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Coordinating Contracts for Two-Echelon Supply Chain with Price and Promotional Sensitive Demand

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Abstract

In this paper three coordinating contracts in supply chain namely (i) revenue-sharing contract (ii) cost-sharing contract (iii) profit-sharing contract are proposed for two echelon supply chain coordination perspective under promotion and price sensitive demand. In our model buyer makes the promotional decision and undertakes the promotional sales effort cost. It is shown that in decentralized channel the results are sub-optimal. It is found analytically that the revenue-sharing contract coordinates pricing decision but not promotional decision for all values of the promotional effort cost. It is also found that the cost-sharing contract fails to coordinate channel. The profit-sharing contract is demonstrated to coordinate both the pricing and the promotional decisions in the channel.

Keywords: channel coordination, promotional effort, revenue-sharing, supply chain contracting

1. Introduction

In a competitive milieu, the customer demand for any product is dependent on the quality of product as a whole; but, there are other factors which play a vital role in dragging customer's attention to a specific product and increase the sales amount. Demand of goods, especially in retail industry, is largely influenced by the product on display (Saha & Goyal 2014). Therefore, those factors can be achieved by:

a) Advertising;

b) Augmenting the attractiveness of the product visual aspects;

c) Hiring more adroit personnel in order to convince more customers to purchase products;

d) Better stocking location;

e) Create much splendid store.

Depending on the product, a few or all of the alleged actions could be executed. In this paper, we subsume the above factors under the category of promotion. And these are the customers who determine its values and will hence have a positive influence on the end demand. It is obvious that all the promotional activities are costly. Therefore, It is always seen a tussle between the supplier and the buyer about promotional costs. At the supplier point of view it is not important how hard the buyer is struggling towards these activities, the supplier always is of preference that buyer exert more effort. However, those activities benefit both sides but are costly to only one firm. To find a solution for this plight, sharing sales-effort cost is suggested in literature. For example, the supplier could incur a quota of the buyer's promotional expenses. But there are many a situations in which cost-sharing is not effectual. For instance, when a promotion only bolsters the image of the buyer's brand and, instead of just supplier's product, elevates the all buyer's goods, see Cachon (2003).

The supplier also can opt to provide the promotional services at the buyer's outlet. The literature refers us to myriad examples of which the supplier or manufacturer decides to prepare the services at the retailer's site. Take PepsiCo for instance that provides the buyer with retail facility such as refrigerators or vendor machines with company label and logo and expect the buyer to carry just their products. This raises customers' attention and has a positive impact on demand. Some companies may supply the buyer with particular placard or poster of their brand and ensure that these placards are exhibited at the felicitous location due to increase customer's demand.

In this paper we analyze three contracts (revenue sharing, cost sharing and profit sharing) to confront the matters of coordinating when the buyer bears all the weight of the promotional cost which provided at the buyer's outlet. Our work focuses on coordinating supply chain when the demand is sensitive to both price and promotional sales activities. Balanced against previous study, in our model the buyer's underwrites promotional sales effort to augment customer demand.

The paper proceeds as follow. Section 2 reviews the literature germane to our study. In section 3, the model and analysis are presented. This is followed in section 4 by three numerical examples. Section 5 concludes.

2. Literature Review

The research has begun to manifest in the territory of the coordination of supply chain when the demand is sensitive to both price and promotional factors. Nettessine & Rudi (2000) study a coordinating contract, which burnishes sharing advertising costs in a newsvendor model in which the demand is influenced by the buyer's effort. Pang et al. (2014) present a three echelon SC and analyze the impact of sales effort on supply chain coordination and expound the reason why traditional revenue sharing contract can not coordinate supply chain. They, finally, propose an improved revenue-sharing contract based on quantity discount policy to coordinate the SC. In Pal et al. (2015), the retailers determine their market sales price(s) and promotional efforts to optimize the profit from the perspectives of the individual and the whole supply chain. They also analyze the coordination mechanisms in a supply chain consisting of multiple retailers and a common supplier with several contracts and find the optimal range for the contract parameters. Liu (2015) proves that revenue sharing contract cannot function when the demand is uncertain and dependent on the retailer's sale effort. So, he proposes a new revenue sharing contract with sale effort cost partaking. Xing & Liu (2012) study sales effort coordination for a supply chain with one manufacturer and two retail channels. Li & Liu (2014), By means of game theory, analyze price and sales effort decisions of the centralized supply chain and show that both the wholesale price contract and the cost-sharing contract cannot coordinate the supply chain. Bernstein & Federgruen (2007) compared the coordination mechanisms when retailers compete only in terms of their prices, and when they engage in simultaneous price and service competition. Tsao & Sheen (2012) considered a two echelon multiple-retailer channel under retailers' promotional efforts and the sales learning curve model where the competition between retailers arises from substitution effect due to shortages. Xie & Wei (2009) developed the optimal equilibrium pricing and cooperating advertising strategies in channel coordination between a manufacturer and a retailer. They also showed that the cooperative model achieves better channel coordination and generates higher channel-wide profits than the non-cooperative, leader–follower model.

3. Model Description and Analyses

We consider a two echelon supply chain consisting of a supplier (manufacturer) and a buyer (retailer). The supplier sells a perishable product to the buyer who resells the product to end customer. The buyer is not allowed to re-order, he only can place the order one time. The demand is assumed to be deterministic and all model parameters are known for both players. Due to simplicity, we don't consider the manufacturing, transportation and marginal cost. Similar to the prior literature (Tsay & Agrawal, 2000) we assume that the demand function is:

$$D = a - bP + \lambda \mathrm{E} \qquad Eq(1)$$

The final customer demand D for the product depends on the price P set by the buyer and on the sales effort E provided at the buyer's outlet. The sales effort E *is* normalized as $0 \le E \le 1$. λ is a parameter that represents the maximum degree to which the demand can be culminated by sales effort and $\lambda, a, b > 0$. As it can be seen the end customer reduces with the price and augments with sales effort. Promotional activity comes at a cost (represent by μ) and this cost is proportional to the level of sales effort. In our model when the buyer sets the price P and the sales effort E he can observe the demand D and order the supplier to charge him a size of $Q = D(P, E)$.

The profit function (represent by π) for the buyer, supplier and the supply chain are:

$$\pi_{b=}(a - bP + \lambda E)(P - W) - E\mu; \qquad Eq(2)$$

$$\pi_s = (a - bP + \lambda E)W; \qquad Eq(3)$$

and

$$\Pi = \pi_b + \pi_s = (a - bP + \lambda E)P - E\mu. \qquad Eq(4)$$

3.1 Centralized Scenario

In a centralized supply chain, the members tend to maximize the total supply chain profit. The subscript c evinces that the variables are considered in terms of the centralized scenario. Therefore the supply chain profit can be stated as:

$$\pi_c(P_c, E_c) = (a - bP_c + \lambda E_c)P_c - E_c\mu. \qquad Eq(5)$$

To find the value of P_c which optimizes the supply chain profit, we can differentiate above Eq. with respect to P_c and equating it to zero. So, the optimal price is acquired as:

$$P_c^* = \frac{a + \lambda E_c}{2b}. \qquad Eq(6)$$

By aggregating the Eq (1) and Eq (6) we can obtain the order quantity as follow:

$$D_c(P_c^*, E_c) = \frac{a + \lambda E_c}{2}. \qquad Eq(7)$$

Superseding P_c^* in Eq(5) eventuates in:

$$\Pi_c(P_c^*, E_c) = \frac{(a + \lambda E_c)^2}{4b} - E_c\mu. \qquad Eq(8)$$

Owing to the fact that the Eq(8) is quadratic expression of convex nature; therefore, it will reach to maximum value at the extreme of the feasible range of E_c. The extreme values of E_c are 0 and 1. So the supply chain profit at these extreme values of E_c are:

$$\pi_c(P_c^*, E_c = 0) = \frac{a^2}{4b}\ ; \qquad Eq(9)$$

and

$$\pi_c(P_c^*, E_c = 1) = \frac{(a + \lambda)^2}{4b} - \mu\ . \qquad Eq(10)$$

When the supply chain profit in Eq (10) is greater than the profit acquired in Eq(9), the centralized supply chain would choose $E_c = 1$. To apprise an upper limit for the cost of sales effort that below which the supply chain would be willing to prepare full promotional effort; it is sufficient to put the Eq(10) and Eq(9) in an inequality (it means $Eq(10) - Eq(9) \geq 0$). As a consequence:

$$\mu \leq \frac{\lambda^2 + 2a\lambda}{4b}\ . \qquad Eq(11)$$

When the condition on μ in Eq(11) is fulfilled, then, $E_c^* = 1$, $P_c^* = \frac{a+\lambda}{2b}$ and the supply chain profit is obtained:

$$\pi_c^* = \frac{(a+\lambda)^2}{4b} - \mu\ ;$$

On the other hand, if the condition on μ is not fulfilled, hence $E_c^* = 0$, $P_c^* = \frac{a}{2b}$, and the supply chain profit will be as follow:

$$\pi_c^* = \frac{a^2}{4b}.$$

3.2 Decentralized Scenario

In this scenario, each supply chain members optimize their own profit by taking individual decisions. In our model the buyer determines the price and decides on the level of sales effort he will provide, and the supplier determines wholesale price (W). The subscript DC refers to decentralized scenario. The profit function for the buyer, supplier and the supply chain are as follow:

$$\pi_{b_{DC}} = (a - bP_{DC} + \lambda E_{DC})(P_{DC} - W_{DC}) - E_{DC}\mu\ , \qquad Eq(12)$$

$$\pi_{s_{DC}} = (a - bP_{DC} + \lambda E_{DC})W_{DC;} \qquad Eq(13)$$

and

$$\Pi = \pi_{b_{DC}} + \pi_{s_{DC}} = (a - bP_{DC} + \lambda E_{DC})P_{DC} - E_{DC}\mu. \qquad Eq(14)$$

The value of P_{DC} that will maximize the buyer's profit function can be acquired by differentiating Eq(12) and equating it to zero:

$$P_{DC}^* = \frac{a + \lambda E_{DC} + bW_{DC}}{2b}. \qquad Eq(15)$$

Clearly, the supplier uses P_{DC} obtained by the buyer to reach his profit function to the maximum level. So by replacing Eq(15) in Eq(13) the value of W_{DC} can be obtained:

$$W_{DC}^* = \frac{a + \lambda E_{DC}}{4b}. \qquad Eq(16)$$

Using W_{DC}^* from Eq(16) instead of W_{Dc} in Eq(15) gives a simplified and analogous buyer's optimal Price as:

$$P_{DC}^* = \frac{3(a+\lambda E_{DC})}{4b}. \qquad Eq(17)$$

Compared with centralized scenario, the decentralized supply chain is of greater buyer's price. As can be observed in Eq(17) and Eq(6) $P_{DC}^* = \frac{3}{2}P_C^*$. The order quantity is:

$$D_{DC}(P_{DC}^*, E_{DC}) = \frac{a + \lambda E_{DC}}{4}. \qquad Eq(18)$$

In comparison to the centralized scenario, it can be seen that the order quantity of decentralized scenario become less than the order size of the centralized scenario, Eq(7) and is abated to half. Substituting P_{DC}^* from Eq(17) in Eq(14) gives the supply chain profit in decentralized scenario as:

$$\Pi_{DC} \quad (P_{DC}^*, E_{DC}) = \frac{3(a + \lambda E_{DC})^2}{16b} - E_{DC}\mu. \qquad Eq(19)$$

As defined earlier, the value of E is normalized such that $0 \leq E \leq 1$ and the μ is defined as the promotional effort cost. For the simple reason that the promotional value is almost identical in two scenarios, it can be concluded that the decentralized SC profit is less than centralized SC profit. In other words, by comparison the Eq(8) and Eq(19) it is obvious that the $\Pi_{DC} \cong \frac{3}{4}\Pi_C$.

To put it briefly, in decentralized supply chain the buyer orders less quantity and fixes the price higher compared to centralized supply chain. And, this affair eventuates in less profit for the entire supply chain.

With P_{DC}^* and the quantity of order values which acquired in Eq(17) and Eq(18), we can restate the buyer's profit function as:

$$\pi_{b_{DC}} = \frac{(a+\lambda E_{DC})^2}{16b} - E_{DC}\mu. \qquad Eq(20)$$

The buyer's profit function is convex respect to E_{DC}, therefore at the feasible extreme values this function will achieve its maximum. Then:

$$E_{DC} = 0 \qquad \pi_{b_{DC}} = \frac{a^2}{16b}; \qquad Eq(21)$$

and

$$E_{DC} = 1 \qquad \pi_{b_{DC}} = \frac{(a + \lambda)^2}{16b} - \mu. \qquad Eq(22)$$

Once the profit in Eq(22) is greater than the profit in Eq(21), the buyer will opt for $E_{DC} = 1$. It conveys:

$$\mu \leq \frac{\lambda^2 + 2a\lambda}{16b}. \qquad Eq(23)$$

The Eq(23) is an upper limit for promotional effort cost. The buyer will prepare full effort for any values bellow Eq(23) ($E_{DC} = 1$). When the condition on Eq(23) is not fulfilled, the buyer will decide not to prepare any promotional effort ($E_{DC} = 0$).

3.3 Revenue-Sharing Contract

In a revenue-sharing contract, the buyer keeps a specified portion (φ) of the total revenue and the remainder goes to the supplier. In return, the supplier charges the buyer W_R (wholesale price) for per unit purchased which is closer to manufacturing cost. The order quantity size is denoted by Q and as before $Q = a - bP_R + E_R\mu$. Subscript R represents variables in terms of revenue-sharing scenario. So the profit function for the buyer, Supplier and the supply chain are as:

$$\pi_{b_R} = \varphi P_R Q_R - W_R Q_R - E_R\mu\,; \qquad Eq(24)$$

$$\pi_{s_R} = (1-\varphi)P_R Q_R + W_R Q_R; \qquad Eq(25)$$

and

$$\Pi_R = P_R Q_R - E_R\mu\,. \qquad Eq(26)$$

As before, the buyer will choose a quantity that maximizes his profit. By considering the buyer's profit function, Eq (24), the optimal value of Q_R is obtained as:

$$Q_R^* = \frac{\varphi(a+\lambda E_R) - W_R b}{2\varphi}\,. \qquad Eq(27)$$

When $W_R = 0$ the Eq(27) is equal to the buyer's optimal quantity in centralized scenario, Eq(7). In order to achieve coordination in supply chain, we consider a revenue-sharing contract $[W_R, \varphi]$ of which $W_R^* = 0$. The optimal selling price can be acquired as :

$$P_R^* = \frac{a+\lambda E_R}{2b}\,. \qquad Eq(28)$$

The profit function for the buyer, supplier and the supply chain with revenue-sharing contract can now be denoted as:

$$\pi_{b_R}(E,\varphi) = \varphi\left(\frac{(a+\lambda E_R)^2}{4b}\right) - E_R\mu\,; \qquad Eq(29)$$

$$\pi_{s_R} = (1-\varphi)\left(\frac{(a+\lambda E_R)^2}{4b}\right); \qquad Eq(30)$$

and

$$\Pi_R = \left(\frac{(a+\lambda E_R)^2}{4b}\right) - E_R\mu\,. \qquad Eq(31)$$

The buyer's profit function when he prepares full promotional sales effort $(E = 1)$ with the revenue-sharing contract is as follow:

$$\pi_{b_R}(1,\varphi) = \varphi\left(\frac{(a+\lambda)^2}{4b}\right) - \mu\,. \qquad Eq(32)$$

The buyer's profit function when he provides no promotional sales effort $(E = 0)$ with the revenue-sharing contract can be acquired as:

$$\pi_{b_R}(0,\phi) = \phi\left(\frac{a^2}{4b}\right)\,. \qquad Eq(33)$$

When Eq(32) leads to higher profit than the profit that Eq(33) engenders, therefore the buyer tends to prepare full promotional effort, which signifies:

$$\mu \le \varphi\left(\frac{\lambda^2 + 2a\lambda}{4b}\right). \qquad Eq(34)$$

3.4 Cost-Sharing Contract

In a cost-sharing contract, the supplier undertakes a percentage of promotional sales effort cost provided by the buyer. In other words, the buyer receives a share of his promotional cost from the supplier. $0 < \tau < 1$ is the portion of the buyer's promotional cost that the supplier pays, while the buyer undertakes the remaining $1-\tau$ portion of the promotional effort cost. Under the cost-sharing contract (denoted by subscript CS), the profit for the buyer, supplier and the whole supply chain are acquired as :

$$\pi_{b_{CS}} = P_{CS}Q_{CS} - W_{CS}Q_{CS} - (1-\tau)E_{CS}\mu\,; \qquad Eq(35)$$

$$\pi_{S_{CS}} = W_{CS}Q_{CS} - \tau E_{CS}\mu \, ; \qquad Eq(36)$$

and

$$\Pi_{Cs} = P_{CS} - E_{CS}\mu \, . \qquad Eq(37)$$

respectively, where $Q_{CS} = a - bP_{CS} + \lambda E_{Cs}$.

Clearly, the buyer will order the value of Q_{CS} that optimizes his profit. By calculating the first order conditions for Eq(35), the optimal order quantity is obtained as :

$$Q_{CS}^{*} = \frac{a + \lambda E_{Cs} + W_{CS}b}{2} \, . \qquad Eq(38)$$

If the wholesale price in the cost-sharing contract equates to zero, Eq(38) will be equal to the optimal supply chain order size in the centralized scenario, while this is true the supplier gain no profit. Therefore, the supplier repudiates this condition and stipulates a wholesale price which warrants his profit. By differentiating Eq(36) respect to W_{CS} and equating it to zero, the optimal value of W_{Cs} is obtained and with substituting that in Eq(38) the optimal order quantity is acquired as:

$$Q_{CS}^{*} = \frac{a + \lambda E_{DC}}{4} \, . \qquad Eq(39)$$

comparing the optimal Q_C from the centralized scenario out of Eq(7) and Eq(39) it is apparent that the order quantity in cost sharing scenario is decreased to half,.and it coincides with Eq(18) which shows the optimal order quantity under decentralized supply chain.

The value of $P_{b_{DC}}$ that will maximize the buyer profit can be obtained by differentiating Eq(35) and equating it to zero as:

$$P_{CS}^{*} = \frac{3(a + \lambda E_{CS})}{4b} \, . \qquad Eq(40)$$

The profit function for the buyer, supplier and the whole supply chain with the cost-sharing contract can be acquired as :

$$\pi_{b_{CS}} = \frac{(a + \lambda E_{DC})^2}{16b} - (1 - \tau)E_{DC}\mu \, ; \qquad Eq(41)$$

$$\pi_{S_{DC}} = \frac{2(a + \lambda E_{DC})^2}{16b} - \tau E_{DC}\mu \, ; \qquad Eq(42)$$

and

$$\Pi_{DC} = \frac{3(a + \lambda E_{DC})^2}{16b} - E_{DC}\mu \, . \qquad Eq(43)$$

As before, it can be stated that the buyer's profit is convex function with respect to E_{DC} and it achieves its maximum at the extreme value of the feasible range for E_{DC}. Therefore, the buyer profit when full promotional service is provided ($E_{DC} = 1$) and when promotional service is not provided ($E_{DC} = 0$) is obtained respectively in Eq(44) and Eq(45).

$$\pi_{b_{CS}} = \frac{(a + \lambda)^2}{16b} - (1 - \tau)\mu; \qquad Eq(44)$$

and

$$\pi_{b_{CS}} = \frac{a^2}{16b} \, . \qquad Eq(45)$$

Apparently, the buyer is of tendency to prepare full promotional service effort ($E_{CS} = 1$) when this engenders a higher profit compared with preparing no promotional service effort ($E_{DC} = 0$), therefore:

$$\mu < \frac{\lambda^2 + 2a\lambda}{16b(1 - \tau)} \, . \qquad Eq(46)$$

3.5 Profit-Sharing Contract

In a profit sharing contract a specific percentage of the buyer's profit goes to the supplier. It can be stated that a profit sharing contract is identified by percentage of the buyer's profit υ $(0 < \upsilon < 1)$ and the wholesale price W. Subscript PS represents parameters in terms of the profit-sharing contract and the order quantity size is denoted by Q and $Q = a - bP_{PS} + E_{PS}\mu$. The profit function for the buyer, supplier and the supply chain under the profit-sharing contract can be acquired as:

$$\pi_{b_{PS}} = (P_{PS}Q_{PS} - W_{PS}Q_{PS} - E_{PS}\mu)(1-\upsilon); \qquad Eq(47)$$

$$\pi_{S_{PS}} = \upsilon(P_{PS}Q_{PS} - W_{PS}Q_{PS} - E_{PS}\mu) + W_{PS}Q_{PS}; \qquad Eq(48)$$

and

$$\Pi_{PS} = P_{PS}Q_{PS} - E_{PS}\mu\,. \qquad Eq(49)$$

Clearly, the buyer seeks the order quantity which optimizes his profit. By finding the first conditions for Eq(47) the buyer obtain his optimal order quantity as:

$$Q_{PS}^{*} = \frac{a + \lambda E_{PS} - W_{PS}b}{2}\,. \qquad Eq(50)$$

Recall that the optimal order quantity in the centralized scenario out of Eq(7) is:

$$Q_C^{*} = \frac{a + \lambda E_c}{2}.$$

It is apparent that the buyer's optimal order size coincides with the optimal supply chain order size when $W_{PS} = 0$. hence, in order to proceed the analyses, we will consider a profit-sharing contract where $W_{PS} = 0$. With this condition the optimal selling price under profit sharing contract is equal to the selling price in centralized scenario and $P_{PS}^{*} = \frac{a+\lambda E_{PS}}{2b}$ .The profit function for the buyer, supplier and the whole supply chain are acquired as:

$$\pi_{b_{PS}} = (1-\upsilon)\left(\frac{(a+\lambda E_{PS})^2}{4b} - E_{PS}\mu\right); \qquad Eq(51)$$

$$\pi_{S_{PS}} = \upsilon\left(\frac{(a+\lambda E_{PS})^2}{4b} - E_{PS}\mu\right); \qquad Eq(52)$$

and

$$\Pi_{PS} = \frac{(a+\lambda E_{PS})^2}{4b} - E_{DC}\mu\,. \qquad Eq(53)$$

The buyer's profit function when he provides full promotional sales effort $(E = 1)$ with the profit-sharing contract is as follow:

$$\pi_{b_R} = (1-\upsilon)\left(\frac{(a+\lambda)^2}{4b} - \mu\right). \qquad Eq(54)$$

The buyer's profit function when he provides no promotional sales effort $(E = 0)$ with the profit-sharing contract can be acquired as:

$$\pi_{b_R} = (1-\upsilon)\left(\frac{a^2}{4b}\right). \qquad Eq(55)$$

Considering Eq(54) and Eq(55) it can be observed that the promotional sales effort will be prepared by the buyer when:

$$\mu < \frac{\lambda^2 + 2a\lambda}{4b}\,. \qquad Eq(56)$$

4. Numerical Examples

In order to obtain a better grasp of the subject, three disparate numerical examples are considered. The numerical data and solution for different scenarios are in the following table:

Table 1. Numerical data and solution for different scenarios and contracts

		$a = 150$		$b = 3$		$\lambda = 30$		$\varphi = 0.65$		$\tau = 0.34$						
		Centralized scenario			Decentralized scenario			Revenue-sharing contract			Cost-sharing contract			Profit-sharing contract		
Example	μ	E_c	P_C^*	Π_C	E_{DC}	P_{DC}^*	Π_{DC}	E_R	P_R^*	Π_R	E_{CS}	P_{CS}^*	Π_{CS}	E_{PS}	E_{PS}^*	Π_{PS}
I	300	1	30	2400	0	37.5	1406	1	30	2400	1	45	1725	1	30	2400

Ii	600	1	30	2100	0	37.5	1406	0	25	1875	0	37.5	1406	1	30	2400
iii	900	0	25	1875	0	37.5	1406	0	25	1875	0	37.5	1406	0	25	2400

In the Table 1, we see that the decentralized scenario has the lowest supply chain profit for all the numerical examples. It is obvious that revenue-sharing contract fails to coordinate the supply chain promotional effort, example (ii), but coordinates the selling price. On closer inspection, We can note that revenue-sharing contract can coordinate supply chain if and only if either $\mu \le \varphi\left(\frac{\lambda^2+2\alpha\lambda}{4b}\right)$ or $\mu \ge \left(\frac{\lambda^2+2\alpha\lambda}{4b}\right)$, where revenue-sharing contract results are identical with centralized scenario. It can be said that cost-sharing contract is better than decentralized scenario, but it fails to coordinates the supply chain as well. Compared to decentralized scenario, the cost-sharing contract generates higher profit in example (i) but the selling price is higher. It seems the profit-sharing contract is the best policy for coordinating the supply chain because both the selling price and the supply chain profit are equal to what the centralized scenario produces.

5. Conclusion

In this paper, it is demonstrated that in a supply chain, when the consumer demand is a function of both selling price and promotional sales effort and the buyer has the decision right about promotional effort, decentralized supply chain gains inadequate profit and fails to achieve coordination. Three contracts for obviating this dilemma are considered. It has been observed that the revenue-sharing contract coordinates the supply chain under certain circumstances. But it fails to coordinates the promotional effort decision for all the values of the cost of this kind of effort. The cost-sharing contract does not provide coordination except that the supplier condones to hoard any profit. Yet, the cost-sharing contract fails to coordinates both the pricing decision and promotional effort decision. The profit sharing contract does coordinate the pricing and the promotional effort decision which takes by the buyer.

We use a parsimonious model to analyze the felicitous way for achieving coordination in supply chain by contract mechanisms. Extending this model to a more complex supply chain and consider marginal cost and asymmetric information would be a good way to examine more sophisticated case.

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