

**ECO107 Antitrust and Regulation**  
**Professor Michael Noel**

**Problem Set #3—Suggested Solutions**

*Show all your work, but keep your written explanations brief.*

**The problem set is due at the beginning of class on Tuesday, February 26.**

1. Discuss the several “theories of tying”. What weights have the Courts given to these theories? Cite several relevant cases in your discussion.

*Some theories of tying are efficiencies, leveraging, and price discrimination.*

*There are efficiencies to selling some products together when they are clear complements and buying them separately would have high transactional costs. Any good containing a number of complicated different parts that are difficult to put together is a good example because then you can consider the whole as a product in and of itself.*

*Price discrimination and leveraging could work if a firm has a monopoly on a (tying) product but not on a complementary (tied) good, such as a fast-food franchise and food inputs. The firm could require franchisees to purchase all their food from it. Despite the uniform franchise price, popular restaurants will end up paying more for it through their food costs. Just like the same percentage tip to your waiter is more costly when your bill is high, the same markup on the tied good is more costly for those who consume more of it.*

*In the rare occasion that only consumers of the tying good need the tied good, then there will be very little demand for other producers of the tied good and they might go out of business. At this point the monopolist of the base good has also become a monopolist in the tied-good market and this is called leveraging.*

*Only efficiency is an allowable defense for tying cases and it worked well for East Jefferson Hospital which tied surgeries with anesthesiology considered to be one product by the court (the Hyde case 1984). The other two justifications have been frowned upon by the courts in cases such as International Salt Co., Inv., v. U.S. (1947) and Northern Pacific Railway Company et al. v U.S. (1958). Though in the latter case, the per se illegality was modified to only cover cases of substantial monopoly in the tying good and substantial effects on competition. (pp. 280-282 of Viscusi et al. 2005)*

2. Chicken Delight was a restaurant chain back in the 1970s whose restaurants were operated by franchisees. Instead of using franchise fees, as others did, the company tied restaurant supplies (napkins, fryers, food supplies) to the leasing of its franchise. That is, franchisees were required to purchase such supplies from the company at a relatively high, and non-competitive price. However, and unlike other restaurant chains, franchisees did not have to pay a franchise fee. Why might Chicken Delight have decided to collect revenues (via markups on inputs rather than franchise fees) in this way? What are the disadvantages (other than the fact they got sued) of this method versus franchise fees?

*As discussed above, such tying is a way for Chicken Delight (CD) to price discriminate imperfectly between profitable franchisees and unprofitable ones. Since, high sales are more or less linked to high profits, then profitable firms will be the ones needing the most supplies and paying the most back to CD. This way CD can get more from those who value the franchise more even though there is a uniform zero license fee. One problem that arises is that of double marginalization which is avoided by the fixed franchise fee since the latter drops out from the FOC of the franchisee.*

3. If a large firm is found to possess monopoly power, what else is needed to find the firm guilty of monopolization? Why is possessing monopoly power insufficient for illegality?

*Monopoly power of a large dominant firm might be due to its superior efficiency or quality of product thus leading to higher consumer surplus. It is however illegal to try to obtain (or to have obtained) monopoly power using anticompetitive means that eventually hurt consumer surplus such as predation, some vertical restraints, and mergers among others.*

4. Two firms compete by simultaneously choosing prices. Firm A faces demand  $q_A = 90 - 2p_A + p_B$ . Firm B faces demand  $q_B = 90 - 2p_B + p_A$ . Each firm has total costs of production equal to  $30q_i$ . That is, marginal and average cost both equal 30.

- a. Find the equilibrium prices. Find quantities, profits, and the Herfindahl index.

*For firm A:*

$$\max_{p_A} (90 - 2p_A + p_B)p_A - 30(90 - 2p_A + p_B)$$

$$\Rightarrow FOC : 90 - 4p_A + p_B + 60 = 0$$

*Similarly for firm B:*

$$\max_{p_B} (90 - 2p_B + p_A)p_B - 30(90 - 2p_B + p_A)$$

$$\Rightarrow FOC : 90 - 4p_B + p_A + 60 = 0$$

*Solving the system of FOCs for the two firms we get the equilibrium prices:*

$$90 - 4p_A + p_B + 60 = 0 \Rightarrow 90 - 4p_A + p_A - 60 = 0$$

$$\Rightarrow p_A = 150/3 = 50 = p_B$$

$$\Rightarrow q_A = q_B = 90 - 2 * 50 + 50 = 40$$

$$\Pi_A = (p_A - 30) * q_A = (50 - 30) * 40 = 800 = \Pi_B$$

*The market share of each firm is a half so the Herfindahl index is:*

$$H = (0.5)^2 + (0.5)^2 = 0.5$$

- b. Now firm B is able to lower its total cost of production to zero, a sizeable cost efficiency. Find the new equilibrium prices, quantities, profits, market shares, and the Herfindahl index. Discuss the antitrust implications of this.

*Nothing is changed in the maximization problem of firm A:*

$$\max_{p_A} (90 - 2p_A + p_B)p_A - 30(90 - 2p_A + p_B)$$

$$\Rightarrow FOC : 90 - 4p_A + p_B + 60 = 0$$

However, firm B now has no costs of production:

$$\max_{p_B} (90 - 2p_B + p_A)p_B$$

$$\Rightarrow FOC : 90 - 4p_B + p_A = 0$$

Solving the system of FOCs we get the new equilibrium prices:

$$90 - 4p_A + p_B + 60 = 0 \Rightarrow 90 - 4(-90 + 4p_B) + p_B + 60 = 0$$

$$\Rightarrow 150 + 360 - 16p_B + p_B = 0 \Rightarrow p_B = 510/15 = 34 < 50$$

$$\Rightarrow p_A = -90 + 4p_B = -90 + 4 * 34 = -90 + 136 = 46 < 50$$

The quantities are:  $q_A = 90 - 2 * 46 + 34 = 90 - 92 + 34 = 32$

$$q_B = 90 - 2 * 34 + 46 = 90 - 68 + 46 = 68$$

$$\Pi_A = (p_A - 30) * q_A = (46 - 30) * 32 = 512$$

$$\Pi_B = 34 * 68 = 2312$$

$$\text{The market shares are : } \alpha_A = \frac{32}{32 + 68} = \frac{32}{100} = 0.32$$

and  $\alpha_B = 1 - \alpha_A = 0.68$ , so the Herfindahl Index

$$\text{is } H = (0.32)^2 + (0.68)^2 = 0.1024 + 0.4624 = 0.5648 > 0.5$$

In the market with zero marginal costs for firm B, both prices have dropped and total quantity sold has increased despite the fact that the market has become more monopolistic (and accordingly the Herfindahl index is higher). The DOJ should not be concerned about increasing market share if it is achieved solely through better efficiency and thus lower prices.

5. Two firms compete by simultaneously choosing prices. Firm A faces demand  $q_A = 20 - p_A + p_B$ . Firm B faces demand  $q_B = 20 - p_B + p_A$ . Each firm has zero total costs of production.

- a. Find the equilibrium prices. Find quantities, profits, and the Herfindahl index.

For firm A:

$$\max_{p_A} (20 - p_A + p_B)p_A$$

$$\Rightarrow FOC : 20 - 2p_A + p_B = 0$$

Similarly for firm B:

$$\max_{p_B} (20 - 2p_B + p_A)p_B$$

$$\Rightarrow FOC : 20 - 2p_B + p_A = 0$$

Solving the system of FOCs for the two firms we get the equilibrium prices:

$$20 - 2p_A + p_B = 0 \Rightarrow 20 - 2p_A + p_A = 0$$

$$\Rightarrow p_A = 20/1 = 20 = p_B$$

$$\Rightarrow q_A = q_B = 20 - 20 + 20 = 20$$

$$\Pi_A = \Pi_B = 20 * 20 = 400$$

The market share of each firm is a half so the Herfindahl index is:

$$H = (0.5)^2 + (0.5)^2 = 0.5$$

b. Assume firm A ‘innovates’ – i.e. produces a better product – and its demand rises to  $q_A = 35 - p_A + p_B$ . Find prices, quantities, profits, and the Herfindahl index. In particular, has prices risen or fallen? Has the Herfindahl risen or fallen? Discuss the antitrust implications of this.

Now, for the innovative firm A:

$$\max_{p_A} (35 - p_A + p_B) p_A$$

$$\Rightarrow FOC : 35 - 2p_A + p_B = 0$$

For firm B, nothing is changed:

$$\max_{p_B} (20 - 2p_B + p_A) p_B$$

$$\Rightarrow FOC : 20 - 2p_B + p_A = 0$$

Solving the new system of FOCs for the two firms we get the new equilibrium prices:

$$35 - 2p_A + p_B = 0 \Rightarrow 35 - 2(-20 + 2p_B) + p_B = 0$$

$$\Rightarrow 35 + 40 - 4p_B + p_B = 0 \Rightarrow p_B = 75/3 = 25 > 20$$

$$\Rightarrow p_A = -20 + 2p_B = -20 + 2 * 25 = 30 > 20$$

$$\Rightarrow q_A = 35 - 30 + 25 = 30 \text{ and } q_B = 20 - 25 + 30 = 25$$

$$\Pi_A = 30 * 30 = 900, \Pi_B = 25 * 25 = 625$$

$$\text{So the market shares are } \alpha_A = \frac{30}{25 + 30} = \frac{30}{55} \approx 0.55$$

and  $\alpha_B = 1 - \alpha_A \approx 0.45$ , so the Herfindahl index is

$$H = (0.55)^2 + (0.45)^2 = 0.3025 + 0.2025 = 0.505 > 0.5$$

Prices have increased not because of more monopolistic power but because people are willing to pay more for the better product<sup>1</sup>.

Once again the Herfindahl index has increased because one firm is making more sales than another, but this added market share is obtained not as a result of illegal activity from firm A, but because they are providing a more attractive product than the one offered by firm B. R&D and innovation in supplying what consumers want should not be discouraged by Antitrust policy even if it means higher prices or a more monopolistic environment.

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<sup>1</sup> Note that the increase in price for the inferior product is an artifact of the Heterogeneous Bertrand model which as any other model is only a stylized version of reality.

6. Discuss three proposed tests to detect predatory pricing and the advantages and disadvantages of each.

*First of all, a firm is guilty of predatory pricing when it prices below its marginal costs hoping to drive competitors bankrupt so it can be monopolists (or close to it) and increase its prices and profits later. We don't have good measure of marginal costs—MC (not even in the financials of publicly traded corporations) so a number of tests are used to guess if predatory pricing is actually happening. Test 1: The Areeda-Turner Rule finds predatory pricing if and only if a firm's price is below average variable cost (AVC). A problem is a firm can be found innocent even if it is pricing below Average Total Costs ( $ATC > AVC$ ) using its cash reserves (deep pockets) to drive out equally efficient but cash-constrained firms who can't afford to stay below ATC for as long. Another problem is that AVC are only slightly easier to measure than MC which makes application in court difficult.*

*Test 2: The Average Total Cost Rule finds predatory pricing if and only if a firm's price is below average total cost (ATC). Since  $ATC > AVC$ , the test will find a lot of innocent firms guilty of predation (the case of  $AVC < MC < P < ATC$ ). In any market, when demand is suddenly lower, prices drop and until some firms have exited, prices might stay below ATC not because anyone is guilty of predation. But at least ATC are usually easy to measure and firms can no longer get away with the "deep pockets" technique.*

*Test 3: The Joskow-Klevorick Rule has 3 requirements in that order: (a) the market has to be able to be monopolized, i.e., a raise in prices will not bring in new entrants quickly enough, (b) the Areeda-Turner AVC test has to be met, and (c) prices in the market have to go up within two years of the alleged predation. Obviously, the first step solves some of the problems of finding too many innocent firms guilty in markets where predatory pricing wouldn't even be smart to begin with. But the last step makes the rule hard to apply because of the timing. What if the market conditions have changed (higher costs and/or higher demand) and those drive the prices up instead of the market power of the alleged "predator." (see pp. 305-322 for full treatment of predatory pricing, and 317-319 for the tests only)*

7. Assume that you are to decide whether a third-degree discrimination situation is in society's interest. Assume that under the "no discrimination allowed" case one group of users (group B) of a new product finds its price too high to buy any of the product. But under discrimination they would buy a positive amount at the lower price offered them. Further, assume that the price charged to the original group of buyers (group A) remains unchanged after discrimination is permitted.

- a. A consumer advocate says: The legal permission to price-discriminate would benefit the monopolist, but the original group of buyers (group A) would be harmed. Do you agree or disagree? Why?

*Disagree. The choice is between no discrimination when group A buys at high price and with discrimination group A buys at the same high price. So either way, group A will buy at the same price and is indifferent (not harmed). The catch is that there is no option under*

*which group A ever pays the lower price (like group B) and this is what the consumer advocate is mistakenly using as a baseline to which to compare discrimination. The consumer advocate is right that the monopolist benefits from discrimination because of the additional sales to group B.*

- b. A company representative says: The legal permission to discriminate would benefit group B buyers and the monopolist, and group A buyers would be unaffected, so the permissions to discriminate is a welfare improving change compared to the no-discrimination situations. Do you agree or disagree? Why?

*Agree. The monopolist's profits from group A sales and the consumer surplus of group A people is unchanged. There is however a gain to total welfare from selling to group B now, which is shared between group B consumers and the monopolist, perhaps all going to the monopolist if the price is high enough.*

8. How was it argued that Microsoft was trying to maintain its monopoly on operating systems by securing a monopoly in internet browsers?

*If Microsoft could ensure that Internet Explorer (IE) has nearly a hundred percent of the market for browsers and IE only runs on Windows, then everybody who wanted to surf the web would have to buy Windows. Since you cannot have the option of getting IE and running it on another operating system (OS), Microsoft could now keep a near monopoly in the OS market.*

*Note that this argument is different from the idea that Microsoft used its dominance in OS and by giving away IE with Windows secured a monopoly on browsers. Few would get Netscape if a close substitute already came with Windows. The two directions are enforcing each other and are equally troublesome. The first paragraph talks about **tying to maintain monopoly in a primary market** of OS (pp. 278-280) and the second paragraph is **tying to extend monopoly into a new market** of browsers (pp. 275-278). (also see pp. 336-343 for the Microsoft case itself).*