Why Use Requirement Contracts? —To Avoid Hold-Up and Litigation

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Abstract

A requirements contract is a form of exclusive dealing in which the buyer promises to buy only from one seller if he buys at all. This paper models a most common-sense motivation for such contracts: that the buyer wants to ensure a reliable supply at a pre-arranged price without any need for renegotiation or efficient breach. This requires that the buyer be unsure of his future demand, that a seller invest in capacity specific to the buyer, and that the transaction costs of revising or enforcing contracts be high. Transaction costs are key, because without them a better outcome can be obtained with a fixed-quantity contract. The fixed-quantity contract, however, requires breach and damages. If transaction costs make this too costly, an option contract does better. A requirements contract has the further advantage that it evens out the profits of the seller across states of the world and thus allows for an average price closer to marginal cost.

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This is a shortened draft to circulate for Harvard's I.O. workshop. I intend to change the notation over the weekend and to pin down a certain stubborn inequality. Thus, I've left out most of the equations.

1. Introduction

In a requirements contract, the buyer agrees to purchase all of his requirements for a particular product from a given supplier for a specified length of time. This is one of the forms of exclusive dealing contracts, which have been much studied because they have a number of motivations, some efficiency-enhancing and some strategic (see Ramseyer & Rasmusen (2015) for a summary). One of the classes of efficiency-enhancing motivations is ways that exclusive dealing can help induce induce relationship-specific investments, a line of thought going back to Klein, Crawford & Alchian (1978, pp. 308-310 especially), Klein (1988), and Frasco (1991).

I will revisit this motivation and suggest that the main problem addressed by exclusive-dealing contracts is not the difficulty of determining whether a contract was performed, but the difficulty of determining damages from nonperformance.

The well-known hold-up problem is based on the difficulty of determining whether a contract was breached. Suppose the seller must make a specific investment. He will be reluctant to do so if the buyer can speciously claim the quality is low and refuse delivery except after the price is bargained down. If the seller has the exclusive right to supply the buyer, the buyer's outside option is closed off and he cannot bargain the seller down to as low a price. Exclusivity helps because courts cannot tell whether the correct product has been delivered but can tell which supplier delivers it. This is the theme of a literature based on the model of Hart & Moore (1990). Segal & Whinston (2000) model this with one seller and two buyers, one of whom can make a relationship-specific investment. In the three-person bargaining specification employed, a contract binding the seller and that buyer does not change the level of investment. De Meza & Selvaggi (2007) revisit the situation with a different bargaining specification and find that exclusivity does promote investment. Other papers in this literature are Bolton & Whinston (1993) on vertical integration for supply assurance and Noldeke and Schmidt (1995) on the use of option contracts. This is distinct

from another class of efficiency-enhancing reasons for exclusive-dealing based on providing incentives, e.g. Bernheim & Whinston (1998), Klein & Lerner (2007), and Marvel (1982). A typical incentive explanation is that if a retailer binds himself to sell only one manufacturer's produtc, then when the manufacturer advertises and brings customers to the retailer, the retailer cannot substitute another, higher-margin product for the manufacturer's.

In the present paper, neither hold-up because of unenforceability of delivery nor incentives for promotion will play a role. We will address the question of how the buyer chooses between an option contract (the buyer has the option to buy a specified amount at a specified price), a requirements contract (which adds exclusivity to the option contract) and a fixed-quantity contract (in which an exact price and quantity are specified). This question is appropriate for the most common kind of contractual situation, where a court can tell whether delivery took place or not. Like the Hart-Moore literature, we will be looking at contracts that are incomplete in the sense of failing to pin down quantity exactly, but in our context complete contracts will be feasible. Our goal will be to explain the absence of quantity terms in the contract. After the identity of the product, quantity is the most important term in a contract, the hardest for a court to fill in. A contract lacking price terms will be binding if courts think that a market price can serve as a default. Courts will fill in the price, and almost any other contract term, but not quantity.[1] The need to specify quantity does not exclude requirement contracts, however, which are specifically allowed. UCC 2-306, "Output, Requirements and Exclusive Dealings," says

> "(1) A term which measures the quantity by the output of the seller or the requirements of the buyer means such actual output or requirements as may occur in good faith,

[1]This is a basic principle of contract law. Price can be filled in by the court (Uniform Commercial Code 2-305), as can place of delivery (UCC 3-308), time of delivery (UCC 3-309) and time of payment (UCC 3-310). For an introduction to the law, see Martin Carrara "The Basics of U.C.C. Article 2 - Sales," http://news.acca.com/accnj/issues/2013-06-07/3.html.

> except that no quantity unreasonably disproportionate to any stated estimate or in the absence of a stated estimate to any normal or otherwise comparable prior output or requirements may be tendered or demanded.
> (2) A lawful agreement by either the seller or the buyer for exclusive dealing in the kind of goods concerned imposes unless otherwise agreed an obligation by the seller to use best efforts to supply the goods and by the buyer to use best efforts to promote their sale." An exception is made, however, for contracts which explicitly give one party the right to name the quantity, and the requirements contract is such a quantity.

In the standard model, the motivation for long-term contracts is the the seller's apprehension of hold-up, of being bargained down to a low price after he has sunk the cost of relationship-specific investment. A hotel chain builds a hotel next to an auto plant, and the auto company forces the price of a hotel room down to below average cost. Here, the motivation will also be hold-up, but on the opposite side: the the buyer will fear being held up because of the seller's relationship-specific investment. If the buyer needs a product with a specific investment and the seller is the only firm that makes the investment, the seller has monopoly power. Once one hotel chain builds a hotel next to the factory, no other hotel will enter and create head-to-head competition.

To avoid this kind of natural monopoly, if the buyer knows the exact quantity he wants he can contract for that quantity in advance, making various potential sellers compete to be the one to make the specific investment. If the buyer is less certain, but litigation and renegotiation are costless, we will see that a fixed-quantity contract is still a good choice for the buyer. A fixed-quantity contract does not constrain the parties to produce the quantity specified; it only provides a starting point for bargaining.

We will compare that with what happens when transaction costs are positive to get something close to the common-sense explanation

for requirements contracts: the buyer isn't sure how much he'll want to buy, and the seller wants exclusivity in exchange for letting the buyer keep his quantity option open. Careful modelling is necessary, however, to compare requirements contracts, option contracts, fixed-quantity contracts, and spot sale.

Since the explanation will appeal to transaction costs, it is useful to start with a true story that illustrates the kind of situation in which a requirements contract is used. *Jullie G. Horn v. United States*, United States Court of Federal Claims No. 07-655C (May 3, 2011), was a lawsuit over a 2005 contract between Jullie Horn and the Federal Bureau of Prisons. Horn was awarded a contract to provide professional dental hygiene services under the direction of the Dentist to the inmate population at the United States Penitentiary and Federal Prison Camp, Marion, Illinois. The contract specified that she was to provide a maximum of 1,560 one-hour dental hygiene sessions at a price of $32 per session. The contract was labelled a "REQUIREMENTS" contract in capital letters. It said,

> (a) This is a requirements contract for the supplies or services specified, and effective for the period stated, in the Schedule. The quantities of supplies or services specified in the Schedule are estimates only and are not purchased by this contract. Except as this contract may otherwise provide, if the Governments requirements do not result in orders in the quantities described as "estimated or "maximum in the Schedule, that fact shall not constitute the basis for an equitable price adjustment.

and

> (c) The estimated quantities are not the total requirements of the Government activity specified in the Schedule, but are estimates of requirements in excess of the quantities that the activity itself furnish within its own capabilities. Except as this contract otherwise provides, the Government shall order from the Contractor all of that activity's requirements for supplies and services specified in the schedule that exceed

> the quantities that the activity may itself furnish within its own capabilities.

One month later, after Horn had completed and been paid for 130 tooth-cleaning sessions, the dentist told her that he had hired an in-house hygienist and her services were no longer needed. She sued for breach of contract on the grounds that she had been awarded all of the prison's tooth-cleaning requirements.

The prison contract is the kind of requirements contract we are trying to explain. Why was there a contract at all, rather than hiring the hygienist session by session? Why wasn't the quantity pinned down precisely in the contract? Why was the contract exclusive rather than at the government's option? Note, too, that there was no attempt to use nonlinear pricing, that is, to set different per-hour prices for different quantities of hours. And there were no lump-sum transfers. The government could have used a contract in which Horn paid a lump sum to obtain the contract and then received a very large hourly fee so she would have ample incentive to make herself available for the marginal hours. We know nonlinear-price and two-part tariff contracts are unrealistic in a context like this, but knowing why they aren't used is more difficult than known they aren't.

I think a requirements contract was used for a relatively simple reason. The government wanted some kind of contract so it could be assured of supply at a low price rather than be faced later with no seller or with just one seller who could charge a monopoly price. A fixed-quantity contract would have required renegotiation later, since the goverment did not know its own future demand precisely. Renegotiation would take up management time and be subject to corruption. An option contract would not need renegotiation but it would need high prices to compensate for the hygienist's risk that the government would switch to buying from someone else. A requirements contract did not have these disadvantages. It does not require renegotiation, and the price that yields zero economic profit to the hygienist could be lower because with outside supply ruled out, she could expect a higher quantity of her services to be demanded. Of course it went wrong in

the end, which is why there was a lawsuit, but I will return to that at the end of the paper and describe what happened to Jullie Horn.

I will build two models, to model two aspects of relationship-specific investment: product development, and capacity. Product development would here be the problem that the hygienist might or might not succeed in providing satisfactory dental services at low enough personal cost and she did not know in advance whether this would happen. She might not be competent, or might dislike the town, or might dislike treating prisoners. Capacity would here be the problem that Mrs. Horn might not budget enough time to treat all the prisoners if the number with dental problems turned out to be higher than expected.[2] [3]

In the model, the buyer desires the seller to make a specific investment in dedicated capacity that will be useful if other firms in the marketplace happen to be unavailable. An easy way to get the first-best would be a contract in which the buyer agrees to a very high price, equivalent to its marginal consumer surplus when the social optimization problem is solved, combined with a large advanced fixed payment from the seller to the buyer to remove seller profit. We do not observe such contracts, perhaps because of seller illiquidity, perhaps because for agency reasons— it is dangerous for a seller firm to allow its manager to make contracts in which he pays out large lump sums in transfers for uncertain future cash flows. So we will rule out side payments in bargaining. We will also rule out nonlinear option contracts, in which the buyer pays more per unit if he buys more units, but has the option to choose whichever amount he wants once he knows the state of the

[2]Note that this illustrates a separate and distinct reason for exclusivity in the opposite direction— that the buyer wants the seller's full attention and loyalty. This is why many employers forbid moonlighting.

[3]I thought of starting with a third, very general model, in which the two I present here are nested. The algebra would be hideous, for no more results, and the referee would tell me to drop it. The reason to include it would be that if I didn't, a referee would tell me to include a more general model, but on seeing what appeared would be reluctant to reverse course and tell me to drop it. I've decided to take the non-strategic and low-effort course of not including it unless requested.

world. They would allow for a very high price for units unlikely to be demanded, to induce the seller to choose a high capacity, combined with a price below marginal cost for a low number of units so as to reduce seller expected profits to zero. This may require too much cleverness to be practical; again, it is hard for the buyer's top manager to monitor and is complex to set up.

A Unit Demand Model with a Specialized Product

We will start with a model in which the buyer demands either 0 or 1 unit, in style of the literature starting with Hart & Moore (1990). The production cost of the good is c, and it is produced by many firms. The buyer will value one unit of the good at v next period, distributed by $F(v)$ on the support $[0, \overline{v}]$. He will thus buy either one or zero units, depending on the price. Any firm may try to design a specialized product by investing I at the start, and with probability $g(I)$ it will succeed, where $g(0) = 0, g' > 0, g'' < 0$ for $I < \overline{I}$ and $g(\overline{I}) = 1$.

With probability θ, the specialized product is worth v to the buyer and the normal product is worth 0; with probability $(1 - \theta)$, either product is worth v to the buyer. The specialized product is worth 0 to any other customer.

We will assume that $I^*(decentralized) < \overline{I}$ and that $I = \overline{I}$ produces more social surplus than $I = 0$, as explained below. Both players are risk neutral. Each side captures half the surplus if bargaining takes place.

First, we will analyze the model as thus far described. Later, however, we will analyze it under the assumption that both buyer and seller feel that the reputational and transaction costs of breaching contracts are higher than any possible benefits. When we assume that breach costs are zero, that does not mean that breach prices are zero. If a player breaches, he will have to meet his legal obligations. Those legal obligations can be met at zero cost, however, by both parties. They do not need to hire lawyers, the managers do not need to discuss the

breach with each other or their subordinates, they do not need to estimate their own and the other party's costs from breach (either at the time of making the contract or after breach), and they do not need to haggle over out-of-court settlement.[4]

We will rule out nonlinear contracts by assumption— that is, rule a lump sum payment as part of the contract. This corresponds with reality, where we do not see contracts that provide the seller with a lump sum and a price equal to marginal cost, perhaps because of the risk that he would take the lump sum and then breach the loss-generating part of the contract. Carrol (2015) is a recent article on why this assumption is reasonable in some circumstances.

This first model does not allow for the possibility of overcapacity by the seller. It is a bit odd to try to model requirement contracts when the buyer needs at most 1 unit, so later we will look at a second model, in which the quantity demanded rises continuously as the price falls but demand can be high or low, depending on chance.

The First Best: Vertical Integration. The first best maximizes the sum of the negative investment costs, the surplus over marginal cost when the specialized product is needed and successfully produced, and the surplus when the specialized product is not needed. This is the surplus that would be achieved by vertical integration, if the buyer could make the investment and produce the product himself. We will denote this first-best investment as I^{**}. [Omitted]

The Decentralized Optimum: Price Equals Average Cost. Since we do not allow lump-sum payments, the seller makes losses and not participate if the price equalled marginal cost. In the "decentralized optimum", the seller's profit must be raised to zero by raising the price high enough to cover the fixed cost of investment, and the buyer cannot

[4]Note that this is different from the assumption in Hart & Moore (2008) that contactors feel cheated if their expectations are not met and so start shading on performance.

be forced to buy at that price. This is the "price equals average cost" equilibrium of rate-of-return regulation. Surplus will not be as high as in the first-best, since the buyer will buy less if the price is above marginal cost. [Omitted]

Spot Sale. With no contract, and thus no pre-set price, only one seller will invest, since if two do they would compete the price of the specialized good down to marginal cost, c.[5] The seller will have profit

$$\pi_{nc}(I) = -I + \theta g(I) \int_{\frac{v+c}{2}}^{\overline{v}} \Big(\frac{v+c}{2} - c \Big) f(v) dv \tag{1}$$

with first order condition

$$\pi'_{nc}(I) = -1 + \theta g'(I_{nc}) \int_{\frac{v+c}{2}}^{\overline{v}} \Big(\frac{v+c}{2} - c \Big) f(v) dv = 0 \tag{2}$$

If $p^* < (v+c)/2$ then the seller's profit will be positive and there will be moderate underinvestment compared to the decentralized optimum. If $p^* > (v+c)/2$, the seller's profit would be negative, so the problem has a corner solution and the first order condition is not relevant: the seller will choose $I = 0$ and there is severe underinvestment. This is the hold-up problem that provides a standard explanation for long-term contracts: if investment costs are sunk at the time of bargaining over price, then investment will be inefficiently low. Thus, we will assume that $p^* < (v+c)/2$ in this paper, to focus on the opposite problem: monopoly power of the seller that results from lack of a long-term contract.

Zero Breach Costs

We will now look at contracting, so breach costs will matter. We will assume breach costs are zero in this section. This does not mean that breach *prices* are zero. If a player breaches, he will have to meet his legal obligations. Those legal obligations can be met at zero real economic

[5] We will ignore the mixed-strategy equilibrium where two or more sellers invest with positive probability, with resulting waste and with the price either c or $\frac{v+c}{2}$.

cost to either party. Managers do not need to hire lawyers, discuss the breach with each other or their subordinates, estimate their own and the other party's costs from breach (either at the time of making the contract or after breach) or haggle over out-of-court settlement. This analysis will conclude with Proposition 1, which I also state here so the reader will know where we are going.

A Fixed-Quantity Contract, Zero Breach Costs. Consider a fixed-quantity contract with 1 unit and price $\overline{p}_{fq}$ (a contract for 0 units would be just like having no contract). There may be efficient breach by either side. If the buyer's value v turns out to be less than c he will breach. If the seller had succeeded in designing the specialized product, the buyer would pay damages of $(\overline{p}_{fq} - c)$ to the seller. If the seller had failed, the buyer would not have to pay damages, since under standard contract law delivery is necessary to trigger the buyer's requirement to pay.[6]

If the seller fails in designing the specialized product, he will pay compensatory damages of $v - \overline{p}_{fq}$ if the buyer values it at more than $\overline{p}_{fq}$, which has probability $(1-g(I))(1-\theta)\int_{\overline{p}_{fq}}^{\overline{v}} f(v)dv$.[7] Note that when the buyer does not need the specialized product, if the seller breaches by supplying the unspecialized product the buyer's damages are zero. The seller will thus have expected profit consisting of the cost of investment, the profit from selling if a normal product is satisfactory, the profit from selling the specialized product if the investment is successful, and the loss from breach damages if the investment is unsuccessful. [Omitted]

[6]UCC 2-507(1): "Tender of delivery is a condition to the buyer's duty to accept the goods and, unless otherwise agreed, to his duty to pay for them. Tender entitles the seller to acceptance of the goods and to payment according to the contract." https://www.law.cornell.edu/ucc/2/2-507.

[7]UCC 2-p511(1): "Unless otherwise agreed tender of payment is a condition to the seller's duty to tender and complete any delivery. " https://www.law.cornell.edu/ucc/2/2-511. There is the possibility of buyer bluff: the buyer shows up with payment, the seller does not perform, and the buyer claims damages. Expectation damages would be zero, however, because the buyer would actually lose by having the contract fulfilled.

The seller now has two incentives to make investment high. First, if the buyer needs the specialized product, the seller both gets his profit margin and avoids paying damages. Second, if the buyer doesn't need the specialized product, the seller gets the margin anyway. It is this second effect which both helps and hurts efficiency. It hurts as far as capacity is concerned, because it makes it excessive. It helps as far as the price is concerned, because it allows for a lower price.

An Option Contract, Zero Breach Costs. We could have an option contract at price $\overline{p}_{oc}$. Then only the seller breaches with positive probability in equilibrium. The seller will have expected profit composed of the profit from the specialized product minus the damages he pays the buyer if he fails in designing it and it would have been useful to the buyer minus the investment cost. [Omitted]

This is the same first order condition as for the decentralized optimum except that the price must be higher: $\overline{p}_{oc} > p^*$. That is because the seller makes a sale with lower probability— with probability $\theta g(I)$ instead of $1 - \theta + \theta g(I)$, and so to recover his investment cost he must charge a higher price. As a result, the amount of investment will also be smaller than in the decentralized optimum.

A Requirements Contract, Zero Breach Costs. We could have a requirements contract at price $\overline{p}_{rc}$. Again, only the seller has a positive probability of breaching in equilibrium. The seller will have expected profit composed of the profit when the buyer does not need the specialized product plus the profit from the specialized product minus the damages he pays when he fails in designing the specialized product and the buyer needs it minus the investment cost. [Omitted]

High Breach Costs

Now the players hate haggling and breaching. That means they will not breach. It is not worth the cost in legal and managerial costs.

Proposition 2: In the specialized-product model with high breach costs, the requirements contract is superior to both the fixed-quantity contract and the option contract.

A Fixed-Quantity Contract, High Breach Costs. We could have a fixed-quantity contract with 1 unit and price $\overline{p}$. The seller does not wish to breach, so he will choose $I = \overline{I}$, which is enough to guarantee success in producing the specialized product. Nor will the buyer breach. Thus, the seller's expected profit is

$$\pi_{fq}(I) \quad = (\overline{p} - c) - \overline{I} \tag{3}$$

Recall that the first-best condition for I is $\theta g'(I) \int_{\overline{p}}^{\overline{v}} \Big(\overline{p} - c\Big) f(v)dv - 1 = 0$. This makes I less than $\overline{I}$, so we now have overinvestment. [Omitted]

The buyer will be buying sometimes when the product is useless. The buyer, as in the case where there are no breach costs, will set ($\overline{p}$ so that seller profits are zero.

An Option Contract, High Breach Costs. We could have an option contract at price $\overline{p}$. As with the fixed-quantity contract, the seller will choose $I = \overline{I}$ to avoid the possibility of breach. [Omitted]

The buyer never has to buy an unwanted specialized product, so that source of welfare loss is absent. He will, however, have to pay indirectly for the excess investment, so this contract will not achieve the decentralized optimum. [Omitted]

A Requirements Contract, High Breach Costs. We could have a requirements contract at price $\overline{p}$. As with the other two contracts, the seller will choose $I = \overline{I}$ to avoid the possibility of breach. [Omitted]

A Model with Capacity Choice

The next explanation for requirements contracts relies on (a) the buyer's uncertainty of how much he needs, (b) his uncertainty over whether the market can supply his needs, and (c) his demand being at least slightly elastic. Thus we will use the following model.

The buyer's demand curve is the weak $q_w(p)$, $q'_w < 0$ with probability w and the strong $q_s(p), q'_s < 0$ otherwise, where $q_w(p) > 0$ and $q_s > q_w$ for any p but $q_s(p)$ is finite so that the monopoly price is finite [think about whether this is enough]. The inverse demand curves will be $p_w(q)$ and $p_s(q)$. The marginal cost is c. With probability θ, the outside market is "thin": the only production is by "the seller," who can sell up to k units if he has invested $I(k)$ before the states of demand and supply are revealed. With probability $(1-\theta)$,the market is "thick" and a competitive market will sell as many units as needed at a price of c, the marginal cost. Neither player knows the state of demand or supply at the time of contracting, and contracts cannot be conditioned on the seller's capacity. Later we will introduce the assumption that negotiations over prices or damages incur a prohibitive cost on both players, but we will not for the first part of the analysis. [Omitted]

If capacity were contractible, the seller would agree to install $k = k^{**}$ with a heavy penalty for breach, the buyer would have the option to choose any quantity up to k^*, and the price would be set to yield zero expected profits to the seller. Note that we allow the contract to condition on the state of demand, but that will not make any difference, for the reason explained in the unit demand model.

Contracts with Side Payments. If side payments are allowed, it is easy to attain the first best. One way is with a contract specifying a price of c, quantity at the option of the buyer, and a side payment of $S = \theta(1-w)\int_{k^{**}}^{q_s(c)}(p_s(q)-c)dq - I(k^{**})$. Under that contract, the seller's cash flows will be the payment of S with zero cash flow from sales of the product, and the loss of expectation damages paid to the buyer of $\int_k^{q_s(c)}(p_s(q)-c)dq$ if the seller chooses $k \leq q_s(c)$. [Omitted]

Contracts with Multiple Prices. Nonlinear pricing could also attain the first best, with a price of $p_a = c + \frac{I(k^{**})-(1-w)(p_b-c)k^{**}}{wq_w(c)}$ per unit for $q_w(c)$ units and p_b per unit for k^{**} units, with the buyer being required to buy one or the other quantity from the seller and $p_b = c + \theta p_s(k^{**})$. [Omitted]

We will henceforth rule out side payments and non-linear pricing—which just involves two prices in our model, but would involve an entire continuous price schedule if we had continuous states of the world. We will allow only a single price in a contract. Managers, it seems, have a strong desire for simplicity, or, if you like, our model will apply only to managers who do have such a desire. We will show later that requirements contracts can do reasonably well, and the managers may well be justified in wanting to reduce the number of dimensions of their optimization problem.

Spot Sale: No Contract At All. How about a spot sale? If two sellers invest in capacity, they will both have negative profits. If just one does, his expected profits are zero if the market is thick. If the market is thin, however, buyer and seller are in a bilateral monopoly. [Omitted]

Under our assumption of costless renegotiation, the buyer and seller will bargain to the efficient output level, $q_w(c)$ or k and choose the price to split the surplus. (If the seller chooses a price, or they can just bargain over a price and not quantity, then the price will be greater than c, so quantity will be inefficiently low, and k will be chosen lower too.)

A Fixed-Quantity Contract. How about a fixed-quantity contract with price $\overline{p}$ and quantity $\overline{q}$? Can we get the first-best? If $\overline{q}$ is set to k^*, then we can set $\overline{p}$ to do it. Note, first, that if $\overline{q} = k^*$ then if demand at price $\overline{p}$ is less than k^*, the buyer will breach the contract. He will purchase either $q_w(\overline{p})$ or $q_s(\overline{p})$ from the seller. If the market is thick

and demand is high, he will buy an additional $q_s(c) - \overline{q}$ at price c from the market.[8] [Omitted]

We do not quite get the first-best. The fixed-quantity contract will create distortion, because $\overline{p}$ will be greater than c, but only when the market is not thick, and this is unavoidable given that we need to compensate the seller for his fixed cost of investment. It is as with public utility rate of return regulation; unless we subsidize the firm (which we ruled out by ruling out lump sum transfers), we cannot avoid a price higher than marginal cost.[9]

An Option Contract. How about an option contract? This would specify a price $\overline{p}$ at which the seller is obligated to provide as much of the good as the buyer desires. [Omitted]

A Requirements Contract. How about a requirements contract? The seller will then definitely choose $k > q_w(\overline{p})$, since he is guaranteed that much in sales whether the market is thick or not. [Omitted]

[8] Alternately, if the market is thick, the buyer could purchase anywhere from 0 to $Max(q_w(c), \overline{q})$ or $Max(q_s(c), \overline{q})$ units from the seller, and buy as much more to add up to $q_w(c)$ or $q_s(c)$ from the market. For the first $\overline{q}$ units, buying from the seller costs $\overline{p}$, while buying from the marketplace costs the price c plus damages of $\overline{p} - c$, for a total cost which is also $\overline{p}$.

[9] With nonlinear pricing, another way to do this would be with a very high price for the first unit and a price of c for later units, but we have ruled that out by assumption too.

The Model with High Breach Costs

The fixed-quantity contract above is informationally demanding and vulnerable to transaction costs. If the buyer wishes to breach because demand is low, the damages he pays depend on c, the marginal cost of the seller. Realistically, they would also depend on whether the seller could sell at the contract price to some other buyer, thought that is not in the model. The seller's choice of k is based on the incentive that if it breaches, it will have to pay damages that depend on v, the marginal benefit of the buyer. Again, realistically, they would also depend on whether the buyer could have obtained the good at some price less than v even if the market were not thick. Not knowing these parameters is something of a problem for designing the contract, since it means that each side is vulnerable to the other side's superior information. The buyer knows less accurately than the seller what damages the buyer would pay in case of breach. The seller knows less accurately than the buyer what damages the seller would pay in case of breach. Trying to learn more or to deduce hidden information from the other side's behavior creates transaction costs. In addition, resorting to court to enforce contracts is costly, and so most cases settle— that is, the parties bargain, so again, bargaining is costly.

What a contract does, then, is to create a fixed price, a price which requires no future bargaining, and particular rights to buy and sell quantities, rights which again do not need future bargaining.

Thus, we will assume that neither player wants to breach. This seems like a strange assumption, but it is not so unrealistic to think that them manager would find the headache from the conflict and readjustment that occurs after breach to be less attractive than taking the loss from complying with the contract.

It's interesting that one's first thought is that it would be wonderful to have a world in which everyone keeps their contracts perfectly. Here, however, the outcome will turn out to be worse than in our case where transaction costs are low enough that efficient breach occurs.

A prohibitive transaction cost for renegotiation does not affect the first-best or the outcome with spot sales. It does affect the fixed-quantities contract, the option contract, and the requirements contract. [Omitted]

What Happened in *Horn v. United States*?

A paper's conclusion usually just restates the results, which can be done quickly here. Requirements contracts are useful when the buyer is unsure of his needs, wishes to avoid the possibility of being caught with no supplier or just one, and has a strong desire to avoid having to think about seller costs or buyer benefit again at a later time. If sellers know the range of possible demands as well as the buyer does, then the problem is not lack of investment, because a seller will provide for the buyer's need speculatively, but the buyer will pay a high price if no price has been arranged in advance. Nor is the problem just that the buyer is unsure of his needs, because a fixed-quantity contract can pin down a price and efficient breach would allow the quantity to be adjusted up or down. The cost of such breach in terms of managerial attention, however, is high enough that the buyer may prefer to pay extra for the option of deciding later how much to buy. This, in turn, leaves the seller vulnerable to being undercut by other sellers, so it will result in a high price unless they go one step further and make it a requirements contract, so that the seller will always earn the contract profit margin and the quantity he sells will depend only on the buyer's needs, not whether competitors are available.

Let us now return to *Horn v. United States*. It illustrates the peril of one party accepting the other party's standard-form contract. As I explained in my 2001 "Explaining Incomplete Contracts as the Result of Contract-Reading Costs," a party to a contract should be wary of complicated contract language, because it may contain concealed "booby trap" language and it is harder to carefully read a complex contract than to write one. Horn's contract contained such a booby-trap. It may even have been unknown to the particular federal officials who awarded her the contract, though the federal government has long

been aware of it. The judge reluctantly but without doubt ruled against Horn, saying,

> Although it appears that both parties entered into the contract with the intent to form a requirements contract, that fact cannot overcome the plain language of the contract. ...
>
> The contract makes clear that the BOP only intended to utilize Ms. Horn for the services it could not fulfill in-house, stating, the Government shall order from the Contractor all of that activitys requirements for . . . services specified in the schedule that exceed the quantities that the activity may itself furnish within its own capabilities.

The plain language of the contract was clear. It addressed the question of whether the government could satisfy its requirements internally, and said it could. Labelling the contract a "requirements contract" and both parties thinking of it as such could not overrule what was written. The crucial clause was not obscurely concealed, but reading a contract incurs a transactions cost, one lower than renegotiating but costly nonetheless. Horn's skipping the cost of reading the contract meant she incurred the cost of abiding by it. Indeed, it may have been precisely because of her mistake that she won the contract award; this may be an example of the winner's curse.

Horn's fallback argument was that this was an "indefinite quantities contract", an option contract giving the buyer the option of a range of quantities, so that even if the prison was justified in meeting some of its requirements internally it still was under an obligation to let her fulfill some too. Again, the plain language of the contract was decisive. The judge said,

> In order for an indefinite quantities contract to be enforceable, it must: (1) specify the period of the contract; (2) specify the total minimum and maximum quantity of supplies or services for the Government to purchase; and (3) include a statement of work. See FAR 16.504(a)(4)(i)-(iii); see also *Varilease Tech. Group, Inc.*, 289 F.3d at 799-800. Without

> an expressly stated minimum quantity purchased by the contract, however, an indefinite quantities contract fails for lack of mutuality and consideration because it does not specifically define the parties obligations under the contract. See, e.g., *Maxima Corp. v. United States*, 847 F.2d 1549, 1557 (Fed. Cir. 1988) (noting a minimum quantity clause serves to ensure mutuality of obligations and to make the contract enforceable by both parties to it)."

The judge was, however, quite critical of the Government, despite ruling in its favor. Apparently, this misleading language has been deceiving unwary government contractors for over seventy years.

> It is unfortunate that the Government has continued to use this standard form document that appears to the non-legal reader as a binding contract, but is in fact not. It is clear that this document misled Ms. Horn into believing she had an agreement with the Government when, in reality, the agreement was unenforceable. More to the point, even the Government officials with whom she dealt did not seem to understand the documents lack of enforceability. This point is particularly troublesome to the Court. While there are certainly instances where a contract contains a latent defect rendering it unenforceable, this is not the case here. As early as 1929, the Supreme Court put the Government on notice that this type of contractual language created an unenforceable instrument. See *Willard, Sutherland & Co.,* 262 U.S. at 493. In 1984, the Court in *Ralph Constr. Inc.* similarly declared an indefinite quantities contract unenforceable that contained seemingly identical FAR language. See *Ralph Constr. Inc.,* 4 Cl. Ct. at 731-32. Yet, more than a quarter of a century later, these FAR provisions are still rendering contracts unenforceable and unsuspecting contractors are being denied the opportunity to pursue what may be meritorious claims.

The Horn case illustrates transaction costs in a variety of ways. The government wanted to obtain teeth-cleaning services at a low price by awarding a contract in advance of knowing the quantity that would be demanded. It used a simple, one-price contract, with no signing fee for either side, keeping complexity down. And it used a form of requirements contract, to induce the provider to focus her attention on the prison's needs first. But the bureaucrats in Washington had written a requirements contract with an out, allowing the prison to hire a provider internally. Perhaps this would have been efficient even if it had been clear to both sides, but presumably the price would have been higher. I hope that Horn did not turn down attractive alternative employers in reliance on the contract, but this shows that the longer the contract, the greater the danger to the side that did not write it.

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