Habitual communication

Konstantinos Ioannidis

University of Cambridge

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Introduction

An illustration

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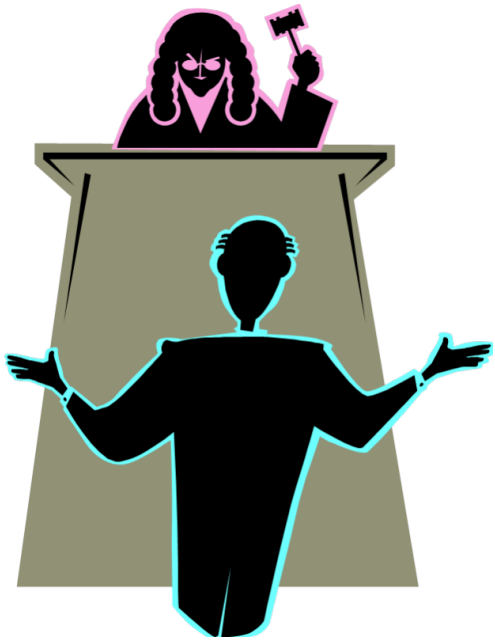

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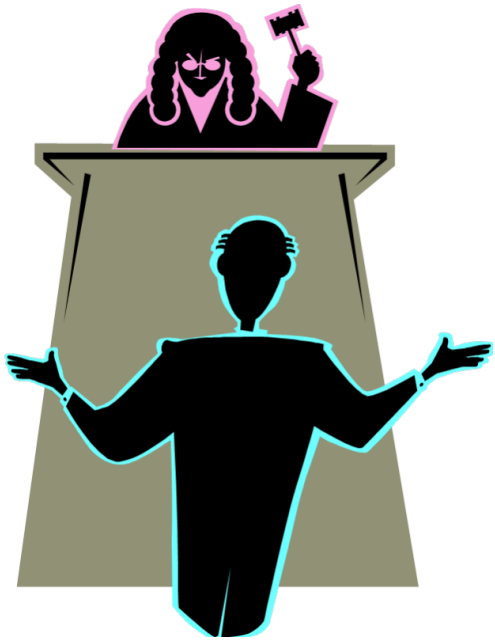

Research questions

1. Do people rely on communication habits in unfamiliar environments?
2. Does reliance on communication habits depend on how often we interact in unfamiliar environments?

Literature & Contributions

1. Habitual behaviour: consumption (Havranek et al., 2017), savings (De Mel et al., 2013), exercising (Charness and Gneezy, 2009; Acland and Levy, 2015; Royer et al., 2015), voting (Coppock and Green, 2016; Fujiwara et al., 2016), cooperation (Peysakhovich and Rand, 2016; Arechar et al., 2018)
   Contribution: *Evidence for habitual (strategic) communication*
2. Communication experiments: (Cai and Wang, 2006; Kawagoe and Takizawa, 2009; Wang et al., 2010; Belot and van de Ven, 2019)
   Contribution: *Habits can lead to either overcommunication or undercommunication*

Design

The sender-receiver game

Participants are randomly rematched to play a sender-receiver game

1. Senders learn the state (s), randomly drawn from $\{1,2,3,4,5\}$
2. Senders send a message (m) of type "The state is X"
3. Receivers see the message and choose an action (a) from $\{1,2,3,4,5\}$
4. Payoffs are realised according to
   $U^S(a,s,b) = 110 - 20|s - a + b|^{1.4}$, $U^R(a,s) = 110 - 20|s - a|^{1.4}$
5. Players receive feedback on state, message, action and realised payoffs
6. Games used: aligned ($b = 0.2$), partial ($b = 1$), and conflict ($b = 2$)

Screenshots here.

2×2 between subjects treatment design

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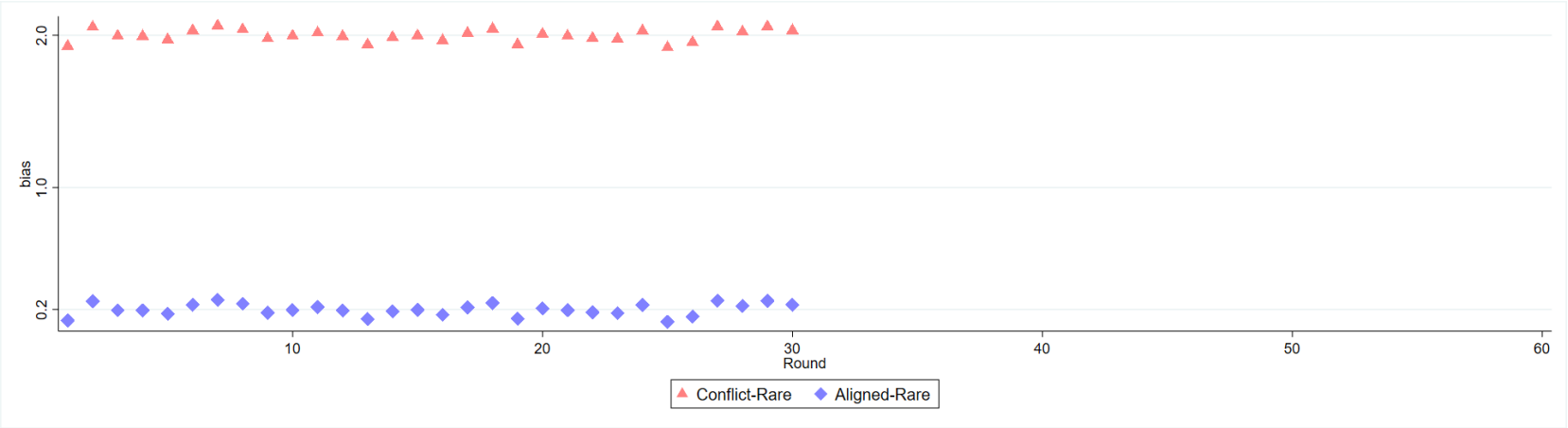
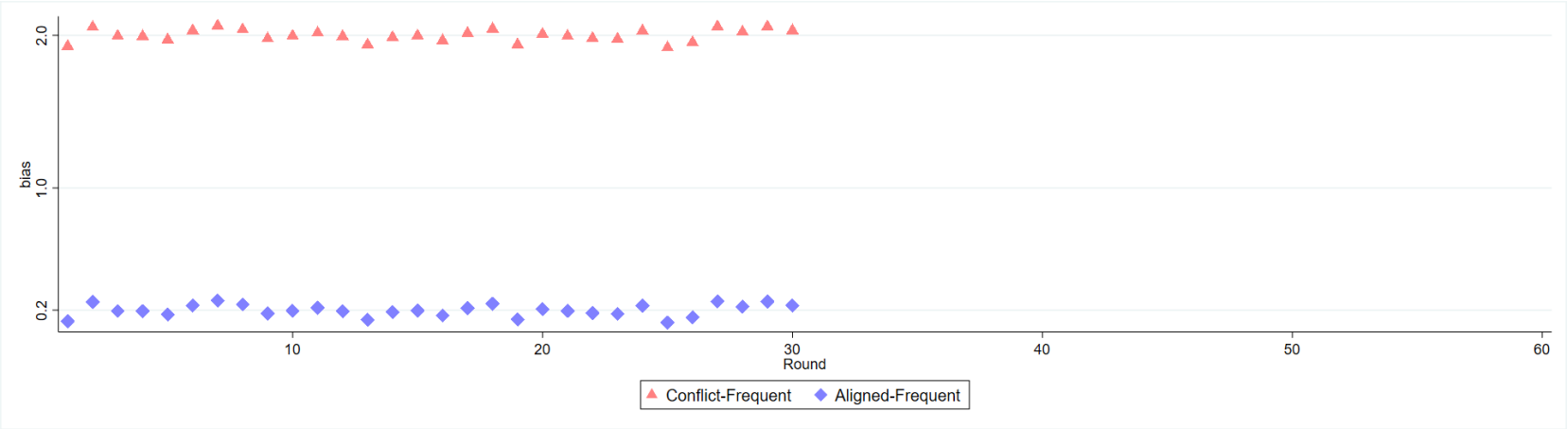
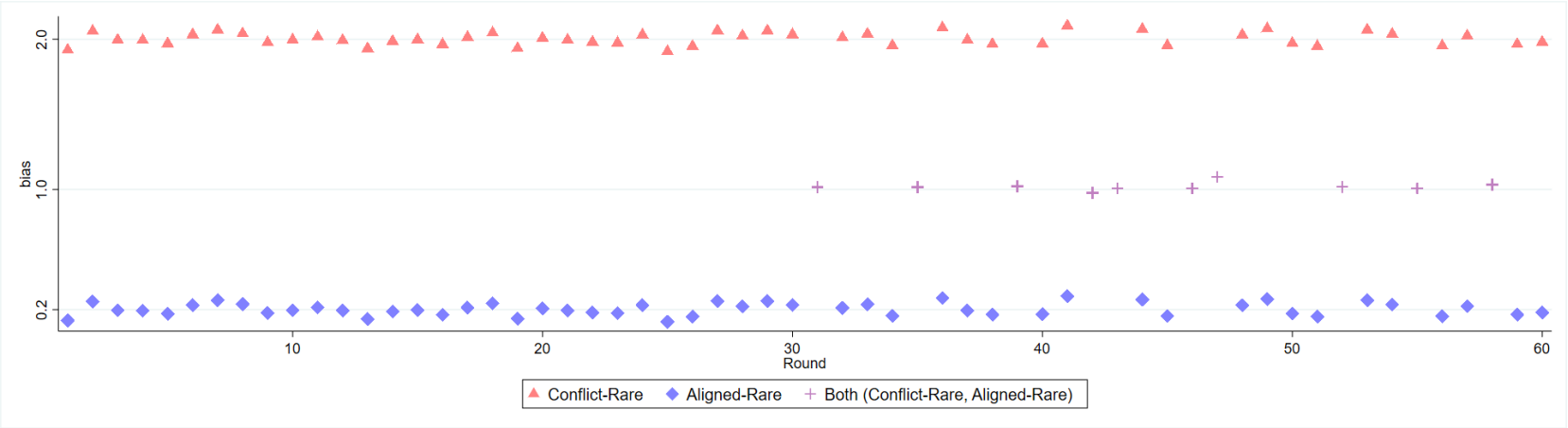


(a) Rare treatments

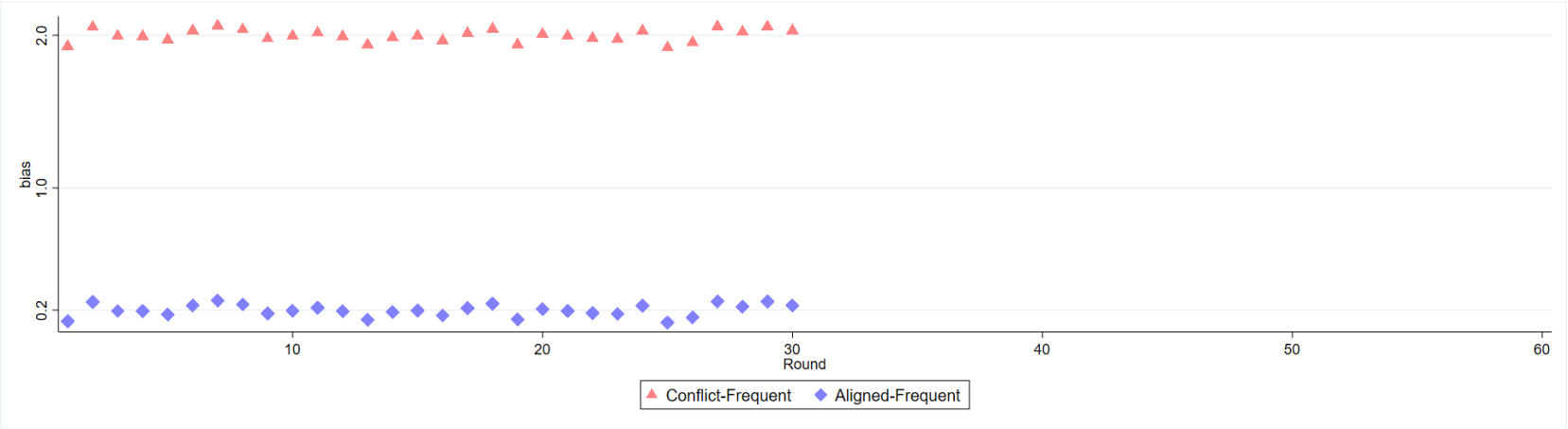


(b) Frequent treatments

2×2 between subjects treatment design

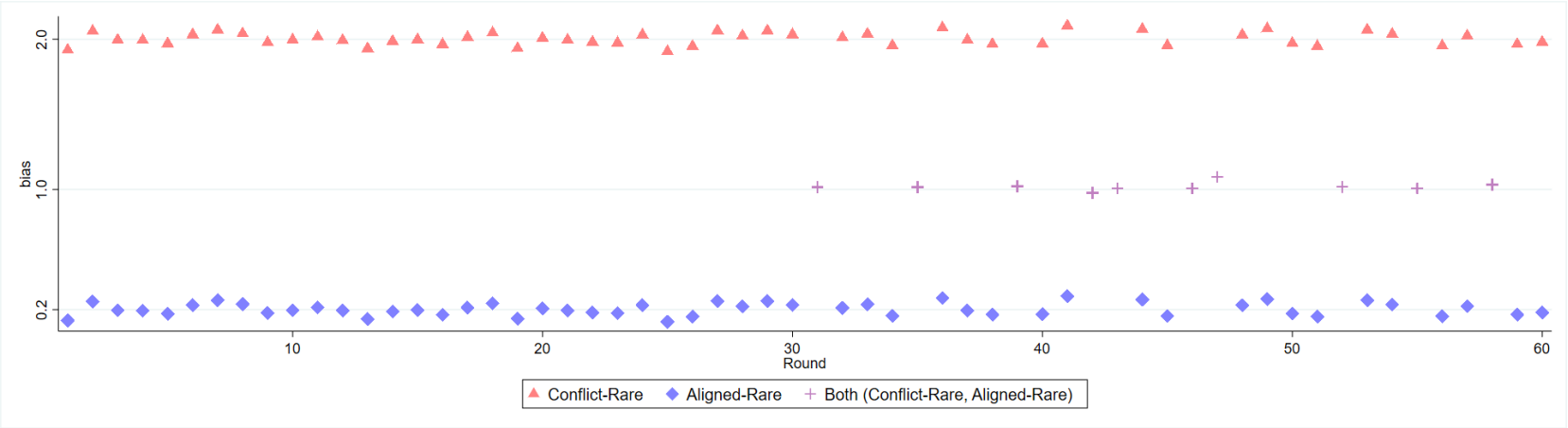


(a) Rare treatments

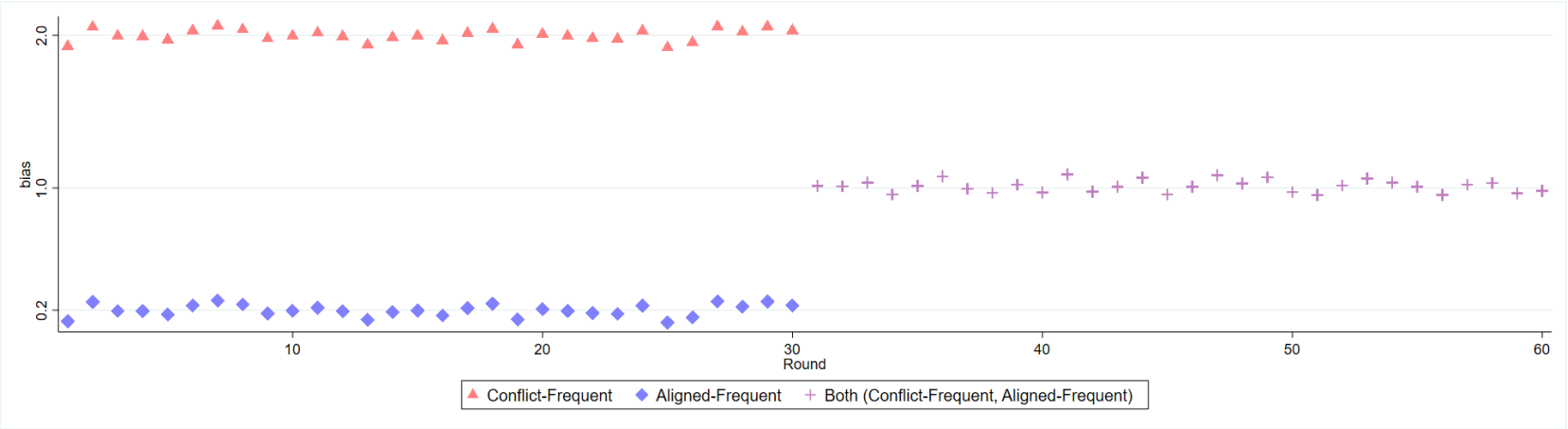


(b) Frequent treatments

2×2 between subjects treatment design



(a) Rare treatments



(b) Frequent treatments

Model & Predictions

Perfect Bayesian benchmark

	$BR^S(s,b)$	$BR^R(m,b)$	
$b = 0.2$	Messages	Actions	Corr(S,A)
1	{1, 2, 3, 4, 5}	{3}	0.00
2	{1, 2}, {3, 4, 5}	{1, 2}, {4}	0.84
3	{1, 2, 3}, {4, 5}	{2}, {4, 5}	0.84
4	{1}, {2, 3}, {4, 5}	{1}, {2, 3}, {4, 5}	0.90
5	{1, 2}, {3}, {4, 5}	{1, 2}, {3}, {4, 5}	0.90
6	{1, 2}, {3, 4}, {5}	{1, 2}, {3, 4}, {5}	0.90
7	{1}, {2}, {3}, {4, 5}	{1}, {2}, {3}, {4, 5}	0.95
8	{1}, {2}, {3, 4}, {5}	{1}, {2}, {3, 4}, {5}	0.95
9	{1}, {2, 3}, {4}, {5}	{1}, {2, 3}, {4}, {5}	0.95
10	{1, 2}, {3}, {4}, {5}	{1, 2}, {3}, {4}, {5}	0.95
11	{1}, {2}, {3}, {4}, {5}	{1}, {2}, {3}, {4}, {5}	1.00
$b = 1.0$	Messages	Actions	Corr(S,A)
1	{1, 2, 3, 4, 5}	{3}	0.00
2	{1}, {2, 3, 4, 5}	{1}, {3, 4}	0.65
$b = 2.0$	Messages	Actions	Corr(S,A)
1	{1, 2, 3, 4, 5}	{3}	0.00

Behavioural model

Assumption

> With positive probability (w) the agent does not change behaviour when the bias changes.

Formally, (expectation of) behavioural best response

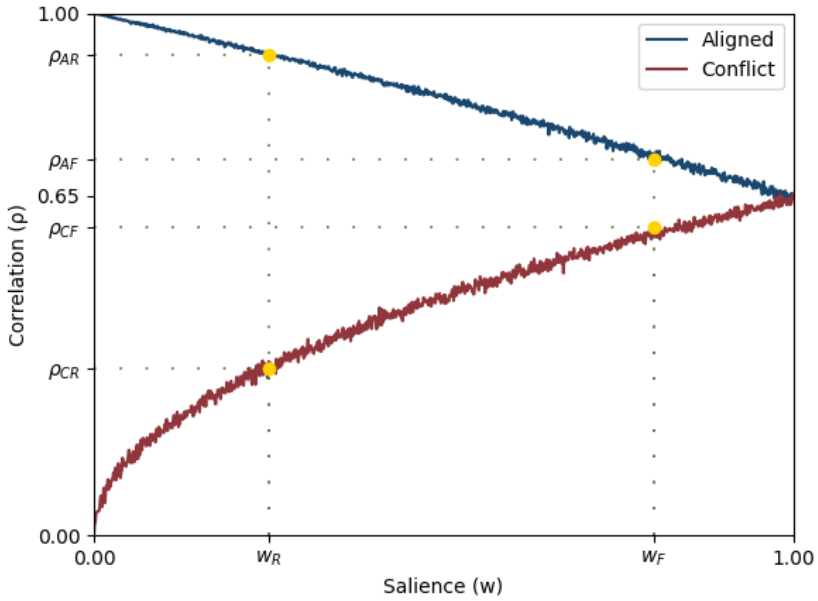
$$BBR^S(s, b, b^*, w) = w \cdot BR^S(s, b^*) + (1 - w)BR^S(s, b)$$
$$BBR^R(m, b, b^*, w) = w \cdot BR^R(m, b^*) + (1 - w)BR^R(m, b)$$

Behavioural equilibria & Predictions

Predictions

1. Habit Rare: $\rho_{AR} > \rho_{CR}$
2. Habit Frequent: $\rho_{AF} > \rho_{CF}$
3. Overcommunication:
   1. Aligned-Rare: $\rho_{AR} > 0.65$.
   2. Aligned-Frequent: $\rho_{AF} > 0.65$.
4. Undercommunication:
   1. Conflict-Rare: $\rho_{CR} < 0.65$.
   2. Conflict-Frequent: $\rho_{CF} < 0.65$.

Equilibria



$$\rho_{AR} > \rho_{AF} > 0.65 > \rho_{CF} > \rho_{CR}$$

Procedure

- Ran at University of Amsterdam (remotely)
- Programmed in oTree
- Pre-registered in AEA registry for RCT
- Sample size of 256: 8 groups of size 8 per treatment
- Additional measures
  1. Cognitive ability: CRT (Frederick, 2005)
  2. Risk aversion: Lottery task (Eckel and Grossman, 2002)
  3. Attitudes towards strangers (Glaeser et al., 2000)
     - i. When I communicate with strangers, I tell them the truth.
     - ii. When I communicate with strangers, they tell me the truth.

Results

Manipulation check: Different behaviour in part one

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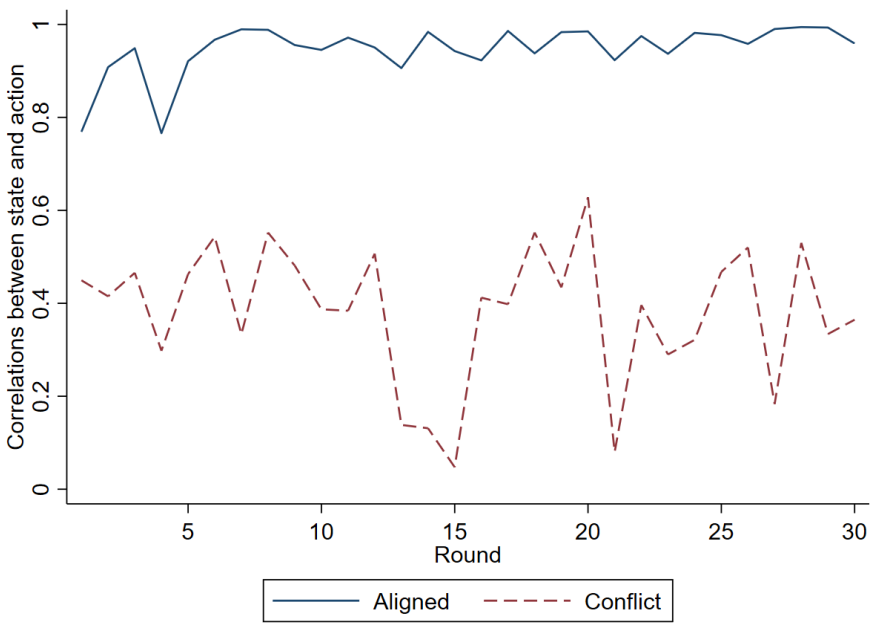
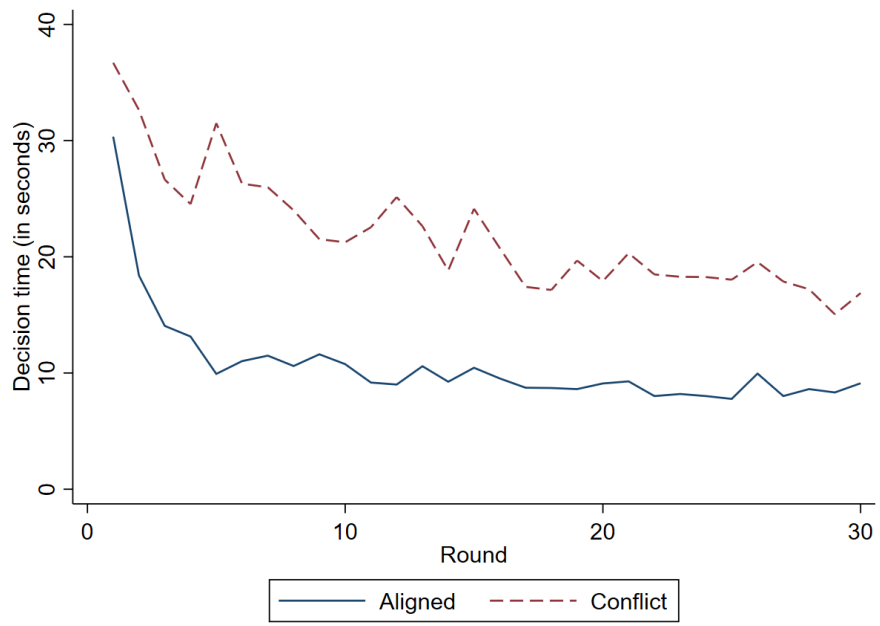
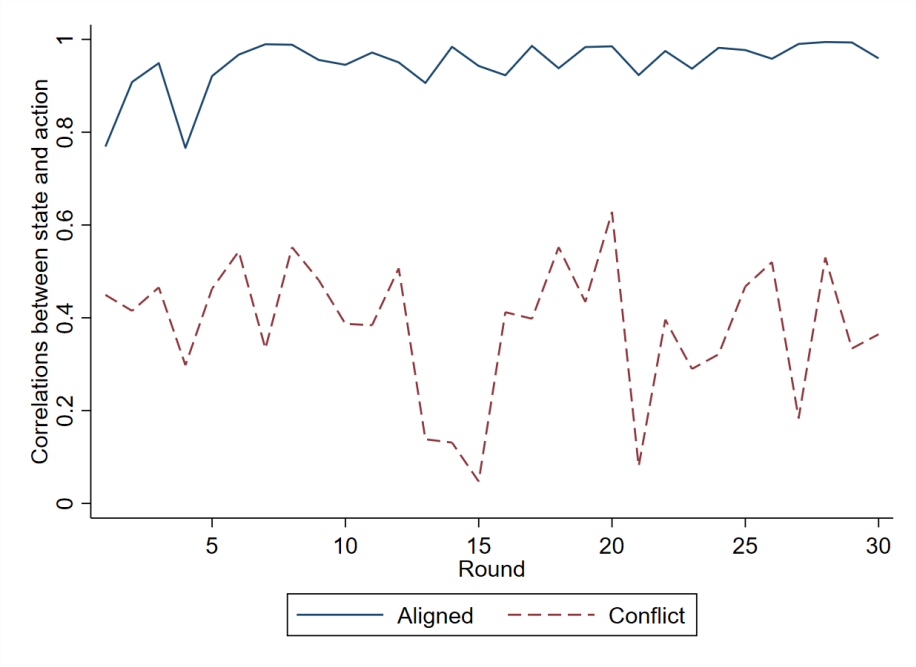
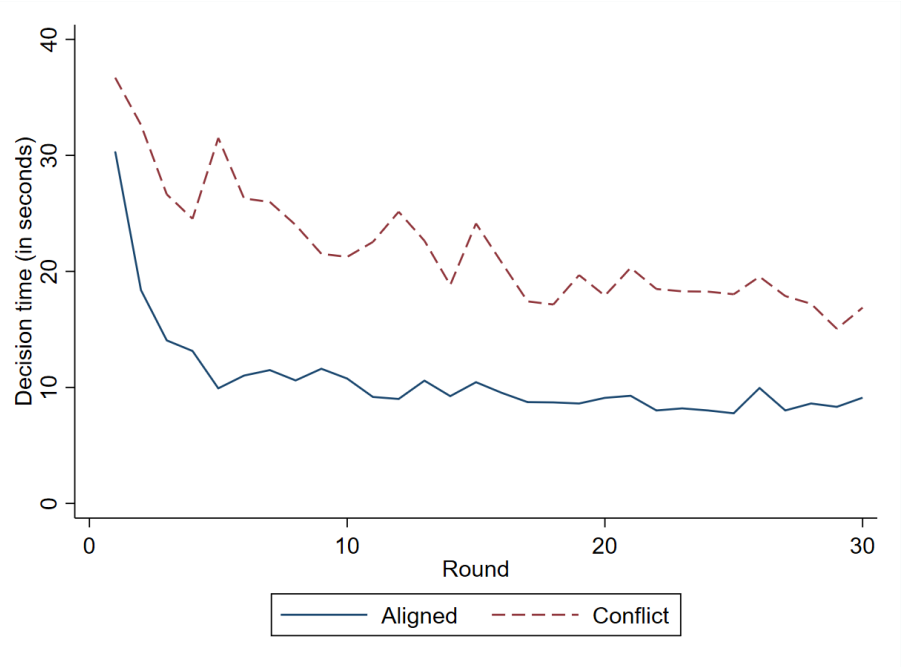




Higher correlations in Aligned VS Conflict

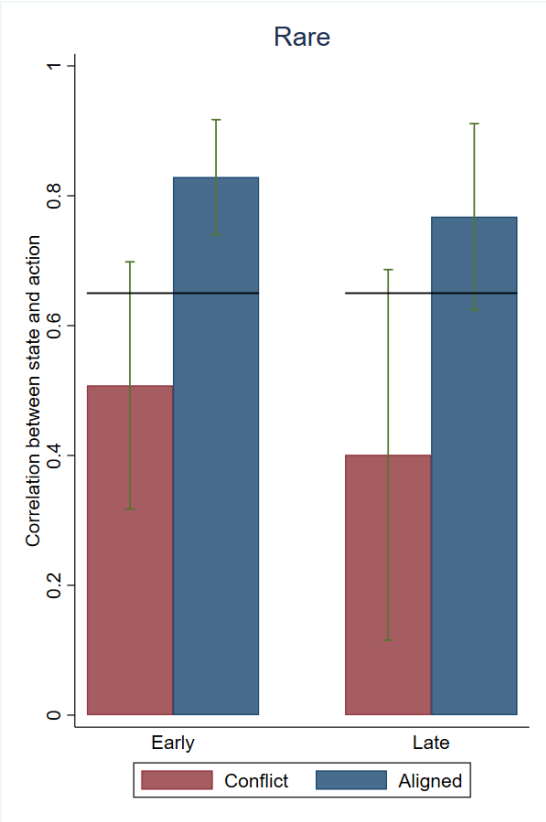
Manipulation check: Different behaviour in part one

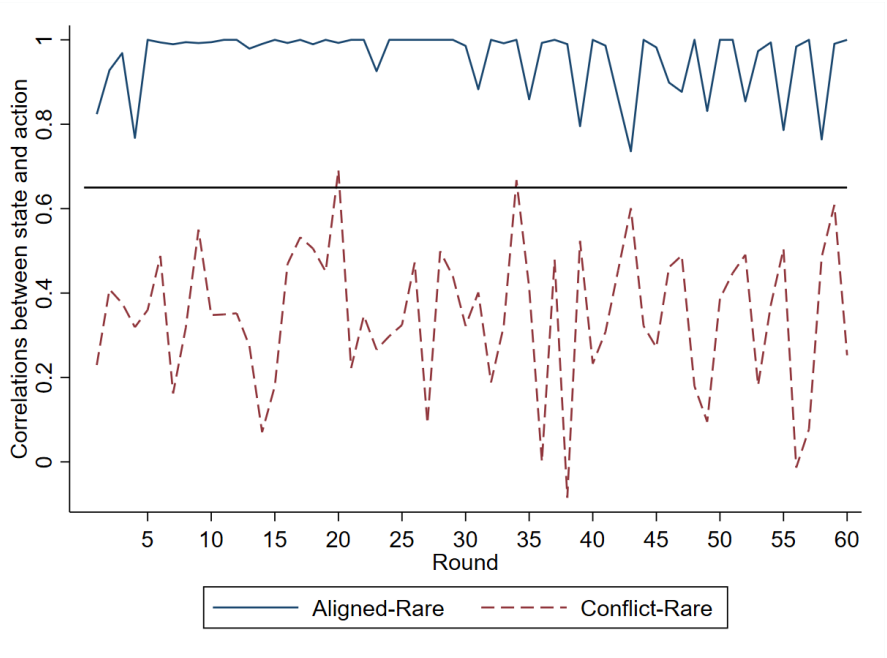




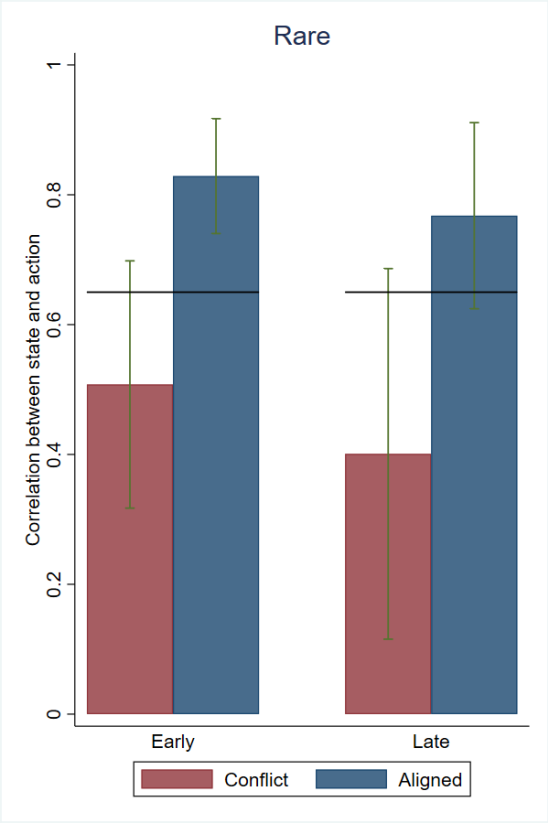
Decision times faster over rounds

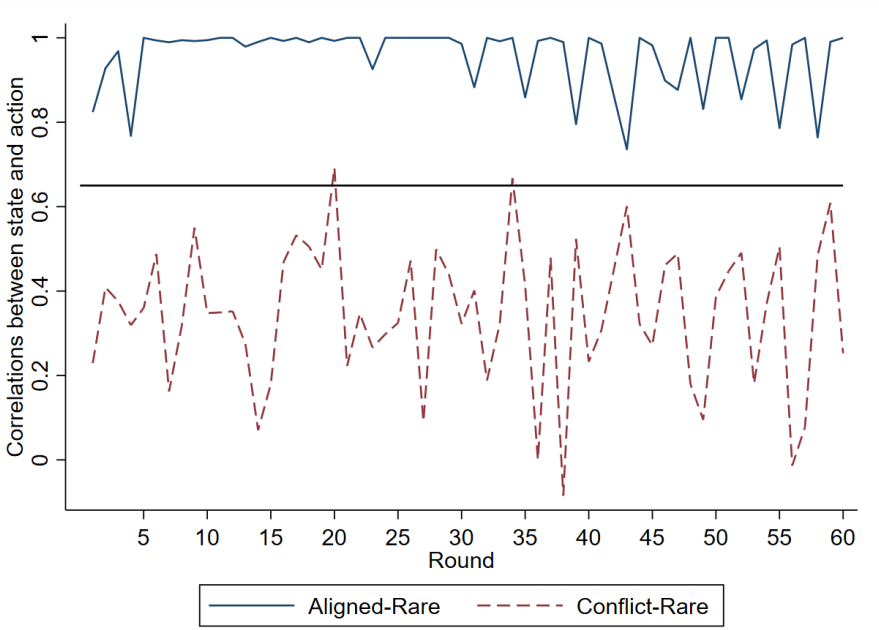
When new environment is rare





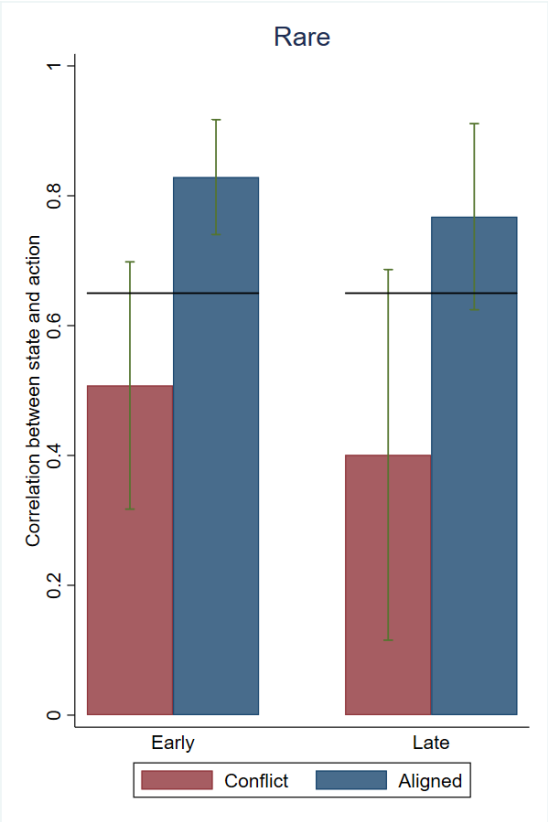
When new environment is rare

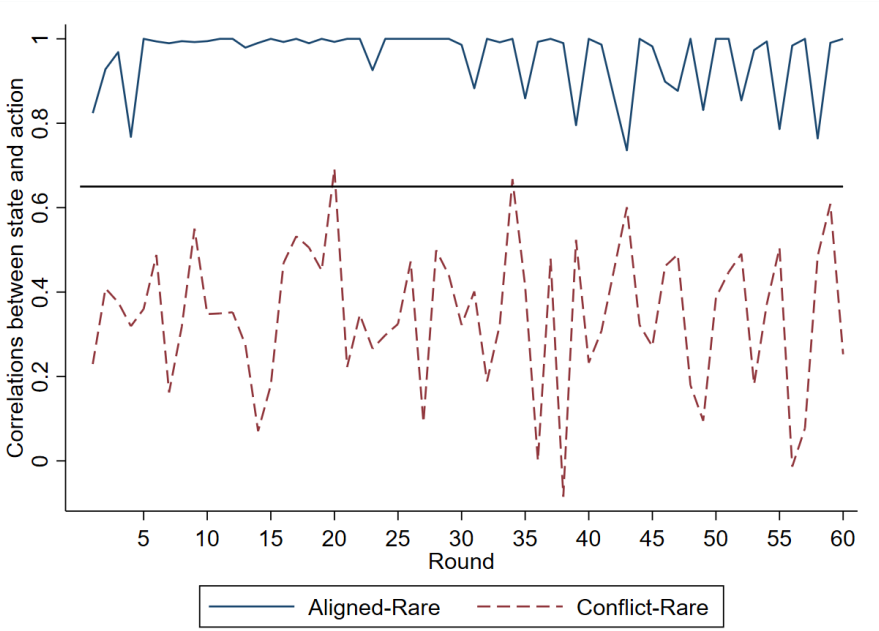




Result 1a: Habitual communication in Early rounds of Rare

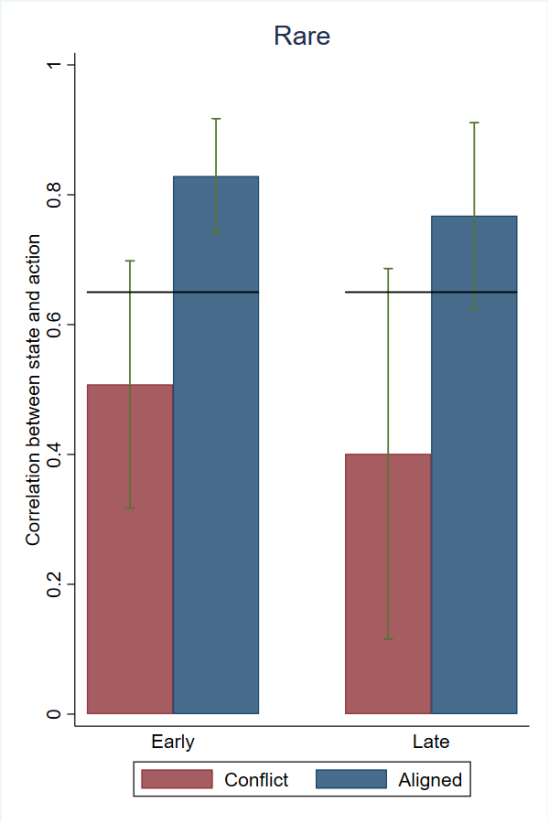
When new environment is rare

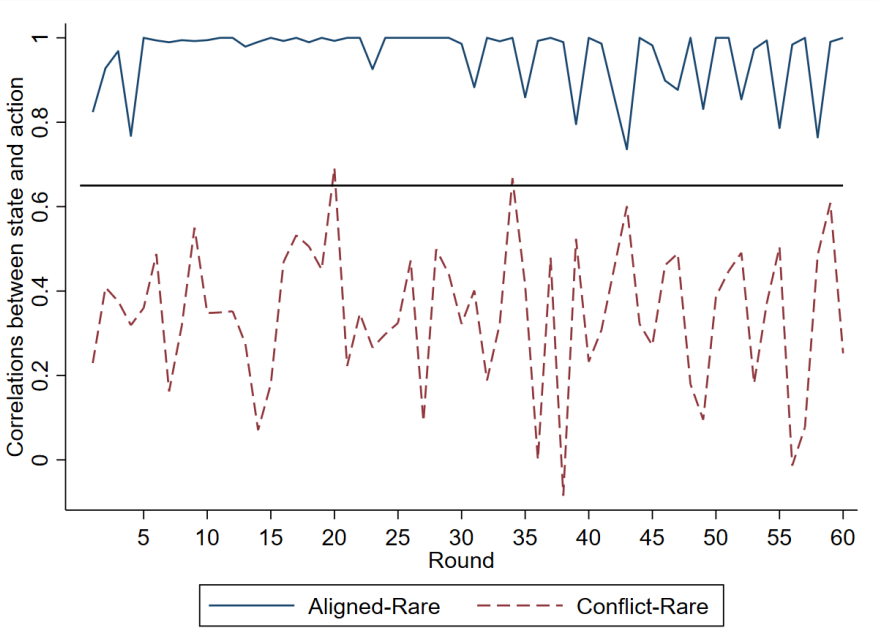




Result 1b: Habitual communication in Late rounds of Rare

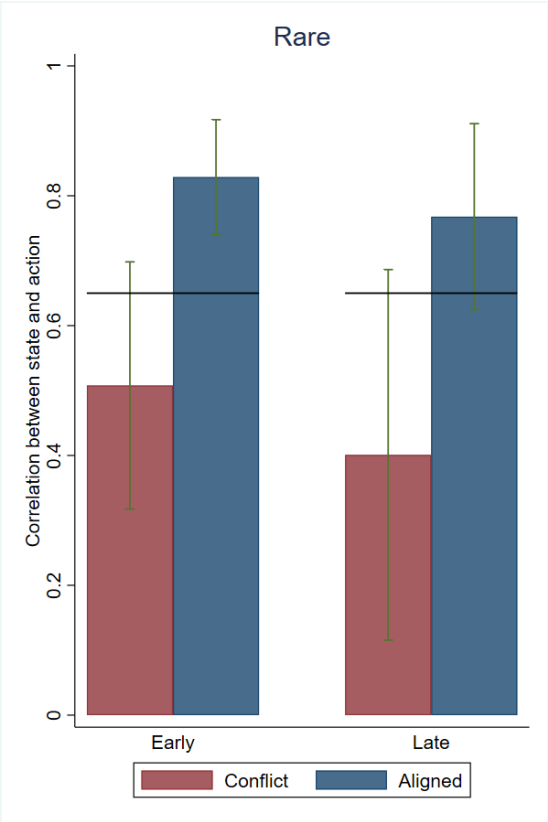
When new environment is rare

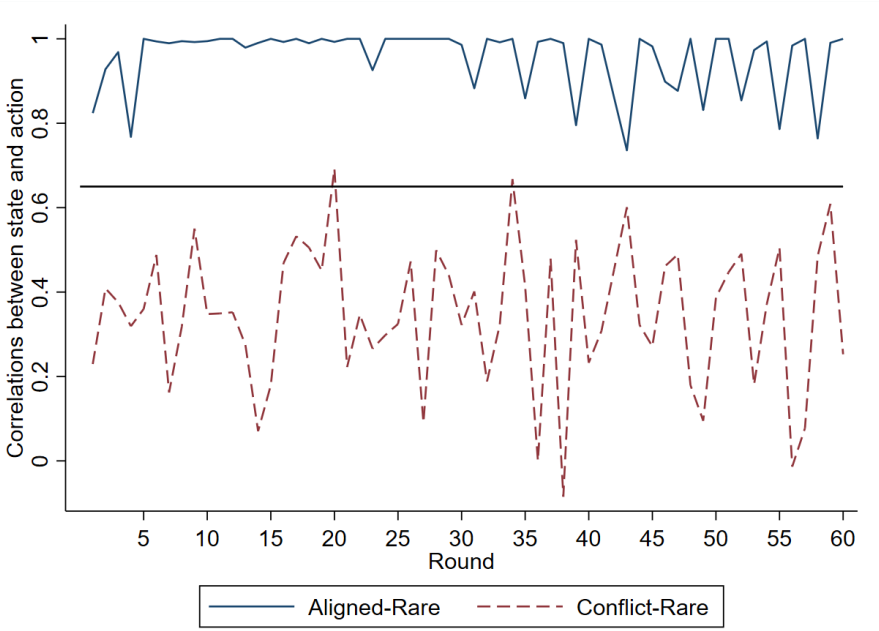




Result 2a: Overcommunication in Aligned-Rare

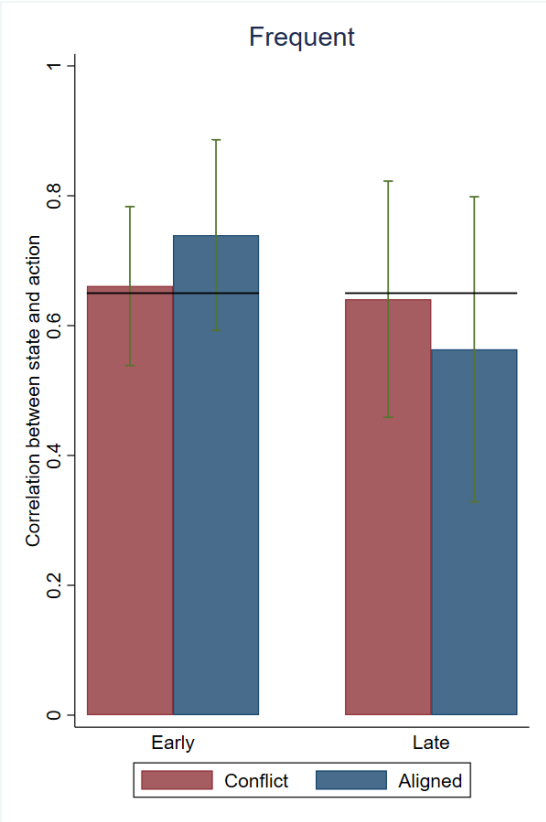
When new environment is rare

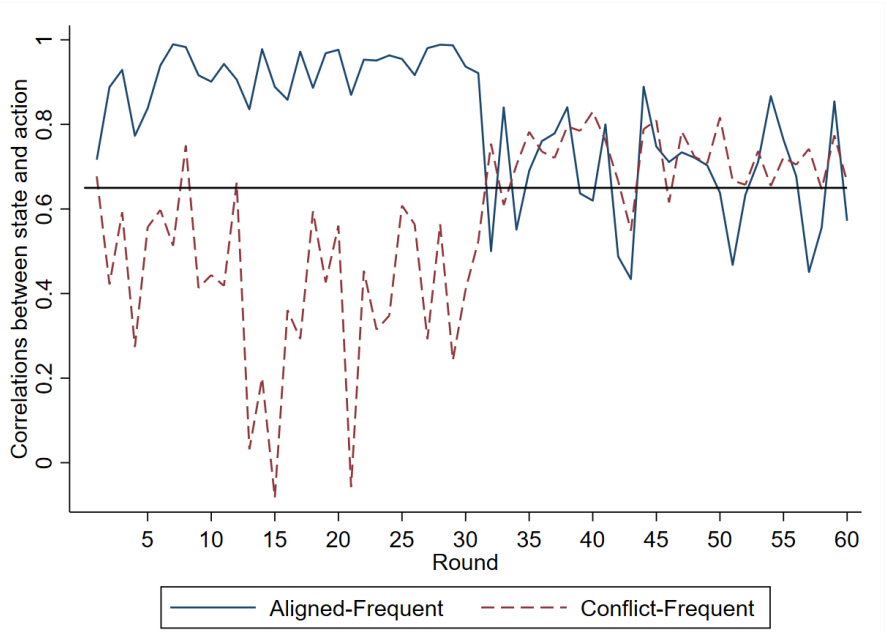




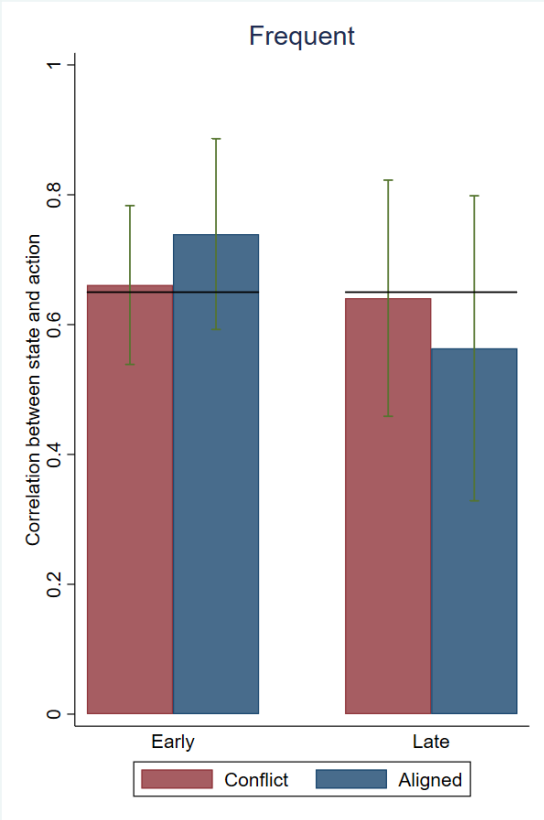
Result 2b: Undercommunication in Conflict-Rare

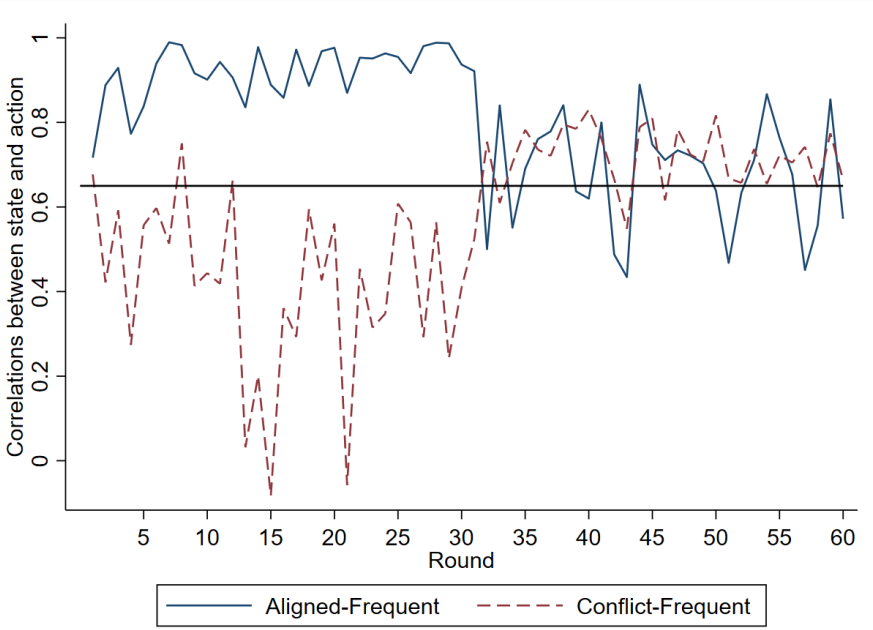
When new environment is frequent





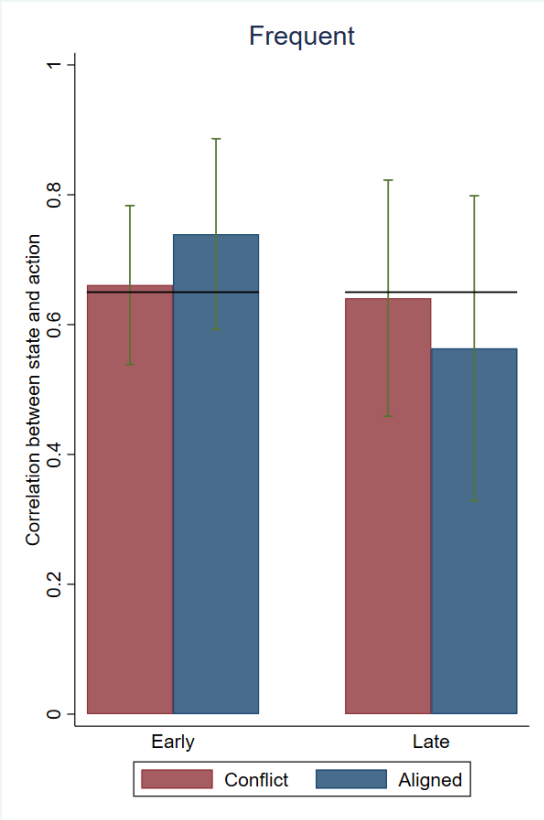
When new environment is frequent

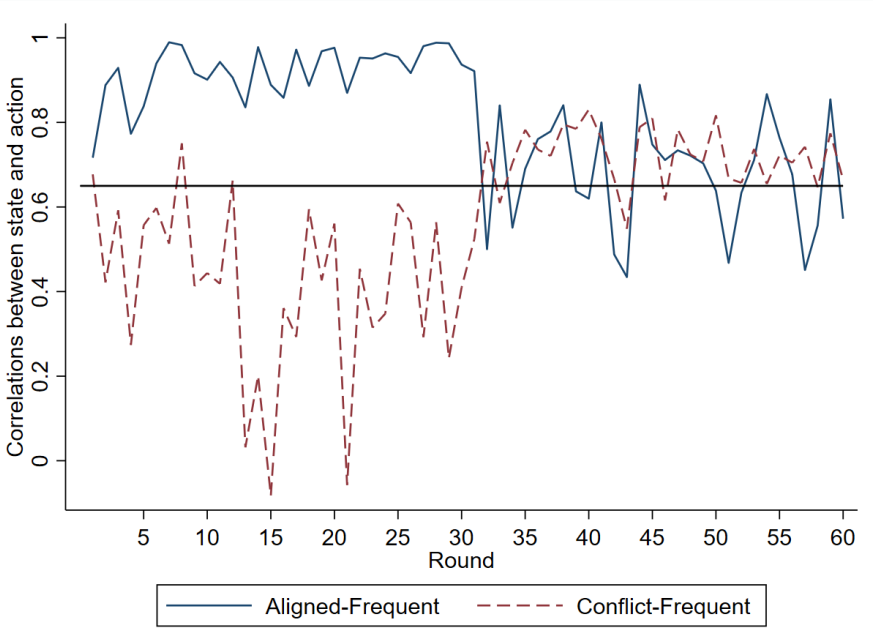




Result 3a: No habitual communication in Early rounds of Frequent

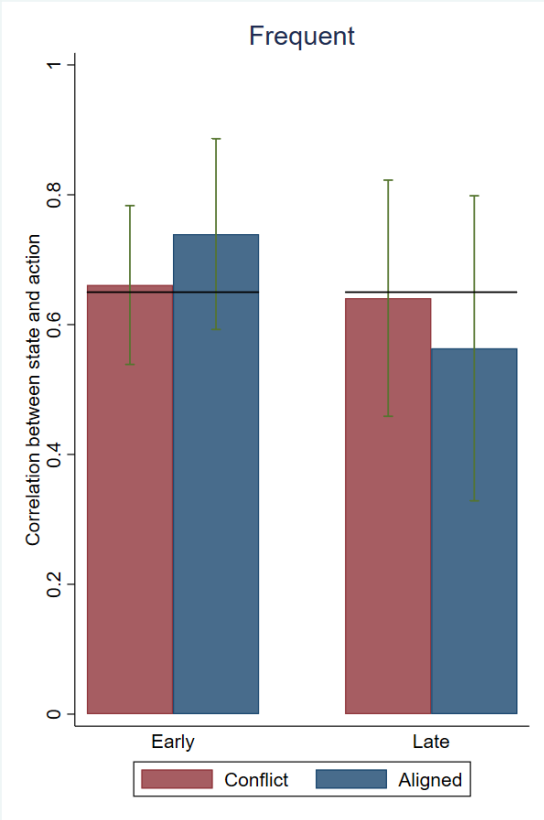
When new environment is frequent

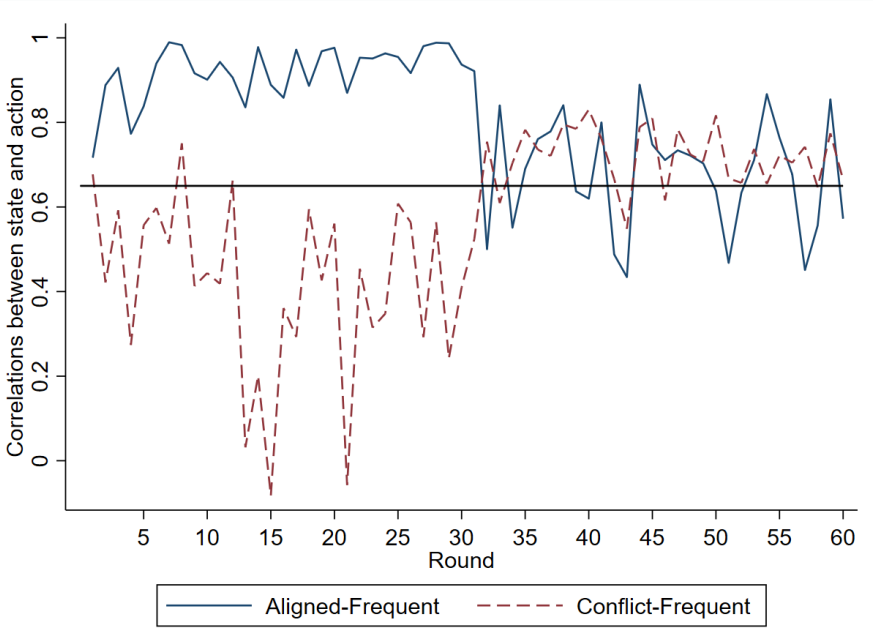




Result 3b: No habitual communication in Late rounds of Frequent

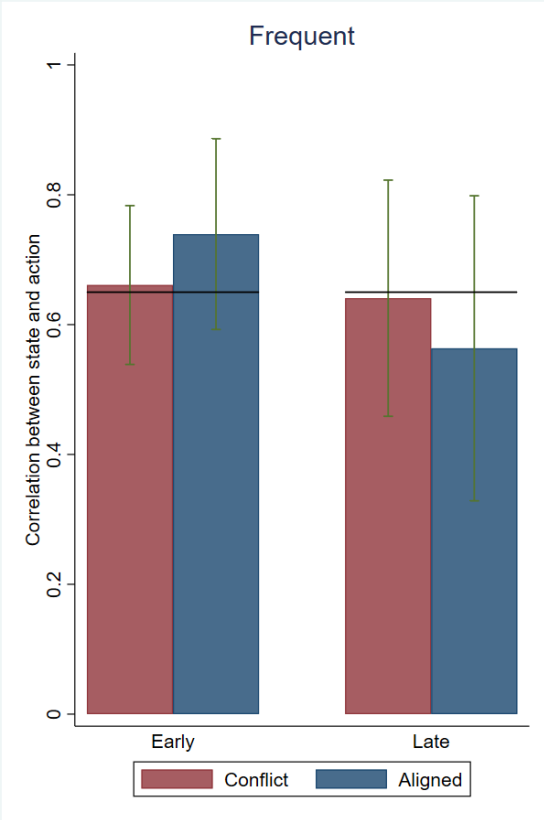
When new environment is frequent

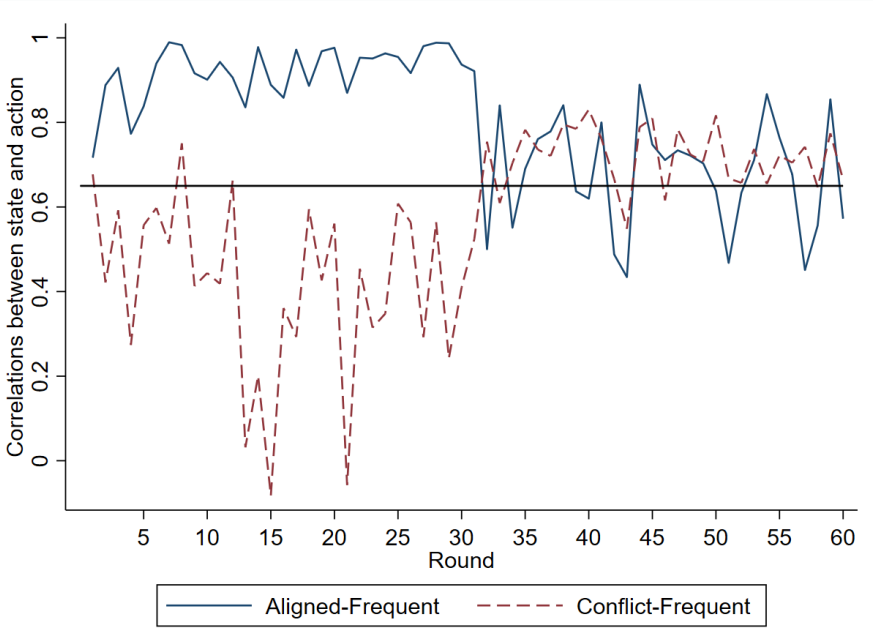




Result 4a: No overcommunication in Aligned-Frequent

When new environment is frequent





Result 4b: No undercommunication in Conflict-Frequent

Habits in individual decisions

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Participant is habitual if:

1. High automaticity: Stable strategy in part one (rounds 11-30)
2. Reduced dependence on goals: The same strategy in part two

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Strategy selection: 3,125 pure strategies

1. Eligibility: consistent with at least 60% of subject choices
2. Selection: highest percentage of matching choices

Habits in individual decisions

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Strategy selection: 3,125 pure strategies

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Classification summary

1. 228/256 participants in part one
2. 236/256 in part two
3. 112/256 habitual participants

Habitual communication in individual data

	Aligned Frequent	Aligned Rare	Conflict Frequent	Conflict Rare	Total
Sender	14	11	10	13	48
Receiver	16	25	11	12	64
Total	30	36	21	25	112

Habitual communication in individual data

	Aligned Frequent	Aligned Rare	Conflict Frequent	Conflict Rare	Total
Sender	14	11	10	13	48
Receiver	16	25	11	12	64
Total	30	36	21	25	112

More habitual participants after Aligned than Conflict (66 VS 46)

Habitual communication in individual data

	Aligned Frequent	Aligned Rare	Conflict Frequent	Conflict Rare	Total
Sender	14	11	10	13	48
Receiver	16	25	11	12	64
Total	30	36	21	25	112

More habitual participants after Rare than Frequent (61 VS 51)

Habitual communication in individual data

	Aligned Frequent	Aligned Rare	Conflict Frequent	Conflict Rare	Total
Sender	14	11	10	13	48
Receiver	16	25	11	12	64
Total	30	36	21	25	112

More habitual receivers than senders (64 VS 48)

Habitual communication in individual data

	Aligned Frequent	Aligned Rare	Conflict Frequent	Conflict Rare	Total
Sender	14	11	10	13	48
Receiver	16	25	11	12	64
Total	30	36	21	25	112

Habitual participants make faster decisions (16.47" VS 13.47")

Habitual communication in individual data

	Aligned Frequent	Aligned Rare	Conflict Frequent	Conflict Rare	Total
Sender	14	11	10	13	48
Receiver	16	25	11	12	64
Total	30	36	21	25	112

Habitual participants have lower CRT scores (2.06 VS 2.24)

Habitual communication in individual data

	Aligned Frequent	Aligned Rare	Conflict Frequent	Conflict Rare	Total
Sender	14	11	10	13	48
Receiver	16	25	11	12	64
Total	30	36	21	25	112

Habitual participants have similar earnings (89.51 VS 90.51)

Habitual communication in individual data

	Aligned Frequent	Aligned Rare	Conflict Frequent	Conflict Rare	Total
Sender	14	11	10	13	48
Receiver	16	25	11	12	64
Total	30	36	21	25	112

41/112: "mechanical" habitual, 71/112: "conscious" habitual

Summary

Summary

Takeaway messages

1. Habitual strategic communication
2. Communication habits persist when new environment is rare
3. Overcommunication could be (partially) driven by habits and familiarity with common interest environments

Broader implications

1. Habits affect (strategic) behaviour
2. Familiarity with an environment has predictive power for behaviour in unfamiliar similar environments

References

References I

Acland, D. and Levy, M. R. (2015). Naiveté, projection bias, and habit formation in gym attendance. *Management Science*, 61(1):146–160.

Arechar, A. A., Kouchaki, M., and Rand, D. G. (2018). Examining spillovers between long and short repeated prisoner's dilemma games played in the laboratory. *Games*, 9(1):5.

Belot, M. and van de Ven, J. (2019). Is dishonesty persistent? *Journal of Behavioral and Experimental Economics*, 83:1–9.

Cai, H. and Wang, J. T.-Y. (2006). Overcommunication in strategic information transmission games. *Games and Economic Behavior*, 56(1):7–36.

Charness, G. and Gneezy, U. (2009). Incentives to exercise. *Econometrica*, 77(3):909–931.

References II

Coppock, A. and Green, D. P. (2016). Is voting habit forming? new evidence from experiments and regression discontinuities. *American Journal of Political Science*, 60(4):1044–1062.

De Mel, S., McIntosh, C., and Woodruff, C. (2013). Deposit collecting: Unbundling the role of frequency, salience, and habit formation in generating savings. *American Economic Review*, 103(3):387–92.

Eckel, C. C. and Grossman, P. J. (2002). Sex differences and statistical stereotyping in attitudes toward financial risk. *Evolution and human behavior*, 23(4):281–295.

Frederick, S. (2005). Cognitive reflection and decision making. *Journal of Economic perspectives*, 19(4):25–42.

Fujiwara, T., Meng, K., and Vogl, T. (2016). Habit formation in voting: Evidence from rainy elections. *American Economic Journal: Applied Economics*, 8(4):160–88.

References III

Glaeser, E. L., Laibson, D. I., Scheinkman, J. A., and Soutter, C. L. (2000). Measuring trust. *The quarterly journal of economics*, 115(3):811–846.

Havranek, T., Rusnak, M., and Sokolova, A. (2017). Habit formation in consumption: A meta-analysis. *European Economic Review*, 95(1):142–167.

Kawagoe, T. and Takizawa, H. (2009). Equilibrium refinement vs. level-k analysis: An experimental study of cheap-talk games with private information. *Games and Economic Behavior*, 66(1):238–255.

Peysakhovich, A. and Rand, D. G. (2016). Habits of virtue: Creating norms of cooperation and defection in the laboratory. *Management Science*, 62(3):631–647.

References IV

Royer, H., Stehr, M., and Sydnor, J. (2015). Incentives, commitments, and habit formation in exercise: Evidence from a field experiment with workers at a fortune-500 company. *American Economic Journal: Applied Economics*, 7(3):51–84.

Wang, J. T.-Y., Spezio, M., and Camerer, C. F. (2010). Pinocchio's pupil: using eyetracking and pupil dilation to understand truth telling and deception in sender-receiver games. *American Economic Review*, 100(3):984–1007.

Screenshots I - Sender

Round 1 of 10

Below you see the table containing the earnings for both players for every combination of state and action.

- For player A, the earnings are the number on the left (shown in blue).
- For player B, the earnings are the number on the right (shown in red).

	Action is 1	**Action is 2**	**Action is 3**	**Action is 4**	**Action is 5**
State is 1	57 , 110	90 , 90	110 , 57	90 , 16	57 , -29
State is 2	16 , 90	57 , 110	90 , 90	110 , 57	90 , 16
State is 3	-29 , 57	16 , 90	57 , 110	90 , 90	110 , 57
State is 4	-80 , 16	-29 , 57	16 , 90	57 , 110	90 , 90
State is 5	-135 , -29	-80 , 16	-29 , 57	16 , 90	57 , 110

You are **player A**. The randomly drawn state is  (**2**).

Please choose a message to send to Player B by clicking the corresponding button below.

Send the message "The state is 1" | Send the message "The state is 2" | Send the message "The state is 3"

Send the message "The state is 4" | Send the message "The state is 5"

Screenshots II - Receiver

Round 1 of 10

Below you see the table containing the earnings for both players for every combination of state and action.

- For player A, the earnings are the number on the left (shown in blue).
- For player B, the earnings are the number on the right (shown in red).

	Action is 1	**Action is 2**	**Action is 3**	**Action is 4**	**Action is 5**
State is 1	57 , 110	90 , 90	110 , 57	90 , 16	57 , -29
State is 2	16 , 90	57 , 110	90 , 90	110 , 57	90 , 16
State is 3	-29 , 57	16 , 90	57 , 110	90 , 90	110 , 57
State is 4	-80 , 16	-29 , 57	16 , 90	57 , 110	90 , 90
State is 5	-135 , -29	-80 , 16	-29 , 57	16 , 90	57 , 110

You are player B.

Player A sent you the message "*The state is 2*".

Please choose your action by clicking the corresponding button below.

I choose action 1 | I choose action 2 | I choose action 3 | I choose action 4 | I choose action 5

Screenshots III - Feedback

Results from round 1 of 10

Below you see the table containing the earnings for both players for every combination of state and action.

- For player A, the earnings are the number on the left (shown in blue).
- For player B, the earnings are the number on the right (shown in red).

	Action is 1	**Action is 2**	**Action is 3**	**Action is 4**	**Action is 5**
State is 1	57 , 110	90 , 90	110 , 57	90 , 16	57 , -29
State is 2	16 , 90	57 , 110	90 , 90	110 , 57	90 , 16
State is 3	-29 , 57	16 , 90	57 , 110	90 , 90	110 , 57
State is 4	-80 , 16	-29 , 57	16 , 90	57 , 110	90 , 90
State is 5	-135 , -29	-80 , 16	-29 , 57	16 , 90	57 , 110

- The state was 2.
- Player A sent the message "The state is 3".
- Player B chose action 3.

You were player B. Therefore, in this round you earned 90 points.

Proceed to next round

(Back to design.)