



The impact of consumer returns policies on consignment contracts with inventory control



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ABSTRACT

We consider a consignment contract with consumer non-defective returns behavior. In our model, an upstream vendor contracts with a downstream retailer. The vendor decides his consignment price charged to the retailer for each unit sold and his refund price for each returned item, and then the retailer sets her retail price for selling the product. The vendor gets paid based on net sold units and salvages unsold units as well as returned items in a secondary market. Under the framework, we study and compare two different consignment arrangements: the retailer/vendor manages consignment inventory (RMCI/VMCI) programs. To study the impact of return policy, we discuss a consignment contract without return policy as a benchmark. We show that whether or not the vendor offers a return policy, it is always beneficial for the channel to delegate the inventory decision to the vendor. We find that the vendor's return policy depends crucially on the salvage value of returns. If the product has no salvage value, the vendor's optimal decision is not to offer a return policy; otherwise, the vendor can gain more profit by offering a return policy when the salvage value turns out to be positive.

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1. Introduction

With the emergence of virtual marketplaces, consignment selling has been thriving at an unprecedented pace. Under such a consignment contract, the vendor retains ownership of the inventory and gets paid from the retailer based on the net sold units. The arrangement is especially popular in on-line marketplaces, such as Amazon.com, Alibaba.com, and eBay.com (Li et al., 2009).

The online channel provides consumers with only a virtual description of the product, using text, graphics, or symbols in a paper or web page catalog. This eliminates the use of touch, taste, smell and may cause evaluation mistakes by shoppers. After purchasing, when a customer further experiences the product, he/she may not like the product as much as anticipated, and will then return the product to the retailer for a refund. So the saliency of returns in today's business world is unquestionable in such items as toys, Christmas decorations, books, seasonal/fashion items and the like. In consignment selling, the consumer returns are sent to the vendor through the retailer. At the end of the selling season, the retailer returns the unsold units together with consumer returns to the vendor. In order to differentiate consumer-retailer returns

from retailer-vendor returns, we use the term “consumer returns” to refer to the consumer-retailer agreement, and “channel return” to refer specially to agreements between the vendor and its retailer. The vendor can salvage all the returned items in secondary and global markets.

The practice of returns policy has been reported widely in both research literature and business, see Bose and Anand (2007). The format of returns policy varies in and across industries. The most generous policy promises to refund the full price for all returned products, while less generous policies only provide partial credits or refund. Under the consignment contract considering consumer returns, the upstream vendor decides his consignment price charged to the retailer for each unit sold and the refund price for returned item. The retailer then chooses her retail price for selling the product to the market. The retailer pays the vendor based on the net sale (total sales minus total returns).

With consignment, the decision about how much inventory to hold in a period can be operated in one of two ways: the traditional way, in which the downstream retailer decides the inventory level, or the new way in which inventory-keeping responsibility and stock level decision are switched to the upstream vendor. The latter arrangement is called Vendor Managed Consignment Inventory (VMCI), and we label the former as Retailer Managed Consignment Inventory (RMCI). Both arrangements take place in practice, however VMCI seems to be a trend. In particular, many big retailers, such as Wal-Mart, Target, Ahold USA, and Meijer Stores, have

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implemented or are considering the implementation of a VMCI arrangement (Lee and Chu, 2005; Rungtusanatham et al., 2007). There have been some continued debates among practitioners as to who should be responsible for the level of consigned inventory in the supply chain. Ru and Wang (2010) study who should control the inventory under a consignment contract without considering possible product returns.

In this paper, we analyze a return policy and inventory control problem under a consignment contract, in which the market demand is uncertain and consumers' post-purchase valuation of the product is also uncertain. The upstream vendor decides his consignment price charged to the retailer for each sold item and his refund price for each returned item before any uncertainty is resolved. The retailer then chooses her response retail price for selling the product to market. Under this general framework, we consider two scenarios regarding who should make a decision about the supply chain inventory. The first scenario is RMCI, in which the retailer controls the inventory; the second is VMCI where the vendor controls the inventory.

To benchmark the channel and individual firm's performance under a consignment contract with return policy, we also consider the channel managed under an alternative contract without return policy. Especially, we are interested in: (i) who should control the inventory under a consignment contract with/without return policy, further, (ii) what is the impact of return policy on consignment contracts with inventory control, and (iii) should the upstream vendor offer a return policy to the unsatisfied customers or not.

The above inventory control issue has previously been tackled in a similar framework by Ru and Wang (2010) (henceforth referred to as R&W). They assume the leftovers have no salvage value and they do not focus on the prevalent consumer return phenomenon because of unsatisfying purchase. R&W then find that it is always beneficial for both parties to delegate the inventory decision to the vendor rather than to the retailer. The non-negative salvage value and the customers' uncertain post-purchase valuation in our analysis, however, cover a much wider range and randomness compared to R&W. Consequently, we are able to generate analytical results with greater scope and application. Moreover, we show that it is profitable to both parties if the vendor takes charge of the inventory decision. We also get that if the salvage value is zero, then the vendor's optimal decision is not to offer a return policy; otherwise, the vendor can gain more profit by offering a return policy. In this sense, our primary contributions are in unifying previous results and in deriving more general results within this area.

Specifically, we consider a supply chain consisting of a vendor and a retailer, in which the vendor contracts with the retailer to sell products through a consignment contract during a single selling season, and the vendor and the retailer each incurs a linear cost for producing and handling the product. The market demand is price-sensitive and uncertain. When the customer further experiences the product after the purchase, if he/she is not satisfied with the product, he/she will return the product back to the vendor through the retailer for a refund. Before the demand uncertainty is resolved, the vendor offers a consignment price charged to the retailer for each unit of product sold and the refund price for each returned unit, and then the retailer chooses a retail price for selling the product to the market. After the demand uncertainty is realized, a portion of consumers will return the product, the proportion depending on the refund price. At the end of the selling season, the retailer pays the vendor based on the net selling units, and the vendor can salvage both the consumer returned items and unsold items in a secondary market. Under the framework of consignment contract with consumer returns, we compare two scenarios regarding who makes the decision about the supply chain inventory. The first scenario is an RMCI setting where the retailer controls the inventory and determines the retail price; the second

is VMCI in which the vendor controls the inventory level, and determines consignment price as well as the refund price.

With the multiplicative exponential demand function, we derive the unique equilibrium solutions for both settings with/without return policy. We show that both RMCI and VMCI always lead to a 50–50 or equal split of the achieved channel profit between the vendor and the retailer. We also find that with/without return policy, both parties should prefer VMCI over RMCI. Furthermore, whether the vendor should offer a return policy depends crucially on the salvage value of the product. If the salvage value turns out to be zero, the vendor's best choice is not to provide a return policy; otherwise, the vendor can earn more profit with return policy compared to without return policy. To sum up, motivated by consignment contracts that have been popularly applied in online marketplace and large quantity of product returns (the readers can refer to <http://www.w7collective.com/> and <http://www.ehow.com> for details of specific examples about the agreement between vendor and retailer), our works include: (1) constructing a game model of a consignment contract that involves the common phenomenon of consumer returns and salvage value; (2) deriving the equilibrium solution of the model and showing the uniqueness of the solution; (3) proposing an optimal inventory control strategy; and (4) showing that the vendor's return policy depends crucially on the salvage value.

The paper proceeds as follows: in Section 2, we provide a brief review of related literature. The model assumption is presented in Section 3. Sections 4 and 5 offer analysis of both RMCI and VMCI with/without return policy. A comparison between no return policy and return policy is provided in Section 6. Finally, concluding remarks are presented in Section 7.

2. Related literature

The model setting we consider is a combination of two distinctive features: (1) consignment contract with inventory decision; and (2) the emerging area of research on consumer return behavior because of misfit. In the following, we provide a brief review of papers that relate to these model features.

The first stream of research is relevant to consignment contracts with inventory ownership. Wang et al. (2004) consider a pure consignment contract, in which the vendor retains full ownership of inventory and bears all the risk associated with overstocking. Lee and Chu (2005) address the issue of who should control the supply chain inventory. In their model, the consignment price and retail price are exogenously given parameters, different from decision variables in our model. Based on Lee and Chu's (2005) work, R&W investigate the similar model, in which the consignment price, retail price as well as the inventory ownership are decisions, and they derive that it is always beneficial for the system to delegate the inventory decision to the vendor. All the above-mentioned papers assume no salvage value and do not include consumer returns. Our research extends R&W's model by assuming non-negative salvage value, and the incorporation of returns into R&W's model with salvage value of leftovers is a new contribution to the literature.

The second relevant literature concerns research on the consumer return problem. A large portion of consumer returns are non-defective, but are returned only because of not fitting customer's taste or expectation. Sciarrotta (2003) reports that the non-defective returns rate was very high. The impact of those returns on the bottom line was significant, amounting to tens of millions of dollars in losses. Lawton (2008) points out that only about 5% of consumer returns were truly defective. A customer buy a product that performs effectively and properly, but the product may not match his/her taste and expectation, and thus the customer will return it back to the retailer (Davis et al., 1995; Anderson et al., 2009).

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