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Research on bargaining in service supply Chain competition under demand uncertainty

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ABSTRACT

In this paper, we established a service supply chain competition model based on bargain between the service suppliers and service integrators under demand uncertainty. According to the game between different service supply chain structures (distributed structure, integrated structure, bargaining structure), we solved their equilibrium solutions. It shows that the bargaining power between service suppliers and service integrators has an important impact on the choice of channel structure. It also gives the corresponding structure evolution process and the scope of the equilibrium results through the comparison of the Nash equilibrium, this provides theory basis to the choice of service channel structure with uncertainty environment.

KEYWORDS

Service supply Chain; Competitive model; Bargaining power; Channel structure.

INTRODUCTION

In the 21st century, with the improvement of people's living standard, people rising demand for services. Whether it is from the service sector growth rate or the extent of its concern, service industries have become increasingly dominant in the global economy. In 2004, the American scholar Lisa M. Ellram published <Understanding and Managing the Services Supply Chain> article, marking the service supply chain started to get attention, the article pointed out the service supply chain is a professional service from the earliest supplier to information management final customers what happened, process management, capacity management, service performance and funding management[1]. Miriam Lau for domestic scholars and Du noted that the purpose of the service of scientific research through scientific approach to service deployment system interdisciplinary research, but this is in the rise of the stage, with the necessity and urgency of the study[2].

Regarding competition service supply chain, Tamer Boyaci and Guillermo Gallego (2004) constructed a supplier and an integrator of two supply chain model, the two supply chains compete on customer service, through the coordination, lack of coordination, coordination mixed equilibrium analysis under three scenarios found that coordination will improve service levels, and the customer is the biggest beneficiary after coordination[3]. Fernando Bernstein and Awi Federgruen (2004) studied the general equilibrium model duopoly companies on price and service competition, discussed the situation integrators while equilibrium in the price or service competition[4]. They then(2007) and studied in a distributed supply chain structure, coordination mechanism for the impact of price and service competition in the supply chain, making the overall coordination mechanisms found in distributed supply chain expected profit equal to the profits generated by the centralized structure of the supply chain, then the demand will depend on the company set the price and the extent of their level of service, etc[5]. Liu Tao, et al (2009)constructed two manufacturers, two integrators supply chain competition model, respectively, from price competition, service competition reveals the impact of supply chain longitudinal control the cost structure of the service industry, but his needs are identified of [6]. Lee studied under symmetric and asymmetric information software as a service model for service supply chain coordination, contract research shows that coordination can make a free trial to achieve the overall best results[7]. Fuqiu Fang constructed the optimization model distribution service supply chain service capabilities through multi-objective bi-level programming method, algorithm analysis service capabilities to achieve decision-making supply chain optimization services[8]. Above literature study on supply chain competitive services, also discussed the issue of the supply chain structure, but ignore the channel management between manufacturers and distributors bargaining process, and the bargaining power will affect the channel to coordinate degree.

In the bargain side, the supply chain literature has Iyer (2003) in the case of independent distribution channels studied the impact on the bargaining power of channel coordination, and found the usual two-step pricing inefficiencies, but he ignored the impact of the competitive environment[9]. In fact one of the industry 's distribution channel alone is rarely the case, and thus the evolution of the channel structure and balanced study of competitive bargaining power based on more realistic. Ai(2007) on the basis Iyer further expand his conclusions, considering the effect of the competitive environment, the independent distribution channels bargaining theory of competition in the supply chain issues facing the channel structure modeling, the bargaining power of different channel structure and evolution of competitive product differences were analyzed and found differences in bargaining power products and integrators have a significant impact on competition to select the channel structure[10]. But their needs are deterministic, we found that with increasing product competitiveness, product life cycles are getting shorter, and for the service industry, products, customer demand for more volatility. Padmanabhan and Png (1997,2004) simply consider the unit price and policy under the demand uncertainty of supply chain competition, while not considering the influence of service factor[11-12]. Hsieh consider multiple manufacturers and a common retailer in a supply chain facing uncertain demand. Research the effects of different channel structure for supply chain participants profits through coordinating mechanism of pricing and ordering decisions, found that under certain conditions, uncoordinated system under decentralized structure may exceed the overall profit of the centralized structure of the system and the distributed profits under the coordination of participants in each chain is higher than the non-coordinated system of each profit chain participants[13]. He Y J considered firms need to deal with not only risks from stochastic demand but also risks from supply side. The supply side risk may be due to parts/service outsourcing, third party logistics, or random yield in production processes. Study how firms sequentially make price and quantity decisions under these two risks[14].

Thus, based on the comprehensive consideration of the previous literature on the demand uncertainty, the service industry providers and integrators such bargaining based on supply chain competition, give full consideration to the situation of the game service supply chain channel structures through comparative analysis of equilibrium concluded that this competition for the service supply chain structure chosen for the channel to provide a theoretical basis.

COMPETITION MODEL OF BASE ON BARGAINING SERVICE SUPPLY CHAIN

We consider the two competing services supply chain, each service supply chain by one service provider and service integrators, service providers and integrators, service prices in the middle game, that is in the middle of NASH bargain price. In this paper, the structure of each of the channels of supply chain services into three categories: First, the leading service providers distributed architecture (MS), the second is the leading service provider of integrated structure (VI); Third, service providers and integrators Manufacturers bargain price based on the intermediate structure ($BW(\alpha)$).

Game sequence is: for MS structure of service supply chain, the service provider first determine the median price to make their own profit maximization, followed by service integrators order to determine his expectations, and finally introducing demand uncertainty, service integrators choose to integrate Price sales conducted; for VI structure of service supply chain, in which case the service provider's cost of production is the initial price, and then select the desired service integrators order quantity, finally introducing demand uncertainty, integrators choose to integrate prices, sales occur; while for $BW(\alpha)$ structure of service supply chain, the service providers and service integrators in the middle bargain prices, after agreement on the expectations of order integrators, and the introduction of demand uncertainty, integrators choose to integrate prices, sales occur.

We use state of the system X represents demand, d_x represents the state of the system demand is the demand for x, then the service supply chain i on demand function services are as follows:

$$d_{ix} = a_{ix} + s_{ix} - b_i s_{jx}, i = 1,2; j = 3 - i \quad \textbf{(1)}$$

The service price of service supply chain i on quality of service is a linear function:

$$p_{ix} = \theta s_{ix}, i = 1,2; j = 3 - i \quad \textbf{(2)}$$

Among them, under the demand state x, d_{ix} represents the market requirements of service i in the chain, a_{ix} represents the market share of the chain i, s_{ix} represents the service quality of service supply chain i, p_{ix} represents service price of the service chain i, b_i represents the service supply chain product can replace coefficient, and $0 < b_i < 1$.

If o_x represents the sales of supply chain system, q represents the supply chain service system integrators order quantity, obviously $o_x = \min(q, d_x)$, and then

$$\pi_x^{sc} = o_x p_x - qc \quad \textbf{(3)}$$

$$\pi_x^R = o_x p_x - qw \quad \textbf{(4)}$$

$$\pi^M = q(w - c) \quad \textbf{(5)}$$

Where, π_x^{sc} and π_x^R denote the service supply chain profits and service integrators, π^M indicates that the service provider profits, q represents the service integrators order quantity, w represents a service in the middle price of the product, c represents the initial service prices. In addition, $\pi^{sc} = E(\pi_x^{sc})$ and $\pi^R = E(\pi_x^R)$ represent expected profit, respectively

We find that the market demand function for demand on their quality of service is a monotonically increasing function, and quality of service is about competitors monotonically decreasing function, while the market price of the demand for services is just the opposite, so here we might as well assume that $\theta = -1$, then for a discussion of the quality of service of its absolute value can be taken to discuss.

COMPETITIVE MODEL AND EQUILIBRIUM OF SERVICE SUPPLY CHAIN

Requirements model construction under uncertainty

To simplify the process, where the demand is assumed uncertainty needs two entities: the high demand h, the probability is u, the low demand for l, the probability is 1-u. We assume that the two supply chains are symmetrical, assuming $a_{ix} = a_x$, $b_i = b$, $c_i = c$, bargaining ability for service providers and integrators, we may assume that the next section $\alpha = 0.5$, at this time reflects the service providers and integrators providers the ability of the market equilibrium. So this time the service supply chain i demand function becomes:

$$d_{ix} = a_x + s_{ix} - b\, s_{jx}, i = 1,2; j = 3 - i, x \in \{h, l\} \quad \textbf{(6)}$$

At this point the service supply chain profits under the model become:

$$\pi_i^{sc} = uo_{ih} p_{ih} + (1-u) o_{il} p_{il} - q_i c, i = 1,2 \quad \textbf{(7)}$$

$$\pi_i^R = uo_{ih} p_{ih} + (1-u) o_{il} p_{il} - q_i w_i, i = 1,2 \quad \textbf{(8)}$$

We put the Nash equilibrium supply chain i strategy selection abbreviated as $ST_i \in \{VI, MS, BW(\alpha_i), 0 < \alpha_i < 1\}$, in order to consider strategy game, quantity and price of services for each service supply chain decisions, we passed a perfect game perfect Nash equilibrium of the child to seek the decision variables solution, and $\pi_i^{sc}(ST_1 ST_2)$ represents the decision by ST_1, ST_2 ,expected profit of the supply chain i .

Requirements equilibrium different decisions under uncertainty

For symmetric demand uncertainty supply chain, in duopoly market, when the high demand state, $o_{ih} = q_i$ supply chain that is equal to sales order; When the low demand state, $o_{il} = d_i$ that is equal to the supply chain sales demand, where the conclusion of this article will be directly introduced into the supply chain to service, see specific references[9-10].

Equilibrium of supply chain services under *VIVI* model

In the *VIVI* model, service providers and service integrators are two branches of the same company, they will face the same market, company in the production q production and service integration Prices p_x continuous decision-making. We use backward induction shows that, when demand is low, the company will determine the best price service to make profit maximization, profit maximization function is:

$$\begin{aligned} &Max_{p_{il}}\left\{\pi_{il}^{sc}\right\} = Max_{p_{il}}\, p_{il}(a_l + s_{il} - bs_{il}) - cq_i, \\ &= Max_{p_{il}}\, p_{il}(a_l - p_{il} + bp_{jl}) - cq_i \end{aligned} \quad ,i=1,2,\ j=3-i. \tag{9}$$

So at this time on the first derivative of p_{il} , can obtain the optimal service prices low demand state as follows:

$$\hat{p}_l = \frac{a_l}{2-b} \tag{10}$$

Such the demand in the state of lower the optimal profits service supply chain are:

$$\pi_{il}^{sc} = \frac{a_l^2}{(b-2)^2} - q_i c \tag{11}$$

When demand is high, service integrators choose to integrate price, this time $q_i = a_h - p_{ih} + bp_{jh}, i=1,2,\ j=3-i$ Solution is:

$$p_{ih} = \frac{a_h}{1-b} - \frac{q_i + bq_j}{1-b^2}, i=1,2,\ j=3-i. \tag{12}$$

$$\pi_{ih}^{sc} = q_i\left(\frac{a_h}{1-b} - \frac{q_i + bq_j}{1-b^2} - c\right), i=1,2,\ j=3-i. \tag{13}$$

In this case, the expected profit of the service supply chain i is：

$$\pi_i^{sc} = q_i u\left(\frac{a_h}{1-b} - \frac{q_i + bq_j}{1-b^2}\right) + (1-u)\left(\frac{a_l}{2-b}\right)^2 - q_i c, i=1,2,\ j=3-i. \tag{14}$$

About q_i requested on the first derivative, solvable drawn portrait centralized service supply chain balancing order quantity:

$$\hat{q}_i = \hat{q}_j = (b+1)\frac{ua_h + c(b-1)}{u(b+2)} \tag{15}$$

Into the optimal service price function can be obtained:

$$\hat{p}_h = \frac{b^2 c - c - ua_h}{u(b-1)(b+2)} \tag{16}$$

At this point the entire service supply chain profit equilibrium solution is:

$$\pi_i^{sc}(VIVI)=\frac{4a_l^2-3b^2a_l^2-b^3a_l^2-4ua_l^2+3b^2ua_l^2+b^3ua_l^2+4ua_h^2-3b^2a_h^2+b^3ua_h^2}{(1-b)(b-2)^2(b+2)^2}-\frac{c(b+1)(2ua_h-c+bc)}{u(b+2)^2} \quad (17)$$

Equilibrium of supply chain services under $MSMS$ model

In this case, the service integrator reflect consistent with model $VIVI$, but its production costs for the w_i face and not c, so that the service prices in the low demand state is consistent with (10) in (14) using w_i instead of c, then in chain i service integrators expected profit is:

$$\pi^R=q_iu(\frac{a_h}{1-b}-\frac{q_i+bq_j}{1-b^2})+(1-u)(\frac{a_l}{2-b})^2-q_iw_i, i=1,2,\ j=3-i. \quad (18)$$

Determined on a first derivative of q_i is:

$$ubq_j+2uq_i+w_i-ua_h-w_ib^2-uba_h=0, i=1,2,\ j=3-i. \quad (19)$$

Simultaneous equations can be obtained:

$$q_i=\frac{ua_hb^2+w_jb^3-bw_j+2w_i-2ua_h-2w_ib^2-uba_h}{u(b^2-4)}, i=1,2,\ j=3-i. \quad (20)$$

To go (19) into the service provider's profit function, and then on the first derivative is obtained as follows:

$$ua_hb^2+w_jb^3-bw_j+4w_i-2ua_h-2c+2cb^2-4w_ib^2-uba_h=0, i=1,2,\ j=3-i \quad (21)$$

Solving available:

$$\hat{w}_i=\frac{2c+2ua_h-2bc-bua_h}{(b-1)(b-4)}, i=1,2. \quad (22)$$

Then we can obtain the best service order quantity and price of services under high demand, equilibrium profits are:

$$\hat{q}_i=\frac{2(b+1)(bc-c+ua_h)}{u(b+2)(4-b)}, i=1,2\ . \quad (23)$$

$$\hat{p}_h=\frac{2c+6ua_h-2b^2c-b^2ua_h}{u(b-1)(b+2)(b-4)}. \quad (24)$$

$$\hat{\pi}_i^M=\frac{2(b-2)(ua_h+bc-c)^2(b+1)}{u(b-1)(b+2)(b-4)^2} \quad (25)$$

$$\hat{\pi}_i^R=\frac{44b^2a_l^2-8b^3a_l^2-5b^4a_l^2+b^5a_l^2-64a_l^2+32ba_l^2+63ua_l^2-44b^2ua_l^2+8b^3ua_l^2}{(b-1)(b-2)^2(b+2)^2(b-4)^2}$$
$$\frac{+5b^4ua_l^2-b^5ua_l^2-32bua_l^2-48ua_h^2+44b^2ua_h^2-12b^3ua_h^2-6b^4ua_h^2+2b^5ua_h^2}{(b-1)(b-2)^2(b+2)^2(b-4)^2}+\frac{2c(b+1)(b^2-6)(bc-c+2ua_h)}{u(b+2)^2(b-4)^2} \quad (26)$$

$$\hat{\pi}_i^{sc}(MSMS) = \hat{\pi}_i^M + \hat{\pi}_i^R \tag{27}$$

Equilibrium of supply chain services under $BW(\alpha_1)BW(\alpha_2)$ model

In the $BW(\alpha)$ model, service providers and service providers focused on the middle price bargain. The model of $BW(\alpha)$ for this case is expressed as:

$$\begin{aligned} &Max_w\{\phi(w)\} = Max_w\{(\pi^M)^\alpha(\pi^R)^{1-\alpha}\} \\ &= Max_w\{((w-c)q_i)^\alpha(E(p_x s_x) - wq_i)^{1-\alpha}\} \end{aligned} \tag{28}$$

Because the two chains are symmetrical, but for each bargaining service supply chain is to allow a different, according to the order of the game shows that service providers first select the median price of w_i, in a given w_i, service integrators profits and service integration model in MSMS's profit is the same, so we will (18), (20) into the (28) in order to obtain a condition on a, the median price of services available for solving equilibrium denoted $\hat{w}_i$, then you can obtain under different supply chain needs of state service order, the price of services, service providers, service integrators, service supply chain equilibrium expected profit as follows:

$$\hat{p}_{il} = \frac{a}{2-b} \tag{29}$$

$$\hat{p}_{ih} = \frac{(b^2-1)\hat{w}_i - ua_h}{(b-1)u(b+2)} \tag{30}$$

$$\hat{q}_i = (b+1)\frac{ua_h + (b-1)\hat{w}_i}{u(b+2)} \tag{31}$$

$$\hat{\pi}_i^M = (b+1)\frac{ua_h + (b-1)\hat{w}_i}{u(b+2)}(\hat{w}_i - c) \tag{32}$$

$$\hat{\pi}_i^R = \frac{b^3ua_l^2 - 3b^2a_l^2 - b^3a_l^2 + 4a_l^2 - 4ua_l^2 + 3b^2ua_l^2 + 4ua_h^2 - 3b^2ua_h^2 + b^3ua_h^2}{u(1-b)(b-2)^2(b+2)^2} + \hat{w}_i(b+1)\frac{(1-b)\hat{w}_i - 2ua_h}{u(b+2)^2} \tag{33}$$

$$\hat{\pi}_i^{sc}(BW(\alpha_1)BW(\alpha_1)) = \hat{\pi}_i^M + \hat{\pi}_i^R \tag{34}$$

Equilibrium of supply chain services under $VIMS$ model

Similarly, we can see both the supply chain to take a vertically integrated structure, when one uses a distributed architecture, then the equilibrium of supply chain services for their decision variables:

$$\hat{w}_2 = \frac{-2c - 2ua_h + b^2c + bc + bua_h}{4(b-1)} \tag{35}$$

$$\hat{p}_{il} = \frac{a_l}{2-b} \tag{36}$$

$$\hat{p}_{1h} = \frac{4ua_h + 4c - 3b^2c - bc}{4u(1-b)(b+2)} \tag{37}$$

$$\hat{p}_{2h} = \frac{3b^2c - 2c - 6ua_h + b^3c - 2bc + b^2ua_h}{4u(1-b)(b+2)} \tag{38}$$

$$\hat{q}_1 = \frac{(ua_h - c + bc)(b+1)(b+4)}{4u(b+2)} \quad \textbf{(39)}$$

$$\hat{q}_2 = \frac{(ua_h - c + bc)(b+1)}{2u(b+2)} \quad \textbf{(40)}$$

$$\pi_1^{sc}(VIMS) = \frac{64a_l^2 - 48b^2a_l^2 - 16b^3a_l^2 - 64ua_l^2 + 48b^2ua_l^2 + 16b^3ua_l^2 + 64ua_h^2}{16(1-b)(b-2)^2(b+2)^2}$$

$$\frac{-44b^2ua_h^2 - 8b^3ua_h^2 + 5b^4ua_h^2 + b^5ua_h^2 + 32bua_h^2}{16(1-b)(b-2)^2(b+2)^2} - c(b+1)(b+4)^2\frac{(bc - c + 2ua_h)}{16u(a+2)^2} \quad \textbf{(41)}$$

$$\pi_2^M = \frac{(b+1)(b-2)(ua_h - c + bc)^2}{8u(b+2)(b-1)} \quad \textbf{(42)}$$

$$\pi_2^R = \frac{4b^3ua_l^2 - 12b^2a_l^2 - 4b^3a_l^2 + 16a_l^2 - 16ua_l^2 + 12b^2ua_l^2 + 4ua_h^2 - 3b^2ua_h^2 + b^3ua_h^2}{4(1-b)(b-2)^2(b+2)^2}$$

$$-\frac{c(b+1)(bc - c + 2ua_h)}{4u(b+2)^2} \quad \textbf{(43)}$$

$$\pi_2^{sc}(VIMS) = \pi_2^M + \pi_2^R \quad \textbf{(44)}$$

Equilibrium of supply Chain services under $VIBW(\alpha_2)$ model

Similarly, we can see both the supply chain to take a vertically integrated structure, the median price of a bargain when using structure-based service supply chain at this equilibrium respective decision variables are as follows:

$$p_{il} = \frac{a_l}{2-b} \quad \textbf{(45)}$$

$$p_{1h} = \frac{2c + 2ua_h - b^2c + b^3c - 2bc - bua_h - b(b-1)w_2}{u(b-1)(b-2)(b+2)} \quad \textbf{(46)}$$

$$p_{2h} = \frac{w_2(b-1)(b^2-2) + 2ua_h - b^2c + bc - bua_h}{u(b-1)(b+2)(b-2)} \quad \textbf{(47)}$$

$$\hat{q}_1 = (b+1)\frac{2c - 2ua_h - 2bc + bua_h + b(b-1)w_2}{u(b+2)(b-2)} \quad \textbf{(48)}$$

$$\hat{q}_2 = (b+1)\frac{b^2c - 2ua_h - bc + bua_h - 2(b-1)w_2}{u(b+2)(b-2)} \quad \textbf{(49)}$$

$$\pi_1^{sc} = \frac{(b+1)(2c - 2ua_h - 2bc + bua_h + (b^2-b)w_2)(2c + 2ua_h - b^2c + b^3c - 2bc - bua_h}{u^2(b-1)(b-2)^2(b+2)^2}$$

$$\frac{-(b^2-b)w_2)}{u^2(b-1)(b-2)^2(b+2)^2} - c(b+1)\frac{2c - 2ua_h - 2bc + bua_h + (b^2-b)w_2}{u(b-2)(b+2)} \quad \textbf{(50)}$$

$$\pi_2^M = (b+1)(w_2 - c)\frac{b^2c - 2ua_h - bc + bua_h - 2(b-1)w_2}{u(b-2)(b+2)} \quad \textbf{(51)}$$

$$\tilde{\pi}_2^{R} = \frac{(b+1)(b^2c-2ua_h-bc+bua_h-2(b-1)\tilde{w}_2)(\tilde{w}_2(b-1)(b^2-2)+2ua_h-b^2c+bc}{u^2(b-1)(b-2)^2(b+2)^2}$$

$$\frac{-bua_h)}{u^2(b-1)(b-2)^2(b+2)^2} - \tilde{w}_2(b+1)\frac{b^2c-2ua_h-bc+bua_h-2(b-1)\tilde{w}_2}{u(b-2)(b+2)} \quad \textbf{(52)}$$

$$\tilde{\pi}_2^{sc}(VIBW(\alpha_2)) = \tilde{\pi}_2^{M} + \tilde{\pi}_2^{R} \quad \textbf{(53)}$$

STRATEGY ANALYSIS SERVICE SUPPLY CHAIN

VI, MS competitive strategy

According to the article on these studies, the main results are as follows:

Lemma 1 in the case of demand uncertainty, channel strategy for service supply chain, the vertical integration of the service supply chain structure dominates, ie $\pi_2^{sc}(VIVI)-\pi_2^{sc}(VIMS)>0$ and $\pi_2^{sc}(MSVI)-\pi_2^{sc}(MSMS)>0$

Proof: In the vertically integrated structure of the service supply chain strategy, there is the expected profit of equilibrium (17), (44) shows that:

$$\pi_2^{sc}(VIVI)-\pi_2^{sc}(VIMS) = \frac{(b+1)(b^2+2)(bc-c+ua_h)^2}{8u(1-b)(b+2)^2} > 0$$

In the service provider dominates the distributed architecture service supply chain strategy, the expected profit of equilibrium (27), (41) shows that:

$$\pi_2^{sc}(MSVI)-\pi_2^{sc}(MSMS) = \frac{(b+1)(b^2+4b+8)(b^2-4b+8)(bc-c+ua_h)^2}{16u(1-b)(b+2)^2(b-4)^2} > 0$$

Theorem 1 in service demand uncertainty in the supply chain competition, the structure of the two supply chains is about vertical integration (VI) and vertical distributed architecture consisting of matrix game, we find:

(1) when $0<b\le\frac{2}{3}$, $\pi^{sc}(VIVI)\ge\pi^{sc}(MSMS)$,this time as the only vertically integrated structure Nash equilibrium.

(2) When $\frac{2}{3}<b<1$, $\pi^{sc}(MSMS)>\pi^{sc}(VIVI)$, this time vertically integrated structure of the Prisoner's Dilemma equilibrium.

Proof: $ST_i(VIVI), ST_i(MSMS)$ known through profit expectations equilibrium (17), (27) comparison shows that:

$$\pi^{sc}(VIVI)-\pi^{sc}(MSMS) = \frac{(2-b)(3b-2)(b+1)(ua_h-c+bc)^2}{u(b-1)(b+2)^2(b-4)^2}$$

From lemma shows that, no matter what the first service supply chain strategy is the best strategy to reflect the second service supply chain is vertically integrated structure (VI). Similarly, no matter what the second service supply chain strategy is the best strategy to reflect the first service supply chain is still vertically integrated structure (VI). Thus, $ST_i(VIVI)$ is under conditions of uncertainty in the demand structure of the Nash equilibrium, and in $0<b\le\frac{2}{3}$ as the only Nash equilibrium, but in the $\frac{2}{3}<b<1$, $ST_i(VIVI)$ is a typical prisoner's dilemma equilibrium.

VI and $BW(\alpha)$ competition policy

In both channel strategy, we will analyze the competition between VI and $BW(\alpha)$ by a numerical example of the method. Here we may assume:

$a_l=0.5, a_h=2, u=0.5, b=0.5, \alpha=0.5$, then you can get the TABLE 1 respectively equilibrium under different decision when $c=0.3, c=0$ and Service Supply Chain Strategy Game respective TABLE 2:

TABLE 1 : The equilibrium solutions of respective decision variables under different strategies with different cost

decision Variable	Supply chain structure $(c = 0.3)$			Supply chain structure $(c = 0)$		
	VIVI	**BW(0.5)BW(0.5)**	**VIBW(0.5)**	**VIVI**	**BW(0.5)BW(0.5)**	**VIBW(0.5)**
w_2	NA	0.662	0.64	NA	0.419	0.394
q_1	1.02	0.80	1.088	1.2	0.948	1.278
q_2			0.744			0.884
p_{il}	0.33	0.33	0.33	0.33	0.33	0.33
p_{1h}	1.96	2.394	2.051	1.6	2.103	1.705
p_{2h}			2.278			1.967
π_2^R	NA	0.485	0.427	NA	0.655	0.577
π_2^M	NA	0.291	0.254	NA	0.397	0.348
π_1^{sc}	0.749	0.775	0.844	1.015	1.053	1.145
π_2^{sc}			0.681			0.925

TABLE 2 : Profit comparison of service supply chain under different cost.

SC1	SC2 (c=0.3) VI	SC2 (c=0.3) BW(0.5)	SC2 (c=0) VI	SC2 (c=0) BW(0.5)
VI	0.749, 0.749	0.844, 0.681	1.015, 1.015	1.145, 0.925
BW(0.5)	0.681, 0.844	0.775, 0.775	0.925, 1.145	1.053, 1.053

From TABLE 2 it can be found, then $(VIVI)$ strategy is unique equilibrium for this game, but the supply chain is based on the game of bargaining, $(VIVI)$ strategy is a typical prisoner's dilemma balanced, because the profits of the service supply chain based bargaining to profit ratio of vertical integration of supply chain services to large, and this case has nothing to do with the cost of production units. At this point the service supply chain strategists who choose to get higher profits based service supply chain bargaining strategy meeting.

CONCLUSIONS

Based on the demand uncertainty, the construction of the service supply chain competition model between service providers and service integrators based bargaining. Service supply chain for different structures (distributed architecture (MS), integrated structure (VI), Bargaining structure ($BW(\alpha)$) between *Nash* solving their equilibrium by comparing analysis under uncertainty in demand in the service chain structure vertically integrated supply chain structure of the game is the only *Nash* equilibrium structure, which differs from the previous literature, except that in the past the competition to build the *Cournot* model, while the paper constructs a *Bertrant* competition model, and this conclusion nor is it caused by demand uncertainty, because when located in the same $u = 1$ from Lemma can be concluded, while MS and $BW(\alpha)$ for comparison, involving parametric much has yet to find a viable way, this is the future direction of research, and we can also consider factors other than price in addition to the multi-service supply chain competition.

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