Mini-Course in Multi-Agent Contracting (Spring 2024)

Classroom and Time: Intensive Sessions, at Social Sciences 社科 608
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Co-Instructor: Joseph Tao-yi Wang (josephw "at" ntu.edu.tw), Social Sciences 754/316
Office Hours: After class or by email appointment

Time and Date	Room	Topics
3/26(Tue) 9:10am-12:10pm	SS 608	Bargaining Experiments (Behavioral Game Theory, Ch. 4 by Joseph)
4/2(Tue) 9:10am-12:10pm	SS 608	Moral Hazard in Multi-Agent Contracting Equality and Discrimination in Multi-Agent Contracting Growth and Coordination in Multi-Agent Contracting Optimal Incentives in Sequential Production Optimal Assignment of Agents and Tasks to Production Slots
4/2(Tue) 1:30-3:00pm	SS 814	Eyal Winter's Talk at (Theory and Experimental) Seminar Title: Peer Effects in Social Media
4/4(Th) 9:10am-12:10pm	SS 814	The Effect of Information about Peers on Incentives Sub-Contracting among Peers Why Less Monitoring May Generate Better Incentives? Incentives for Joint Initiatives Incentive Reversal
4/5(Fri) 9:10am-12:10pm	SS 814	Multi-Agent Contracting vs. Public Good Mechanisms Experimental Results on Incentives and Team Production Empirical and Field Evidence on Peer Effects and Incentives in Teams Multi-Agent Contracting and Monitoring
4/9(Tue) 9:10am-12:10pm	SS 608	Macro Effects in Multi-Agent Contracting Multi-Agent Contracting and Tort Law Multi-Agent Contracting in Financial Markets Informational Design in Multi-Agent Contracting
4/11(Th) 3:30-5:00pm	SS	Eyal Winter's Popular Talk Title: Feeling Smart (情緒賽局)

Course Description

This mini-course on multi-agent contracting will survey some of the recent theoretical literature on incentive schemes in multi-agent environments, with special emphasis on teams and the role peer effects in team-contracting. While most of the course builds on theory papers we will also discuss experimental and empirical papers on team behavior and on peer effects in teams.

We shall start with a short introduction to standard models of principal-multiagent, and then move on to a moral hazard model of organizations in which agents' effort decisions are mapped into a probability of the project's success. We shall see that optimal incentive mechanisms may require that agents be rewarded differentially even when they are completely identical and induced to act the same. We shall characterize the

environments in which such discrimination is unavoidable in terms of the organizational technology.

Our next step in the course will be to consider models in which agents are asymmetrically informed about each other's effort. We will start with a model in which agents move sequentially in performing their tasks (as in an assembly line) with each agent observing the effort of his predecessors. We shall see how agents' role in the production process affects the rewards they receive in the optimal mechanism. We shall use an extended version of the model to address the issue of the optimal allocation of agents and tasks to different production slots depending on agents' skills and the criticality of tasks to the success of the entire project. In interpreting these results we shall reflect on issues such as the role of leadership and of hierarchies in organizations.

From the model of sequential production, we shall move on to a general model of information among peers, to discuss the role of transparency in organizations. We shall describe information structures among peers by means directed graphs in which an arrow from agent i to agent j represents a situation in which i sees the effort decision of j before making his own decision. We shall discuss conditions under which the cost of providing incentives is declining with the level of transparency in the organization. This model also will allow us to compare architectures of information structures and address several issues on the optimal design of the work area. In particular, we shall show why process-based teams (in which each agent resumes a different function in the production of the same product) are more effective than function-based teams (where all agents perform the same function).

We shall discuss other multi-agent models related to the above models including one in which agents are assumed to interact repeatedly in performing a joint project, and another model in which agents compete under a scheme that rewards them based on relative performance. Within the latter model we shall also demonstrate why excessive monitoring by the principal may be counterproductive even when monitoring is not costly. Next, we shall the anomaly of "incentive reversal." i.e. situations in which higher rewards are counter-effective. As we shall see in a multi-agent framework such a phenomenon can arise in a fully rational environment (without relying on any behavioral or psychological effect). Finally, will also study several important applications of multi-agent contracting. One such application involves the raising of capital by a firm. We will study the implications of optimal contracting on the choice of investment contracts as well as on the choice of the set of investors. We will also study the role of multi-agent contracting in tort law and explain why such contracts tend to induce excessive care against damages.

While the main part of the course involves theoretical results, we will survey a number of experimental and empirical results (based on field data) on incentives and team production. These studies will address the following issues:

1. The role of psychological peer effect and peer pressure in inducing agents to exert effort.
2. Coordination and mis-coordination of efforts in teams.
3. Inter-group solidarity and intra-group conflict.

List of topics include:

1. Moral Hazard in Multi-Agent Contracting
2. Equality and Discrimination in Multi-agent Contracting
3. Growth and Coordination in Multi-Agent Contracting
4. Optimal Incentives in Sequential Production
5. Optimal Assignment of Agents and Tasks to Production Slots
6. The Effect of Information about Peers on Incentives
7. Sub-Contracting among Peers
8. Why Less Monitoring May Generate Better Incentives?
9. Incentives for Joint Initiatives
10. Incentive Reversal
11. Multi-Agent Contracting vs. Public Good Mechanisms
12. Experimental Results on Incentives and Team Production
13. Empirical and Field Evidence on Peer Effects and Incentives in Teams
14. Multi-Agent Contracting and Monitoring
15. Macro Effects in Multi-Agent Contracting
16. Multi-Agent Contracting and Tort Law
17. Multi-Agent Contracting in Financial Markets
18. Informational Design in Multi-Agent Contracting

References:

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5. Berenstein, S. and E. Winter (2012), "Multi Agent Contracting with Heterogeneous Externalities" *American Economic Journal: Microeconomics*, 4(2), 50-76.
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21. Winter, E., (2006) "Optimal Incentives with Information about Peers," *RAND Journal of Economics*, 37(2), 376-390.
22. Winter, E (2009), "Incentive Reversal," *American Economic Journal: Microeconomics*, 1, 133–147.
23. Winter, E., (2010), "Transparency and Incentives Among Peers," *RAND Journal of Economics*, 41, 504-523.

Assignment (100%): Students will have to write a *one-page introduction* for one of the papers discussed. In the introduction, you should write a short summary (*less* than 500 words) that briefly answers the following questions:

a. What is the question (of the paper)?
b. Why should we care about it?
c. What is your (or the author's) answer?
d. How did you (or the author) get there?

In addition, to illustrate "why we should care about it", you should provide *one real world example* the results of this paper can be applied to on the back page, plus a list of common notations used (theory) or regression variables (empirical study) throughout the paper so people can easily refer to during the talk.

Note: Your introduction need not be in the same language as the paper, and doing it in a different language is the best way to avoid plagiarizing.