

The Impact of Opportunism of the Manufacturer on Revenue Allocation in Supply Chain

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Keywords: Opportunism; Supply Chain; Effort Level; Profits.

Abstract: The opportunism is a common risk in supply chain, which could include fraud, conceal or other negative behaviours. The reason of opportunism is multiple, and the most important reasons can be summarized as human nature, trade environment and information asymmetry. Due to the potential risk that opportunism will create, this field have attracted scholars to study for a long time. However, based on the literature, the gap of this field is that, scholars seldom consider about objective conditions and how these conditions impact on opportunism. Therefore, this research will focus on this field, assume a single manufacturer-retailer condition, and then set up a theoretical model which considers how the manufacturer's effort level impacts on profits, and how this situation will influence decisions that are made by the manufacturer and the retailer. Based on Monte Carlo simulation by software Crystal Ball, the result shows that different manufacturer's effort level will lead to different profits. However, manufacturer and retailer cannot achieve their largest profits in the same time. Besides, if they want to achieve the highest total profits, then both of them have to sacrifice part of their profits. Therefore, opportunism may be showed up. To prevent this happening, the optimal method is through norm-based trust mechanism, rather than just sign for contracts.

1. Introduction

Along with the commodity economy develop rapidly in today's society, most of firms from around the world are more likely to seek for a stable buyer-supplier relationship with their suppliers and customers, thereby setting up a supply chain to gain benefits. With a stable supply chains, companies can set up a more effective and even a lower cost communication tunnel with other partners, and this alliance relationship enhance the cooperation between companies thus can achieve a win-win situation. However, on the other hand, there are potential risks within such cooperation relationship as well. One of the critical risks comes from self-seeking with guile, which can be called as opportunism (Williamson, 1985). Because transaction cost theory is based on two basic factors, which are the limited sense from participants and opportunism. Besides the reason that lead to opportunism are come from three fields. First, the eager of opportunism of human being will lead people to chase additional profits even there are contrasts to restrict them, and people's limited sense will lead to incomplete information, thus provide potential advantage for opportunism. Second, the uncertainty of trade, the frequency of trade and the exclusiveness of trade capital will all impact on opportunism. Third, the uncompletion and uncertainly of information within a trade environment will also lead to opportunism directly or indirectly. Therefore, in other words, due to suppliers may eager to seek for more additional profits for themselves only, thus the mercenary suppliers may cheat on their buyers, and the opportunism appears. Scholars also believe that such harmful behaviour should be stopped (Lai et al., 2012, Bhattacharya et al., 2015), because such behaviour could threat the partner relationship between firms that within a same supply chain. The opportunism contains false advertisement, break contract or shrinking behaviour etc. and consider it is been influenced by human nature and common trade environments, thus opportunism can show up in trades commonly.

Therefore, within this study, the research questions will be discussed as follows: how will opportunistic behaviours impact on the revenue allocation within supply chains? The study will establish a supply chain model, besides in order to simplify the task, this model will be only carried out by assume a one supplier (seller) one retailer (buyer) situation in a certain supply chain, and

Monte Carlo Simulation is conducted to explore how key factors will influence opportunistic behaviours in the supply chain and revenue allocation between the supplier and the retailer.

2. Literature Review

Through reading and analysing the previous literature, the researcher of this study found that most of former scholars adopt three kinds of approach to study opportunism related questions.

The most common approach was through quantitative approach, for example, Huo, et al. (2016) tested 240 Chinese companies by mail questionnaires. Based on this data set, they concluded that when suppliers' procedure and distribute justice, buyers are more likely to enhance specific investments, yet this behaviour only help communications from buyers to suppliers. Besides, on one hand buyers' communication can prevent suppliers' opportunism, however the specific investment of buyers will increase suppliers' opportunism. On the other hand, buyers' opportunism will be held back by communications and procedure justice. After testing 228 Malaysian manufacture about what factors that impact on suppliers and customers in strategic alliances, Siew-Phaik, et al. (2013) pointed out that, the relationship of relational capital and percept opportunism is important for alliance with customers, besides the relationship of interdependence and percept opportunism is important for alliance with suppliers. Besides, Lai, et al. (2011) investigated how to reduce the opportunistic behaviour when logistics outsourcing happens, they studied 119 Chinese manufacturing companies, and learned that create standards and trust partner were effective methods to reduce the potential risk from opportunism. Sambasivan et al. (2012) studied data that based on 2156 manufacture firms from Malaysia to investigated supply chains' strategic alliances and by generating a framework that combines resource-based theory, social exchange theory, contingency theory and transaction cost theory, as well as personal relationship theory, they found that the opportunistic behaviour on interdependence which in strategic alliance motives and perception have an significant relationship with relational capital. Besides, Wang, et al. (2014) tested 272 manufacturers which are also from China to investigate how managerial ties are impacted and the trust issues on information sharing within supply chain and the opportunism of suppliers. Based on the data, they summarized that the information sharing could be impacted by trust managerial ties on both quantity and quality. On the other hand, although managerial ties impact on information sharing as well, the quality of information that was shared, however, cannot be guaranteed, thus through managerial ties it is important to focus on the quality that has been shared rather than quantity, and this should be referred as the main leverage of lessen the opportunistic from supplier.

Scholars also adopted function models to learn specific field, for example, Heese and Kemahlioglu-Ziya (2014) studied opportunistic behaviour that occur when sales revenues are unavailable to suppliers. They consider a simple supply chain model with one supplier and one buyer, and assume buyer behaves opportunistically and hides information about sales revenues from supplier when it is profitable, and supplier have the ability to monitor the buyer and investigate sales revenue. However, Heese and Kemahlioglu-Ziya pointed out that the supplier cannot find a suitable method to actual sales revenues that to guarantee the truthful report from buyer, besides buyer's opportunistic behaviour can enhance the total profits within supply chain. Furthermore, in their later research in 2016, they adopted same approach to test how dishonesty in sales such as underreporting impact on suppliers and retailers' market decisions and the profits been created in supply chains. Besides they also investigated after suppliers detected dishonest behaviour in trades, then how suppliers will adjust their goals when negotiating with retailers about contracts (Heese and Kemahlioglu-Ziya, 2016). By considering a single supplier and single retailer model, they summarized that the supplier might get profits from retailers' dishonest behaviour, and when retailer with a high negotiation power or effective effort, the supplier should consider to decrease the revenue share of retailer and enhance retailer's participation by taking some risk of demand. The last well adopted approach is through game theory. For example, Xu et al. (2015) investigated the opportunistic behaviour in firms' vertical R&D cooperation by using game theory approach. They suggested that such R&D cooperation is not stable because it is more likely for downstream

companies to break the agreement due to the opportunism. Besides, Brusset (2013) demonstrated a situation that buyers' willing to pay for the products from suppliers is unknown by suppliers, which means the buyers hide information from suppliers, thus to impact on suppliers pricing. This opportunistic behaviour increases the risk of loss efficiency in a certain supply chain. Therefore, Brusset (2013) adopted an approach that uses game theory to investigate such question and found that downstream partner's information sharing behaviour would lead to upstream party's opportunistic behaviour, besides the effort that to enhance the payment in supply chain may be misplaced or fall to undertaken, and this will lead to supply chain inefficiency from a long-term perspective.

According to literature mentioned above, it can clearly show that quantitative, set up function model and game theory are well adopted by scholars when studying such area. However, the gap within these studies is that most of these studies have not considered how opportunism made by the supplier will influence the revenue allocation between the supplier and the buyer. Therefore, this research will also establish a supply chain model, and adopt Monte Carlo simulation to test how factors that mentioned above will influence supplier and retailer's decision.

3. Hypotheses and Simulation

3.1 Hypotheses

In this research, to simplify the process of study, and also to adopt from former scholars' research, the paper will consider a commerce situation that have only one manufacturer (i.e. the seller in a certain supply chain, also been called supplier) and one retailer (i.e. the buyer). Within this single buyer-supplier relationship, the manufacturer wholesales their products to the retailer, and the effort level of manufacturer will determine the quality of products, thereby impacting on the sales volume of products. On the other hand, when the retailer sells products to customers, the amount of the funds that have been used to advertise the products will impact on the popularity of product as well, thus impacting on the sales volume of products as well. Therefore, the hypotheses of this paper are as follows.

Hypothesis 1: Consider c and w to represent the manufacture cost of product and wholesale price of product respectively, and product's retail price is p , thus the relationship among these three factors should meet $p \geq w \geq c$, and the need of the product from market will be represented by Q .

Hypothesis 2: Consider the effort level of the manufacturer as e , and the cost of manufacturer's effort will be $c(e) = \frac{b \cdot e^2}{2}$. In the meantime, the amount of funds that have been used to advertise products by the retailer will be I . Thus, the paper assumes that the need of product meets Cobb-Douglas production function, i.e. $Q(I, e, \theta) = AI^\alpha e^{1-\alpha} + \theta$, within this function α means the degree of importance towards sell of product from both manufacturer and retailer perspectives. Besides the $\theta \sim N(0, \sigma^2)$ shows how market change will impact on the need of product, and σ shows the uncertainty of market.

Therefore, based on these two hypotheses, the manufacturers' profit function will be

$$R_m = \left[\left(w - \frac{be^2}{2} \right) \right] * Q$$

And the retailers' profit function will be

$$R_r = (p - w) * Q - I$$

Thus, the profit function of the whole supply chain will be

$$R = \left(p - \frac{be^2}{2} \right) * Q - I$$

3.2 Simulation

After giving the value of factors in function that mentioned above, the researcher adopts the approach that uses Monte Carlo simulation to test the sensitive analyse, i.e. investigate the change of the effort level of manufacturer (e), and how will these changes impact on the difference between R_m and R_r . And the value of relevant parameters is as follows.

Assume that $c=10$, $w=20$, $p=30$, $b=0.1$, $I=100$, $A=10$ and $\sigma=10$. And the value of e is set from 2 to 18. Thus, the simulation results are shown as Table 1 and Figure 1.

Table 1 The impact of effort level on profits

e	2	4	6	8	10	12	14	16	18
R_m	2800	3840	4458	4752	4743	4434	3816	2880	1612
R_r	1314	1900	2349	2728	3062	3364	3642	3990	4143
R	4114	5740	6807	7480	7805	7798	7458	6870	5755

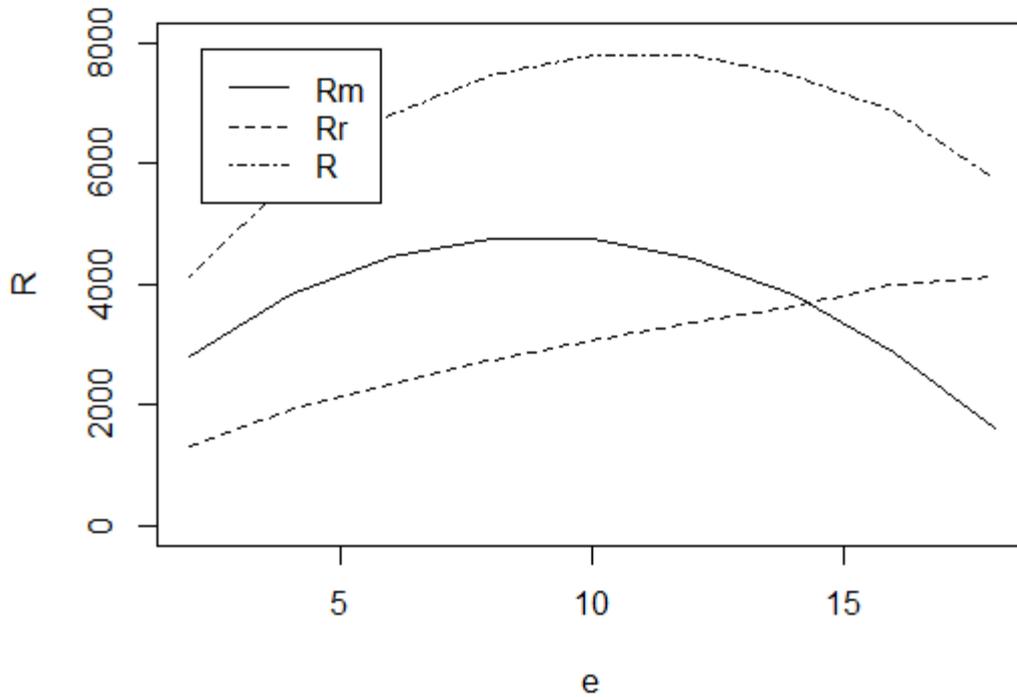


Figure 1 The impact of effort level on profits

Based on the data that simulated by software Crystal Ball, it clearly shows the relationships between effort level (e) and profits (R_m , R_r and R). As the effort level increases, the manufacturer's profits also grow until reach to its peak, which is 4752 when effort level is 8, then it starts to fall. In the meantime, along with the effort level grow, the profit of retailer continually grows as well, and reach to its peak when effort level is maximums. Besides, when focus on the total profits, the graph also shows a first rise and then goes down pattern, and the peak of the total profits is 7805 when effort level meets 10. Therefore, it is worth mentioning that, when effort level is 8, the manufacture gets the highest profits, and when effort level is 18, the retailer gets the highest profits, and when effort level is 10, they can achieve the best total profits. Thus, the contradiction between manufacturer and retailer shows up, because the difference will lead them to adopt opportunism to achieve the highest profits for themselves, rather than achieve the highest total profits by both of them sacrifice part of their own profits. To avoid this problem, the manufacturer and retailer can restrict each other by stimulation, punishment or even profit transfer payment methods, thus to enhance the effort level of manufacturer and reach the optimal effort level of both parties, thereby achieving the common profits of both participators.

4. Conclusion

This research developed a theoretical model which considered the relationship among the effort level of the manufacturer and the manufacturer's profits, the retailer's profits and total profits, then value the factors in the model and adopted Monte Carlo simulation which ran by software Crystal

Ball to obtain the final data. According to the data, it can be found that the manufacturer's different effort level will make the manufacturer or the retailer reach their largest profit, however, not the same time. Besides, if the manufacturer and the retailer aim at achieving a largest total profit, then both of them have to sacrifice some of their own profit. This situation, therefore, leads to a phenomenon that the manufacturer will behave opportunistically and achieve for own largest profit rather than consider for the profit of whole supply chain.

To prevent such opportunism which causes losses to the whole supply chain, the former scholars suggested that collaborative behaviour is an effective method to control the opportunism (Brown et al., 2000; Jap and Ganesan, 2000; Cavusgil et al., 2004; Liu et al., 2009), and Liu et al. (2009) pointed out that collaborative behaviour is widely used in supply chain relationships currently as well. Besides Wathne and Heide (2000) also suggested that based on Transaction Cost Economics (TCE), the collaborative method can benefit all kinds of repeated transactional relationships, thus this behaviour should be continually developed.

In conclusion, to develop a stable collaborative relationship between the manufacturer and the retailer is an essential way to eliminate the opportunism. Moreover, within a collaborative supply chain, there are three commonly used governance mechanisms, which are contracts, specific investment and relational norms (Lai et al., 2011). Lee and Cavusgil (2006) claimed that to strengthen the relationship, governance by norm is more effective than governance by contracts. Besides, Wu et al. (2007) also tested three governance behaviours that mentioned above and found that trust (norm-base governance) is the only effective way to limit the opportunism. Thus, when manufacturer's different effort level will lead to different profits and create potential opportunism, the retailer cannot just rely on contracts to restraint opportunism of the manufacturer, because manufacturer may also hide certain information from retailer, which is a kind of information asymmetry. The best way to prevent such opportunism is through building a long-term trust mechanism between them.

The limitation of this research is that this study only focuses on the manufacturer's opportunism and how this opportunism impact on the manufacturer's profit, retailer's profit and total profit. Therefore, for the following research, it would be meaningful to consider that the retailer will adopt awards or punishments to the manufacturer in accordance with the quality of the product, and to test whether awards or punishments will influence the decisions of both the manufacturer and the retailer as well as how this adoption will influence the profits of the both participators.

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