Repeated Purchases: Supplementary Section, Tirole

Based on Farrell 1984, Moral Hazard as an Entry Barrier

Iterated Decision Making with Imperfect Information

Repeated Purchases allow consumers to gain information about a good as long as their current experience is somehow related to future quality.

This can work in two ways:

Case #1: quality is fixed, therefore observation of current quality brings direct information about future quality.
Case #2: quality can be manipulated over time, however current quality may still act as a signal.

1. Repeat Purchases with Fixed Quality

Quality is not changed over time.

What is the value of Goodwill? Should the producer alter pricing to broaden it?
1.1 Goodwill and Introductory Offers

A 2 Period Matching Game with N Consumers.

1) Consumers do not know whether they will like a product, and satisfaction from a product is a matter of a “match” between them rather than a measure of quality.

2) Both the consumer and producer know the overall probability of match, and it is defined as \( x \).

3) A Consumer with taste \( \theta \) has the following per period preferences:
\[
U = \{ \theta s - p \}
\]

4) \( U = \{ 0 \} \) if buys at \( p \), and zero otherwise

5) Where \( s \) is a match success indicator and \( s=1 \) with probability \( x \).

6) The taste parameter is distributed over the consumers with cumulative distribution function \( F(\theta) \).

7) Without loss of generality we normalize population to equal 1, and the unit cost of producing the good is \( c \).

8) Producer determines prices \( p_1, p_2 \) for \( t=1,2 \)

9) Consumers who purchased in period 1 recognize the existence of a match in \( t=1 \), and given a match will purchase in \( t=2 \) if \( \theta > p_2 \).

Consider the Myopic Case (i.e. \( \delta=0 \)):

In \( t=1 \), a consumer with \( \theta \), will purchase at \( p_1 \) if and only if the expected surplus is positive:
\[
E[\theta s] - p_1 \geq 0
\]
\[
\theta \geq \frac{p_1}{x}
\]
Therefore demand at price $p_1$ is $1 - F\left(\frac{p_1}{x}\right)$

First Period Profit is

$$\left(p_1 - c\right)\left[1 - F\left(\frac{p_1}{x}\right)\right]$$

Price $p_1$ associated with probability $x$ of liking the product, is equivalent to price $\frac{p_1}{x}$ to be paid only if they are matched where:

$$\theta x - p_1 = x\left(\theta - \frac{p_1}{x}\right)$$

Now define $\tilde{p} = \frac{p_1}{x}$ and let $\tilde{c} = \frac{c}{x}$. The producer’s first period profit is:

$$x(\tilde{p}_1 - \tilde{c})\left[1 - F(\tilde{p}_1)\right]$$

This can be interpreted as the profit that would be received if the fraction $x$ who are going to like the product knew it in advance.

The new unit cost is now the production cost per satisfied customer, where $\tilde{c} \geq c$.

How does this compare with the full information monopoly model?

Let $p^m(\lambda)$ define monopoly price under full information with unit cost $\lambda$, i.e. $p^m(\lambda)$ maximizes $x(p - \lambda)\left[1 - F(p)\right]$.

In the 1st period, the producer chooses $\tilde{p}_1 = p^m(\tilde{c})$.

Because $\tilde{c} \geq c$, then $\tilde{p}_1 \geq p^m(c)$. 
Therefore the price exceeds the full information monopoly price adjusted by the probability of consumers not liking the product.

Consider now the 2\textsuperscript{nd} period:

The producer has 2 options:
1. Cater pricing to only the goodwill (1\textsuperscript{st} period) customers
2. Try to gain new customers.

Consider the 1\textsuperscript{st} strategy:

The marginal consumer in $t=1$ has $\theta = \tilde{p}_1 = p^m(\tilde{c}) \geq p^m(c)$. Since these goodwill customers are now perfectly informed and cost of production is now $c$, the 2\textsuperscript{nd} period profits are:

$$x(\tilde{p}_1 - c)[1 - F(\tilde{p})].$$

The alternative strategy, now fixing price at $p_2 \leq x\tilde{p}_1$ attracts new customers. Second period profit is now:

$$\left(p_2 - c\right)[x(1 - F(\tilde{p}_1)) + F(p_1) - F(p_2 / x)].$$

Note that this can be rewritten as:

$$x(\tilde{p}_2 - \tilde{c})[x(1 - F(\tilde{p}_1)) + F(\tilde{p}_1) - F(\tilde{p}_2)] < x(\tilde{p}_2 - \tilde{c})[1 - F(\tilde{p}_2)].$$

Where $\tilde{p}_2 \equiv p_2 / x$

Thus with a myopic producer and customers, the monopolist charges $p_2 = p_1 / x$ and caters exactly to the first period customers with which goodwill was established.

Given that the first period price is lower than the 2\textsuperscript{nd} period, does this constitute an “introductory offer”?
Note that a customer would be indifferent between paying $P_1$ for sure and paying $P_2$ conditional on their liking of the product. Farrell (1984) defines an introductory offer as a 1st period price that is strictly lower than the full information second period price multiplied by the 1 period probability of the customer liking the good.

In this sense, this is not an introductory offer.

Now consider the nonmyopic case.

Customers and the producer have a common discount rate $\delta$. One would suppose that when taking a dynamic perspective, the monopolist should accommodate a large clientele to take advantage of it in the second period. This intuition is flawed.

Monopolists will not try to gain new customers in the dynamic case as in the myopic case because decreasing price would benefit period one purchasers as well. In this case, it would be better to consolidate the gains of goodwill.

The discounted profit can be written as

$$x(\tilde{p}_1 - \tilde{c})(1 - F(\tilde{p}_1)) + \delta x(\tilde{p}_1 - c)(1 - F(\tilde{p}_1)) = (1 + \delta)x(\tilde{p}_1 - c(\delta))(1 - F(\tilde{p}_1))$$

Where $c(\delta) = \frac{(\tilde{c} + \delta c)}{(1 + \delta)}$ is the average discounted cost. Recall that producing a clientele of $N$ consumers is equal to $Nc/x = N\tilde{c}$.
Note that $c(\delta)$ is decreasing in $\delta$. Since the maximization of this profit function is equivalent to that of a monopolist with unit cost $c(\delta)$, the market price is also a decreasing function of $\delta$.

As $\delta$ approached infinity, the demand converges to the monopoly demand under full information.