**Appendix A: Supplemental Results**

In this appendix we include a number of supplementary results that are discussed, but not included, in the manuscript.

Table A1 reports the results of looking at the interaction between Network Knowledge and Degree Centralization for two different regressions, one that includes only the first 12 trials per session and other that includes the first 19 trials per sessions.

We implement this analysis to account for the greater number of trials conducted in the medium information condition. In both regressions we find the same results as reported in the main text in the manuscript. In both regressions the number of edges is significantly related to the average time to solve a coordination problem and the medium information view also significantly reduces coordination time. Degree centralization appears unrelated to coordination time in the Low Information condition.

In both regressions the joint effect of degree centralization and information view is significantly different than zero based on an F-test of the combined coefficients for degree centralization and its interaction with the information view. An F-test for the combined effect of centralization in the Interact13 regression has a p-value of 0.02 and an F-test for the combined effect in the Interact20 has a p-value of 0.0003. The results of these two regressions are consistent with our expectations about the relationship between number of edges, network knowledge and the interaction between knowledge and degree centralization.

Table A1: Network Structure, Knowledge and Coordination Time

|  |  |  |
| --- | --- | --- |
|  | (1) | (3) |
|  | Interact13 | Interact20 |
| VARIABLES | timetaken\_secs | timetaken\_secs |
|  |  |  |
| Edges | -1.699\*\*\* | -1.741\*\*\* |
|  | (0.457) | (0.367) |
| Medium Information view | -104.8\*\*\* | -67.79\*\*\* |
|  | (30.38) | (23.86) |
| Degree centralization | -40.88 | -32.71 |
|  | (26.31) | (21.24) |
| Medium information\*degree centralization | -3.293 | -24.65 |
|  | (28.24) | (22.93) |
| 3.newdate | -65.70\*\* | -50.62\*\* |
|  | (29.34) | (22.79) |
| 4.newdate | -64.80\*\* | -10.97 |
|  | (29.19) | (23.08) |
| 5.newdate | 29.63 | 42.92\* |
|  | (26.91) | (22.45) |
| 6.newdate | 69.27\*\* | 98.34\*\*\* |
|  | (27.62) | (23.18) |
| 7.newdate | -3.058 | 27.14 |
|  | (26.88) | (22.09) |
| 8.newdate | -47.30\* | -46.64\*\* |
|  | (26.79) | (21.78) |
| 9.newdate | -126.8\*\*\* | -71.39\*\*\* |
|  | (28.85) | (22.58) |
| 10.newdate | -21.02 | -32.49 |
|  | (26.88) | (21.83) |
| 11.newdate | -55.40\* | -29.65 |
|  | (29.47) | (23.04) |
| 12.newdate | 28.89 | 23.95 |
|  | (27.22) | (22.02) |
| 13.newdate | -20.89 | -27.29 |
|  | (26.85) | (21.80) |
| 14.newdate | -29.38 | -37.13\* |
|  | (26.86) | (21.83) |
| 15.newdate | -7.570 | -7.475 |
|  | (31.40) | (30.01) |
| 16.newdate | -4.744 | -15.60 |
|  | (27.45) | (22.45) |
| 17o.newdate | - | - |
|  |  |  |
| trialid | 3.495\*\* | 1.476\*\* |
|  | (1.462) | (0.745) |
| Constant | 216.4\*\*\* | 193.6\*\*\* |
|  | (31.47) | (23.93) |
|  |  |  |
| Observations | 186 | 289 |
| Number of Groups | 16 | 16 |

In Table A2 we turn to reporting multiple other empirical specifications to examine the relationship between Degree Centralization, Network Knowledge and Coordination. In the first column of the table we report the relationship between degree centralization and coordination in the Low Information condition. The results indicate that in the Low information condition there is a significant relationship between the number of edges and coordination time and there is NOT a significant relationship between degree centralization and average coordination time. Both of these results are what we expected and consistent with the expectations we outline in the paper.

In the next three columns we report regression results from trials in the Medium Information conditions. The second column reports regression results for all of the trials we conducted and the third and fourth columns report results we restrict our analysis to the first 12 and first 19 trials, respectively. In each regression we find the same basic result that both the Number of Edges and Degree Centralization are related to coordination time.

Together these results are consistent with what we report in the paper and our theoretical expectations about the relationship between network knowledge and structural features of the network (edges and degree variance).

Table A2: Robustness for Degree Centralization and Information View

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  | Low | Medium | Medium13 | Medium20 |
| VARIABLES | DV: timetaken\_secs | DV: timetaken\_secs | DV: timetaken\_secs | DV: timetaken\_secs |
|  |  |  |  |  |
| Edges | -2.140\*\*\* | -1.646\*\*\* | -1.469\*\*\* | -1.569\*\*\* |
|  | (0.712) | (0.312) | (0.508) | (0.399) |
| Degree centralization | -29.52  (29.14) | -57.74\*\*\*  (11.90) | -40.14\*\*  (18.70) | -52.43\*\*\*  (15.06) |
|  |  |  |  |  |
| 6.newdate |  | 52.77\*\* | 37.40 | 51.89\*\* |
|  |  | (21.28) | (24.98) | (20.80) |
| 7.newdate |  | -10.01 | -33.13 | -16.28 |
|  |  | (18.86) | (24.34) | (19.91) |
| 8.newdate |  | -77.83\*\*\* | -76.94\*\*\* | -88.31\*\*\* |
|  |  | (17.89) | (24.26) | (19.68) |
| 10.newdate |  | -84.31\*\*\* | -49.94\*\* | -74.12\*\*\* |
|  |  | (17.80) | (24.32) | (19.68) |
| 12.newdate |  | -12.51 | -1.628 | -19.02 |
|  |  | (20.13) | (24.65) | (19.86) |
| 13.newdate |  | -36.81\*\* | -50.39\*\* | -68.99\*\*\* |
|  |  | (18.73) | (24.29) | (19.71) |
| 14.newdate |  | -96.24\*\*\* | -58.80\*\* | -78.69\*\*\* |
|  |  | (17.71) | (24.34) | (19.68) |
| 15.newdate |  | -52.47\* | -40.09 | -50.71\* |
|  |  | (27.13) | (28.65) | (26.81) |
| 16.newdate |  | -63.60\*\*\* | -34.95 | -57.51\*\*\* |
|  |  | (18.16) | (24.87) | (20.23) |
| 17.newdate |  | -53.14\*\*\* | -30.07 | -42.69\*\* |
|  |  | (17.86) | (24.41) | (19.83) |
| trialid | 2.387\*\* | 0.806\*\*\* | 1.695 | 1.047 |
|  | (1.072) | (0.308) | (1.611) | (0.805) |
| 3.newdate | -50.11\* |  |  |  |
|  | (28.52) |  |  |  |
| 4.newdate | -1.902 |  |  |  |
|  | (28.13) |  |  |  |
| 9.newdate | -72.47\*\*\* |  |  |  |
|  | (26.45) |  |  |  |
| 11.newdate | -40.68 |  |  |  |
|  | (28.29) |  |  |  |
| Constant | 203.8\*\*\* | 171.7\*\*\* | 144.9\*\*\* | 165.2\*\*\* |
|  | (37.00) | (18.74) | (29.04) | (21.98) |
|  |  |  |  |  |
| Observations | 119 | 328 | 126 | 194 |
| Number of newdate | 5 | 11 | 11 | 11 |

**Appendix B: Reporting Standards for Experiments**

In this section of the appendix we explain how our experiment meets the standards set out in the Reporting Guidelines for Experimental Research (Gerber et al. 2012).

1. Hypotheses

Discussed in the paper

1. Subjects and Context

Some of this is addressed in the paper, but we offer some elaboration here. Subjects could be any undergraduate at one of the universities in which our experiments were conducted. Recruitment was done via email and flyers posted on campus. We sent emails to any departments or professors that allowed us to use their email lists.

Subjects were eligible to participate one time in the experiment and any undergraduate who had not already participated in the same experiment was eligible to participate, and we did not employ any type of subject screening.

Subjects were assigned to a date/time to participate in an experiment and at that time reported to a classroom or computer lab (depending on the school) to participate in the experiment. Both universities were large West Coast universities; one public and one private.

1. Allocation Method

Subjects signed up for dates/times to participate in the experiment based on their availability. Experimenters did not control who signed up for which experiment and had no knowledge of subject characteristics when recruiting them or conducting the experiments.

For each experiment, we randomized the order of the networks that were used. Our experiments included costs for subjects to choose the color of their node and there were multiple levels of costs. We would conduct a block of trials in a given cost condition, and the order of the cost blocks were assigned randomly prior to the experiment. The exception is that we always had subjects complete a few trials in which it was not costly to choose a color to ensure that they understood how to interact with the web interface and that the software was working correctly.

1. Treatments

The treatments are described in the text and amount to the network that connects subjects to one another and the information view they are presented with of the network.

The networks changed between every experimental trial and were done without subject knowledge. They only were able to see their view of the network and were not informed about the overall network.

We did tell them about the information view, because it changed what was visible on the computer interface. As such, we had to ensure they understood the information presented to them.

Our experiments utilize both within- and between-group comparisons. Each experimental group took part in multiple trials during a session. They only conducted our network experiments during this time and did not complete other experiments.

Other details about time span of an experimental session, treatment fidelity, manipulation checks, and incentives are reported in the paper.

Consensus Game Protocols

Experiment materials:

1. 16 dividers, and index cards with subject numbers   
   (kept in the storage closet across from CSE 210; access via keycard)
2. Money bag
   1. At least $1,000, with plenty of small bills and quarters
   2. Tape for posting sign-up sheet
   3. Pens and pencils
3. 16 Linux or PC Computers for subjects
   1. Hide the toolbars at the top of the screen (right-click on the yellow part of the screen and disable the toolbars).
4. One Mac or Linux computer to control the server (ideally a laptop)
5. Handouts (at the end of this file)
   1. 1 Sign-in sheet
   2. 1 Show-up payment form
   3. 16 consent forms
   4. 16 copies of each quiz
   5. 16 Receipts
   6. 16 Post-Experimental Questionnaires

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Welcome to the USC Political Science Experimental Lab. Today’s experiment is part of a study on decision making. You will be paid for your participation. Today’s experiment will last no longer than 2 hours. During the experiment you will earn money based on the decisions you and others make. Please do not use the computers or push any buttons on them until I instruct you to do so.

Instructions for the experiment will be given shortly. Along the way, you may have some questions about the experiments. If you do, please raise your hand and one of us will assist you. It is important that you do not communicate with any other participant at any time during the experiment. If you do, we will ask you to leave. [Pause] Additionally, please check your cell phones and turn them off so they do not disrupt the experiment.

Please pay careful attention to the instructions. After explaining the procedures, we will provide a quiz on the instructions, in which you will earn $0.25 for each correct answer.

Each of you has an index card on your desk. That card has a number on it. Please keep that number private. We will use your number to keep track of the actions you take and to pay you at the end of the experiment. Please write that number on your consent form now, and then we will collect your consent form and distribute a $5 on-time bonus.

In this experiment, you will earn money for the decisions you and others make. To expedite the experiment we will pay you your entire earnings at the end of the experiment.

During the time you are here today you will take part in many different sessions. Each session will last up to 3 minutes. I will now describe the decisions and actions you must make in each session during the experiment.

There are 16 subjects here participating in the experiment. During the experiment each subject will represent a node in a network that contains all 16 of you. To repeat, each of you is a part of the same network and you each control one of the 16 nodes. As I stated earlier, the experiment today will consist of multiple sessions, with each session lasting no longer than 3 minutes. During each session, your task will be to choose a color for your node, and your goal will be for every node of the network to have the same color. Each of you will earn money if every person in the network chooses the same color before the 3-minute time limit runs out. We will refer to this as a “successful session” in the remaining instructions. You will make decisions about the node you control using the computer in front of you.

Please turn to the computer and enter the number on your index card in the box on the screen and press enter. After you press the “enter” button, a new screen will appear after a few moments. Please be patient and do not click on anything else on the computer screen.

[OPEN FIRST GRAPH]

You should now see a screen shot that is similar to the ones you will see during each session of the experiment. During the experiment you should NOT attempt to close or minimize this window or click on anything else unless we tell you to do so. If you do, it will cause us to stop the experiment and start over. This will waste your time and the other subjects’ time.

Your computer screen should now be displaying your node and the nodes that are connected to you. You will not see all 16 of the nodes that are in the network – you will only see your immediate neighbors. Please raise your hand if this is NOT what your screen is displaying.

As I described earlier, you will not see a picture of the entire network. You will only see the nodes you are connected to. To reiterate, you will only see your immediate neighbors. The number of other nodes you are connected to may change as we move from session to session.

The node that you control has “YOU” written in the middle of it.

[read the following if using the Medium Information Condition] The nodes you are connected to have a number in the center. The number tells you how many neighbors each node has. For instance, if the number 2 appears in the center of a node it means that node has 2 total neighbors, you and one other node. If a three appears, then your neighbor has 3 total neighbors, you and 2 other nodes. If a one appears, you are that node’s only neighbor.

There is a time bar at the top of the screen that shows how much time is remaining in the experiment. Again, if the session is successfully completed before 3 minutes elapse then that session of the experiment will end immediately. If the network is not completed before the time runs out, that will also end the session of the experiment. In either event when the session ends you will not be able to take any further actions, and I will announce that the session has ended.

As I stated earlier, the goal is for every node in the network to be the same color. To pick a color, click on the color and word that is below the picture of you and your neighbors. You can change your color as many times as you wish during each session of the experiment. You will not be able to change the color of your node until I announce that the session has begun.

Now that you understand the individual task I will provide more information about how you earn money. In each session, you earn money if every person in the experiment chooses the same color. If everyone in the experiment successfully chooses the same color before the 3-minute time limit is reached then each person will be paid $1. If the time limit is reached before everyone chooses the same color, then no one earns any money in that session of the experiment.

We will run these sessions until [END TIME -15 MIN].

[E.G. IF THE EXPERIMENT BEGINS AT NOON, 1:45 PM.]

Therefore, the less time each session takes, the more sessions you will participate in, and the more money you may be able to earn. To reiterate, there is not a fixed number of sessions, but we continue running sessions until [END TIME -15 MIN].

Now, to ensure that everyone understands the experiment we will distribute a quiz. We will pay you 25 cents for each correct answer.

[Hand out “QUIZ” (the one without a number)]

We will now collect the quizzes. Please ensure that you have written your number at the top of the quiz.

Now please turn toward you computer and prepare for the first session of the experiment.

[INSTALL & LOAD A GAME] The next session is ready.

[PRESS START BUTTON] You may begin now.

[WHEN SESSION ENDS] That session is now complete.

[REPEAT UNTIL 15 minutes BEFORE END]

That completes this experiment. We will now distribute a post-experimental questionnaire, and call you up one by one to pay you in private. Please do not approach our desk until your number has been called. Once you are called up, we will hand you your remaining earnings. Please complete the questionnaire before and/or after you are called up to be paid.

MODIFICATIONS FOR THE COST TO MOVE

We will now make one minor change to the experiment. As before your task is for everyone to choose the same color. You will still only earn money if every subject chooses the same color before time expires in the session. If the session ends successfully, you will again earn $1.

However, now you will lose 5¢ every time you choose a color, including your first choice of a color.

Every time you change colors, 5¢ will be deducted from your earnings, whether or not the session in which you changed colors ended successfully. For example, in a particular session, if you make three color choices, you will lose15¢, whether or not every node is the same color before the time limit runs out. Therefore, if the session ends successfully, you will earn $1 minus 15¢, or 85¢ in that session. If the time runs out and the session is unsuccessful, you will simply lose 15¢ in that session.

To ensure that everyone understands the new directions we will hand out a quiz for you to complete. As before, we will pay you $.25 for each correct answer.

[distribute quiz, called Quiz 2]

Now that all quizzes are graded and collected we will begin the actual experiment.

Please face your computer screen and wait until I instruct you to choose a color.

[LOAD THE FIRST GAME] The session is ready.

[PRESS START BUTTON] You may begin now.

[WHEN SESSION ENDS] That session is now complete.

CONTINUE WITH THE OTHER COSTS – 20 CENTS, 50 CENTS,

EACH TIME WE SWITCH COSTS WE NEED TO QUIZ THE SUBJECTS. THE QUIZ WE GIVE THEM IS CALLED “QUIZ 3” EACH TIME

After the trials for a given cost are done read the following and use 20¢ or 50¢ as appropriate

“As before your task is for everyone to choose the same color. You will still only earn money if every subject chooses the same color before time expires in the session. If the session ends successfully, you will again earn $1.

However, now you will lose [20¢ or 50¢] every time you change your color. The first time you pick a color, you will not lose any money, but once you have chosen a color, you will lose [20¢ or 50¢] every time you change the color of your node.”

Sign-In Sheet for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. .
2. .
3. .
4. .
5. .
6. .
7. .
8. .
9. .
10. .
11. .
12. .
13. .
14. .
15. .
16. .

Show-up Payment

I

Date:

Name / Signature:

1. .
2. .
3. .
4. .
5. .
6. .
7. .

Subject Number: \_\_\_\_\_\_\_\_\_\_

Quiz 1

How do you earn money during the upcoming session?

a. only if every person chooses the same color

b. if you choose the same color as your neighbor(s), regardless of everyone else

2. When will a session end?

a. if all subjects choose the same color

b. when the 3-minute time limit is reached

c. never

d. either a or b, whichever happens first

3. When will you get paid your earnings from the total experiment?

a. after each session

b. at the end of the entire experiment

4. How often can you change the color of your node?

a. once

b. twice

c. as often as you wish

Subject Number: \_\_\_\_\_\_\_\_\_\_

Quiz 1

How do you earn money during the upcoming session?

a. only if every person chooses the same color

b. if you choose the same color as your neighbor(s), regardless of everyone else

2. When will a session end?

a. if all subjects choose the same color

b. when the 3-minute time limit is reached

c. never

d. either a or b, whichever happens first

3. When will you get paid your earnings from the total experiment?

a. after each session

b. at the end of the entire experiment

4. How often can you change the color of your node?

a. once

b. twice

c. as often as you wish

5. If there is a number in the center of one of your neighboring nodes,   
 what does that number mean?

a. it represents the neighbor’s total number of connections, including you

b. it represents your neighbor’s color

Subject Number: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Quiz 2

1. In the next sessions you will earn money if . . .
   1. Every person chooses the same color
   2. The 3-minute limit elapses
2. In the next sessions you will lose money when . . .
   1. You pick a color at the beginning of the session
   2. You change colors (after having picked a color the first time)
   3. Both
   4. Neither
3. In any given session, your total earnings . . .
   1. Can only increase or stay the same, depending on whether the session was successful
   2. Can only decrease or stay the same, depending on how many times you change your color
   3. Can either increase, decrease, or stay the same, depending on whether the session was successful and how many times you changed your color
4. How much will you lose when you change your color?
   1. 5¢
   2. 10¢
   3. 20¢
   4. 50¢

Subject Number \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Quiz 3

1. In the next sessions you will earn money if . . .
   1. Every person chooses the same color
   2. The 3-minute limit elapses
2. In the next sessions you will lose money when . . .
   1. You pick a color at the beginning of the session
   2. You change colors (after having picked a color the first time)
   3. Both
   4. Neither
3. How much will you lose when you change your color?
   1. 5¢
   2. 30¢
   3. 20¢
   4. 50¢

Subject Number: \_\_\_\_\_\_\_\_\_\_

Post Experiment Questionnaire

Year in School: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Undergraduate Major(s): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date of Birth: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

College GPA: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Did you take a college math course: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

If so, which courses: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Have you participated in other experiments \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

If so, in what department: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Did you have any strategiees for picking which nodes to request?

Study of Learning and Decision-Making Under Risk and Uncertainty

Recognition of Payment

I acknowledge that I have received the earnings listed below. I agree that this constitutes payment in full for my participation, and I do not have any further claims to the University of California or the University of Southern California, or the investigators conducting this study for my participation in this study.

Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Earnings from on-time bonus: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Earnings from quiz answers: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Earnings from all sessions: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Total Earnings: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Full Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_