	(0.0004)
Supergame \times RD	0.0038***	(0.0010)
Length of Previous Supergame - $E(\text{Length})$	0.0057***	(0.0007)
Other's Coop in Previous Supergame	0.120***	(0.0140)
Coop in Supergame 1	0.292***	(0.0367)
<i>N</i>	45,991	

Clustered Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A9.3: No Papers by Authors

	(1)		(2)	
	Marginal Effects	Standard Errors	Marginal Effects	Standard Errors
g	-0.0454	(0.0421)	0.0133	(0.0217)
ℓ	-0.0747***	(0.00818)	-0.0636***	(0.00708)
δ	0.267***	(0.0880)	0.0920	(0.0613)
SPE	-0.132***	(0.0387)	-0.0728**	(0.0345)
RD	0.206***	(0.0313)	0.249***	(0.0675)
<i>SizeBAD</i> \times RD	-0.536***	(0.174)	-0.416	(0.355)
Supergame \times Not RD	-0.0003***	(0.0001)	-0.0003***	(0.0001)
Supergame \times RD	0.0100***	(0.0015)	0.0104***	(0.0015)
Length of Previous Supergame – $E(\text{Length})$	0.0064***	(0.0019)	0.0066***	(0.0021)
Other's Coop in Previous Supergame	0.105***	(0.0180)	0.108***	(0.0177)
Turnpike			0.223***	(0.0717)
Complete Stranger			0.0137	(0.0309)
Coop in Supergame 1	0.340***	(0.0323)	0.351***	(0.0336)
<i>N</i>	11,355		11,355	

Clustered Standard errors in parentheses

 $* p < 0.10$, $** p < 0.05$, $*** p < 0.01$