Study about the Competing Channel Structure under Bargaining Power

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Abstract From the bargaining process, competing channel structure models are presented. The evolving process of channel structure under different bargaining power is analyzed. The important role of different bargaining power is discussed and the equilibrium result is found. Also the theoretical evidences for competing channel structure choice are given.

Key words channel structure; bargaining power; equilibrium

Bargaining game between manufacturer and retailer is very important for many distributing channel. The bargaining power would influence the allocation of the total income and coordination of the channel. In grocer distribution channel, manufacturer often complain that retailers try to find new ways to plunder the profit of channel. Alister (1997) found that the sum of product disrepair all over world was as high as 25 hundred million dollar in recent year, and that increasingly turn into a cancer of destroying the relationship between the manufacturer and the retailer[1]. The key issue is who should be charged for it? The retailer charges the transportation accident and the defect of manufacturer packing design; the manufacturer charges the disrepair issue of the retailer inventory. According to the recent reports, in saloon car industry, GM Company has taken compulsion measure to resist the supplier’s extruding the material cost. As a business enterprise leader, GM generally overlooks the subscribed contract, and begins to negotiate another favorable term[2].

These situations disclose some key problems in the distribution channel management. The first is that channel management is a bargaining process between manufacturer and retailer, but not a general taking-leaving, and that the bargaining power would influence the coordination range. The second result from a renew negotiation, it would emerge opportunism action. The third is that the theory of the two-step pricing, in fact is seldom real[3-5]. Lopomo (2001) considered two-person bargaining game with interdependence preference and bilateral incomplete information[6]. Bikhchandni (1992) discussed the multiplicity equilibrium of bargaining game with incomplete information[7]. Ziwck (1999) considered bargaining behavior in situation where one party is stronger than another party[8]. Agmengol (2003) examined the bargaining game related with network[9]. Iyery and Miguel (2003) has discussed how the bargaining power would influence the channel coordination in the solo-distribution channel and found that the two-step pricing hardly possesses efficiency[10]. In fact, there are seldom solo-distribution channel in industry. Thus it is even more important to study the evolving process and equilibrium of competitive channel structure based on the bargaining power.

In this paper, our attention is put on how the difference of bargaining power and product affects the channel structure in competitive channel with non-observed retail price. Iyery and Miguel’s conclusion is improved in the first. The more clear theory is proposed for the choice of channel structure and the design of channel coordination mechanism in competitive environment.

1 The Bargaining Process and Channel Structure Model

In general, the condition of cost and product among manufacturers and retailers is different. There are two major channel structures: the integrated structure (I) and the de-centralization channel structure (D). In the former, the manufacturers decide the retail price. In the latter, the manufacturers sell the products to the independent retailers, and the retailers decide the retail price.

Here we suppose the basic demand model is

\[ q_i = 1 - p_i + ap_2 \]  

(1)
\[ q_2 = 1 - p_2 + a p_i \]

where \( a \) is the difference degree of competitive product, and \( 0 < a < 1 \). \( q_i \) is the demand amount and \( p_i \) is the price of product.

The manufacturer’s wholesale price results from the bargaining process and has nothing to do with the retailer’s choice for the price. Therefore the retailer chooses the retail price based on its own optimization profit. Usually, the coordination retail price is not the final result, but the retail price is decided after the bargaining process based on the wholesale price. The whole process can be described as

\[
\hat{w}_i = (1 - b) \hat{p}_i 
\]

\[
\hat{p}_i = \arg \max_p (p_i - \hat{w}) q_i (p_i, p_2) 
\]

where \( b \) is the retailer bargaining power and \( 0 < b < 1 \).

### 1.1 II Type Channel Structure Model

When two manufacturers both select the integration channel structure, the corresponding channel profit model is

\[
m_{11} = q_1 p_1 \\
m_{21} = q_2 p_2 
\]

The first order condition is

\[
\frac{\partial m_{11}}{\partial p_1} = 1 - 2 p_1 + a p_2 = 0 \\
\frac{\partial m_{21}}{\partial p_2} = 1 - 2 p_2 + a p_1 = 0 
\]

The result and profit based on the price game is

\[
p_i = p_2 = \frac{1}{2 - a} 
\]

The manufacturer equilibrium profit is

\[
m_{111} = m_{211} = \frac{1 - b}{(2 - a)^2} 
\]

### 1.2 DD Type Channel Structure Model

When two manufacturers both select the de-centralization channel structure, the corresponding channel profit is

\[
m_1 = w_i q_1 \\
m_2 = w_j q_2 \\
r_i = q_i (p_i - w_i) \\
r_j = q_j (p_2 - w_j) 
\]

The game result of retailer’s optimization profit under fixing wholesale price is

\[
\frac{\partial r_i}{\partial p_i} = 1 + (w_i - 2 p_j) + a p_j = 0 
\]

Thus the equilibrium result is

\[
p_i = \frac{2 + a + aw_i + 2w_j}{4 - a^2} \\
p_2 = \frac{2 + a + aw_j + 2w_i}{4 - a^2} 
\]

On account of the non-observed retailer’s pricing, the wholesale prices of the manufacturers result from the bargaining process, independent of the retailer’s choice. Thus the wholesale price based on the retailer’s bargaining power \( b \) is

\[
w_i = (1 - b) p_i \\
w_j = (1 - b) p_2 
\]

The equilibrium results are

\[
p_i = p_2 = \frac{a + b + 1}{1 + 2b + b^2 - a^2} \\
w_i = w_j = \frac{1 + a - b^2 - ab}{1 + 2b + b^2 - a^2} 
\]

Each manufacturer’s equilibrium profit is

\[
m_{101} = m_{201} = \frac{(1 + a - ab - b^2)(a + b + 1)b}{(1 - a^2 + b^2 + 2b)^2} 
\]

### 1.3 DI Type Channel Structure Model

When the first channel is de-centralization but another is integration, the corresponding channel profit model is

\[
m_1 = w_i q_1 \\
m_{21} = q_2 p_2 \\
r_i = q_i (p_i - w_i) 
\]

The first order condition is

\[
\frac{\partial r_i}{\partial p_i} = 1 + (w_i - 2 p_2) + a p_2 = 0 \\
\frac{\partial m_{21}}{\partial p_2} = 1 - 2 p_2 + a p_1 = 0 
\]

The result is

\[
p_i = \frac{2 + a + bca + 2w_i}{4 - a^2} \\
p_2 = \frac{2 + a + 2bc + aw_i}{4 - a^2} 
\]

Obviously, the manufacturer 1 can’t observe the
retailer 1’s choice of the price, but the manufacturer 2 can observe the retail price. Hence the wholesale price structure based on the retailer’s bargaining power b is

\[ w_1 = \frac{1 - b}{p_1} \]  

(25)

Then the equilibrium result is

\[ p_1 = \frac{a + 2 + 2b - a^2}{2 + 2b - a^2} \]  

(26)

\[ p_2 = \frac{a + 1 + b + 2b - a^2}{2 + 2b - a^2} \]  

(27)

\[ w_1 = \frac{2 + a - ab - 2b}{2 + 2b - a^2} \]  

(28)

The manufacturer’s equilibrium profit is

\[ m_{D11} = \frac{(2 + a - ab - 2b) b(a + 2)}{(2 - a^2 + 2b)^2} \]  

(29)

\[ m_{D12} = \frac{(1 - b)(a + 1 + b)^2 (a + 2)}{(2 - a^2 + 2b)^2} \]  

(30)

### 1.4 ID Type Channel Structure Model

When the first channel is integration but another is decentralization, the corresponding channel model is

\[ m_{I1} = p_1 q_1 \]  

(31)

\[ m_2 = q_1 w_2 \]  

(32)

\[ r_2 = q_1 (p_2 - w_2) \]  

(33)

The first order condition is

\[ \frac{\partial r_2}{\partial p_2} = 1 + (w_2 - 2 p_2) + ap_1 = 0 \]  

\[ \frac{\partial m_1}{\partial p_1} = 1 - 2 p_1 + a p_2 = 0 \]  

Then the result is

\[ p_1 = \frac{2 + a + aw_2}{4 - a^2} \]  

(34)

\[ p_2 = \frac{2 + a + 2w_2}{4 - a^2} \]  

(35)

Clearly, the manufacturer 2 can’t observe the retailer 1’s choice of price, but the manufacturer 2 can. Thus wholesale price structure based on the retailer’s bargaining power b is

\[ w_2 = \frac{1 - b}{p_2} \]  

(36)

Then the equilibrium result is

\[ p_1 = p_2 = \frac{a + b + 1}{2 - a^2 + 2b} \]  

(37)

\[ w_1 = \frac{2 + a - ab - 2b}{2 - a^2 + 2b} \]  

(38)

\[ m_{ID1} = \frac{(1 - b)(a + 1 + b)^2 (a + 2)}{(2 - a^2 + 2b)^2} \]  

(39)

\[ m_{ID2} = \frac{(2 + a - ab - 2b) b(a + 2)}{(2 - a^2 + 2b)^2} \]  

(40)

### 2 The Evolvement of the Competitive Channel Structure

#### 2.1 The Area I

In Fig.1 the area I is the left region of borderline \( m_{D11} = m_{D11} \), the profit is equal for manufacturer 1 in spite of the system types: DD type or ID type. The numerical calculation shows that the evolution process characterizes with consistency and the evolution structure as shown in Tab.1. The process would be DD → DI (ID) → II, this shows that the final equilibrium is II type channel structure. In the region I, the numerical calculation farther indicates \( m_{II1} > m_{II2} \) and \( m_{II2} > m_{II2} \). Namely, in this region the II type channel structure is the exclusive final Nash equilibrium result.

<table>
<thead>
<tr>
<th>Area</th>
<th>Old structure</th>
<th>M1</th>
<th>M2</th>
</tr>
</thead>
<tbody>
<tr>
<td>I, II</td>
<td>II</td>
<td>DI</td>
<td>&lt;0</td>
</tr>
<tr>
<td></td>
<td>DD</td>
<td>ID</td>
<td>&gt;0</td>
</tr>
</tbody>
</table>

#### 2.2 The Area II

In Fig.1 the area II is the region enclosed by the borderline \( m_{D22} = m_{D22} \) and \( m_{D22} = m_{D22} \). The numerical calculation shows that the evolution process characterizes with consistency and the evolution structure as shown in Tab.1. It display two kinds of evolution processes are DD → DI (ID) → II. The evolvement routes entirely depend on the original choice of the first manufacturer. The numerical calculations indicate that the manufacturers’ profits are \( m_{II1} < m_{II1} \) and \( m_{II2} > m_{II2} \). The both sides’ profit would be worse owing to the opportunism action, that is, the choice of the channel structure is like what is called “prisoner dilemma”. Thus it is necessary to
implement coordination mechanism to assure the win-win results in this region.

2.3 The Area III

The district III is the lower right region enclosed by the borderline \( m_{III} = m_{ID1} \) and \( m_{III} = m_{ID2} \). The numerical calculation shows that the evolvement process characterizes with consistency and the evolvement structure as shown in Tab.1. It displays two kinds of evolvement processes: a) DI (ID) \( \rightarrow \) DD, and b) DI (ID) \( \rightarrow \) II. The evolvement routes entirely depend on the original choice of the first manufacturer. At the region VI, the numerical calculations indicate that the manufacturers’ profits are \( m_{III} < m_{ID1} \) and \( m_{III} < m_{ID2} \), and shows that final equilibrium structure is the same, but selecting the second route for manufacturers could obtain more profit for the both sides. Namely, this would occur the mix channel structure equilibrium DI.

2.4 The Area IV

The district IV in Fig.1 is the lower right region enclosed by the borderline \( m_{III} = m_{ID1} \) and \( m_{III} = m_{ID2} \), and characterizes with the evolvement structure as shown in Tab.1. The two kinds of evolvement processes are II \( \rightarrow \) DI (ID) \( \rightarrow \) DD. The evolvement routes entirely depend on the original choice of the first manufacturer. The numerical calculations indicate that the manufacturers’ profits are \( m_{III} < m_{ID1} \) and \( m_{III} < m_{ID2} \). Namely, the manufacturers’ profit gets a win-win improvement, and reaches Nash equilibrium result.

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References


Brief Introduction to Author(s)

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