



Coordination for distribution of motion pictures in the context of piracy

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ABSTRACT

In addition to the traditional DVD rental channel, with the pervasive use of Internet, consumers can also watch motion pictures by purchasing videos on demand (VOD) from an on-line digital channel. However, both traditional and online channels suffer from piracy, which may decrease the overall real demand for such products. This study proposes a revenue-sharing mechanism in which the relationships among the film distributor, traditional DVD rental store, and Internet VOD service provider are investigated to avoid channel conflicts and achieve effective supply chain coordination. We assume that the services provided by the two channels are substitutable for consumers, and consider that both the diffusion effect and piracy rate are essential in order to forecast the demand for motion pictures. A game theoretic model is constructed to obtain the optimal revenue sharing ratio and the equilibrium retail prices for the two channels, with the aim of enhancing overall supply chain performance and profitability. The results show that when piracy is considered in the market, the market potentials of the two channels would decrease, and the price elasticity would increase, so the members of the supply chain in the film industry have to pay more attention to the impacts of cross elasticity, and be more prudent when determining their pricing strategies.

1. Introduction

Until recently the revenues of the film industry were collected mainly from movie theaters and, sometimes, DVD rental stores. However, advances in technology now allow motion pictures to be uploaded to the Internet for rental or sale. For example, online streaming technology can be used to enable consumers to view videos on demand (VOD) online, or to download movies to their cell phones or computers to watch offline (Chang, Lee, & Lee, 2004; Das, 2008). Moreover, this technology allows consumers to directly search for movies of interest online, which is a more convenient, faster and cheaper way to obtain such services. This has significantly affected the revenue of the traditional DVD rental stores, as people tend to spend less time in these and more time in virtual ones (Cook & Wang, 2004; Hennig-Thurau, Henning, & Sattler, 2007; Hennig-Thurau, Henning, Sattler, Eggers, & Houston, 2007). For example, Netflix (USA) is an online DVD rental provider from which consumers can directly rent DVDs through its website, and then wait for the home delivery service, so they can watch DVDs at their convenience without worrying about penalty fees for late returns. In addition to changes in sales channels, both traditional DVD and online digital channels suffer from piracy due to the ease with which people can copy and share movies (Hennig-Thurau, Henning, & Sattler, 2007; Hennig-Thurau, Henning, Sattler,

Eggers et al., 2007; McCalman, 2005; Siwek, 2006). Moreover, some people may illegally produce pirated DVDs for sale at a very low price, and this represents a serious threat to both physical and online channels. Such developments may even deter movie producers from investing in the industry. The main form of piracy, which is torrent files, available at sites like Pirate Bay, is a major cause of such problems.

Film distributors play an important role in marketing movies. They are responsible for coordinating the schedules at local theaters and also distributing movie prints to second-run theaters, disks to DVD rental stores, and access to files for online channels based on lease or buyout contracts (Eliashberg, Elberse, & Leenders, 2006; Kind, Nilssen, & Sorgard, 2009; Suman, Kalpesh Kaushik, & Debabrata, 2006). Jones and Mendelson (2011) noted that channel members of the film industry often use different marketing strategies to draw consumer attention in a highly competitive environment. Moreover, channel members often attempt to attract consumers by differentiating their products or offering promotions, which may increase costs and lead to price wars. In addition, and as noted above, consumer demand for these channels is decreasing due to rampant piracy (Hill, 2007; Prasad & Mahajan, 2003). In practice, only a few large-scale channel members use a buyout approach to purchase movies along with the related copyrights from film distributors, with others mostly using cooperative lease contracts to reduce purchase costs and earn profits from revenue sharing.

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Therefore, it is worth investigating how to negotiate an optimal revenue sharing mechanism and price with the film distributor for channel members with consideration of the effects of piracy, with the aim of maximizing the overall profits. However, it should also be noted that piracy may be advantageous in drawing more consumer attention, which can then result in greater legal demand (King & Lampe, 2003; Martínez-Sánchez, 2010; Minniti & Vergari, 2010), although this varies in different countries due to economic, legal, and cost factors (Al-Rafee & Cronan, 2006; Hill, 2007; Holm, 2003; Jacobs, Heuvelman, Tan, & Peters, 2012; Lau, 2003). Therefore, simply considering the piracy rate as an arbitrarily estimated constant may not be practical and may under- or over-estimate the threat it represents (Bae & Choi, 2006; Chellappa & Shivendu, 2005; Domon & Yamazaki, 2004; Jain, 2008; Papiés & Clement, 2008; Wang, 2005).

Some factors may cause the intention of piracy, and several aspects have been discussed in the literature. Cronan and Al-Rafee (2008) considered that the intention to engage in is affected by the following critical factors: attitude, perceived behavioral control, moral obligation, and past piracy behavior. Coyle, Gould, Gupta, and Gupta (2009) also considered that attitude and past piracy behavior play a critical role in the intention to pirate content. Furthermore, they also revealed that individual differences (gender, age and household income) are another important factor which influence this. Taylor (2012) found that the degree of piracy intention is highly related to the frequency of past piracy. Furthermore, Yang, Wang, and Mourali (2015) considered that self-control will significantly affect unauthorized downloading and sharing (i.e., piracy). Less self-control will enhance the likelihood of future piracy. Accordingly, different studies might have different perspectives on the intention to pirate content. It is thus necessary to better understand piracy behaviors and take appropriate actions earlier in order to make more appropriate pricing decisions.

Since there has been relatively little research on competition between multiple channels in the film industry, and related studies on pricing strategies with consideration of piracy mostly assumed that the piracy rate is constant, this study thus considers a dynamic piracy rate to develop the optimal pricing strategies for channel members based on a revenue sharing coordination contract with the film distributor. We consider a film distributor who sells movies to physical DVD rental and online VOD channels, and demand is forecasted regarding both the piracy rate and the effects of diffusion. A revenue sharing mechanism is used to avoid channel conflicts and achieve supply chain coordination, and a Stackelberg game model is constructed to obtain the equilibrium retail prices and the optimal revenue sharing ratio with the aim of maximizing the profits. This study is applicable for distributors and retailers of all digital goods, such as music, e-books, and movies, as its results can help to determine their optimal strategies in an environment with the pervasive use of the Internet, changes in consumer behaviors, and significant piracy.

The rest of this paper is organized as follows: Section two reviews the related literature. Section three describes the research problem and notation adopted in the proposed model. Section four presents the research framework and the model formulation regarding the research problem, while section five performs analytical and numerical analyses to obtain the managerial implications. Finally, section six gives the conclusion and states the contributions of this work and suggestions for future studies.

2. Literature review

With regard to pricing strategies in the film industry, Liu, Cheng, Tang, and Eryarsoy (2011) classified consumers into two groups: those who pirate and those who do not, and suggested that, with consideration of piracy and the word-of-mouth effect, firms should use a skimming pricing strategy when only few people pirate and a penetration one when more people do so. Khouja, Hadzikadic, Rajagopalan, and Tsay (2008) used a complex adaptive system and agent-based modeling

to state that when piracy is rampant, a skimming pricing strategy would be less profitable, and the change in strategies would depend on consumer purchasing behaviors. Khouja and Rajagopalan (2009) examined the pricing strategy of a monopolist when piracy is inevitable and there is a lack of network externalities, and suggested that the firm should set a high price to maximize its profits, since a high level of piracy may actually increase the number of potential consumers and extend the lifecycle of the movie.

With advanced technologies and the widespread use of online services, movies are not only distributed to theaters and rental stores, but can be also downloaded to computers, tablets, cell phones and other devices (Brynjolfsson & Smith, 2000; Chiang, Chhajed, & Hess, 2003; Yao & Liu, 2005; Zettelmeyer, 2000). Smith and Telang (2010) stated that Internet penetration is positively related to DVD sales, because pirated movies are often low quality. Danaher, Dhanasobhon, Smith, and Telang (2010) investigated the interaction between legitimate digital (VOD) and physical distribution channels (DVD) in the film industry. In their empirical study, the availability of VOD can reduce the whole piracy rate, and therefore decision makers should carefully evaluate the degree of VOD availability to estimate the possible piracy rate. Feng, Guo, and Chiang (2009) stated that it is more profitable and a higher level of service can be achieved if firms adopt dual-channel distribution (B2C and C2C) rather than single channel distribution, since the Internet can quickly attract more consumers, and the issues of quality and service are increasingly important. Kim (2006) stated that when determining the Pay-Per-View rate for a VOD service provider, the provider's service quality, such as delivery speed and resolution, should be taken into account to offer differentiated services with different prices. Khouja, Park, and Cai (2010) classified consumers into two groups: those who prefer the traditional channel and those who are happy with either the traditional or online channels, and found that the critical factors in channel selection are the variable costs of the two methods and the number of the consumers who find both acceptable.

Conflicts always occur when multiple market channels exist in the market, since every channel member aims to achieve profit maximization for themselves (Yan, 2008; Yan, Wang, & Zhou, 2010; Yao & Liu, 2005). However, Gong, Smith, and Telang (2015) provided a different perspective in which the price promotion by a specific sales channel for a digital movie can lead to an increase in rentals for the other rental channel for the same movie. This result seems very different from the common idea about competition between two market channels. However, they proposed a possible explanation for the phenomenon by considering the effect of information spillovers. That is, the price-discount promotion of a movie could encourage more people to watch it. Yan (2008) proposed a framework to discuss the conflict and competition between an online market channel and a traditional retail channel in which the conflict and competition can be coordinated by a profit sharing policy to achieve overall optimization. Yan and Ghose (2010) also studied a similar problem and presented a Bertrand game theoretic model to formulate the situation of the conflict and competition between traditional and online retailers. Brynjolfsson, Hu, and Rahman (2009) suggested that a dual-channel vendor can reduce channel conflicts by using the Internet channel to sell niche products because of its low searching cost for consumers, and use the traditional retail channel to sell more popular and common products because of its accessibility. Tsay and Agrawal (2004) stated that a dual-channel structure is not necessarily detrimental to traditional retailers if the firm can use the traditional channel as a dealer to provide services and the Internet channel as a retailer for promotions and receiving orders. Khouja and Wang (2010) suggested that music providers selling albums by brick-and-mortar channels should use a skimming pricing strategy, and found that the revenues of the two channels and damage from piracy are related to the size of the two consumer segments (retail-captive and hybrid segments). Li (2010) stated that using channels or product features to segment the market and offer different prices can help a retailer avoid cannibalizing their own sales. That is, the greater the

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