Inertia 1: Price Competition

Chapter 10, 2nd half

Yuya Furusawa

Graduate School of Economics, The University of Tokyo

16th June

Table of contents

Price Frame Competition
- Equilibrium Properties
- Two Market Interventions

Consumer Switching

Asymmetric Default Assignment

A Few General Remarks
- More Than Two Frames
- Revealed Preference

Summary

Spurious product differentiation

- In the model, the product is assumed to be homogeneous.
- However, each of the frames a and b is adopted with positive probability.
- This differentiation is spurious: there is no relationship between consumer's preference and firm's response to consumer inertia.

Correlation between prices and frames

- Case 1: the frame a dominates the frame b in terms of comparability
  - the framing decision is relevant.
  - firms strictly prefer to adopt the frame a (b) when they charge low (high) prices.
- Case 2: no frame dominates the other in terms of comparability
  - The firm's pricing and framing decisions are independent in equilibrium.
- Whether prices and frames are correlated in equilibrium depends on whether we can rank the two frames according to their comparability.

The possibility of collusive profits

- Question: Are competitive forces in the model strong enough to push firms' profits to the max-min level given the consumers' bounded rationality?
- Case 1: max-min payoff is $\frac{1}{2}(1-q)$
  - opponent plays $(a,0)$, and plays $(b,1)$
  - But equilibrium payoff is strictly above the max-min level.
- Case 2: max-min payoff is $\frac{1}{2}(1-v^*)$
  - opponent plays $(\lambda^*,0)$, and plays $(\lambda^*,1)$
  - This is exactly the payoff that firms earn in the equilibrium.
- Both price frame correlation and the possibility of collusive equilibrium profits are linked to the question of whether one frame dominates another in terms of comparability.

Enhancing the transparency of price formats

- The interpretation for case 1 was that a represents a simple price format, while b represents a complex price format.
- Imagine a regulator wishes to improve the "market transparency" and his intervention has the effect of increasing q_a.
- From (10.8), we can see that the forms' equilibrium payoff increases as a result of the intervention.
- High values of q_a, q_b, and q represent that we make the consumer "more rational". Nevertheless, a higher value of q_a implies higher equilibrium prices and industry profits.

Enhancing the transparency of price formats (cont.)

- Intuition
  1. A higher q_a strengthens an expensive firm's incentive to adopt the complex format b.
  2. The equilibrium fraction of firms to adopt frame b goes up.
  3. The probability that expensive firms face a price comparison goes down.
  4. This gives expensive firms greater market power and as a result, equilibrium profits go up.
- By contrast, when the regulator's intervention entails an increase in q_b, this lowers equilibrium payoffs.
  - Such intervention reduces the fraction of firms that charge a high price and adopt the frame b.

Introducing new brands

- Assume that a regulator considers consumers' benefit from introducing a new brand category into the market.
- However this intervention may diminish consumer welfare.
  - Suppose that a and b stand for two brand categories.
  - If q is lower than q_a and q_b (Case 2), equilibrium profits and prices are higher than if we eliminated one of the two categories.

Consumer switching

- Question: How frequently consumers get stuck with their default option in equilibrium? How this quantity is related to the competitiveness of the market outcome?
- *switching cost*: the probability that a consumer switches away from the default in equilibrium.
- *conversion rate*: the rate of switching conditional on the event that the consumer has made a price comparison.
- In the basic model of Section 10.1, the conversion rate is $\frac{1}{2}$ and the switching rate is $\frac{1}{2}\beta$. It follows that weaker inertia leads to a more competitive equilibrium outcome and a greater frequency of consumer switching.

Switching rate in the price-frame competition (Case 2)

- The conversion rate in any symmetric equilibrium remains $\frac{1}{2}$.
  - $p_1 \neq p_2$ with probability one
- In contrast, the probability of a price comparison depends on the underlying parameters.
- In case 2, firms play independent pricing and framing strategies. Therefore, the switching rate is half that expression (10.10).
  - the switching rate unambiguously rises as equilibrium profits falls.

Switching rate in the price-frame competition (Case 1)

- In contrast, in case 1, the equilibrium probability of a price comparison is

$$[\lambda(a)]^2 q_a + 2\lambda(a)\lambda(b)q + [\lambda(b)]^2 q_b$$

- This probability can lie above or below q.
- Furthermore, the comovement between price comparison and competitiveness is ambiguous.
- When the price and frames are correlated in the equilibrium, the clear positive link between the switching rate and the competitiveness of the market outcome breaks down.

Asymmetric Default Assignment

- So far, each firm plays the role of a default option for exactly half the population of consumers. Now, suppose all consumers are initially assigned to firm 1.
- Here firm 1 has an incentive to choose a frame that minimizes the probability of a price comparison, independently of the price it charges.
- Then, firms choose their pricing strategies as if they play zero sum game.
- equilibrium pricing strategies are defined over the interval $[1 - v^*, 1)$ as follows:

$$F_1(p) = 1 - \frac{1 - v^*}{p}$$

$$F_2(p) = \frac{1}{v^*} F_1(p)$$

Equilibrium Properties

- expected payoff: firm 1 is $1 - v^*$, firm 2 is $v^*(1 - v^*)$
- firm 2's equilibrium payoff does not rise monotonically with the probability of a price comparison v^*.
  - high v^* means that competitive forces are strong and thus prices are close to zero.
- Industry profits in Nash equilibrium are equal to $1 - (v^*)^2$.
  - asymmetric default assignment may generate a less competitive equilibrium outcome.
  - Generalization is not easy.

Generalization

- Can we generalize the insights obtained in the model of price -frame competition under the restriction to two frames?
  1. What is the general condition for the equilibrium outcome?
  2. Is there a proper extension of the distinction between cases 1 and 2 in the two-frame model?

Conditions for a competitive equilibrium outcome

- When $\pi(x, y) = 1$ for all $x, y \in X$, the consumer's behavior is rational, so in this case, firms play $p = 0$ and an arbitrary framing strategy in Nash Equilibrium.

Proposition 10.4

Firms play $p = 0$ in Nash equilibrium if and only if there exists $x^* \in X$ such that $\pi(y, x^*) = 1$for all $y \in X$.

- Intuition: x^* is a frame that enforces a price comparison with a more expensive firm, and competitive forces imply that each firm has an incentive to lower its price and adopt this frame.

Frame neutrality

- In case 1, one frame dominated the other in terms of comparability. In contrast, in case 2, it was possible to find a framing strategy that equalizes the probability of a price comparison across frames.

Definition

π is frame-neutral if there exist a framing strategy $\lambda^* \in \Delta(X)$ and a number $v^* \in [0,1]$ such that

$$\sum_{y \in X} \lambda^*(y)\pi(x,y) = v^*$$

for every $x \in X$. We then say that π is frame-neutralized by λ^*.

Frame neutrality (cont.)

Proposition 10.5

In symmetric Nash equilibrium, firms earn max-min payoffs if and only if π is frame-neutral.

- if π is frame-neutral, firms play a framing strategy that neutralizes π in any symmetric equilibrium.
- if π is not frame-neutral, prices and frames must be correlated in any symmetric equilibrium.

Revealed Preference

- A consumption problem with a default option can be described as a pair (A, d).
  - A is the set of available alternatives
  - $d \in A$ is the default option
- $z \succ z'$ if the consumer choose z in the choice problem $(\{z, z'\}, z')$
- $z \sim z'$ if $z \not\succ z'$ and $z' \not\succ z$.
- if the consumer choose z in $(\{z, z'\}, z')$, then he necessary chooses z in $(\{z, z'\}, z)$.

Revealed Preference (cont.)

- in the model of price-frame competition, an alternative z is a pair (x, p).
- if the consumer chooses (x, p) in the problem $(\{(x, p), (x', p')\}, (x, p))$, it must be the case that $p < p'$.
- this means that the consumer chooses (x, p) in the problem $(\{(x, p), (x', p')\}, (x', p'))$.
- Thus, consumer behavior indeed satisfies the choice-theoretic definition of default bias.

Revealed Preference (cont.)

- However, the revealed preference over price-frame pairs is generally intransitive.
  - Let $X = \{a, b, c\}$, and $p < p' < p''$
  - assume $\pi(a, c) = \pi(c, a) = 0$ and $\pi(x, y) = 1$ for every other pair of frames.
  - the consumer chooses (a, p) in the problem $(\{(a, p), (b, p')\}, (a, p))$ and $(\{(a, p), (b, p')\}, (b, p'))$.
  - the consumer chooses (b, p') in the problem $(\{(b, p'), (c, p'')\}, (b, p'))$ and $(\{(b, p'), (c, p'')\}, (c, p''))$.
  - but in the problem $(\{(a, p), (c, p'')\}, (a, p'))$ and $(\{(a, p), (c, p'')\}, (c, p''))$, the consumer sticks to his default alternative because he fails to make a price comparison.

Summary

- Consumer's inertia gives firms partial market power that gives rise to price variation.
- In a two-firm, two-frame model, firms' pricing and framing decisions are correlated in the equilibrium when one frame dominates the other frame. Firms' profit is above max-min level. In contrast, when no frame dominates another, pricing and framing are independent in the equilibrium. Firms' profit is max-min level.
- Weakening consumer inertia can give rise to a less competitive equilibrium outcome.
- The frequency with which consumers switch suppliers in equilibrium is ambiguously related to the competitive of the equilibrium outcome.