# Institutions Field Exam
August 2009

***<u>Instructions</u>***
*Answer both questions. The two questions count equally. There are two pages to the exam (i.e., Question 2 continues to the next page).*

**Question 1: A Multi-Task Theory of Bureaucracies**

Using Holmstrom and Milgrom's (1991, 1994) multi-task principal agent framework, develop a model of government organizations that could be applied to government agencies— such as the State Department. In answering this question,

(a) Discuss the key differences between government and private organizations.

(b) Describe in detail the Holmstrom & Milgrom framework as developed originally.

(c) Describe how, and why, you would modify the Holmstrom & Milgrom framework so as to capture the essence of government agencies as discussed in (a). In doing so, describe in detail the set of assumptions—*i.e.,* players, information set, actions, and equilibrium concept that you need so as to develop a theory of public bureaucracies.

(d) Without attempting to solve your model formally, describe what you believe will be the empirical implications of such a model.

**Question 2: Joint Venture**

Consider the following scenario. Two profit-maximizing firms wish to engage in a joint venture. The profit from the joint venture (gross of investments) is $\pi(I_1, I_2)$, where $I_n$ is the amount of money firm $n$ invests in the joint venture. Assume the function $\pi(\cdot,\cdot)$ is symmetric (*i.e.,* $\pi(I,J) = \pi(J,I)$), at least twice differentiable in all arguments, and exhibits the following properties:

- $\partial\pi(0, I_2)/\partial I_1 > 1$ for all $I_2$ and $\partial\pi(I_1, I_2)/\partial I_1 > 0$ for all $I_1$ and $I_2$ (observe, by symmetry, the same properties hold when $I_1$ and $I_2$ are interchanged).
- There exists an $\bar{I}$, finite, such that $\partial\pi(I,I)/\partial I_1 + \partial\pi(I,I)/\partial I_2 < 2$ for all $I > \bar{I}$.

- $(I_1 - I_2)\left(\frac{\partial\pi(I_1,I_2)}{\partial I_1} - \frac{\partial\pi(I_1,I_2)}{\partial I_2}\right) \leq 0$, with the inequality holding strictly whenever $I_1 \neq I_2$.

(a) Give a condition for the levels of $I_1$ and $I_2$ that maximize the joint profits of the two firms. What relation holds between $I_1$ and $I_2$ at such an optimum? Prove your answer.

(b) Suppose that it is impossible for the firms to contract on the levels of $I_1$ and $I_2$; that is, each firm is free to investment as much or as little in the joint venture as it wishes. Suppose that the profit of the joint venture is divided evenly between the two firms. Will the equilibrium investments of the two firms maximized their joint profits? Prove your answer.

(c) Same assumptions as the previous part. Prove (i) that a pure-strategy equilibrium exists; (ii) that $I_1 = I_2$ in any pure-strategy equilibrium, and (iii) that the equilibrium values you found cannot exceed the values you found in part (a).

Assume the following. The "joint" venture is wholly owned by firm 1 initially. After firm 1 has invested, firm 2 can see how much has been invested in the joint venture (but this amount cannot be verified). At this point, it is possible to transfer ownership to firm 2 and for firm 2 to invest. (Firm 2's investment is also not verifiable.) The firms can contract with each other prior to firm 1's investment. Payments between the firms, as well as ownership of the joint venture, are verifiable. Assume that the pair $(I_1^*, I_2^*)$ that maximizes joint profit is unique.

(d) Assume renegotiation is impossible. Does there exist a contractual solution that achieves the first best? If so, derive it. If not, prove there does not.

(e) What would be the consequence of allowing the parties to recontract after firm 1 has invested? Discuss the issues that could arise. You do not need to prove anything or work out the analysis formally for this part. Limit your answer to 150 words.