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Strategic alliance via co-opetition: Supply chain partnership with a competitor

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ABSTRACT

Why do two competitors form an alliance yet still compete with each other in the marketplace? Consider Yahoo's recent alliance with Microsoft to use its Bing search engine, yet both companies will compete with each other to sell search ads. In this paper we study dynamic alliance formation among competing firms with a multi-period model. In each period, there is a two-stage game of co-opetition. In Stage 1, two competing firms decide on forming a partnership by negotiating a contractual agreement; and in Stage 2, all firms in the market engage in price competition. We formulate the economic incentives and costs of the cooperation, propose the optimal contract and discuss the reasons for a temporary co-opetition and a delayed co-opetition. The results of the paper shed light on firms' strategic decision on co-opetition and provide implications to public policy makers.

"You have to compete and cooperate at the same time."
— Ray Noorda, Novell

1. Introduction

It is no longer the case that firms perform all the vital functions in-house to build and maintain competitive advantages rather than partnering with other firms to execute some of the business activities. The boundary of firms traditionally being explained as a result of transaction cost [20,35] and competitive advantages [30,31] has been changed in the networked world. Collaborations and alliances among different business entities arise in various markets. This paper studies the formation of a specific type of "co-opetition" [5], a supply chain partnership between competing firms with different competencies through a contractual agreement to meet each other's strategic objectives such as expanding market share, enhancing efficiency, entry to a new channel, etc.

Numerous such supply chain partnerships exist in the retail and service industries. For example, after Amazon.com developed an innovative IT-enabled supply chain, Borders sought to leverage it instead of trying to match it since Borders would have had a harder time achieving similar efficiencies with a smaller consumer base. The Borders Group partnered with Amazon.com under a long-term contract in 2001. Under the agreement Amazon.com provided design and underlying technology to its rival bookseller's Web site, took over customer service and order fulfillment, and was compensated by sharing a portion of the sales from Borders.com. Toys 'R' Us and Target also formed a similar form of collaboration with Amazon.com in 2000 and 2001, respectively. The Walt Disney Company partnered with eBay.com to build a co-branded shopping website in 2000; and Yahoo partnered with Microsoft's Bing in 2010 to use its search engine. Those successful co-opetition cases result in a win–win situation for both partners. They leveraged synergies with each other, gained quicker entry into the online markets, and developed new competencies [9]. This collaborative relationship, however, may not always sustain. Borders ended the collaboration with Amazon and launched a new Web site to sell to its online customers in early 2008. Toys 'R' Us terminated the collaboration of building a co-branded online store with Amazon.com before the end of the ten-year contract and started to run its retail website independently in 2006. Disney ended their partnership with eBay and moved the Disney Auction website under its own banner as of fall of 2006.

Specifically, we examine in an oligopolistic market a high-cost firm that partners with a low-cost firm based on a contract so that the low-cost firm produces goods or provides services for the high-cost firm for a payment. Firms negotiate the contract by bargaining the surplus from the alliance [25]. Subsequent to the contract negotiation, both firms proceed to engage in a price competition that also involves a third "outside" competitor that takes no part in the alliance. Following the contracting literature [32], we model the contract as a two-part tariff form (a fixed payment plus a unit payment), which is consistent with business practices. For example, Amazon.com and Toys 'R' Us partnered based on such contractual terms that, "Under the terms of the 10-year agreement, Amazon.com will be compensated through a combination of periodic fixed payments, per unit payments and single-digit percentage of revenue. All parties, including Toys 'R' Us, Inc., will market the co-branded store to their respective customers."

In addition, we also inspect the possible effects of intertemporal efficiency gains on optimal contracting with a dynamic model. Considering the learning-by-doing effect (i.e. it becomes increasingly efficient over time through learning from its own experiences or

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spillovers from the alliance), we find it may be optimal for the high-cost firm to terminate a partnership at some point in time and subsequently move to self-sufficient production or services, or to delay the alliance after an initial period of self production or services.

Based on the above setting, we intend to examine the following research questions:

1) Why and when should a high-cost firm overcome the efficiency disadvantage by forming an alliance with a low-cost competitor? Is the low-cost firm interested in forming the alliance given that it already enjoys a substantial cost-advantage?
2) What are the factors that affect the optimal co-opetition contract?
3) What are the implications of the co-opetition on the partner firms as well as on the outside competitor? Does such a co-opetition hurt consumers? What is the impact of the co-opetition on social welfare?

The paper is organized as follows. Section 2 reviews the relevant literature. Section 3 presents a single-period competitive model and characterizes the strategic behavior of firms in the market with and without collaboration. It provides the incentive and tradeoffs for firms to partner. The decision process is analyzed with a two-stage game with each stage discussed in Subsections 3.1 and 3.2, respectively, and the impacts of a co-opetition practice on market competition and economic welfare are investigated in Subsection 3.4. Section 4 examines the optimal timing and duration of co-opetitions in a dynamic setting. Section 5 summarizes the major results and discusses the insights and implications. Conclusion and further research directions are provided in Section 6. All proofs to the propositions and corollaries are provided in the Appendix A.

2. Literature review

The model setting of this paper is relevant to the literature on licensing of cost-reducing innovations [14,21,32], where subsequent to the license contract of a cost-reducing technology (with both a fixed fee and a per-unit royalty) in an oligopolist market, the licensee and licensor firms, which produce imperfect substitute goods, proceed to engage in a price competition. However, due to the difference in market structure, the licensing contracts in prior studies are based on either an auction mechanism [32] or a take-it-or-leave-it offer by the licensor [14,21], while our supply chain co-opetition contract is based on bargaining between the partners. We also contribute to the general licensing theory by examining an expanded market setting with an outside competitor and a repeated licensing game.

Research on supply chain coordination through contracts proposes contracts of various formats (See Cachon [6] and Kouvelis et al. [22] for detailed literature reviews): buy-back contracts [29], quantity flexibility contracts [33], revenue sharing contracts [7], VMI with revenue sharing contracts [15], and information sharing [36]. All those contractual relationships are examined under a vertical supply chain environment, e.g. between a supplier and an assembler, as are most other supply chain partnership studies [8,10,13,19]. We, however, study a revenue sharing contract in a horizontal supply chain, that is, between two competitors in the same market.

Some related works should be further mentioned. Granot and Sosic [16], Nagarajan and Sosic [26] and Granot and Yin [17] have also analytically studied cooperation of competing firms in a market. This paper differs from them in the following ways: 1) We consider a more complete problem including endogenizing alliance contract negotiation and discussing the renewal/breakup of the alliance in a dynamic setting; 2) The co-opetition in this paper is formed based on a mutually agreed contract, whereas Granot and Sosic [16] simplify the impact of a coalition on each member as an exogenously determined and reduced wholesale price, and Nagarajan, and Sosic [26] assume that all coalition members tacitly agree to set the same price; 3) We assume that partners remain competitors and have control over their own pricing (and quantity) decisions, whereas Granot and Sosic [16] and Nagarajan, and Sosic [26] explicitly model the within-coalition pricing/inventory decisions as a cooperative result; 4) In contrast to the results in Granot and Sosic [16] and Oum et al. [28], we find that the "outsider" may not be worse off after the formation of the alliance of its competitors.

This paper differs from Long and Soubeyran [23] who model a two-stage game of firm co-opetition in the following ways: 1) Long and Soubeyran does not consider a specific contractual relationship like this paper but rather abstracts the cooperation mechanism with a cost-saving parameter e which directly affects firms' costs; 2) while the marginal costs of firms are either collusively determined or under the direct influence of a dominant actor (cost manipulation) in Long and Soubeyran, they are endogenously determined by a Nash Bargaining game in this paper; 3) Long and Soubeyran does not consider the multiperiod game of repeated co-opetitions as in this paper.

3. Model of the co-opetition game

Consider three firms competing in the same market selling substitutable goods that are horizontally differentiated in product attributes, brand names, company images, or customer relationships. Demand of firm i, q_i, is a function of its own price, p_i, and the competitors' prices, p_{-i}. Following Vives [34], we define the demand function as

$$q_i(p_i, p_{-i}) = a - p_i + d\left(p_j + p_k\right), \quad i,j,k = 1,2,3 \text{ and } i \neq j \neq k \tag{1}$$

in which a represents the total market size, and d denotes the degree of demand substitution (the effect that one firm's price change has on the demand of the other firms). To render the interpretation meaningful, we impose the finite market restriction that $0<d<\frac{1}{2}$ such that the substitutability is limited — the three products cannot perfectly substitute for each other or one for the combination of the other two. We assume that the functional form of each firm's demand remains the same after forming the alliance to eliminate the demand externality as the incentive for firms to collaborate. We further assume a linear cost function and a sunk fixed cost to rule out economy of scale as a motive for the alliance. Instead we focus on incentives that arise solely from sharing complementary competence.

Suppose two of the three firms are more efficient in certain operational or marketing activities than the other firm; let's say they are more experienced and advanced in supply chain management, order fulfillment or in customer services. We label the efficient firms as Firm 1 and Firm 2 and normalize their marginal costs to zero; while Firm 3 has a relatively higher marginal cost $c>0$. Firm 2 is a representative "outsider" that only competes with the other firms in the market but does not participate in the alliance. Firm 1 and Firm 3 have complementary needs: Firm 3 has incentive to share Firm 1's advantages in those activities and Firm 1 aims at Firm 3's market share. Firm 1 incurs a cost of c_1 for each unit of goods produced or sold for Firm 3, which is lower than Firm 3's marginal cost, that is, $0 \le c_1 \le c$. In addition, Firm 1 and Firm 3 each incur a cost in forming and monitoring the alliance, denoted by c_{k1} and c_{k3} respectively.

We model the co-opetition game as a multi-period dynamic process: for each round of alliance, we envisage a two-stage game: Firms 1 and 3 decide whether to collaborate through negotiating a contract in stage I before all firms engage in price competition in stage II; at the end of an alliance, the two partner firms decide whether to renew or discontinue the relationship according to their updated status (Fig. 1).

The alliance contract specifies that Firm 1 will provide certain manufacturing or service activities for Firm 3 and will receive payment $R(q)$ based on quantity produced or sold q. We assume the transfer payment is in the form of a two part tariff which incorporates a fixed fee f and a per unit payment r, that is, $R(q)=rq+f$. This two-part tariff contract is more general than the exclusive unit ($f=0$) or fixed fee ($r=0$) payment contract because they are both reduced forms of a two-part tariff contract.