Compensation for delivery delay in online retailing

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Abstract:

In online selling, consumer can only test and use the product after purchase. That's why delivery has emerged as a key competitive factor that influences consumers' purchase intentions. This research generalizes existing delivery models by drawing on concepts of providing compensation when delivery delay occurs. To decrease the return rate and maximize the revenue, seller provides a compensation for customers who intend to return the delayed products. An analytical analysis is conducted to find whether retailer should compensate and how much retailer should compensate. The effects of delayed time, retail price and the optimal compensation are also analyzed. Our results indicate that the optimal compensation strategy is associated with the probability of delivery delay. Numeric experimentations are conducted to demonstrate the effects of delivery delay probability and compensation on retailer' decisions and profits in the basic model.

Key words: delivery delay; service recovery; compensation;

1. Introduction

The advent of internet technology has given rise to electronic commerce which has brought people convenience and speedy in our daily life. However, a key feature of electronic commerce is the spatial separation between sellers and consumers. Under the E-Commerce, consumers want what they want and want it whenever they want it. Therefore, shipping as the link between sellers and buyers becomes significant. Retailers rely on it to deliver the products to sellers, which also brings lots of trouble. The on-time delivery of products and services is the primary concern for customers in valuing the product before making the purchase intention. So far, the strategic role of delivery reliability has been recognized by many researchers and practitioners (see, e.g., Ashton and Cook, 1989, Stalk and Hout, 1990 and Blackburn, 1991). In fact, it has become so prevalent a concern in business that Hill (1994) noted that for most companies, delivery reliability has become an order qualifier especially in a competitive market environment.

There are already many papers about shipping delay consequences. Kumar et al. (1997) found that customer satisfaction is higher at firms that offer and meet delivery-time guarantees than those who don't which also show lower return rates. It is estimated retailers have return rates as high as 25% during the Singles Day in 2014 which mostly are blame to the failed delivery capacity. Shipping delay has a substantive impact on firm profitability as returned units do not have the same value as when they were sold as new. Thus, there is an obvious value in developing strategies to reduce these consumer returns caused by delivery delay properly. Among all service recovery strategies, compensation is proven to be the most effective measure(Wirtz and Mattila ,2004). Providing compensation can help reduce discontent at the most extent and add to the customers' loyalty and repurchase intentions. In 2013, Amazon has compensated for customers who didn't receive products before Christmas $20 gift card with also free shipping service. Through compensation, Amazon successfully keep customers and saved his reputation.

For consumers, before making purchase decisions, they have expectations about the value of owning the product. However, when delivery delay happened, consumers may find return to be more valuable than waiting for the late arrival. Sellers thus have to pay for the mistakes. So they create costs to the consumer who intends to return by imposing financial penalties such as restocking fees or shipping payments to bring down the return rates. However it doesn't work well when it comes to the retailers' fault. Consequently, we come up with the thought of providing compensation when products don't arrive on time. In this paper, we develop an analytical model to examine the compensation decision in the process of purchasing and returning. Unlike other shipping researches, we provide compensation strategy for consumers who intend to return the unpunctual product based on the time value model. Considering heterogeneous customers' self-selection behavior, each retailer sets the selling price and the compensation policy of different levels to maximize the total profit. The objective of this paper is to segment the consumers and to decide whether and how to compensate for different groups. We then performed empirical analyses to validate the results from the analytical model. In this scenario, we also show how retailers use compensation to implicitly distinguish the consumer segment through their self-selection behaviors. In addition, consumers are compensated accordingly based on their self-selected level. We organize the rest of this paper as follows. In the next section, we provide a review of the existing literature on shipping and service recovery. Then, we expose the conceptual model of the problem, identifying and rationalizing each of the generalizations proposed in Section 3. In Section 4, we conclude some propositions by analyzing the results. Finally, Section 5 concludes the paper and suggests areas for future research.

2. Literature review

2.1 Shipping in e-retailing

There is a growing body of literature on internet retailers' shipping issues. Brynjolfsson and Smith(2000) found that customers are very sensitive to shipping fees and shipping times in analyzing price dispersion online. Also, Ahmad (2002) indicated that poor customer experiences, such as delivery delay, may cause customer dissatisfaction if no appropriate recovery strategies. Díaz and Ruíz (2002) stated that waiting time positively influences anger and negatively influences repurchase intention. Marimon et al. (2010) also indicated that delivery time positively influences repurchase intention by studying purchasing behavior in an online supermarket.

At the same time, there are also papers discussing delivery guarantee problems by modeling between suppliers and retailers. Grout and Christy (1993) investigated blanket guarantees in the context of a just-in-time purchasing contract, in which the supplier sets an appropriate delivery time and the buyer offers the supplier a bonus for on-time delivery. To reflect customers' sensitivity to delivery time, So and Song (1998) modeled the expected demand of the product as a multiplicative function of price and quoted delivery time and it was extended by So (2000) to a multiple-firm setting. Palaka et al. (1998) developed a similar model, assuming exponential delivery times and modeling the expected demand to be a linear function of price and quoted delivery time. Hill et al. (2000) developed the exponential demand function to decide the optimal delivery-time guarantee. Ray and Jewkes (2004) presented a linear demand function of delivery time and delivery time. However, they reduced the demand to be the function of delivery time only by modeling the price to be the function of delivery time. In 2004, Ho and Zheng (2004) presented a new model with demand being the function of the guaranteed time of delivery and the service quality. Timothy L. Urban (2008) established delivery guarantee policies by analyzing with the three different demand functions each as there is no consensus on the standard functional form of expected demand. We adopted the linear demand function in order to simplify the problem in this paper.

2.2 Service recovery

The research on e-retailing has penetrated into all aspects of e-commerce while a considerable number of papers have been worked out. The Internet retailer's service recovery policy is such an important factor influencing consumer's online purchasing intention that it has been widely concerned by both consumers and retailers. Service recovery has always been a topic when a service failure happens.

Service recovery, according to Gronroos (1988), is defined as an action taken by a service provider to redress a perceived service failure. It is the process by which steps are taken to twist negative customer perception of initial service delivery. When service failure occurs, the online retailers can take diverse ways to reduce customers' dissatisfaction about sellers. Forbes, Kelley, and Hoffman (2005) found that the recovery measures conducted by retailers included refunds, repairing the damaged or faulty item, replacements, discounts, paying for return of goods and apologies. However compensation for service failure is considered one of the most effective and widely used measures. Wirtz and Mattila (2004) conducted an experimental study to examine the three dimensions of fairness when dealing with service failures: compensation, recovery speed and apology. Their results showed that compensation was more effective in increasing customers' satisfaction accompanied with other recovery measures. Chang and Wang (2012) empirically studied four main attributes of recovery for products shipping delays by using a sample of 201 Internet users: compensation, response speed, apologies, and contract channels. The empirical results also suggest that consumers are more likely to focus on the compensation attribute among the four main attributes. Van Vaerenbergh, Vermeir, and Larivière (2013) reveals that providing an appropriate service recovery, not only reduces the complaining rate of customers, but also effects them next-in-line. Kim (2007) studied the effect of service recovery on the customer satisfaction by providing compensation and apology. Liao and Keng (2013) studied a new type of psychological recovery strategy for consumers that experience online shopping delivery delay and experimental results reveal that providing consumers with online consumer experiences could increase satisfaction and reduce complaint intention when they meet delivery delays.

3. Model framework

3.1 Model parameters

In this part, we model a business-to-consumer setting that starts with an interaction between a retailer and consumers. We consider a single product transferring from a e-retailer to consumers. As we have mentioned in this paper, due to the nature of spatial separation between the retailer and customers, when a customer placed an order from an online retailer, he needs to wait for a certain time before receiving the products. The customer's waiting time is associated with the retailer's shipping mode—for example, 3-5 day ground service versus overnight service. Here we assume that the retailer's on-time shipping time is represented as d. And d_0 represents the expected number of days delayed which we will notify when it happens. For different customers, they are heterogeneous in their marginal of waiting time. Some consumers are so sensitive to waiting time that they can't endure a late delivery and may turn to purchase the same product from another way. However, some are not sensitive to waiting time and purchase online only for a lower price. We assume that the customers' waiting disutility is uniformly distributed between 0 and 1, and the waiting disutility is represented as θ. The higher the θ, the higher the marginal waiting cost. In other words, customers with high marginal waiting cost would like to pay less time to get wanted products delivered on time. And when internet retailers have difficulty to fulfill the request on time, consumers with high θ tend to return the product only to save time. We use f to represent the probability of delay and in contrast $f_q = 1 - f$ is represented as the on-time probability for the shipping service.

Next we specifically model a consumer's self-selection behaviors between these two possible choices: accept or return. Prior to that, there is an important aspect we must mention: the reason that result in delivery delay is only attributed to the retailers in this paper. When a consumer receives that the product will arrive later than the guaranteed shipping window, he has the choice to either wait for the product or return it to the retailer. The customer's decision of accepting or returning relies on whether he can get a higher utility when comparing two different choices. We assume that if the customer returns his product, he can purchase the same product from an alternative source (e.g., a physical store). Without loss of generality, the net utility of this outside option for a customer is normalized as zero minus the waiting disutility. All money will be refunded when a consumer chooses to return the product.

Unlike other papers which also focus on returning, we consider that the customer's consumption utility v is independent of customer types in this paper, and v is sufficiently large to guarantee a non-empty market coverage. Here we assume p is the selling price; the product cost is denoted by c and the compensation for delivery delay is denoted by r, respectively. Table 1 presents the mathematical notation for all variables in the analytical model.

Table 1–Variables in the analytical model

Variables	*Definition*
θ	*A consumer's marginal disutility in terms of shipping time*
v	*The consumption utility independent of customer types*
p	*product price*
c	*Product cost*

D	*Total demand for this product*
p_1	*Shipping fee*
d	Days of delivery
d_0	Expected number of days delayed
f	The probability that delivery delay happens
r	The compensation provided for delivery delay

3.2 Customer utility

When a consumer chooses to purchase a product from online retailer, he should first consider whether it is more worthy than what he can get from the physical store. According to the analysis of section 3, we can get customer's utility function when purchasing online:

$$U = v - p - p_1 - \theta * d \qquad (1)$$

$$\theta_1 = \frac{v-p-p_1}{d}. \qquad (2)$$

When U is greater than zero, consumer chooses to purchase the product. In another way, consumer with $\theta < \theta_1$ will consider it more valuable to wait d days to get the goods through online sources.

Similar to this previous analysis, when the retailer doesn't provide compensation for shipping delay, a customer's net utility that accepts delayed product can be written as follow:

$$U_a = v - p - p_1 - \theta * (d + d_0) \qquad (3)$$

If the customer returns the product when shipping delay occurs, his net utility can be modeled as follows:

$$U_r = -\theta * d \qquad (4)$$

$$\theta_3 = \min(\frac{v-p-p_1}{d_0}, \frac{v-p-p_1}{d}) \qquad (5)$$

However under the condition of delay compensation, the net utility that a customer accepts delayed product can be rewritten as follows:

$$U_a^{'} = v - p - p_1 - \theta * (d + d_0) + r \qquad (6)$$

$$\theta_2 = \frac{v-p-p_1+r}{d_0} \qquad (7)$$

When we compare the utility under different cases, we can conclude when consumers choose to return or keep it. And we certainly know what the rational consumer base on to make his choice. When $d > d_0$, retailers who intend to return the product have disutility in the whole process. Based on the assumption that each customer is rational, consumers then found accepting the delayed products is more valuable comparing to return so long as the expected delayed time is no more than the delivery guarantee time. In this case, there exists no compensation for delivery delay. To further simplifying the model, we assume that the expected time delayed is longer than the delivery guarantee time. This being the case, when it turned out that θ is smaller than θ_3, consumers will have to waste time waiting until it arrives. However, when the marginal waiting disutility happens to meet $\theta_3 < \theta < \theta_1$, consumers will balance the gain and loss and return the not-on time product. Then it comes to our point that internet retailers choose to compensate the consumers who want to return with refund r. With this suggestion, consumers again have two options: to keep it or return for a refund. When $\theta_3 < \theta < \theta_2$, consumers will accept the compensation and wait for delayed products. The others who are also provided with the choice still insist for a refund.

3.3 E-tailer's profit

As stated previously, in our paper, the retailer will refund the whole charges when a consumer asks for returning goods because of delivery delay,. We assume that all customers are rational and their choices are decided only based on their net utility. When $d_0 > d$, all customers who bought this product will not return their products because the net utility of return is lower than the net utility of accepting the good ($U_r < U_a$). If the retailer provides compensation for delivery delay, the proportion of customers who tend to purchase will increase and average revenue will decrease. With the customer segmentation listed before. We model it to analyze the retailer's optimal compensation strategy and maximum profit under the circumstance of delivery delay.

The retailer's profit function is built as follows:

$$\pi = D(1-f)\theta_1(p-c) + Df\left[(p-c)\theta_3 + (p-c-r)\frac{r}{d_0} - c(\theta_1-\theta_2)\right] \quad (8)$$

$$s.t.\ 0 \le \theta_3 < \theta_2 < \theta_1 \le 1$$

where in the objective $D(1-f)\theta_1(p-c)$is the profit of retailers when no delivery delay happens, whereas the other represents the profit considering providing compensation for shipping delay.

Existing models have already incorporated the selling price as well as the compensation in the demand function (Palaka et al., 1998; Mukhopadhyay and Setoputro, 2004; Timothy L. Urban, 2008;). The specific demand function is assumed to take the following form:

$$D = \eta - hp + er \quad (9)$$

where $\eta > 0$ represents the potential market demand base that is independent of price and compensation factors and is only affected by non-price factors like inherent preferences of customers. $h > 0$ is a price sensitivity parameter representing the sensitivity of the demand to selling prices. $e > 0$ is a compensation sensitivity parameter representing the demand's sensitivity to compensation policy.

4. Analysis

As we proposed in section 3, consumers make choice according to the comparison between the utility before and after. Retailers can use this model to predict the sales and returning rate. And to maximize the profit, retailers should prepare the compensation policy in case that service failure unfortunately occurred. In this section, we aim to solve the problem and find out the optimal compensating strategy.

Solving the above profit model, we obtain the optimal compensating solutions as stated in the following propositions:

$$\frac{\partial \pi}{\partial r} = -3er^2 + 2r(pe - \eta + hp) + p(\eta - hp) + e(v - p - p_1)\left[d_0\left(\frac{p-c-pf}{df}\right) + p\right] \quad (10)$$

Proposition 1. When $f \leq 1 - \frac{c}{p}$,there exists a unique solution to the equitation, and retailers' optimal compensating amount :

$$\Delta = 4(pe - \eta + hp)^2 + 12e\left\{p(\eta - hp) + e(v - p - p_1)\left[\frac{(p-c-pf)d_0}{fd} + p\right]\right\} \quad (11)$$

$$r^* = \frac{hp + pe - \eta + \sqrt{\Delta}}{3e}. \quad (12)$$

From above, it indicates that when f is sufficiently low, there is only one unique solution to the problem. Due to $\frac{\partial r^*}{\partial d_0} > 0$, it is easily found that the compensating amount is positively associated with delayed time. However， there is no sign of upper limit. It suggests that the later you got your purchased goods, the more compensation you will get if you are persuaded to give up returning and instead waiting until it arrives. We can easily prove that retailers' profit is positively connected with compensation when it is not bigger than r* and when it exceeds, retailers' gain less.

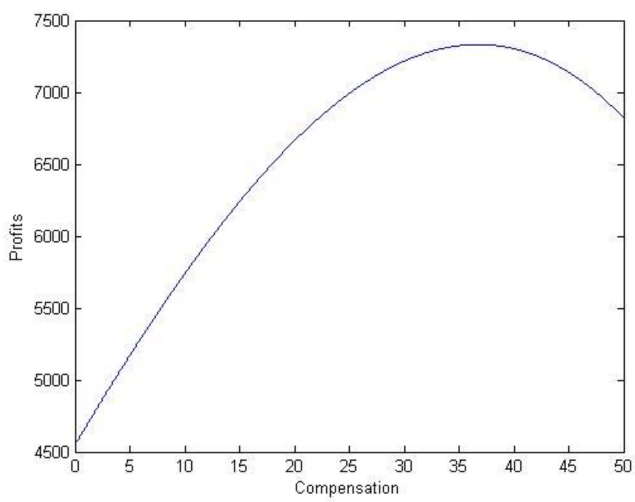


Fig 1–Retailer's profit with respect to compensation for delivery delay

$$\eta = 1000, h = 10, e = 5, d = 1, d_0 = 30, v = 60, p = 50, c = 30, p_1 = 9.4, f = 0.1$$

Proposition 2. When $f > 1 - \frac{c}{p}$, only when $d_0 \leq d'$, retailers will choose to provide compensation for consumers who prefer not to return, otherwise there is no compensation.

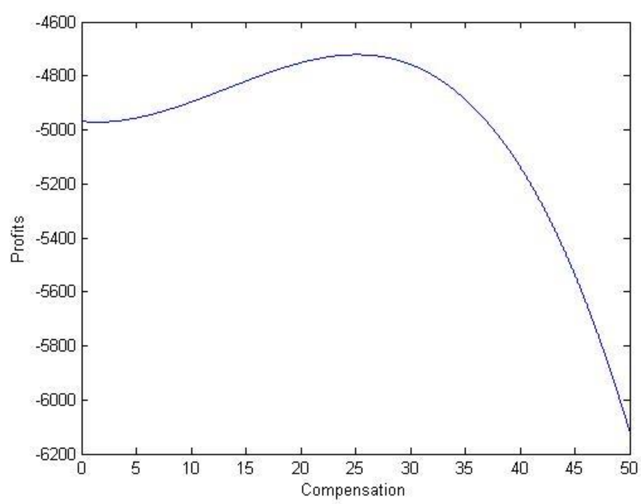
$$d' = \frac{[(pe - \eta + hp)^2 + 3ep(\eta - hp) + 3pe^2(v - p - p_1)]fd}{3e^2(v - p - p_1)(pf + c - p)} \quad (13)$$

Considering our purpose of finding out whether to compensate and how much should we make up for, the equation should have at least one solution. By following this idea, we get proposition 2 which shows us that we compensate only when the delayed time is no more than a threshold. It is clearly conform to the fact we have observed in our daily life. Because of the time value, when delayed time reached to a maximum, most people have no more patience to wait for the late product. In that case, even we provide consumers with refund, still it will be unworthy for them when they judge and weight. Proposition 2 reveals when retailers can choose to compensate for service failure and only in that case compensating policy not only can eliminate the adverse consequences but also maximize retailers' profit.

Proposition 3. Suppose that $d_0 \leq d'$. At optimality, when $1-\frac{c}{p} < f \leq \frac{ed_0(p-c)(v-p-p_1)}{pe(v-p-p_1)(d_0-d)-dp(\eta-hp)}$, the retailer compensates r^* for delivery delay.

Proposition 4. Suppose that $d_0 \leq d'$. When $\frac{ed_0(p-c)(v-p-p_1)}{pe(v-p-p_1)(d_0-d)-dp(\eta-hp)} < f \leq 1$, retailers offer no compensation when $p < \frac{\eta}{e+h}$, otherwise r is which makes retailers' profit more among $\{0, r*\}$.

When the probability of delivery delay is bigger and not bigger enough, retailers tend to compensate consumers for the usually happened mistakes. On the other side, when d_0 is fairly big, there doesn't exist a optimal compensating amount of money, which means no compensation at all. In pt, we conclude the compensation do not always exists. When looking into equitation 3, it is obvious that the price of the product should be greater than $\frac{\eta}{h+e}$, then compensation is valuable for retailers to gain more. The compensation have two solutions, however, retailers can strategically choose according to the actual profit.



Fig– 3. Retailer's profit with respect to compensation for delivery delay

$$\eta = 1000, h = 10, e = 5, d = 1, d_0 = 120, v = 90, p = 80, c = 30, p_1 = 9.4, f = 0.9$$

5. Results

Along with increasing number of retailers in the market, the competition among online retailers is becoming fiercer than before. Strategically providing better service has become a critical tool for Internet retailers to differentiate himself from others. For those customers who purchase online, it is very annoying to experience service failure like delivery delay, especially after retailers have promised to fulfill orders ontime. Delivery delay will enhance customer's displeasure with the retailer and reduce their purchase intention. When delivery delay occurs, they may return their orders and purchase from other channels, such as physical stores. Effective service recovery strategy is a necessary tool for the retailers to reduce customers' dissatisfaction. Although numerous scholars have recognized that the negative effect of the delayed delivery of goods on e-retailers, only some researchers have examined and introduced a corresponding recovery strategy (Chang & Wang, 2012; Kwon & Jang, 2012; Wirtz & Mattila, 2004). However, all of these researches studied from empirical direction and few papers which focus on model have been published.

In our paper, we consider the retailer's recovery measure by building an analytical model. It is proven that when customers choose to return their goods because of delivery delay, appropriate compensation can effectively decrease the probability of returning and increase retailers' profit. In this paper, we find that the optimal compensation is positively associated with the time delayed when the probability of delivery delay is no more than $1-\frac{c}{p}$, while there exists a threshold of delayed time when f exceeds it. Our findings also suggest that online retailers, to maximize profits, should strategically choose compensation in all situations, as we have proven in section 3 and 4. And furthermore, we investigate how the factors significantly influence the sellers' incentive to offer compensation with experimental studies.

Our research contributes to the electronic commerce literature on service recovery in following ways: (1) by constructing an analytical model comprehensively captures the decisions of purchasing and returning among different customers with time value model; (2) by studying the effect of compensation for delivery delay on retailers and consumers from the perspective of modeled analysis. Our paper builds a theoretical framework for Internet retailers making decisions on the price and compensation when some consumers return their unpunctual goods. To our best knowledge, our research is one of the few in this area that studies the compensation issues with respect to internet retailers' service failure.

Although our model captures the mechanism by which an Internet retailer interacts with heterogeneous consumers, several limitations have not been solved in our research. For example in this paper we consider the retailer's compensation and charge in single purchase, future research can extend our study to multiple purchase and study the effect of compensation on consumer's future repurchase behavior. When delivery occurs, the retailer provides higher compensation, the more likely the consumer will purchase from the same retailer. On the other hand, our research assume that consumers are sufficiently rational when make their purchasing decisions. Their purchasing intention maybe affected by some other factors, such as their personal preference. In conclusion, future research can expand our models to other fields and find out more useful suggestions for internet retailing.

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