Information Sharing on Retail Platforms

“Platforms are eating the world”, Parker et al. brought up the slogan as an upgrade to Netscape founder Marc Andreessen’s vision of “Software is eating the world”. Retail platforms, one of the earliest platform applications, not only have all advantages of traditional retailing business, but also lower the barriers for small businesses to gain access to the market.

With the digitization of retail platforms, demand forecasting has become more important as the platform can gather enormous information from customers’ engagement and virtual footprint data, such as product views and cart add-ins, on top of the traditional purchasing data. Moreover, since most of these activities happen between the platform and customers who visit the platform’s website, the platform is in an advantageous position than the sellers to collect demand related information. Thus a natural question for the platform is whether and how to share her proprietary demand information with the sellers.

Practical evidence shows that retail platforms have already started providing information sharing services to their sellers. For example, in 2011 Alibaba started to provide information such as consumers’ aggregated browsing and purchasing behaviors to their sellers. More recently, Alibaba has formed a special-task team to launch a dedicated website that allows sellers to obtain industry-level information. Similarly, Amazon also provides a rich interactive dashboard that allows sellers to track several key metrics including sales, traffic, and conversion rates though Seller Central.

Despite the growing popularity of platforms sharing detailed footprint data to individual sellers, there is little research about whether and how retail platforms should share the vast information they gathered with the sellers on the platform. Improper information sharing may intensify competition and cause other undesired outcomes, which can be detrimental to both the sellers and the platform. Therefore, it is crucial for firms to understand the impact of information sharing on both the platform and the sellers.
To obtain a better understanding of the above question, we develop a game-theoretic model where multiple sellers distribute substitutable products through an online retail platform. The sellers face a common demand uncertainty in the market and have their own prior beliefs about the demand uncertainty. The platform can collect demand signals based on consumers’ browsing and purchasing behaviors at the website, which are not observable to the sellers. The platform’s problem is to decide whether and how she should share these signals to each individual seller.

We consider the revenue sharing contract between the platform and the sellers, which has been widely observed in practice. For instance, both Tmall.com (i.e., Alibaba) and Amazon charge a fixed percentage of the revenue generated through the platform as a commission fee. We focus on two commonly adopted information sharing formats: full sharing (FS) and private sharing (PS). Under the full sharing format, the platform shares the same information aggregated from all signals to every seller in the market. Under the private sharing format, the platform offers a personalized private signal to each seller. For both sharing formats, the platform also needs to determine the precision of the information to share (e.g., by adding a noise to the signals). Upon receiving the signals, the sellers can update their own beliefs about the market uncertainty and make their quantity decisions to maximize their expected profit.

We first consider the case where the sellers are homogeneous in size and market power. We find that, under the full sharing format, the platform is willing to share all the signals truthfully to all sellers. This is because the sellers will have the same information under the full sharing format and thus make exactly the same quantity decisions. In this case, the profit loss due to more correlated decisions cannot be lowered; in addition, the only way to increase total expected profit is to offer the sellers information as accurate as possible. Under the private sharing format, however, contrary to the industry practice, we show that the platform could be significantly better off by sharing the information only to a subset of sellers instead of to everyone. Moreover, we can
prove that the private sharing format dominates the full sharing format if and only if the market size is large enough.

We also study the case where the sellers are asymmetric in terms of market power. We consider two types of sellers in the market: one with high market power and the other with low market power. A high-type seller is less likely to be influenced by his competitors’ decisions or, alternatively, has a bigger impact on the other sellers. In such an asymmetric case, interestingly, we find that a seller may react adversely to demand signals -- he may produce less when observing a high demand signal, but produce more when observing a low demand signal. Moreover, when there is a sufficiently high asymmetry level, we show that the platform should truthfully share information with a subset of sellers, and the optimal subset always contains both types of sellers when the market size is large enough.

Lastly, we show that under revenue-sharing, optimizing the platform’s profit is equivalent to maximizing the social welfare, as long as the sellers’ production costs are common knowledge. This is because the production costs do not affect the value of information for the platform and the sellers. This finding is useful for the government when making regulation policies that help induce platform information sharing actions to improve social welfare.

References