Price Theory I Fall 2018

Problem Set 7, Question 2 Solutions

Ivan Kirov

November 30, 2018

Takeaways and General Points:

1. There are many ways to approach this question. The solutions below attempt to do so simply. In practice, the US Department of Justice (DoJ) used the Nash Bargaining concept when litigating this case before a federal court. If you went this route in your solutions, that was fine. The important thing is to think about the different incentives facing a merged firm.
2. You can find many more details on mergers and antitrust policy in *Modern Industrial Organization* (Carlton & Perloff).

(a) Pricing Structure

(Not TWC but TWX) Let's first consider the economic environment here. There are three actors: **(1)** distributors (e.g. AT&T and Comcast); **(2)** networks (e.g. Time Warner); **(3)** consumers (e.g. viewers). We assume that there is imperfect competition amont both distributors and networks. Therefore there are two 'levels' to the video market: competition between networks to produce and sell channels to distributors, and competition between distributors to buy channels and transmit them to viewers. At each level, this competition is not *perfect competition*, but rather a game played by actors at that level. The outcomes of each game are a set of market prices (for differentiated but similar goods) and a set of outputs (quantities of video). The outcomes of the competitive game between networks are inputs into the competitive game between distributors. For the purposes of this question, we summarize the outcome of the distributor game by the pricing function $p(c+t)$.

Now consider how networks price their content to distributors. Let's assume that networks have zero marginal cost of adding viewers. Consider the pricing decision of *distributors* to customers. They face a marginal cost $c + t$, where c is their own marginal cost and t is the marginal cost of carrying Time Warner (TW). Denote the total marginal cost $C \equiv c + t$. Suppose that distributors have some market power: that is, they face a downward-sloping demand curve. Thus, distributors choose a

profit-maximizing quantity of TW subscribers Q and price p subject to the demand curve for TW. The representative distributors' profit-maximization problem is:

$$\max_p Q(p) \cdot (p - C)$$

With associated FOC:

$$\begin{aligned} [p] \quad & Q + (p - C)\frac{dQ}{dp} = 0 \quad \Rightarrow \quad \frac{-Q}{dQ/dp} = p - C \\ \Rightarrow \quad & \frac{-Q}{p} \cdot \frac{1}{Q'} = \frac{p - C}{p} \quad \Rightarrow \frac{p - C}{p} = \frac{1}{\epsilon^D} \end{aligned} \tag{1}$$

Where ϵ^D is the elasticity of the distributors' demand function for TW. The LHS of (1) is the *Lerner index*: the percentage markup of price over (total) marginal cost C. (1) indicates that distributors which have less elastic demand charge a higher markup (of p over C). Equilibrium in the distributor market can be illustrated by the a downward-sloping demand curve and the flat marginal-cost curve $C \equiv c + t$. The downward-sloping demand curve implies a downward-sloping marginal revenue (MR) curve. Distributors price where $MR = C$. There is some implied producer surplus, as well as some consumer surplus due to imperfect price discrimination. Note that this is the *producer surplus of having TW content only*, rather than the entire surplus of being a distributor.

Now consider the pricing decision of TW. If it had perfect information, it could charge each distributor a lump-sum for its content equal to that distributor's producer surplus in the output market. Each distributor would take this deal (technically, would be indifferent between taking it or not), and TW could do no better. Note that this would mean that *larger distributors* and *distributors which face more inelastic demand* would be charged a higher price for TW content. Thus, TW would not simply charge one lump-sum to every distributor.

Is this then identical to charging per subscriber? No. Note from (1) that charging a positive per-subscriber price t increases distributors' marginal costs. But markups are fixed by distributors' elasticities of demand. So distributors would respond to an increase in t by increasing their prices. This will decrease TW output Q and distributor producer surplus, will lowers profits for both distributors at TW. We know profits and producer surplus fall since distributors were previously optimizing.

Thus, with perfect information, TW would price on a lump-sum basis with the lump sum differing between distributors. Choosing a per-subsriber price decreases TW's profits, but also ameliorates its information asymmetry (since it no longer needs to know each distributor's producer surplus to price optimally). Therefore with imperfect information TW might find it optimal to charge a per-subscriber price.

(b) Effect of Merger on Competitors

True. Consider the effects of TW raising its price to Comcast. Pre-merger, this increase in the price to Comcast would result in some customers moving to AT&T. But because TW is optimally pricing its product (e.g. in a per-subscriber fashion) to each distributor, it is indifferent between an AT&T customer and a Comcast customer.

Post-merger, if the merged firm increases the price of TW to Comcast, some Comcast customers switch to AT&T in the distributor market. Then the merged firm earns the *distributor* profits on these customers (as well as the network profits). This extra effect induces the merged firm to increase prices to its competitors.

More formally, Time Warner sets its price P_{TW}^D to Comcast in the upstream market. Then in the downstream market, this choice of P_{TW}^D determines Comcast's marginal cost MC_D. Because Comcast has some market power, it pass changes in its marginal costs onto consumers (see **(a)** above). Because distributors are substitutes for each other, this change in the cost of Comcast drives some consumers to switch to AT&T. This increase in demand for AT&T allows AT&T to raise its own prices.

This is illustrated in Figure 1. In the top panel, Time Warner sets its optimal pricing strategy. In the middle panel, Comcast's marginal costs are shown to depend on this pricing strategy. Finally, the bottom panel illustrates that demand for AT&T depends on Comcast's choice of pricing in the downstream market.

Thus, the profit of the merged entity depends on Time Warner's price choice *through the effect of that price choice on demand for Comcast*. Pre-merger, this would not have been a consideration for Time Warner. Post-merger, it is. This drives up the cost of AT&T to consumers.

(c) Effect of Merger on AT&T's Costs

True. After the merger, the merged firm is one entity. Transactions between parts of this firm carry a zero (economic) price (there may still be some positive *accounting* price).

(d) Effect of Merger on AT&T's Prices

True. This is a classic double-marginalization problem. Pre-merger, each level of the supply chain (networks and distributors) was subject to market power. Firms at each level therefore restrict output and raise prices. The net effect is a large reduction in quantity and increase in price.

Figure 2 shows this. The downstream distributor (AT&T) faces demand curve D_{ATT} and marginal revenue curve MR_{ATT}. The horizontal line represents AT&T's

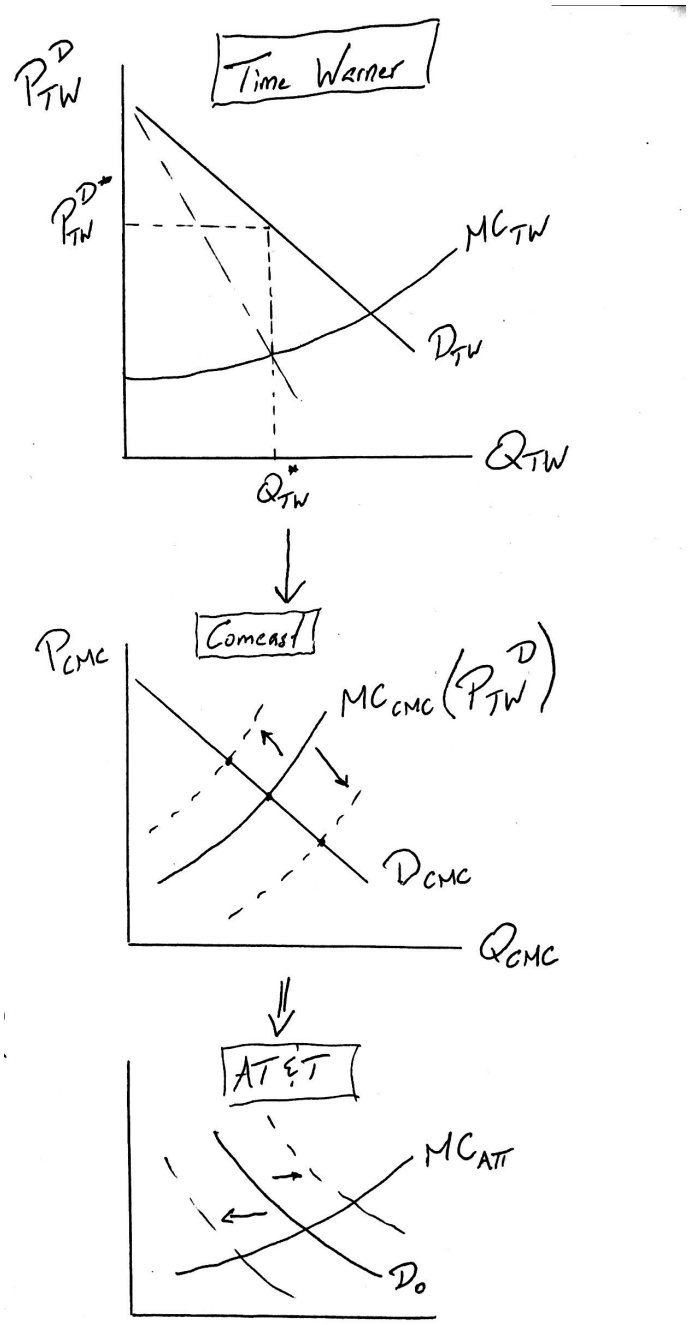

Figure 1: Vertical Integration Changes Demand for AT&T

marginal cost. If AT&T and TW were merged, the joint firm would charge price P^{**} and quantity of TW Q_{Merger}. Absent the merger, AT&T's MR curve *is TW'S demand curve.* TW therefore has its own marginal revenue curve MR_{TW} and chooses $MR_{TW} = MC$, charging price P^{**} to AT&T. AT&T then marks this price up to P_0 along its own demand curve. Price to consumers is P_0 and quantity is $Q_0 < Q_{Merger}$.

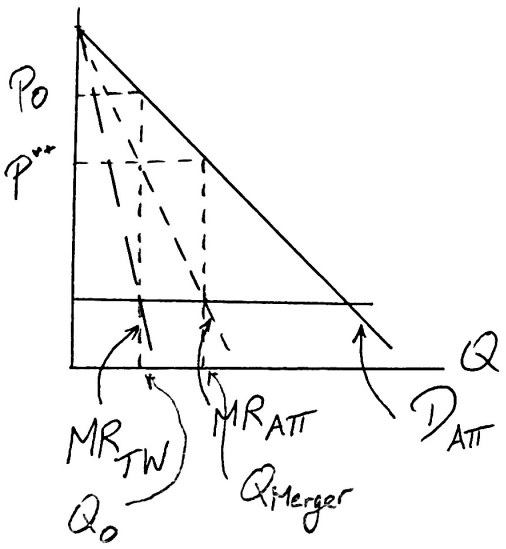

Figure 2: Double-Marginalization

The vertical merger eliminates this double-marginalization and lowers the prices to AT&T's customers. How does this compare to the increase in prices to consumers of competitors in **(b)**? If the elasticity of demand for Comcast is high, an increase in the price of Comcast will cause many customers to swith to AT&T. This makes the merged AT&T-TW entity want to increase price to Comcast significantly. Conversely, if Comcast's demand elasticity is low, the merged entity will not increase the price of Time Warner to Comcast by much.

But the merged entity only raises its price to Comcast in order to be able raise its own price. The size of this price increase depends on the elasticity of substitution between Comcast and AT&T and the price elasticity of demand for Comcast. Meanwhile, the strength of the downward pricing pressure depends on AT&Ts own demand elasticity.

Therefore we cannot say which effect dominates without estimates of the own-price elasticities of the two distributors as well as their cross-price demand elasticities.

(e) Inefficiency

False. From **(c)**, we know that AT&T's costs of providing TW have fallen. In an efficient world, we would like output to come from the lowest-cost producer. Therefore, a shift of customers away from Comcast and toward AT&T is *not* inefficient.

(f) Mergers and Efficiencies

False. It is true that mergers can reduce costs. In Figure 3, a firm with market power increases prices above its marginal cost c_0 and leads to deadweight loss DWL_0. After a merger, the firm's marginal cost falls to c_1, and it lowers prices. The new deadweight loss DWL_1 may well be lower than DWL_0.

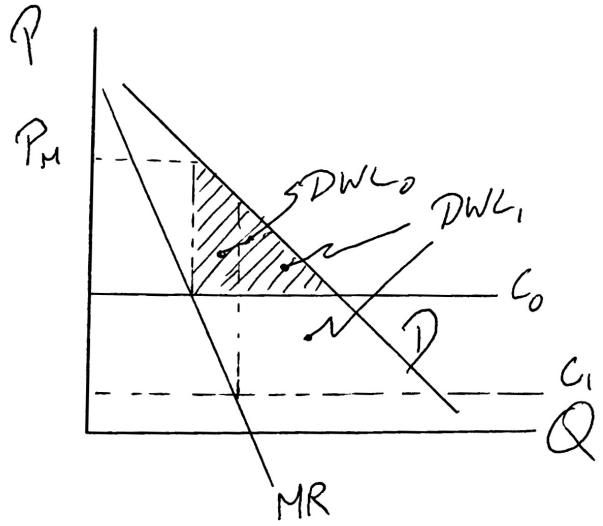

Figure 3: Mergers and Efficiencies

In principle, the same outcome can be achieved through contracting: the two firms agree to split the market in some predefined way, and the same reduction in marginal costs could occur without the merger. There are two problems with this argument:

1. Contracting is expensive. Firms must expend resources to negotiate and monitor any resulting contract.
2. The Department of Justice Merger Guidelines and US Federal law (the Sherman and Clayton Acts) do not look favorably upon contracting (they call it collusion) between competing firms.

Therefore, mergers are justified on economic (cost of contracting) and legal grounds.

(g) Mergers and Output

The goal of antitrust policy in the US is consumer welfare. The response of output is a first-order approximation to consumer welfare. For instance, in Figure 3 above, the merger reduces costs by so much that quantity increases (and price falls). In general, then, higher output is likely to mean that a merger has generated gains in consumer welfare.