“Observable” and “verifiable”: Can these be the basic concepts in incomplete contract theory?[*]

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Abstract

The assumption that certain characteristics are observable to the contracting parties but unverifiable to a third party is fundamental in formal incomplete contract theory. This paper sets out to scrutinise this assumption from different perspectives. The arguments from complete contract theorists and legal scholars are presented and reviewed. Alongside these, two new arguments will be presented, one by critically examining a specific example and one based on an idea in the philosophy of language. The example show that verifiability can be attained if it is wanted by the parties ex ante, and the arguments from philosophy of language indicate that everything is verifiable in principle. Language cannot be learned if terms are not related to observable events. The paper concludes that if something is unverifiable ex post, it is because the contracting parties have chosen this, based on the trade-off between cost and benefits of verifiability in the specific case.

1. Introduction

Incomplete contracts are usually explained by transaction costs, which are caused by the existence of unforeseen contingencies, writing costs and/or enforcement costs. The informal story says that contracts cannot be complete, i.e., regulate every contingency, since (i) all contingencies cannot be foreseen, (ii) and even if one could, it would be infinitely expensive to write all of them down and negotiate terms for all contingencies. Even if both (i) and (ii) would be fulfilled, then (iii) language is not clear enough to describe everything in such a way that there would be no problems of interpretation and enforcement.

A seminal work on formal incomplete contract theory[1] is Grossman and Hart (1986), whose work is further elaborated in e.g. Hart and Moore (1990) and Hart (1995). These models explain incomplete contracts, without requiring that people cannot foresee every contingency. The underlying assumption is instead that some information is observable (by the parties involved) but non-verifiable (by a third party). This has been referred to as the *observable- but nonverifiable assumption* (Tirole 1999). Hart and Holmström (1988) express it in the following way:

> "Both parties may recognize that the state of the world is such that the buyer's benefit is high or the seller cost is low… The difficulty is conveying this information to other" (p.134).

An interpretation is that the two contracting parties have symmetric information about states of the world, quality of work or actions carried out, but that these circumstances cannot be contracted on because they are not verifiable to a third party , i.e., a court.

[1] Incomplete contract theory will henceforth refer to formal models of contract theory based on the assumption of observable but non-verifiable information (e.g. Hart and Moore, 1999 and similar), not to be confused with transaction cost economics or new institutional economics. See e.g. Brousseau and Fares (2000) and Gibbons (2005) for arguments about the differences between these approaches.

This paper sets out to scrutinise the underlying assumption of incomplete contract theory that says that certain facts are observable but not verifiable. Voices have been raised against this assumption, mostly from complete contract theorists (e.g. Tirole, 1999; Maskin and Tirole, 1999 and Segal, 1999), but also more recently from legal scholars (e.g. Sanchirico and Triantis, 2004; Scott and Triantis, 2006a and Scott and Triantis, 2006b). The paper will review these arguments (section 2 and 3) where it is concluded in section 2 that the complete contract theorists' arguments are not convincing. In section 4 the arguments against the distinction are developed further by a closer analysis of an example that has been mentioned in the literature. Section 5 shows that both the legal arguments and the analysis of the example can be based on some theories in modern philosophy of language. A central tenet is that language can not be learned if there are not publicly available criteria for judging whether a statement is true or false.

It is finally concluded that the question of ex post verifiability is determined ex ante. Verifiability ex post should not be seen as something given by nature, but as something endogenous. If certain conditions in a contract are difficult to verify, it is because the parties have chosen this, based on a trade-off between gains and costs in the specific case. Examples of why it can be rational to choose not to make certain facts verifiable are given.

2. Message games as arguments against the importance of verifiability

In a number of articles, models have been created with the aim of showing that the observable but nonverifiable distinction is unimportant for the implementation of contracts. This literature accepts that transaction costs matter in reality and that actual contracts are incomplete. Maskin and Tirole (1999, p. 84), writes for example "… we certainly

acknowledge that transaction costs matter in reality…", but the criticism against the transaction cost-based incomplete contract theory is instead focused on what is seen as the foundations of the theory. Tirole (1999), Maskin and Tirole (1999) and Segal (1999) do not accept the standard argument about verification problems as rigorous enough to explain the existence of incomplete contracts.

Their strategy is to construct models where some aspects are unverifiable, but where the parties still can implement any conceivable contract. The conclusion is that complete contracts, in the sense that anything can be implemented, are possible even if some aspects are unverifiable. Hence, the problem of verifiability can therefore not be a fundamental cause of incomplete contracts. Before looking in more detail at their message game models it is necessary to be clear about what in general can be accomplished with a model-building strategy of this type.

If a model is constructed where problems of verifiability does not lead to incomplete contracts, then it has been shown that verification problems is not a ***logically sufficient condition*** for incomplete contracts.

Sugden (2000) has a discussion about why certain "unrealistic" models are convincing and are taken seriously. He argues that the world created in the model then must seem credible even if it is unrealistic in some respects. Unrealistic assumptions can be included in a model that tries to explain real-world facts, but these assumptions must be ***harmless*** in the sense that the basic story in the model do not depend upon these assumptions.[2]

[2] See Lind (2006) for further discussion about "stories" and "models".

In order to ascertain the credibility of the message game models, some of the assumption presented in Maskin and Tirole (1999) will be scrutinised. The model will be evaluated by examples from construction and maintenance contracts (see Nyström, 2007).

Maskin and Tirole (1999, p. 88f) assume that states of the world cannot be described and not verified ex post. They show that this does not matter in a model that is based on some crucial elements.

- The model assumes that there is an *enumerable set of feasible actions* that both parties ex post can verify as feasible actions.

This assumption is very hard to accept in most construction and maintenance contracts, as there are so many options available in the production of a specific building and during e.g. a five-year road maintenance contract. Some of the options can also be seen as including continuous variables, e.g. how much of a specific substance that should be spread on a road during the winter time. The term feasible is also not unproblematic in practice, as it in practice usually includes both a technical- and an economic aspect. Things that are very costly are often classified as not feasible, and this aspect would obviously lead to conflict about whether a certain action is feasible or not. To specify in advance what are "reasonable" costs for a large number of options would then be necessary in order to reach agreement ex post about what is the feasible actions. Investigations about whether a certain action really is feasible or not, would then in practice be very time-consuming and costly.

- A message game in the model is played *after* the state of the world is determined but before the agent chooses his action.

In construction and maintenance contracts that spans over a considerable period of time, the state of the world unravels continuously and new decisions are made every day. In the morning the road-maintenance entrepreneur might find a damaged surface of the road and has to make a decision about what to do, including a decision about whether to make a more thorough investigation about the quality of the foundation of the road. In a situation where the state of the world unravels more or less continuously it is very difficult to apply the idea of playing a message game after the state of the world is determined, but before action is taken.

The conclusion is then that, at least so far, models like the one presented in Maskin and Tirole (1999) only shows that verifiability do not matter in the rather strange world that they have constructed. As the models contain crucial assumptions that are not credible for many real world contracts, it is not possible to use the results from the models as an argument against those who argue that problems with third party verifiability can explain why many contracts are incomplete.[3]

3. Criticisms from legal scholars

The assumption that certain things are observable but not possible to verify in a court has been criticised from legal scholars, see e.g. Sanchirico and Triantis (2004) and Scott and Triantis (2005, 2006). The starting point for their critique is the observation that actual contracts contain a number of vague terms and conditions, e.g. “best effort”, “reasonable care”, and “good faith”, and also that civil courts actually take a stand on these issues if there

[3] The issue of what should characterise a "foundation" for a specific theory, e.g. incomplete contract theory, will not be discussed here, but it should be noted that Tirole (1999) discusses this without clarifying the criteria for judging whether something is a foundation or not.

is a conflict between the contracting parties. These observations lead to a number of more general points.

The first point concerns the meaning of the concept verifiable. Sanchirico and Triantis (2004) interpret this concept in economic contract theory in the following way: "Verifiability in this context refers to the feasibility of establishing the truth to a court" (p. 1). Scott and Triantis (2005) however, argue that there is an important distinction between criminal courts and civil courts. According to their description, in criminal courts there is an objective standard, which says that the evidence should prove "beyond all reasonable doubt" that the accused is guilty. In civil courts, on the other hand, the courts weight the evidence presented by the different parties. Sanchirico and Triantis (2004) write: "Courts in civil action make determinations of complex facts on the basis of the balance of probabilities" (p. 24). Scott and Triantis (2005) formulate the same point in the following way: "…judgments in civil trials compare the case presented by each of the parties. The evaluation of the evidence is relative rather than absolute" (p. 12).

Verifiable then means that there are evidence that affect the probability of a statement, and that the evidence can be used for something like a Bayesian updating of the probabilities of a statement. The authors mentioned above simply assume that for each statement there is some possible evidence that makes truth or falsity more likely.

The second general point is that when the parties design a contract they can weight what Scott and Triantis (2006) calls "the front end" of contracting against "the back end" of contracting. One alternative is to state as many conditions as possible in precise terms in the contract, which will make the fulfilment of the contract easy to verify. This means putting a

lot of resources in the “front end” of contracting. In such a case it will be simple to afterwards find out if the contract has been fulfilled. The “back-end costs” in the form of conflict resolution costs would in such a case be small. On the other hand, the parties can save front end resources by using general and rather vague conditions, knowing that there is a probability that considerable resources might have to be spent at the “back end” of the contract in order to produce enough evidence to get the court on their side, if there should be a conflict over whether the contract has been fulfilled or not.

Scott and Triantis (2006) observes that many contracts contain a mix of vague and precise conditions, and that such a mix can be seen as a balance between two ways of choosing the more verifiable proxies that are used to evaluate whether the parties have fulfilled the contract or not. Precise conditions in the contract mean that the parties themselves determine the proxies ex ante, while vague terms mean that the court ex post determines the proxies.

From the perspective of the argument that certain things are observable by the parties but not verifiable by a third party, two central points have been made in the legal literature. The first one is (1) that it sees verifiability as a matter of degree and second point is (2) that there always exists evidence, which affect the probability of a specific statement compared to another statement, even if the evidence does not prove the truth of the statement. The weak point in this literature is that this is just claimed with reference to standard legal procedures, but not further justified.

4. A critical evaluation of a example of observable but not verifiable characteristics

4.1 Introduction

In this section a critical evaluation is made of an example from the literature, where something is claimed to be observable by the parties but not verifiable for a third party. One way to argue that this is an important distinction, is to present convincing and important examples of such cases. The question is then whether any convincing examples have been presented.

The kind of information that, in the example, is thought to make the characteristics observable will first be presented. Focus will then be turned to whether this information can be made verifiable without prohibitive costs, if the parties actually wanted this. If it can be concluded that this is possible, it would be an argument for the general thesis in this paper that if something is observable for the parties but not verifiable, it is because the parties have chosen not to make it verifiable.

There are very few specific cases analysed, or even mentioned, in the literature where something is observable for the parties but not verifiable. Given the thesis in this paper, this is not surprising. There might of course exist other cases, but the "burden of proof" to present such examples is then on those who argue that the distinction between observable and verifiable is an important distinction. Other examples of observable but non-verifiable can be found in Hart (1995) and Fluet (2003). Similar in-depth reviews and conclusion as below can be made of them (see extended version of this paper in Lind and Nyström, 2007)

Before looking at the example, the term verifiable might need to be clarified somewhat further. To be verifiable here means, as in the legal literature, that it is possible to find evidence that clearly points in a specific direction. There is evidence that changes the probability of a statement, and sometimes evidence to prove something "beyond all reasonable doubt". It does not mean that it in all cases is possible to say what the correct answer is, because there are cases where the difference is small. We do not say that the length of a stick is unverifiable, just because it is impossible in some cases to say which of two sticks is the longest.

4.2 Example: The effort of the university teacher

In Bernheim and Whinston (1998) it is stated that faculty members' effort is non-verifiable but reasonably observable. The authors do not develop the example further in their article, but it is an interesting starting point for discussing the central issue concerning in what way effort might be observable, but not verifiable.

Assume that the Professor of an economics department hires two PhDs, X and Y, to deliver two identical courses. There are so many students that they have to be divided into two groups with one teacher each. Both X and Y are given the material used by an earlier teacher. The newly hired teachers have the same background. They have attended the same PhD-program, read the same courses, have similar grades and wrote their PhD-thesis in a similar area. They are considered to have roughly the same intellectual ability.

The evidence that makes effort "reasonably observable"

When the courses have been completed, the Professor concludes that X has put in a lot more effort than Y. Remember that the starting point is the belief that this effort is "reasonably

observable" by the parties. The first question is then what the Professor could base his conclusion on. Given our experience it could be based on things like the following:

- X has consulted a pedagogy consultant and updated the syllabus with clear goals concerning learning outcomes.
- When looking at the handouts it can be seen that Y is using exactly the same material as last year, while X has updated his handouts with new examples and references to recent articles to help students that want to know more.
- Y changed the exam into an exam with multiple-choice questions, using questions that he found on the website from another university. As the Professor has regular meetings with other universities, he recognises the exam.
- X has several times consulted the professor about various issues in the course, e.g. about more recent examples. He has also been discussing such issues with other colleagues during coffee and lunch breaks. Several colleagues have commented to the Professor that X seems to be an ambitious guy. Y is only discussing research issues or his hobbies with the colleagues.
- The course evaluation shows much higher grades for X's course than for Y's. In Y's course there are several complaints that the teacher did not seem to be well prepared and had to stop several times during the lectures.

As will be returned to in the section below about arguments from the philosophy of language, evidence is very seldom conclusive, but that does not mean it should be disregarded. It is e.g. theoretically possible that Y after hard work came to the conclusion that modern pedagogical ideas are wrong, and that the old material was the best possible, that he did not want to bother his stressed colleagues with his petty questions about the course, and that his wife threatened

with divorce just when the lectures should start so he had difficulties to focus during the lectures. Notice, however, that most of these things are also “rather observable”.

The possibility of making the effort verifiable

Assume that the Professor decides to hire X but fires Y. Y protests and argues that this is based on discrimination as both the Professor and X are afro-americans, while Y is not. The Professor asserts that X is hired because he put in a lot more effort. According to Bernheim and Whinston (1998) this “reasonably observable” effort would not be verifiable for a third party.

Let us then go back to the different things that the Professor used to draw the conclusion that X put in more effort, and see whether it really is impossible to use them in order to convince a third party.

- Some types of evidence are obviously unproblematic: Everyone can for example see that X´s syllabus is updated, that he uses new examples in his handouts, and that the course evaluations are better in X´s course.
- Another type of evidence is related to various meetings and discussions with colleagues, including the pedagogy consultant. With modern surveillance equipment there would not be any technical problems and no large costs to install such equipment so that each visit and each conversion on the premises is recorded.
- Much preparation for lectures is done by using the Internet and working with various files. There are no technical problems to keep log-files on all computers in order to observe how long various files have been in use, what

changes that were made during a certain time period, the websites that were visited and the downloads that were made.

- Finally the court can, as in all cases, use witnesses, e.g. a random selection of students and colleagues that would make their testimony under oath about what they have observed.

Given that the Professor had anticipated the problem of verification and the risk for complaints about discrimination, which is a reasonable assumption, as he happens to be an expert in contract theory, he would have kept log-files and installed the camera-surveillance before anyone was hired. If he wanted to be able to verify high effort, there would be no technical and economical problems to make the "reasonable observable" effort also "reasonably verifiable". If effort was not possible to verify in a specific situation, the conclusion would then be that this was caused by a more or less conscious choice not to make it verifiable, and not because effort by nature is unverifiable.

5. An argument from philosophy of language: The impossibility of unverifiable propositions

In the earlier sections it was argued that if something is observable for participants in a contractual relation, then there must be some indications to base the participant's knowledge on. If there are such indications, and since this is known in advance, there should not be any dramatic cost for registering these indications in such a way that they can be observed by a third party.

In this section the same conclusion will be reached by a more fundamental argument based on certain theories in the philosophy of language. The argument will primarily be based on

the works of Donald Davidson, even though similar views can be found in works from philosophers like Wittgenstein and Quine.

The basic argument - and the observable/verifiable distinction

One starting point for these philosophical arguments is the question how a concept can be learned, and how the concept can be used in a meaningful way for communication. The idea is that in order to learn a concept it has to be related to something observable, and that the meaning of the concept is related to these observable features:

> "The semantic features of language are public features. What no one can, in the nature of the case, figure out from the totality of the relevant evidence, cannot be part of meaning" (Davidson (1979), quoted from Ludwig, 2003, p. 1),

moreover:

> "Davidson's purpose is to show how it is possible to attribute meanings and other propositional attitudes when observable behaviour is our only evidence (and is, furthermore, constitutive evidence)." (Rawling, 2003, p. 93).

If this idea is correct it implies that the terms used in a contract, assuming they are ordinary terms (or technical terms defined in relation to the ordinary terms), must all be related to publicly observable characteristics. Accepting this idea implies that the terms can, as argued above, be observed and recorded by a third party.

These ideas can be illustrated by continuing the discussion above about the concept of effort, which has been used much in the observable/verifiable debate among economists.

A starting point can be how the concept of effort is learned. The most likely answer is that people have learned from cases where they as children tried to understand certain things. They observed that the parents used terms like effort in cases where one child tried again and again while another child gave up after one attempt. One put in a lot of effort, while another did not try hard enough. Or where one child could do a certain thing directly, without effort, while another had to try again and again. Starting with simple cases like these people learn to use the concept in more and more complex situations of similar type.

An important point is that the concept only has a meaning in certain classes of situations where it is ordinarily used. In some contractual situations effort is not relevant. If a movie producer hires a composer to write a theme song, the question of effort is probably of minor importance. With inspiration the composer can write a great song in a couple of hours, and even if effort can polish some details, it would be surprising if the movie producer was interested in how and when the composer worked, and how much time the composer spent writing the song.

Davidson does not claim that interpretations cannot be wrong in a specific situation, where a claim is made that, e.g., a certain person has (not) put in a lot of effort. However, it is impossible to understand language and communication if there is no relation between the observable evidence and the truth of the statement in general. If all imaginable evidence exists, i.e., the person is observed over the whole relevant period, then it must be possible to

make a well-founded statement about whether the person really put in a lot of effort or not. Davidson argues that people cannot be "massively wrong" in our everyday statements:

> "But there need be nothing we are indubitably right about for it to be certain that we are mostly right about the nature of the world" (Davidson, 2001, p. 45).

It is, e.g., impossible to imagine that all the things called blue turns out not to be blue, or that all dogs really are cats. An important reason for this is that when trying to identify what a term means, an assumption must be made that those who use the concept are making true statements most of time. Davidson calls this way of interpreting statements the *principle of charity*. A classical example is how an anthropologist learns the meanings of the words used by a tribe with an unknown language.

Notice that there can always be problems about knowing what is correct if there is no evidence, but that is true for all statements, and in this respect the contracting parties are in exactly the same situation as a third party. Usually the difference between the contracting parties and a third party is the amount of evidence. However, as argued above, this depends upon how the situations are structured by the contracting parties ex ante, with e.g. surveillance equipment.

This line of argument from the philosophy of language supports the view of the legal scholars described above, where the main point was that in all cases there are some relevant evidence that the court can use.

6. To make things more or less verifiable – an endogenous decision

The arguments presented above indicate that verification is possible and does not have to be extremely expensive. This leads to the conclusion that the degree to which the variables in a contract will be easy to verify or not is an endogenous decision. Basically it is a question about finding the optimal contract, where the marginal benefit of making conditions more verifiable is equal to the marginal cost of such an increase in verifiability. Such a general optimisation problem about the incompleteness of a contract (where the benefit of more complete contracts consists of avoiding ex post bargaining over surplus and the cost of completeness is identifying and regulating contingencies in the contract) has been formalised in different ways, even if earlier work have not focused on the issue of verifiability.

Dye (1985), Crocker and Reynolds (1993), Anderlini and Felli (1994, 1999) and Battigalli and Maggi (2002) have modelled writing costs in different ways. An aspect missing in these formal models is, however, that when the parties enter a contract they can decide about the things that they want to be able to verify after the finalising of the contract. They can e.g. decide what kind of surveillance equipment should be installed. An interesting example from the Swedish construction sector is that some firms step by step photograph the installation of certain equipment that later will be difficult to check because it will be covered by other material. In this way they can convince a third party that they have done the work correctly. Banerjee and Duflo (2006), in an article about public sector absentee in developing countries, describe a case where a teacher had to photograph himself each day together with his students in order to get his salary.

Whether verifiability is important or not, or whether there are important negative side effects of making things verifiable, will depend on the circumstances in the specific case. There are at least two examples of situations, where it can be rational for the contracting parties not to facilitate verification ex post. Firstly, the benefit is judged to be small if the parties have a long run relationship where a good reputation is important, and where both parties can inflict damage on the other ex post if they are not satisfied with the result of the contract. The probability of cheating is then so low that it is not rational to make verification easier of e.g. how the work was carried out. This is usually described as a relational contract, see e.g. Baker et al. (2002). Secondly, the surveillance, mentioned above, might have various kinds of side effects. There might be a "psychic" cost connected with being surveyed that might reduce the productivity of the agent. Prat (2005) describes an interesting case where the agent has special skills that he does not want others to copy. Strict surveillance might then lead to a situation where the agents do not use all their skills and in such a case it might be rational for the principal not to demand information about any details of how the work was carried out. From this perspective, the development towards more "performance contracts" for road maintenance in Sweden can be noted. Instead of defining how and when the road should be ploughed, the client procures e.g. a minimum level of friction on the road surface, leaving the method of doing this up to the contractor.

7. Concluding comment

The main point of this paper is that no contractual terms are unverifiable in principle. There will always be evidence that makes the truth of a certain statement more or less likely. How easy it is in practice to verify a certain statement will to a large extent depend upon how the initial contract is written and what measures have been taken to document or register specific situations or processes. It is therefore not justified to base the explanation of incomplete

contracts on the idea that certain conditions are observable to the parties but not verifiable by a third party. The conclusion is that verifiability should be seen as an endogenous decision, based on standard optimisation.

There is always an interaction between organisational form and the technological development, and there have been some interesting changes in recent years from the perspective of this article. The first is the development in surveillance technology that has made registration easier and cheaper. The second is a higher degree of acceptance for surveillance as a part of the struggle against terrorism and other crimes, which means that the "psychic" costs of being watched over, have been reduced. There also seems to be a change that makes it more and more important to be able to document ones past history and achievements, e.g. when applying for a job. All of this can be expected to change the systems for verification of characteristics and conditions that are important in a specific contract.

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