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Decision Support

To join or not to join group purchasing organization: A vendor's decision

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ABSTRACT

A group purchasing organization (GPO) is an entity that utilizes collective buying power to obtain significant discounts from vendors, which can be suppliers, distributors and manufacturers. In the healthcare sector, it is reported that about 72% of hospital purchases are settled through GPO contracts. This paper seeks to examine two critical questions that vendors face: (1) business strategy: does partnering with a GPO to offer quantity discounts make strategic sense? And, if so, (2) pricing policy: what price will yield optimal, maximum profits in such a relationship? Using a linear quantity discount scheme, we find that the size of GPO members strongly influences the vendor's decision to contract (or not) with the GPO. Furthermore, we show that vendors should price their products close to the reservation prices of the GPO members if the vendors indeed wish to pursue such partnerships.

1. Introduction

A group purchasing organization (GPO) is an entity that utilizes collective buying power to obtain significant discounts from suppliers, distributors and manufacturers (collectively called vendors in this paper). GPOs do not purchase product but instead represent their members to negotiate contracts with respective vendors. GPOs are commonly seen in many industries, including the healthcare sector, grocery industry, and the nonprofit world. Some prominent examples of GPOs include GroupSource, NexCentra, PrimeAdvantage, and FoodBuy. In the healthcare sector, for example, it is reported that "on average, about 72% of purchase that hospitals make are done using GPO contracts" (RxCommercial Research International Inc., 2012). Members who participate in the GPOs are able to enjoy both discounted price and reduced costs (Burns & Lee, 2008; Schneller, 2009). According to a healthcare spending report by Dobson, Heath, Reuter, and DaVanzo (2014), GPOs generated up to $55.2 billion in cost savings for the healthcare system in 2012, a finding echoed in many other prior industry studies (Burns & Colleagues, 2002; Cleverley & Nutt, 1984; Raventos & Zolezzi, 2009; Schneller & Smeltzer, 2006). Prior research also confirms that GPO mechanisms could benefit the industry by improving efficiencies (Jayaraman, Taha, Park, & Lee, 2014).

GPOs play a similar role to that of supply chain intermediaries. Wu (2004) defines intermediaries as the "agents who coordinate and arbitrage transactions in between a group of suppliers and customers." Sometimes they are also called the middlemen (see some discussions in Biglaiser, 1993, Rubinstein & Wolinsky, 1987). Prior studies have investigated various issues in this area, for example, the profitability of the intermediaries (Adida, Bakshi, & DeMiguel, 2016; Rubinstein & Wolinsky, 1987) and the informational advantage of intermediaries (Belavina & Girotra, 2012; Yang & Babich, 2014). A brief summary of the benefits of intermediaries in the electronic market is reviewed in Grieger (2003). Although they play a similar role to that of intermediaries, GPOs concentrate more on the "group" side, and our research shows that the number of members in a GPO plays a critical role in forming the pricing mechanism. Specifically, the larger the size of the group, the greater bargaining power the GPO has in negotiating with the suppliers, a phenomenon that has been capture in a related literature stream: quantity discount.

A quantity discount is a reduction in price that sellers offer buyers who purchase in greater quantities. It is commonly seen

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in supply chain coordination (see discussions in Chen & Roma, 2011; Li & Wang, 2007; Sarmah, Acharya, & Goyal, 2006; Shin & Benton, 2007). Quantity discount is often discussed along with price sensitive demand (Viswanathan & Wang, 2003; Weng, 1995). Researchers have identified and studied several issues central to quantity discount, including suppliers' optimal pricing, collaboration among buyers, and the benefits of quantity discount. For example, Monahan (1984) analyzes how a supplier determines her optimal quantity discount pricing schedule to match her major customers' orders. In Keskinocak and Savaşaneril (2008), buyers collaborate in the procurement process but compete on consumer markets. They focus on the short term transactions so that buyers do not need to sign long-term contracts with suppliers. Keskinocak and Savaşaneril (2008) show that when buyers are not capacitated by procurement quantity, it is optimal for all the buyers to collaborate; however, when buyers are capacitated, they find conditions of collaboration under different capacity levels. Erhun, Keskinocak, and Tayur (2008) investigate a dynamic procurement process where a single buyer engages with a single supplier for multiple trades instead of one single trade. They build an analytical model on multiple periods and show that dynamic procurement is similar to incremental quantity discount, in which all parties, including the buyers, will benefit.

One of the main revenue sources of GPOs is the administrative fees collected from either the vendors or the GPO members, or both (Hu & Schwarz, 2011). The administrative fees are partly employed to support the operation of the GPOs. Prior literature has mostly concentrated on the vendor-paid administrative fees (usually the case in the healthcare industry), upon which government regulations impose a ceiling of 3% of the contract price. Sometimes these vendor-paid fees are passed down to the buyers as cash rebates to incentivize competition. Hu, Schwarz, and Uhan (2012) model administrative fees as a percentage of total contract revenue charged on the vendors. They suggest that in the healthcare-product supply chain, the administrative fees will affect the profit distribution between vendors and GPOs, but not the providers' total purchasing costs. There are also GPOs that charge administrative fees on the buyers, a phenomenon that is understudied in the literature. For instance, GroupSource (http://groupsourceinc.com), a large GPO that contracts with suppliers in numerous industries (e.g., healthcare, construction, banking), states in its Medical Letter of Commitment that members (i.e., buyers) have the option to pay GroupSource either a small percentage of the total purchase price or a flat rate per product (GroupSource, 2012).

For our study, we focus on the administrative fees collected from the buyers to address two questions that vendors face: (1) business strategy: does partnering with a GPO to offer quantity discounts make strategic sense? And, if so, (2) pricing policy: what price will yield optimal, maximum profits in such a relationship? Using a linear quantity discount scheme, we find that the size of GPO members strongly influences a vendor's business strategy. We also show that it is not always more profitable for vendors to partner with a GPO. Depending on the number of GPO members, the vendor may choose different strategies and pricing policies to maximize her profit. There exists a critical range such that the vendor is better off to contract with the GPO. Our results are robust in that vendors' qualitative behavior remains the same when we use a nonlinear two-step function quantity discount scheme. Our analyses suggest that vendors should price products close to GPO members' reservation price if it is in the vendor's best interest to join the GPO. We also study GPOs' optimal administrative fees to show that a GPO's revenue is proportionate to the square of its fee.

The remainder of this paper is organized as follows. In Section 2, we present our analytical models, starting with the benchmark case of the vendor not partnering with the GPO and then proceeding to the case in which the vendor contracts with the GPO. In doing so, we show the analytical results of the vendor's optimal pricing policies and profits for both cases. To determine whether the vendor should contract with the GPO, we compare the vendor's optimal profits for two cases, and we first show the analytical findings for the case in which the vendor's marginal production cost is negligible. Then, in Section 3, we conduct numerical analysis for the case that includes non-negligible marginal production costs and show that the managerial insights are the same as those of the analytical findings with negligible marginal production costs. We conclude this paper with discussions in our last section. All proofs are relegated to the online supplement.

2. The model

Without loss of generality, we normalize the total number of consumers to 1. Let Λ $(0 < \Lambda \leq 1)$ represent the GPO members, and thus $1 - \Lambda$ represent the non-members. The segments of GPO members and non-members correspond to the "informed" and "uninformed" consumers, respectively, in the information economics literature (Kocas, 2003; Shapiro, 1983; Smallwood & Conlisk, 1979; Varian, 1980). Specifically, the informed consumers are those who have more information about the distribution of product prices (Varian, 1980). These pieces of information can be obtained through marketing campaigns, various advertisements, word-of-mouth, or previous purchase experience. Examples of informed consumers include the newspaper readers who collect coupons and vouchers so that they do not need to pay the full price, and the grocery shoppers who can infer when there might be a price drop. Hence, the informed consumers usually shop when the perceived price at a particular store is low, whereas the uninformed consumers have less information about the price distribution and usually shop at a random store, which is most likely pricier. In other words, the informed consumers are more price sensitive; or, equivalently, their reservation prices (i.e., the maximum willingness to pay) are lower (Edelman, Jaffe, & Kominers, 2011). There is anecdotal evidence that suggests the proportion of the informed is relatively small (Neslin, Henderson, & Quelch, 1985). Subsequently, the terms *the informed* and GPO members (likewise, *the uninformed* and non-members) are used interchangeably in our paper.

To capture the price sensitivity of the informed (i.e., GPO members) and uninformed consumers (i.e., non-members), we let α_i be the price sensitivity of the informed, and α_u be the price sensitivity of the uninformed where $\alpha_i > \alpha_u$. The empirical study of Tellis (1988) shows that the price sensitivity of the informed is higher and could be as high as four times that of the price sensitivity of the uninformed. We incorporate this result in the numerical analysis in the next section. We denote the price by p, then, the demand function of the informed $D_i(p)$ is

$$D_i(p) = \Lambda - \alpha_i p, \tag{1}$$

and the demand of the uninformed is

$$D_u(p) = (1 - \Lambda) - \alpha_u p. \tag{2}$$

Following Anand and Aron (2003), we normalize α_u to 1 and let α_i be m where $m > 1$. Table 1 summarizes notations that we use in the model.

We find the reservation price of the informed by setting Eq. (1) to zero, which yields $R_i = \frac{\Lambda}{m}$, and that of the uninformed by setting Eq. (2) to zero, which yields $R_u = 1 - \Lambda$. Since the informed have a lower reservation price than the uninformed as described before, we establish that

$$\frac{\Lambda}{m} < 1 - \Lambda. \tag{3}$$

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