Cooperative Strategy on Price Decision

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Abstract. For price decision, dealer and manufacturer usually make price decision independently to maximize their own profits. However, if they can cooperate in pricing behavior, they can improve their profits at the same time. Nevertheless, consumers will lose in the process. From the perspective of dealer and manufacturer, cooperation will be better than competition in price decision, but from the perspective of society, dealer and manufacturer should be in competition instead of cooperation in price decision.

Introduction

A retail dealer whose major business is in the products of a single manufacturer form an organizational system with that manufacturer[1]. A manufacturer distributes its brand through exclusive retail dealer and must compete for consumers indirectly by inducing retailer to carry its brand[2]. As cooperative ventures and strategic alliances have increased in numbers, there is need for an analysis which does not proceed from presumption that singular-person action is the only form of action. When doing things with others, certain wrongs become possible that solo activity does not recognize[3]. Subsequent rivalry among trade associations facilitated the development of tacitly cooperative pricing arrangements[4]. Theoretical research on such channel structures has analyzed the optimal behavior of channel members under alternative assumptions of manufacturer-retailer interaction (Vertical Strategic Interaction)[5].

The Model

Assume there are two kinds of companies in the market, they are manufacturers and dealers. Manufacturers produce products and sell them to dealers. Dealers buy products from manufacturers and sell to consumers. The market sale (Q) is determined by retail price (p^0): Q = a − p^0. Profit of retail dealer (\pi^0) is determined by market sale (Q), retail price (p^0) and its purchase price (p^1): \pi^0 = Q \times (p^0 − p^1). Purchase price of retail dealer is the same as selling price of manufacture. Profit of manufacturer (\pi^1) is determined by market sale (Q), selling price (p^1) and production cost. Assume variable cost is constant at c and no fixed cost. The profit of manufacturer is as \pi^1 = Q \times (p^1 − c). Consumer surplus (\pi_c) is as \frac{Q^2}{2}. Society welfare is the sum of retail dealer’s profit, manufacturer’s profit and consumer’s surplus (w = \pi^0 + \pi^1 + \pi_c).

Dealer chooses p^0 to maximize its profit (\pi^0). Manufacturer chooses p^1 to maximize its profit (\pi^1). p^0 and p^1 will determine market sale, consumer surplus, retail dealer’s profit manufacturer’s profits and society welfare.

Optimal Outcome of Price Cooperation

If retail dealer and manufacturer cooperate at price, they will negotiate at retail price and
manufacturer’s price to maximize their total profits. The sum of retail dealer’s profit and manufacturer’s profit is as follow:

$$\pi^{0+1} = (a - p^0) * (p^0 - p^1) + (a - p^0) (p^1 - c) = (a - p^0) * (p^0 - c)$$  \hspace{1cm} (1)$$

$$\frac{\partial \pi^{0+1}}{\partial p^0} = a + c - 2p^0 = 0$$

Its first order condition is as:

From above first order condition we yield

$$p^0 = \frac{a + c}{2}$$  \hspace{1cm} (2)$$

Substitute Eq.(2) to Eq.(5), yielding

$$\pi^{0+1} = \frac{(a-c)^2}{4} > \frac{3}{16}(a-c)^2$$  \hspace{1cm} (3)$$

when  \quad p^0 = \frac{a+c}{2}, \quad we \quad get \quad following \quad equations.

$$Q = a - p^0 = \frac{a-c}{2}$$  \hspace{1cm} (4)$$

$$\pi^c = \frac{Q^2}{2} = \frac{(a-c)^2}{8} > \frac{(a-c)^2}{32}$$  \hspace{1cm} (5)$$

$$w = \pi^0 + \pi^1 + \pi^c = \frac{3}{8}(a-c)^2 > \frac{7}{32}(a-c)^2$$  \hspace{1cm} (6)$$

From equation (2) and in-equation (3), it can be found that when retail price is at \( \frac{a+c}{2} \), no matter how much is the manufacturer’s price, the sum of retail dealer’s profit and manufacturer’s profit is at maximum as \( \frac{(a-c)^2}{4} \). From formula (4), (5) and (6), it can be found that price cooperation between retail dealer and manufacturer can lower retail price and expand market volume, enhance consumer surplus and society welfare. This price cooperation can benefit for all parts, including retail dealer, manufacturer and consumer, hence it is worthy being adopted. Although here manufacturer’s price can not affect the sum of retail dealer’s profit and manufacturer’s profit, it can determine whether manufacturer and retail dealer can raise their profits at the same time or not, which in consequence determines whether the price cooperation can be realized or not.

1. Acceptable manufacturer’s price for manufacturer

When  \quad p^0 = \frac{a+c}{2}, \quad from \quad formula(3) \quad we \quad yield \quad manufacturer’s \quad profit \quad as \quad follow:

$$\pi^1 = \frac{a-c}{2} (p^1 - c)$$  \hspace{1cm} (7)$$
The acceptable manufacturer’s price \( p^1 \) for manufacturer must bring manufacturer a higher profit than that under price competition, namely as: 
\[
\pi^1 = \frac{a-c}{2} (p^1 - c) > \frac{(a-c)^2}{8}.
\]

From above formula we yield: 
\[
\frac{a+3c}{4} < p^1 < \frac{a+c}{2}.
\] (8)

(2) Acceptable manufacturer’s price for retail dealer

When \( p^0 = \frac{a+c}{2} \), from formula (1) we yield retail dealer’s profit as follow.

\[
\pi^0 = \frac{a-c}{2} (\frac{a+c}{2} - p^1).
\] (9)

The acceptable manufacturer’s price \( p^1 \) for retail dealer must bring retail dealer a higher profit than that under price competition, namely as: 
\[
\pi^0 = \frac{a-c}{2} (\frac{a+c}{2} - p^1) > \frac{(a-c)^2}{16}.
\]

From above formula we yield: 
\[
p^1 < \frac{3a+5c}{8}.
\] (10)

From formula (8) and (10) we find that, when two companies cooperate to reduce retail price to \( \frac{a+c}{2} \), the acceptable manufacturer’s price for both sides must fall to \( [\frac{a+3c}{4}, \frac{3a+5c}{8}] \).

Conclusion

If manufacturer and dealer can cooperate in pricing behavior, they can achieve more profit than that when they make price decision independently. In cooperation, they can achieve optimal outcomes and sub-optimal outcomes when they set the cooperative prices at different level. Although dealer and manufacturer can achieve more profits if they cooperate in pricing, the welfare of consumer and the whole society will decrease in the process. As actors in market, dealer and manufacturer should consider how to cooperate in price decision, but government should prevent they cooperate in price decision to protect the in interest of whole society.

References


