

Experiments on Trust and Bargaining in Bulgaria:
The Effects of Institutions and Culture

Kenneth Koford

Department of Economics
University of Delaware
Newark, DE 19716

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ABSTRACT

Economic development in transition economies requires reasonably high levels of cooperation and trust. Experiments may indicate the level of mutual cooperation in particular circumstances.

This paper replicates in Bulgaria experiments carried out by Berg, Dickhaut and McCabe (1995), and Fehr and Falk (1999), respectively in Minnesota and Switzerland. In both series of experiments, the self-interested equilibrium behavior is no cooperation. Nevertheless, in both Minnesota and Switzerland most subjects engaged in reciprocity. The two series are somewhat different, in that the former appeared to be a game of trust between equals, while the latter seemed to be a game between bosses and workers.

The amount of reciprocity in the Berg, Dickhaut and McCabe replication was actually higher in Bulgaria, perhaps representing the different social history of Bulgarian students. While the students in the experiment did not know each other well, they could observe that the other students were members of the same "elite" faculty (group of related majors). The amount of reciprocity in the replication of the Fehr and Falk (1999) game was considerably less, and led to the students obtaining considerably lower payments.

It appears that students visualized the two games differently, even though the basic structure of the games was the same. Perhaps Bulgarian students feel trust toward fellows who are equal, but show a lack of trust in vertical relationships like those between bosses and workers.

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It is now becoming widely accepted that trust, reciprocity and bargaining strategies can vary across cultures. Recent work has shown that in extremely varied environments, behavior can be extremely different. It is also becoming established that such values as trust and civic cooperation help determine the level of income and of economic growth [Putnam (1993), Knack and Keefer (1997), Barro (1997)]. We can perhaps take these two relationships as confirmed, with trust and civic cooperation seen as “cultural” independent variables caused by historical experience and by institutions that are not yet well explored.¹ This paper examines some of the specifics of trust and cooperation, and tries to relate them to some institutional facts in Balkan history. Balkan countries have been characterized as “low-trust” environments, and considerable casual evidence supports this perspective. Yet, personal trust among friends and relatives seems very high, while trust between superiors and “inferiors” may be low.

The paper reports two series of experiments aimed at examining horizontal and vertical trust and reciprocity. Berg, Dickhaut, and McCabe (1995) experimentally test students’ willingness to make trusting acts, where “trust” is defined as a risky act that relies on cooperation from another person who may find it in his interest NOT to cooperate. The experiment then tests for the amount of reciprocity that occurs in response to these trusting acts: do those who “trust” come out ahead or behind? The experiment seems to examine “horizontal” trust among similarly-placed individuals, who are both students choosing to send money to the other person or not.

In contrast, the Fehr and Falk (1999) experiment begins with an explicit understanding

that there are two quite opposed groups, workers and bosses. And there is a separate first stage, in which “market” wages are determined, before the choices of trust and reciprocity are made. This first stage emphasizes by label and behavior the differences between the two groups--each group appears to have interests opposed to the other. It seems that the “bosses” have the upper hand, as there are fewer of them and this gives them market power in arranging wages. Yet, ultimately this experiment relies upon mutual trust almost exactly like the horizontal-trust experiment. Thus, this game can best be identified as a test of “vertical” trust. Figure 1 indicates the alternative mental structures I want to examine.

The details of the first experiment are given in Berg, Dickhaut and McCabe (1995); below I just review the experiment briefly and note how our experiment differed from the original protocol. Then I give a description of the second experiment; again, the details are in Fehr and Falk (1999). The results of the horizontal experiment are given in Section 2, while Section 3 discusses the results of the vertical experiment. Section 4 considers what the results may mean for cooperative behavior in Bulgaria. I conclude with some plans for future experiments.

The basic Berg, Dickhaut and McCabe “investment” game placed a group of subjects in room A and paid them each a \$10 show-up fee; each subject then chose privately to send any portion of the \$10 to an anonymous fellow subject in room B. The money sent would be tripled by the _____ before it reached room B. Each subject in room B then could decide privately how much of the money to keep and how much to return to the counterpart subject in room A. The rules assured that neither the subjects nor the experimenters knew the amount any subject sent.

All of the subjects knew the specific rules for both groups of subjects, and there were safeguards to assure the subjects that the experimenters were actually following the rules.

The Bulgaria replications used (1) volunteer students from courses in the _____ at Sofia University, (2) volunteer students from a course in Varna University of Economics, and (3) volunteer students from a course at the University of National and World Economy in Sofia. The students at Sofia University were distributed across the four undergraduate classes and between the economics and business administration majors. The students in Varna and from the University of National and World Economy were obtained from a single large class, and so may have been more homogeneous. Students in fall 1997 were paid 1000 leva, which was about two hours' wages for a student, and so comparable to the \$10 paid in the U.S. experiments. Students in spring 2000 and spring 2002 were paid 5 new leva, equivalent to 5000 old leva, which was a higher real payment, equal to about 3-4 hours of work at that time. In Fall 1997, two groups of 16 subjects each participated. Spring 2000 had one group of 16 students at Sofia University and one group of 15 students at Varna University of Economics.

Students in the _____ of Economics and Business Administration are required to be proficient in English; the introductory required textbooks (Samuelson and Nordhaus, Steiner) were in English, and some of their required courses are taught in English by American instructors. The students in Varna and at the University of National and World Economy were informed that the experiment was in English, and so only students proficient in English should participate. We gave out the directions for the experiment in English, both in written form and orally. We handed out the written instructions, which were very similar to Berg, Dickhaut and McCabe's directions and then read them to the students. We asked for questions, and also

stated, “If you wish to ask questions in Bulgarian, you are welcome to do so.” (Only in Varna were there some questions in Bulgarian).

The subjects were given large envelopes that contained smaller envelopes that in turn would contain any money that the subject would choose to pass on. Thus, it was impossible to tell whether a subject sent money or not. There was a private location where each subject went to place money in the envelopes to send to the other subject. The person who opened the envelopes, recorded the amounts of money, and placed the new amounts in new envelopes, did this away from the subjects and the other experimenters.

The interest in the experiment comes from the difference between its actual results and the predictions of game theory. The best self-interested strategy for both groups of players is to keep all of the money for themselves. Working backwards, the second group either keep the money or give it to an unknown other person. Keeping money is better than giving it to a stranger who will never know who sent the money. So keeping the money is a dominant strategy. The first group can see this and should keep the money rather than give it to an unknown other person who will just keep it (admittedly, tripled in value).

In Minnesota, however, the second (room B) group often did return money. Of the 28 subjects in room B who were sent more than \$1, 16, or more than half, returned more than \$1. Of the 32 subjects in room A, 30 sent some money and 28 sent more than \$1. On average, however, those in room A lost some money--the average amount sent was \$5.16, while the average amount returned was \$4.66. However, the high-givers may have received some extra reciprocity: taking all of those who sent \$5 or more, they paid in \$139 and received \$130 back, so they on average received 94% of the money they paid. Those who sent \$4 or less, paid \$26

but received \$19, or 75% of the amount they sent.

The Fehr and Falk (1999) experiments began with two groups of students, one labeled “workers” and the other “employers”. There were 11 workers and 7 employers. In the first stage, they make offers of wage rates, until they establish contracts between a worker and an employer. In these negotiations, the workers and employers are in separate rooms, so they cannot observe who their counterparts are. Since there are only 7 employers, and each employer can hire only one worker, four workers must remain unemployed. This puts the bargaining power at this stage in the hands of the employers. In the second stage, however, the workers decide how much effort to provide. The effort is costly to them in terms of utility (and so payoffs). Their choices are private, and the employers are only informed after the workers have been paid and have left the building. In the third stage, the workers and then the employers are paid. The compensation system rewards the employers for the effort provided by the workers. Yet the workers decide this after having an agreement on their wage, so effort is entirely a “gift” to the employer. Actually, if wages are low, a worker can end up with very low or even negative compensation if the worker provides high effort. The players all know all of the rules, including the compensation scheme. Specifically, employers received compensation of $\Pi_e = (120 - w)e$, where w is the “wage” paid to the worker, and e is the effort chosen by the worker. Thus, the employer’s compensation fundamentally depended on the effort choice of the worker. Workers received compensation of $U_w = w - C(e) - 20$. Employers had to pay then at least $C(e) + 20$ for them to be better off in the contract. The $C(e)$ schedule and the wage payment needed to make the worker one unit better off than without a contract for a given level of effort, w^* , are given below:

e:	.1	.2	.3	.4	.5	.6	.7	.8	.9	1.0
C(e)	0	1	2	4	6	8	10	12	15	18
MC C(e)	-	1	2	2	2	2	2	2	3	3
w*	21	22	23	25	27	29	31	33	36	39

In Bulgaria, the players were paid in leva 1/4 of the amount calculated by the Fehr-Falk formula. This gave players amounts in the 5-30 leva range, at a time when the lev was worth 1/2 of a USD, and the lev is equal in nominal value to a Deutsche Mark. The experiment was run in spring 2000 and in spring 2002.

This game is almost exactly analogous to the Berg, Dickhaut and McCabe game. In the first stage, the employer has the choice of how much to offer--in principle, down to 21. Given the intense competition, it seems very likely that offers down to 21 would be accepted. Higher offers are in a way "gifts". After the "gift" has been accepted, the worker has the choice of how much to return to the employer. The effort reduces the worker's "income" but the gift is much larger than the cost. For example, if the wage were 60, an increase in effort of .1 increases the employer's income by 60, at a cost to the worker of 1 or 2.

If the game is analyzed in terms of narrow self-interest at each stage, the outcome is simple: The workers will provide minimum effort in the second stage, and so the employers should try to pay minimal wages in the first stage. In this equilibrium, neither side gets high payments, which can come to both of them only from high effort levels and high wages.

If the two maximize joint returns, the worker must provide maximum effort. Then the two divide a total of 82. Joint returns with lower effort depend on wages--higher wages lead to higher total returns, but of course lower Π_e . So any strategy the players think up (but of course,

are not able to discuss) must deal with these opposed interests.

Figure 2 gives a graphical comparison of the two games, indicating that overall they are similar in their basic payoff relationships, although the Berg, Dickhaut and McCabe game has a more linear payoff structure.

The game played in Bulgaria was a one-shot game (in contrast to the approach of Fehr and Falk), to make it as equivalent as possible to the Berg, Dickhaut and McCabe game in basic structure.ⁱⁱ Yet the symbols are very different. One side is considered employers and the other is called workers. There is a “market” process that is unfair to workers, if the employers use their market advantage. So, while the game really involves mutual gift giving, it is more easily visualized as a game of conflict.

2. “Horizontal” experiment results

We review the experiments in the four groups separately as well as pooled, since small differences in the protocol might have influenced the outcomes. A point of some independent interest is whether these small protocol differences actually did have a substantial effect.ⁱⁱⁱ The results are given in detail in Table 1.

Table 1

1997 results:			
Subject	Sent to B	X3	Returned to A
1	1000	3000	300
2	800	2400	900
3	700	2100	900
4	700	2100	400
5	600	1800	800
6	600	1800	600
7	400	1200	300
8	200	600	300
Total	5000		4500
Average	625		
Overall Return to A Ratio: .9			
Case by case Return to A Ratio: .983			
Gainers: 4, Losers: 3, Tie: 1			
9	1000	3000	2000
10	1000	3000	2000
11	1000	3000	1600
12	900	2700	1800
13	900	2700	1200
14	700	2100	1500
15	600	1800	1200
16	0	0	0
Total	6100		11300
Average:	763		
Overall Return to A Ratio: 1.8			
Case by case Return to A Ratio: 1.868			
Gainers: 7, Losers: 0 (one sent no money)			
Total for both experiments:			
	11100		15800
Average:	694		988
2000 Results: Sofia			
Subject	Sent to B	X3	Returned to A
1	9	27	1
2	6	18	6
3	6	18	1
4	5	15	7
5	5	15	5
6	4	12	9
7	4	12	5
8	0	0	0*
Total:	39		34
Average	4.875		4.25
Overall Return to A Ratio: .87			
Case by case Return to A Ratio: 1.025			
Gainers: 3, Losers: 2, Tie 2 (one sent no money)			

2000 Results: Varna

Subject	Sent to B	X3	Returned to A	
1	10	30	24	
2	10	30	10	
3	8	24	7	
4	7	21	6	
5	3	9	4	
6	3	9	3	
7	3	9	14*	*Player B sent more money back than s/he received--perhaps the 5 leva payment for playing the game.
Total:	44		68	
Average	6.29		9.71	Overall Return to A Ratio: 1.55 Case by case Return to A Ratio: 1.73 Gainers: 3, Losers: 2, Tie: 2

Total for both experiments:

	83		102
Average:	5.56		6.8

2002 Results: Sofia University

Subject	Sent to B	X3	Returned to A	
1	10	30	18	
2	10	30	15	
3	8	24	13	
4	7	21	6	
5	6	18	7	
6	5	15	5	
7	4	12	4	
8	1	3	3	
Total:	51		69	Overall Return to A Ratio: 1.35
Average:	6.375		8.625	Case by case Return to A Ratio: 1.91 Gainers: 5, Losers: 1, Tie: 2.

2002 Results: University of National and World Economy, Sofia

Subject	Sent to B	X3	Returned to A	
1	10	30	5	
2	8	24	10	
3	7	21	9	
4	5	15	5	
5	5	15	3	
6	4	12	2	
7	3	9	1	
8	0	0	0	
Total:	42		35	Overall Return to A Ratio: .833
Average:	5.25		4.375	Case by case Return to A Ratio: .782 Gainers: 2, Losers: 4, Tie: 1. (One sent no

			money)
Total for all six experiments (adjusted to new leva):	287	364	Overall Return to A Ratio: 1.27
Average:	6.11	7.74	Case by case Return to A Ratio: 1.32
		-	Gainers: 24, Losers: 11 Tie: 8 (three sent no money)

Overall, the evidence indicates that students “trust” other students. The average amount of money sent by the room A students, 6.11 leva, is comparable to--though larger than--the \$5.16 that the U.S. students sent. The proportion of Room A subjects who sent some money--44 of 47, is the same as the 30 of 32 in the U.S. experiments. The distribution of amounts sent, shown in Table 2, is fairly similar:

Table 2

Amounts sent by Room A Subjects

Amount sent	U.S.	Bulgaria	Percents		Cumulative Percents	
			U.S.	Bulgaria	U.S.	Bulgaria
0	2	3	6.25	6.25	6.25	6.25
\$1 or 1 lev	2	1	6.25	2.08	12.5	8.33
\$2 or 2 leva	2	1	6.25	2.08	18.75	10.42
\$3 or 3 leva	4	4	12.5	8.33	31.25	18.75
\$4 or 4 leva	2	5	6.25	10.42	37.5	29.167
\$5 or 5 leva	6	5	18.75	10.42	56.25	39.58
\$6 or 6 leva	5	6	15.625	12.5	71.875	52.08
\$7 or 7 leva	3	6	9.375	12.5	81.25	64.58
\$8 or 8 leva	1	4	3.125	8.33	84.375	72.92
\$9 or 9 leva	0	4*	0	8.33	84.375	81.25
\$10 or 10 leva	5	9	15.625	18.75	100	100

*In the Varna experiment, there were 8 room A subjects, but one room B subject failed to appear.

Table 2 shows that for both Bulgarian and American subjects, a wide range of actions was

chosen--there is no focus on a single value. The average amount for Bulgarian subjects is higher and so their distribution is concentrated at the upper end. Individual “focal points” seem different for the two groups--U.S. subjects like 50-50, which was less chosen by the Bulgarians. They also gave 1/10, not chosen by the Bulgarians. In contrast, some Bulgarians chose 9/10, not chosen by any of the U.S. subjects.

Evidently the room A subjects in both countries expect reciprocity. The mean values are not very different, and the wide distribution of choices indicates no common understanding or confidence among subjects as to what the room B subjects will do. For if room A subjects were confident that the room B subjects would “share equally” in the gains, the logical thing to do would be to send all of the money. If room A subjects were sure that the room B subjects would keep all of the money, the logical thing to do would be to send nothing. The large number of intermediate amounts indicates “hedging”, not consistent with any clear maximizing strategy.^{iv}

We can make some statistical tests. The hypothesis that room A subjects will see the logic of the game and so send no money to room B subjects is rejected, with 45 of 48 subjects sending positive amounts. We can test if the average amount provided by Bulgarian students is different from the average of the U.S. students. Using a difference in means test, the difference is 1.007 ± 1.361 at the .05 level of significance (two-tailed test). At the .1 level, the difference is still not significant: 1.007 ± 1.134 . Bulgarians may have shown a bit more trust than the U.S. students, but the overall impression is a similar distribution.

Turning to room B subjects, in the six sessions, overall they gave back more than they received. None played the dominant strategy of returning nothing. In a few cases, the room B subjects were much more generous. In Group 2, 1997, subjects gave back on average nearly twice what they kept. Every room A subject who sent money to room B received a larger amount back--thus gaining from exchange. The fourth session had two very generous room B

subjects--one returned 24 of the 30 received, and one returned 14 of the 9 received--giving up the “show-up” fee to a not very trusting Room A subject.

Pooling the cases, we see that Bulgarian room B subjects provided a little more back than the U.S. subjects: in total amounts, the U.S. subjects returned .903 of what they received, while the Bulgarians returned 1.27 of what they received. A more precise test involves comparing the individual ratios of money returned to money received for each student. For the Bulgarians this was 1.32 and for the Americans it was .91.^v A test of the difference of means fails to reject equality at the .05 ratio--the 95% confidence interval of this difference is $.410 \pm .413$. At the .1 level, the 95% confidence interval is $.410 \pm .345$. With moderate confidence we might think that the Bulgarian students were somewhat more generous in responding.

Between the 1997 and 2000/2002 experiments, the amount of money involved in the experiment increased by 10 times in leva--clearly, a large change. We can test whether the increased “value” of the experiment changed the amount sent by the subjects. Often it is argued that increased monetary value in experiments will lead to increased use of straightforward economic rationality. Here that would imply less “trust” and “reciprocity” in 2000. Considering the amount of “trust” shown by room A subjects, in 1997 subjects sent an average of 694 leva to room B; in 2000 the average was 5.56 new leva, and in 2002 the average was 5.81; giving for 2000/2002 an average of 5.69. This difference is not statistically significant at the .05 and is just barely significant at the .1 level (two-tailed test): a difference of 1.25 ± 1.24 . The ratio of returned to sent money (by each subject) was 1.396 in 1997 and 1.35 in 2000/02, not significantly different. So the large change in value had minimal effects on behavior, that were only possibly statistically significant.

The large number of intermediate amounts indicates some sort of “hedging” strategy, not consistent with any clear maximizing strategy.^{vi} However, as we shall see, overall their choices

did seem reasonably successful, indicating that in some deeper sense than “game theoretic maximizing” their actions must have been sensible.

On average, the ratio of amount returned to amount sent was about the same, so those who sent more made larger gains. Berg, Dickhaut and McCabe (1995) found that the ratio of amount sent to amount returned was about the same for all amounts sent; they had an $r = .01$ using a rank-order test. Using their test for all of the cases in our data, we have $r = .07$, which was also not statistically different from 0. The specific ratios are given in Table 3, which gives the average of the individual ratios for each amount.

Table 3
Ratio of amount room B subjects returned to amount received
Returned/received

Amount received	U.S.	Bulgaria
\$1 or 1 lev	.5	-
\$2 or 2 leva	1.0	1.5
\$3 or 3 leva	1.0	2.33
\$4 or 4 leva	.25	1.42
\$5 or 5 leva	1.43	1.2
\$6 or 6 leva	.8	1.1
\$7 or 7 leva	.14	1.21
\$8 or 8 leva	.5	1.0
\$9 or 9 leva	-	1.15
\$10 or 10 leva	1.02	1.55

One problem in our results is the difference in room B subjects' amounts sent back between the second group and other groups. This suggests some difference in subjective view or in instructions. Here are three possible explanations for this difference:

1) While we gave the same directions in each case, we emphasized more to the second group that the room A subjects were using their only payment of 1000 leva to send money to the room B. Subjects. This changes the "focal point" of the room B subjects from dividing the money sent to them, to dividing the total of money sent to them and paid to them for participating. Then it would make sense to send back to the room A subjects more than half of the amount received, so that they get a "fair" payment. This was only one sentence that was read with more emphasis, but perhaps it made a difference.

2) In the first experiment, we were careful to assure that when the room B subjects entered and left the "private room" they had no contact with anyone except for the cashier who was near the exit to that room. In the second experiment, while the physical layout remained the

same, we were perhaps less strong in keeping members of the experimental team out of sight of the room B subjects. While subjects made their decisions privately, handed in their envelopes and left, perhaps seeing team members next to the cashier could have influenced their decision.

In addition, it is possible that some information about the first experiment “leaked” to the second group, although it is hard to think what information would change the results in the way observed. (Roth et. al. (1991) had a similar large variation among experiments in Ljubljana, which they were not able to resolve either).

In the experiments after the second one, we were lucky to be able to “control” information more effectively, since two were unique to a particular university, and the two at Sofia University were done in different years.

Since the amounts sent the room A subjects vary in both our experiment and in Berg, Dickhaut and McCabe differ, we normalize for it in considering the behavior of room B subjects. We compare the percent of money each subject returned in the two experiments. In ours, the average percent was .47 [need to check!], while in Berg, Dickhaut and McCabe, it was .3. This difference is statistically significant at the .05 level.

3. Vertical experiment

The results of the three experiments are given in Table 4.

Table 4

Results of Fehr-Falk Single-Shot Replications

Sofia -- May 23, 2000

Pair	Wage	Effort	π_E	π_w		
1	70	.1	5.0	50		
2	57	.1	6.3	37		
3	57	.1	6.3	37		
4	55	.1	6.5	35		
5	54	.1	6.6	34		
6	52	.5	34.0	26		
7	50	.1	7.0	30	$\Sigma\pi_E : 71.7$	$\Sigma\pi_w : 249$

Sofia -- June 3, 2000

Pair	Wage	Effort	π_E	π_w		
1	65	.6	33	37		
2	50	.4	28	26		
3	50	.3	21	28		
4	40	1.0	80	2		
5	35	.1	8.5	15		
6	25	.1	9.5	5		
7	20	.1	10	0	$\Sigma\pi_E : 190$	$\Sigma\pi_w : 133$

Varna -- June 6, 2000

Pair	Wage	Effort	π_E	π_w		
1	47	.1	7.3	27		
2	47	.1	7.3	27		
3	41	.2	15.8	20		
4	35	.2	17	14		
5	34	.3	25.8	12		
6	34	.3	25.8	12		
7	33	.1	8.7	13	$\Sigma\pi_E : 107.7$	$\Sigma\pi_w : 125$

3 experiments: $\Sigma\pi_E : 369.4$ $\Sigma\pi_w : 507$

Sofia — May 31, 2002

Pair	Wage	Effort	π_E	π_w
1	70	.9	45	32
2	65	.6	81	37
3	63	.5	88.5	37
4	60	.6	36	32
5	60	.4	24	36
6	58	.1	6.2	38
7	— no match --			

Sofia — June 5, 2002 (Round 1)

Pair	Wage	Effort	π_E	π_w
1	90	.8	24	58
2	70	.8	40	48
3	70	.1	5	50
4	65	.5	27.5	39
5	60	.8	48	28
6	60	.7	42	30
7	60	.5	40	34

Sofia — June 5, 2002 (Round 2)

Pair	Wage	Effort	π_E	π_w
1	95	.9	24	60
2	65	.1	6.5	45
3	65	.1	5.5?	45
4	60	.7	42	30
5	50	.5	35	24
6	50	.2	21	29
7	45	.3	27	23

Note: π_E is profit to the employer and π_w is profit to the worker.

Overall, it is clear that effort levels tend to be fairly low: 16 of the 41 effort levels were the minimum, .1. The mean effort is just .368. The wage agreed to does not appear to affect the effort level much; the correlation between the two is just .04 [check!]. In fact, tobit regressions of wage on effort level obtain: [need to be updated]

$$\text{Effort} = -.0078 + .00075 \text{ Wage} \quad R^2 = .002$$

(.42) (.0089)

$$\text{Effort} = -.86 + .0114 \text{ Wage} + .64 \text{ Sofia2} + .48 \text{ Varna} \quad R^2 = .26$$

(.61) (.009) (.29) (.32)

$$\text{Effort} = -1.44 + .163 (\text{Wage} - 20)^{1/2} + .65 \text{ Sofia2} + .49 \text{ Varna} \quad R^2 = .27$$

(.99) (.125) (.29) (.31)

Standard errors are in parentheses.

Since the dependent variable is constrained at .1 and 1, a limited dependent variable approach makes sense.^{vii} As the constraint really just binds at .1, tobit is a reasonable statistical approach.

While there is some effect from different experiments, as seen by the Sofia2 variable--showing higher levels of effort in that experiment--there is no effect from the wage (though the results come somewhat close to statistical significance). Actually, this negative result appears to occur in Fehr and Falk's experiment, looking at their Figure 4, Period 1. It appears that considerable experience is needed to see how to obtain mutual gains. Or, perhaps, a "continuing relationship" with the other members of the experiment is needed to see some reason to reward unusually high wages--so perhaps the workers needed a "standard" to compare their wage contracts with. In the last pair of experiments, with two rounds (Fehr and Falk were able to obtain 10 rounds, something I hope to do in the future), the wages were generally similar, but the effort levels fell somewhat.

As Fehr and Falk found, there is massive underbidding by workers, who see their chance of making any profit in getting a contract. This did not appear in the first bids, however--rather after several rounds of bidding in which the workers demanded high wages, their wage demands "collapsed" as they saw that holdouts would get nothing [not shown]. Nevertheless, in comparison with Fehr and Falk's average wage of 54 in the first session, we obtained an average wage of 54.4--just the same, including the second round in 2002 (average 61). Thus, the most remarkable pattern we note is the low effort level compared with the Berg, Dickhaut and McCabe experiments. (It is not possible to determine from Fehr and Falk's Figure 4 or Figure 5 the average effort level--from Figure 4, it appears to be around .2 in the first period, which would

be lower than our result.)

Another remarkable point, however, is how low the payments were to the employers compared to the workers in some experiments. Clearly, if the employers really had expected to obtain effort level .1, they would have been better off pushing wages far below where they did. Thus, while employers seem to have shown forbearance, or at least workers showed early signs of demanding high wages, the ultimate result was nothing like the “trust” found in the Fehr and Falk experiments, at least after they had repeated the experiments several times.

4. Observations on the Results

The first set of experiments largely confirmed the experimental findings of Berg, Dickhaut and McCabe: the game-theoretic equilibrium does not occur; rather, subjects cooperate, and they reasonably expect cooperation and reciprocity. The amount of cooperative and reciprocal behavior in our experiments is comparable to theirs. The amount of reciprocal behavior is a bit higher.

We confirm that *subjects do not follow the game-theoretic strategy, even for the dominant-strategy equilibrium. Also, on average, those who first sent money gained by their action--contrary to the Minnesota results.*

The second set of experiments confirmed most of the experimental findings of Fehr and Falk: workers generally try to underbid, while employers do not drive wages down to the minimum of 20. We did not examine the repeated-play learning that they were interested in, but it seems that in the first period, Bulgarian behavior was perhaps less cooperative than that of their student subjects. In particular, even though the cost to the workers would have been very low to providing some effort more than the minimum, many were not willing to provide very much effort. The result was that the employers often received very low payments. Of course,

the low contracts typically offered by the employers (not much “gift-giving”) may have helped elicit the low payments. And, overall, the players received much less than they might have.

We now consider the results in the Bulgarian context, which might be taken as a larger “Balkan” context. Cooperative and reciprocal behavior is not always found in Bulgaria; Miller (1998) follows a long tradition in noting that often there is a “lack of trust” in markets in Bulgaria, similar in some ways to what Fukuyama (1995) describes for “low-trust” societies. Koford and Miller (1996) found (in interviews with business executives) numerous cases of fraud that Bulgarian firms had suffered from counterpart firms, and Koford and Tschoegl (1997) found (in interviews with bank lending officers) numerous cases of fraud involving bank lending --either failure to repay loans, or lending officers giving loans in exchange for bribes. Bogetic and Hillman (1995) report similar problems of corruption from their World Bank research. Similar stories could be told in many other environments, including universities.

Extracting money? Our experiments involved students playing one of several potentially cooperatives game that might extract money from outsiders. Students are used to cooperating mutually in Bulgaria, in studying (and in cheating), and doing so “against” some powerful authority. (This appears very common in former communist countries). They might see this experiment as reciprocity to gain income from a common adversary. Yet they succeeded in doing this in the “horizontal” experiments, but not the vertical experiments.

Horizontal trust among “friends”? It seems that under certain specific conditions Bulgarian students trust as much as American students, and very likely more. This may be due to the focus upon “students,” who feel that they should share a principle of solidarity in Bulgaria. Then, when they are divided into workers and employers, this solidarity disappears. Discussion with students suggested that if the horizontal experiment were run with the other group being

significantly different--say, ordinary workers, or a different ethnic group (in Bulgaria gypsies or turks)--the level of trust would be considerably lower. It is interesting to speculate if students *receiving* a trusting payment from an out-group would reciprocate more or less.

The logic of such close connections is cultural in the Balkans, and was institutional (but may not be so at present). Historically, the Balkans were ruled by exploitative rulers who varied between Olson's stationary bandits and his roving bandits (see Palairot, Chapter 2). The Ottoman rulers were highly exploitative of the local population, particularly the Christian part, and they typically appointed temporary rulers of the local regions (*pasaluks*) who might be in place for only short periods, depending on political trends (see generally Lampe and Jackson 1982, Palairot 1997, and for earlier background, Fine, *The Early Medieval Balkans* and *The Late Medieval Balkans* 1994). The local population regarded government as exploitative, and gained no security from it. Large businesses in the towns were typically run by outsiders. The only source of help was similarly-situated locals. (Bulgarian literature of the time emphasizes these points--see *Under the Yoke*). After liberation in 1878, the government remained exploitative (Palairot 1997, Part II), and under communist rule (1944-1989) non-communists certainly felt themselves exploited. Reliance on trusted friends and relatives, or at least similarly-placed people from one's town or village, was the norm. Trust among such individuals was high, and necessary.

Under the current transition economy, merit is supposed to be the determinant of success, and the large organizations that provide most employment and social services should act "objectively". Nevertheless, most Bulgarians expect decisions to be made on the basis of "connections" (*vruski*). Yet, most Bulgarians believe that it would be better if organizations were structured so that decisions were made on merit, and restructuring of both government and large firms is aimed at doing this. Given the costs of "connections" (which we might call

nepotism, favoritism, or corruption), large organizations are strongly pushed by profitability concerns to implement “objective merit” criteria. Thus, I think that the logic of development of trust is

organizations (Ottoman) \Rightarrow an institution (low trust of superiors, need for high trust among similars) \Rightarrow a culture of low trust of organizations.

Now, the organizations have started to change, but the continuing culture (among individuals) supports the institution of low trust of superiors, and so the relatively high trust among similars.

Why little trust between bosses and workers? While the previous section suggested that students placed in the situation of “workers” would not trust bosses, it is not so clear what the “bosses” would think. In addition, here we are looking at a fairly specific situation, where the players all know that they are fellow students. Thus, while we could imagine some distrust between, say, aging communist *apparatchiks* as bosses, and young anti-communist students as workers, this was not the case here. Yet, students do not generally have much experience of firms. (Actually, Bulgarian students probably have considerably less direct work experience than U.S. students; my university students pointed out that the wages offered in local service jobs were low, and so they did not take them.)

Vertical trust relations should then be “cultural”--the result of general ideas of proper or normal relationships. A widespread perspective in Bulgaria is that relationships between bosses and workers are normally conflictual. This comes in large part from the communist-era teaching, and convinced anti-communists will say that capitalism is and should be “dog-eat-dog” in its approach to management relations.^{viii} Students may accept this general perception that normal roles of workers and employers are hostile, and involve taking as much as one can.

Figure 3 suggests some institutional and cultural reasons for different forms of “trusting”

relationships in Bulgaria, looking back into the past 600 years to find organizations, culture, and equilibrium institutions. The figure shows how the current market economy may be strongly affected by past institutions and culture. Here, organizations are organized (usually hierarchical) bodies, culture is a common understanding among a population, and institutions are accepted patterns of behavior, an equilibrium among culture and organizations. “Rule of law” would be an institution, while an army is an organization, and linguistic conventions are a part of culture.

5. Planned Future Experiments

Experiments are a good way to define our understanding of different forms of trust. We have found high levels of cooperative behavior with reciprocal giving in a specific group in Bulgaria. We plan to extend this experiment, asking the experimental subjects their reasons for their choices. In addition we will extend the boss-worker game to multiple periods (hopefully to ten), and see if mutual cooperation as in Fehr and Falk (1999) develops. Will the self-interest equilibrium of “they pretend to pay us and we pretend to work” still be the result after multiple plays and so some experience, in Bulgaria?

Another game relevant to economic performance is the “ultimatum” game studies by Roth et al. (1991). Our team plans to carry out some of these experiments next year in Bulgaria. This will compare attitudes toward “trust” with attitudes toward “toughness” and retaliation. Numerous “ultimatum game” studies have been carried out around the world with highly varied results (Cameron 1999, Henrich 2000, Henrich et al. 2001,)

In examining a number of types of cooperative behavior, this research project is effectively looking for different dimensions of both “culture” and of business behavior. The objective is to identify several dimensions that vary a lot across societies, and will allow us to get beyond the rather vague idea of “trust” and see more specifically what it involves and how it

affects economic growth. The literature specifically on “trust” starts with Putnam (1993), adds Fukuyama (1995) and then finds a more complete formulation with several dimensions of cooperation in Knack and Keefer (1996)’s addition of Mancur Olson’s model of cooperation. Dimensions of behavior related to economic growth also appear in Inglehart (1997), although the idea that religiosity would be a negative factor does not fit so well with Max Weber or the contemporary U.S. Another approach that seems appealing is that of Douglas (1982) and Thompson (1982, 1990), which proposes two dimensions of social control: essentially degree of group control or of hierarchical control. Low levels of both involve “individualism”, with other categories being collectivism, fatalism and hierarchy. Fatalism describes Bulgarians’ view of large organizations, while collectivism may better describe traditional mutual work traditions. If additional experiments show significant differences in “trust” in vertical, horizontal, and defensive vs. aggressive behaviors, it will be useful to tie the findings to these more general multidimensional frameworks.

Figure 1

Vertical and Horizontal Relationships

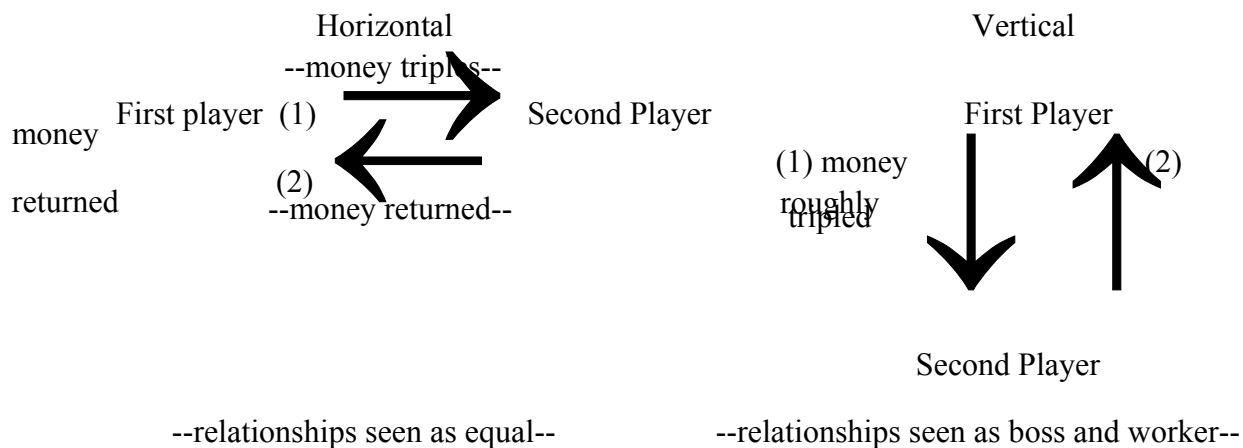


Figure 3

Causal Relationships: Horizontal and Vertical Ties in Bulgaria

(1) Ottoman Institutions transition	⇒ (2) Bulgarian self-rule	⇒ (3) Communist rule	⇒ (4) Post-communist
Imposed 1390--1878	1878-1944	1944-1989	1990-
culture: distrust of superiors (foreign rulers)	culture: trust within villages (some among co-ethnics)	culture: trust among friends distrust of government	culture: same as before
institutions: arbitrary rule, exploitation of weak "others"	institutions: two-class system based on "connections"	institutions: communist, Stalinist but clientilistic	institutions: clientilistic some Weberian ideas
organization: military government aimed at extracting resources	organizations: strong government taxation, and provided services	organizations: socialist, but with "connections"	organizations: clientilistic but facing markets

Vertical and Horizontal Relations:
(causal arrows over time)

(1) Organization causes culture and institutions	(2) Culture of trust plus new organizations (based on German model) cause institutions based on two classes and connections	(3) Communism implied two classes New organizations, no market institutions	(4) Market economy Markets created in place of socialism
Ottoman Army ⇒ culture of distrust ⇒ institution of arbitrary rule (of hostile forces)	⇒ culture of distrust } Bulgarian mutual trust + domestic government	two-class system } crony friends ⇒ crony friends	communism ⇒ no market firms
			organizations of socialism abolished ⇒ crony capitalism market pressure (& World Bank) ⇒ some efficient firms

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Endnotes

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- i. Putnam (1993) is rather extreme in seeing institutions perpetuating themselves over a thousand years in Southern and Northern Italy, but the empirical work on connecting causality between institutions and culture has yet to be done. We can see North (1990) as the fundamental theoretical perspective, however.
 - ii. This one-shot quality is not extremely different from the Fehr-Falk experiments, as their play is repeated only in a group of 18 players, so it is not likely that one's behavior will affect the behavior of the other players. Still, their experiment showed some learning and end-of-experiment effects, which "should not" occur but did. Finally, as with their experiments, these included, after the directions, a practice run that was the same in all respects as the real thing, except that there were no money payments.
 - iii. Roth et. al. (1990) had a similar problem with their Ljubljana experiments.
 - iv. It appears that humans "naturally" choose randomized hedging strategies when they face considerable uncertainty, despite its lack of game theoretical optimality. See Herrnstein (The Matching Law, 1997).
 - v. This includes the one student who returned "everything"--subject 7 in Varna.
 - vi. It appears that humans "naturally" choose randomized hedging strategies when they face considerable uncertainty, despite its probably lack of game theoretical optimality. See Herrnstein (The Matching Law, 1997).
 - vii. Adding a right-hand constraint to deal with the one data point that ended up at the right-hand limit made little difference to the results.
 - viii. A related point that I personally found is that bosses very often try to avoid doing hard work--since they are bosses, it is their job to make the workers do the hard work. Naturally, this helps build antagonistic relationships with the workers.