Contract law and Contract theory. A survey and some considerations

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Abstract

In this study we parallel Contract theory and Contract law and offer a few considerations about the link between the two literatures. First, we highlight that studies in Contract theory can be classified in analyses of principal-agent relationships and analyses of specific investment problems, and that Contract law mainly focuses on the latter, in general. This leaves aside the analysis of the potential role of the law, for instance, in containing the contractual costs of asymmetric information. Second, we try and clarify under what legal rules the parties fully commit with the contract, or they do not, taking into account that the notions of full and limited commitment are very common in Contract theory whereas they are not in Contract law. This further allows us to provide a unified presentation of the literature, based on the features of the contractual environment: complete versus incomplete contracting, full versus limited commitment. Third, we point out that, unlike studies in Contract law, studies in Contract theory devote little attention to the litigation process. For this reason, there is no unified analysis of optimal contracts accounting for the transaction costs that appear in the various stages of a contractual relationship.

Keywords: Contract law, Contract theory, Law and economics, Incomplete contracts

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1 Introduction

A theory of contract is studied both from an economic perspective and from a legal / law-and-economics perspective. Contract theory (the former perspective) mostly studies the optimal contractual design, taking into account that the contractual parties may behave opportunistically. Contract law (the latter perspective) studies rules and standards that govern the contracts. Rules refer to precise contractual terms that are not subject to interpretation; standards refer to terms that can be interpreted by a court of justice in case of disputes.\(^1\) In either field of study, normative analyses aim at identifying conditions under which a contractual allocation is efficient. The two fields are clearly intertwined and, yet, they have not always developed along consistent research lines. We provide three reasons for which it is useful to align the two perspectives.

First, one may classify studies in Contract theory in two categories, but only one of them is usually considered in Contract law. The first category includes studies on informational asymmetries between contractual parties, the so-called principal-agent relationships (henceforth, PA). The second category includes studies on incomplete contracting, pioneered by Williamson [48] and further developed by Grossman and Hart [18] and Hart and Moore [22] (henceforth, GHM).\(^2\)\(^3\) In Contract law, scholars often on the latter category, as for instance, in the study of Schwartz and Scott [40], the first authors to develop a theory of Contract law. By focusing on GHM, studies in Contract law, similarly to Hart and Moore [22], usually assume that contracts are signed \(\textit{ex ante}\) and that, if contingencies are non-verifiable, parties will want to renegotiate \(\textit{ex post}\), which results in \(\textit{ex-ante}\) suboptimal investments. The focus is then on how to create rules and standards that induce efficient investments \(\textit{ex ante}\) and efficient trading \(\textit{ex post}\). However, in PA models, contracts are often signed at \(\textit{interim}\), namely, when the agent is privately informed of his type. The principal must leave a costly information rent to the agent in order to elicit information. Renegotiations are likely as well \(\textit{ex post}\), after everybody has learnt the contingency. Renegotiations weaken the incentives to reveal information in the contracting stage and make asymmetric information more costly to the principal. In that case, the role of the law is not supposed to be that of protecting specific investments. It is rather that of containing the costs associated with the informational asymmetry.

Second, in Contract theory and Contract law there is no unified analysis concerning the contractual environment. On the one side, whereas a distinction between complete

\(^1\)In the definition provided by Kaplow [24], the difference between rules and standards consists in the extent to which efforts to give content to the law are undertaken before or after individuals act. The same author mentions that the distinction between rules and standards can be viewed as being the extent to which a given aspect of a legal command should be resolved in advance, or it should be left to an enforcement authority for consideration.

\(^2\)In many studies, GHM models are presented together with PA (see Tirole [46], for instance). The distinction here made is functional to comparing Contract theory and Contract Law.

\(^3\)Obviously, contracts can be incomplete also in PA models and asymmetric information can arise also within the GHM approach. See Schmitz [38] for a survey.
and incomplete contracts is made in either field, it is only in Contract theory that the
notion of full commitment is contrasted against that of limited commitment. The liter-
ature on Contract law is usually silent about this instead. For instance, if contracts are
signed at interim, as is very often the case in PA models, then the contractual parties
might want to renegotiate ex post, even if the contract is complete in the first place. It
is essential to distinguish not only between complete and incomplete contracts, but also
between full and limited commitment, in order to clarify the role that the law should play
in contracts. On the other side, several studies in Contract theory assume that contract-
ing occurs under full or limited commitment, without clarifying what kind of legal rules
apply for the assumed contractual environment to be such. In particular, in Contract
law it is known that rules that apply to contracts, which may induce full commitment,
are either mandatory or default rules, whereas these notions are uncommon in Contract
theory.

Third, studies in Contract theory devote insufficient attention to the litigation process
between contractual parties, an issue recently highlighted by the studies in Contract law.
Obviously, knowing how the litigation process works is essential in order to understand
under what conditions parties will be prone to litigate, to renegotiate, or execute the
initial contract.

To develop the analysis, we proceed as follows. Given that the literature in either
field is now huge, we restrict attention to the three issues listed here above, at the aim of
aligning the economic and the legal / law-and-economics perspective on contracts. In par-
ticular, we abstract from the literature on repeated contractual interactions, which would
deserve a specific investigation. We will rely on some formal ingredients of the basic GHM
and PA models wherever useful throughout the discussion. The comparison between the
two strands of literature will be developed within different contractual environments, i.e.,
first complete and incomplete contracting, next full and limited commitment.

2 Basic settings

For convenience, we present, first, a simple GHM setting; next, a PA model of adverse
selection.

GHM A risk neutral buyer (B) and a risk neutral seller (S) contract for the production
of one unit of some good. For simplicity, it is assumed that both of them have zero
outside opportunity both prior to contracting and during the execution of the contract.
(S) has a production cost $C(i_S)$, where $i_S$ is an amount of investment to which the cost
is inversely related. The cost of production decreases with the investment at a decreasing
rate: $C'(\cdot) < 0$ and $C''(\cdot) > 0$. (B) uses the good as an input to produce some final
good, which is sold in the market. Denote $R(i_B)$ the benefit that (B) obtains in the final
market, where \( i_B \) is an amount of investment made in the production of the final good. The benefit increases with the investment at a decreasing rate: \( R'(\cdot) > 0 \) and \( R''(\cdot) < 0 \). If all these values are commonly known and the investments \( i_B \) and \( i_S \) are contractible, then the contractors could decide, say, to share equally the contractual surplus, which is given by \( R(i_B) - C(i_S) - i_B - i_S \). In that case, the transfer to be made by (B) to (S) amounts to

\[
t_{i_S,i_B} = \frac{1}{2} [R(i_B) + C(i_S)] + \frac{1}{2} (i_S - i_B).
\]

We assume for simplicity that there is no externality related to the activities of (S) and (B). The social surplus generated by the contractual relationship is maximized by solving the following problem:

\[
\max_{i_S,i_B} [R(i_B) - C(i_S) - i_B - i_S].
\]

The solution is given by the pair \((i^*_S, i^*_B)\), which is such that the condition \(R'(i_B) = -C'(i_S) = 1\) is satisfied. Provided that \(R(i^*_B) - i^*_B > C(i^*_S) + i^*_S\), the economic efficiency of the contract is attained if the contractors choose \(i^*_S\) and \(i^*_B\). This is true for any transfer \(t\) such that \(R(i^*_B) - i^*_B > t > C(i^*_S) + i^*_S\).

**PA** Suppose that there is no relationship-specific investment to be made in the activity. The unit cost of production of the agent is either \(\theta\) or \(\tilde{\theta}\), where \(\theta < \tilde{\theta}\) and \(\text{Prob}(\theta) = \nu\), where \(\nu \in (0, 1)\). Further take the outside opportunity of the agent to be zero. This is actually the basic adverse selection setting, as presented in the book by Laffont and Martimort [26]. The focus is now on a contract where the principal makes a take-it or leave-it offer to the agent rather than on a negotiated contract.\(^4\) Denoting \(\{(q,t), (\bar{q}, \bar{t})\}\) the pairs of productions and transfers designed for each \(\theta \in \{\theta, \tilde{\theta}\}\), and \(r(q)\) the surplus obtained by the principal from the activity, where \(r'(\cdot) > 0\) and \(r''(\cdot) < 0\), the optimal contractual allocation is such that

\[
r'(\bar{q}^{sb}) = \theta; \quad r'(\bar{q}^{sb}) = \tilde{\theta} + \frac{\nu}{1-\nu}(\tilde{\theta} - \theta) \quad \bar{t} = \theta q^{sb} + (\tilde{\theta} - \theta) \bar{q}^{sb}; \quad \bar{t} = \tilde{\theta} \bar{q}^{sb},
\]

where the super-script \(sb\) is appended to denote the second-best solution. The first-best quantity solution, which would be chosen under complete information, is such that \(r'(\bar{q}^*) = \theta\) and \(r'(\bar{q}^*) = \tilde{\theta}\). Because of the informational asymmetry, the transfer targeted to the low type is set above the cost of production in order to prevent this type from claiming a higher cost at the aim of earning a private benefit of \((\tilde{\theta} - \theta) \bar{q}^{sb}\). In turn, the quantity recommended from the high type is distorted below its efficient level, namely \(\bar{q}^{sb} < q^*\). No distortion is induced for the efficient type, namely \(\bar{q}^{sb} = q^*\), because the agent

\(^4\)This is the case also in the other kind of information problem that is considered by the literature, namely the moral hazard, which we do not report for simplicity.
has no intention to exaggerate the cost. In substance, the principal leaves no information
rent to type \( \theta \), whereas she must leave a rent of \((\theta - \theta) \bar{q}^{ab}\) to the efficient type to induce
truth-telling. This amount is obtained as a difference between the cost reimbursement
\( \theta q^{ab} \) and the real cost of production \( \bar{q}^{ab} \), which type \( \bar{\theta} \) would face if it were to cheat.

A comparison of the two models highlights that in the GHM approach there are specific
investments to be made by the contractual parties, whereas no asymmetric information
problem arises. By contrast, in the basic PA model there is no specific investment but
there is asymmetric information between the contractual parties.

3 Complete contracts

There exists no univocal definition of contractual (in)completeness. However, econo-
mists usually adopt the definition referred to by Hart [19], according to which a contract
is complete when the following three conditions are all met: 1) the contractual parties
are certain about future contingencies; 2) when drawing up the contract, they are able
to negotiate about future plans at no cost; and 3) they can write down the contractual
terms in a such way that courts of justice can enforce them at no cost. We adopt this
definition of contractual completeness in our study. The three conditions apply regardless
of whether we refer to the GHM or the PA model.\(^\text{5}\)

Provided that the contractual obligations are enforceable at no cost, contractual dis-
putes are not foreseen. If any change takes place with respect to the initial agreement,
then this can only mirror a mutual consent by the contractual parties. For this reason,
a distinction should be made between full and limited commitment. Under \textit{full commit-
ment}, both parties simply commit to respect their initial agreement during its execution.
Under \textit{limited commitment}, the parties do not commit to not renegotiate their deal when
some specific contingency is realized.

3.1 Full versus limited commitment

In any contractual relationship, if the contingency is observed by both of the contrac-
tual parties prior to signing the contract, and is also verified by the court at no cost, then
the distinction between full and limited commitment is irrelevant. This is no longer true
when some information is missing, as is the case in the PA model previously described,
in which one contractual parties is privately informed about the contingency.

First consider GHM and suppose that both the investments made and the results
obtained thereof are commonly observed and verified at no cost by the court of justice.
The contractual parties will simply agree on the pair \((i_s^*, i_B^*)\) as well as on some mutually

\(^{5}\)A presentation of the three situations defining contractual (in)completeness is also made by Tirole
[46] and Maskin [30], who agree on the lack of a univocal definition of contractual (in)completeness.
convenient transfer. No new agreement will be Pareto improving over the initial allocation so that the contractual parties will stick on it, regardless of whether they are able or not to commit to the contract. This result obtains because there is no information problem over the allocation when the contract is signed. The outcome to be realized, conditional on the pair \((i_S, i_B)\), is known since the beginning. To illustrate, suppose that the seller has two options, namely, invest \(i_{S1} = 12\) and be faced with a cost of production of \(C(12) = 20\), and invest \(i_{S2} = 20\) and be faced with a cost of production of \(C(20) = 10\). The buyer might be faced with two options as well, namely, invest \(i_{B1} = 10\) and obtain revenues of \(R(10) = 30\), and invest \(i_{B2} = 15\) and obtain revenues of \(R(15) = 50\). We see that both the seller and the buyer gain, if they invest more, namely \(i_{S2} = 20\) and \(i_{B2} = 15\). Moreover, their joint surplus is higher so that, in this example with discrete values, \((i^*_S, i^*_B) = (20, 15)\). Supposing that the two parties agree to share the surplus equally, the transfer from the buyer to the seller is \(t = 37.5\).

Let us now turn to consider the PA model, and recall the assumption previously made that the agent knows privately his type. In other words, the contract is signed at interim, rather than ex post as in the above example. The contract is complete because the pair of types \(\{\theta, \overline{\theta}\}\) is commonly known; it is contingent on the types because the principal elicits information from the agent. In spite of the contract being complete, the principal can always make a new offer to the agent, if his type comes out to be \(\overline{\theta}\), since she knows that, in that case, she will not need to give up a rent of \((\overline{\theta} - \theta) q\), as is assigned to the efficient type. In particular, the principal would prefer to propose the complete-information allocation, namely \((\tilde{q}, \tilde{t})\), which is Pareto improving over the contractual one. However, that allocation would tighten the incentive constraint of type \(\theta\). Indeed, by telling the truth this type obtains an information rent of \((\overline{\theta} - \theta) q^{ab}\), as contractually stipulated, whereas by cheating it would obtain a higher benefit equal to \((\overline{\theta} - \theta) q^*\). As the efficient type anticipates renegotiation, it will have no incentive to reveal information up-front, and the outcome will be inefficient (see Laffont and Martimort [26], page 63 for more details). A similar issue would arise in the GHM model, for instance, if the seller had private information about the cost of production.

**Conclusion 1**  
*In complete contracts which are signed under limited commitment and asymmetric information, the contractual parties might find it mutually convenient to renegotiate ex post.*

Whereas these results are straightforward in Contract theory, the natural question is whether the courts of justice prohibit suboptimal renegotiations of complete contracts. In Contract law, little is said about complete contracts, in general. However, we learn from Contract law literature that contractual agreements to not renegotiate are not enforceable (Schwartz and Watson [42], Scott and Triantis [43]). In particular, Scott and Triantis [43] explain that courts do not enforce consensual prohibitions on contract modification. And, even if they were to do so, *those* prohibitions would be difficult to enforce.
since it is relatively easy to conceal a modification within a "new" agreement. Although the literature on Contract law mentions this issue when focusing on specific investment problems and incomplete contracts, this "positive" statement clearly applies to the PA approach as well, and to renegotiations that concern complete (rather than incomplete) contracts.\(^6\)

**Conclusion 2** *In practice, the court of justice does not enforce contracts (whether complete or incomplete) when contractual parties mutually agree to renegotiate.*

Basically, this "limit" imposed by the judicial practice justifies a bunch of PA models, in which it is assumed that the contractual parties are unable to commit to not renegotiate *ex post*. The issue is first investigated by Dewatripont [16], who considers a repeated adverse selection problem under limited commitment. A succinct presentation of the renegotiation issue and the results derived under adverse selection in a complete contract, is also found in chapter 9 of the book by Laffont and Martimort [26]. Other studies on renegotiation of complete contracts in PA settings are presented in Laffont and Martimort [26] and Maskin and Tirole [33]. The consequence of limited commitment in such settings is that, anticipating renegotiation, the parties consider any renegotiated outcome in the initial contract. As Bolton [9] states, given that the parties anticipate how exactly the contract would be renegotiated in each state, an additional constraint is imposed on the set of *ex-ante* feasible contracts, which eliminates the possibility of undoing, by mutual consent, the commitment to the contract. Basically, the resulting renegotiation-proof contract is such that it will not be renegotiated along the equilibrium path.

**Conclusion 3** *Because renegotiation is not an issue specific to incomplete contracts, the issues with contract renegotiation, as identified in Contract law, arise with complete contracts as well, as long as there is asymmetric information between the contractors.*

### 3.2 What makes a contract complete?

In order to understand whether a contract is complete because the contractual parties make it complete, or because the legal system makes it complete, or both, it should first be considered that the definition of (in)complete contracts is not alike in Contract theory and in Contract law. Recall the three conditions stipulated by O. Hart for the contract to be complete. If any of them is not satisfied, then the contract is incomplete because some information is missing either to the contractual parties or to the court of justice. From a legal perspective, the definition of contractual (in)completeness is somewhat different. Indeed, a contract is considered to be complete if it is "obligationally complete" (Scott

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\(^6\)See also Schmitz [39], who refers explicitly to renegotiations of complete contracts. The author shows that in a repeated moral hazard setting, the common practice of not enforcing mutual agreements to renegotiate may be economically justified.
and Triantis [43]). To take one example, Al Najjar [4] defines a contract as being complete not only when all contingencies are known, but also when there is uncertainty about them but the contractual conditions are adjusted efficiently ex post, once the contingency is known. This definition is clearly different from that usually provided in Contract theory, as also adopted in this study.

**Conclusion 4** Unlike in Contract theory, in Contract law contracts are considered to be complete if they are "obligationally complete."

Given this definition, one can say that contracts are either complete or, if they are not, then they may be obligationally complete. In the GHM example above, suppose that the investment $i_S$ made by the seller and the resulting cost of production $C(i_S)$ cannot be verified by a court of justice. Hence, the seller chooses freely whether to invest $i_{S,1} = 12$ or $i_{S,2} = 20$. Instead, the contract can stipulate that the seller is compelled to provide the good he produces in return for some pre-determined payment, except that now the payment cannot depend on the two investments $i_S$ and $i_B$, as was the case of $t_{i_S,i_B}$ above. This kind of contract is obligationally complete, in spite of the contingency $C(i_S)$ being non-verifiable. Whereas the inefficiency that non-verifiability might create will be discussed in the presentation of incomplete contracts below, here we focus on the following questions. Could the legislation itself make contracts complete? If contracts are incomplete, what kind of rules warrant that contracts be obligationally complete?

To reply these questions, it is first necessary to distinguish between mandatory rules and default rules. Whereas these terms are common in Contract law, they are quite uncommon in Contract theory. Mandatory rules include contracting terms which are established by Contract law and cannot be altered by the contractual party. On the contrary, default rules can be altered in the contract and apply only if the contractual parties do not stipulate contractual terms which are in contradiction with such rules. Therefore, a contract could be complete by the way in which the legislation is designed, only if mandatory rules make them complete. In their theory of Contract law, Schwartz and Scott [40] argue that there should exist mandatory rules, yet, with a limited scope in contracts. For instance, they argue that courts should enforce contractual terms that prevent contract modification, which is not the case in practice, as mentioned in Conclusion 2. The reason why mandatory rules should be limited to such situations is that nobody knows better than the contractual parties what is best for their mutual benefit. This includes the legislator, in particular. Given the limited scope of the mandatory rules, it is easily deduced that a contract can be complete only if the contractual parties make it such, incurring transaction costs. This justifies the assumption, very often made in the literature, that contracts are incomplete simply because the contractual parties would incur transaction costs to make them complete (see Tirole [47], for instance). To reply the second question, we need to recall the definition of default rules. As these rules
apply when contractors do not stipulate contractual terms which are in contradiction with them, it is easy to deduce that default rules apply when contracts are incomplete. As stated clearly by Ayres and Gertner [3], the role of default rules is precisely that of filling the gaps in the contracts.  

**Conclusion 5** Complete contracts are costless when information is complete and obtained at no cost. In that case, it is irrelevant whether the contractors or the legislation make the contract complete. When the information is costly contracts are complete only if the contractual parties are available to incur transaction costs to make them complete. If contracts are incomplete, then they are "obligationally complete" in case default rules apply for obligations which are not stipulated by the contractors.

The arguments presented so far suggest that default rules are necessary because parties leave some terms unspecifed in the contract, given that they need to incur transaction costs to make contracts complete. When default rules make contracts "obligationally complete", and in such a way that an efficient allocation is implemented, it means that they are efficient. There seems to be a general agreement, among the Law and economics scholars, that default rules are efficient when they replicate what the contractual parties would stipulate themselves in a contract. If default rules are inefficient but the contract is complete, then it must be the case that the contractual parties have incurred transaction costs to stipulate efficient terms, which are absent in the default rules. This leads to the idea that the Coase theorem applies when default rules are efficient but not otherwise. Burton [10] mentions that the Coase theorem states that negotiations are efficient in the absence of transaction costs, whereas it is silent about how to set efficient defaults to avoid transaction costs.

**Conclusion 6** Default rules are efficient if they lead to efficient transactions in the sense of the Coase theorem.

The question is then what kind of default rules should apply to contracts. Schwartz and Scott [40] explain that if defaults fail to be efficient, then the contractual parties will want to change such terms in their contract, which will raise their transaction costs. This points to the idea that there should exist no defaults, which is supported by the

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7 A common notion in Contract law is that of "penalties default rules", as introduced by Ayres and Gertner [3]. Baker and Krawiec [7] make a clear distinction between "default rules", which are meant to diminish or eliminate transaction costs, and "penalties default rules", which refer to situations in which the contractors leave out some contractual terms for incentive reasons. However, the latter notion is debated in the literature (see Posner [37] and Maskin [31]), for we shall not insist on it in the sequel of the analysis.

8 Specifically, the author mentions that the scholars have furnished four main standards for defining efficient defaults, which are all related to the efficient transactions in a Coasian sense. He further suggests a fifth standard for situations in which courts learn information from a dispute, rather than prior to it.
observation that there are few default rules in commercial law. On the other hand, defaults are necessary when parties cannot foresee contingencies but want to condition their payoffs on the realized contingencies. In that case, defaults are used to make contracts obligationally complete.

Before concluding this part of the discussion, we find it useful to make two observations on the notion of "default rules". First, in Contract law a distinction is made between "default rules" and "default standards". Burton [20] gives an example. He mentions that in existing law, a default rule may provide that, unless otherwise agreed by the parties, the place for delivery of the goods shall be the seller’s place of business or, if he has none, his residence. A default standard provides that, unless otherwise agreed by the parties, the price of the goods shall be a reasonable price. However, the literature usually refers to default rules only. Schwartz and Scott [40] provides the following explanation for default standards being inefficient, which explains somehow why they are little mentioned in general. Default standards refer to states of nature that are uncertain when the contract is signed, like the quality of the product and the inflation. This induces both moral hazard and adverse selection. First, because a default standard can only be vague, either contractual party will have incentives to behave opportunistically in a court, so as to influence the court’s decisions in her favour. This is the moral hazard issue. Second, in the presence of a hidden information, as in the PA model, the default standard cannot induce information release at a lower cost than can the contract itself.

**Conclusion 7** The use of default standards is likely to induce inefficiencies because of adverse selection in complete/incomplete contracts and moral hazard in incomplete contracts. No formal analysis is found in the literature, demonstrating that incentive contracts are a better solution to contractual problems than default standards.

4 Incomplete contracts

Similarly to complete contracting, one should distinguish between full and limited commitment when contracts are incomplete as well.

4.1 Full commitment

As will become clear in a moment, it is useful for the presentation to distinguish between situations in which specifying contingencies is costly (the second case of contractual incompleteness, according to Hart’s definition), and situations in which contingencies are either non-observable or non-verifiable (the first and the third case in Hart’s definition).
4.1.1 Costs of specifying contingencies

In Contract theory, the assumptions which are made most often to consider contractual incompleteness, are those of non-observability and non-verifiability. To gain a clue on why the second situation is usually left aside, it is useful to read the following statement of Eric Maskin (see Maskin [30]): "...we have not yet discovered a widely accepted principle for gouging the cost of specifying contingencies." However, as mentioned by Maskin [30] and Shavell [45], there do exist a few studies that deal with such costs. Dye [15] investigates the equilibrium in an Arrow-Debreu economy when buyers and sellers face costs in writing contracts. The contracting cost is a function of the number of contingencies the contractors must consider in setting the contractual terms. The higher this number is, the more costly it is to write a complete contract. Anderlini and Felli [2] formalize contracts as functions mapping contingencies into outcomes, and argue that they are not necessarily computable. In particular, if a contract takes an infinitely long time to be written, one cannot identify a computable function that maps contingencies into outcomes and, hence, the contract is incomplete. Unlike in previous studies, Battigalli and Maggi [6] make a distinction between two forms of contractual incompleteness: excessive discretion, which is relevant when the parties’ behavior is not specified with sufficient precision, and excessive rigidity, which is relevant when the parties’ obligations are too poorly related to an external state. As an illustration, they refer to a construction contract, in which discretion is excessive if it does not specify materials with sufficient precision, and rigidity is excessive if the completion time is fixed rather than being conditioned on certain exogenous events.9

Remarkably, the distinction between full and limited commitment is essential in the presence of costs of writing contracts. Indeed, an implicit assumption in the studies aforementioned and all the rest in this section, is that parties fully commit to contracts and, hence, there is no opportunistic behavior ex post. In the latter case, there exists a link between ex-ante and ex-post transaction costs, an issue to be described at a later stage.

4.1.2 Non-observability and/or non-verifiability

The most important result for the case of observability and non-verifiability is found in Maskin [29]. In that setting, the allocation is not decided by the contractual parties but, rather, by a mechanism designer. The contractual parties know the state of nature (i.e., the set of contingencies) when the contract is signed, whereas the mechanism designer does not. They are assumed to fully comply with the contractual solution adopted by the designer. The latter establishes an allocation rule and each of the contractual parties

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9Importantly, in the environment considered by the authors the set of possible contingencies is commonly known prior to writing the contract. It that is not the case, contractual incompleteness cannot be attenuated by conditioning the time of completion on exogenous events.
makes a report about the contingency, given that rule. Under the necessary and sufficient conditions identified by E. Maskin, either partner makes a truthful report and the socially efficient contractual outcome is implemented. As the parties are taken to fully comply with the solutions adopted in this and other studies developed thereafter, the implicit assumption is that the contract is obligationally complete.\footnote{The assumption that the contractual parties fully commit to the mechanism is relaxed in Maskin and Moore [32].} Moore and Repullo [34] show that, in the setting considered by Maskin [29], an optimal allocation can be implemented if the contractors commit to a sequence of actions similar to those we present in the example below. The most powerful result for the case of non-observability and non-verifiability is the "Irrelevance theorem" stated by Maskin and Tirole [33]. They show that non-observability of the state of nature in the contracting stage is irrelevant as long as the parties observe the state \textit{ex post}, namely, after the contract is signed but before the transaction takes place. The contractual allocation does not depend on states of nature, which is uncertain in the contracting stage and non-verifiable \textit{ex post}. It rather depends on a number of pre-determined actions, like requiring each party to make a report about the realized state, and then giving each of them the possibility of challenging the other’s report, in a pre-determined order. Detailed explanation of this mechanism and examples are found in Tirole [46] and Maskin [30].\footnote{Besides, Maskin and Tirole [33] show that in an environment in which the parties do not commit to not renegotiate, it is possible to obtain a similar allocation under milder conditions.} Remarkably, the results derived in Maskin [29] and in Maskin and Tirole [33] suggest that contracts can be made "obligationally complete".

\textbf{Conclusion 8} \textit{When contingencies are non-verifiable and parties fully commit to the contractual obligations, economic solutions can be found to make contracts obligationally complete.}

The remaining question is then whether there are default rules under which the economic solutions previously highlighted apply. In these settings, the economic solutions are such that some optimal allocation is implemented by a system of bonuses and penalties, which depend on the strategy adopted by each player \textit{ex post}. Moreover, the strategy that each player is allowed to follow is a report about the realized contingency, in general. If the reports delivered by the contractors do not match, then one of them is penalized. By the way the mechanism is constructed, the penalty is paid by the contractor who cheats.

To clarify why a penalty is necessary, again we make use of the numerical example in the GHM model previously proposed. Suppose for simplicity that only the buyer has a specific investment to make in the relationship, and that this investment is non-verifiable. In particular, the court of justice cannot verify whether the buyer invested $i_{B,1} = 10$, or $i_{B,2} = 15$, or any other amount. By contrast, the buyer and the seller both know that,
if one of the two investments were made, then the buyer would obtain either $R_1 = 30$ or $R_2 = 50$ from the relationship. Whereas they both observe $R_j$, where $j \in \{1, 2\}$, when it is realized, the court cannot verify the outcome, just as with the specific investment. For simplicity, we now assume that the seller has no specific investment to make, and that the cost of production is zero. Because $i_{B,2} = 15$ is the socially desirable investment, the mechanism should induce the buyer to choose exactly this amount. Then, the two contractors commit to the following mechanism, which stipulates actions in the following pre-determined order.\footnote{The steps listed in the text are similar to those of the mechanism proposed by Maskin [30]. He applies the results of Moore and Repullo [34] to explain the mechanism developed in Maskin and Tirole [33], which is such that the contract does not depend on the states of nature but, rather, on a sequence of actions, as in Moore and Repullo [34]. Moreover, Maskin [30] applies the mechanism to the specific investment problem, as we also do in our example. There is a difference though. Maskin [30] assumes that the investment made by the buyer affects the cost of production of the seller, rather than her benefit as in our example, and the investment made by the seller affects the benefit of the buyer, rather than her cost as in our example. Because of this, for the mechanism to work, the payments we present in the third stage differ from those of Maskin [30].}

1. Once the contingency $R(\cdot)$ is realized, the buyer makes a report $\hat{R}$, which can be either $R_1 = 30$ or $R_2 = 50$. The seller has the possibility of challenging the report made by the buyer (stage 2 hereafter). If she does not challenge, then the mechanism proceeds to stage 3 below.

2. Following the challenging, the buyer must pay a fine (or penalty) of $f$ to a third party $T$. Subsequently, the buyer can choose between one of two quantity-and-transfer pairs $(q_1, t_1)$ and $(q_2, t_2)$. This allocation is chosen in such a way that, regardless of the report $\hat{R}$, the buyer chooses $(q_j, t_j)$ if the true state of nature is $R_j$, where $j \in \{1, 2\}$. The incentive constraints such that this choice is made are as follows:

\begin{align*}
q_1 R_1 - t_1 & \geq q_2 R_1 - t_2, \\
q_2 R_2 - t_2 & \geq q_1 R_2 - t_1. \tag{1} \tag{2}
\end{align*}

Notice that the fine $f$ represents a sunk cost for the buyer, which explains why it does not matter in (1) and (2). If the buyer reports $R_j$ in stage 1 and chooses the pair $(q_j, t_j)$ in stage 2, then it must be the case that her report was truthful. If she reports $R_j$ but then she chooses the other allocation, then it must be the case that she lied. Besides, the mechanism must be such that the seller is induced to challenge the buyer’s report if the report was untruthful but not otherwise. The fine $f$ is used as an instrument to that end. If the seller challenges and the report made by the buyer comes out to be untruthful, then the seller receives the fine $f$ previously paid by the buyer to the third party $T$. On the contrary, if the seller challenges but the report was truthful, then also the seller will pay a fine of $f$ to the third party. Thus, the incentive constraints such that the seller
challenges if and only if the report was untruthful are written as:

\[
\begin{align*}
t_j + f & \geq \hat{t}_{-j}, \quad \forall j, -j \in \{1, 2\}, j \neq -j \\
\hat{t}_j & \geq t_j - f, \quad \forall i \in \{1, 2\},
\end{align*}
\]  

(3) \hspace{1cm} (4)

where \( \hat{t}_j \) is the transfer obtained at stage 3 below, after a report \( R_j \) has been made and there is no challenge. The two conditions hold if the fine \( f \) is set large enough. The mechanism stops.

3. Recall that this stage applies if and only if the seller did not challenge and so stage 2 did not occur. The allocation \((\hat{q}_1, \hat{t}_1)\) or \((\hat{q}_2, \hat{t}_2)\) is implemented and no player pays any fine. The transfer is such that

\[
\hat{t}_j = \hat{q}_j R_j + k_j, \quad \forall j \in \{1, 2\},
\]

for some \( k_j \in (-R_j, -i_{B,j}) \), which is meant to ensure that the payoff \( R_j - i_{B,j} - k_j \) of the seller is non-negative in either state. Considering that the seller challenges if and only if the buyer reported untruthfully, the buyer will report truthfully if and only if

\[
\hat{q}_j R_j - \hat{t}_j \geq q_j R_j - t_j - f, \quad \forall j \in \{1, 2\},
\]

(5)

which is satisfied again by setting the fine \( f \) large enough. In this way, stage 2 works as a threat, and does not take place in equilibrium. The relationship will proceed from state 1 directly to stage 3. It remains to see how the buyer can be induced to invest \( i_{B,2} = 15 \), instead of \( i_{B,1} = 10 \), because \( i_{B,2} \) is socially optimal, as we know. This is the case if the following incentive constraint is satisfied:

\[
R_2 - \hat{t}_2 - i_{B,2} \geq R_1 - \hat{t}_1 - i_{B,1}.
\]

(6)

Using \( R_j - \hat{t}_j = -k_j, \forall j \), this reduces to

\[
-k_2 - i_{B,2} \geq -k_1 - i_{B,1}.
\]

Numerically, one can check that taking \( q_1 = 0, t_1 = 0, q_2 = 1, t_2 = 30, \hat{q}_1 = \hat{q}_2 = 1, k_1 = -20, k_2 = -30 \), and \( f = 30 \), all constraints are satisfied. In stage 2, if the state is \( R_1 \), then the buyer is indifferent between the allocations \((0, 0)\) and \((1, 30)\) because \( (1) \) holds as an equality. If the state is \( R_2 \), then she prefers the latter allocation because \( (2) \) is rewritten as \( 20 \geq 0 \), and is thus strictly satisfied. Therefore, after being challenged, the buyer chooses the allocation \((q_j, t_j)\) that was designed for the true state \( R_j \). Because \( (3) \) and \( (4) \) are satisfied, the seller challenges if and only if the report was untruthful. For instance, if the state is \( R_2 \) and the report was \( R_1 \), then by challenging she obtains \( t_2 + f = 60 \). If she does not challenge and the game proceeds to stage 3, then she obtains
\[ \hat{t}_1 = R_1 + k_1 = 10, \text{ hence a lower profit. Furthermore, because (5) is satisfied, a truthful report is made on the equilibrium path (involving that the game proceeds to stage 3).} \]

Take the true state to be \( R_2 \), for instance. By reporting truthfully, the buyer obtains the profit \( R_2 - t_2 = -k_2 = 30 \); by reporting untruthfully, she obtains \( R_2 - t_2 - f = -10 \). Hence, she has a strict preference for truth-telling. Lastly, the buyer will prefer to invest \( i_{B,2} = 15 \), instead of \( i_{B,1} = 10 \), because (6) is satisfied. Indeed, with a higher investment her payoff is \( R_2 - \hat{t}_2 - i_{B,2} = -k_2 - i_{B,2} = 15 \) instead of \( R_1 - \hat{t}_1 - i_{B,1} = -k_1 - i_{B,1} = 10 \).

As a conclusion, the mechanism should include a fine \( f > 0 \), to be paid in the event of an untruthful report, in order to induce the implementation of an optimal allocation. In equilibrium, no such fine is paid because the report is actually truthful.

Turning back to the literature, Scott and Triantis [43] criticize the approach by saying that although laws against perjury exist, they do not operate in this manner and, in any event, perjury rules are never invoked in civil trials.\(^{13}\) If no penalty can be set for reports that are considered to be "untruthful", then it is not necessarily the case that conditions are found under which the mechanism is efficient.\(^{14}\)

**Conclusion 9** *Legal rules do not necessarily allow for perjury fines, which are nonetheless necessary to implement the economic solutions to non-verifiability proposed by the literature.*

### 4.2 Limited commitment

One distinguishes between two kinds of situations. In the first, the parties stipulate up-front specific obligations, which will apply if unforeseen contingencies are realized. In the second kind of situations, the parties do not introduce any such obligation and the Contract law is supposed to fill the gap, in the event of a litigation. Anticipating litigation, the parties may also renegotiate.

#### 4.2.1 Non-verifiability and renegotiation

The literature on renegotiation under limited commitment is now huge, in both PA and GHM settings. As in a complete contracting environment, renegotiation may be beneficial to both contractual parties. However, under non-verifiability, one party may threaten to breach the contract. To avoid this outcome, the other party may accept to renegotiate. In that case, renegotiation succeeds because it is Pareto improving over break-up, although it is not over the initial contract. This is the core issue considered by

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\(^{13}\)To be precise, Scott and Triantis [43] refer to Maskin [29] but the contractual solution proposed by Maskin and Tirole [33] is similar in nature to the "Nash implementation" of Maskin [29], as emerges from the example provided by Maskin [30].

\(^{14}\)Remarkably, the word "penalties" in Law refers to "liquidated damages", namely, to payments which one party must make to the other in the event of a contractual breach. Hence, by "penalties" one does not mean payments with which the contractual partners comply when they sign the contract.
the literature in the specific investment problem of GHM. Hart and Moore [22] investigate the issue of relationship specific investments and renegotiation under the hypothesis that both contractors only observe the state of nature after the contract is signed and specific investments are made, whereas the court cannot verify it. The contractors choose investment levels that affect the distribution of states. They assume away any possibility of making the contract obligationally complete. They also assume that renegotiation is Pareto improving over break-up of the relationship, so that renegotiation succeeds in equilibrium.

**Conclusion 10** In the GHM model, renegotiation takes place because the state of nature is taken to be non-verifiable.

In their study, Hart and Moore [22] assume non-observability and a stochastic relationship between *ex ante* investment decisions and *ex post* contingency. In fact, the relationship does not need to be stochastic, as represented in the model developed by Hart [19], for instance. In our numerical example of the GHM model, let us assume that if the contract is breached before the transaction takes place, then the seller must sell the product in the market at a price of $t_m = 35$ units. Before selling it, she bears a production cost of $C_m(i_s)$, depending again on the amount of investment. Take $C_m(12) = 25$ and $C_m(20) = 20$. Thus, $C_m(i_s)$ decreases with $i_s$, and $C_m(i_s) > C(i_s)$ for any given $i_s$. As Hart [19] explains, before selling the product in the market, the seller must modify it so that it becomes a “standard” product. In turn, the buyer must resort to the market to purchase the product. She will buy a “standard” product at a price of 35 units. Her revenue function is also affected by the breach of the contract. She will obtain $R_m(i_b)$, where $R_m(i_b) < R(i_b)$, $\forall i_b$. We take $R_m(10) = 20$ and $R_m(15) = 40$. Suppose first that both parties made the socially optimal investment, namely $(i_s, i_b) = (20, 15)$, but one of them threatens to breach the contract before production takes place. When renegotiating, they agree to share the surplus equally. Considering that their joint surplus from the transaction is $R(15) - C(20) = 50 - 10 = 40$, and that their joint surplus in the event of a breach is $R_m(15) - C_m(20) = 40 - 20 = 20$, the economic value of renegotiation succeeding is equal to 20. By accepting to renegotiate the contract, each party will obtain 10 units more than the break-up payoff, so each party strictly prefers to avoid the contractual breach. Then, the seller obtains $t_m - C_m(20) + 10 = 25$ and the buyer obtains $R_m(15) - t_m + 20 = 25$. It is easy to show that, in this example, at least the seller prefers to underinvest and choose $i_{s,1} = 12$, instead of $i_{s,2} = 20$. Indeed, if the pair of investments is $(i_s, i_b) = (12, 15)$, then the joint surplus in the event of a breach is $R_m(15) - C_m(12) = 40 - 25 = 15$, whereas the joint surplus from renegotiation is $R(15) - C(12) = 50 - 20 = 30$. Hence, each party will obtain 7.5 units more than the profit which would be obtained with a break-up, which is less than in the previous scenario. Overall, the seller obtains $t_m - C(12) + 7.5 = 17.5$, which is $25 - 17.5 = 7.5$.
units less than with the previous pair of investments. However, because the seller invested \( i_{s,2} - i_{s,1} = 8 \) units less, she is nonetheless better off by underinvesting. Hence, the pair of optimal investments \((i^*_s, i^*_b)\) cannot represent a Nash-equilibrium in the strategies of the contractors, if they expect to renegotiate the contract.

Essential for these results is that specific investments are non-verifiable, and so are the outcomes of those investments. The "Irrelevance theorem" of Maskin and Tirole [33] somehow challenges the contractual solution of Hart and Moore [22], in that, under certain conditions, the theorem extends to settings with limited commitment and renegotiation. On the other hand, as already mentioned, the literature has not yet clarified whether there exists an obligationally complete contract under the hypotheses of Maskin and Tirole [33]. In the more recent study by Tirole [47], either contractual party may make an effort to learn the state of nature prior to writing the contract, rather then after signing it, as in GHM. Moreover, unlike in Hart and Moore [22], the effort affects the cognition of the state of nature rather than its distribution. At optimum, the degree of contractual incompleteness depends on how big the effort must be to improve cognition.

Much of the literature approaches the renegotiation game as if no legal rule disciplines the renegotiation process. This approach is found in Hart and Moore [22], for instance. Instead, some studies look at how to regulate the renegotiation process. Indeed, Aghion, Dewatripont and Rey [1] show that efficiency is enhanced, if the parties can agree in the initial contract on how to share surplus in a later renegotiation. However, this kind of solution is deemed to be unrealistic from a legal perspective (Scott and Triantis [43]). This does not look surprising in light of our previous discussion, since it is difficult to explain why there are no efficient default rules concerning the initial contract, whereas there are efficient rules for the renegotiation process, as implicitly assumed by Aghion, Dewatripont and Rey [1].

Although the issue of renegotiation which is detrimental to one party arises both in PA and GHM settings, a powerful solution has been adopted in the latter, receiving general consensus. The solution consists in the property rights. By allocating property rights in assets specific to the transaction, the parties assign the bargaining power in future negotiations to the property-right holder. Remarkably, this solution does not necessarily work in the PA model. Actually, Hart [19] point out that economists have not proved that property rights improve incentives in a PA setting.

Another solution to attenuate the negative effects of renegotiation is to use payment deposits before performance, as suggested by Edlin and Reichelstein [17]. These authors consider two kinds of instruments, namely, "upfront payment before performance" and "expectation damages remedies". "Expectation damages remedies" entail the full compensation of the victim of a breach. The "upfront payment before performance" is used to discourage one party from breaching the contract so that concerns about a potential breach only arise with the other party. With the expectation damages remedy, the
breacher obtains the residual, after paying the victim compensatory damages. If the
breacher is also the investor, then he will invest efficiently to maximize the residual.

**Conclusion 11** Under non-verifiability, limited commitment and suboptimal renegotiation, one legal solution in both the PA and the GHM model is the up-front involvement of a third party. A legal solution in the GHM model is the assignment of property rights to one party over the assets of the other party.

The assignment of property rights to one contractual party has been relied upon to avoid suboptimal renegotiation under the assumption of non-verifiability. However, renegotiation would be avoided, if a mandatory rule were available, under which the court of justice would ban contract modifications.

Without a legal solution to prevent renegotiation, parties will simply renegotiate, if break-up and litigation are costly. Therefore, one needs to clarify how the litigation process works, and what potential costs it brings about, in order to understand whether the contractual parties will wish or not to renegotiate. This requires departing from the GHM setting, in which either the contractual parties renegotiate or they break up, without any intervention by the court of justice in the process.

### 4.2.2 Verifiability and litigation

Scott and Triantis [43] - [44] argue that courts of justice do not verify information *ex post* by themselves, as implicitly assumed in many Contract theory studies. It is up to the contractual parties to make an effort to prove compliance (or non-compliance by the partner) with contractual obligations. In Scott and Triantis [44], it is mentioned that contract theorists rely on highly stylized enforcement mechanisms, in which the court, first, verifies information and, then, orders the parties to execute or not the trade, at odds with real-world practice. Courts only need to establish which of the "proxies" presented by the parties is closer to some pre-determined standard. By specifying a standard, a court can ascertain the compliance with that standard within some space of admissible compliance evidences.

**Conclusion 12** *Ex post* verifiability of contingencies involves that contractors make a costly effort.

The result of the litigation is that some party will compensate the other for the provoked "damages". In Law, a distinction is made, for instance, between compensation (compensatory, liquidated) damages, which are meant to compensate the non-breaching party for the incurred damages, and punitive damages, which consist in the payment of a penalty for breaching the contract. In substance, they are all transfers from the breaching party to the damaged party.\(^{15}\)

\(^{15}\)See, for instance, Calleros [11], who makes a comparative analysis of liquidated damages and punitive damages in the US civil law and in the French civil law. Along a similar line, Hatzis [23] inves-
4.2.3 Trade-offs between contracting costs and renegotiation-verification-litigation costs

Let us first consider renegotiation and litigation. There is obviously no trade-off between the two situations. Either renegotiation is Pareto improving over litigation and, hence, it succeeds; or this is not the case, and the party who expects to gain more through litigation will prefer to breach the contract. By contrast, a trade-off is clearly found between the costs incurred in the contracting stage and the costs incurred during the contractual execution. In the contracting stage, the parties may incur costs for identifying contingencies and writing contracts; during the contractual execution, they may incur either costs of renegotiation or costs of verification/litigation.

Bajari and Tadelis [5] consider a delegation model for constructing an infrastructure. Before contracting, the buyer chooses a design of the project, which can be or not successful. The probability of the design being successful increases with an investment previously made by the buyer. The complexity of the project, which is defined as the number of states of nature, in the spirit of Dye [15], is taken as given. It follows that the project specification depends fully on the probability of the design being successful. If the design fails, then the project will require modifications, without which it will not be worth to the buyer. The contract is incomplete because the cost of the project modifications is non-verifiable, which leads to renegotiation. The contractual solution trades off the cost of project design against the cost of renegotiation. Re-interpreting the authors assumptions, one can read the cost of project design as a cost of attenuating the contractual incompleteness. Hence, one can say that the contractual solution trades off the cost of writing the contract against the cost of renegotiation. Kvaloy and Olsen [25] consider a setting in which the cost of writing the contract is traded off against the likelihood of verifiability by the court. A higher initial cost improves the likelihood of perfect verifiability.

The trade-off between \textit{ex ante} and \textit{ex post} costs in contracts is also identified in a Law and economics perspective. Shavell [45] clarifies that there is a link between the way in which the parties write contracts and that in which the courts interpret them. Scott and Triantis [43] - [44] rest on the observation that very often contracts contain ambiguous terms, such as "best efforts" and "reasonable care", and are thus left incomplete. They suggest that this results from a rational decision made by the contractors, who deliberately choose to limit the \textit{ex ante} transaction costs, trading them off against the \textit{ex post} transaction costs. The enforcement of such vague terms entails additional layers of evidence production. For example, a promisor would first propose activities that constitute "reasonable care" in front of a court; she would then provide evidence of having preformed such activities. The evidence is made by using a selection of

tigates the way in which penalty damages are set in Common law countries as opposed to Civil law countries.
pre-determined proxies for "reasonable care" (the authors specify that proceduralists refer to the proxies as to "operative facts"). A precise term, which eliminates the contractual incompleteness, narrowly confines the content of the proxies.\textsuperscript{16} Schwartz and Whatson \cite{42} investigate the link between the transaction costs occasioned by the Contract law itself to the contractors and the choice of the contractual terms. Specifically, if the parties opt for a complex contract, then they will prefer renegotiation to be very costly, so that they will be discouraged from engaging in renegotiation \textit{ex post}. However, if it is considered that contractual complexity raises the costs of interpretation by the court, then it is understood why the parties may also prefer to write contracts which are not too complex. Lastly, for the contractual parties to trade off \textit{ex ante} and \textit{ex post} transactions costs efficiently, they should be faced with fewer mandatory rules than currently in place.

\textbf{Conclusion 13} The costs of writing the contract are inversely related to both renegotiation costs and verification/litigation costs.

In this stage, no unified analysis is yet available of the trade-off between contracting costs, on one side, and costs related to renegotiation, verification and liquidation, on the other.

\section{5 General conclusion}

Without the ambition of being exhaustive, we presented the literature in Contract theory (mainly on incomplete contracting) and Contract law in such a way as to suggest three directions in which our investigation should be useful to gain a better understanding of how the economic and the legal perspective of contracts are intertwined. By structuring the discussion on the basis of the contractual environment, we attempted to clarify the studies in either research field so as to offer an aligned view of the two perspectives. In particular, we pointed out that renegotiation is not specific to incomplete contracts, and it would be useful if studies in Contract law were extended to environments where contracts are complete but renegotiated. Legal limits on the application of the economic results to incomplete contracts would deserve a closer attention so as to better define their realm of applicability. Trading off \textit{ex ante} and \textit{ex post} transaction costs in contracts is a complex issue because those costs are multifaceted and not necessarily easy to measure. This may all suggest alleys for future research.

\textsuperscript{16}Scott and Triantis \cite{43}, \cite{44} criticize contract theorists for assuming that verifiability is too costly to incur, for parties try to specify the contracts \textit{ex ante} as well as possible. In reality, they choose how costly verifiability will be in the aforementioned trade-off, which is basically a trade-off between precise and vague terms (see, for instance, Scott and Triantis \cite{43}, footnote 25).
References


