April 8, 2017

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(1) The Hold-Up Problem Is Greatest When One Side of the Market Is Perfectly Competitive

(2) Competitive Hold-Up: Monopoly Prices Are Too High To Maximize Profits when Retailers or Complements Are Perfectly Competitive

(3) A New Cost of Monopoly: Hold-Up of Perfectly Competitive Retailers or Complementary Products

A New Cost of Monopoly: Hold-Up of Perfectly Competitive Retailers or Complementary Products

Eric Rasmusen (BEPP, Kelley School, Indiana University)

If a monopolist cannot commit to a wholesale price in advance, even competitive retailers will be reluctant to enter the market, knowing that once they have entered the monopolist has incentive to choose a higher price and reduce their quasi-rents. Retailers earn zero profits in the long run, but this hurts the monopolist by shifting in the retailer short-run supply curve. I call this "competitive hold-up". A similar problem occurs if the monopolist's product is sold directly to consumers but is complementary to a product sold by a competitive industry. This is not double marginalization or the two-monopoly complements externality.

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A Numerical Example of the Retailer Model

The upstream monopolist has constant marginal cost $a = 1$ which he will sell at wholesale price w per unit.

A continuum of length n of competing retailers with identical cost curves enter at cost $F = 1$. Each retailer chooses to sell $q(p)$ of the good at marginal cost $c(q) + w$, with $c(q) = q$ here.

Thus, retailers have U-shaped cost curves.

Let consumer market demand be linear for this example: $Q(p) = 1000 - 200p$.

Since retailers compete, and since free entry will make their profits equal to zero, all retailers must produce at exactly the minimum average cost. This is found by minimizing $\frac{.5}{q} + .5q + w$, which yields $q = 1$ per retailer.

Social Optimum

The social marginal cost of serving consumers equals the minimum average cost when the wholesale price is set to the wholesale marginal cost, so $w = a = 1$, in which case the average cost is $\frac{5}{1} + .5(1) + 1 = 2$.

If we set $p = 2$, then $Q = 1000 - 200p = 600$.

Dividing by $q = 1$ yields the quantity of retailers at the social optimum, $n = 600$.

This will yield zero profits to the monopolist since $w = a$ and zero profits to the retailers since retailer revenue of $pnq = (2)(6)(1) = 12$ equals the retailer cost of $n(.5+.5q^2+wq) = (6)(.5+.5(1)^2+1((1)) = 12$.

It will yield consumer surplus of $.5(5-2)(600) = 900$.

Proposition 1

If the upstream monopolist cannot precommit to his wholesale price before retailers enter, his price will be higher, sales lower, and profits lower.

As consumer surplus will also be lower, total surplus is lower than in a vertically integrated monopoly or a monopoly that can commit to wholesale prices.

Retailer behavior in equilibrium

A retailer's profit is

$$\pi_{retailer} = pq - \int_0^q c(x)dx - wq - F \tag{1}$$

Maximizing with respect to quantity yields price equals marginal cost:

$$p = c(q) + w \tag{2}$$

Because of free entry, retailer profits equal zero, so in the long-run,

$$\pi_{retailer} = (q + w)q - .5q^2 - wq - F = 0, \tag{3}$$

which solves to $q = 1$. Substituting into the market equilibrium condition gives us the amount of retailers n^* as a function of the wholesale price w:

$$n^* = 800 - 200w. \tag{4}$$

Short Run Supply

In the short run, n is fixed and profits are not necessarily zero. Following the rule of marginal cost equals price, $c(q) = q = p + w$ so the individual retailer short-run supply curve is

$$q(p, w) = p - w. \tag{5}$$

In equilibrium, market supply equals market demand, so

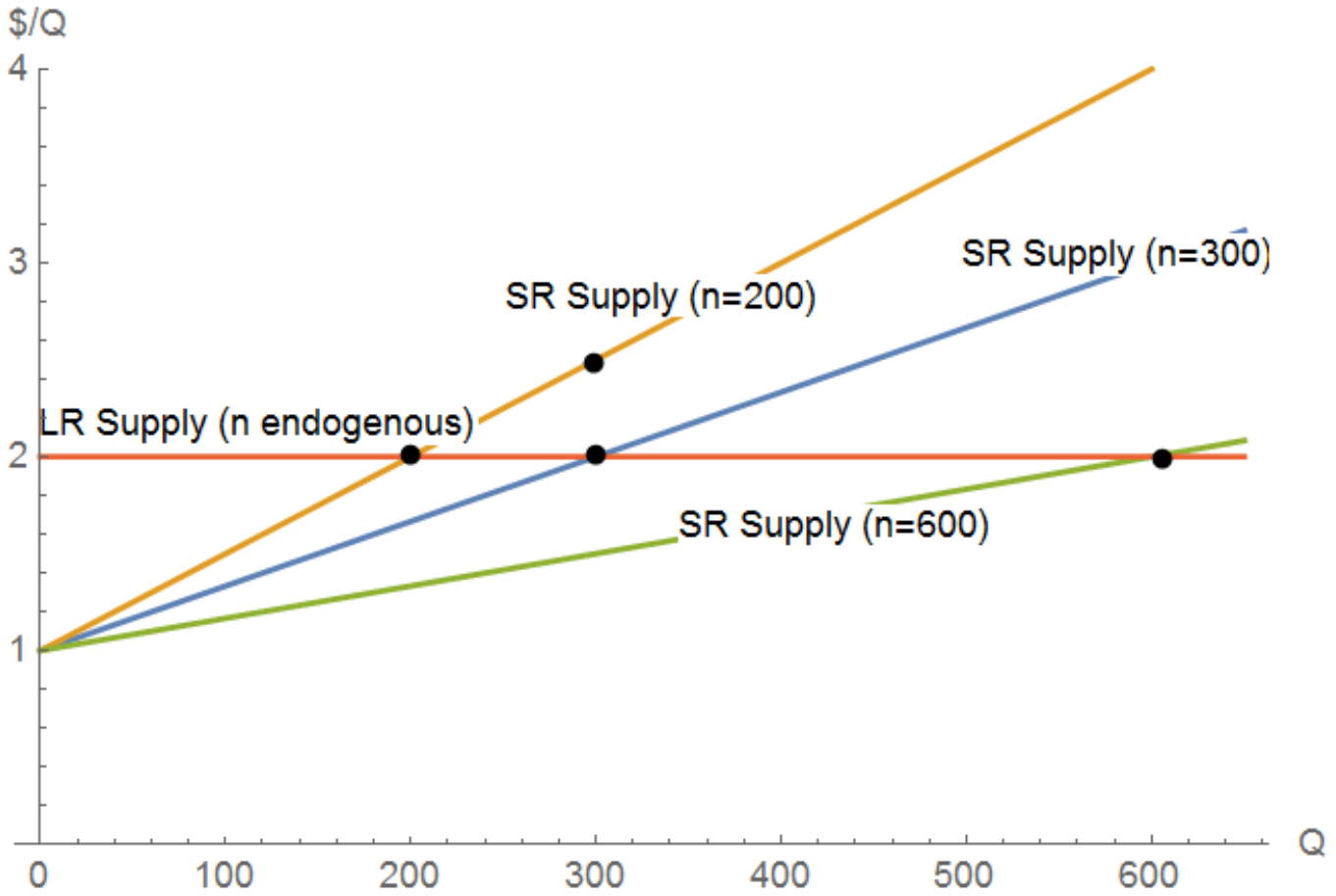
$$Q_s = nq = Q_d = 1000 - 200p \tag{6}$$

Solving for p and substituting yields $q = 5 - n/200 - w$, which, solving for q, leaves us with an expression for the individual retailer's output as a function of n and w when p takes its resulting short-run equilibrium value:

$$q(n, w) = \frac{5 - w}{1 + .005n}. \tag{7}$$

The Retailer Supply Curve

As Figure 3 shows, the market supply curve swivels down as the number of retailers n increases, since to increase market supply requires moving less far up the individual retailer's marginal cost curves.



Monopolist behavior with commitment to a wholesale price

The monopolist's profits equal the wholesale price minus the wholesale production cost times output. Since the monopolist can commit to the price before retailers choose whether to enter, he takes into account his effect on n and uses the retailer's long-run equilibrium condition (4) in choosing w:

$$\begin{aligned} \pi_{monopolist} &= (w-a)qn \\ &= (w-1)(1)(800-200w) \\ &= 1000w - 800 - 200w^2. \end{aligned} \tag{8}$$

Solving for w yields $w = 2.5$.

Using this w, in equilibrium $p = 3.5, n = 300, q = 1$ and $Q = 300$. The monopolist earns $\pi_{monopolist} = (w-a)Q = 450$, compared to 0 at the social optimum. Consumer surplus falls from 900 to .5(5-3.5)(300) = 225.

Monopolist behavior without commitment to a wholesale price

The monopolist takes n as given when he chooses w, and uses the retailers' short-run supply function for his expectation as to the level of q they will choose. Thus,

$$\begin{aligned} \pi_{monopolist} &= (w-a)nq(n,w) \\ &= \left(\tfrac{n}{1+.005n}\right)(5w-5-w^2+w) \end{aligned} \tag{9}$$

the monopolist will choose a wholesale price of $w = 3$, regardless of the level of n (special to the example) because

$$\frac{d\pi_{monopolist}}{dw} = \left(\frac{n}{1+.005n}\right)(6-2w) = 0 \tag{10}$$

The actual level of n will anticipate w. For zero profit, a retailer must have minimum efficient scale of $q = 1$ with marginal cost of 1, so $p = w + 1 = 4$. Demand is $Q_d = 1000 - 200p = 200$, so $n = 200$.

The case when the monopolist cannot commit but retailers are deceived.

Suppose the monopolist promises $w = 2.5$ but charges $w = 3$. As we have seen, if they believe that $w = 2.5$ then amount $n = 300$ of retailers will enter. The retailers will use their short-run supply curve and choose

$$q(n, w) = \frac{5 - w}{1 + .5n} = \frac{5 - 3}{1 + 1.5} = .8, \tag{11}$$

so output will be $Q = (300)(.8) = 240$ and $p = 5 - 2.4/2 = 3.8$.

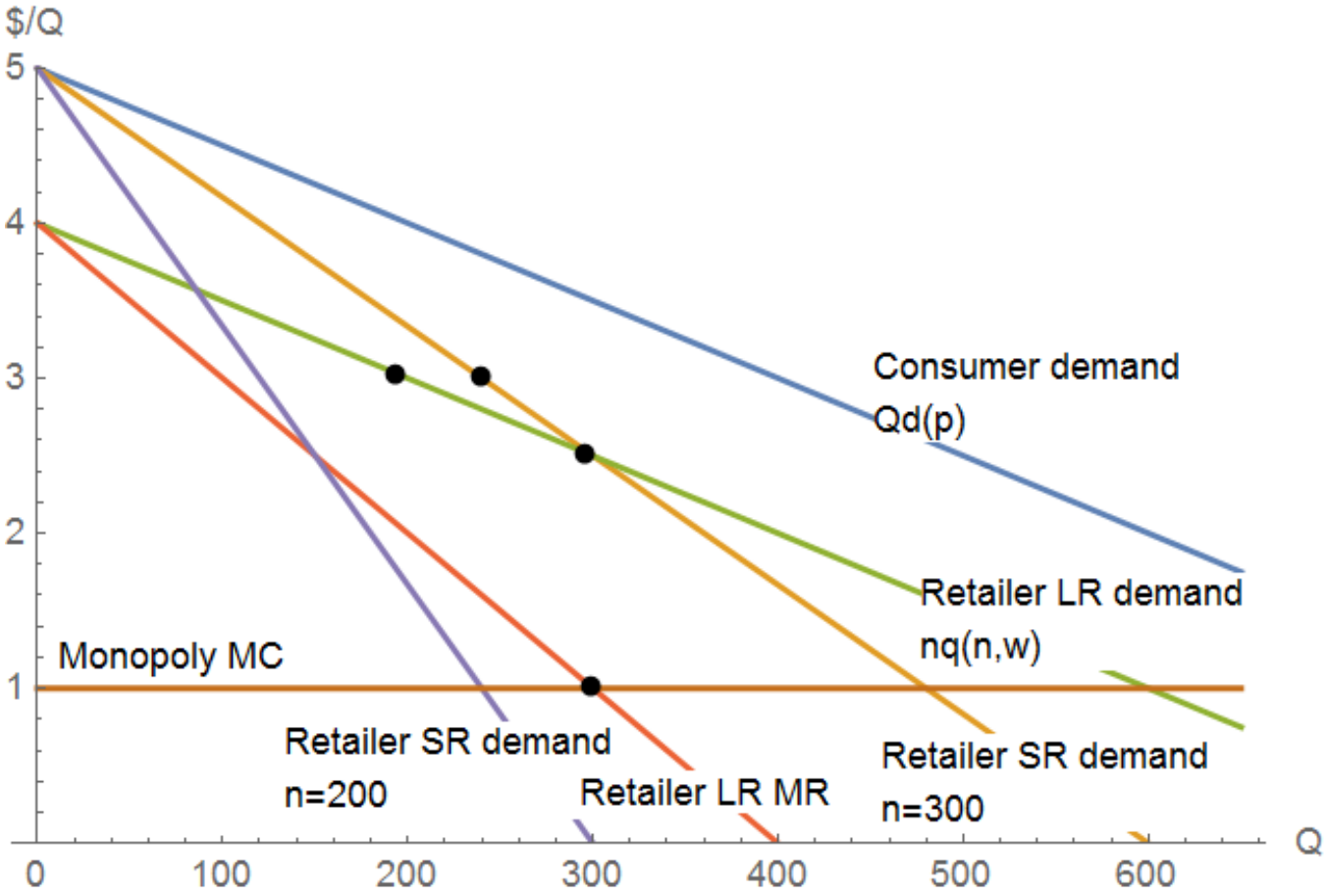
Monopoly profit will be $(w - a)Q = 480$. Consumer surplus will be $.5(5 - 3.8)(240) = 144$. Retailer profits will be negative.

Industry profit is higher if the retailers are deceived than if they are not— 426 instead of 400.

TABLE 1:
Equilibrium Values in the Numerical Example

	Monopoly with commitment	Monopoly without commitment	Monopoly with deception	Social Optimum
Wholesale price, w	2.5	3	3	1
Retail price, p	3.5	4	3.8	2
Amount of retailers, n	300	200	300	600
Output per retailer, q	1	1	.8	1
Monopolist profit	450	400	480	0
Retailer profit	0	0	-54	0
Consumer surplus	225	100	144	900
Total surplus	675	500	570	900

Retailer Demand as a Function of Wholesale Price w



For a given Q there is no inefficiency in production as the result of hold-up: retailers operate at q^*, though n is maybe too small. If the retailers were surprised by the high wholesale price, too many would enter and they would end up each producing at too small a scale. They foresee the high wholesale price, though, so just enough enter to earn zero profit at the minimum efficient scale. But Q is the result of an inefficiently small industry. If it tried to produce the first-best output with n too small, the cost would be inefficiently high, despite minimizing the cost of producing the second-best output.

Proposition 2

If the monopolist cannot precommit to his output before competitive firms enter the market for a complementary good, his output and profit will be lower.

As consumer surplus will also be lower, total surplus is lower than in a vertically integrated monopoly or a monopoly that could commit to future output.

Observations

1. "Monopoly" here just means the supplier has downward-sloping demand, not literal monopoly.

2. This doesn't depend on retailers being perfectly competitive. Monopolistic competition in retail would work out the same way.

The Complements Model

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Think of the benefits to the monopolist from successful deception. Suppose the monopolist promises to produce Q^* once the secondary market opens up. After the market does open up, the monopolist will break his promise. He has already gotten the entry he wanted to stimulate to help his own good would sell more, and the entrants will not leave (in the short run) even if their revenues do not cover their entry costs. So the monopolist will produce more than Q^*. Foreseeing this, fewer firms would enter the competitive market.

This may look like double marginalization, but it is not.

Double marginalization is the problem of successive monopolies, where the monopoly markups of the wholesaler and the retailer result in a price higher than what a vertically integrated monopolist would charge a subsidiary.

Here, the retailers have no market power and would earn zero profits in any equilibrium. Unlike in double marginalization, two-part tariffs would not solve the monopolist's problem, but commitment to a one-part wholesale price would. As with double marginalization, however, vertical integration would solve the problem, reducing the wholesale and retail prices and increasing the combined profits of the sellers.

This is not the usual problem of overpricing of complements.

It is well known that if two firms that sell complementary goods each have market power, they can increase their profits by merging and reducing their prices. The problem they have is that they both mark up their prices above marginal cost, and when one of them increases his mark-up, he captures the entire gain but inflicts a negative externality on the other monopolist.

Here, in the competitive market firms are charging a price equal to marginal cost, and price-taking to boot, so there is no margin over cost to adjust and make too high— the profit margin is zero. Rather, the monopoly would like to commit to a low price to get more firms to enter the other market. When fewer enter, it shifts in the supply curve for the competitive good to the detriment of demand for the monopolist's good.

This is not "secret quantity expansion": the monopolist secretly selling more to some retailers. Hart & Tirole (1990), O'Brien & Shaffer (1992).

This would "cheat" the other retailers who paid a wholesale price based on their belief that the retail price would be high because of the limited market quantity. Foreseeing this opportunism, the retailers will not pay a high price in the first place, dealing a serious blow to the monopolist's profits, a problem reminiscent of the Coase Conjecture's competition between a monopolist present and future selves.

With constant MC, the retail price would be above MC, making retailers eager to be allowed to buy and resell more of the good and creating the temptation for secret quantity expansion by the supplier.

Here, with rising MC, any retailer who buys more will have higher MC and hence weaker demand than the others.

[explain better]

Two other kinds of models of vertical relations

First is the opportunism problem created by unobservable actions. Telser (1960) pointed out that if retailers provide unobservable consumer services with positive externalities, the monopolist can use resale price maintenance to encourage competition in providing those services and discourage opportunistic low-service discount outlets (see, too, the discussion in the survey by Lafontaine & Slade [2007]). Here, neither monopolist nor retailer will be taking unobserved actions.

Second, common agency, the idea that upstream oligopolists can use contracts with retailers to soften competition between them. This literature began with Bernheim & Whinston (1985) and Bonnano & Vickers (1988); a recent example is Hunold & Stahl (2016). Relaxing competition will be irrelevant in competitive holdup, however, since the model will contain only a single monopolist and retailers will be price-takers.