Econ 476: Industrial Organization

Quality

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Lecture 10

Intro

- What does quality even mean??
- `https://www.thebump.com/a/top-10-car-seats`

Income and Quality

- Consider 2 firms producing a product that is only differentiated by "quality:" quality level $k = H$ and quality level $k = L$ where $H > L > 0$.
- There are 2 consumers $(i = 1, 2)$. Consumer 1 is the high-income consumer (I_1) and consumer 2 is the low-income consumer (I_2) such that $I_1 > I_2 > 0$.
- Each consumer only buys one unit and utility is given by

$$U_i \equiv \begin{cases} H(I_i - p_H) & \text{if he buys the high-quality brand} \\ L(I_i - p_L) & \text{if he buys the low-quality brand} \end{cases}$$

Income and Quality

Proposition:

1. If the low-income consumer buys the high-quality brand, then the high-income consumer definitely buys the high-quality brand.
2. If the high-income consumer buys the low-quality brand, then the low-income consumer definitely buys the low-quality brand.

Income and Quality

- Let's prove part 1!
- We want to show that $U_1(H) > U_1(L)$
  - i.e. the high-income consumer prefers the high-quality brand to the low-quality brand

Income and Quality

- prove part 2 in the homework(!)

Durability

- Why produce a durable good instead of a disposable good?
- What might be some of the incentives to durable good producers?
- Does durability depend on market structure (i.e. monopoly, Cournot, etc.)?
  - Let's build a model!

Durability

- Assume there is one consumer who lives for 2 periods. In each period the consumer values light services and is willing to pay $\$V$ per period where $V > 0$.
- There are two types of light bulbs: a short-durability light bulb that lasts one period and a long-durability light bulb that lasts two periods. Assume the unit cost to produce light bulbs is c^S and c^L for the short-durability and long-durability light bulbs, respectively. Also assume that $0 < c^S < V$, $0 < c^L < 2V$, and that $c^S < c^L$.

Durability - monopoly

- Under what conditions would the monopolist produce the long-durability light bulbs?

Durability - monopoly

Results:

- $p^S = V$
- $\pi^S = 2\left(V - c^S\right)$
- $\pi^L = 2V - c^L$
- produce long-durability bulbs if $2c^S > c^L$

Durability - competitive

- How do the results change if a perfectly competitive market produce light bulbs?
- Let's look at this through the consumer's viewpoint.

Durability - competitive

Results:

- $p^S = c^S$ and $p^L = c^L$
- $U^S = 2\left(V - p^S\right)$
- $U^L = 2V - p^L$
- produce long-durability bulbs if $2p^S > p^L$

Innovation - durability

- http://www.bbc.com/future/story/20160612-heres-the-truth-about-the-planned-obsolescence-of
- http://www.nytimes.com/2013/11/03/magazine/why-apple-wants-to-bust-your-iphone.html

Innovation - durability

- Is the iPhone too durable?
- How durable would a social planner make the iPhone?

Innovation - consumers

Consider a 2 period model:

- In $t = 1$, there is only one consumer who seeks a computer for the two periods of his/her life. In period $t = 2$, one additional consumer enters the market seeking a computer.
- Let V be the per period gain from the quality of the technology embedded into the computer and let per period utility be defined by

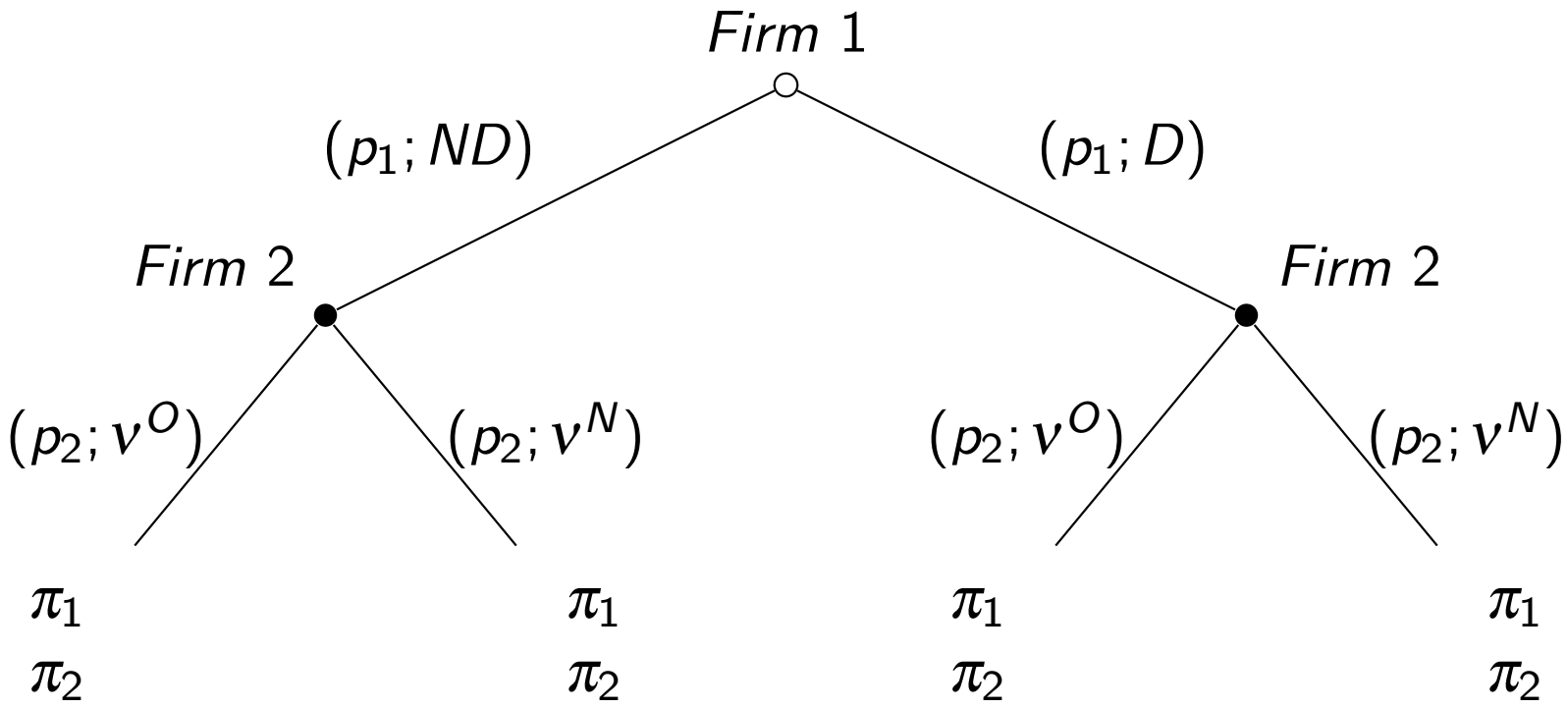
$$U_t \equiv \begin{cases} V_t - p_t & \text{if purchasing the period } t \text{ technology product} \\ 0 & \text{if not purchasing} \end{cases}$$

Innovation - firms

There are 2 firms:

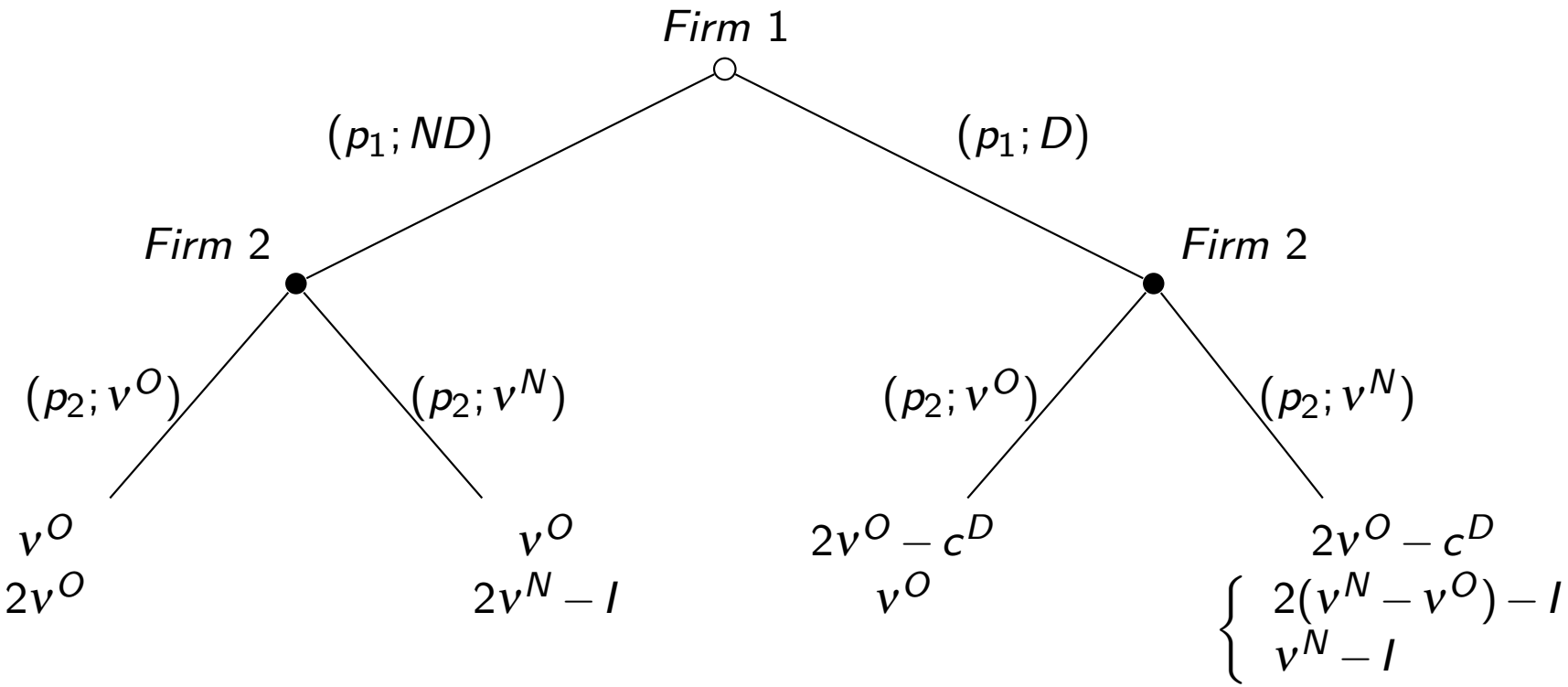
- Firm 1 only operates in the first period and is endowed with an old technology that provides a per period quality level of v^O to consumers.
- Firm 2 may enter in period 2 and can produce the old technology computer (v^O), or upgrade the computer to a new technology level of v^N for an innovation cost of $I > 0$, where $v^N > v^O$.
- Assume that production cost is independent of the technology level but only depends on the durability of the computer. A durable computer lasts for 2 periods and a nondurable good lasts for 1 period. Let the production cost of the durable and nondurable good be c^D and c^{ND}, respectively, where $c^D > c^{ND}$. Assume that $c^{ND} = 0$ for simplicity.

Innovation - the game



Let's solve for the profits of each firm (outcomes).

Innovation - results



Innovation - results

- Under what conditions would Firm 1 choose the durable good?
- Assume that Firm 1 produced a durable good. Under what conditions would Firm 2 set its price such that only the new consumer would purchase the computer with the new technology (the old consumer would not upgrade)?

Warranties

Consider a microwave whose value to a consumer is V if the microwave works and 0 if the microwave is defective, where $V > 0$. Suppose that it is commonly known that microwaves have a probability ρ of being functional, where $0 < \rho < 1$. The firm producing the microwaves have 2 options: sell microwaves with a full replacement warranty (i.e. keep replacing until functional microwave is delivered), or sell microwaves without a warranty. Let p be the price and $c > 0$ denote the unit production cost of each microwave. The utility to the consumer is

$$U \equiv \begin{cases} V - p & \text{purchase with a full replacement warranty} \\ \rho V - p & \text{purchase without any warranty} \\ 0 & \text{does not purchase} \end{cases}$$

Warranties

- What is the profit function of the firm (monopoly) if no warranty is offered?
- What is the profit function of the firm (monopoly) if a full replacement warranty is offered?

Warranties

- Remember that $1+\delta+\delta^2+\cdots=\sum_{t=0}^{\infty}\delta^t=\frac{1}{1-\delta}$
- Similarly,
  $c+c(1-\rho)+c(1-\rho)^2+\cdots=\sum_{t=0}^{\infty}c(1-\rho)^t=\frac{c}{1-(1-\rho)}=\frac{c}{\rho}$

Warranties - results

- $\pi^{NW} = \rho V - c$
- $\pi^{W} = V - \frac{c}{\rho}$
- Under what condition would the monopolist offer a full replacement warranty?