Impact of Recommender System on Competition Between Personalizing and Non-Personalizing Firms

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Abstract

How do recommender systems affect prices and profits of firms under competition? To explore this question, we model the strategic behavior of customers that make repeated purchases at two competing firms: one that provides personalized recommendations and another that does not. When a customer intends to purchase a product, she obtains recommendations from the personalizing firm and uses this recommendation to eventually purchase from one of the firms. The personalizing firm profiles the customer (based on past purchases) to recommend products. Hence, if a customer purchases less frequently from the personalizing firm, the recommendations made to her become less relevant. While considering the impact on the quality of recommendations received, a customer must balance two opposing forces: (1) the non-personalizing firm usually charges a lower price, and (2) a reduced profile quality due to not purchasing from the personalizing firm. The customers typically distribute their purchases across both firms to maximize surplus. Anticipating this response, the firms simultaneously choose prices. We study the sensitivity of the equilibrium prices and profits of the firms with respect to the effectiveness of the recommender system and the profile deterioration rate. We also analyze some interesting variants of the base model in order to study how its key results could be influenced. Our results show that the improved recommender system due to increased learning rate may not only benefit the personalizing firm but also the non-personalizing firm, i.e., the non-personalizing firm may free-ride on the improved recommender system of the personalizing firm. We also analyze data sharing between the two firms. Our results show that the data sharing may not always occur in equilibrium. Under certain conditions, both firms should share data willingly. On the other hand, in some scenarios, the personalizing firm needs to pay a part of its profit to the non-personalizing firm in order to obtain the data.

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