Team formation, overconfidence and leadership: lab and field experiments

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In this paper we present some general experimental results on teamwork in presence of overconfident workers and managers. Teamwork has become increasingly popular in organizations and a large body of literature has analyzed whether teamwork was successful in organizations (for example Hamilton et al. 2003). But what are the factors that lead to team success? And what are the motivations of individuals to work in teams?

The laboratory report is organised in two parts: first, we test a behavioural model of cooperation in self-managed teams in the laboratory; second, we test a design that introduces a team manager through a field experiment. We use the field experiment in order to analyze the importance of psychological and social factors on the success of teams and on the willingness of people to join teams. We believe it is a convenient method to abstract from the standard analysis of team success and to focus on teams outside the organization. Then, we can control for the organizational context, team design, heterogeneity in teams, tasks and the reward structure. As a result, we are able to focus on the influence of behavioral factors on team success and team stability.

In both parts we assume observability of coworkers' actions. We consider the most favourable case for workers' cooperation by focusing on teams with a sufficiently close level of collaboration such that agents are able to observe each others' performances and actions, i.e. there is no place for free riding.

A. Overconfidence and teamwork

In the first part, we show that holding a(n) (over) positive self-image systematically undermines the formation of teams. Agents becoming overconfident tend to ask for an excessive share of the group outcome.

To analyze team formation we consider the two-period model presented in Corgnet (2006) in which workers jointly decide whether to form a team or work alone. No asymmetry of information is present ex ante since performances are observable by both workers, but asymmetry of information arises as a consequence of self-serving biases: workers hold different beliefs about their ability and the ability of their partner on the given task. The two-period game is described as follows. At t = 0, the two coworkers decide simultaneously whether to undertake the individual or the group project. The team project is undertaken only if both workers agree to do so. At the end of the first period the outcome of the project chosen is observed by both workers and profits are split between partners on a 50%-50% basis. At t = 1, agents are asked to declare their contribution to the outcome of the team, as a percentage and they have to decide whether to continue with the project undertaken in the first period, and on which profit sharing rule basis. The outcome associated to the project performed in the second period is observed at t = 2.

We assume that workers' abilities are unknown, and agents update their beliefs about abilities after receiving a signal at the end of the first period. Following Corgnet (2006), when workers suffer from self-serving attribution, cooperation among agents is undermined whatever the allocation rule that is considered for the group outcome. The negative impact of self-serving biases on team formation is referred to as the teams inefficiency result.

We test this theoretical setting within three experimental treatments: workers are to form a team in order to achieve a simple, a moderate and a difficult task. The experiment was put into practice with 170 students in the Burgundy School of Business. In this experiment, the subjects had to complete different tasks according to the treatment (language ability tasks, difficult logical tasks and guessing game) in a given time interval. They first had to undertake the task in pairs and

were paid according to the performance of the team on that task. Each subject was paid the same amount that was equal to half the profit of the team. Then, subjects were isolated and asked to declare what has been their contribution, in percentage terms, to the performance of the team. Subjects were then asked the conditions under which they would like to repeat the task, in particular, they had to decide whether they wanted to work as a team or work alone. This decision took place in a negotiation phase that involved the two subjects that undertook the first task together. Subjects decided whether to agree on an allocation of the group outcome in a given time interval, and continue the task as a team if they agree and work alone if not.

We find that on simple and moderate tasks the inefficiency team result is confirmed, that is, overconfident workers prefer to work alone, whereas on difficult tasks teams survive.

B. Leadership and teamwork

The population of 170 students that we considered for the lab experiment in the first part has to work in teams on several projects during a semester in the Psychology class. This is the setting of our field experiment since the students, while doing their projects, do not know they are participating in a parallel experiment. The rules for grading in this class are as follows: team members are rewarded according to the quality of the project; the team manager is rewarded according to a parallel work that he (she) has to fulfil during the semester, i.e. he (she) has to write a manager report on the perception he (she) had of the teamwork.

Each team has team a team elected manager (leader) able to observe workers' performances. The leader has first to choose if he will effectively participate in the project while observing the others for the manager report or if he will only be an observer of the teamwork. Based on his observations, the team manager has to design a team reward contract (in terms of grades allocation) and to be sure that team members are cooperators. The team members can be rewarded following an egalitarian reward scheme (if the leader considers that each member of the team including himself equally contributed to team grade, then each team member receive the same percentage of the final grade) or a personalized grade scheme (in which the leader decides the percentage of contribution to the team grade for each of the team members, and the total of all

contributions equals 100%). When the project is finished, the manager and the members of the team have to fulfil satisfaction questionnaires giving personal estimates about contribution to work and perception about others. After these questionnaires are fulfilled, the manager decides of the grade allocation scheme and announces it to the team members: he (she) can choose to negotiate the reward allocation scheme and to communicate the final resolution to the teacher or he can directly transmit the evaluation of the team members to the teacher without negotiation with the others (dictator scheme).

The questionnaires that students have to fulfil are adapted from usual questionnaires used in human resources management classes. Team members have to answer 5 questions: they have to estimate their personal implication in the team project; they have to tell if they feel that their ideas were properly considered in the team; if the leader encouraged them to give their best; if they trust the leader for the reward scheme; if they would like to work again in this team. The leader had to answer 11 questions on team relations: are team members willing to compromise; do they have practical ideas; how is the team organisation and planning; how are team relations when members are in difficulty; how do team members deal with information; what is a good "team spirit", effort coordination, and major difficulties in managing the team etc. For each question there are 5 possible answers (not at all, less than average, average, more than average, totally agree).

We find that if managers are involved in the production process of the project instead of being only team coordinators, they may tend to blame workers for insufficient performances rather than challenging the organisation system that they decided to implement. Also, team workers may mistakenly attribute successes and failures of teams to their leader’s personal traits. Most of the managers implement egalitarian allocation schemes but comment that they shouldn't. Most of the team members estimate to have overcontributed to team work and prefer not to continue working in the current team.

We run probit regression in order to explain team stability and team success. We include in the regressions the answers to each question coded in ascending values (between -2 and 2, 0 stands for "average"). The factors that may explain team success (the final grade given by the teacher) and team stability (as a statement on future intentions) are as follows:

Team stability

1.1) Psychological factors:

Self-perception may affect team stability. As most of the students revealed overconfident in the lab experiment, we expected to find this result (team members tend to be more self-serving when they attribute a great share of the group outcome to their own effort), confirmed by declarations in questionnaires and by significant coefficients in regressions.

Altruism may explain the willingness of workers to form teams. However, this explanation falls short since in our regressions the variable "helping others" is negative and statistically significant. That is, the more team members propose to help each others, the less workers are willing to work with each others in the future!

Inequity aversion. Team members may be willing to form teams only when the outcome of the group outcome is shared equally among workers, but our results from regressions go against the inequity aversion theory since we should expect that less heterogeneity in team workers' rewards promotes team stability and we find the opposite.

There is evidence from the regression in appendix that DVQ1 is significantly and positively related to team stability. It means that a lower heterogeneity in beliefs about individuals' efforts facilitates team stability.

1.2) Social factors:

Questions 8 and 10 are related to the impact of social factors in the teams. We find that the coefficients associated to these variables are positive and highly significant. This stresses the importance of fellowship and personal relationship in the stability of teams.

1.3) Non-behavioral factors:

In our context of students group projects, the role of non-behavioral factors is limited.

a) Leaders' role:

In question 3, team members are asked to value the role of their team leader. We find that the coefficient associated to Q3 is not significant.

b) Organization of the team:

We find that the variables related to the organization of the team are (Q3L, Q5L, Q9L) are either non significant or negatively related to team stability. It seems that team members are valuing autonomy in the team (Regression 10).

c) Information processing:

This factor captured by question 6 does not appear to be significant (Regression 9).

d) Heterogeneity: it does not seem an important factor since variables such as the Variance of Q1 and LA are not significant (Regression 1). Also, we have sample of similar people in terms of age, education, perspectives, cultural background so that heterogeneity is a priori not the most relevant factor.

Team success

The variable that matter in explaining team success are used as independent variables in Regression 12. We see that social factors are negatively related to team success (Q8L). That is, as team members have better relationships they tend to do worse. They possibly spend more time socializing than working. Also, the variance of LA seems to affect team success positively. Indeed, as leaders start to reward workers on a rule that is not based on equal splitting of the group outcome, team members have more incentives to perform well individually.

In short, in our field experiment, a team that succeeds is such that the leader avoids rewarding subjects according to the equal splitting rule. As a result, team members work more and socialize less. The final effect is an increase in the quality of the team project. However, such teams may not be stable as we previously showed. Indeed, stable teams are such that team members are friends and dedicate time to socialize. Teams that are stable tend to be teams with worse outputs. For a team to be stable, time has to be dedicated to socializing. A mechanism is to reward team members according to the equal splitting of the group outcome.

We find in this field experiment a strong opposition between the factors leading to team success and team stability. This may be due to the fact that behavioral factors (psychological and social factors) are crucial to explain the stability of teams.

Appendix

For each question the answer is coded between –2 and 2. We denote Q1, Q2, Q3, Q4, Q5 the answers to the questions asked to the members of the teams. We denote Q1L, Q2L, …, Q10L the answers to the questions asked to the leader of the team. We then run ordered probit regressions. We also use the following variables:

- LA takes value 1 (0) [-1] if a given individual is rewarded more than (the same as) [less than]: 1 divided by the number of group members.
- DVQ1 takes value 1 if the variance of Q1 (denoted VQ1) is strictly positive and takes value 0 otherwise.
- SC (Self-confidence) is a dummy variable that takes value 1 if for a given individual Q1>LA.
- Note is the mark given to the project.

- Regression 1

Dependent Variable: Q5+2				
	Coefficient	Std. Error	z-Statistic	Prob.
Q1L	0.522942	0.153453	3.407830	0.0007
Q4	0.683734	0.240317	2.845134	0.0044
Q4L	-0.250716	0.116988	-2.143083	0.0321
Q3L	-0.381270	0.164579	-2.316638	0.0205
Q5L	-0.388120	0.219069	-1.771677	0.0764
Q8L	**0.447639**	**0.124916**	**3.583530**	**0.0003**
Q10L	**0.728975**	**0.167968**	**4.339963**	**0.0000**
Q1	**-0.792789**	**0.222960**	**-3.555739**	**0.0004**
DVQ1	0.543088	0.239268	2.269794	0.0232
	Limit Points			
LIMIT_1:C(10)	-1.197081	0.520038	-2.301910	0.0213
LIMIT_2:C(11)	0.205902	0.485495	0.424107	0.6715
LIMIT_3:C(12)	0.963026	0.485102	1.985201	0.0471
LIMIT_4:C(13)	3.010518	0.542796	5.546311	0.0000
Akaike info criterion	2.307112	Schwarz criterion		2.598249
Log likelihood	-133.5016	Hannan-Quinn criter.		2.425397
Restr. log likelihood	-165.1967	Avg. log likelihood		-1.051194
LR statistic (9 df)	63.39014	LR index (Pseudo-R2)		0.191863
Probability(LR stat)	2.96E-10			

- Regression 2

Dependent Variable: Q5+2				
	Coefficient	Std. Error	z-Statistic	Prob.
Q2	0.053072	0.176669	0.300401	0.7639
Q1L	0.424896	0.148173	2.867577	0.0041
Q4	0.759138	0.239184	3.173862	0.0015
Q4L	-0.245239	0.117426	-2.088464	0.0368
Q3L	-0.380665	0.164294	-2.316979	0.0205
Q5L	-0.466554	0.217709	-2.143019	0.0321
Q8L	0.401992	0.123469	3.255807	0.0011
Q10L	0.800449	0.167810	4.769960	0.0000
SC	**-0.655829**	**0.265756**	**-2.467785**	**0.0136**
DVQ1	0.619610	0.249901	2.479417	0.0132
	Limit Points			
LIMIT_1:C(11)	-1.219997	0.507900	-2.402040	0.0163
LIMIT_2:C(12)	0.025276	0.479090	0.052759	0.9579
LIMIT_3:C(13)	0.743065	0.478201	1.553875	0.1202
LIMIT_4:C(14)	2.775205	0.529678	5.239418	0.0000
Akaike info criterion	2.377224	Schwarz criterion		2.690757
Log likelihood	-136.9537	Hannan-Quinn criter.		2.504609
Restr. log likelihood	-165.1967	Avg. log likelihood		-1.078376
LR statistic (10 df)	56.48587	LR index (Pseudo-R2)		0.170966
Probability(LR stat)	1.66E-08			

- Regression 3

Dependent Variable: Q5+2				
	Coefficient	Std. Error	z-Statistic	Prob.
Q2	0.027905	0.175154	0.159316	0.8734
Q1L	0.420544	0.148266	2.836413	0.0046
Q4	0.740287	0.238598	3.102656	0.0019
Q4L	-0.285278	0.118121	-2.415141	0.0157
Q3L	-0.373363	0.163832	-2.278940	0.0227
Q5L	-0.442108	0.217087	-2.036550	0.0417
Q8L	0.426318	0.124019	3.437528	0.0006
Q10L	0.773296	0.166509	4.644175	0.0000
Q1-LA	-0.310744	0.142708	-2.177484	0.0294
DVQ1	0.496487	0.237609	2.089512	0.0367

	Limit Points			
LIMIT_1:C(11)	-1.181734	0.509084	-2.321294	0.0203
LIMIT_2:C(12)	0.061263	0.480691	0.127448	0.8986
LIMIT_3:C(13)	0.772779	0.479491	1.611664	0.1070
LIMIT_4:C(14)	2.786981	0.531483	5.243779	0.0000

Akaike info criterion	2.387827	Schwarz criterion	2.701360
Log likelihood	-137.6270	Hannan-Quinn criter.	2.515212
Restr. log likelihood	-165.1967	Avg. log likelihood	-1.083677
LR statistic (10 df)	55.13930	LR index (Pseudo-R2)	0.166890
Probability(LR stat)	2.97E-08		

- Regression 7

Dependent Variable: Q5+2				
	Coefficient	Std. Error	z-Statistic	Prob.
Q1L	0.400721	0.149401	2.682185	0.0073
Q4	0.590137	0.236648	2.493732	0.0126
Q4L	-0.249590	0.117063	-2.132101	0.0330
Q3	0.239401	0.257434	0.929951	0.3524
Q3L	-0.340152	0.164054	-2.073416	0.0381
Q5L	-0.513763	0.217171	-2.365712	0.0180
Q8L	0.368945	0.131921	2.796711	0.0052
Q10L	0.646037	0.163402	3.953660	0.0001
Q1	-0.678410	0.226511	-2.995041	0.0027
ABS(Q1)	-0.194769	0.254245	-0.766069	0.4436
	Limit Points			
LIMIT_1:C(11)	-1.958581	0.466941	-4.194491	0.0000
LIMIT_2:C(12)	-0.555020	0.411920	-1.347398	0.1779
LIMIT_3:C(13)	0.205242	0.407786	0.503306	0.6147
LIMIT_4:C(14)	2.164443	0.437484	4.947479	0.0000

Akaike info criterion	2.353757	Schwarz criterion	2.667290
Log likelihood	-135.4636	Hannan-Quinn criter.	2.481142
Restr. Log likelihood	-165.1967	Avg. log likelihood	-1.066642
LR statistic (10 df)	59.46618	LR index (Pseudo-R2)	0.179986
Probability(LR stat)	4.57E-09		

- Regression 8

Dependent Variable: Q5+2				
	Coefficient	Std. Error	z-Statistic	Prob.
Q1L	0.281293	0.136787	2.056423	0.0397
Q4	0.736753	0.232688	3.166273	0.0015
Q4L	-0.279439	0.114268	-2.445464	0.0145
Q3L	-0.359174	0.162374	-2.212014	0.0270
Q5L	-0.514347	0.212425	-2.421308	0.0155
Q8L	0.382533	0.121327	3.152919	0.0016
Q10L	0.711466	0.160752	4.425853	0.0000
	Limit Points			
LIMIT_1:C(8)	-1.751068	0.411607	-4.254228	0.0000
LIMIT_2:C(9)	-0.562490	0.376495	-1.494016	0.1352
LIMIT_3:C(10)	0.138936	0.374559	0.370933	0.7107
LIMIT_4:C(11)	2.055994	0.400854	5.129032	0.0000
Akaike info criterion	2.403343	Schwarz criterion		2.649690
Log likelihood	-141.6123	Hannan-Quinn criter.		2.503431
Restr. Log likelihood	-165.1967	Avg. log likelihood		-1.115057
LR statistic (7 df)	47.16881	LR index (Pseudo-R2)		0.142766
Probability(LR stat)	5.17E-08			

- Regression 9

Dependent Variable: Q5+2				
	Coefficient	Std. Error	z-Statistic	Prob.
Q1L	0.523956	0.155800	3.363004	0.0008
Q4	0.682376	0.243073	2.807286	0.0050
Q4L	-0.250368	0.117357	-2.133393	0.0329
Q3L	-0.380651	0.165407	-2.301296	0.0214
Q5L	-0.391116	0.233068	-1.678116	0.0933
Q6L	0.003687	0.097862	0.037676	0.9699
Q8L	0.447687	0.124929	3.583544	0.0003
Q10L	0.728350	0.168795	4.314996	0.0000
Q1	-0.792636	0.223000	-3.554422	0.0004
DVQ1	0.541785	0.241755	2.241051	0.0250
	Limit Points			

LIMIT_1:C(11)	-1.198259	0.520968	-2.300060	0.0214
LIMIT_2:C(12)	0.204621	0.486681	0.420442	0.6742
LIMIT_3:C(13)	0.961613	0.486554	1.976377	0.0481
LIMIT_4:C(14)	3.009196	0.543907	5.532556	0.0000

Akaike info criterion	2.322849	Schwarz criterion	2.636381
Log likelihood	-133.5009	Hannan-Quinn criter.	2.450233
Restr. log likelihood	-165.1967	Avg. log likelihood	-1.051188
LR statistic (10 df)	63.39156	LR index (Pseudo-R2)	0.191867
Probability(LR stat)	8.22E-10		

- Regression 10

Dependent Variable: Q5+2				
	Coefficient	Std. Error	z-Statistic	Prob.
Q1L	0.512716	0.161535	3.174026	0.0015
Q2L	**0.008344**	**0.218224**	**0.038237**	**0.9695**
Q4	0.680265	0.248139	2.741471	0.0061
Q4L	-0.252188	0.131938	-1.911411	0.0560
Q3L	**-0.375405**	**0.175034**	**-2.144751**	**0.0320**
Q5L	**-0.382639**	**0.235273**	**-1.626357**	**0.1039**
Q6L	0.002683	0.102947	0.026067	0.9792
Q8L	0.448089	0.125489	3.570743	0.0004
Q9L	**-0.030925**	**0.128895**	**-0.239921**	**0.8104**
Q10L	0.744827	0.180252	4.132138	0.0000
Q1	-0.795401	0.223180	-3.563936	0.0004
DVQ1	0.536575	0.248032	2.163334	0.0305
	Limit Points			
LIMIT_1:C(13)	-1.201872	0.577851	-2.079900	0.0375
LIMIT_2:C(14)	0.198097	0.550308	0.359975	0.7189
LIMIT_3:C(15)	0.956108	0.549087	1.741269	0.0816
LIMIT_4:C(16)	3.005836	0.597882	5.027470	0.0000

Akaike info criterion	2.353797	Schwarz criterion	2.712120
Log likelihood	-133.4661	Hannan-Quinn criter.	2.499379
Restr. log likelihood	-165.1967	Avg. log likelihood	-1.050914
LR statistic (12 df)	63.46116	LR index (Pseudo-R2)	0.192078
Probability(LR stat)	5.24E-09		

- Regression 11

Dependent Variable: Q5+2				
	Coefficient	Std. Error	z-Statistic	Prob.
Q1L	0.442159	0.208430	2.121377	0.0339
Q4	**0.642084**	**0.243072**	**2.641544**	**0.0083**
Q4L	-0.259295	0.123835	-2.093878	0.0363
Q3	**0.237522**	**0.259013**	**0.917027**	**0.3591**
Q3L	-0.350758	0.167293	-2.096671	0.0360
Q5L	-0.485456	0.244432	-1.986056	0.0470
Q8L	0.435429	0.136614	3.187303	0.0014
Q10L	0.750117	0.169747	4.419039	0.0000
Q1	-0.832082	0.227878	-3.651440	0.0003
DVQ1	0.580175	0.243636	2.381322	0.0173
Note	-0.263637	0.368109	-0.716191	0.4739
	Limit Points			
LIMIT_1:C(12)	-1.409922	0.624393	-2.258068	0.0239
LIMIT_2:C(13)	-0.001339	0.604505	-0.002215	0.9982
LIMIT_3:C(14)	0.752035	0.607696	1.237519	0.2159
LIMIT_4:C(15)	2.837983	0.639429	4.438307	0.0000
Akaike info criterion	2.327384	Schwarz criterion		2.663312
Log likelihood	-132.7889	Hannan-Quinn criter.		2.463868
Restr. log likelihood	-165.1967	Avg. log likelihood		-1.045582
LR statistic (11 df)	64.81552	LR index (Pseudo-R2)		0.196177
Probability(LR stat)	1.17E-09			

- Regression 12

The variable GEND is a dummy variable that takes value 0 if the team leader is a man. If the team leader is a woman the variable GEND is defined as follows: ABS(GENDERP-0.5), where GENDERP is an average gender variable that takes value 1 (0) if all the members of the team are women (men).

Dependent Variable: Note
Method: Least Squares
Date: 02/26/07 Time: 18:39
Sample (adjusted): 1 30
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	16.91519	0.403355	41.93621	0.0000
Q8L	-0.417313	0.231247	-1.804624	0.0827
GEND	-3.810778	1.380064	-2.761306	0.0104
VARIANCE(LA)	0.942550	0.418520	2.252102	0.0330

R-squared	0.432047	Mean dependent var	16.43333
Adjusted R-squared	0.366513	S.D. dependent var	1.628059
S.E. of regression	1.295802	Akaike info criterion	3.479703
Sum squared resid	43.65669	Schwarz criterion	3.666529
Log likelihood	-48.19554	F-statistic	6.592799
Durbin-Watson stat	1.939872	Prob(F-statistic)	0.001839

Regression 13: Negative relationship between team success and team stability

Dependent Variable: Q5+2				
	Coefficient	Std. Error	z-Statistic	Prob.
NOTE	-0.101747	0.060576	-1.679677	0.0930
Limit Points				
LIMIT_1:C(2)	-3.573151	1.045972	-3.416105	0.0006
LIMIT_2:C(3)	-2.570883	1.014438	-2.534294	0.0113
LIMIT_3:C(4)	-1.996873	1.010944	-1.975256	0.0482
LIMIT_4:C(5)	-0.444073	1.003345	-0.442593	0.6581

Akaike info criterion	2.657970	Schwarz criterion	2.769946
Log likelihood	-163.7811	Hannan-Quinn criter.	2.703465
Restr. log likelihood	-165.1967	Avg. log likelihood	-1.289615
LR statistic (1 df)	2.831123	LR index (Pseudo-R2)	0.008569
Probability(LR stat)	0.092454		