Conflicting Clauses in Contracts

Haaris Mateen*

July 20, 2026

Abstract

We study optimal contracting in a bilateral trade model in the presence of ambiguity. Ambiguity averse preferences lead to the buyer and vendor concentrating their priors over different states, creating a conflict over an appropriate license fee. We show how the optimal contract is to have "conflicting clauses" – broad standards giving control rights to either party but allowing for a simple resolution mechanism when the two parties report different states. The contract achieves first best investment levels when the first best benchmark is defined with respect to a planner who also has ambiguity averse preferences. The contract is sufficient when (i) the surplus maximizing action can be different from the individual payoff maximizing action, and (ii) the bargaining powers of the two parties is not fixed across states. Among other applications, the result provides an explanation for the real-world phenomenon of conflicting clauses in Intellectual Property contracts.

JEL Codes:

Keywords:

*University of Houston

1 Introduction

> *Contract interpretation remains the most important source of commercial litigation and the least settled, most contentious area of contemporary contract doctrine and scholarship.* - Gilson et al. (2014)

Can contracts with conflicting clauses – two clauses that seemingly contradict each other – provide incentives that achieve first best investment levels? This paper investigates a bilateral contracting problem over the sale and use of intellectual property in the presence of deep uncertainty, i.e., a coarse knowledge of future states, no agreement over payoff values, and ex-post actions being unknown. In such a set-up a large space of models can describe a distribution over end payoffs for both agents. The paper provides a simple mechanism that allows the two parties to make optimal investment decisions even in this constrained environment.

The law literature recognizes two opposing theoretical frameworks in the domain of contract interpretation. The "textualist" tradition advocates a strict textual interpretation of the contents of the contract under the assumption that the agreement is written between two legally sophisticated parties who choose to incorporate everything that is relevant to their business in the contract and therefore would not require interpretation by a court or a mediator (Schwartz and Scott (2010)) unless specified *in* the contract. On the other side is the "contextualist" tradition which advocates that courts must try to understand the intentions of the two parties when they were signing the contract and evaluate any other relevant information that may lead to the correct ex-post action and division of surplus, even if not mentioned in the contract. The most salient application of this concept is in the Uniform Commercial Code (UCC) of the United States that provides guidelines for interpreting contracts between commercial entities and requires courts to understand both the formal and informal elements of contracting that may need ex-post assistance by a court (see, for example, Burton (2009)). This debate is hardly academic. In many states, such the state of New York, the courts adopt a strictly textualist stance while in some other states, such as the state of California, the courts encourage a contextualist approach.

Perhaps the most interesting consequence of extreme uncertainty is the phenomenon of conflicting clauses. Shur-Ofry and Tur-Sinai (2015) discuss how IP contracts often have clauses that contradict each other. Consider one of the examples they show, about a software license contract that talks about derivative materials. One section states:

> "...the licensee has a right in all derivative works, other than Pre-Existing Materials..."

while the definition of Pre-Existing Materials is stated as:

> "...the Licensed Technology and any and all modifications and/or enhancement thereof."

The first clause allows the licensee to have a right over derivative works *barring* "Pre-Existing Materials." However, the definition of Pre-Existing Materials, in the second clause, seems to include derivative works as well. In other words, the two clauses contradict each other. There is, at the very least, vagueness built into the contract.[1]

These conflicting clauses seem to give control rights to each party based on ex-post contingencies. However, the imprecision in the language – the definition of pre-existing materials seems to cover derivative works – means there is a chance the two sides will not agree on who gets control ex-post and therefore it may have to be negotiated or adjudicated. This is not an atypical phenomenon. A prominent recent case is a $1 billion suit filed by SCO against IBM in 2003 where the parties were contesting a similar set of conflicting clauses over derivative works.[2] The case was settled in 2016 and relitigated in 2018.

This paper investigates optimal contracting in a bilateral setting in the presence of deep uncertainty which we define to be an inherent indescribability of the state space beyond coarse characterizations – for example, "bad disaster." It advocates a reliance on setting default points in the contract and allowing contingent ex post control based on coarse signals conditional on fulfilling the default point commitment. The main result of the paper is that a contract with default points and contingent ex-post control is robust to an aversion to uncertainty as well as a fundamental inability to completely specify transfers or actions in every contingency. The model studies a contracting problem over the sale of an intellectual property between two agents, a buyer and vendor, who both share ambiguity over the correct probabilistic model that can describe coarse future outcomes, as well as indescribability of ex-post actions related to extreme events. The bite in the problem comes from the events of nature that the two parties worry most about: under ambiguity, the buyer cares about states of nature where profits are very low, while the vendor cares about states of nature where the cost of technology delivery is very high. Therefore, the two sides endogenously develop non-common priors over the future. Based on a planner's benchmark, the two agents may make incorrect investments because their distribution over the outcomes are different.

Importantly, we allow the uncertainty to extend over the bargaining power parties may have ex-post. Parties are uncertain about the state of nature as well as the bargaining power or sharing rule that will exist once the state is realized. This has real world motivation. The law literature identifies the problem of strategic actions taken by the party that is "losing" in a given state ex-post; therefore the ex-post bargaining power even in a constant sharing rule becomes an uncertain parameter of the problem (Gilson et al. (2014)). Real world contracts try to avoid these uncertainties in renegotiation by setting broad standards of control in the contract. The idea of setting default points while allowing for coarse contingent control rights recalls more recent developments in the law literature. Recent work has shown the importance of text *and* context contracts. Gilson et al. (2014) present a typology of contracts which vary in the degree of ex-ante uncertainty and the thickness of the market in which the two parties negotiate. Under conditions of medium uncertainty – the authors refer to "Knightian uncertainty" – and a thin market the authors talk about the need for broad standards that give one party the control or obligation to choose the appropriate action based on

[1] Shur-Ofry and Tur-Sinai (2015) term this as a type of "constructive ambiguity."

[2] See `https://www.zdnet.com/article/novell-challenges-sco-linux-claims/` and `http://www.sco.com/company/legal/update/website2.1.pdf`

the contingency. An intellectual property contract is arguably a relevant setup that has both a reasonable degree of uncertainty as well as a thin market.

There is an extensive literature on robust mechanism design, as surveyed by Carroll (2019). However, most of the contracting applications of ambiguity-aversion and related preferences have been with respect to the principal-agent problem, as in Miao and Rivera (2016). A notable is exception is Mukerji (1998). Mukerji (1998) had earlier shown that, in a bilateral buyer-seller environment with Choquet expectations, and with full ex-post verifiability of state, the optimal contract may be a "null contract," i.e. a contract with no clauses. In other words, there would be no transfer vector that would be able to induce first best investments. This paper differs from Mukerji (1998) in a number of ways. Unlike his paper, we consider the role of disagreement over ex-post actions and the role of uncertainty over bargaining power across different states. As a consequence, the verifiability of the state ex-post is limited and left at a coarse level. However, the main result in our paper comes at the cost of putting more structure on the payoffs of the two parties.

There is, of course, a huge literature on incomplete contracts. The incomplete contracts literature advocates a residual control rights based theory, a literature initiated by Grossman and Hart (1986) and Hart and Moore (1988). The idea is that complete contracts cannot be written because investments, borne by individual parties, are not verifiable and/or actions are not describable. Therefore, a reliance on ex-post bargaining means that either party may not receive their marginal return on investment, a situation that typically leads to underinvestment. The canonical solution is to give control or property rights to the party that has the higher marginal return on investment. This paper also has non-verifiability of investments and an indescribability of actions but the uncertainty aversion naturally leads to a problem of underinvestment and overinvestment. In addition there may be disagreement over both the payoffs in different events, as well as disagreement over the optimal action ex-post. The contractual solution in our paper is to give contingent control rights to both parties but after setting the default point. When the uncertainty is high enough these become overlapping control rights. This paper therefore can also be seen to add to the literature on renegotiation design, such as Chung (1991) and Aghion et al. (1994), in the presence of uncertainty aversion and a non describability of actions for extreme events.

The failure to correctly conduct dynamic programming both because of non-common priors *and* disagreement over payoff in events speaks to the literature investigating the foundations of incomplete contracting, most notably Maskin and Tirole (1999). The authors showed that the rationality typically assumed by agents, of being able to conduct correct dynamic programming over the payoffs, meant that messaging mechanisms could be used ex-post to correctly elicit the state of nature and therefore a contract could be written that gave first best investment incentives. The absence of such mechanisms in the real world suggest that something else must be the reason for such incompleteness. Papers with enough complexity such as by Segal (1999) and Hart and Moore (1999) or the cooperative investments approach by Che and Hausch (1999) are not affected by this critique. A second wave of the incomplete contracts literature discussed the importance of cognitive costs (such as Bolton and Faure-Grimaud (2010) and Tirole (2009)) and reference points (Hart and Moore (2008)), among other approaches that also explained the indescribability of actions. Our paper also proposes a mechanism that gets around the incorrect investment problem. However, it does this in the presence of non-common priors and when the agents cannot correctly conduct dynamic programming.

This paper allows for an uncertainty averse social planner. The two agents in the problem have non-common priors and disagree over payoffs – with some structure over the disagreement – and therefore do not correctly consider the distribution of payoffs that is actually "correct." Despite this, the main result is not a negative result. The optimal contract *does* achieve the first best investment levels by allowing for a simple mechanism for the two parties to resolve the decision for the appropriate action ex-post. A judicious choice of default points and the appropriate distribution of contingent control rights allow the parties to focus on the business-as-usual event – the event that a planner would focus on – knowing that extreme events are well protected.

The paper is structured as follows. Section 2 discusses the model set-up. Section 3 provides a set of preliminary results. Section 4 provides the main result of the paper. Section 5 concludes.

2 The Model

In this section, we will first introduce the model. Then, we will establish a full state and action verifiability benchmark. We will successively relax our assumptions on what can be verified and show that the conflicting clause contract is robust to this coarsening of verifiable information.

2.1 Overview of Environment

Consider a world with three regimes s_1, s_2, s_3.[3] There is a vendor (he) who wants to sell an Intellectual Property (IP) and there is a buyer (she) who wants to buy it. Both the vendor and the buyer make investments that are sunk at the time the states are known to both parties. The investments are not verifiable.

The timing is as follows:

1. $t = 0$ the vendor and buyer write a contract.
2. $t = 1$ the vendor and buyer make investments.
3. $t = 3$ the regime is known, the contract executed, and profits and costs realized.

A contract is a default product q and transfer t. The contract allows the two parties to report the regime. According to the regime they report, the contract gives one party the right to make a take-it or leave-it offer, conditional on a minimum transfer.

We will compare the above general contract with simple fixed transfer and regime-wise transfer contracts. Note that we restrict the environment from the very beginning to not include reporting

[3]We refrain from calling this set "states" because a state is defined as a complete payoff relevant description and for that we would also need to include respective investment levels along with regimes.

of investment levels. It may be possible to have a mechanism that achieves that, however, as we will see, such a mechanism is not necessary.

In Section 3, we will consider three cases. First, the optimal actions for each state are known ex-ante. Second, the optimal actions for each state are not known. Lastly, we will introduce the idea of correctly verifying the state with probability $\omega \in [0, 1]$.

2.2 Payoffs

We refer to the set of regimes $s \in \{s_1, s_2, s_3\} \equiv S$ and to the set of products $q \in \mathcal{K}$ finite.

The buyer's payoff is:

$$u_b(s, q, j) = \pi(s, q)f(j) - \psi(j) - t$$

where $\pi(s, q)f(j)$ is the profit, f increasing concave, $j \in [\underline{j}, \bar{j}] \in \mathbb{R}^+$ is buyer investment, $\psi(j)$ is convex investment cost.

The vendor's payoff is given by:

$$u_v(s, q, i) = t - r(s, q)g(i) - \phi(i)$$

where $r(s, q)g(i)$ is delivery cost, $g(i)$ decreasing convex, $i \in [\underline{i}, \bar{i}] \in \mathbb{R}^+$ is vendor investment, $\phi(i)$ is a convex investment cost.

We will make two assumptions on the profit and cost functions described above.

- **P1: Common Ground** There exists a *common* optimal product choice for buyer and vendor for each regime s, given by $p(s)$.

$$\pi(s, p(s)) \geq \pi(s, q)$$

$$r(s, p(s)) \leq r(s, q)$$

- **P2: Ordering**

$$\pi(s_1, p(s_1)) < \pi(s_2, p(s_2)) < \pi(s_3, p(s_3))$$

$$r(s_1, p(s_1)) < r(s_2, p(s_2)) < r(s_3, p(s_3))$$

Since the space of products $\mathcal{K}$ is finite, there will always be an optimal product for the profit function and for the cost function. Assumption **P1** allows for at least one common product that is optimal for both the buyer and the vendor. This common optimal product is given by $p(s)$. The assumption helps us abstract away from a consideration of the welfare weights of the two parties, which would happen if there were no product that was best for both of them in the same regime.

The ordering assumption **P2** ensures a basic tension in the problem which, as we will see in Section 2.3, ensures that the buyer and vendor have different priors in a simple fixed license fee world. Any variation on assumption **P2** can be analyzed using the steps followed in this paper.

2.3 Preferences

We assume that all agents have ambiguity averse preferences à la Gilboa and Schmeidler (1989), henceforth GS. The set of possible distributions over the three regimes is given by Δ which is a convex, compact set of distributions. The planner shares this preference and evaluates

$$\max_{i,j} \min_{\delta \in \Delta} \sum_{s \in S} u_{sp}(s, p(s), i, j)\delta(s)$$

We assume that the planner cares about the ex-ante value of surplus, like in Mukerji (1998). The optimization problem for the planner is then

$$\max_{i,j} \min_{\delta \in \Delta} \sum_{s \in S} \left[\pi(s,q)f(j) - r(s,q)g(i) - \psi(j) - \phi(i)\right]\delta(s) \tag{1}$$

This notion of first best would be the one chosen by the parties if investment levels were contractible. In that case, the objective would be to maximize ex-ante surplus and find an adequate distribution between the buyer and seller. We could have considered an alternative optimization program for the planner, which would be the sum of the perceived ex-ante utility of the buyer and the seller.

$$\max_{j} \min_{\delta \in \Delta} \sum_{s \in S} \left[\pi(s,q)f(j) - \psi(j) - t(s)\right]\delta(s) + \max_{i} \min_{\delta \in \Delta} \sum_{s \in S} \left[t(s) - r(s,q)g(i) - \phi(i)\right]\delta(s) \tag{2}$$

with the constraint that the transfer $t(s)$ regime-by-regime is the same for both buyer and seller as well as a participation constraint with GS preferences. As will be seen, the optimal contract tries to maximize exactly equation (2) and a conflicting clause contract achieves the planner's level of utility in equation (1).

2.4 Contract

We define a contract as a set of clauses, each clause being a set of mechanisms. Formally, a mechanism is a function l that maps a finite set of actions A to a set of outcomes X, $l : A \to X$. A clause of a contract is a non empty set of mechanisms C. In other words, a clause describes a property of the contract. Finally, a contract is a finite set of clauses $C_i, i \in N$, where $N \in \mathbb{Z}_+$, i.e. a finite subset of the set of positive integers. The clauses taken together $\bigcap_{i \in N} C_i$ define the contract $\mathcal{C}$.

Definition 1. *A contract is non-conflicting if $\mathcal{C} = \bigcap_{i \in N} C_i$ is a singleton. That is, for each action $a \in A$, there is only one possible outcome $x \in X$. If $\mathcal{C}$ is not a singleton, then the contract is called a conflicting clause contract.*

The contract is defined in a manner similiar to Jakobsen (2020) with some important differences. Firstly, the definition of the outcome space X is deliberately kept abstract. Depending on the informational constraints of the environment, this may be the actual transfer and product chosen, or merely the ability to make a take-it or leave it offer.[4] Secondly, this paper takes seriously the possibility of conflicting (non-singleton) contracts, something which the literature, to the best of our knowledge has not considered.

2.5 Bargaining Power

We do not assume fixed bargaining power between the two parties. Instead, we assume that the bargaining power $\alpha(s) \in [0,1]$ is unknown ex-ante and can vary regime to regime. Agents take into account this uncertainty when evaluating their ex-ante payoffs, given a contract.

3 Preliminary Results

3.1 First Best Benchmark

The optimization program (2.1) leads to some optimal investment levels i^*, j^* which corresponds to some distribution δ^*. To prevent the selection of ties, we make a monotonicity assumption on the payoffs.

Assumption A.1

$$\frac{\pi(s_3, p(s_3)) - \pi(s_2, p(s_2))}{r(s_3, p(s_3)) - r(s_2, p(s_2))} > \frac{\pi(s_2, p(s_2)) - \pi(s_1, p(s_1))}{r(s_2, p(s_2)) - r(s_1, p(s_1))}$$

We can then have three cases.

Proposition 1. *Given Assumption **A.1**, there can be three cases:*

1. $\delta^* = \delta_{s_1}$
2. $\delta^* = \delta_{s_3}$
3. $\delta^* = \delta_{s_2}$

Proof. Note that the investments come from a compact, convex set. The distributions come from a compact, convex set, a simplex in fact. The objective function is concave for a given δ and is convex (linear) for a given investment level i, j. We can therefore use the minimax theorem (von Neumann 1928) and exchange the orders of minimzation and maximization.

For brevity, we refer to $\pi(s_i, p(s_i)) = \pi_i$ and $r(s_i, p(s_i)) = r_i$.

With three states, nature chooses a probability δ with probability weights $\delta_1, \delta_2, \delta_3$ on the three states. To solve the maxmin problem, we will characterize the optimal investment response of the planner first. For any distribution δ chosen by nature, the planner will choose buyer investment given by

$$\delta_1 \pi_1 + \delta_2 \pi_2 + (1 - \delta_1 - \delta_2)\pi_3 = \frac{\psi'(j)}{f'(j)} = \chi(j)$$

[4] We do not define preferences over this abstract outcome space, as suggested by Kreps (1992). The mechanism will ultimately induce a certain payoff relevant transfer and product through the game it induces. Preferences are over these downstream payoff streams.

Therefore, the optimal buyer investment is given by

$$j(\delta_1, \delta_2) = \chi^{-1}(\delta_1\pi_1 + \delta_2\pi_2 + (1 - \delta_1 - \delta_2)\pi_3) \tag{3}$$

It is easy to see that the optimal buyer investment continuously decreases in δ_1 and in δ_2. Similarly, the vendor investment condition is given by

$$\delta_1 r_1 + \delta_2 r_2 + (1 - \delta_1 - \delta_2) r_3 = -\frac{\phi'(i)}{g'(i)} = \xi(i)$$

And so the optimal vendor investment is given by

$$i(\delta_1, \delta_2) = \xi^{-1}(\delta_1 r_1 + \delta_2 r_2 + (1 - \delta_1 - \delta_2) r_3) \tag{4}$$

which again continuously decreases in δ_1 and δ_2. Now, nature chooses the distribution knowing that the planner will choose an optimal investment response given by (1) and (2). So the optimization program for the planner can be written as

$$\max_{\delta_1,\delta_2} -\big[(\delta_1\pi_1 + \delta_2\pi_2 + (1 - \delta_1 - \delta_2)\pi_3) f(j(\delta_1, \delta_2)) - \\ (\delta_1 r_1 + \delta_2 r_2 + (1 - \delta_1 - \delta_2) r_3) g(i(\delta_1, \delta_2)) - \psi(j(\delta_1, \delta_2)) - \phi(i(\delta_1, \delta_2))\big] \text{ s.t.}$$

$$\delta_1 \geq 0, \delta_2 \geq 0, \delta_1 \leq 1, \delta_2 \leq 1, \delta_1 + \delta_2 \leq 1$$

The Langrangian from the problem, denoting the objective function as $\mathcal{O}$ is

$$\mathcal{O} + \lambda_1\delta_1 + \lambda_2\delta_2 + \gamma_1(1 - \delta_1) + \gamma_2(1 - \delta_2) + \mu(1 - \delta_1 - \delta_2)$$

The FOC with respect to δ_1, δ_2 are

$$(\pi_3 - \pi_1) f(j(\delta_1, \delta_2)) - (r_3 - r_1) g(i(\delta_1, \delta_2)) + \lambda_1 - \gamma_1 - \mu = 0$$

and

$$(\pi_3 - \pi_2) f(j(\delta_1, \delta_2)) - (r_3 - r_2) g(i(\delta_1, \delta_2)) + \lambda_2 - \gamma_2 - \mu = 0$$

The terms related to derivatives of the investment functions drop out because of the optimality of the investment response.
Case A: $0 < \delta_1 < 1, 0 < \delta_2 < 1, \delta_1 + \delta_2 < 1$
The case of a strictly interior solution with weights on all states is only possible if

$$\frac{(\pi_3 - \pi_1)}{(r_3 - r_1)} = \frac{(\pi_3 - \pi_2)}{(r_3 - r_2)} = \frac{(\pi_2 - \pi_1)}{(r_2 - r_1)} = \frac{g(i(\delta_1, \delta_2))}{f(j(\delta_1, \delta_2))}$$

Case B: $0 < \delta_1 < 1, 0 < \delta_2 < 1, \delta_1 + \delta_2 = 1$

Here, we are putting no weight on state 3.

$$\frac{(\pi_2-\pi_1)}{(r_2-r_1)}=\frac{g(i(\delta_1,\delta_2))}{f(j(\delta_1,\delta_2))}\leq\frac{(\pi_3-\pi_1)}{(r_3-r_1)}=\frac{(\pi_3-\pi_2)}{(r_3-r_2)}$$

Case C: $0<\delta_1<1, \delta_2=0$
Here we are putting no weight on state 2 implying

$$\frac{(\pi_2-\pi_1)}{(r_2-r_1)}\geq\frac{(\pi_3-\pi_1)}{(r_3-r_1)}=\frac{g(i(\delta_1,0))}{f(j(\delta_1,0))}\geq\frac{(\pi_3-\pi_2)}{(r_3-r_2)}$$

Case D: $\delta_1=0, 0<\delta_2<1$
Here we are putting no weight on state 1. That implies

$$\frac{(\pi_3-\pi_2)}{(r_3-r_2)}=\frac{g(i(0,\delta_2))}{f(j(0,\delta_2))}\geq\frac{(\pi_3-\pi_1)}{(r_3-r_1)}=\frac{(\pi_2-\pi_1)}{(r_2-r_1)}$$

Case E: $\delta_1=1, \delta_2=0$
Then we must have

$$\frac{(\pi_3-\pi_1)}{(r_3-r_1)}\geq\frac{g(i(1,0))}{f(j(1,0))},\frac{(\pi_2-\pi_1)}{(r_2-r_1)}\geq\frac{g(i(1,0))}{f(j(1,0))}$$

Note that this implies $(\pi_2-\pi_1)f(j(\delta_1,\delta_2))-(r_2-r_1)g(i(\delta_1,\delta_2))\geq 0$ and that $(\pi_3-\pi_1)f(j(\delta_1,\delta_2))-(r_3-r_1)g(i(\delta_1,\delta_2))\geq 0$. This matches our intuition that state 1 should be inferior to both states 1and 3.
Case F: $\delta_2=1, \delta_1=0$
For $\delta_2=1$, we must have

$$\frac{(\pi_2-\pi_1)}{(r_2-r_1)}\leq\frac{g(i(0,1))}{f(j(0,1))}\leq\frac{(\pi_3-\pi_2)}{(r_3-r_2)}$$

which implies that $(\pi_2-\pi_1)f(j(\delta_1,\delta_2))-(r_2-r_1)g(i(\delta_1,\delta_2))\leq 0$ and that $(\pi_3-\pi_2)f(j(\delta_1,\delta_2))-(r_3-r_2)g(i(\delta_1,\delta_2))\geq 0$.

Case G: $\delta_1=\delta_2=0$
We must have

$$\frac{(\pi_3-\pi_1)}{(r_3-r_1)}\leq\frac{g(i(0,0))}{f(j(0,0))}\text{ and }\frac{(\pi_3-\pi_2)}{(r_3-r_2)}\leq\frac{g(i(0,0))}{f(j(0,0))}$$

and similarly matches our intuition that state 3 is inferior to both states 1 and 2.

It should be clear only cases E, F, G do not violate the monotonicity condition and these correspond to Cases 1,3,2 respectively. □

Henceforth, we will focus on Case 3 which gives rise to conflicting clauses.[5] Case 3 intuitively means that the surplus is lowest in the middle state. Unforeseen innovation will create more surplus but its magnitude and distribution across profit and delivery cost are unknown.

[5] The other two cases are special instances of the same optimal contract. As will be clear, they do not require a conflicting clause structure.

Assumption 1. *The first best investment level is given by optimal investments i^*, j^* when $\delta^* = \delta_{s_2}$, where δ^* is the probability distribution chosen in the planner's problem.*

3.2 Information Environment

Assumption 2. *There is a business-as-usual state s_2 with the property that the common optimal action $p(s_2)$ is known ex-ante.*

We maintain Assumption 2 throughout the paper. The idea is intuitive: both agents are aware of the optimal product that can be made for the business-as-usual state.

3.3 Candidate Contract

Definition 2 (Conflicting Contract)**.** *The contract consists of a default transfer $t \in \mathbb{R}^+$ and a default product $q \in \mathcal{K}$ and the following clauses:*

1. *The buyer claims the regime is not s_2 and makes a take it or leave it offer to the vendor with maximum transfer $-r_d$ to take control.*
2. *The vendor claims the regime is not s_2 and makes a take it or leave it offer to the vendor with minimum transfer π_d to take control.*
3. *If neither makes a claim, then trade proceeds at the default point.*

The contract doesn't rule out the possibility of renegotiation. Clearly, clauses 1 and 2 are in conflict with each other.

3.4 Baseline Results

We start with a set-up where the regime as well as actions are known and verifiable. This means the common optimal action $p(s)$ is known and verifiable. In this information environment, the optimal contract can be one that defines the product to be made in each regime along with regime-by-regime transfers.

Note, however, that a fixed license contract will not work. With a fixed license contract having some transfer t, the buyer's investment decision is:

$$\max_{j} \min_{\delta \in \Delta} [\pi(s, p(s)) f(j) - \psi(j) - t] \delta(s)$$

Similarly, the vendor's investment decision is:

$$\max_{i} \min_{\delta \in \Delta} [t - r(s, p(s)) g(i) - \phi(i)] \delta(s)$$

It is easy to see that the buyer puts all probability weight on its worst case lowest profit state, while the vendor puts all probability weight on its worst case highest delivery cost state. In other words, the buyer chooses δ_{s_1} and the vendor chooses δ_{s_3}. Therefore, a fixed license does not achieve first best investment levels.

In this information environment, we can also work with a relaxed version of the conflicting contract. Consider the following contract:

Definition 3 (Relaxed Contract)**.** *The contract consists of a default transfer $t \in \mathbb{R}^+$ and a default product $q \in \mathcal{K}$ and the following clauses:*

1. *The buyer claims the regime is s_1 and makes a take it or leave it offer to the vendor with maximum transfer $-r_d$ to take control.*
2. *The vendor claims the regime is s_3 and makes a take it or leave it offer to the vendor with minimum transfer π_d to take control.*
3. *If neither makes a claim, then trade proceeds at the default point.*

The relaxed contract simply assigns control rights in the respective regime that is worst-case for each agent – low profit s_1 for the buyer and high delivery cost s_3 for the vendor. By doing so, first best investment levels are achieved.

Proposition 2. *With regimes and actions known and with full verifiability:*

1. *A contract setting $(t(s), p(s))$ for each $s \in S$ achieves first best investment levels.*
2. *A contract setting $(t, p(s))$ does not achieve first best investment levels.*
3. *The relaxed contract with $r_d = r(s_2, p(s_2))g(i^*)$ and $\pi_d = \pi(s_2, p(s_2))\pi(j^*)$ achieves first best investment levels i^*, j^*.*

Proof. The first two parts are already shown in the main text. For the third part, first recall that i^*, j^* are the first best investments from the planner's problem. If the vendor believes $\delta_{s_1} = 1$, then the vendor chooses investment $\hat{i}$ so that the buyer is still induced to claim that the state is s_1. (Note that the contract doesn't allow the vendor to claim s_1.) This indifference condition is given by:

$$\pi_1 f(j^*) - r_1 g(\hat{i}) + r_2 g(i^*) = \pi_2 f(j^*)$$

The LHS is the buyer's profit minus the delivery cost given the vendor keeps the investment at $\hat{i}$ and plus the payoff the buyer receives from the vendor $r_d = r_2 g(i^*)$. The RHS is the buyer's payoff at the default point. The vendor is, therefore, effectively optimizing in $i \in [\hat{i}, \bar{i}]$. Therefore, we can again reverse the order of maximization and minimization using the minimax theorem. The vendor's objective function is

$$\max_{i \in [\hat{i}, \bar{i}]} t - \phi(i) - \delta_1 r_2 g(i^*) - \delta_2 r_2 g(i) + (1 - \delta_1 - \delta_2)(\pi_3(f(j^*) - r_3 g(i) - \pi_2 f(j))$$

which gives us

$$\delta_2 r_2 + (1 - \delta_1 - \delta_2) r_3 = -\frac{\phi'(i)}{g'(i)} = \xi(i)$$

Nature's problem

$$\max_{\delta} \delta_1 r_2 g(i^*) + (\delta_2 r_2 + (1 - \delta_1 - \delta_2) r_3) g(i) + \phi(i) - t - (1 - \delta_1 - \delta_2)(\pi_3 - \pi_2) f(j^*)$$

gives $\delta_1 = 0$, $\delta_2 = 1$, under Assumption 1. □

4 Main Results

In the previous section, we established that a simplified version of the conflicting clause contract would achieve first best investment levels under full regime and action knowledge and verifiability. However, the same result could be achieved with a simple product and transfer vector contract as well. We will now see that, as we reduce the information availability of the environment, the conflicting clause contract remains robust while other alternatives cannot be implemented.

4.1 Actions not known and verifiable

Now assume that the actions $p(s)$ are unknown apart from the business-as-usual product $p(s_2)$. The regimes are verifiable. In this situation, we cannot have a contract that sets the product for each regime. We can show that the relaxed contract is still robust.

Proposition 3. *The relaxed contract in Proposition 2 provides first best investment incentives in a world where optimal actions are not known ex-ante beyond $p(s_2)$.*

Proof. The relaxed contract does not depend on specifying actions in other regimes because it simply gives rights to one or the other party. Therefore, the same proof as in Proposition 2 goes through. □

The reason why a transfer vector contract is not enough is because a decision needs to be taken, in each regime, about the action that is to be taken. It is possible, for example, that there are multiple products that are optimal for one party. A disagreement is possible.

4.2 States not verifiable

We assume now that the states are not verifiable. The only thing that is known ex-ante is the business-as-usual product $p(s_2)$. At time $t = 3$, both agents know the regime and know the correct action. However, neither the regime nor the action is verifiable. In addition, the bargaining power between the two parties is only revealed at time $t = 3$, denoted by α.

In this case, the contract necessarily reaches a situation where the two parties can report the regimes. However, the paucity of information means that there is nothing that can be written in the contract that can differentiate between s_1 and s_3. Writing a contract based on regime-wise transfer is vacuous – what would matter would be the outcome of the renegotiation and, for an ambiguity averse agent, they can envision getting nothing if $\alpha = 0$.

However, the conflicting clause contract provides exactly the default position that ensures the interests of both parties are protected.

Proposition 4. *The conflicting clause contract in Definition 2 implements the first best investment levels i^*, j^*, by setting $r_d = r(s_2, p(s_2))g(i^*)$ and $\pi_d = \pi(s_2, p(s_2))\pi(j^*)$.*

Proof. Consider the vendor's problem. The bargaining power α can vary by regime. From the vendor's perspective, nature's choice of α depends on the payoffs – case by case – but ultimately the payoff in s_1 and s_3 is higher than that in s_2. We can solve for the choice of investment and nature's distribution over regimes.

Consider if $\delta_{s_3} = 1$ and $\alpha = 0$. The vendor will invest $\tilde{i}$ so that:

$$\pi_3 f(j^*) - r_3 g(\tilde{i}) + r_2 g(i^*) = \pi_2 f(j^*)$$

Consider if $\delta_{s_1} = 1$ and $\alpha = 1$. The vendor will invest $\hat{i}$ so that:

$$\pi_1 f(j^*) - r_1 g(\hat{i}) + r_2 g(i^*) = \pi_1 f(j^*)$$

So our problem is effectively restrained to $[\sup\{\tilde{i}, \hat{i}\}, \bar{i}]$. But note that $\sup\{\tilde{i}, \hat{i}\} \leq i^*$. The vendor's objective function is

$$\max_{i \in [\underline{i}, \bar{i}]} t - \phi(i) - \delta_1 r_2 g(i^*) - \delta_2 r_2 g(i) + (1 - \delta_1 - \delta_2) r_2 g(i^*)$$

The vendor's response function can be derived. Nature will minimize when $\delta_2 = 1$. We can similarly solve for the buyer's problem. □

References

Aghion, P., M. Dewatripont, and P. Rey (1994): "Renegotiation Design with Unverifiable Information," *Econometrica*, 62, 257–282.

Bolton, P. and A. Faure-Grimaud (2010): "Satisficing Contracts," *The Review of Economic Studies*, 77, 937–971.

Burton, S. J. (2009): *Elements of Contract Interpretation*, Oxford University Press.

Carroll, G. (2019): "Robustness in Mechanism Design and Contracting," *Annual Review of Economics*, 11, 139–166.

Che, Y.-K. and D. B. Hausch (1999): "Cooperative Investments and the Value of Contracting," *American Economic Review*, 89, 125–147.

Chung, T.-Y. (1991): "Incomplete Contracts, Specific Investments, and Risk Sharing," *Review of Economic Studies*, 58, 1031–1042.

Gilboa, I. and D. Schmeidler (1989): "Maxmin Expected Utility with Non-Unique Prior," *Journal of Mathematical Economics*, 18, 141–153.

Gilson, R. J., C. F. Sabel, and R. E. Scott (2014): "Text and Context: Contract Interpretation as Contract Design," *SSRN Electronic Journal*.

Grossman, S. J. and O. D. Hart (1986): "The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration," *Journal of Political Economy*, 94, 691–719.

Hart, O. and J. Moore (1988): "Incomplete Contracts and Renegotiation," *Econometrica*, 56, 755–785.

——— (1999): "Foundations of Incomplete Contracts," *The Review of Economic Studies*, 66, 115–138.

——— (2008): "Contracts as Reference Points," *The Quarterly Journal of Economics*, 123, 1–48.

Jakobsen, A. M. (2020): "A Model of Complex Contracts," *American Economic Review*, 110, 1243–1273.

Kreps, D. M. (1992): "Static Choice in the Presence of Unforeseen Contingencies," in *Essays in Honour of F. Hahn, P. Dasgupta et al Eds.*, MIT Press.

Maskin, E. and J. Tirole (1999): "Unforeseen Contingencies and Incomplete Contracts," *The Review of Economic Studies*, 66, 83–114.

Miao, J. and A. Rivera (2016): "Robust Contracts in Continuous Time," *Econometrica*, 84, 1405–1440.

Mukerji, S. (1998): "Ambiguity Aversion and Incompleteness of Contractual Form," *The American Economic Review*, 88, 1207–1231.

Schwartz, A. and R. E. Scott (2010): "Contract Interpretation Redux," *SSRN Electronic Journal*.

Segal, I. (1999): "Complexity and Renegotiation: A Foundation for Incomplete Contracts," *The Review of Economic Studies*, 66, 57–82.

Shur-Ofry, M. and O. Tur-Sinai (2015): "Constructive Ambiguity: IP Licenses as a Case Study," *University of Michigan Journal of Law Reform*, 48, 391–435.

Tirole, J. (2009): "Cognition and Incomplete Contracts," *American Economic Review*, 99, 265–294.