TIROLE, CHAPTER 4: VERTICAL RESTRAINTS

30 November 2006. Eric Rasmusen, Erasmuse@indiana.edu. Http://www.rasmusen.org.

TERMS

HORIZONTAL RESTRAINTS: All sellers of peanuts agree to sell at the same price.

VERTICAL RESTRAINTS: A seller of peanut butter agrees to buy all the peanuts a particular farmer wants to sell, at an agreed-upon price.

MANUFACTURER, WHOLESALER, RETAILER, and CONSUMER: The Manufacturer makes the product and sells it to the Wholesaler, who resells to the Retailer, who resells to the Consumer. (not in Tirole)

VERTICAL INTEGRATION: The manufacturer and wholesaler are combined into one firm. Or the wholesaler and retailer are combined. Or the retailer and consumer are combined. And so forth.

This can be a tricky idea. If the makers of tires and cars merge, is that vertical integration? How about makers of telephones and providers of telephone service? Inputs are complementary to each other, but ultimate consumption goods can also be complements.

UPSTREAM AND DOWNSTREAM FIRMS: The Upstream firm sells to the Downstream firm, which sells to the ultimate consumer.

CONTRACT TERMS

LINEAR PRICE: The buyer pays Px for x units– the same price for each unit he buys. No quantity discounts.

If resale is possible, linear prices are the only practicable prices.

FRANCHISE FEE. The buyer pays amount F to be able to buy any positive quantity, besides any price per unit. (not a standard term)

TWO PART TARIFF: The buyer pays fixed amount F plus price P per unit. Walter Oi article–The Disneyland Dilemma.

RESALE PRICE MAINTENANCE (RPM): The buyer agrees to resell the product at an agreed-upon price.

QUANTITY FIXING: The buyer agrees to restrictions on how much he can buy– maybe a maximum, maybe a minimum, maybe a fixed amount. (not a standard term)

REQUIREMENTS CONTRACT: The buyer must only buy from this seller, not from other sellers. (He must satisfy all his requirements from this one seller.) But he doesn't have to buy anything.

EXCLUSIVE DEALING: Usually a requirements contract (the buyer can only buy from this one seller), but could restrict the seller (if the seller sells to this buyer, he can't sell to other buyers). I don't like Tirole's p. 173 definition of this.

CONTRACT TERMS–NOT PRICE OR QUANTITY

EXCLUSIVE TERRITORIES: The buyer can resell only within a certain region.

TIE-INS: If a buyer buys one product from the seller, he must buy another product too.

BUNDLING: A type of Tie-In in which the buyer must buy a fixed proportion of product X to product Y if he buys anything from the seller.

THREE IDEAS

All three of these ideas boil down to the problem that if the manufacturer and the retailer share the profits from sale to the consumer then each one has insufficient incentive to maximize their joint profits.

DOUBLE MARGINALIZATION (Chain of Monopolies– a less common term, though a better one) (Spengler, 1950, JPE) (Example 1, p. 174): If a manufacturer with market power charges a high price to a retailer who also has market power (in the retail market), the retailer will decide not to sell much to the consumer, reducing profits from what they would be if the two firms were merged.

DOWNSTREAM MORAL HAZARD (Example 2, p. 177): This is like any moral hazard. The downstream firm (the retailer) doesn't work hard to sell the product. The retailer doesn't get all the benefit from advertising, so he doesn't advertise enough.

There is an upstream moral hazard problem too, as Tirole mentions. The wholesaler doesn't get all the benefit from advertising, so he doesn't advertise enough.

INPUT SUBSTITUTION (Example 3, p. 179): If one input is priced high, the buyer will reduce use of it, inefficiently. To maximize the profit of the input-seller, the input ought to be used efficiently.

DOUBLE MARGINALIZATION I

DOUBLE MARGINALIZATION (Chain of Monopolies– a less common term, though a better one) (Spengler, 1950, JPE) (Example 1, p. 174): If a manufacturer with market power charges a high price to a retailer who also has market power (in the retail market), the retailer will decide not to sell much to the consumer, reducing profits from what they would be if the two firms were merged.

I have changed the notation some. Suppose we have an upstream union (= the manufacturer) and downstream retailer. Neither has any competitors. The union picks a wage w at which to sell labor L. Labor has constant marginal cost of $c < 1$ (think of it as opportunity cost.) Ultimate demand is $D(P) = 1 - p$, and the retailer adds no value. One hour of labor produces one hour of output: $f(L) = L$.

1. The upstream union picks w to maximize

$$(w - c)L(w) \tag{1}$$

2. The retailer picks p to maximize

$$(p - w)(1 - p). \tag{2}$$

Let's find the equilibrium.

DOUBLE MARGINALIZATION II: Non-Integration

1. Upstream union picks w to maximize

$$(w - c)L(w) \tag{3}$$

2. Retailer picks p to maximize

$$(p - w)(1 - p). \tag{4}$$

Work back from the end of the game. The retailer's first order condition yields

$$p = \frac{1 + w}{2}. \tag{5}$$

Thus, demand for the final good is

$$q = 1 - p = 1 - \frac{1 + w}{2} = \frac{1 - w}{2} \tag{6}$$

and retailer profit is

$$\left(\frac{1 - w}{2}\right)^2. \tag{7}$$

The upstream union picks w to maximize

$$(w - c)\left(\frac{1 - w}{2}\right) \tag{8}$$

which yields

$$w = \frac{1 + c}{2}. \tag{9}$$

Thus, from our earlier equation for p,

$$p = \frac{1 + w}{2} = 1/2 + (\frac{1 + c}{2})/2 = 3/4 + c/4 = \frac{3 + c}{4}. \tag{10}$$

Then retailer profit is

$$\left(\frac{1 - w}{2}\right)^2 = \frac{(1 - c)^2}{16} \tag{11}$$

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and upstream union profit is

$$\frac{(1-c)^2}{8} \tag{12}$$

for a total industry profit of

$$\frac{3(1-c)^2}{16}. \tag{13}$$

DOUBLE MARGINALIZATION III: Integration

DOUBLE MARGINALIZATION (Chain of Monopolies– a less common term, though a better one) (Spengler, 1950, JPE) (Example 1, p. 174): If a manufacturer with market power charges a high price to a retailer who also has market power (in the retail market), the retailer will decide not to sell much to the consumer, reducing profits from what they would be if the two firms were merged.

Non-integration, we earlier found, yields a total industry profit of

$$\frac{3(1-c)^2}{16}. \tag{14}$$

from choices of $w = \frac{1+c}{2}$ and $p = \frac{3+c}{4}$.

If the industry were integrated, it would choose $w = c$ and maximize by choice of p

$$(p-c)(1-p), \tag{15}$$

so

$$p = \frac{1+c}{2} \tag{16}$$

and profit is

$$\frac{(1-c)^2}{4} = \frac{4(1-c)^2}{16} \tag{17}$$

which is a lower w, a lower p, and a higher profit than under divided ownership. Consumer surplus is higher too, since p is lower.

Under integration, the central manager is using Authority instead of the Market (remember Coase 1937). He is saying that the Upstream firm (the union) must accept a low price and 0 profits so as to increase the profit of the Downstream firm. The Upstream managers might not like that.

Or, you could say the central manager is using markets, in a way, by setting a Transfer Price of $w = c$. He doesn't have to pick L directly.

Suppose the upstream union could sell some L to the downstream firm and some to buyers in an unrelated industry. The central manager, maximizing total profit, would let the upstream union set $w_u > c$ for the unrelated buyers, but keep $w_d = c$ to the downstream firm. This might cause even more grumbling by the Upstream manager.

Another way to look at this is that the upstream union and the downstream firm are selling highly complementary goods to the consumer. To consume the labor that goes into a widget, the consumer

must also consume the retailing services that go into it. Recall that independent monopolists sell complementary goods at too high a price and both can benefit from reducing the price. The difference is that here the upstream union chooses its price first and the downstream firm reacts— like Stackelberg instead of Cournot quantity choice.

DOUBLE MARGINALIZATION SOLUTIONS

1. A franchise fee. A two part tariff. Set $w = c$ and add a fixed union-fee A that takes away all the retailer's profit.

2. Resale price maintenance. Require that the price charged by the downstream retailer be no higher than the optimal integrated price:

$$p \le p^m \equiv \frac{1 + c}{2}.$$

This is a price ceiling, not a floor. Then set $w = \frac{1+c}{2}$. The retailer will earn zero profit.

In both examples, the retailer earns zero profit, the result of the upstream union having all the bargaining power. What if union and retailer have equal bargaining power? Then the franchise fee that downstream pays upstream would be A/2, and under resale price maintenance the payment goes the other way: the upstream union would pay the downstream firm A/2.

We didn't have effort in the model above. Resale price maintenance has a problem: since the retailer can't charge a higher price, he has no incentive to exert effort to keep quality high. How about the franchise fee ? What if the upstream firm needs to exert quality effort too?

INPUT SUBSTITUTION I

INPUT SUBSTITUTION (Example 3, p. 179): If one input is priced high, the buyer will reduce use of it, inefficiently. To maximize the profit of the input-seller, the input ought to be used efficiently.

Suppose we have an Upstream union (= the manufacturer) and Downstream retailer. The union picks a wage w at which to sell labor L. The Downstream firm chooses how much labor L and capital K to buy, where the price of capital is fixed at r, and produces output $f(K, L)$ which it sells at $p(f)$ per unit. Labor has a constant marginal cost of c (think of it as opportunity cost.)

1. The Upstream union picks w to maximize

$$(w - c)L(w) \tag{18}$$

2. The downstream firm picks K and L to maximize

$$p(f(K, L))f(K, L) - wL - rK \tag{19}$$

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INPUT SUBSTITUTION II

Work back from the end of the game. The downstream firm's first order conditions are

$$\frac{d\pi}{dK} = \frac{dp}{df}\frac{\partial f}{\partial K}f + p\frac{\partial f}{\partial K} - r = 0 \tag{20}$$

and

$$\frac{d\pi}{dL} = \frac{dp}{df}\frac{\partial f}{\partial L}f + p\frac{\partial f}{\partial L} - w = 0, \tag{21}$$

which means that K and L are chosen so that

$$\frac{\frac{\partial f}{\partial K}}{\frac{\partial f}{\partial L}} = \frac{r}{w}. \tag{22}$$

The last equation can be solved for L, if we have specific functional forms, to yield a function $L(r, w)$.

The upstream union uses that function to solve its own problem of maximizing profit by choice of w. For our purposes, all we need to see is that in doing this, the upstream union will pick $w > c$. This is easy to see, because $w \leq c$ will yield zero or negative payoff to Upstream, while there do exist values of w greater than c that yield positive profits.

Once we have solved for the equilibrium value of w, we could find the equilibrium values of K, and L if we had a specific functional form for $f()$. After that, we would discover the equilibrium value of $f(K, L)$. Let's call that equilibrium value under nonintegration Q_n.

$$\frac{\frac{\partial f}{\partial K}}{\frac{\partial f}{\partial L}} = \frac{r}{w}.$$

We know from basic price theory that to minimize the costs of producing some fixed quantity such as Q_n by choice of K and L that have social costs r and c it must be true that

$$\frac{\frac{\partial f}{\partial K}}{\frac{\partial f}{\partial L}} = \frac{r}{c}. \tag{23}$$

The Downstream firm will not pick K and L to do that. Rather, since $w > c$, it will use less L than it should and more K to produce Q_n. If the Downstream and Upstream firms were integrated and decided to produce Q_n, L would be bigger and K would be smaller, and total profits would be higher, since revenue from ultimate consumers would be the same but the production cost would be lower.

DOUBLE MARGINALIZATION AND INPUT SUBSTITUTION

But there is a second problem. Q_n is too small to maximize industry profits. We still have Double Marginalization as a problem here. The integrated firm would have a lower marginal cost of production, because it would use K and L in cost-minimizing proportions. So it would choose a bigger $f(K, L)$.

(It might even have both *K* and *L* higher, I think–certainly L is higher and *f* is higher.) Let's call that value Q^*.

What can the firms do about these problems by contracting, even if they do not merge? We now have two distortions (wrong K/L ratio and wrong Q), the contract may (but need not) need two "instruments" to get to the first-best.

INPUT SUBSTITUTION AND DOUBLE MARGINALIZATION SOLUTIONS

1. Franchise fee. Two part tariff.

Set $w = c$ and add a fee A that takes away all the Downstream firm's profit.

Here, two policy instruments are not needed to attain efficiency. Instead, this is "selling the store" or "making Downstream the residual claimant," and the second instrument, the fee, is just being used to transfer wealth, not to induce efficient behavior.

2. A Tie-In Plus Resale Price Maintenance

Let's introduce something new: a tie-in.

The Upstream union wants it to be true that

$$\frac{\frac{\partial f}{\partial K}}{\frac{\partial f}{\partial L}} = \frac{r}{c}. \tag{24}$$

So what it can do is say that if the Downstream firm buys any labor *L* from it, Downstream must buy *K* from it too, and in just the right proportion so the cost-minimization condition is satisfied. Thus, maybe the Downstream firm has to buy 2 units of K whenever it buys 1 unit of L.

The tie-in will not by itself solve the double marginalization problem. The contract must also require that $p \leq p(Q^*)$. That will induce the Downstream firm to produce Q^*.

This is not a simple tie-in. It is a tie-in with an exclusivity clause. Otherwise, Downstream would buy both K and L from upstream, and then buy more K from someobdy else.

Tie-ins (and bundling) are also much used with ultimate consumers as a sort of variant on price discrimination. Joe will pay (10,3)= 10 for movie 1 and 3 for movie 2; Mary will pay (4, 9), Sam will pay (0,11). Charge 13 for a bundle of two movies and 11 for either movie individually, and the seller can get all the surplus.

INPUT SUBSTITUTION AND DOUBLE MARGINALIZATION SOLUTIONS: FRACTIONAL LICENSE FEES

3. Fractional License Fees (Not in Tirole)

Set $w = c$ but require the Downstream firm to pay fraction θ of its profit (not revenue) to the Upstream firm.

This will attain the first-best, though it will not maximize Upstream's profit unless $\theta = 1$, in which case it is close to being method (1)–the franchise fee/two-part-tariff.

If Upstream and Downstream both had positive bargaining power, this would be a good contract for them to use. (Or they could use contract (1) with a smaller lump sum payment.)

4. Royalties. How about a a fixed royalty rate in which Downstream pays Upstream a royalty of t per unit of output, or fraction t of revenue, on top of an upstream wage of $w = c$?

On page 181, Tirole is a bit confusing about this. A Royalty will not attain the first-best if Downstream has market power. Then, either a per-unit or per-revenue royalty would induce Downstream to produce too little, since it would not get the entire benefit of the last unit produced. (Method (3) is a share of *profits*, not a royalty.)

What Tirole is saying on page 181 is that Royalties attain the first best **if the downstream industry is competitive, so Downstream has no market power**, a special case. Then there is no problem of double marginalization (though there is still a problem of input substitution). Setting $w = c$ solves the input substitution problem. Then, Upstream extracts profit by the "tax" of royalty t, setting it so that $c + t$ (if t is per-unit) equals the monopoly price for the downstream firm.

RESALE PRICE MAINTENANCE (RPM)

1. The Double Marginalization Motivation. We've just discussed that. Using RPM maximizes industry profit— and it helps consumers too, because the ultimate price to them is lower. (In this situation, a franchise fee works just as well.)

2. The Service Externality Motivation. Telser, Journal of Law and Economics, 1960. The manufacturer wants to induce the retailers to compete in quality, not price. So he requires a high price, and the retailers compete to provide good service, good information, nice environment, lots of variety. (Tirole, p. 183) (In this situation, RPM is better than a franchise fee.)

3. The Cartel Manager Motivation. Retailers use the manufacturer as a cartel manager. The manufacturer requires a high price, but this is just to create a retailer cartel that would not otherwise exist. The manufacturer might have no market power. (Tirole, p. 184) (In this situation, RPM is better than a franchise fee.)

WHEN IS EXCLUSIVE DEALING EFFICIENT?

1. To prevent **free riding.** The manufacturer does not want the retailer to sell both the manufacturer's and somebody else's product, with the other product free riding on the manufacturer's advertising and so forth. (Tirole, p. 185)

2. To prevent **quality dilution.** The manufacturer does not want the retailer to sell both the manufacturer's high-quality product and somebody else's low-quality product, confusing the consumer. Not in Tirole.

3. To prevent **hold-up** (not in this chapter of Tirole). If the retailer can only buy from this manufacturer, the manufacturer feels safer in investing.

4. To encourage the manufacturer **to promote the product.** If manufacturer ads induce consumers to visit the retailer, but then the retailer sells a competing product to them, the manufacturer does not get the benefit of the ads.

5. But sometimes exclusive dealing can be inefficient. The manufacturer wants to exclude rivals from selling to the retailers. Under special circumstances, exclusive dealing contracts can do this profitably. In Rasmusen, Ramseyer and Wiley (AER 1991), this works because rivals have a minimum efficient scale and can't find enough retailers to allow them to reach that scale.