Social Learning and the Design of New Experience Goods

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Consumers often consult the reviews of their peers before deciding whether to purchase a new experience good; however, their initial quality expectations are typically set by the product’s observable attributes. This paper focuses on the implications of social learning for a monopolist firm’s choice of product design. In our model, the firm’s design choice determines the product’s ex ante expected quality, and designs associated with (stochastically) higher quality incur higher costs of production. Consumers are forward-looking social learners, and may choose to strategically delay their purchase in anticipation of product reviews. In this setting, we find that the firm’s optimal policy differs significantly depending on the level of the ex ante quality uncertainty surrounding the product. In comparison to the case where there is no social learning, we show that (i) when the uncertainty is relatively low, the firm opts for a product of inferior design accompanied by a lower price, while (ii) when the uncertainty is high, the firm chooses a product of superior design accompanied by a higher price; interestingly, we find that the product’s expected quality decreases either in the absolute sense (in the former case), or relative to the product’s price (in the latter case). We further establish that, contrary to conventional knowledge, social learning can have an ex ante negative impact on the firm’s profit, in particular when the consumers are sufficiently forward-looking. Conversely, we find that the presence of social learning tends to be beneficial for the consumers only provided they are sufficiently forward-looking.

1. Extended Abstract

The influence of consumer reviews on the purchase decisions of potential product buyers has grown dramatically in the last decade, with recent surveys suggesting that up to 69% of consumers now consult peer reviews before deciding whether to purchase a product (e.g., Mintel.com 2015). This figure can only be expected to increase in the future: on one hand, rapid innovation and technological advancements are rendering more and more products increasingly complex and difficult to evaluate before purchase (e.g., consumer electronics such as smartphones, media items such as movies, digital goods such as software, etc.); on the other, the proliferation of online forums and platforms hosting product reviews (e.g., Amazon, TripAdvisor, Yelp, etc.) is providing consumers with unprecedented ease-of-access to the post-purchase opinions of their peers.
From the firm’s perspective, these trends translate into increasing pressure to understand how various product policies interact with review-based social learning (SL) and to optimize these policies accordingly. In working towards such an understanding, a recent stream of literature has adapted the classic theory of “experience goods” (Nelson 1970) to allow for the exchange of post-purchase consumer opinions through product reviews. So far, efforts in this area of research have focused primarily on developing insights regarding the optimal pricing of experience goods, implicitly assuming that the firm is endowed with a product whose attributes are specified exogenously (e.g., Papanastasiou and Savva 2016, Yu et al. 2015). This paper takes the natural next step of recognizing the firm’s role in choosing these attributes – a decision we refer to as “product design” – and investigating how this decision interacts with the process of review-based SL.

We focus, in particular, on product-design choices pertaining to ex ante observable “quality attributes” (i.e., attributes which are valued by all consumers in a “more-is-better” fashion); for example, in the design of a new smartphone, these attributes may include the processor speed, screen definition, and memory capacity. Thus, product design in the context of this paper exhibits the familiar tradeoff between adding or enhancing product attributes that increase the product’s perceived quality (so as to increase the consumers’ willingness-to-pay), and avoiding higher costs of production (so as to maintain higher profit margins). Although this tradeoff has been previously studied from numerous perspectives (e.g., Netessine and Taylor 2007), existing work has by-and-large treated products as “search goods,” in that, conditional on the product design, there is no quality uncertainty or, equivalently, no opportunity for consumers to interact to resolve such uncertainty.\(^1\) As a result, the implications of SL for product design remain as-of-yet unclear.

Taking the above into account, in this paper we consider two main research questions. First, how should a firm incorporate review-based SL into its choice of product design and, by extension, how does SL affect the quality of new experience goods? Second, how does the interaction between SL and product design impact the firm’s profit and the consumers’ surplus? To investigate these questions, we develop a two-period model that captures the interactions between a monopolistic firm and a population of strategic (i.e., forward-looking) rational consumers. At the beginning of the selling season, the firm chooses the product’s price and design. In our model, the latter determines the product’s quality only up to the expected value, and designs associated with higher expected quality incur higher per unit production costs. Consumers are Bayesian social learners, and those who choose to defer their purchase decision to the second period can benefit by observing the reviews of first-period buyers, thereby reducing their uncertainty over product quality. Our equilibrium analysis of this model yields insights along three dimensions, summarized as follows:

\(^1\) In reality, experience goods can exhibit significant quality uncertainty even when their design is perfectly observable (e.g., owing to the complex interaction between a product’s components); recent notable examples include Apple’s “bending” iPhone 6 (Forbes 2015) and Samsung’s “exploding” Galaxy Note 7 (Cnet.com 2016).
(i) **Product Design.** We show that the firm’s policy choice in the presence of SL differs significantly depending on the magnitude of the quality uncertainty surrounding the product. In particular, when the uncertainty is relatively low, the firm focuses on increasing early adoption through a policy that involves an inferior product design and a lower price (as compared to the case where there is no SL). By contrast, when the uncertainty is high, the firm focuses instead on increasing its profit margin, through a policy that involves a superior design and a higher price. Interestingly, we find that the product’s expected quality in the presence of SL is lower either in the absolute sense, or relative to the product’s price.

(ii) **Firm Profit.** We illustrate that, contrary to conventional knowledge, SL can have a net negative impact on the firm’s ex ante profit, in particular when the consumers are highly strategic. As the fraction of buyers who write reviews increases (thus increasing the pervasiveness of SL among consumers), we find that the consumers’ increased tendency to delay purchase in anticipation of reviews may in fact reverse the benefits of increased consumer learning for the firm. Thus, depending on the level of strategic consumer behavior, we observe that the firm’s ex ante profit may be maximized when all (low degree), some (intermediate degree), or none (high degree) of the consumers engage in writing reviews.

(iii) **Consumer Surplus.** Although the exchange of information through product reviews generates value for consumers by allowing for better-informed purchase decisions, we find that SL in most cases has a negative (from the consumers’ perspective) impact on the firm’s chosen price-and-design combination. As a result, we show that the presence of SL tends to be detrimental for the consumers’ ex ante surplus, unless they are sufficiently forward-looking in their purchase decisions; interestingly, when this is not the case, we further observe that consumers are worse off when more of their peers engage in writing reviews.

**References**