Notes on Information Technology—Econ 100C

Where there are network externalities, the amount that any individual is willing to pay for a product depend on the number of other people who also have the product. If this is the case, how can we possibly draw a demand curve? If we think of the demand function as reporting the number of units that people are willing to buy at a given price, then how can we draw the curve? It appears that we don’t know how many will buy until we know how many will buy. Things become a little less mysterious if we construct the ”inverse demand function” by focusing on price as a function of quantity rather than the other way around. Suppose we ask the following question. For any quantity $q$, suppose that consumers believe that the number of units sold will be $q$. At what price would $q$ be the actual quantity demanded?

Let us consider an example. Suppose that people come in 100 different types, which are numbered by $x = 1, 2, \ldots, 100$. If a person of type $x$ believes that $q$ people will buy the product, she would be willing to pay $(100 - x)q$ for the product. Suppose that everybody believes that $q$ people will buy. At what price would $q$ actually be the number demanded? I claim that the answer is $p = (100 - q)q$. Why is that? If everybody believes that $q$ units will be sold, then everybody of type $q$ or higher will be willing to pay up to $(100 - q)q$. This is true since if $x > q$, then $(100 - x)q > (100 - q)q$ so a type $x$ will buy. But if $x < q$ then $(100 - x)q < (100 - q)q$, so that a type $x$ will not buy.

What does equilibrium look like? Draw graph. Don’t forget vertical axis is part of demand curve.

Note that demand is not a “function” of price. There are 3 possible quantities consistent with any price over the relevant range.

Try a supply curve.

Now do the in-class case.

0.1 Spreadsheets and Word Processors

Notice that early leaders often were not winners.

Wordstar, Wordperfect, Word
Visi-calc, Lotus, Excel
Apple, Radio Shack, Commodore, IBM, Clones
Apple, Microsoft, Linux
Who is big now?
Ebay
Google
Amazon
Leibowitz argues that network effects are not important. He also claims that software is cheap. Both claims seem questionable to me.

The overwhelming dominance of the winning software seems evidence of network effects. (with feedback to quality)

Prices of MS Office are very high compared to marginal cost and to average cost.
Potential competition keeps fees from getting too high.

0.2 Price Discrimination and Information Goods—Lecture 2

This lecture is based on the two papers by Varian, that are on the class website.

1) Internet sales allow personalization of markets that is not possible in brick and mortar stores.

Example, Amazon experiments with offering different prices to different consumers in order to learn demand functions. Internet also allows price to depend on previous purchases or other information about you.

2) A study of product versioning—based on Varian’s versioning paper.

Draw "Quality demand curves" price on vertical axis, quality on horizontal. $P(Q)$ is answer to question "What would you pay to have a single item of quality Q?" Note that we are thinking of buyers who buy only one unit. This is NOT a traditional demand curve with quantity on the horizontal axis. But it is an interesting tool, nonetheless.

Varian’s two type example. Zero marginal cost of quality. If you can distinguish consumer types, you would charge areas under demand curves to each. If marginal cost is other than zero—show diagram.

Suppose you had to charge the same price to everyone. Then you could either make the low quality and charge $A$ or make the high quality and charge $B$ where $A < B$. Which is better? Let $p$ be the fraction of type B’s. Depends on whether $A > pB$. Note that if $pB > A$, you charge $B$ and shut out all of the low types. This is inefficient, since it costs nothing to supply them.

You could offer two different price-quality combinations. What if you charge $A$ to low types and $B$ to high types. Everybody buys $A$. But you could charge $A+C$ to high types. See Varian’s picture. More profitably, you could debase the quality of the low-type offering. Illustrate with Varian’s picture and show profit-max point.

Note that however you do this, low type gets no surplus.

Examples: Airlines nuisance restrictions (over Saturday night, no changes, advance purchase) Read Dupuit quote from Varian

Other examples, read from Varian. Damage Goods: Deneckere and McAfee.

More generally, there are many types. Probably want many versions. “Goldilocks pricing.”

0.3 Switching Costs and lock in

Examples, operating systems, software, printers and printer cartridges, razors and blades, internet suppliers, bank loans, brokerage firms, online sellers Amazon.

Competitive model with lock in, two period version, firms not able to commit to period two prices.
\( s = \) switching cost \( c = \) marginal cost of producing. Every consumer thinks the service is worth \( v \) per period. Assume \( v > c \) and \( v < c + s \). Price will be \( v \) in period 2, because you are locked in. Nobody will sell to you at less than \( c \) and cost would be \( c + s \). But then value of a customer is \( v - c \). Competition forces a discount of \( v - c \) in period 1. Therefore period 1 equilibrium price will be \( c - (v - c) = 2c - v \). Firm loses money in period 1, makes it back in period 2.

Model of printers. Two different types of consumers, monopoly supplier. See handwritten notes based on Varian’s model.

Further remarks on printers: Firms make two different kinds for different markets, home and office. Home printers very low initial cost, expensive ink. Office printers, higher initial cost, cheap cartridges. What is going on? Different price elasticities of demand for printing is probably part of it. Also cartridge markets for office laser printers seems to be pretty competitive. Not so for home printers. Why? patents, model changes?