Chapter 4
The Elements of a Valid Contract

1. Coercion: The Holdup Problem

Consider the scenario in the *Geobel v. Linn* case. A brewery wishes to make an initial investment, x, (representing the amount of beer to brew) that will yield total revenue of $V(x)$, where $V'>0$ and $V''<0$. Once invested, x is sunk (i.e., non-salvageable). The production process also requires an essential input (ice), the cost of which is not known at the time x must be chosen. Specifically, let C be the cost, which is a random variable with known probability distribution $F(C)$, where $F'\equiv f>0$.

Social Optimum. The social optimum involves two decisions: first, the choice of x by the brewery, given uncertainty about C, and second, the decision about whether or not to deliver the ice once C is realized. We consider these choices in reverse order of time.

Once C is realized, it is efficient for the ice to be delivered if $V(x)\geq C$; that is, if the revenue from sale of the beer exceeds the cost of delivery. Note that the cost of x is irrelevant to this choice because it is a sunk expenditure. As shown in Figure 4.1, delivery should proceed if $C\leq C^*$.

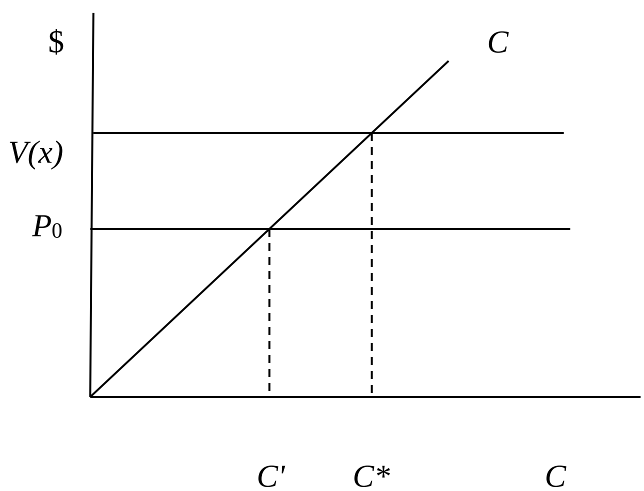

Figure 4.1. The holdup problem.

Now move back to the choice of x. Given the expected delivery decision, the optimal choice of x maximizes the expected surplus, given by

$$F(V(x))E[V(x)–C \mid V(x)\geq C] – x$$

$$= \int_0^{V(x)} [V(x) - C] f(C) dC - x. \quad (4.1)$$

The resulting first-order condition is

$$F(V(x))V'(x) – 1 = 0, \quad (4.2)$$

which defines x^*.

Determination of the Price of Delivery. According to the facts of *Goebel*, the parties had negotiated a price to be paid on delivery of the ice. Let that initial price be P_0. As the situation unfolded, the realized cost exceeded this price (i.e., $C>P_0$), which precipitated the renegotiation. According to Figure 4.1, as long as the cost falls in the range between C' and C^*, delivery is still efficient, and renegotiation ensures that it will take place. This scenario apparently reflects the facts of the *Goebel v. Linn* case.

Suppose, however, that realized costs were below P_0. This reflects the situation in *Alaska Packers' v. Domenico*, where the cost of fishing had not changed between the time the wage was negotiated and the ship arrived at the fishing grounds. Thus, a price increase was *not* necessary to make performance profitable for the workers—it merely redistributed the gains from trade in their favor. The problem is that once the beer is brewed, or the ship is at sea, the brewery/ship owner is vulnerable to a threat of a holdup.

To see the impact of this threat, suppose that the holdup succeeds and the parties negotiate the price of delivery after C is realized, maintaining the assumption that delivery proceeds whenever it is efficient (i.e., for all $C\leq C^*$). Assuming ordinary Nash bargaining, the new price, P, solves

$$\max_P (V(x) - P)(P - C), \quad (4.3)$$

taking as given x and C. The resulting price is

$$P = \frac{V(x) + C}{2}. \quad (4.4)$$

Now reconsider the brewery's prior choice of x in anticipation of this later bargaining. It will choose x to maximize its expected profit:

$$F\big(V(x)\big)E(V(x) - P \mid V(x) \geq C) - x, \quad (4.5)$$

where P is given by (4.4). Substituting yields

$$\int_0^{V(x)} \left(\frac{V(x)-C}{2}\right) f(C)dC - x. \qquad (4.6)$$

The resulting first-order condition for *x* is

$$\frac{F\big(V(x)\big)V'(x)}{2} - 1 = 0. \qquad (4.7)$$

Compared to (4.2), this shows that the brewery underinvests in beer compared to the efficient level. This is the inefficiency due to the holdup problem.

One solution to this problem is for the parties to make an enforceable commitment to the initial price, P_0. If it turns out that $P_0<C$, the contract should then proceed as planned. There are two problems with this solution, however. First, it may be too costly to enforce P_0, as was apparently the case in both *Alaska Packers'* and *Goebel*. The other problem is that strict enforcement of P_0 does not allow for efficient renegotiations, such as when C is between C' and C^* (which was the case in *Goebel*). Here is where the "Posner rule" is applicable. In cases of contract modification, where the parties have renegotiated the original price under threat of a holdup by one of the parties, the court should (i) reinstate the original price if $C \le P_0$ (the situation in *Alaska Packers'*), but (ii) allow a new price that does not exceed the realized cost (i.e., $P=C$) if $C>P_0$. Under this rule, the party making the initial investment choice will maximize

$$F(P_0)(V(x)-P_0) + \int_{P_0}^{V(x)} (V(x)-C)f(C)dC - x. \qquad (4.8)$$

The first term is the brewery's profit in the state where the original price is reinstated, and the second is its profit under the renegotiated price which reflects the actual cost increase. The resulting first-order condition for *x* is identical to that in (4.2), and the efficient outcome is achieved.

2. Mistake

These notes generalize the numerical example presented in the text. Let

V_F = value of a fertile cow;
V_I = value of an infertile cow;
a = fraction of fertile cows in the population.

The expected value of a randomly chosen cow is therefore $\bar{V} = aV_F + (1-a)V_I$.

Purely distributive information. In this case, the true nature of the cow is eventually revealed through no effort by the parties after the contract is made but before delivery (as was true in *Sherwood v. Walker*). If the original price is set at the cow's expected value ($P=\bar{V}$) and the contract is enforced, the buyer's expected return is

$$a(V_F-P)+(1-a)(V_I-P) = 0, \quad (4.9)$$

while seller's return is $P=\bar{V}$. Thus, the joint return is $\bar{V}$.

If the contract is not enforced, $P=V_I$ since any cows that turn out to be fertile must be returned to the seller. Thus, the buyer's expected return is

$$(1-a)(V_I-P) = 0, \quad (4.10)$$

while the seller's expected return is

$$aV_F + (1-a)P = \bar{V}. \quad (4.11)$$

Again, the joint return is $\bar{V}$, which shows that the enforcement rule has no effect on social value.

Now suppose that the buyer can test for fertility at cost c prior to entering a contract, and that he can withhold the results of the test. Thus, the test gives the buyer *foreknowledge* of the cow's type. As a result, he will only contract to buy fertile cows. If the contract is enforced, the price is $P=\bar{V}$ as above, and the buyer's expected return from conducting the test is

$$a(V_F-P)-c = a(1-a)(V_F-V_I) - c \quad (4.12)$$

which may be positive or negative. Suppose it is positive, so the buyer conducts the test. The expected return for the seller is

$$aP+(1-a)V_I\ . \quad (4.13)$$

The joint return is the sum of (4.12) and (4.13), or $\bar{V}-c$, which is just the expected value of the cow less the cost of the test. Thus, while the test is privately valuable to the buyer (by assumption), it is *socially wasteful*. This is true because the test does not change the use of the cow, only the party who ends up with it.

Now suppose the contract is not enforced. In that case, the buyer will never conduct the test, and the joint return will be $\bar{V}$ as above (given that the cow's type is revealed even without the test). Thus, enforcing the contract is inefficient in this case because it induces buyers to conduct wasteful testing.

Socially valuable information. Suppose both parties believe the cow is infertile and information about the cow's true nature will *not* come out, absent the buyer's test. Thus, all cows not identified by the buyer as fertile will be slaughtered. In this case, $P=V_I$ for untested cows.

If contracts are enforced, the buyer's expected return from conducting the test is

$$a(V_F – P) – c = a(V_F – V_I) – c. \tag{4.14}$$

Assume this is positive so the buyer conducts the test. Note that this expression is positive if and only if the test is in fact socially valuable. The expected return for the seller is

$$aP + (1 – a)V_I = V_I \tag{4.15}$$

Adding (4.14) and (4.15) yields the joint return, $\bar{V} – c$, which is the same as above.

If the contract is not enforced, the buyer will not conduct the test, and the cow will be slaughtered. The resulting value is V_I, regardless of the cow's true type. Comparing this to the return under enforcement, we find that enforcement enhances the value of the cow in this case if $\bar{V} - c > V_I$, which coincides exactly with the condition for (4.14) to be positive. Enforcement of the contract therefore enhances the value of the cow precisely because it induces the seller to undertake efficient testing.