

# Comment on W. Bentley MacLeod, "Incentives in Organizations: An Overview of Some of the Evidence and Theory"

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In the first part of his paper Professor MacLeod offers an excellent survey on different types of empirical studies that try to test some of the implications and predictions of the theory of contracts and incentives. This survey is highly welcome. It shows that there already exists quite a substantial empirical literature and that at least some of the predictions of incentive theory are compatible with the empirical evidence. Furthermore, the survey points at many open questions, and it is to be hoped that it will attract more empirical researchers to this fascinating area. The second part of the paper discusses some of the conceptual problems of the empirical literature in connection with the theory of *implicit* contracts. MacLeod argues that many contracts, in particular employment contracts, are necessarily incomplete and that comprehensive explicit contracts that are contingent on all relevant states of the world are typically not feasible. Nevertheless, incentive problems may be solved using implicit contracts. An implicit contract cannot be enforced by the courts, but has to be self-enforcing, i.e., it has to be in the private interest of each of the involved parties to stick to the terms of the agreement. MacLeod shows that self-enforcing contracts can be very powerful in implementing an efficient allocation and completely solving the underlying incentive problems. However, there are typically many self-enforcing contracts that achieve efficient allocations, and the theory cannot predict which of these contracts will prevail.

In this comment I would like to make three points. First, I would like to discuss the interplay between implicit and explicit contracts. If implicit contracts are so powerful, why do we observe explicit contracts at all? I will show that the mere possibility of writing an explicit contract can render implicit contracts worthless. Second, I will briefly discuss the incomplete contracts literature on solutions to the holdup problem, confirming MacLeod's main theme that contract theory often cannot offer clear-cut empirical predictions. Finally, I will come back to the question the organizers of this workshop asked us: Under what circumstances should a principal induce competition rather than cooperation between several agents interacting within an organization? I will give a brief survey on what we know about this problem, addressing some conceptual problems and open questions along the way.

Let me start with a simple observation on implicit versus explicit contracts. Implicit or self-enforcing contracts work well when there is a repeated relationship between the involved parties in a stationary environment, when actions are perfectly observable, and when each transaction is small in the sense that the gain from an opportunistic deviation is not too big. However, even if these conditions are met, we often observe that explicit contracts are used. For example, an employment contract specifies some verifiable obligations of the employee and the employer, such as the number of hours the employee has to work, or piece-rate or bonus payments as a function of verifiable performance data. Why not rely entirely on an implicit contract? In the following I want to argue that the mere fact that a variable is contractible may make it necessary to write an explicit contract on this variable.

To see this, consider the repeated principal-agent model described in Section 4.a. Let me further simplify this model by assuming that only the agent has to take an action ( $e_1$ , which is perfectly observed by both parties) and by ignoring the possibility of bonus payments. In this case proposition 1 tells us that a contract,  $c^* = (\bar{w}, e_1^*)$ , is self-enforcing if and only if

$$[1] \quad U_0(c^*) \geq \bar{U}_0 \text{ and}$$

$$[2] \quad U_1(c^*) \geq (1 - \delta) \max_{e_1} U_1(\bar{w}, e_1) + \delta \bar{U}_1.$$

The first inequality says that the principal must get at least his outside option utility if the agent sticks to the (implicit) agreement and works  $e_1^*$ , while [2] requires that it not be profitable for the agent to cheat in one period, be fired, and receive his outside option utility forever thereafter. This implicit agreement is sustained by the threat that the agent will be fired if he does not work at least  $e_1^*$ . The threat is credible because the principal believes that if the agent cheats in one period, then he is going to cheat in all future periods as well.

Now suppose that the action  $e_1^*$  is verifiable and can be contracted upon. Is the implicit contract described above still viable? The answer is no. Suppose the agent deviates from the implicit agreement and chooses  $e_1 < e_1^*$ . The implicit contract requires that it now be optimal for the principal to fire the agent. However, the agent could offer to renegotiate and to write an explicit contract on  $e_1^*$  for all future periods. The explicit contract guarantees that the agent is not going to cheat in the future, so it is no longer optimal for the principal to carry out his threat of firing the agent. Hence, the implicit contract is not self-enforcing if  $e_1$  can be contracted upon. Note that in this simple example the

fact that  $e_1$  becomes contractible forces the parties to write an explicit contract on  $e_1$  even if writing such a contract is costly.<sup>1</sup>

Let me now turn to the case where contracts are necessarily incomplete but where self-enforcing contracts are not feasible, for example, because the environment in which the parties interact is not stationary or because there is only a one-shot relationship. Most of the literature on incomplete contracts, starting with Williamson (1985) and Grossman and Hart (1986), focuses on the holdup problem that arises when comprehensive explicit contracts are not feasible. There are several recent papers (e.g., Aghion et al., 1994; Hermalin and Katz, 1993; MacLeod and Malcolmson, 1993; Nöldeke and Schmidt, 1995) that show that there exist rather simple incomplete contracts that can be used to solve the holdup problem and to implement an efficient allocation. The basic idea of most of these papers is to use the incomplete contract to affect the default point of the renegotiation game that is going to be played after the state of the world has materialized. By choosing the default point appropriately, efficient investment incentives can be given while renegotiation ensures efficient trade for any given state of the world. Unfortunately, the type of contracts suggested by these papers are quite different. While each paper can make a convincing point that its contracts are simple and that they can be observed in reality, the econometrician is left with the problem that there is no uniquely optimal contract predicted by the theory. This is exactly the same problem as the one discussed by MacLeod in the context of self-enforcing contracts. The theory can be used only to rationalize some observed contracts *ex post*. But it is difficult to derive unambiguous and empirically testable predictions.

Finally, let me turn to the question whether cooperation or competition should be promoted between the agents within an organization. Of course, it is always desirable to achieve cooperation between *all* members of an organization in order to maximize the total surplus that can be generated. The question rather is whether cooperation between *some* members of an organization should be promoted if cooperation between all members is not feasible.

The earlier literature on moral hazard emphasized that it may be optimal for the principal to promote competition between agents. Two main arguments have been put forward. First, suppose that the principal receives some information about the performance of his agents, but that this information cannot be

<sup>1</sup> The interaction of explicit and implicit contracts is discussed more extensively in Schmidt and Schnitzer (1995). Baker et al. (1994) made a similar observation in a hidden action model where "objective" and "subjective" performance measures can be used to give second-best effort incentives to the agent. If the "objective" signal (on which an explicit contract can be written) is too precise, then an implicit contract based on the "subjective" performance measure does not work because the fallback position after renegeing on the implicit contract is too attractive.

verified in court. In this case the principal may not be able to commit to an incentive scheme that pays each agent conditional on his performance level. However, the principal can commit to a tournament, saying, for example, that the agent with the best performance in a given group is going to be promoted or to get a prize. The tournament provides incentives to the agents, and it solves the principal's commitment problem: since he has to promote one agent, he can just as well promote the one with the best performance (Lazear and Rosen, 1981).

Second, consider the case where the performance of each agent can be verified. In this case it may still be optimal to induce competition among agents. Suppose that the technological shocks or measurement errors affecting the performance measure of some agents are correlated. Then the information conveyed in the performance of one agent can be used to filter out noise from the performance measure of all other agents. Hence, *relative performance evaluation* can be used to reduce incentive costs (Holmström, 1982). Note that if there is a positive correlation between performance measures, then the high output of one agent signals that the environment was favorable, so the high output of another agent is more likely to be attributable to good luck rather than to hard work. Thus, the reward for agent 1 will decrease as the output of agent 2 increases.

These arguments ignore, however, the adverse effects of competition. In particular, in a tournament or under relative performance evaluation each agent is interested in the other agents' performing badly. Thus, they may refuse to cooperate and help each other in cases where cooperation would be desirable. Furthermore, even if there is no productive interaction among agents, they may be able to monitor each others' actions. Thus, the principal could offer a team contract and rely on the agents to monitor each other.

There is a recent theoretical literature discussing the pros and cons of team contracts versus relative performance evaluation. This literature faces an important conceptual problem, namely, how to model the interaction among agents. Typically, two extreme cases are considered:

- Side contracts are feasible and enforceable: in this case it is assumed that the agents can write binding contracts among themselves in order to maximize their joint payoffs given the incentive scheme offered by the principal.
- No side contracts are feasible: the agents play a noncooperative game given the incentive scheme offered by the principal.

It is difficult to justify the first case on theoretical grounds. If the agents can write an enforceable contract, then it should also be possible to include this side

contract in a grand contract between the principal and the agents which would presumably increase efficiency. An alternative view is that the side contract is an implicit, self-enforcing contract, like the ones discussed by MacLeod. However, if there is a repeated relationship among the agents, there is presumably also a repeated relationship with the principal. So why not include the principal in a *grand* implicit contract? A possible answer may be that the agents observe each others' actions more frequently because they are working more closely together, which in turn makes it easier to sustain an implicit agreement between them than is the case with an implicit contract with the principal. However, this has not yet been modeled explicitly and is an important topic for future research.

Despite these conceptual problems, the possibility of side-contracting seems to be plausible if the agents are working together closely. Furthermore, the principal can affect whether or not side contracts are feasible by appropriately designing the task structure and the job environment of the agents.

Most of the specific results on the pros and cons of competition versus cooperation are derived in rather specific models and depend on the underlying technology, in particular on the degree of productive interaction between agents. However, there seem to be at least three general insights that I want to summarize informally (see Holmström and Milgrom [1990] and Itoh [1992] for a more formal and more detailed discussion):

1. Relative performance evaluation becomes more attractive the more closely the performance measures of the agents are correlated, provided that productive interactions are not too important and that the principal can separate the agents in order to prevent side-contracting. This result is very intuitive. If the performance measures are highly correlated it is possible to filter out the noise almost perfectly. If there are no productive interactions and if the principal can prevent side-contracting, then the first-best can be achieved using relative performance evaluation. This result is consistent with the empirical evidence provided by Gibbons and Murphy (1990), which shows that there is a significant component of relative performance pay for top executives.
2. If the agents observe only public information (also observable by the principal), then side contracts can only reduce efficiency. This is also very intuitive. If the agents have no private information, any contract between them could be part of a grand contract including the principal. Hence, by revealed preference, if the principal does not include the side contract in a grand contract, he must be worse off than if the agents collude and write a separate side contract.

3. Suppose that the agents can observe one others' actions but that they are not observed by the principal. Even if there is no productive interaction, side-contracting (cooperation) is better than relative performance evaluation if the correlation coefficient is sufficiently small. Here the point is that if side contracts are feasible, then the principal can exploit the fact that the agents can monitor and control each other by offering a team contract. This is cheaper than using competition if relative performance evaluation is not too informative.

These results are consistent with some recent trends in business organization. For example, there has been a recent movement in U.S. manufacturing to implement the Japanese just-in-time-production system in order to reduce in-process inventories. Itoh (1992) points out that this movement forces a fundamental change in the way workers relate to one another: The traditional hierarchical organization with a highly specialized division of labor and little lateral flow of information is too inflexible to deal with the problems of just-in-time production. Instead, intense interaction between adjacent operations is necessary. Thus, teamwork, lateral communication, and job rotation is promoted. These practices increase the scope for communication, mutual monitoring, and side-contracting between agents, which may explain some of the efficiency increases brought about by just-in-time production. However, a detailed empirical investigation of these phenomena is still missing.

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