

Price Discrimination Game

Overview

Over the next week, teams are going to compete in a team challenge on price discrimination. The goal of each team is to maximize profits using the tools of price discrimination.

Each team, which will represent a firm, will be a distinct and separate monopoly. Therefore, your team is insulated from the pricing and quantity decisions made by other firms.

You will design a menu of service packages – perhaps some big and perhaps some basic– and will determine the pricing for those service packages. You offer these packages and customers sign up for whichever service they want or perhaps none at all.

You will have an opportunity to see how well you are doing relative to other firms and make any changes you want to your menu of services and prices.

Some market background

Cell phone coverage in the many South Pacific island countries is sporadic to nonexistent, but demand for such a service has been growing in many of these countries.

A leading U.S. wireless carrier has decided to develop cell phone service on ten country-islands, erecting one central cell phone tower on each major island and providing wireless service to the 100,000 citizens that live in each one of these countries.

The U.S. based company is unfamiliar with the exact nature of demand in these countries, however, and has thus entered into contracts with five different firms, one familiar with each South Pacific country, to market the wireless service to the people on its behalf. The hired firms will be in complete control of what service plans to offer and what to charge for those service plans.

Your firm is one of these firms.

Because of the cost of traveling between island nations, customers will only buy wireless service from the firm in their own country. Thus you do not face pressure from the firms marketing the same service in other countries. Moreover, the U.S. wireless carrier is the only wireless provider in the entire region. These two facts mean that your firm is a monopoly seller of wireless service plans in your country.

As a monopolist, you have more scope for price discrimination. (You are not required to price discriminate, but you will not do very well if you don't.)

How the market operates

Your job is to maximize your profits on selling wireless “service plans”. A service plan is a fixed number of airtime minutes in a given calendar month that is sold at a bundled monthly price. For example, 500 minutes of airtime at a price of \$20 per month is an example of a service plan.

To keep things simple, all service plans must take this exact form: X minutes per month at a monthly price of Y. We assume away all the other complications that are common to U.S. wireless plans. For example, customers cannot buy “additional minutes”. Instead, they will use up exactly the minutes they have in their plan during the month. Also, there are no annual or other contracts that lock them into a plan for many months. Instead, every month your customers make a new decision of whether to purchase a service plan and, if so, which one. Also, you can assume that the cell phones are sold competitively on the open market at their marginal cost. You only deal selling the wireless service.

You can change, add, or delete service plans as you wish, or change their prices, at the beginning of every month.

You can offer as many or as few service plans as you wish.

Demand

Each country, including yours, has 100,000 inhabitants. (If fact all countries are identical, are contracts between the firms and the wireless carrier are identical, and all teams have the same information.)

Your market research has determined there are six “types” of customers in the marketplace: A, B, C, D, E, and F types.

All customers of the same type are identical to one another in terms of their valuation for wireless service. However, customers from one type are different from customers of another type.

In particular, type “A” customers have the highest valuation for wireless service. Each type A customer will receive a surplus of $u_A = 0.12q - R$ for a service plan that includes q minutes of airtime and that costs a total of R dollars. Your research tells you there are a total of 10,000 type A customers in your country.

Type “B” customers have the next highest valuation for wireless service. Each type B customer will receive a surplus of $u_B = 0.1q - R$ for a service plan that includes q minutes of airtime and that costs a total of R dollars. There are a total of 10,000 type B customers in your country.

Next in order are type “C” customers. Each type C customer will receive a surplus of $u_C = 0.08q - R$ for a service plan that includes q minutes of airtime and that costs a total of R dollars. There are a total of 10,000 type C customers in your country.

Type “D” customers will receive a surplus of $u_D = 0.07q - R$ for a service plan that includes q minutes of airtime and that costs a total of R dollars. There are a total of 10,000 type D customers in your country.

Type “E” customers will receive a surplus of $u_E = 0.06q - R$ for a service plan that includes q minutes of airtime and that costs a total of R dollars. There are a total of 10,000 type E customers in your country.

Type “F” customers have no interest in cell phones and will not buy wireless service regardless of the price. You have no chance of selling to them. There are 50,000 type F customers in your country.

You can assume each customer will either buy one (and only one) service plan or else she will buy nothing at all. If she buys nothing, she will receive zero surplus $u_i = 0$, regardless of her type.

Note that surplus for a given type on a given service plan can be positive (if the price is low and contains many minutes) or it can be negative (if the price is high and does not contain enough minutes).

The goal of each customer is to maximize her own surplus. This is important to remember. Therefore, each customer will consider the service plans you offer and choose the option that provides her with the greatest surplus. It may be one of your service plans or it may be not to buy a service plan at all.

If a customer is indifferent between two service plans, assume that she will purchase the service plan with the largest number of minutes in it. (It would be easy enough to reduce the price of the bigger plan by a tiny tiny tiny amount and that would break the tie. But don't worry about that, we'll just assume that when there are ties, the biggest one is chosen.)

You can also assume that any and all customers that purchase a wireless plan from you have already bought a compatible cell phone. Do not worry about this.

The most serious difficulty you have in price discriminating effectively is that there are no identifiable characteristics that would allow you to identify the type of any individual customer that approaches you. The customer knows her type, but you do not. You only know how many of each type there are in total in the country's population (10,000 for each of types A through E, 50,000 for type F). This means that you cannot prevent any particular customer from buying the service plan of their choice, as long as that is one of the service plans you offer.

Said another way, all your service plans must be available (at the prices you chose, of course) to all customers.

You generate all your revenues from service plan sales. As an example, if you sell 1000 plans at \$100, 1000 plans at \$110 and 1000 plans at \$120, your total revenues are simply equal to $1000 \cdot 100 + 1000 \cdot 110 + 1000 \cdot 120$

Costs

You have three sources of costs.

The first is a fixed cost of \$30,000 per month for operating your storefront and for paying your sales clerk and market research staff.

The second cost is a fixed franchise fee of \$250,000 each month that you must pay to the wireless carrier. This fee stays the same regardless of how many wireless service plans you sell or what is contained in them.

The third cost is a royalty fee that you must also pay to the wireless carrier. The royalty fee is imposed on every sale of a service plan to a customer and is based on the number of minutes contained in the plan that is sold. For a plan sold to a customer that has q minutes in it, you pay a royalty of $0.00005q^2$. The royalty structure is designed to generate higher royalties when you sell service plans that contain more minutes. (These are bought by customers that tend to have high demand for wireless service.)

As an example of the royalty fee, if you sell 1000 service plans with 200 minutes in each, 1000 service plans with 250 minutes in each, and 1000 service plans with 300 minutes in each, the total royalty would be equal to:

$$1000*0.00005*200^2 + 1000*0.00005*250^2 + 1000*0.00005*300^2$$

Your total costs are equal to the sum of the fixed cost, the fixed franchise fee, and the royalty payment.