

Algebraic Model of Lock-In

Present value

y today grows to $y(1 + r)$ next period

x dollars next period = $x/(1 + r)$ today

$$PV = x + x/(1 + r) + x/(1 + r)^2 \dots = x/r$$

Argument 1: algebra

Argument 2: economics

Model

2 firms, identical products and costs

1 consumer (or many identical consumers)

v = value to consumer (given)

c = constant cost of production (given)

p = price of product (to be determined)

Equilibrium (no lock-in)

consumers choose based on benefit - price =
 $v - p$

firms compete for consumers

equilibrium: $p = c$

exercise: what happens if costs differ: $c_1 < c_2$

Switching costs

s = cost to consumer of switching

d = discount offered to consumer first period by a firm

what is equilibrium price?

Consumer

$$v - (p - d) - s \geq v - p$$

or

$$v - p + d - s + \frac{v - p}{1 + r} + \dots \geq v - p + \frac{v - p}{1 + r} + \dots$$

same as

$$\frac{v - p}{r} + d - s \geq \frac{v - p}{r}$$

implies

$$d \geq s$$

competition forces $d = s$

Producer

$$-d + \frac{p - c}{r} \geq 0$$

competition pushes profits to zero

Equilibrium

$$(p - c)/r = s$$

or

$$p = c + sr$$

interpretation (stock): PV of customer = switching cost

interpretation (flow): consumer gets discount up front, amortizes it over rest of cycle

Observe

switching cost raises price to consumer!

because incumbent can raise price without losing consumer

nature of competition has changed

lesson: if you can lockin for $d < s$, do it!

Example

Xerox: has monopoly on machine, monopoly on parts

Kodak: enters and breaks monopoly on machine

both companies still have monopoly on parts

(...but monopoly profits are competed away)

Generalization

switching cost to firm of k

$$\frac{p - c}{r} = s + k$$

should the firm try to increase its own switching costs? Why or why not?