Money Illusion and Coordination

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Introduction

Non-neutrality of money and stickiness of prices puzzled the economist for decades. One of the reasons is that in short-term money seems to be salient and natural unit. The phenomenon of money illusion is one of the central aspects with this regard. The term *money illusion* coined by well-known economist Irving Fisher. Money illusion refers to the tendency to confuse nominal and real aspects of the economy. According to the concept, even though people are aware of existing difference between nominal and real values, it still could be a case that peoples' thinking of transactions is dominated by nominal values.

Behavioural economic theory classifies money illusion as a potentially important form of bounded rationality. Money illusion seems to be persistent and not removed by learning. The theory tries to account of money illusion on physiological basis, in order to better understand this phenomena and model its consequences. However, there is no any formal model that allows explaining this phenomenon. Nevertheless, developments in experimental economics shed some light on this issue.

The series of experimental investigations put on the table contradictory evidences against standard theory. An experimental study by Shafir et al (1997) examined peoples' attitudes towards changes in nominal magnitudes under different context and framing. They found that nominal values affect people's perception of constraints and individual-level money illusion does exists ("indirect" effect). More importantly, people not only are prone to money illusion but they also expect other peoples to be prone to money illusion ("indirect" effect).

The experimental study by Fehr and Tyran (2004) (henceforth FT (2004)) addresses to the phenomenon of money illusion. In particular, FT (2004) examined the role of money illusion and its impact as a coordination device in equilibrium selection problem within homogeneous subjects. They experiment found evidences against standard theory; under strategic setting when strategic complementarily prevails, "indirect" effect of money illusion has large and permanent effect.

We draw our inspiration from this study and propose to experimentally examine the effect of money illusion on equilibrium selection problem within heterogeneous subjects. Our experiment has two main aims. First, we want to experimentally investigate and draw comparison of the aggregate outcomes with the different levels of heterogeneity in terms of money illusion prone and money illusion free subjects.[1] Secondly, we want to find whether under strategic setting money illusion prone subject/s are able to learn by imitating the money illusion free subjects.

Economic Theory and Relevance

Economic theory is considered to be a real theory and economists are mainly concerned to what is happening with real economy. However, almost all transactions in economy are carried out in money and thus, economy is nominal as well. Finally, Economic theory has little to say how equilibrium is reached. As it is often the case, for equilibrium to prevail, assumption of rationality is not sufficient; one has also to assume a common knowledge of rationality, which is highly unlikely to be met in practice.

The Keynesian theory considered the money illusion as an important phenomenon and introduced short-term money non-neutrality in order to account to, and argued that pure monetary changes could have real effects on economy. However, since "rational expectation revolution" in 1970s, money illusion explanation was ultimately dismissed and plays no role in nowadays standard economic theory. The reason is straightforward, since rationality and rational expectation was assumed, there was nothing to study; money illusion assumption was ignored on "a priori" grounds.

The Experiment

In order to investigate our subject of interest, we followed the study by FT (2004). Since, our experiment is largely based on FT (2004), we present their experimental design and protocol, and then introduce our modifications.

[1] Perhaps it is more natural way to think about complex economic reality, in terms of interaction between heterogeneous agents, rather then homogeneous ones.

Design

FT (2004) designed following experimental protocol. They introduced coordination game with three Pareto-ranked equilibria described in Table 1. Each player had to set simultaneously a price between 1 and 30 and the subjects were grouped in 5 subjects (or 6).

Table 1 *Three Pareto Equilibria Of The Game*

Equilibrium	Equilibrium price	Real equilibrium payoff	Nominal equilibrium payoff
A	$P_A = 4$	$\pi_A = 28$	$\pi_A P_A = 112$
B	$P_B = 10$	$\pi_B = 5$	$\pi_B P_B = 50$
C	$P_C = 27$	$\pi_C = 21$	$\pi_C P_C = 567$

The game was with strategic complementarities, thus, say, subject i's real payoff depend only on his price P_i and the average price of the rest of the players in his group $\bar{p}_{-i}$. Moreover, subject i was playing unique best replay for every level $\bar{p}_{-i}$. In general, as $\bar{p}_{-i}$ was increasing, the player i best response was to increase his price as well. The game was symmetric and the best replay function was located on 45 degree line in payoff matrix (see appendix A).

The money illusion was captured as a behavioural pattern in relation to nominal payoff matrix and real payoff matrix (see appendix A). There was no objective difference in terms of real payoffs between these two payoff matrixes. Only difference was that the players with nominal payoff matrix had to divide the nominal payoff by $\bar{p}_{-i}$ in order to find out real payoff.[2]

[2] Further, the authors created conflict between nominal payoff equilibrium and real payoff equilibrium, whereas in real payoff matrix the equilibrium A was yielding clearly the highest payoff and in nominal payoff matrix the equilibrium C loomed as the equilibrium with highest payoff. Thus, in real payoff matrix equilibrium A had obvious real dominance, while in nominal payoff matrix equilibrium C had nominal dominance.

Standard Theory Predictions

In fact the equilibrium A was the only Pareto efficient point in all payoff space, regardless whether it was represented in nominal payoff matrix or in real payoff matrix. Therefore, since subjects were faced objectively the same equilibrium selection problem where the equilibrium A was the only Pareto efficient point regardless whether the problem was represented in real or nominal terms, the standard theory predicts no difference between behaviour in real representation and in the nominal representation. In other words, the standard theory predicts that subject will permanently coordinate on the equilibrium A, despite the difference between nominal and real payoff representation.

The Representation

The session was run at the CeDEx laboratory at the School of Economics, University of Nottingham. The recruited subjects where mainly postgraduate students from the School of Economics. The session was computerised using z-tree software. Students were seated in a random order at PCs. Instructions were read aloud and questions were answered in private.[3] Throughout the experiment students were not allowed to communicate and could not see others' screens. Subjects were not told and did not expect whether there was any difference in any terms across and within groups.[4] Subjects were allowed to take notes and many of them did.[5]

The Protocol

To be able to compare the results of our experiment to the results of the FT (2004), we drew a protocol as close as possible to theirs. Thus, we maintain the game the same as FT (2004), using the same payoff matrixes. Analogously to FT(2004), subject had to decide to choose price between 1 and 30 and also indicate what they expected as the

[3] Before the start of the experiment, subjects were given 5 minutes to read the instructions themselves. However, due to unexpected technical difficulties with the computer, subjects had additional 10 minutes to before the experiment took place. Moreover, the technical difficulty forced us to exclude one group of five subjects and conduct 10 rounds instead of 15 planned rounds.

[4] During dealing the technical difficulty that we experienced we could not fully control fro the communication between subjects that we can not exclude.

[5] The salience in the experiment was met; the subjects were repaid according to their profits earned in the experiment by chewing gums. The exchange rate was 20 (experimental) points 1 chewing gum.

average price of the rest of her group. After each period, each subject, received feedback of her real payoff, and the average price of the rest of her group members.

We only did slight modifications, which did not have any impact on the logic and structure of the game. We firstly took the same group size (5 subjects). Secondly, given the constraints, we had only 15 subjects. Thirdly, we took as baseline treatment group of 5 subjects with nominal payoff matrixes.[6] Finally, we induced the heterogeneity by endowing real and nominal payoff matrixes accordingly the group composition in each treatment and created two different levels of heterogeneity in the group. Thus, in the group of 2R&3N, we experimentally induced two money illusion free subjects. Similarly, in the group of 4R&1N we increased the number of these subjects to the maximum. The two following treatments that are envisaged in the new experiment are *Treatment 2* and *Treatment 3*:

Treatment 1: The group of 5 subjects with nominal payoff matrix *(5N)*

Treatment 2: The group of 2 subjects with real payoff matrix and remaining 3 subjects with nominal payoff matrix *(2R&3N)*

Treatment 3: The group of 4 subjects with real payoff matrix and remaining 1 subject with nominal payoff matrix *(4R&1N)*

Expectations

FT (2004) found that that money illusion exists only temporarily and it disappears at the individual level when subjects can repeatedly make the same decision in the context of an individual optimization task. Further, the authors found that in first few periods individual-level of money illusion is dominant relative "indirect" effect of money illusion which dominates afterwards. With respect to the two group composition, we have two different strength of learning effect from money illusion free subjects. We expect that this learning effect would reduce or possibly outweigh

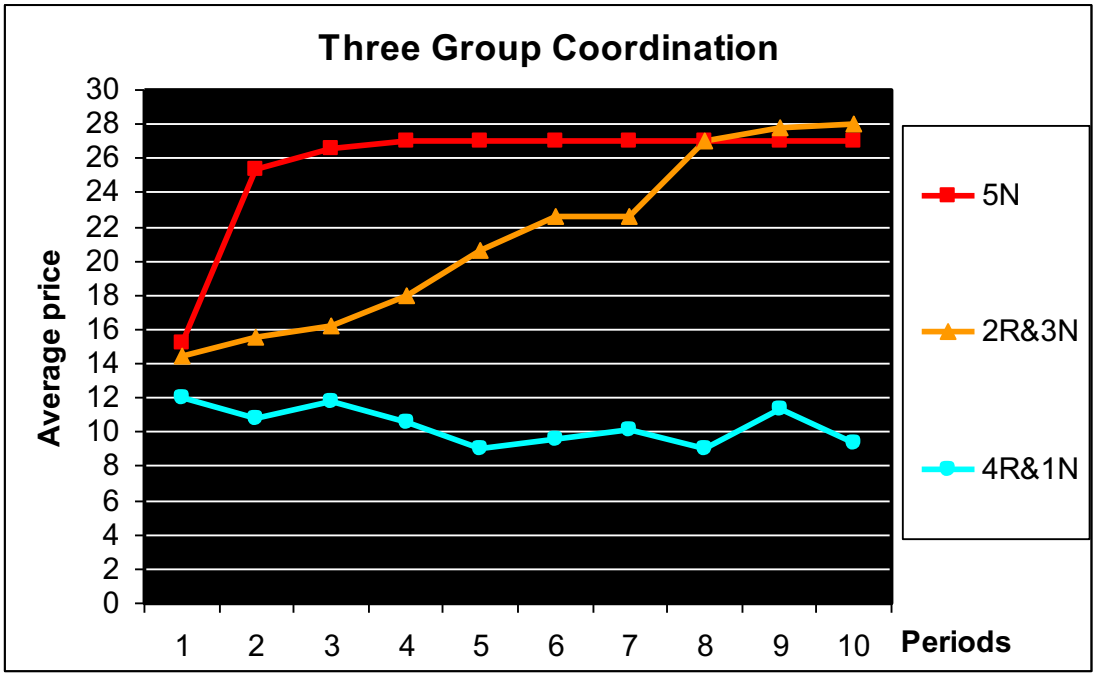
[6] We choose the treatment with 5 subjects with nominal payoff matrix as baseline treatment, because was more relevant given the subject of interest the design had and it served as best measurement tool for remaining two treatments. Moreover, we expected the outcome of group of 5 subjects with real payoff matrix relatively straightforward.

the effect of individual-level money illusion. Therefore, we expect that the group 4R&1N has relatively higher chance to coordinate to the Pareto-efficient equilibrium rather than the group 2R&3N.

The Results

In this section we present our results from different treatment conditions. Our main interest lies in comparison between 4R&1N and 2R&3N treatments, with particular focus on 4R&1N treatment. Figure 1 depicts the coordination path to the equilibria of three different groups. The vast majority of subjects were playing the best replay to the average expectations of the other players. Thus the subject choices were determined by subjects' average expectations (see Appendix C).

Figure 1: *Three Group Coordination*



The average price of the group of 5N started around 15 and converged to the inefficient equilibrium C relatively fast. This result supports the FT (2004) results that nominal representation of payoff matrix caused the convergence to the inefficient equilibrium. However, two subjects in this group played price 1 and 2. This, finding indicates that these to players overcame the direct effect of money illusion. However,

they did not expect others to do so and tried to influence the average price.[7] Nevertheless, all players in period 4 played equilibrium price 27.

The group 2R&3N stared at average price 14 and converged slowly to the inefficient equilibrium. In the group only one real subject choose efficient equilibrium price 4, other three nominal subjects play on average price 15. Noteworthy, second real subject chose price of 21, which could be interpreted as a bounded rationality (see Appendix B).

Interestingly, the group 4R&1N remained relatively stable around unstable equilibrium price 10. In this group, only one real subject chose price 4 and second real subject chose 5 (see Table 2 in Appendix B).[8] The other two remaining real subjects choose price 15 and 13, which either could be interpreted as bounded rationality or in some sense as players' strategy to choose "something in between". More importantly, we observed that that the only nominal subject in this group that chose price 23 in first period, played price 7 in second period. Onwards, one part of the subjects was playing prices above 10 and the other part below. However in last to periods most of them played unstable equilibrium price.

Conclusion

Despite the fact that we do not have sufficient observations and the experiment did not run as one would consider appropriate, our experimental results suggest that money illusion persist with heterogeneous agents under strategic setting. The results contradict standard theory assumptions. We found no support to the efficient market hypothesis that irrational agents will be driven out by rational ones. In general, as we increased the heterogeneity in terms of money illusion free subjects, the group efficiency was decreasing.[9] Our evidences show that small bounded rationality also

[7] It is worth to note that FT(2004) did not find any evidence in their treatment of 5 nominal subjects, that at least one to choose price 4 or below. This can be partly explained by the fact that due to our technical difficulties players had nearly 15 minutes to examine the payoff matrix.
[8] One real subject in first three periods was repeatedly choosing price 4, probably in order to signal the rest of the group members on the efficient equilibrium. However, he "gave up" in period 4.
[9] The group 5N – 58% of efficiency, group 2R&3N – 34% of efficiency and group 4R&1N – 14% of efficiency. We measure the efficacy in terms of total profits earned during the experiment relative to the maximum profit that group could achieve by playing efficient equilibrium. Moreover, it is

persists and affects group's outcome. The data from treatment 3, suggests that even one money illusion prone agent can cause inefficient outcome. Interestingly, we find that under strategic setting money illusion prone subject learns from others behavior. However, the effect of learning under strategic setting seems to be a double-edged; while money illusion free subject learns fast by imitating others to how to overcome money illusion, at the same time her previous actions distorts the aggregate behavior. As it seems, this pattern is largely responsible for the observed stability around unstable equilibrium.

The results from treatment 3 cast doubts, whether under this experimental setting the group would be able to converge either to one of the stable equilibria. Therefore, it would be interesting to investigate these findings further.

interesting to note that in the group 2R&3N the highest total profit of nominal players was twice as much as the lowest total profit earned by real player.

Reference

Fehr, E. and Tyran, J.-R. (2004): Money Illusion and Coordination Failure. *Working paper*, University of St. Gallen, May 2003

Kahneman, D. and Tversky, A. (2003): Choices, Values and Frames, Cambridge University Press

Shafir, E., Diamond, P.A. and Tversky, A. (1997): Money Illusion. *Quarterly Journal of Economics* 112(2): 341-74.

Tyran J-B.: Lecture notes, Behavioral and Experimental Economics, University of Copenhagen, winter semester 2004

APPENDIX A

Real payoff matrix

Average price of other firms

selling price	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	13	6	4	4	4	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	24	13	6	6	6	4	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	13	24	15	15	15	6	3	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4	6	13	28	28	28	14	6	3	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
5	3	6	15	15	15	27	13	5	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
6	2	4	6	6	6	14	24	10	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7	2	3	4	4	4	6	13	19	7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
8	2	2	3	3	3	4	6	10	12	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
9	1	2	2	2	2	3	3	5	7	3	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
10	1	2	2	2	2	2	2	3	3	5	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
11	1	2	2	2	2	2	2	2	2	3	4	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
12	1	2	1	2	1	2	2	2	2	2	6	4	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
13	1	1	1	1	1	1	1	2	1	1	4	7	5	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
14	1	1	1	1	1	1	1	1	1	1	2	4	8	5	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1
15	1	1	1	1	1	1	1	1	1	1	2	2	5	9	6	3	2	2	2	1	1	1	1	1	1	1	1	1	1	1
16	1	1	1	1	1	1	1	1	1	1	1	2	2	5	10	6	3	2	2	2	1	1	1	1	1	1	1	1	1	1
17	1	1	1	1	1	1	1	1	1	1	1	1	2	3	6	11	7	3	2	2	2	1	1	1	1	1	1	1	1	1
18	1	1	1	1	1	1	1	1	1	1	1	1	1	2	3	6	12	7	4	2	2	2	1	1	1	1	1	1	1	1
19	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	3	7	13	8	4	3	2	2	2	1	1	1	1	1	1
20	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	3	7	14	8	4	3	2	2	2	1	1	1	1	1
21	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	3	8	15	9	4	3	2	2	2	2	2	1	1
22	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	4	8	16	9	4	3	2	2	2	2	2	1
23	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	4	9	17	10	5	3	2	2	2	2	2
24	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	4	9	18	10	5	3	3	3	2	2
25	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	3	4	10	19	11	5	5	5	3	2
26	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	3	4	10	20	11	11	11	5	3
27	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	3	5	11	21	21	21	12	6
28	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	3	5	11	11	11	23	13
29	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	3	5	5	5	12	24
30	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	3	3	3	5	13

Nominal payoff matrix

Average price of other firms

selling price	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	13	11	11	15	19	15	13	12	11	10	11	12	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
2	24	25	19	25	32	22	16	14	12	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
3	13	48	44	58	73	37	23	16	13	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
4	6	25	84	112	140	84	39	22	15	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
5	3	11	44	58	73	162	88	37	19	12	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
6	2	7	19	25	32	84	168	80	29	12	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
7	2	5	11	15	19	37	88	152	59	14	13	14	15	16	17	18	19	19	20	21	22	23	24	25	26	27	28	29	30	31
8	2	4	8	10	13	22	39	80	108	18	14	15	15	16	17	18	19	20	21	22	23	24	25	25	26	27	28	30	31	32
9	1	3	6	8	10	15	23	37	59	30	17	16	17	17	18	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
10	1	3	5	7	9	12	16	22	29	50	22	19	18	18	19	19	20	21	21	22	23	24	25	26	27	28	29	30	31	32
11	1	3	5	6	8	10	13	16	19	30	39	26	22	21	20	20	21	21	22	23	24	24	25	26	27	28	29	30	31	32
12	1	3	4	6	7	9	11	14	15	18	66	48	31	25	23	22	22	22	23	23	24	25	26	27	27	28	29	30	31	32
13	1	2	4	5	7	8	10	12	13	14	39	84	59	36	29	25	24	24	24	24	25	25	26	27	28	29	30	31	32	33
14	1	2	4	5	6	8	9	11	12	12	22	48	104	70	42	32	28	26	26	26	26	26	27	28	28	29	30	31	32	33
15	1	2	4	5	6	8	9	10	11	12	17	26	59	126	83	48	36	31	29	28	27	27	28	28	29	30	31	32	33	34
16	1	2	4	5	6	7	9	10	11	11	14	19	31	70	150	96	54	40	34	31	30	29	29	29	30	30	31	33	33	34
17	1	2	3	5	6	7	8	9	10	11	13	16	22	36	83	176	111	61	44	36	33	32	31	31	31	31	32	34	34	35
18	1	2	3	5	6	7	8	9	10	11	12	15	18	25	42	96	204	126	68	48	40	36	34	33	32	32	34	35	35	36
19	1	2	3	4	6	7	8	9	10	10	12	14	17	21	29	48	111	234	143	76	53	43	38	36	35	34	35	37	37	37
20	1	2	3	4	6	7	8	9	10	10	12	13	15	18	23	32	54	126	266	160	84	57	46	41	38	36	38	39	39	38
21	1	2	3	4	5	7	8	9	10	10	12	13	15	17	20	25	36	61	143	300	179	92	62	49	43	40	42	43	42	41
22	1	2	3	4	5	7	8	9	10	10	12	13	14	16	19	22	28	40	68	160	336	198	101	67	53	46	48	50	46	44
23	1	2	3	4	5	6	8	9	9	10	11	13	14	16	18	20	24	31	44	76	179	374	219	110	73	57	59	61	54	49
24	1	2	3	4	5	6	7	8	9	10	11	13	14	15	17	19	22	26	34	48	84	198	414	240	120	78	81	84	67	57
25	1	2	3	4	5	6	7	8	9	10	11	12	14	15	17	18	21	24	29	36	53	92	219	456	263	130	135	140	93	71
26	1	2	3	4	5	6	7	8	9	10	11	12	14	15	16	18	20	22	26	31	40	57	101	240	500	286	297	308	157	99
27	1	2	3	4	5	6	7	8	9	10	11	12	14	15	16	18	19	21	24	28	33	43	62	110	263	546	567	588	348	168
28	1	2	3	4	5	6	7	8	9	10	11	12	13	15	16	17	19	21	23	26	30	36	46	67	120	286	297	308	667	375
29	1	2	3	4	5	6	7	8	9	10	11	12	13	15	16	17	19	20	22	24	27	32	38	49	73	130	135	140	348	720
30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	16	17	18	20	21	23	26	29	34	41	53	78	81	84	157	375

Instructions

Welcome and thank you very much for participating in this experiment. Please read these instructions carefully. You can earn chewing gums through this task. During the experiment, we calculate your payoff in points. All points you earn during the experiment will be converted into a number of chewing gums, according to the exchange rate: 20 points = 1 chewing gum.

Please **do not communicate** with other participants during the experiment. If you need to ask questions, please **stay silent** and raise your hand. One of the experimenters will come to answer your question.

This experiment will be run for 15 periods. All participants are divided into groups of 5 people. You will not know who is in your group but the composition of the group remains stable throughout the experiment. Only the decisions in your group are relevant for your earnings. Decisions by other groups are irrelevant for you.

All group members play the role of firms. In each period, all firms must simultaneously set a price from 1 to 30 (1 and 30 included). How much you earn depends on the price you choose and on the average price that all **other** firms in your group choose.

The income table distributed shows your **nominal point income**.
Example: Suppose you choose a price of 15 and the other firms choose prices of 16 on average. In this case your *nominal* point income is 48 points.

For the determination of your earnings at the end of the experiment, only the real point income is relevant. This holds for all firms. To calculate your real point income from your nominal point income, you have to divide the nominal point income by the average price of other firms. Thus, the nominal and the real point income are related as follows:

Real point income = Nominal point income / Average price of other firms

In the example above, your nominal point income is 48 points, but your real point income is 3 points (= 48 points/ 16).

The procedure of the experiment is the following:
At the beginning of each period, you choose a selling price (that is, a number from 1 to 30) and indicate which average price of the other firms you expect. At the end of each period you are informed about the actual average price of the other firms and about your actual real point income.

Instructions

Welcome and thank you very much for participating in this experiment. Please read these instructions carefully. You can earn chewing gums through this task. During the experiment, we calculate your payoff in points. All points you earn during the experiment will be converted into a number of chewing gums, according to the exchange rate: 20 points = 1 chewing gum.

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This experiment will be run for 15 periods. All participants are divided into groups of 5 people. You will not know who is in your group but the composition of the group remains the same throughout the experiment. Only the decisions in your group are relevant for your earnings. Decisions by other groups are irrelevant for you.

All group members play the role of firms. In each period, all firms must simultaneously set a price from 1 to 30 (1 and 30 included). How much you earn depends on the price you choose and on the average price that all **other** firms in your group choose.

The payoff matrix distributed shows your **real point income**.
Example: Suppose you choose a price of 15 and the other firms choose prices of 16 on average. In this case your *real* point income is 3 points.

The procedure of the experiment is the following:
At the beginning of each period, you choose a selling price (that is, a number from 1 to 30) and indicate which average price of the other firms you expect. At the end of each period you are informed about the actual average price of the other firms and about your actual real point income.

Appendix B

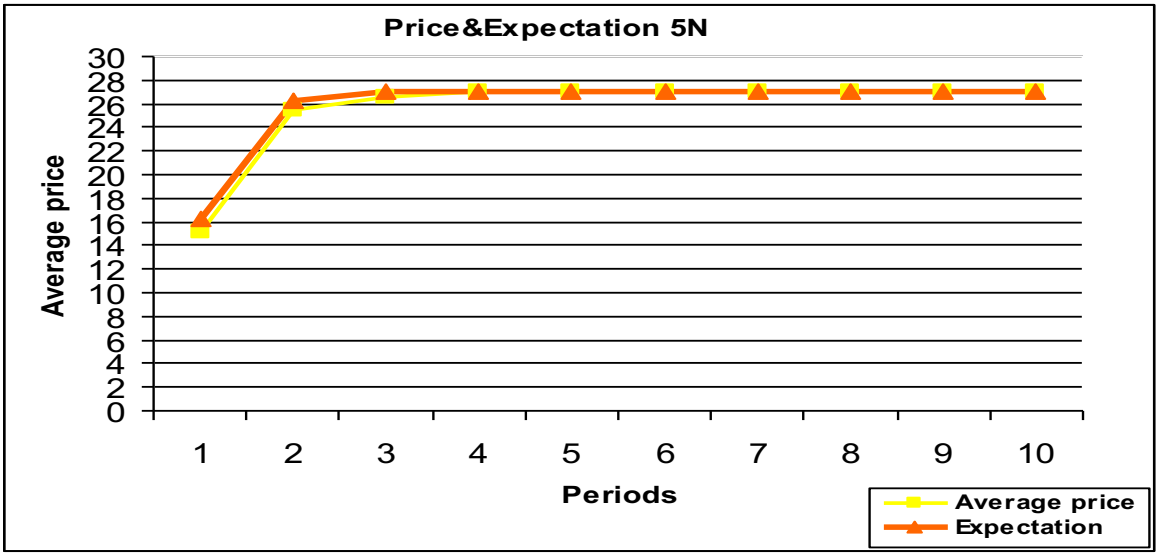
Table 2: *Group of 4R&1N*

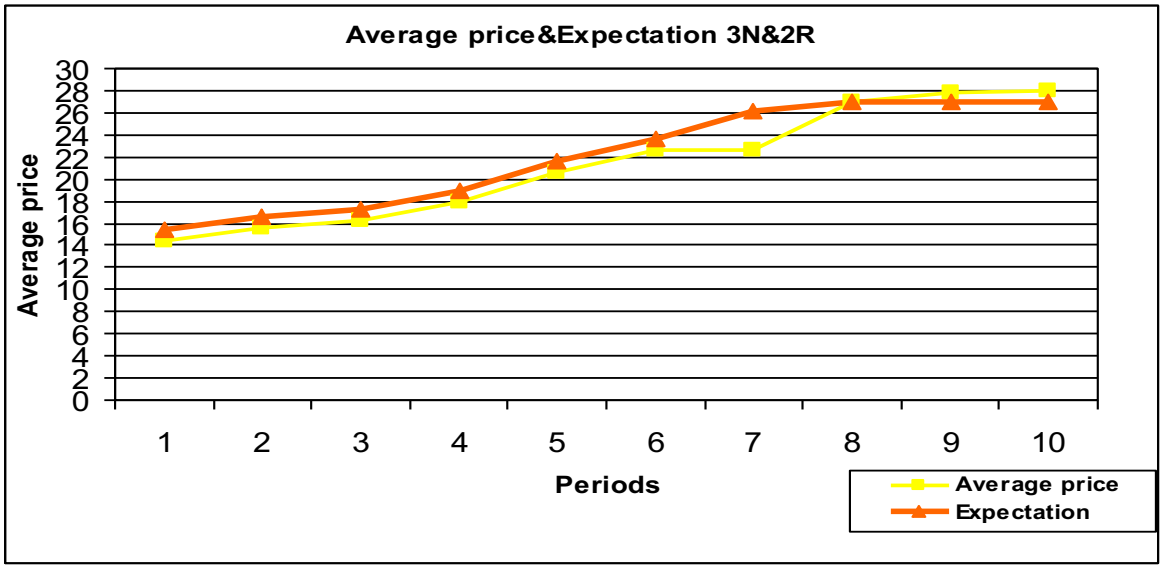
Period 1			
Player	*Price*	*Expectation*	*Average price of others*
Real	15	16	11
Real	13	15	12
Real	4	4	14
Real	5	6	14
Nominal	23	22	9
Period 2			
Player	*Price*	*Expectation*	*Average price of others*
real	17	19	9
real	10	11	11
real	4	4	12
real	15	14	10
nominal	7	8	12
Period 3			
Player	*Price*	*Expectation*	*Average price of others*
real	7	11	13
real	10	11	12
real	4	4	14
real	20	19	10
nominal	17	16	10

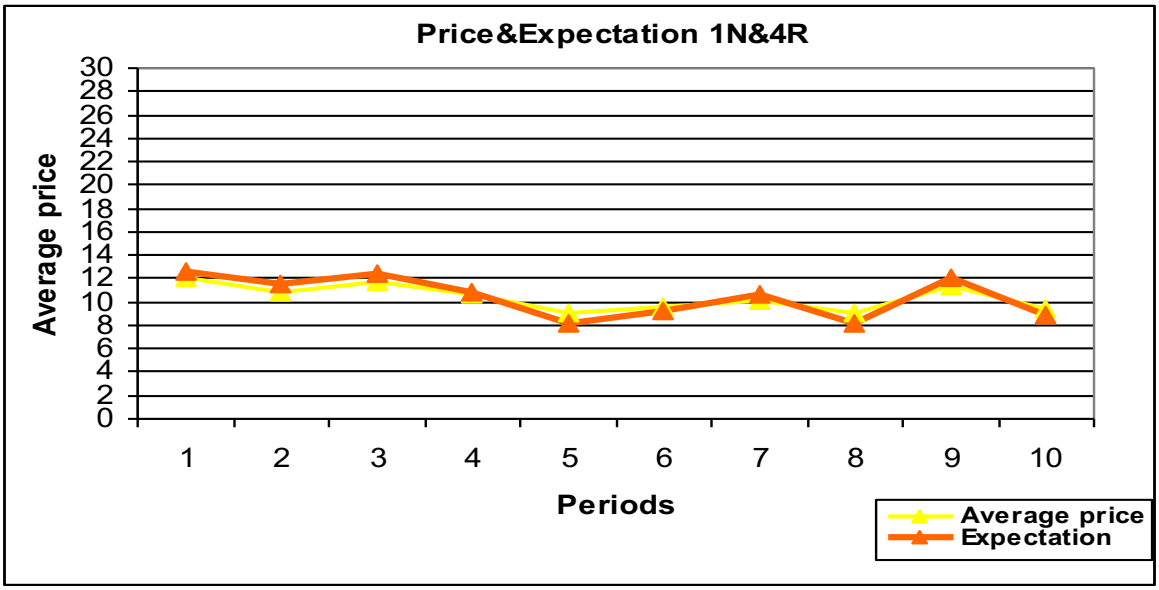
Table 3: *Group of 2R&3N*

Period 1			
Player	*Price*	*Expectation*	*Average price of others*
nominal	15	15	14
nominal	15	15	14
nominal	16	15	14
real	21	20	13
real	4	4	17
Period 2			
Player	*Price*	*Expectation*	*Average price of others*
nominal	14	15	16
nominal	15	14	16
nominal	16	15	15
real	14	18	16
real	18	17	15
Period 10			
Player	*Price*	*Expectation*	*Average price of others*
nominal	28	29	28
nominal	27	27	28
nominal	28	28	28
real	29	28	28
real	27	26	28

Appendix C


Price&Expectation 5N
Average price
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
1
2
3
4
5
6
7
8
9
10
Periods
Average price
Expectation


Average price&Expectation 3N&2R
Average price
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
1
2
3
4
5
6
7
8
9
10
Periods
Average price
Expectation


Price&Expectation 1N&4R
Average price
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
1
2
3
4
5
6
7
8
9
10
Periods
Average price
Expectation