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Econ 304—Bethany College

**Homework 06**

Answer all the following on a ***typed, stapled*** (if applicable)separate sheet of paper. Make sure that you justify your answers, use your own words, and show your work. All questions are equally weighted.

1. Recall the location model discussed in class. Suppose there is increasing marginal cost to travel; thus x is indifferent between Firm A and Firm B when:

$$-p\_{B}-τ\left[x-(L-b)\right]^{2}=-p\_{A}-τ\left[x-a\right]^{2}$$

Determine the new demand curve for Firm A. (Note I removed the absolute values because, with squaring the distances to reflect increasing marginal cost of travel, the absolute values are no longer needed.)

*Here we just do some algebra to isolate x.*

$$p\_{A}-p\_{B}=-τ\left[x-a\right]^{2}+τ\left[x-(L-b)\right]^{2}$$

$$\frac{p\_{A}-p\_{B}}{τ}=\left[x-(L-b)\right]^{2}-\left[x-a\right]^{2}$$

$$\frac{p\_{A}-p\_{B}}{τ}=x^{2}-2x\left(L-b\right)+(L-b)^{2}-x^{2}+2ax-a^{2}$$

$$\frac{p\_{A}-p\_{B}}{τ}+a^{2}-(L-b)^{2}=-2x\left(L-b\right)+2ax$$

$$\frac{p\_{A}-p\_{B}}{τ}+a^{2}-(L-b)^{2}=x\left(-2\left(L-b\right)+2a\right)$$

$$\frac{p\_{A}-p\_{B}}{2τ(a+b-L)}+\frac{a^{2}-(L-b)^{2}}{2(a+b-L)}=x$$

1. If you do a little more math to your answer in Question 1, you should also get Firm A’s profit (since we assume zero costs, profit equals revenue):

$$π\_{A}=\frac{p\_{A}\left(p\_{A}-p\_{B}\right)}{2τ(a+b-L)}+\frac{p\_{A}\left[L\left(2b-L\right)+a^{2}-b^{2}\right]}{2(a+b-L)}$$

 And Firm B’s profit equation:

$$π\_{B}=\frac{p\_{B}\left(p\_{B}-p\_{A}\right)}{2τ(a+b-L)}+\frac{p\_{B}\left[L\left(2a-L\right)-a^{2}+b^{2}\right]}{2(a+b-L)}$$

Set up the equation to solve for the price Firm A charges or the price Firm B charges. Note I’m not asking you to actually solve for pA or pB, just to get to the point where you would start to do a lot of tedious algebra.

*First, we take the derivative for each, set equal to zero, and isolate…*

$$\frac{∂π\_{A}}{∂p\_{A}}=\frac{2p\_{A}-p\_{B}}{2τ(a+b-L)}+\frac{L\left(2b-L\right)+a^{2}-b^{2}}{2(a+b-L)}=0$$

$$\frac{∂π\_{A}}{∂p\_{A}}=\frac{2p\_{A}-p\_{B}}{τ}+L\left(2b-L\right)+a^{2}-b^{2}=0$$

$$2p\_{A}-p\_{B}=-τ\left[L\left(2b-L\right)+a^{2}-b^{2}\right]$$

$$p\_{A}=\frac{p\_{B}-τ\left[L\left(2b-L\right)+a^{2}-b^{2}\right]}{2}$$

$$\frac{∂π\_{A}}{∂p\_{B}}=\frac{2p\_{B}-p\_{A}}{2τ(a+b-L)}+\frac{L\left(2a-L\right)-a^{2}+b^{2}}{2(a+b-L)}=0$$

$$\frac{∂π\_{A}}{∂p\_{B}}=\frac{2p\_{B}-p\_{A}}{τ}+L\left(2a-L\right)-a^{2}+b^{2}=0$$

$$2p\_{B}-p\_{A}=-τ\left[L\left(2a-L\right)-a^{2}+b^{2}\right]$$

$$p\_{B}=\frac{p\_{A}-τ\left[L\left(2a-L\right)-a^{2}+b^{2}\right]}{2}$$

*Then we substitute one into the other…*

$$p\_{A}=\frac{\frac{p\_{A}-τ\left[L\left(2a-L\right)-a^{2}+b^{2}\right]}{2}-τ\left[L\left(2b-L\right)+a^{2}-b^{2}\right]}{2}$$

*Technically you’re done for this question. But I’m sure you’re curious what the price turns out to be…*

$$p\_{A}=\frac{p\_{A}-τ\left[L\left(2a-L\right)-a^{2}+b^{2}\right]}{4}-\frac{τ\left[L\left(2b-L\right)+a^{2}-b^{2}\right]}{2}$$

$$p\_{A}=\frac{p\_{A}-τ\left[L\left(2a-L\right)-a^{2}+b^{2}\right]-2τ\left[L\left(2b-L\right)+a^{2}-b^{2}\right]}{4}$$

$$\frac{3p\_{A}}{4}=\frac{-τ\left[L\left(2a-L\right)-a^{2}+b^{2}\right]-2τ\left[L\left(2b-L\right)+a^{2}-b^{2}\right]}{4}$$

$$3p\_{A}=-τL\left(2a-L\right)+τa^{2}-τb^{2}-2τL\left(2b-L\right)-2τa^{2}+2τb^{2}$$

$$3p\_{A}=τb^{2}-τa^{2}-τL\left[\left(2a-L\right)+2\left(2b-L\right)\right]$$

$$p\_{A}=\frac{τ}{3}\left[b^{2}-a^{2}-L\left[\left(2a-L\right)+2\left(2b-L\right)\right]\right]$$

$$p\_{A}=\frac{τ}{3}\left[b^{2}-a^{2}-\left[2La-L^{2}+4Lb-2L^{2}\right]\right]$$

$$p\_{A}=\frac{τ}{3}\left[3L^{2}+b^{2}-a^{2}-L\left(2a+4b\right)\right]$$

1. Consider the following quote:

MP3 players, on the other hand, seem to be designed with more rapid planned obsolescence in mind. Unlike many gadgets, these units are rarely upgradable with more memory, meaning consumers are more likely to buy a whole new unit after they fill up their old one.[[1]](#footnote-1)

Is this actually an example of planned obsolescence? Why or why not? If it isn’t, offer a reason why aren’t MP3 players easily upgradable.

*No, this is not an example. For one, the market for MP3 players is competitive. If you don’t want to buy one manufacturer, there are others to choose from. Moreover, MP3 players don’t break thanks to a pre-determined expiration date. At best, this is an example of items that are fashionably rendered fashionably obsolete, not functionally.*

*MP3 players aren’t easily upgradeable because the costs of upgradability exceed the benefits. Upgradability is expensive to add and few need to upgrade because they “fill it up.” Consumers are much more willing to consider what size they need before buying rather than discovering as they go and upgrade appropriately.*

1. For each of the following examples of price discrimination, indicate which type of price discrimination it most resembles. Justify your answer with ***no more*** than two sentences.
	1. Buying chapters assembled as a textbook rather than buying them individually.
	2. Charging more for electricity during times of the day when energy demand is high.
	3. Getting Adobe Acrobat Reader for free while being charged for the advanced version.
	4. Costco charging a flat rate to buy from their store and then separately charging customers for each item they buy.
2. *This is an example of bundling. If you want more copies of chapter 3, for example, you have to buy all the other chapters the book comes with.*
3. *This is an example of peak-load pricing. By charging more when the demand is high—a peak time—the power company charges more to people with a high willingness to pay.*
4. *This is an example of cross-subsidy. By giving away the Reader for free, the firm is not only enhancing the value of the advanced version but also ensuring only customers with a low willingness to pay will use it (because it is a stripped down version of the more advanced program).*
5. *This is an example of tying. By requiring people purchase membership and then charging them for each item they purchase, Costco ties two different products (membership and goods) together.*
6. Describe ***two*** example of price discrimination not discussed in class. Justify why these are examples of price discrimination.
7. *Many online video games are using a “freemium” model, where the game is free to play but to get access to “premium” features you need to pay a monthly fee. Such games become more valuable the more people play them (no one wants to play an online game where there are few other people online). This is example of cross-subsidization: those sensitive to price won’t pay anything but generates a large player base which attracts paying subscribers. Like Adobe Acrobat users, such paying players aren’t sensitive to price.*
8. *Popcorn at movie theaters is an example of price discrimination. Think of movie theaters as selling “a night at the movies” and they sell to two different types of customers: those who really like to watch movies with snacks and those who don’t like or are indifferent to snacks with their movie. The former has an inelastic demand curve to the night at the movies and the latter has an elastic curve. By charging little for tickets (theaters make very little money from ticket sales) and a lot for snacks (their profit margins on food is huge), they can profit from those who like to see the movie with food without deterring those who just want to see a movie.*
1. <http://www.thedailygreen.com/environmental-news/latest/planned-obsolescence-460210?fb_comment_id=fbc_10150169117388288_25976697_10151537190323288#slide-8> [↑](#footnote-ref-1)