Free or bundled: Channel selection decisions under different power structures ☆

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ABSTRACT

The smart phone industry has unique supply chain relationships. Companies at all levels of the supply chain compete and coordinate with each other for market share and profit. This paper examines the impact of power structures on the decision of pricing and channel selection between a free channel and a bundled channel. We investigate the smart phone supply chain that consists of a handset manufacturer and a telecom service operator. Based on game theory models, the manufacturer's optimal retail pricing policies in free and bundled channels and the telecom service operator's optimal subsidy policies in a bundled channel are derived under different power structures. It is demonstrated that the firm that has higher channel power will gain more profit, and the smart phone supply chain's profit in a Vertical Nash (VN) power structure is higher than that in Telecom Service Operator-Stackelberg (TS) and Manufacturer-Stackelberg (MS) power structures. It is also shown that the smart phone supply chain will choose a bundled channel in TS and MS power structures under certain conditions and will select a free channel in a VN power structure.

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1. Introduction

Consider a consumer looking for a new smart phone. When picking a smart phone handset from various models and manufacturers, the consumer has to choose a service package ranging from "pay as you go" to various tariff contracts among different telecom service operators. The relationship with the ultimate customers is determined by the complete combination of product features and telecom services offered by a unique supply chain setting [14]. On one hand, a telecom service operator cannot provide good quality telecommunication and data service without a good quality functioning handset produced by manufacturers. On the other hand, the innovative functions developed by a handset manufacturer cannot be materialized without a fast and reliable data service provided by telecom service operators. The handset and service package themselves and the prices charged for both the handset and service are all influential in the consumer purchasing decision. Different from traditional supply chain management that often focuses on delivering a product or service, this involves the strategic process of coordinating companies within the supply chain to competitively deliver both service and product to the end customers.

Adding to the complexity of the decision problem, customers can choose their handsets and services as a bundled package from manufacturers (e.g., Apple Store), telecom service operators, and third party smart phone retailers, or alternatively, they can buy handsets from manufacturers and services from telecom service operators separately. Here we use the terms, bundled channel and free channel, to describe the two different channels above, respectively. In a bundled channel, a manufacture designs a smart phone handset to work exclusively with a single telecom service operator, and customers have to buy the handset and the service together from either the manufacturer or the telecom service operator. In a free channel, the manufacturer works with multiple telecom service operators and customers can buy the handset from the manufacturer and the telecom service from a telecom service operator separately. Both bundled channel and free channel are popular in many world leading smart phone markets including China, the United States (US), and the United Kingdom (UK). For example, consumers in these countries can buy iPhones from Apple stores either as a standalone handset or as a handset bundled with a service contract. Alternatively, consumers can also buy a bundled package from telecom service operators. However, the prices consumers pay for their smart phone handsets varies

significantly depending on where they purchase handsets and which service package they choose.

This price variation is obscured by the bundling of product and service and various subsidies in the supply chain. Furthermore, the pricing and subsidy policies of manufacturers and service operators are affected by their power in the relative market and supply chain against each other and against customers. A dominant power relationship with other supply chain members not only enables firms to force through their strategic and operational decisions from other supply chain members but also allows them to be the driving force in the negotiation of subsidies. To manage supply chains strategically and operationally, it is important that power structures that exist in the supply chains are properly understood by managers [13]. Although power issues such as market power [30,1], channel power [23,33], and supply chain power [13,2,6,45] were widely explored in the marketing and operations management literature, to our knowledge, the power effect on channel selection, pricing and subsidy decisions has not been analyzed in a unique supply chain setting. Therefore, in this paper, three classic power structures [9,20,3]: Telecom Service Operator-Stackelberg (TS), Vertical Nash (VN) and Manufacturer-Stackelberg (MS) are taken into consideration in examining their influences on channel selection, pricing and subsidy decisions.

Channel management has received increasing attention from scholars and practitioners in recent years. There is a stream of marketing and operations research literature on the problem of channel management. There is also extensive economics literature examining firms' behavior under competition and the effect of strategic alliance. However, to the best of our knowledge, there are no published papers that place the channel selection problem in a supply chain model in which end consumers can buy their product and service from upstream manufacturer(s) and downstream service operator(s), respectively, or can buy product and service bundled packages directly from either parties, examine the impact of different power structures on these decisions, or specify pricing and subsidy policies that enable manufacturers and service operators to coordinate decisions. In a competitive marketplace with a growing need for customer orientation, both manufacturers and service operators should look beyond their organizational boundaries to develop and leverage their supply chain partners' resources and capabilities to create superior value. Our objective is to contribute in addressing the aforementioned research gap by presenting an analytical model and analysis method for simultaneously modeling and estimating optimal pricing and channel selection policies under different power structures.

The pricing, subsidy and channel selection problems are investigated in a supply chain setting that consists of a manufacturer and a service operator and has different power structures. The manufacturer may directly sell smart phone handsets to consumers in a free channel or sell them through a telecom service operator in a bundled channel. In contrast to high prices and a huge discrepancy of handsets in the smart phone market due to a short product life cycle and rapid technological development, the service price is relatively more stable. Therefore, in addition to the channel selection problem, this research mainly focuses on handsets manufacturer's pricing policies. Several key questions are addressed in this article.

- What are the smart phone manufacturer's optimal retail pricing policies in a free channel and bundled channel under different power structures?
- What are the telecom service operator's optimal subsidy policies in a bundled channel under different power structures?
- What are the smart phone supply chain's optimal channel selection policies (free channel or bundled channel) under different power structures?

After a review of the literature in Section 2, the model formulation and assumptions are presented in Section 3. In Section 4 the pricing policy in a free channel is discussed. In Section 5, the pricing policies and subsidy policies in a bundled channel and the effect of different power structures are discussed separately. In Section 6, we focus on channel selection policies for the smart phone supply chain. The effects of channel selection decisions, pricing decisions and subsidy decisions on the supply chain performance are analyzed. The analysis results will help firms in the smart phone industry adopt proper strategies. In Section 7, a numerical example is provided to demonstrate the validity of the proposed models. Finally, we discuss managerial insights and consider directions for future work in Section 8.

2. Literature review

The importance of channel selection and pricing to the competitiveness of a supply chain has been recognized in practice and literature for some time. A considerable amount of prior work has been conducted in the areas of competitive pricing effects e.g., economic work on cross-price effects [31,19]; the literature on price image [12,18]; price wars [37]; optimal pricing on product decision models [15,26,27,39]; and some recent reviews on retail pricing [29,28,17]. More relevant to the setting of this research, Choi [10] models price competition in a channel structure consisting of duopoly manufacturers and duopoly common retailers. This research finds that product differentiation helps manufacturers but hurts retailers and store differentiation helps retailers but hurts manufacturers conversely. Cattani et al. [5] investigate pricing strategies of both the manufacturer and retailer when a direct internet channel in introduced by a manufacturer. Their finding indicates that if the retail channel is considerably more convenient than the Internet Channel, a consistent pricing strategy is appropriate.

The literature on channel selection and coordination has been rich and the marketing literature on these issues also focuses on pricing decisions. Jeuland and Shugan [22] consider a simple channel with one retailer and one supplier and find that the supply chain can be coordinated by that a simple quantity discount. Chiang et al. [8] examine the impact of customer channel preference on dual-channel supply-chain design problems. Their study finds that setting up a direct channel to compete with its retailer is beneficial for a manufacturer if consumers are assumed to have a common positive preference for the local retailer. Tsay and Agrawal [36] study retail and direct channels and their finding indicates that both the retailer and manufacturer would benefit from a dual channel if the manufacturer is willing to reduce the whole sale price. They also suggest that the preference for an alternative channel is dependent on marketing capability and supply chain efficiency. Cai [4] investigates the influence of four supply chain structures with and without coordination on the supplier and retailer. Their finding suggests that the channel selection and coordination preferences depend on parameters such as channel base demand, channel substitutability and operational cost. Khouja et al. [24] analyze channel selection and pricing in the presence of retail-captive consumers. Their findings indicate that their variables (including the customer distribution among the retail-captive and hybrid segments, their channel preference and the relative values of unit cost in the retail channel and direct channel) determine optimal channel choice.

Another relevant stream of literature looks into channel selection and pricing problems from the supply chain management perspective. Cohen and Whang [11] adopt a game-theoretic framework to study the competition for the provision of after-sales service between the manufacturer and an independent service