The Hold-Up Problem and Incomplete Contracts: A Survey of Recent Topics in Contract Theory

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Abstract

This article provides a non-technical survey on recent topics in the theory of contracts. The hold-up problem is presented and the incomplete contracts approach is discussed. Emphasis is put on conceptual problems and open questions that await further research.

Keywords: Contract Theory; Hold-Up Problem; Incomplete Contracts

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1 Introduction

Contract theory is one of the most active fields of research in contemporary microeconomics. One of the reasons why it has been particularly popular in recent years may be the fact that many economists think that the incomplete contracts approach as pioneered by Grossman and Hart (1986) and Hart and Moore (1990) can help to answer important questions regarding the boundaries of the firm, which have been raised by Coase (1937) and more recently by Williamson (1985). In the meantime, the incomplete contract paradigm has been fruitfully applied to many relevant economic topics which are no longer restricted to the theory of the firm.[1] However, several economic theorists still feel uncomfortable about important issues surrounding the incomplete contracts approach. Why should one only compare the consequences of writing one of two 'simple' contracts, C_1 or C_2, which both result in inefficient outcomes, if there could be a more sophisticated contract, C_3, which might even implement the first best?[2] Such concerns have lead some researchers to a renewed interest in the more traditional theory of complete contracts, which is closely related to the theory of implementation or mechanism design.[3]

[1] Browsing through recent issues of economic journals, one quickly finds papers which apply incomplete contracting in fields such as political economy, fiscal federalism, industrial organization, public procurement, regulation, privatization, transition economies, international trade or law and economics.

[2] For example, C_1 could give the right to make a future decision to party 1, while C_2 allocates the right to party 2. Hence, a comparison of C_1 and C_2 can reveal when it is better to give party 1 or party 2 the authority to make the decision. Yet, there may be a superior contract C_3 that prescribes a decision depending on future announcements of the parties, so that it is unclear why any party should have authority at all.

[3] See the surveys of Moore (1992a) for implementation in the complete information framework and Palfrey and Srivastava (1993) for Bayesian implementation. Implementa-

This article complements existing surveys on contract theory in two ways.[4] First, the surveys that I am aware of are of a quite technical nature and therefore difficult to access for readers who are not already specialists in the field. In contrast, while trying to be as rigorous as necessary, this paper presents all ideas verbally without any mathematical pyrotechnics. Second, instead of attempting to be exhaustive and to provide final answers, this paper is focused on some specific topics which received particular attention by researchers in recent years and puts emphasis on open questions that should be addressed in future research.

2 What are incomplete contracts?

Given the fact that the theory of incomplete contracts has received considerable attention in recent years, it is interesting to note that there is no clear definition of what really constitutes an incomplete contract.[5] One popular view is that incomplete contract theorists restrict the class of contracts they consider in an *ad hoc* way. It is then difficult to judge whether a given contract is incomplete or not. Let a certain allocation problem be given and assume that without restricting the class of admissible contracts one could show that some contract C_1 is optimal. If a model builder took only the (maybe 'simple') contracts C_1 and C_2 into consideration and conjectured that C_1 is optimal, one could not be sure that there exists no superior (maybe

tion theory considers the case of many agents and is focused on uniqueness of equilibrium outcomes, while contract theory has its roots in the principal-agent framework and often assumes that parties can select an equilibrium when writing a contract.

[4] See Hart and Holmström (1987), Salanié (1997), and Schweizer (1999). See Hart (1995) and Tirole (1999) for discussions of incomplete contracts.

[5] See for instance Hermalin and Katz (1993) and Tirole (1999).

'complex') contract C_3.[6] The modeler hence would have chosen an incomplete contracts *approach*. Nevertheless, had he taken a complete contracts approach (i.e., had he not restricted his search to C_1 and C_2), he would have found the same contract C_1. It therefore does not make much sense to call the *contract* C_1 either complete or incomplete. What may really be incomplete is the model builder's justification to consider only $\{C_1, C_2\}$. Hence, it is difficult to understand what could be the meaning of a theoretical foundation for the incomplete contracts approach. If one could prove that no other contract can dominate $\{C_1, C_2\}$, then one would in fact be back in the world of complete contracts, since such a proof would require the consideration of all contracts which are feasible given the allocation problem.

Some authors use the label 'incomplete contracts' only when referring to the class of models initiated by Grossman and Hart (1986). These models, which will be discussed in Section 4, are mainly concerned with the optimal allocation of asset ownership and are also known under the label 'property rights approach'. An important ingredient of these models is the so called hold-up problem. The following section introduces the hold-up problem and explains how traditional contract theory deals with this problem.

3 The hold-up problem

3.1 Symmetric information

Consider the following allocation problem A_1. There are two risk-neutral parties. One of the parties, the (potential) seller, possesses one unit of an

[6] Of course, if C_1 already achieves the first best, then there is no need to consider other contracts.

indivisible good. The other party, the (potential) buyer, is interested in this good. It is efficient to exchange the good whenever the buyer's valuation exceeds the seller's costs. Assume that there are no wealth constraints and that there is no private information. Then, according to the Coase Theorem,[7] voluntary bargaining among the parties will result in trade whenever it is efficient.

Now consider the more complicated allocation problem A_2. Assume that the two parties meet at some initial date 0. At date 1, the seller can exert effort (or make an investment).[8] At date 2, the buyer's valuation and the seller's cost of trade are realized and the good can be exchanged. Valuation and cost can depend on the seller's investment and on the realization of an *ex ante* uncertain state of the world. It is useful to distinguish two special cases. Following Che and Hausch (1999), the seller's effort is called "self investment" if it aims at decreasing the seller's date-2-costs, while it is called "cooperative investment" if it aims at increasing the buyer's valuation.[9] The *ex post* efficient trade decision is to exchange the good whenever the seller's date-2-costs are smaller than the buyer's valuation, while the *ex ante* efficient

[7] For a discussion of the Coase Theorem, see Schweizer (1988) and the literature cited there.

[8] For simplicity, the discussion will be focused on the case of one-sided investment. If the buyer also has an investment opportunity, it is more difficult to develop an intuition (since there is an additional team-problem involved). I will make some remarks on which results carry over to this more general case.

[9] Cooperative investment is particularly natural if the seller produces the good at date 1 (effort increases the quality of the good). In this case it may well happen that the seller has no additional costs of trade at date 2 (so that trade is always *ex post* efficient). In the case of self investment it is natural to assume that the seller produces the good at date 2, and the production costs can be reduced by date-1-investments.

effort level maximizes the total expected surplus including the seller's effort costs, given the *ex post* efficient trade decision. The first best is achieved if the *ex ante* efficient effort decision and the *ex post* efficient trade decision are made.

Assume first that the valuations are common knowledge at date 2. If the parties have not written a contract at date 0, they still exchange the good whenever the buyer's valuation is larger than the seller's cost, i.e., *ex post* efficiency is always achieved according to the Coase Theorem. However, does the seller exert the *ex ante* efficient amount of effort? She will certainly do so if she has all the bargaining power at date 2. In this case she can make a take-it-or-leave-it offer to the buyer which makes him just indifferent between accepting and rejecting, so that the seller receives the total return to her investment. However, if the buyer has all the bargaining power at date 2, he will leave the seller no rent, so that she has no incentive to invest. In this case a 'hold-up problem' occurs, i.e., the fact that the seller does not receive the fruits of her investment lead her to underinvest. Yet, there is no accepted theory that allows to predict which bargaining game the parties will play. For example, nature might give each party the opportunity to make a take-it-or-leave-it offer with probability 1/2, which gives each party half of the date-2-surplus in expectation.[10] This would correspond to the Nash bargaining solution with 'no trade' as threatpoint, and there would again be a hold-up problem since the seller does not receive the full marginal returns on her investment.

Of course, the parties can write a contract at date 0. If the seller's effort were verifiable, it could simply be made part of the contract. Now assume that effort is only observable by the parties, but not verifiable by the court.

[10] See also Hart (1995, p. 77).

If the parties' valuations were verifiable, one could still achieve the first best. The contract could simply specify trade whenever it is ex post efficient and make the seller residual claimant (i.e., give her the total surplus at date 2).[11]

Most of the literature considers the case in which the valuations are observable by the two parties, but unverifiable to the court. If the parties can commit not to renegotiate, this causes no additional problems. The parties can write a contract which specifies the following 'message game' to be played at date 2: The buyer and the seller both simultaneously report the seller's costs as well as the buyer's valuation to the court. If the reports of the parties match, then the good is exchanged at a price which equals the (reported) buyer's valuation, provided that this covers the (reported) seller's costs. If the reports do not match, no trade and no payments occur. Given that one party tells the truth, it is optimal for the other party also to tell the truth. The seller gets the total surplus and hence has the right incentives to invest. Of course, truth-telling is only one equilibrium in this 'shoot-the-liar-mechanism'. But implementation theory has developed more sophisticated mechanisms in which the equilibrium outcome is unique under quite general circumstances.[12] In the present setting, it is not difficult to find such a sophisticated mechanism.[13] Even if both parties have investment opportuni-

[11] Note that the buyer could be compensated by an up-front lump sum payment without altering the incentives.

[12] See Moore and Repullo (1988) and Moore (1992a). Since nearly everything is (at least virtually) implementable in the complete information framework, some authors think that this branch of literature is by now (at least virtually) dead. However, the difficult issue of renegotiation might lead to a renewed interest in this field (see Maskin and Moore, 1999).

[13] Consider the following 'fill-in-the-price-mechanism': At date 2, the seller can name a price and the buyer can subsequently decide whether or not to trade at that price. It is straightforward to see that in the unique subgame perfect equilibrium outcome the seller

ties, it has been shown by Rogerson (1992) for the case of self investments and by Che and Hausch (1999) for the case of cooperative investments, that the first best can be achieved in such a way in quite general settings.

Some authors question the relevance of results along these lines for two different but related reasons, linked by the role that can be played by renegotiation. First, a major problem of traditional complete contract theory is the fact that optimal contracts are often more complex than real world contracts. Contract theorists have exerted considerable effort in order to show that in certain circumstances 'simple contracts' are optimal.[14] In an interesting paper, Huberman and Kahn (1988) argue that optimal complex contracts may sometimes be substituted by simple, unconditional contracts, when they are renegotiated at a later date.[15] Hence, renegotiation may be helpful in order to explain the prevalence of simple contracts.

Second, some authors argue that if the message game that is specified in the initial contract leads to an *ex post* inefficient outcome (which happens

receives the total gains from trade. Hermalin and Katz (1993) show that even if both parties have to make self investments, the first best can be achieved by such a mechanism when it is augmented by a base price which has to be paid independent of whether trade occurs or not.

[14]For example, Holmström and Milgrom (1987) prove that in a dynamic principal agent framework linear contracts can be optimal in sufficiently complex environments. Yet, their result depends on several technical assumptions. Romano (1994) and Bhattacharyya and Lafontaine (1995) show that linear contracts can implement the second best in Holmström's (1982) 'moral hazard in teams' problem. However, Kim and Wang (1998) argue that this result is not robust if agents are (slightly) risk-averse.

[15]For instance, Hermalin and Katz (1991) show that in the traditional principal agent model the first best can be achieved if the principal observes the agent's effort, either with complex contracts specifying message games, or with simpler contracts which are renegotiated. The authors argue that the latter case is more natural.

out of equilibrium only), then the parties will renegotiate towards the Pareto frontier. These authors find it unrealistic to believe that parties are able to commit themselves to actually execute the 'no trade' threat at date 2, when they know that there are positive gains from trade.[16] From a complete contracts perspective, the parties can anticipate the renegotiation outcome and make it part of the initial contract. They can hence confine their attention to contracts which are never renegotiated. Of course, the lack of commitment power can only harm the parties, since the class of contracts is thus reduced to contracts which satisfy additional renegotiation-proofness constraints.

Both research programs therefore suggest a closer look at the issue of renegotiation.[17] This is a difficult issue. Some authors argue that the date-2-bargaining game can be designed at date 0. In the present setting, one could then give the seller all date-2-bargaining power. If this is possible, the original contract can be simple indeed, since it needs just specify 'no trade and no payments'. Whenever there are positive gains from trade, the seller will then make a take-it-or-leave-it offer to the buyer demanding his valuation as price for the good, and the first best is achieved.[18] Such results are interesting, because they show that a contingent contract can be substituted by a simple contract and a renegotiation game.[19] The problem with this approach is that

[16] See Tirole (1999) for a discussion of this controversial issue.

[17] See Schmitz (2005a) for a discussion whether or not courts should enforce contractual clauses that rule out renegotiation.

[18] Chung (1991) and Aghion, Dewatripont and Rey (1990, 1994) show that with renegotiation design the first best can also be achieved if both parties must make self investments. In this case, the original contract must specify trade with a certain probability $q_0 \in (0, 1)$.

[19] However, it may be questioned whether writing an unconditional contract and designing a renegotiation procedure is qualitatively different from writing a comprehensive contract.

it is unclear whether a renegotiation game can be designed *ex ante* and, more basically, it is unclear why the second criticism above should not be applicable here. For example, if the renegotiation game consists of a 'take-it-or-leave-it offer', what about the 'or-leave-it' part? This is certainly inefficient.[20] If this were a credible threat at date 2, why should one rule out contracts that may lead to inefficient out-of-equilibrium outcomes at date 0?

Other authors argue that one should take the renegotiation game as exogenously given. There are many games the parties could play. For example, Nöldeke and Schmidt (1995) postulate one certain non-cooperative bargaining game with the property that the party which does prefer the efficient trade decision given the initial contract gets the total renegotiation surplus if the other party were to trigger an inefficient outcome under the terms of the initial contract.[21] They then consider simple option contracts which give the seller the right to decide at date 2 whether or not to trade at a prespecified price. Since only the seller could trigger an inefficient outcome given such an initial contract, this means in effect that the buyer has all the bargaining power at date 2. Even though the buyer gets the total renegotiation surplus, the seller can still be given incentives to invest, since now the threatpoint in

[20] Rubinstein and Wolinsky (1992) argue in their Proposition 1 that hardly anything can be implemented if inefficient threats in the renegotiation game are ruled out.

[21] Their game is a reduced form of the more complicated bargaining process described by Hart and Moore (1988), which takes place over several rounds (there is a last date when trade can occur). These authors also show that the first best can be achieved in the case of one-sided self investment. They get an inefficiency result for the case of two-sided self investment, which crucially relies on their assumption that specific performance contracts are ruled out (courts cannot enforce contracts that specify a certain trade level). This assumption, which has also been made by Tirole (1986), is not made in any other paper discussed here.

the bargaining game is no longer zero. In the case of self investment, the seller can increase her threatpoint payoff by exerting effort. Nöldeke and Schmidt (1995) show that indeed the first best can be achieved with an appropriately chosen strike price, even if two-sided self investments are required.[22]

Of course, there are many alternative ways in which renegotiation could be modeled. One popular concept is the Nash bargaining solution. Edlin and Reichelstein (1996) show that in this case the first best can be achieved with an appropriate fixed-price contract, provided that the seller's effort is self investment.[23] For the case of cooperative investment, Maskin and Moore (1999) and Che and Hausch (1999) prove that the first best cannot be achieved, even with arbitrary complex initial contracts, if inefficient outcomes are renegotiated according to the Nash bargaining solution.[24] The intuitive reason for their result is that if investment is cooperative, then the seller's effort can

[22]The buyer always gets the renegotiation surplus and hence has the right incentives since he is residual claimant on the margin. If trade is always efficient (e.g., since there is no uncertainty), then one can set the strike price so high that the seller always wants to trade. There will then never be scope for renegotiation and the right investment incentives result. If trade is not always efficient, the price must be lower, so that the seller does not overinvest. See also Bös and Lülfesmann (1996) for a related analysis in the context of public procurement.

[23]In the present setting of an indivisible good, such a contract would require trade with a certain probability $q_0 \in (0,1)$. Let the price be zero. If $q_0 = 0$, the seller underinvests since she receives only half of the renegotiation surplus. If $q_0 = 1$, the buyer always insists on trade so that the seller incurs her costs whenever trade is efficient, but also half of her costs when trade is inefficient, which leads to overinvestment.

[24]In contrast, if renegotiation takes place according to Hart and Moore's (1988) procedure which allocates the whole renegotiation surplus to one party, the first best can be achieved even if investments are cooperative, provided they are one-sided (see Nöldeke and Schmidt, 1995) or take place sequentially (see De Fraja, 1999).

only improve the buyer's (instead of her own) threatpoint payoff. In this case it is optimal to choose 'no trade' as threatpoint, i.e., write no initial contract at all.[25]

Let me summarize the discussion of the case of observable valuations. If the parties can commit not to renegotiate, the first best can be achieved with a complex contract specifying a message game. In some cases, the first best can also be achieved by a simple unconditional contract which is renegotiated. On the other hand, given a certain renegotiation procedure, it may also happen that the first best is no longer achievable even by complex contracts.

3.2 Asymmetric information

Consider now the allocation problem $\tilde{A}_1$ which corresponds to A_1, except that now only the buyer knows his valuation and only the seller knows her costs. It is well known that in general there is no bargaining game in which the parties voluntarily participate and which leads to trade whenever the buyer's valuation exceeds the seller's costs, provided that the parties already possess their private information when they first meet. This is the famous impossibility result of Myerson and Satterthwaite (1983).[26] Loosely speaking, the seller can

[25] Note that a distinction between Hart and Moore (1988) or Nöldeke and Schmidt (1995) as non-cooperative approach and Edlin and Reichelstein (1996) or Che and Hausch (1999) as cooperative approach would be somewhat misleading. There are several non-cooperative games which lead to the Nash bargaining solution, e.g. a perturbed Nash demand game or an alternating offers game (cf. Osborne and Rubinstein, 1990). See also the appendix of Edlin and Reichelstein (1996).

[26] It is required that the buyer's valuation and the seller's cost are continuously distributed on intersecting intervals and that they are stochastically independent. See Matsuo (1989) for the case of discrete distributions. Some authors question the relevance of the

only be induced to reveal her costs when she receives the total surplus, and the buyer can only be induced to reveal his valuation when he gets the total surplus. However, the surplus can be generated only once, so that *ex post* efficiency cannot be achieved (provided that there is no third party willing to subsidize the buyer and the seller).[27] It is also well-known that according to the classical results of d'Aspremont and Gérard-Varet (1979) and Arrow (1979), *ex post* efficiency can be achieved if the parties meet before they learn their valuations. In this case the participation constraints of the parties are less severe, since they must hold only in expectation and not for each possible realization of the valuations.

Now consider the allocation problem $\tilde{A}_2$, which corresponds to A_2 except that now only the buyer learns his valuation and only the seller learns her costs.[28] Let the effort choice be hidden action. Assume that the parties have full commitment power. Rogerson (1992) and Hermalin and Katz (1993) show that the first best can still be achieved with sophisticated mechanisms which specify message games to be played at date 2, provided that effort is self investment (possibly even two-sided).[29] Intuitively, the mechanism which

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Bayesian mechanism design literature in the tradition of Myerson (1981) since, as has been shown by McAfee and Reny (1992), the importance of private information is near zero if arbitrarily small amounts of correlation are introduced. However, note that McAfee and Reny's (1992) bilateral trading mechanism requires large enough payments and a third party acting as budget balancer.

[27] Cf. the discussion in Bulow and Roberts (1989).

[28] See also Schmitz (2008a), who shows that in a hold-up problem with two-sided private information, in the absence of an ex ante contract a party's investments may be *decreasing* in its ex post bargaining power.

[29] For the case of one-sided investment, see also the early paper of Konakayama, Mitsui and Watanabe (1986).

makes them reveal their valuations does so by making them (in expected terms) residual claimants on the margin, and this also induces them to invest efficiently. It is an interesting question for future research whether (in the spirit of Huberman and Kahn, 1988) it is also possible to achieve the first best with a simple, unconditional contract which is renegotiated.[30] Moreover, the case in which the seller's investment is cooperative and the buyer has private information needs further investigation.[31]

Recently a number of papers have tried to endogenize the information structure in models that are somewhat related to allocation problem A_2. In these models, the effort decision does not influence an agent's valuation. Instead, the investment aims at learning a given parameter with a higher probability or precision.[32] Further research along these lines certainly seems to be worth pursuing.

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[30] This is not an easy question since asymmetric information makes the issue of renegotiation even more difficult. Schmitz (2002a) shows that there exists a renegotiation procedure such that the first best can be achieved in the case of two-sided self investments when the initial contract just specifies trade with a certain probability $q_0 \in (0,1)$. See also Farrell and Gibbons (1995) for a model in which there is *pre*contractual private information and renegotiation.

[31] Schmitz (2002b) shows that in this case the first best may not be achievable, even if the parties can write sophisticated contracts and have full commitment power.

[32] For example, see Aghion and Tirole (1997), Crémer, Khalil, and Rochet (1998), Dewatripont and Tirole (1999), Ewerhart and Schmitz (2000), Kessler (1998), Levitt and Snyder (1995), Lewis and Sappington (1997), and Prendergast (1993).

4 Incomplete contracts and asset ownership

4.1 The property rights approach

Grossman and Hart (1986), Hart and Moore (1990), Moore (1992b) and Hart (1995) apply the incomplete contracts approach in order to explain costs and benefits of different allocations of ownership rights.[33] To clarify the discussion, consider again allocation problem A_2. So far it was assumed that the parties' default payoffs, i.e. their payoffs if they did not trade, were equal to zero. This means that investments were completely relationship-specific. If trade between the seller and the buyer under consideration did not occur, then the investments would be lost. Now assume that the seller's effort may also increase her payoff if trade with the buyer does not occur, because she can alternatively use her (input) good herself in order to produce a final good and sell it on the competitive spot market. However, the seller can only realize this positive payoff if she owns a certain asset (say, a machine needed in order to produce the marketable good). If instead the buyer owns this asset, then her default payoff is still zero (this means that the asset is essential to realize the returns to her investment). Ownership of an asset is interpreted as the right to control the use of the asset (in particular, the owner can exclude anyone else from using it).[34] The buyer's default payoff

[33] While these models were originally focused on the costs and benefits of vertical integration with regard to private firms, the framework can also fruitfully be applied to the issue of privatization, see Hart, Shleifer, and Vishny (1997) and Hoppe and Schmitz (2008).

[34] One could argue that in the original formulation of A_2, ownership means the right to decide whether or not the good is exchanged without payments (in the absence of renegotiation, the seller would choose no trade, while the buyer would choose trade, so the allocation of ownership would be equivalent to writing one of two simple contracts in the

does not depend on the seller's effort (it is investment in her human capital, not in the asset) and for simplicity is assumed to be zero (i.e., the seller is indispensable). Trade between the buyer and the seller is always *ex post* efficient by assumption. The class of contracts that can be written *ex ante* is restricted to the allocation of ownership rights. The idea is that the good to be traded at date 2 cannot yet be described at date 0.[35] *Ex post* negotiations are modelled by the Nash bargaining solution.

Asset ownership is relevant because it determines the threat point of the date-2-bargaining game. If the buyer owns the asset, the default payoffs of both parties are zero. According to the Nash bargaining solution, the seller then gets half of the gains from trade at date 2, hence there will be underinvestment. If the seller owns the asset, she could sell her good on the spot market, while the buyer's default payoff is zero. The seller's payoff af-

sense of Edlin and Reichelstein (1996) without the need to specify the good *ex ante*). This would be misleading. The fact that the buyer owns the asset means that he can deny the seller access to the asset, but the buyer cannot force the seller to incur costs. This would be different with a public good or externality interpretation (the owner decides whether or not to produce; production is beneficial for one party but has negative external effects on the other party), where the decision variable is one-dimensional. If there is no prior contract in a pure private good setting, the seller always has the right not to deliver and the buyer always has the right not to accept any delivery.

[35] Aghion and Tirole (1994) relate ownership directly to the good to be traded, even though *ex ante* it cannot be described. They assume that at date 2 no more costs have to be incurred by the seller and that only the buyer can market the good. Hence, both parties' default payoffs under seller-ownership are zero, while under buyer-ownership the buyer gets the full gains from trade. It it difficult to justify why in the latter case the seller cannot simply keep her good. One might argue that the seller produces non-tangible ideas which cannot be hidden from the buyer, but then it is unclear why this is possible under seller-ownership.

ter renegotiation equals her potential spot market revenue plus half of the amount by which the gains from trade with the buyer exceed this revenue. Hence, she gets half of her default payoff plus half of the gains from trade with the buyer. If the marginal return to her investment were the same independent of whether she sold to the buyer or on the spot market, then the first best would be achieved. However, the fact that investments are relationship-specific usually means that they increase the seller's default payoff less than the gains from trade with the buyer. Hence, there is underinvestment, but it is less severe than in the case of buyer-ownership. The fundamental insight of this analysis is that if only one party has an investment opportunity, then this party should be the asset owner.

The model can be generalized to the case in which both parties can exert effort and may realize positive payoffs outside their relationship. Then the party whose investments are 'more important' (in the sense of their marginal impacts on the default payoffs) should be the owner. A central insight of the literature for this case is that joint ownership in the sense of bilateral veto-power (the asset can only be used if both parties unanimously agree) can never be optimal.[36] The intuitive reason is that if bilateral veto power is substituted by unilateral veto power, then the investment incentives of the new owner can only be higher (since consent of the other party to use the asset is no longer required if no agreement is reached), while those of the other party cannot be smaller.

It has already been pointed out that results along these lines may be crit-

[36]In the same spirit, two assets which are complementary (i.e., useless unless they are combined) should always be owned by the same party. If they were owned by different parties, this would be equivalent to bilateral veto power over the combination of both assets. See Hart and Moore (1990) and Hart (1995).

icized because it is assumed that initially only simple governance structures such as buyer-ownership, seller-ownership or joint ownership are considered. For example, it may be beneficial to consider stochastic ownership structures or options to own.[37] Moreover, it is unclear what is the precise meaning of the assumption that on the one hand the good to be traded at date 2 can only be described *ex post,* but not *ex ante,* while on the other hand the parties may *ex ante* foresee their date-2-payoffs. Maskin and Tirole (1999a) have recently stressed the incompatibility of unforeseeable contingencies and sequential rationality. They prove that *ex ante* undescribability is often irrelevant, since sophisticated mechanisms in the spirit of Moore and Repullo (1988) can be used to implement the same payoff outcomes as if contingencies were describable.[38] In contrast, Hart and Moore (1999) and Segal (1999) argue that even if contingencies are perfectly describable, the impossibility of ruling out renegotiation in the real world is sufficient to make such mechanisms worthless.[39] However, the fact that under certain circumstances writing no contract may be optimal still does not explain the prevalence of certain simple ownership arrangements (that are usually deterministic and

[37] See also Hart (1995). Nöldeke and Schmidt (1998) show that options to own may under certain circumstances even achieve the first best if the parties invest sequentially.

[38] Since observable but non-verifiable information that is no longer payoff-relevant cannot be elicited as a unique subgame perfect equilibrium outcome, it is required that the optimal complete contract would not discriminate between payoff-equivalent states.

[39] Recall that in the simple hold-up framework it turned out that contracts are worthless if investments are cooperative and renegotiation cannot be ruled out. In the case of selfish investments such a result can only be obtained if the number of goods that can potentially be traded *ex post* tends to infinity, while investments can merely enhance the gains from trading only one specific good.

unconditional).[40] Of course, this does not imply that incomplete contract models are completely useless. One may just accept that (for reasons which are not yet fully understood) in certain real world applications some simple governance structures are predominant and ask which of these are optimal under what circumstances. If the insights of the property rights approach were particularly robust, then they would be very valuable with regard to such important questions.

4.2 Robustness of the property rights approach

Recent papers show that the basic insights of the incomplete contracts approach are quite sensitive to the underlying assumptions. DeMeza and Lockwood (1998) and Chiu (1998) point out that the results critically depend on the exact nature of the renegotiation game. They assume the so-called deal-me-out solution, according to which each party receives half of the gains from trade, except in cases in that one party would thus receive less than its outside option payoff. In such cases the party that would be worse off receives its outside option payoff, and the other party is residual claimant. An alternating offers bargaining game leads to the deal-me-out solution if a party has the possibility to choose the outside option and thus stop bargaining, while Grossman and Hart's (1986) split-the-difference rule is appropriate if the parties receive their threatpoint payoffs while they are bargaining (so-called inside options) or if bargaining can break down with an exogenously given probability. If the deal-me-out solution is assumed, a party's investment incentives can be strengthened when it loses control over an asset. The reason is as follows. Assume that the parties' outside option payoffs are ini-

[40] See also Tirole (1999) and Maskin and Tirole (1999b).

tially smaller than half of the gains from trade. Then the gains from trade are split equally, so that party 1 does not receive the full marginal returns on its investment. If asset ownership is transferred from party 1 to party 2, the outside option payoff of party 2 may become larger than half of the gains from trade, so that party 1 becomes residual claimant and therefore has improved investment incentives.[41]

Even if one does not change the assumptions about renegotiation, the basic results of the property rights literature may not be robust under certain circumstances. Rajan and Zingales (1998) point out that if a party's investment has a negative effect on this party's default payoff, then ownership can reduce investment incentives, so that it may be optimal to allocate asset ownership to a non-investing party.[42] Rosenkranz and Schmitz (1999, 2003) argue that in the context of research joint ventures joint ownership in the sense of bilateral veto power can be optimal. The reason is that the parties are not only concerned about incentives to exert effort, but also about incentives to disclose know-how. Know-how disclosure can be modelled as

[41] The fact that different assumptions about renegotiation may lead to substantially different results is by now well known. In the standard hidden action principal-agent model, Fudenberg and Tirole (1990) show that high effort cannot be implemented with probability one if the principal makes the renegotiation offer, while Ma (1994) shows that the second best of the model without renegotiation can be obtained if the agent proposes the renegotiation contract.

[42] See also Schmitz and Sliwka (2001) for a related result. There it is assumed that the parties can choose the degree of asset specificity. If only one party invests it can be optimal to make the other party owner of the asset, since this induces a higher degree of specificity (provided that specificity is not contractible). If the parties have the possibility to contractually determine specificity, it is always optimal to make the investing party owner. However, then the parties will deliberately choose less then the first best degree of specificity, since this improves investment incentives.

a form of cooperative investment, i.e., it improves the other party's default payoff. Therefore, it may well happen that a party will not disclose its know-how unless it has veto power (since then the other party's default payoff is always zero) and thus bilateral veto power can indeed be optimal. Further research with regard to the robustness of the results reported in Hart and Moore (1990) and Hart (1995) certainly seems to be desirable.[43]

5 Conclusion

The discussion can be summarized as follows. Even though it is difficult to justify the *ad hoc* restriction on the class of contracts, the incomplete contracts approach can help to explain which arrangements are optimal in a given set of governance structures. While the results seem to crucially depend on the exact nature of the assumptions made, this approach can yield a number of interesting insights which go beyond the results that have been obtained in the traditional complete contracts theory.

However, does this really mean that the idea of Grossman and Hart (1986) to look for the optimal governance structure in a given set of rules is a path-breaking novelty? One might have some doubts that this really is the case. In fact, the comparison of the implications of rational behavior under some exogenously given rules is an old habit of the law and economics literature (which, of course, is also strongly influenced by the work of Ronald Coase). The typical approach of this literature can for example be illustrated by

[43] In more recent research, Schmitz (2006, 2008b) has shown that some of the most prominent implications of the property rights approach may be overturned if a party has private information about its default payoff. In particular, ownership by a non-investing party and joint ownership may be optimal.

Shavell (1984).[44] In this paper, strict liability and safety regulation in the sense of a uniform minimum standard are compared. More general rules of regulation (which could in particular mimick everything that liability can achieve) are simply not considered. Obviously, the arguably old-fashioned way in which only two special rules are compared in such papers is not qualitatively different from what is done in the recent incomplete contracts literature. Hence, the fact that putting ad hoc restrictions on the class of analyzed rules has a long tradition in the law and economics literature may indeed cast some doubts on the novelty of the allegedly path-breaking incomplete contracts approach. What may be different is the fact that following Grossman and Hart (1986) at least some authors try to argue more carefully why they think the restriction they make is reasonable. Moreover, the contribution of Grossman and Hart (1986) is also novel since they no longer identify ownership with income streams, but draw the attention to control rights instead.

In any case, one may argue that bounded rationality may ultimately explain why agents consider only some rules or contracts. However, it is then not clear whether it makes sense to build models in which the parties perfectly foresee the outcome of rational behavior given such rules or contracts. This certainly seems to be a difficult but important topic for future research.[45]

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[44] See Brown (1973) and Calabresi (1970) for early research comparing liability rules. See also Schmitz (2000) for a detailed discussion of Shavell (1984).

[45] See also Tirole (1999) and Schmitz (2005b) for discussions of the fact that some questions that have been addressed in the incomplete contracting framework may also be analyzed in traditional complete contracting models.

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