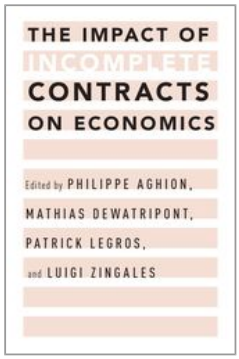

The Impact of Incomplete Contracts on Economics
Philippe Aghion, Mathias Dewatripont, Patrick Legros, and Luigi Zingales

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Comments on the Foundations of Incomplete Contracts

Eric Maskin

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Abstract and Keywords

The chapter reviews the argument that mechanism design theory can be enlisted to achieve the same outcome as the best state-contingent contract, even if some states cannot be described ex ante.

Keywords: mechanism, state contingent contract, ex ante describability

I am very happy to participate in this conference—not just because Oliver and Sandy are old friends but also because their paper is such a great piece of theory. The conference concentrates mostly on the many applications of Grossman and Hart (1986), and that is only right: these applications have been very important. But quite apart from the way it has been applied, the paper makes a pure theoretical contribution of landmark significance—in particular, its formalization of the

concept of ownership as the residual rights of control has been deeply influential.

That said, I think it is fair to suggest that the theoretical *foundations* for incomplete contracts remain incomplete, and I'd like to outline why developing them has proved so elusive.

The incomplete contracts literature, starting from Grossman and Hart (1986), studies how assigning ownership rights for productive assets affects the efficiency of contractual outcomes. But from the Coase theorem, we know that there must be *constraints* on contracting for this issue to be interesting. Specifically, for there to be any departure at all from first-best efficiency, contracts cannot be as fully contingent on the state of the world as the parties would want.

Roughly speaking, there have been two major approaches to explaining a possible lack of contingency. One approach (see Bolton and Dewatripont 2005) assumes pervasive moral hazard: it posits that if a party to a contract controls an asset, nobody else can observe what he does with it. Such an assumption guarantees that ownership *must* matter; since a contract cannot specify *how* the asset is used, the best it can do is to specify *who* gets to use it, that is, who the "owner" is. However, this assumption of nonobservability is very strong and doesn't apply to many situations of interest.

(p.346) Thus, a common alternative assumption is to suppose that the set of possible states of the world is so vast that it cannot be foreseen or described in advance. For example, imagine the parties to a contract plan to trade some good in the future, but at the time of contracting, they do not yet know the good's characteristics. Assume, furthermore, that the number of possibilities is far too big to enumerate. Then, seemingly, the contract will necessarily be incomplete.

Nevertheless, the so-called irrelevance theorem (as developed, in Maskin and Tirole 1999) challenges this conclusion. The theorem asserts that if parties are risk averse and can assign a probability distribution to their future payoffs, then under certain conditions they can achieve the same expected payoffs as with optimal fully contingent contracts (even though they

cannot describe the possible states in advance). In other words, the fact that contracts are incomplete does *not* constrain parties' welfare possibilities.

Let me give a sketch of the ideas in the proof. The first idea is to make a contract's outcome contingent on the payoff possibilities (which can be described ex ante) associated with a given state of the world, rather than on the state itself (which cannot be described). Then, once the state is realized, its remaining details can be "filled in" (since the state is observable to the parties ex post).

The potential hitch in this scheme is that filling in the details must be done by the parties themselves; they are, after all, the only ones who know the state ex post (if a third party, e.g., a judge, could also observe it, then making the contract fully state-contingent would be easy: the judge himself could be made responsible for providing the details). But how can we be sure they will be willing to reveal the states truthfully?

This is where the second idea comes in. Provided that parties have different preferences in each possible state (this is a critical condition for the theorem to go through), mechanism design theory can be enlisted to construct a mechanism g that makes the truthful revelation of states incentive compatible. The mechanism g becomes part of the contract.

Let's pursue this line of reasoning and consider a bilateral contract in which, in mechanism g, the two parties are supposed to play strategies (s_1, s_2) in state θ, that is, (s_1, s_2) is the equilibrium of g in state θ, and $g(s_1, s_2)$ is the outcome that an optimal fully contingent contract would attain in that state. If party 1 instead played s'_1, then he must be "punished"; otherwise, (s_1, s_2) won't be an equilibrium. But imagine that strategies (s'_1, s'_2) constitute an equilibrium in state θ'. Then, if (s'_1, s'_2) are the strategies actually played, it may not be clear to a judge whether it was party 1 who deviated in state θ or party 2 who deviated in state θ' (remember that the state is unobservable to anyone but the parties themselves). A way out of this difficulty is to punish *both* parties. That is, the

mechanism could assign a "punishment" outcome a to (s'_1, s'_2) (p.347) (i.e., $a = g(s'_1, s'_2)$) such that party 1 doesn't prefer a to $g(s_1, s_2)$ in state θ, and party 2 doesn't prefer a to $g(s'_1, s'_2)$ in state θ'.

Now, if parties get such punishment payoffs from outcome a (in states θ and θ'), then a would appear to be a successful punishment. But there's a potential problem: what if parties can renegotiate the outcome a ex post? This issue would not arise were the judge able to prevent renegotiation. But what if the parties can replace the original contract with a renegotiated one without this being detected by the judge? Then the parties need not settle for a, and if a is Pareto inefficient in state θ, they won't settle: they will renegotiate the contract ex post so that the resulting outcome a' is Pareto optimal.

Such renegotiation can limit the effectiveness of punishments, and to see how limiting it can be, suppose that the two parties are risk neutral. In this case, the Pareto frontier (in payoff space) is linear for any state, and so if one party strictly prefers $g(s_1, s_2)$ to a' in state θ, the other must strictly prefer a' to $g(s_1, s_2)$—it is not possible to strictly punish both players provided they can renegotiate. Indeed, this constraint on punishment underlies the results in Segal (1999) and Hart and Moore (1999). Those papers give conditions under which renegotiation imposes such severe limitations that mechanisms are completely useless.

If, however, parties are risk-averse, then the Pareto frontier becomes strictly concave (for such concavity, it suffices to have one risk-neutral and one risk-averse party). This is where the third idea comes in: if a mechanism randomizes between two Pareto-optimal points, it will generate a point that is strictly below the frontier. In other words, by allowing a to be a random outcome, a mechanism can punish both parties after all.

Why isn't this randomization itself renegotiated away? The key reason is that the randomization occurs only out of

equilibrium. Ex ante, parties have no incentive to renegotiate, because they forecast equilibrium outcome $g(s_1, s_2)$ in state θ, not a. Indeed they have an incentive not to renegotiate, since renegotiation would interfere with getting to that equilibrium. And renegotiation ex post can be ruled out by designing the randomizing device so that the randomization is realized as soon as a party deviates from equilibrium. In other words, there is no time to renegotiate before the outcome of the randomization is known. Finally, since that outcome is itself Pareto optimal, there is no scope for renegotiation afterward.

Thus, I have outlined a way that parties can achieve the payoffs of a first-best fully contingent contract without being able to foresee states. The elements of story are (1) payoff-contingent contracts, (2) mechanisms that implement the desired outcomes in each state, and (3) random out-of-equilibrium outcomes.

This suggests that we do not yet have a fully satisfactory foundation for second-best incomplete contracts. But this should not be cause for (p.348) discouragement. The history of economic thought is replete with seminal ideas for which rigorous foundations were found only later. I have no doubt that Sandy and Oliver's ideas are in this category.

Note

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