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Buying frenzies in durable-goods markets

Ting Liu [a,*], Pasquale Schiraldi [b]

[a] Department of Economics and College of Business, Stony Brook University, Stony Brook, NY, 11794, USA
[b] Department of Economics, London School of Economics, London, UK

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ABSTRACT

We explain why a durable-goods monopolist would like to create a shortage during the launch phase of a new product. We argue that this incentive arises from the presence of a second-hand market and uncertainty about consumers' willingness to pay for the good. Consumers are heterogeneous and initially uninformed about their valuations but learn about them over time. Given demand uncertainty, first period sales may result in misallocation and lead to active trading on the secondary market after the uncertainty is resolved. Trading on the second-hand market will generate additional surplus. This surplus can be captured by the monopolist ex-ante because consumers are forward-looking, and the price they are willing to pay incorporates the product's resale value. As a consequence, when selling to uninformed consumers, the monopolist faces the trade-off between more sales today and a lower profit margin. Specifically, because the product's resale value is negatively related to the stock of the good in the second-hand market, selling more units today will result in a lower equilibrium price of the product. Therefore, the monopolist may find it optimal to create a shortage and ration consumers to the second period. We characterize conditions under which the monopolist would like to restrict sales and generate buying frenzies.

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1. Introduction

Introductions of new goods are often featured by serious shortage and such phenomenon is particularly pronounced in a durable-goods environment where shortage is coupled with active trading on second-hand markets. Examples include video games, game consoles, iPads, iPhones and luxury cars. Although shortages might be driven by limited capacity, shortage of components or demand uncertainty, their repeated occurrence in durable goods markets suggests that firms may use scarcity as a strategic choice. If the firm benefits from scarcity strategies, what is the mechanism behind them? What are the welfare implications of buying frenzies? How does the existence of a second-hand market affect the firm's optimal selling strategy? These are the questions addressed in this paper.

The internet revolution has substantially enhanced active trading on second-hand markets when buying frenzies occur.[1] When iPad 2 was launched, Apple stores across the U.S. sold out the tablet while the price of it spiked on eBay.[2] A similar phenomenon was documented for other electronics including Wii and PlayStation 2 (see Stock and Balachander, 2005).

* Corresponding author. Tel.: +1 631 632 7532; fax: +1 631 632 7516.
E-mail addresses: ting.liu@stonybrook.edu (T. Liu), p.schiraldi@lse.ac.uk (P. Schiraldi).

[1] See, for example, Rapson and Schiraldi (2013), for an empirical analysis of the internet impact on the trade volume of used cars on the second-hand market.

[2] "iPad 2 Prices Are Spiking on eBay", the Atlantic Wire, March 14, 2011.

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Despite the important role played by the second-hand market, it is ignored by the existing literature aiming to explain firms' scarcity strategies. In fact, the predominant theories are not robust against resale. To the best of our knowledge, our paper is the first one to study durable-goods producers' incentives to induce buying frenzies while taking into account the active trading on the second-hand market. Contrary to the existing literature, we argue that the existence of a second-hand market can be one of the driving forces for buying frenzies.

We develop a model in which production and sales of a durable good occur in two periods. There is a monopolistic firm in the market and a mass one of the two types (optimistic and pessimistic) of consumers heterogeneous in their valuations for the good. A consumer's type is her private information which determines the probability distribution of her valuation for the good. Specifically, optimistic consumers are *affectionados* whose distribution of valuation first-order stochastically dominates the distribution of pessimistic consumers' valuation. So, optimistic consumers on average value the good more than pessimistic consumers.

The first period is the launching phase of the new product and consumers are uncertain about their valuations. However, they learn about their valuations in the second period which is the product's mature phase and is characterized by the presence of an active second-hand market. When the monopolist sells to uninformed consumers in the first period, the product may end up with those who turn out to have low valuations. Hence, re-allocation of the good among consumers takes place through the second-hand market when the uncertainty about consumers' valuations is resolved. Trading on the second-hand market will generate an additional surplus. This surplus can be captured by the monopolist *ex-ante* because consumers are forward-looking, and the price they are willing to pay incorporates the product's resale value. As a consequence, when selling to uninformed consumers, the monopolist faces the trade-off between more sales today and a lower profit margin. Specifically, because the product's resale value is negatively related to the stock of the goods in the secondary market, selling more units today will result in a lower equilibrium price of the product. Therefore, the monopolist may find it optimal to create a shortage and ration consumers to the second period.

Buying frenzies arise when the monopolist intentionally undersupplies the product (rationing occurs) and some of the consumers are strictly worse off when being rationed out. In our model, buying frenzies occur when it is optimal for the monopolist to sell to both types of consumers and ration some of them to the second period. Among consumers rationed out, optimistic ones are strictly worse off because they strictly prefer to consume the product in period one. In contrast, pessimistic consumers are indifferent between consuming the product in period one and postponing consumption. Specifically, buying frenzies are more likely to happen when (i) there is a large number of pessimistic consumers, and (ii) the ex-ante surplus from selling to pessimistic consumers is sufficiently small. Under the former condition, it is optimal for the monopolist to charge pessimistic consumers' maximum willingness to pay and sell to both types. Conditional on selling to both types, the latter condition ensures that the monopolist makes more profit from undersupplying the product than selling to all. To see this, suppose that the monopolist sells to everyone in period one. By undercutting the supply, the monopolist increases the product's resale value and hence consumers' willingness to pay in period one. So, the marginal benefit from restricting supply is the incremental increase in the product's first period price multiplied by the total mass of consumers. The marginal cost of undercutting the supply is the forgone surplus from selling to the marginal consumer in period one, which is the ex-ante surplus from selling to pessimistic consumers. Thus, when condition (ii) holds, the marginal benefit from undersupplying the product outweighs the marginal cost and it is optimal for the monopolist to ration consumers.

We also analyze the monopolist's optimal selling strategy when the secondary market does not exist. In this case, the monopolist never rations consumers. We compare the social welfare in the presence of the secondary market and buying frenzies with that when there is no secondary market. Social welfare is higher without the secondary market when marginal cost is sufficiently low. The existence of the secondary market and consequently buying frenzies may improve social welfare when marginal cost is sufficiently high.

While we assume for simplicity that the monopolist commits to future price and quantity, the driving force for buying frenzies is robust against the monopolist's commitment power. We found that when the monopolist cannot commit to future price and quantity, it may ration consumers more aggressively than it would like to when it has the commitment power. This is because when the monopolist lacks the commitment power, it will make too much sales in the second period with respect to what it would like to do from the first period point of view. Therefore, in order to maintain a high resale value for the goods, the monopolist will try to counterbalance this effect by reducing the first period sales more aggressively which in turn leads to more consumers rationed to the second period.

Our paper is most closely related to DeGraba (1995). DeGraba argues that when a discrete number of consumers learn their valuations over time, the monopolist can extract more consumer surplus by committing to a fixed output short of demand in the first period. When output is short of demand, consumers risk losing the opportunity to buy the good if they strategically delay purchases. As a consequence, consumers all rush to buy the good when they are uninformed. DeGraba's results rely on the following assumptions: no secondary market, no production in the second period and the monopolist cannot commit to future price. The option of purchasing the good in the second period in case of further production or an active secondary market voids the risk borne by consumers when they delay consumption. We instead show that the monopolist still has incentives to induce buying frenzies when we relax these assumptions in an environment with a continuum of consumers. Moreover, we show that the occurrence of buying frenzies does not depend on the monopolist's ability to commit to future price. Finally, we argue that our results hold under any rationing rule except for the efficient rationing rule whereas DeGraba focuses on the class of rationing rule with “last customer rationing monotonicity”.