An Experimental Study on the Effect of Social Restriction in Cooperation Governance for Temporary Knowledge Teams

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Abstract： Based on relative theories, this paper shows some influencing factors which have effect on the cooperation of the Temporary Knowledge Teams (TKTs) members through the team dynamic mechanisms. With the theory of peer pressure, it proposes the hypothesis that social restriction can motivate the members to cooperate with each other in TKTs. To verify the effect of social restriction, we design an experiment with the ideology of experimental economics to simulate the construction and the operation of the TKTs. The results of the experiment show that social restriction can motivate the members to cooperate more smoothly and deeply in TKTs. Finally, this paper puts forward several proposals for the mechanism design of TKTs' cooperation: it's useful to introduce the economic constraints and the social sanction to promote the cooperation among TKTs members; Classification management should be applied to the TKTs members; it's necessary and helpful to build fair team atmosphere to promote the member's cooperation and the performance of the team through the adoption of social restriction mechanisms.

Keywords: Temporary Knowledge Team, Cooperation Governance, Social Restriction, Experiment

1 Introduction

In the era of knowledge economy, the management of knowledge workers is important for enterprises to maintain innovation vigor. The knowledge team is the fundamental form in which the knowledge employees work and it's also the important platform for them to display their value and contribution. The temporary knowledge team (TKT) is the main form of knowledge team at present, which is composed of an amount of knowledge workers to complete certain new product or new service or other tasks together in limited time; it takes innovation as the goal and makes the team members to take joint action and take on the responsibility mutually. In this kind of group, on one hand, the knowledge workers understand their own research area tacitly than the superintendents and whether they cooperate fully with other team members is unpredictable. On the other hand, the team will dismiss after the completion of the task, and the possibility that the original team members cooperate once again is small. So in the unrepeatable cooperation process, the free riding behavior will be extremely easy to occur to suppress the enthusiasm of the members to cooperate. Therefore, it is necessary to design effective team cooperation mechanisms to stimulate the members to cooperate positively. It's meaningful to study the mechanisms to increase the operation efficiency and achievements of the knowledge teams and it's also valuable to help construct the temporary knowledge teams such as project teams, cross-organization cooperation teams, university scientific research teams and so on.

Considering the characteristics of the mutual supervision among the agents of TKTs from the point of the theory of peer pressure, this paper designs the knowledge team cooperation mechanisms; It verifies the validity of cooperation mechanisms using the

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public goods experimental technique; In view of the experimental results, it puts forward several proposals for the design of the temporary knowledge team's cooperation mechanisms.

2 Literature review

The result of the team cooperation was often that both sides served its respective purpose while realizing the common goal (Oberchall, 1978). Deutsch (1973, 1980) considered that the belief of the members in their goals' relevance was the important variable which affected the dynamic and results of their interaction. Lewin (1935) showed that the group dynamic process was not only the interaction process of various factors, but also the coordinating process of the relationship change among members; If the majority of members had the common prospect and goal, their confidence and the working zeal would be more intense and the group dynamic would have the amplification effect which was not inevitable and needed governance and peer pressure. The importance of the peer pressure lies in that it may become the credibility threat to the members' breaking the team rule. The literatures on the behavior of being loaf and free ride in the team cooperation are quite rich(Alchian & Demsetz, 1972; Holmstrom, 1982; Rasmusen, 1987; McAfee & Mcmilian, 1991; Arya et al., 1997; Che & Yoo, 2001; Zhang, 2004; Tian et al., 2005; Wei et al., 2006; Li, 2007). Goodman (1976) is the scholar who took the temporary organization as the research object most early, and he defined it as an organization which was constituted by a crowd of technical people who strove to complete some complex task within certain amount of time together. Lundin (1995, 2003) pointed that the temporary organization would become the new tendency of the organization development in the future. The temporary knowledge team originates from the concept of temporary team and it is usually based on some knowledge projects. The fast trust mechanism is the key point of the research on the temporary knowledge team cooperation mechanisms. Hung (2004), McKnight et al. (1998) equated the fast trust for the initial trust and considered it as the first stage of conventional trust. Lundin (1995) thought that the team members must be influenced by the same social norm although their attributes were different. Posner (1997) thought that the social norm was one kind of rule which was not issued through official channel and was also not executed under the threat of legal sanction, but was observed by everybody voluntarily. Elster (1989) thought that the social norm was one kind of informal rule and it was the stable anticipation and the common faith of the group behavior.

3 Theory and experiment design

3.1 Experiment hypotheses

The social norm is realized through social restriction among the members. In the theory of peer pressure, the social restriction includes the economic constraint and the non-economic constraint (i.e. social sanction). To study the influence of the social norm on the team cooperation effectively, the experiment will verify the influence of economic constraint and the non-economic constraint to the cooperation of temporary knowledge teams.

3.1.1 The influence of economic constraint on temporary knowledge team cooperation

Until now, there have been numerous literatures on applying the economic constraint to the research on team loan, for example, the disqualifying of the loan to the promise-breaker again in the team is economic constraint. Wei et al. (2006) designed the dynamic incentive mechanism for the team cooperation based on implicit side contract which adopted the strict group incentive compatibility contract in the first stage and individual incentive compatibility contract in the second stage. Through the repeated games in the two stages, it can implement team cooperation in the process of risk aversion. We define the economic constraint as below: if there is a member adopting the behavior of free riding, other

members may adopt retaliation to make the former suffer the economic loss. Here, we propose the following hypothesis:

Hypothesis 1：Through the implementation of economic constraint, it may promote the temporary knowledge team's cooperation behavior effectively.

3.1.2 The influence of non-economic constraint on temporary knowledge team's cooperation

The non-economic constraint mainly manifests as social exclusion, ridicule, criticism, reputation-damage and so on. At the same time, it also manifests as the social identity of the group. Akerlof (1980), Lindbeck and Snower (1988), Hollander (1990) all thought that people had the preference to social identity, namely the non-economic constraint may present as the fact that the people may respect the existed social norm when taking action, which had nothing to do with the money and may be regarded as the non-economic constraint manifestation. Rehder (1990) discovered that the peer pressure and the group norm had obvious suppress effect on intentionally being absent from work without an excuse and the detention behavior in the work. The workers with this behavior would not only suffer the economical loss, but also receive other member's social sanction such as taunt, criticism and so on in the team. So, we propose the following hypothesis:

Hypothesis 2：Through the implementation of non-economic constraint, it may promote the temporary knowledge team's cooperation behavior effectively.

3.2 Experiment design

Using the public goods experimental model, through the selecting of the subjects and environment establishments, this experiment uses the fund allocation process to simulate the real team cooperation and then verify the hypotheses. The core thought of the public goods experimental design is trying to inspecting the group's investment behavior tendency to the public interest with the money as stimulation. It means that the more the public investment, the more favorable the subjects to the cooperation. If the two hypotheses both obtain the verification, then we may believe that the social restriction mechanisms have the effect of promoting the temporary knowledge team's cooperation. As shown in Figure 1:

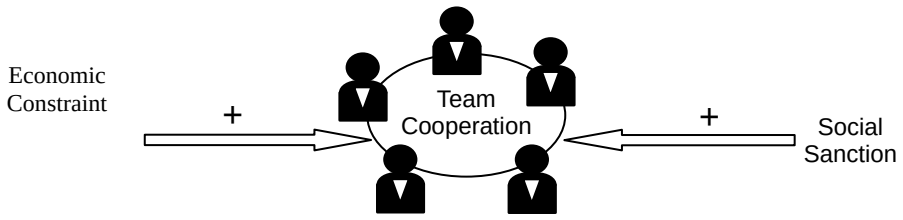

Figure 1 The influence of the two factors in social restrains to the cooperation

This experiment was carried on March 16 and March 29 in 2008 in the SeltenLab of Nankai University, and we carried on 4 experiments altogether (i.e. representing 4 temporary teams). The subjects were undergraduate students and the graduate students of Nankai University. Each team was composed of 8 members who were not familiar with each other, and they were from different schools, specialties and grades separately. The male and female proportion is 1:1.

This research conducted two kinds of experiment namely non-language social sanction and the economic constraint. In the non-language social sanction experiment, all subjects' contributions in every experiment were public and this made the non-language sanction

possible. The economic constraint was realized through two repeated experiments, namely each group carries on this experiment for two times and each subject's reward was the sum of the reward in the two experiments. As shown in Table 1, this experiment had 4 kinds of experiment environments.

Table 1 The 4 experiment environments

EC \ SS	N	Y
N	NEC/NSS	NEC/YSS
Y	YEC/NSS	YEC/YSS

Notes: EC-economic constraint; SS- social sanction; NEC-without economic constraint; NSS-without social sanction; YEC-with economic constraint; YSS-with social sanction.

Each kind of experiment (in EC context) was carried by a group to complete separately and was repeated for two times, namely we must carry on 2×2 experiments. Each group was composed by 8 subjects and altogether needs 8×2×2 subjects. In every experiment, 20 real 1-Yuan RMB cash notes were assigned to each subject, and the subjects were requested to divide the 20 notes in two parts and load them separately into the public envelope and the personal envelope; the personal envelope represents individual income and the public envelope represents the group income. After the experiments, all subjects left the laboratory in turn, and it may make them to lay down the worry of the group member's rumor and it can also manifest the provisionality characteristic of the temporary knowledge team.

4 Analysis of the experiment results

The results of this experiment are shown in Table 2:

Table 2 Experiment results

Contents \ Subjects		1	2	3	4	5	6	7	8	Mean	Median
A	PE	1	2	2	13	20	0	1	1	—	
	PCR	0.05	0.1	0.1	0.65	1	0	0.05	0.05	0.25	0.08
	II	29	28	28	17	10	30	29	29	25	28.5
B	PE	20	8	0	9	9	10	20	8	—	
	PCR	1	0.4	0	0.45	0.45	0.5	1	0.4	0.53	0.45
	II	21	33	41	32	32	31	21	33	30.5	32
C	PE	10	12	8	0	8	20	20	20	—	
		20	8	20	7	0	10	20	10	—	
	PCR	0.75	0.5	0.7	0.17	0.2	0.75	1	0.75	0.60	0.73
	II	29.12	34.13	30.13	40.63	40.13	29.13	24.13	29.13	32.06	29.63
D	PE	20	18	17	18	20	20	16	20	—	
		0	20	19	20	18	20	20	20	—	
	PCR	0.5	0.95	0.9	0.95	0.95	1	0.9	1	0.89	0.95
	II	45.75	36.75	37.75	36.75	36.75	35.75	37.75	35.75	37.88	36.75

Notes: 1) A= "NEC/NSS", B= "NEC/YSS", C= "YEC/ NSS", D= "YEC/YSS"; PE= "public

envelope", it means the money put into the public envelope; PCR= "public contribution rate"; II= "individual income". 2) C and D were conducted for two times separately, and to compare with A and B, the PCR and II were presented as mean value, namely the mean value of the indicidual comes of the two times.

4.1 The central tendency analysis of public contribution rate

We choose the arithmetic mean value and the median to measure the central tendency of PCR. As shown in figure 2, in the environment of NSS, PCR = PE/20×100% and in the environment of YSS, PCR = (PE1+PE2)/40×100%. We suppose that the importance of the two experiments have the similar weight, so in the environment of YEC, we choose the simple mean as the measure of the PCR. We can see in figure 2 that the mean and median of PCR are the least in the environment of "NEC/NSS", and they are 25% and 7.5% separately. With the adding of SS, the PCR becomes bigger, namely the mean is from 25% to 52.5% and the median is from 7.5% to 45%. And then after adding EC into the experiment environment, the mean becomes 89.375% and the median becomes 95%.

To explain precisely the remarkable difference of the PCR in different experiment environments, we adopt Wilcoxon (Mann-Whitney) test to verify the difference level. We design 4 groups of experiments of which the test 1 and test 2 examine the influence of the SS on PCR and the test 3 and test 4 examine the EC. The results are shown in table 3.

According to the analysis above, we can see that the higher the PCR, namely the higher the public envelope's income, the higher the cooperation degree of the team members.

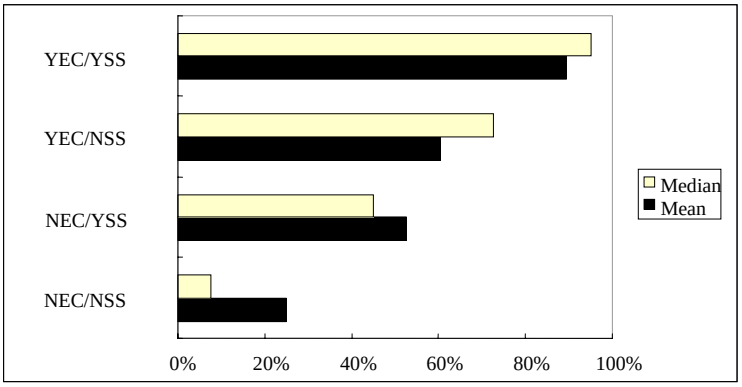

Figure 2 The public contribution rate

Therefore, the two hypotheses are verified.

Table 3 The result of Wilcoxon(Mann-Whitney)

Contents / Tests	Test 1	Test 2	Test 3	Test 4
Null hypothesis	$m_A \geq m_B$	$m_C \geq m_D$	$m_A \geq m_C$	$m_B \geq m_D$
Alternative hypothesis	$m_A < m_B$	$m_C < m_D$	$m_A < m_C$	$m_B < m_D$
P value	0.083	0.005	0.011	0.014
Result	Reject the null hypothesis	Reject the null hypothesis	Reject the null hypothesis	Reject the null hypothesis

4.2 The distribution analysis of public contribution rate

To understand the distribution of PCR thoroughly, we classify the subjects into 3 types: the first are those who put all their money into the public envelope, namely the 100%-PCR subjects; the second are those who put 1-99% of their money into the public envelope, namely the 1-99%-PCR subjects; the third are those who put all their money into their own envelopes, namely the 0%-PCR subjects. As shown in figure 3, the number of 0%-PCR subjects almost hasn't changed although the experiment environment has changed, while the number of 100%-PCR subjects increases progressively along with the experiment environment's change, namely from NEC to YEC and then from NSS to YSS. On the contrary, the number of 1-99%-PCR subjects decreases progressively.

In real life, the 3 groups represent three types of people separately: the first are those who don't consider completely the EC and SS and won't make any contribution to public interest; the second are those who care about the EC and SS very much and will change their own strategies along with the social environment's change; the third are those who have the strongest cooperation consciousness and will contribute 100% of their own to the public regardless of whether the EC and SS exist or not. In the team, the majority of members are the second type that conforms to the complex man hypothesis to the knowledge worker and will change their strategies along with the social environment's change. Meanwhile, the existence of the EC and SS may promote the knowledge worker to adopt the cooperation strategy effectively to enhance the team performance.

4.3 The central tendency analysis of individual income

Figure 4 is the scatter diagram of the mean and median of II in different experiment environments. We can see that with the experiment environments' change, namely the adding of EC and SS, the mean and median of II show the increasing tendency. In the experiment, the increasing of II is manifested as the higher income of public envelope, namely the high cooperation degree among the team members. The central tendency analysis of II verifies that the EC and SS can promote the member's cooperation in laboratory environment.

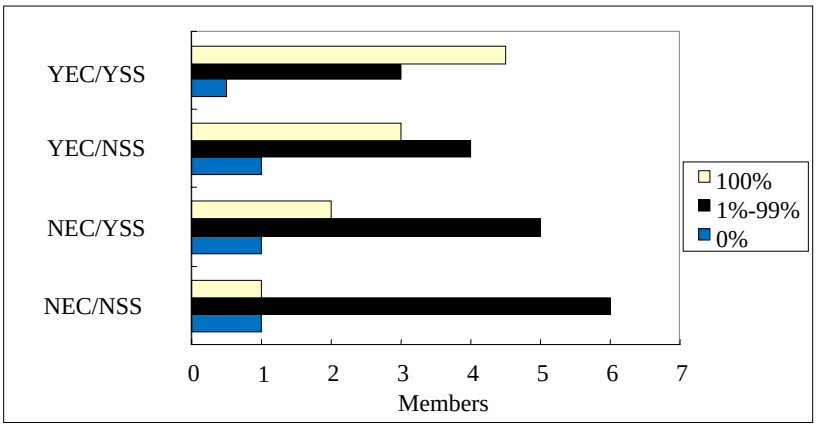

Figure 3 The distribution of the three types of subjects

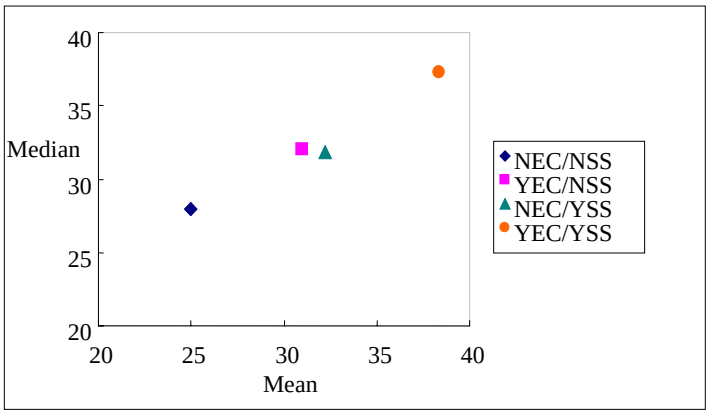

Figure 4 The individual income in different environments

4.4 The difference analysis of individual income

We adopt standard deviation to measure the difference of II, and the formula is as follow:

$$\sigma = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n}}$$

x_i - the income of member *i*; $\bar{x}$ - the mean of II; n- the number of members.

Table 4 shows the standard deviation of II in different environments. We can find that with the adding of EC and SS, the standard deviation of II reduces continuously and we can deduce that the adding of the EC and SS separately can only reduce the standard deviation of II in the small scale, while the adding of the two together can reduce it enormously.

Table 4 The standard deviation of individual income in different environments

Environments	A	B	C	D
Standard Deviation（Yuan）	7.37	6.63	5.80	3.27

To further describe the difference of II, using the Lorenz curve, we arrange the II from low to high and compute the population accumulation proportion and the income accumulation proportion. As shown in Figure 5, the line AB is “the absolutely average line” on which any spot satisfies the condition that the population accumulation proportion is equal to the income accumulation proportion. It can be seen that the closer the curve to the absolutely average line, the smaller the difference of II. The change of the experiment environments makes the approach degree of the curve to the absolutely average line change. So, the adoption of EC and SS can reduce the difference of II effectively, namely in the process of team cooperation, the EC and SS can make the team members feel more fair and have more tendency to cooperate with others.

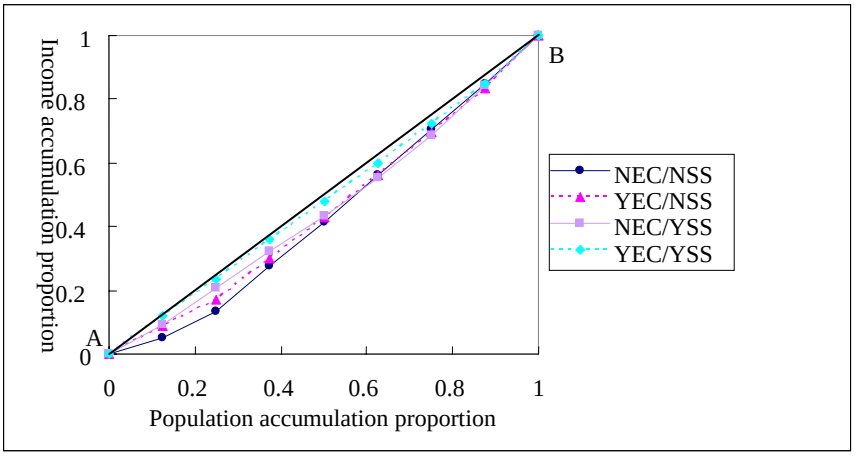

Figure 5 The difference of individual income

5 Conclusions

With the theory of peer pressure, we propose the hypothesis that social restriction, including the economic constraint and social sanction, can motivate the members to cooperate with each other in TKTs. To verify the effect of social restriction, we design an experiment with the ideology of experimental economics to simulate the construction and operation of the TKTs. The results of the experiment show that social restriction can motivate the members to cooperate more smoothly and deeply in TKTs. Finally, we put forward several proposals for the mechanism design of TKT's cooperation. It's useful to introduce the EC and SS to promote the cooperation among TKTs members, especially induce the members to adopt the cooperation strategy before the occurrence of cooperation and make them believe that if they use the tactics of free riding as such, they will suffer social sanction from other members. Classification management should be applied to the TKTs members, it means that to the 100%-PCR members, we should commend them appropriately; to the 1-99%-PCR members, we should implement the effective social restriction mechanisms to urge them to cooperate with others; and to the 0%-PCR members, we should reject them from the group as possible as one can. It's necessary and helpful to build fair team atmosphere to promote the member's cooperation and the performance of the team through the adoption of social restriction mechanisms.

This paper has some limitations: 1) Because of the limitation of laboratory experiment in simulating the real team cooperation process, it's necessary to verify whether the results of the experiments are suitable for the real process of team cooperation through more cases. 2) Because of the experiment condition, we just choose students to represent the knowledge workers and this may influence the reliability of the results.

The future study should revolve the following points: 1) Although this paper has proven that the social restriction mechanisms from the peer pressure have effective influence on the knowledge team cooperation under the controlled condition, the cost of the peer pressure is not studied in this paper. So it's necessary to further verify the influence degree with more cases and other methods. 2) The social restriction is just one of the factors that have influence on the real knowledge team cooperation and we should consider more other factors comprehensively to design the cooperation mechanisms of the knowledge team effectively.

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临时型知识团队合作治理中社会约束影响的实验研究

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摘要：本文在理论回顾的基础上，通过团队动力传导机制分析影响临时型知识团队合作的若干因素；结合横向监督理论，提出将社会约束引入临时型知识团队合作能够有效激励团队合作的假设；为验证社会约束对临时型知识团队合作的影响，本文采用实验室实验中的公共品实验方法，模拟临时型知识团队的构成和运作过程；实验结果表明，社会约束能够提高临时型知识团队合作行为；最后文章为临时型知识团队合作机制设计提出建议：应引入社会制裁和经济约束以促进临时型知识团队的合作，对临时型知识团队成员应进行分类管理，通过社会约束机制营造公平的团队氛围以促进成员之间的合作，进而提高团队绩效。

关键词：临时型知识团队；合作治理；社会约束；实验研究

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