

Practice Questions. - Solutions

1. *Pricing Strategies (make sure you are familiar with the various strategies we discussed including price discrimination and bundling).*

- (i) Describe what is meant when a firm engages in bundling. Distinguish between pure bundling and mixed bundling
- (ii) Consider a firm that has zero marginal cost of production for the two products it sells, namely washing machines and tumble dryers. There are 4 customers each with the valuation indicated in the table below:

Customer	Washing Machine	Dryer
Arnie	900	100
Beatrice	800	600
Colm	600	600
Doris	100	900

What is the monopolist's profit maximizing (uniform) price for the washing machine and dryer separately? What is the profit maximizing price if a pure bundle is offered? Choose from among the following three options:

- (a) $P_W=900$; $P_D=900$; $P_B=1000$.
- (b) $P_W=600$; $P_D=600$; $P_B=1200$
- (c) $P_W=600$; $P_D=600$; $P_B=1000$

What is the monopolist's profit maximizing (uniform) price for the washing machine and dryer separately and the bundle if a mixed bundling strategy is used? Choose from among the following three options

- (a) $P_W=100$; $P_D=100$; $P_B=1000$.
- (b) $P_W=600$; $P_D=600$; $P_B=1200$
- (c) $P_W=900$; $P_D=900$; $P_B=1200$

Which strategy generates the highest profit?

Solution:

Consider what happens if no bundle is offered. Consider the outcomes with different prices for the washing machine and dryer as follows:

$P_W=P_D=900$. In this case you sell a W to Arnie and a D to Doris. Total profits (assuming marginal and average cost equals zero) is \$1800.

$P_W=P_D=600$. In this case you sell a W to Arnie, Beatrice and Colm; and a D to Beatrice, Colm and Doris. Total profits (assuming marginal and average cost equals zero) is \$3600.

Hence, if no bundle is offer then clearly prices of \$600 are profit maximising.

With a bundle we can consider a bundle with a price of \$1000 in which case all four purchase the bundle because the sum of their valuations is always greater than or equal to \$1000. Hence, four bundles are sold at a profit of \$4000.

With a bundle we can consider a bundle with a price of \$1200 in which case all Beatrice and Colm purchase the bundle because the sum of their valuations is greater than or equal to \$1200. Hence, four bundles are sold at a profit of \$2400.

Hence, the correct answer here is (c) . With no bundling prices of \$600 maximise profit, but if only a bundle is offered then a price of \$1000 maximises profit.

Consider what happens if the mixed bundling or an optional bundling strategy. Consider the outcomes with different prices for the washing machine and dryer as follows:

$P_W=P_D=100$ & $P_B=1000$. This would clearly not maximise profit because everyone buys the items singularly and nobody would buy the bundle. total profits would be \$800. .

$P_W=P_D=600$ & $P_B=1200$. Beatrice and Colm buy the bundle while Arnie buys the washing machine and Doris the dryer. Total profits are $\$3600 = 2 \times \$1200 + 2 \times \$600$.

$P_W=P_D=900$ & $P_B=1200$. Beatrice and Colm buy the bundle while Arnie buys the washing machine and Doris the dryer. Total profits are $\$4200 = 2 \times \$1200 + 2 \times \$900$.

Hence, the correct answer here is (c) . With a mixed bundling strategy, the best approach is to set $P_W=P_D=900$ & $P_B=1200$.

2. *Game Theory (make sure you are familiar with the various strategies we discussed including price discrimination and bundling).*

(i) Consider the game below:

		Bob	
		Left	Right
Alice	Up	(1, 3)	(3, 2)
	Down	(4, 1)	(2, 4)

Find all the equilibria in this game.

What is the subgame equilibria if this is a sequential game with Bob moving first.

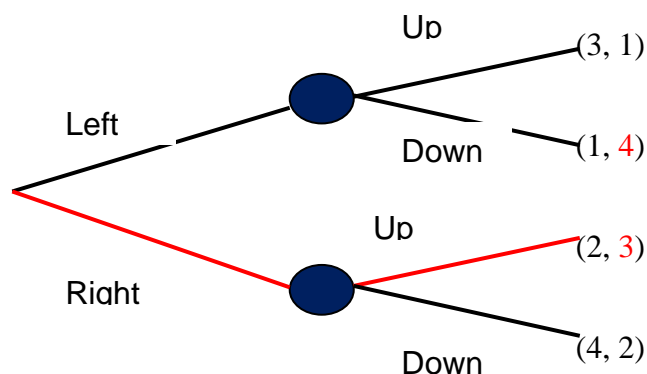
Solution:

		Bob	
		Left	Right
Alice	Up	(1, 3)	(3 , 2)
	Down	(4 , 1)	(2, (4))

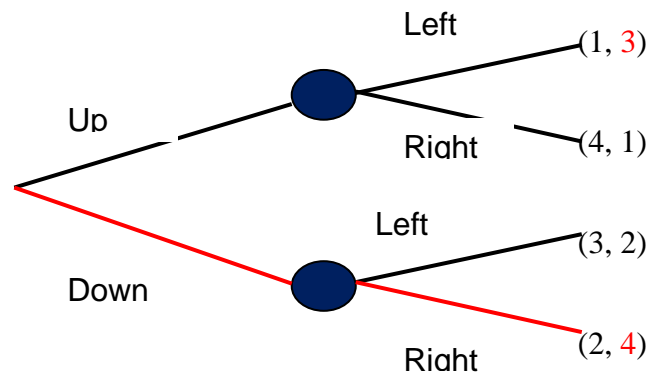
Find all the equilibria in this game. Best response shown with circle – no NE in pure strategies.

What is the subgame equilibria if this is a sequential game with Bob moving first.

Decision tree shown below. The best responses are shown in red and the subgame Nash perfect equilibria is Right , Up. Note that the payoff for Bob is 2.



I also suggest in class that we might want to consider the sequential game if Alice moved first. In that case the decision tree shown below. The best responses are shown in red and the subgame Nash perfect equilibria is Down , Right. Note that the payoff for Bob is now 4. This suggest that in this particular game Bob has a second mover advantage.



3. Strategic Commitments

- (i) Describe what is meant by a soft commitment by a firm. What might be an example of a soft commitment under Bertrand and Cournot competition?
- (ii) Using a set of diagrams, show how a soft commitment might harm a firm and that it should only be undertaken if the strategic effect makes it worthwhile to do so.

Please refer to pages 48-56 of lecture notes 4 and question 9 tutorial 3. What is important here is the idea that making a credible commitment (make sure you understand what it means for a decision to be credible) a firm/ organisation is effectively tying its hands. For it to be worthwhile, the firm should consider both the direct and indirect effect of its commitments. If we think about an investment in a new plant in a Cournot model (an example of a tough commitment because it shifts the reaction function for the firm out to the right), then the firm needs to weigh up the direct and indirect or strategic effect of the commitment. There might be a negative net payoff from the direct effect of the commitment – for example the increased revenue from higher sales (remember we are considering a shift in the reaction function out to the right so the firm produces more for any given level of output from its rival) may not actually have a positive net present value. However, by producing more you lead to your rival/ competitor producing less and therefore the price in the market will rise. This has a positive impact on the profitability of the investment and it is this indirect or strategic effect that makes the investment worthwhile.

4. Price discrimination

- (i) What is required for firms to undertake third degree price discrimination? Give two examples of third degree price discrimination and explain the intuition behind third degree price discrimination.
- (ii) With menu pricing it is commonly assumed that firms do not need to identify what type a particular customer is, or prevent resale. Explain.

Solution: Under third degree PD a firm must be able to distinguish different type so buyers. For example, theatres require students or seniors to display their concession card – you know who you are selling to and charge a different price depending on who you are selling to for the same product/ good/ service. Similarly, with haircuts or clothes, you know that you are selling the haircut/clothes to a male or female and in turn can charge different types of buyers a different price. Now of course it is always possible that males will buy female clothes (or vice versa), but this is unlikely and for all intents and purposes it is possible to charge different prices for two very similar articles of clothing such as a blouse sold to women) and a shirt (sold to men). With haircuts it is very easy (usually!) to know who is getting their haircut and charge different prices according to gender.

The second requirement of third degree price discrimination is that resale can be prevented. We do not want students who buy cheap movie tickets reselling them to non-students who would otherwise have to pay higher prices. Hence, theatres will generally say such tickets are non-transferable. Haircuts for obvious reasons are not transferable, and clothes because they appeal to specific genders would generally not be resold.

The intuition behind the practice of price discrimination is simple – you charge a higher price to those who have less elastic demand or who are less price sensitive. That is, if we assume that students are more price sensitive than non-students when it comes to movies, then what we want to do is to charge students a lower price and non-students a higher price. This will in general lead to higher overall profits than if we simply charge the same price to everyone.

With menu pricing (commonly referred to as second degree PD the idea is that you are not able to distinguish between different types of buyers. Suppose that somebody sells movie tickets over the internet in which case it is impossible to verify if they are a student. In this case, what you do know is that there are some buyers out there who are price sensitive (the students) and some who are non-price sensitive (non-students). What you must do is to offer a menu of items and price them in such a way that the ‘right type of buyer’ buys the ‘right product’ so as to increase your profits. There was a simple example of this in the lecture (the computer software) and a more complex one in the tutorial (using magazines). In both cases the intuition is the same – present a menu of options that anyone can choose, and if priced appropriately there is an opportunity to increase profits. Note the challenge however, if you try to charge too high a price for some of the products then buyers switch, and you end up with lower profits.

5. Make sure you are familiar with the following concepts. **Please note that I have not provided a detailed discussion of each of these concepts. They are covered in the lecture notes and associated readings**

- Different types of barriers to entry (see lecture 3 and associated reading).
- Different types of market structure including their characteristics (see lecture 3 and associated readings).
- Solutions to game theory problems including games in which players make choices simultaneously or sequentially (lecture 4).
- Mixed strategy equilibrium in games, especially the example covered in lecture 4 with Airbus and Boeing (lecture 4).
- How repeated interaction might change the outcome of games (lecture 4).
- First, second and third degree price discrimination (lecture 5).
- Transaction costs including the different types (lecture 6).
- Product differentiation (lecture 6).
- Different views of the firm (see lecture 7 and article by Hart).

Also, please read the news (and other) articles available on canvas including:

Hart, O., (1989), 'An Economist's Perspective on the Theory of the Firm', *Columbia Law Review* 89(7), pp. 1757-74.

Daripa, A. and S. Kapur (2001), 'Pricing on the internet', *Oxford Review of Economic Policy* 17(2), pp. 202-16.