Study about the Asymmetry Competing Channel Structure under Bargaining Power

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Abstract On the problem of competing channel structure, we present asymmetry competing channel structure models under bargaining power, analyze the evolving process of channel structure under different bargaining power and product nature, find different bargaining power and product nature important role for channel structure, and also present equilibrium result. Furthermore, the academic proof for channel structure choice is presented.

Key words channel structure; bargaining power; equilibrium

The bargaining game based on the trade clause between the manufacturer and retailer is an important trait for many distributing channels. This bargaining power would influence the distribution of the total income and the harmony of the channel. In the grocer distribution channel, the manufacturers often complain the retailer’s finding new way to plunder the channel’s profit. MnAlister find that the sum of product disrepair is as high as 25 hundred million dollar. And increasingly become a cancer of destroying the relationship between the manufacturers and the retailers. The key issue is who should be charged for it. The retailers charge the transport accident and the packing design defect of the manufacturers; the manufacturers charge the disrepair issue in hold and store of the retailers. According to the recent news, in saloon car industry, company GM takes compulsion measure to oppose the upper-providers’ extruding the material cost. As the group leader business enterprise GM generally overlooks the signed contract, and begin to negotiate another favorable term. These conditions reflect some key issue in the distribution channel management. The first is the bargaining process between the manufacturer and the retailers in channel management, but not the generally refuse-accept clause. Bargaining power would influence the harmonious degree. The second results from the non-practically, it would lead to a refresh negotiation. Here would emerge opportunism action. The third is that the theory character the two-step pricing is the optimization contract design, but in fact it is seldom practicality. Iyery, J.Miguel studied how the bargaining power would influence the channel harmony on the condition of solo-distribution channel, and find that the two-step pricing yet possesses efficiency. But in fact these are seldom solo-distribution channel condition in an industry, thus it is even more have reality meaning for studying the evolving process and equilibrium of competitive channel structure based on the bargaining power. We focus on how would the difference of manufacturer and the retailer’s bargaining power and the product influence the channel structure on the condition of competitive channel with non-observed retail price. On this issue we farther expand the Iyery, J.Miguel’s conclusion, provide an integrated theory for the choice of channel structure and the construction of the channel harmony mechanism on the condition of competitive environment.

1 The Bargaining Process and Asymmetry Channel Structure Model

We analyze the condition based on the difference of product with two manufacturers and two retailers. There are two major channel structures: one is the integrated structure (I) and the manufacturers have its’ own retailers, the manufacturers decide the retail price; another is the non-centralization channel structure (D), the manufacturers sell the products to the independent retailers by wholesale price, and the retailers decide the retail price. Here we suppose the basic demand model is:
\[ q_1 = 1 - p_1 + ap_2 \quad q_2 = 1 - p_2 + ap_1 \]

where \( a \) represent the difference degree of the competitive product, and \( 0 < a < 1 \).

The retailer chooses the retail price decision-making based on its own optimization profit. Commonly, the harmony retail price is not the model’s equilibrium result, but the both sides’ equilibrium result based on the synchronization decision-making.

The bargaining process of the both sides is

\[ \hat{w}_1 = (1 - b) \hat{p}_1 \quad \hat{w}_2 = (1 - be) \hat{p}_2 \]

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

where \( b \) is bargaining power of manufacturer1, and \( 0 < b < 1 ; e \) is the bargaining power difference of manufacturer 2, and presume \( 0 < e < 1 \).

### 1.1 II Type Channel Structure Model

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

\[ m_i = q_i p_1 \quad m_2 = q_2 p_2 \]

The first order condition is

\[ \frac{\partial m_i}{\partial p_i} = 1 - 2p_1 + ap_2 = 0 \quad \frac{\partial m_2}{\partial p_2} = 1 - 2p_2 + ap_1 = 0 \]

The tactic result and the profit based on the price game is

\[ p_1 = p_2 (2 - a)^{-1} \]

Each manufacturer’s equilibrium profit is

\[ m_{e1} = (1 - b)(2 - a)^{-2} \quad m_{e2} = (1 - be)(2 - a)^{-2} \]

### 1.2 DD Type Channel Structure Model

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

\[ m_i = w_i q_i \quad m_2 = w_2 q_2 \]

\[ r_i = q_i (p_i - w_i) \quad r_2 = q_2 (p_2 - w_2) \]

The game result of retailer’s optimization profit on the condition of fixing wholesale price is

\[ \frac{\partial r_i}{\partial p_i} = 1 + (w_i - 2p_i) + ap_1 = 0 \]

thus we get the equilibrium result

\[ p_1 = (2 + a + aw_i + 2w_1)(4 - a^2)^{-1} \quad p_2 = (2 + a + aw_i + 2w_2)(4 - a^2)^{-1} \]

On account of the non-observed retailer’s pricing on the condition of two manufacturers, the wholesale prices of the manufacturers result from the bargaining process, and have nothing to do with the retailer’s choice of the actual price. Thus the wholesale price structure based on the retailer’s bargaining power \( b \) is

\[ w_i = (1 - b)p_1 \quad w_2 = (1 - be)p_2 \]

The equilibrium results are

\[ p_1 = (a + be + 1)(1 + be + b + eb^2 - a^2)^{-1} \quad p_2 = (a + b + 1)(1 + be + b + eb^2 - a^2)^{-1} \]

\[ w_i = (1 + a + be - e^2 - ab)(1 + be + b + eb^2 - a^2)^{-1} \quad w_2 = (1 + a + be - e^2)(1 + be + b + eb^2 - a^2)^{-1} \]

Each manufacturer’s equilibrium profit is

\[ m_{d11} = (1 + a + be - ab - e b^2 - b)(a + eb + 1)b \times (1 + b + eb + eb^2 - a^2)^{-2} \]

\[ m_{d22} = (1 + a - ab - e b^2 + b)(a + b + 1)be \times (1 + b + eb + eb^2 - a^2)^{-2} \]

### 1.3 DI Type Channel Structure Model

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

\[ m_i = w_i q_i \quad m_2 = q_2 p_2 \]

\[ r_i = q_i (p_i - w_i) \]

the tactic result is

\[ p_1 = (2 + a + bca + 2w_1)(4 - a^2)^{-1} \quad p_2 = (2 + a + 2bc + aw_2)(4 - a^2)^{-1} \]

Due to that 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

\[ w_i = (1 - b)p_1 \]

then we get the equilibrium result

\[ p_1 = (a + 2)(2 + 2b - a^2)^{-1} \quad p_2 = (a + 1 + b)(2 + 2b - a^2)^{-1} \]

\[ w_i = (2 + a - ab - 2b)(2 + 2b - a^2)^{-1} \]

each manufacturer’s equilibrium profit is

\[ m_{d11} = (2 + a - ab - 2b)(2 + a)(2 + 2b - a^2)^{-2} \]

\[ m_{d22} = (1 - be)(1 + a + b)^2(2 + 2b - a^2)^{-2} \]

### 1.4 ID Type Channel Structure Model

When the first channel is integration but another is decentralization, the corresponding channel profit model is
New process would be DDDI(ID) the evolvement structure as shown in Tab.1. The evolvement process characterizes with consistency and Fig.1 shows. The numerical calculation shows that the whole profit could be carried out with win-win improvement.

Due to that the manufacturer 2 can’t observe the retailer 1’s choice of price, but the manufacturer 2 can clearly observe the retail price, thus wholesale price structure based on the retailer’s bargaining power is

\[ w_2 = (1 - be)p_2 \]

Then we get the equilibrium result

\[ p_1 = (2 + a + aw_2)(4 - a^2)^{-1} \]
\[ p_2 = (2 + a + 2w_2)(4 - a^2)^{-1} \]

Due to that the manufacturer 2 can’t observe the retailer 1’s choice of price, but the manufacturer 2 can clearly observe the retail price, thus wholesale price structure based on the retailer’s bargaining power \( b \) is

\[ w_2 = (1 - be)p_2 \]

Then we get the equilibrium result

\[ p_1 = (a + eb + 1)(2 + 2eb - a^2)^{-1} \]
\[ p_2 = (2 + a)(2 + 2eb - a^2)^{-1} \]
\[ w_2 = (2 + a - abe - 2eb)(2 + 2eb - a^2)^{-1} \]
\[ m_{ii1} = (1 - b)(a + eb + 1)^2(2 + 2eb - a^2)^{-2} \]
\[ m_{ii2} = (a + 2 - abe - 2eb)(a + 2eb)(2 + 2eb - a^2)^2 \]

2 Analysis of the Evolvement of the Competitive Channel Structure

2.1 The Area I, II, III

The district I, II, III is the left region of borderline \( m_{ii1} = m_{ii1} \), where the profit is equal for manufacturer I no matter the system is DD type or ID type, as shown in Fig.1. The numerical calculation shows that the evolvement process characterizes with consistency and the evolvement structure as shown in Tab.1. The process would be DD → Di(ID) → II, this shows that the final equilibrium of the three region is II type channel structure. At the region I, the numerical calculation farther indicate \( m_{ii1} > m_{ii1} \), \( m_{ii2} > m_{ii2} \); at the region II there are \( m_{ii1} < m_{ii1}, \ m_{ii2} > m_{ii2} \), this shows that for the manufacturer I the result has not been improved in the evolvement process; at the region III there are \( m_{ii1} < m_{ii1}, \ m_{ii2} < m_{ii2} \), the both sides’ profit would be reduced owing to the opportunism action of the both sides, that is the choice of the channel structure behave like what is called “prisoner puzzle”. Thus it is very necessary at this region to implement union and harmony mechanism for sure the whole profit could be carried out with win-win improvement.

\[ \begin{align*}
\text{Area} & \quad \text{Old structure} & \quad \text{New structure, Profit variety} & \quad \text{New structure} & \quad \text{Profit variety} \\
I, II, III & \quad \text{DD} & \quad \text{ID} & \quad <0 & \quad \text{ID} & \quad <0 \\
IV, V & \quad \text{DD} & \quad \text{ID} & \quad >0 & \quad \text{DI} & \quad >0 \\
VI, VII & \quad \text{DD} & \quad \text{ID} & \quad >0 & \quad \text{ID} & \quad <0 \\
VIII & \quad \text{DD} & \quad \text{ID} & \quad <0 & \quad \text{ID} & \quad <0 \\
IX & \quad \text{DD} & \quad \text{ID} & \quad <0 & \quad \text{ID} & \quad <0 \\
X & \quad \text{DD} & \quad \text{ID} & \quad <0 & \quad \text{ID} & \quad <0
\end{align*} \]

2.2 The Area IV, V

The district IV, V is the region enclosed by the borderline \( m_{ii2} = m_{ii1} \), \( m_{ii2} = m_{ii2} \), \( m_{ii1} = m_{ii1} \), as Fig.1 shows. The numerical calculation shows that the evolvement process characterizes with consistency and the evolvement structure, see Tab.1. It behaves out two kinds of evolvement processes: 1) ID → DD → Di(ID) → II; 2) ID → ID. The evolvement routes entirely depend on the original choice of the first one in the two manufacturers. At the region IV, the numerical calculations indicate that the manufacturers’ profits area \( b = 0.6 \) is

\[ \text{manufacturer profits area, } b = 0.6 \]

Fig.1 Channel structure equilibrium district
2.3 The Area VIII
The district VIII is the lower right region enclosed by the borderline \( m_{d1} = m_{d1}, \quad m_{d2} = m_{d2} \), as shown in Fig.1. The numerical calculation shows that the evolvement process characterizes with consistency and the evolvement structure, as shown in Tab.1. It behaves out two kinds of evolvement processes: 1) ID \( \rightarrow \) II \( \rightarrow \) DI; 2) ID \( \rightarrow \) DD \( \rightarrow \) DI. The evolvement routes entirely depend on the original choice of the first one in the two manufacturers. At the region VI, the numerical calculations indicate that the manufacturers’ profits are
\[
m_{o1} < m_{d1}, \quad m_{o2} < m_{d2}
\]
It shows that although the final equilibrium structure is the same but selecting the second route for manufacturers could obtain more route profit for the both sides; namely it would come forth the mix channel structure equilibrium DI. At the region VII, the numerical calculations indicate that the manufacturer profits are
\[
m_{o1} < m_{d1}, \quad m_{o2} < m_{d2}
\]
namely the manufacturer 2 would prefer the first kind of channel evolvement route, but the manufacturer 1 would prefer the second one.

2.4 The Area VIII
The district VIII is the lower right region enclosed by the borderline \( m_{d2} = m_{d2}, \quad m_{o1} = m_{d1}, \quad m_{o3} = m_{d1} \), as shown in Fig.1 and characterizes with the evolvement structure as shown in Tab.1. It behaves out two kinds of evolvement processes: 1) ID \( \rightarrow \) II \( \rightarrow \) DI \( \rightarrow \) DD; 2) ID \( \rightarrow \) DD. The evolvement routes entirely depend on the original choice of the first one in the two manufacturers. The numerical calculation indicate that the manufacturers’ profit are
\[
m_{o1} < m_{d1}, \quad m_{o2} < m_{d2}
\]
namely the manufacturers would prefer the third and the fourth evolvement route.

2.6 The Area X
The district X is the upper confine enclosed by the borderline \( m_{o2} = m_{d2} \), as shown in Fig.1 and characterizes with the evolvement structure as shown in Tab.1. It behaves two kinds of evolvement processes: 1) II \( \rightarrow \) DI \( \rightarrow \) DD; 2) II \( \rightarrow \) ID \( \rightarrow \) DD. The evolvement routes entirely depend on the original choice of the first one in the two manufacturers. The numerical calculation indicate that the manufacturers’ profit are
\[
m_{o1} < m_{d1}, \quad m_{o2} < m_{d2}
\]
namely the manufacturers’ profit realize the win-win improvement, and form the Nash equilibrium result.

References

Brief Introduction to Author(s)
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