



Turning Piracy into Profits: a Theoretical Investigation

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ABSTRACT

We analyse how the presence of a (private, small-scale) file-sharing community affects the profitability of producers of digital goods within a spatial duopoly model à la Hotelling (1929). Consumers can download pirated content by joining this file-sharing network. To gain access to the community, consumers have to buy and share a digital good with other members. We show that firms benefit from piracy in emerging markets, that is, markets that are not fully covered. The activity of file-sharing, in fact, allows firms to reach a larger share of customers who otherwise would not buy at all. This effect is missing in mature and widespread markets where firms prefer to be protected from piracy. Our results provide a rationale for the observation that in emerging countries, companies are unlikely to take a firm stance against piracy.

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1. Introduction

Despite many efforts by governments and media industries to stop piracy, the popularity of Internet file-sharing has increased significantly over the last decade. The diffusion of digital goods over the net has been facilitated by the emergence of more efficient storage and distribution models. Aside from the centralised, server-based approach (Napster, Emule), new organisational models based on peer-to-peer (P2P) networks (Direct Connect, Morpheus) have recently been developed. While in the former model communication is usually to and from a central server where files are stored, P2P system peer nodes simultaneously work as both *clients* and *servers* to the other nodes of the network. The resources shared within these communities are similar to club goods (Buchanan, 1965; Samuelson, 1954); they exhibit characteristics of excludability and non-rivalry, at least to some extent, due to possible congestion effects (Krishnan et al., 2007). To avoid

problems of free riding, access to these communities is generally restricted through membership rules (such as the requirement of providing some minimal quality good to the community). For instance, most P2P networks either provide incentives for uploading files or force the sharing of files that are currently downloaded.¹

The aim of the present paper is to analyse how the presence of a (private, small-scale) file-sharing community affects the pricing behaviour and profitability of producers of digital goods. Our analysis is based on a spatial duopoly model with two horizontally differentiated digital goods (software, music files, DVD movies, etc.). Firms are located at the extremes of a Hotelling segment, whereas consumers are uniformly distributed along the segment. Distinct from the standard linear city model, consumers can download one of these two goods by joining a file-sharing community. Access to this network is restricted; consumers can join only if they buy and share a digital good with the community. This initial purchase requirement is a reasonable assumption within small, private

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¹ There is a literature studying how to improve the efficiency of goods' provisions in P2P networks. Asvanund et al. (2003) developed a model in which access is made contingent on content made available by users to the community.

communities where consumers share only the files they own. There are some important file-sharing systems that exhibit these features. WASTE is a decentralised file-sharing application that enables secure communication between small trusted groups of users. It builds a virtual private network that connects a restricted group of computers, as determined by the users. WASTE networks are decentralised, which means that there is no central server that stores file data; peers must connect to each other individually. Another example is represented by Direct Connect which, in contrast to WASTE, is a centralised system of file-sharing: clients connect to one or more small servers (hubs) that keep track of connected users and their shared files. These hubs are often thematic and collect a restricted number of users with similar interests.

In our model, there may be three different categories of agents: consumers who use only one good (buying it), consumers who use both goods (buying the favourite good and downloading the other), and agents that refrain from consumption. Consumers located closer to the extreme of the segment value their favourite good more than do consumers located closer to the middle of the segment, regardless of whether this good is bought on the market or downloaded from the network. Moreover, the stronger the preference for one of the two digital goods, the lower the valuation of the other good (the second one). Thus, in our model, a consumer located closer to the extreme of the segment is less likely to join the community and download the good.

In the present paper, we show that market coverage is crucial in determining firms' attitudes towards piracy. In markets that are not (yet) completely covered or, stated differently, not mature, firms benefit from piracy. The intuition is that piracy may allow firms to enlarge their market shares when there are consumers still to be conquered.² In this scenario, we have two monopolies in the market, as the demands for the goods are independent. The introduction of the downloading option enlarges firms' market shares (positive *demand effect*), but it does not result in an increase in competition; a firm's market power gets larger as the downloading possibility makes the goods more attractive and (at least) some consumers use both goods. In contrast, in fully covered markets, the activity of file-sharing is harmful to firms, such that they would prefer to be protected from piracy. In this case, the positive *demand effect* is missing; we have duopolistic competition in the market, and the downloading option makes price competition tougher. Firms are unable to fully appropriate consumers' willingness to pay when pirated material is diffused over the net (*appropriability problem*). Finally, the transition from fully served markets to partially served markets is characterised by a market configuration that we call "covered at the limit"; in this case, companies quote a price that is just sufficient to cover

the market by making the consumer equidistant from the two firms indifferent between buying either of the two goods and refraining from consumption. In this intermediate market configuration, firms do not compete. We find that in this case as well, companies benefit from piracy. In fact, even if firms split the market evenly, the downloading possibility increases the value of the goods for consumers and, in turn, their willingness to pay. Consequently, in order to cover the market, companies may set a higher price in the presence of downloading, which provides firms with the possibility of indirectly appropriating some revenue from piracy.

Our work is related to a vast theoretical literature that analyses the consequences of piracy on firms' profitability. Some contributions point out the negative effect of piracy on firms' sales, as some consumers use a free copy of the original good instead of buying it. In a pioneering paper about the economics of copying, Johnson (1985) shows that copying can reduce social welfare in the short run due to a reduction in the demand for the originals, as well as in the long run due to the supply elasticity of creative works. In contrast, Liebowitz (1985) highlights how a seller might indirectly appropriate some revenues from unauthorised copiers; the ability to copy increases the value that purchasers place on originals, thereby increasing their willingness to pay. In an interesting paper, Ben-Shahar and Jacob (2004) show that a monopoly may strategically promote infringement of the copyright; the monopoly sacrifices short-run profits, gaining a long-run benefit in the form of reduced competition. This is a predatory pricing strategy whereby the incumbent, failing to enforce copyright protection, obtains the same result as lowering prices (but without giving rise to antitrust complaints). Other papers argue that a monopolist may benefit from piracy in the presence of network effects (Takeyama, 1994; Gayer and Shy, 2003). The main idea of these papers is that when there is no enforcement of copyright protection and network externalities are at work, an increase in the number of users makes the good more valuable, which enables a company to secure higher profits.³ More recently, Peitz and Waelbroeck (2006b) consider the problem of a multiproduct monopolist and show that piracy in the music industry can also be beneficial for firms without network externalities; starting from the observation that digital products often exhibit the characteristics of experience goods, the authors show that, by introducing consumer sampling, music sales can increase due to downloading.

A distinguishing feature of the present paper is that we focus on small-scale piracy by assuming that content uploading (sharing) is contingent on access to the private file-sharing community. Our results predict that the extent of market coverage is relevant to determining firms' attitudes towards piracy, because in partially served markets the presence of these communities has a sales-enhancing effect. Thus, we provide another rationale for piracy to be advantageous for firms without relying on network externalities. Another important feature of our model is that it

² There is evidence of such incentives in emerging markets where companies used piracy for their own advantage: in the software industry, for instance, the computer giant Microsoft has recently admitted that piracy of its Windows operating system has contributed to its huge market share (90%) in China (see "Piracy: Look for the Silver Lining", The Economist, July 19–25th, 2008, p. 23.)

³ For a complete critical review, see Peitz and Waelbroeck (2006a).

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