Social Networks and Conspicuous Consumption

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ABSTRACT. This paper identifies an optimal distribution strategy for a seller of products with conspicuous consumption value (such as luxury products) amongst its socially connected customers. We build a stylized game-theoretic model of strategically interacting consumers in a general social network. Customers decide whether to buy the product or not; their utility of owning the product, depends on who else in the network has the product. The seller can choose how much of the product to make available (level of exclusivity) and, more importantly, whom to make the product available to. By using information on the structure of social network, the seller identifies the optimal level of exclusivity. In contrast to conventional wisdom and ad-hoc industry practice, we find that the optimal distribution strategy is non monotonic in the connectivity of customers – neither the most nor the least connected customers are prime distribution targets. We show that the least connected consumers are the hardest to induce to buy. Surprisingly, the most connected consumers, can be efficiently used for creating a perception of scarcity. Finally, we conduct a sensitivity analysis to study how network structure, product price, and extent of conspicuous consumption value influence this optimal strategy.

1 Introduction

The luxury market is an important and growing constituent of developed and emerging economies. With annual sales exceeding $1.8 trillion worldwide and a growth rate of 7% (Abtan et al. [2014]), the market for luxury outpaced all other major categories. Consumers–the main driving force of such growth–value exclusivity and pay high premiums for it. Companies, in turn, by producing limited quantity emphasize craftsmanship of the product and create a perception of unattainability. The value from possessing an exclusive good comes from the ability to show it to others, signal one's status within the social network and is thus intricately tied to which customers socially interact with others, or the social network of customers.

The rise of online social networks, and the ease of their use, has enhanced the importance of such social comparison. Further, they provide sellers of luxury products a look into the structure of social interactions of their consumers. Providing this network information to the seller is the key business proposition of all social networks including Facebook. This paper provides guidance on how firms selling luxury products could use the rich social networks data generated by Facebook, Instagram, etc. to use product distribution strategies to obtain the optimal trade-off between exclusivity and top-line sales.

Specifically, this study provides the first examination of inventory management strategies for luxury products sold to strategic consumers that are influenced by social factors. Our stylized model formulates the distribution problem of a luxury firm as a game played amongst players connected by a social network (Jackson and Zenou [2014]). We show that firms can use the information about social connections of their

consumers to develop inventory distribution strategies to best manage the tradeoff between product exclusivity and sales volumes. We demonstrate that certain factors, such as the influence of a consumer's friends on her consumption decision and network structure, should be taken into account by a firm when making a production decision. Furthermore, we identify optimal distribution policies.

To summarize, we make three important contributions. To the best of our knowledge, this is the first study in operations literature that builds theoretical framework of interactions over the social network. Secondly, we explore the value of the information about the structure of social network for improved operational decisions making. Lastly, we identify the cases when information about the topology of social interactions is useful.

2 The set up

We consider a monopolist who sells a luxury product to a social network of consumers. We model a social network as a random graph with pre-specified degree distribution.

Consumers. The utility function of each consumer who obtains the product consists of two parts: functional and social. The former represents how much she values functional properties of the product. The latter is the result of social comparison within the network: each consumer prefers the product that she owns to be exclusive. The more friends have the product, the lower social component of the utility is. Consumers are homogenous across functional utility, while differ in how much they value social benefit of the consumption. The type of the consumer is defined by the number of friends she has.

Seller. Seller maximizes his profit by choosing the best distribution strategy. The seller faces the following tradeoff. He could produce a lot, satisfying all the demand, but drastically lowering social component of customer utility. Alternatively, he could produce a little, keeping the product exclusive and increasing the social component of the utility, thus inducing more customers to buy.

Information structure. Seller observes the network structure and thus knows the number of friends of each consumer. Consumers have a limited access to information. Namely, each consumer knows her friends but doesn't observe how many friends any other agent in the network has.

The game. We study a sequential move game played by a seller and social network of consumers. Seller moves first and makes a credible commitment on distribution strategy: probabilities with which each consumer will get the product. Each consumer observes the chosen distribution strategy and makes a single decision whether to buy the product or not. Consumers make their decisions without observing what their peers do. After consumers decided, each of them either gets the product or not according to distribution strategy of the seller.

Equilibrium concept. We use Bayes-Nash equilibrium in which strategy for each degree-type consumer is the best response to 1) the play of other consumers obeying this strategy 2) seller's distribution strategy. Seller's equilibrium distribution strategy is profit maximizing given the best response of consumers.

3 Major results

In the game described above, any distribution strategy leads to the best response of the social network, which, by itself, constitutes an equilibrium of the simultaneous move game among individual consumers. Consequently, we are able to formulate the solution of the game as seller's profit maximization problem over the set of all possible distribution strategies given the consumer participation constraint set. Further, we show that consumers of the same type (defined as her network degree) will have equal chances of getting the product and the original problem can be transformed as follows. For any set of types, which do not receive the product, the problem of optimizing distribution strategy over the complement set turns out to be a modification of knapsack problem. Therefore, the original problem can be restated as knapsack's value maximization problem over all possible choices of consumer types to which seller will choose not to distribute the product.

We establish the rules for the optimal distribution strategy in a general network structure. We find that the seller will distribute only to consumers with degree (number of friends) being not too large or too small. In other words, in equilibrium, there exist two thresholds in consumer degrees. Only those consumers with the number of friends being between the two thresholds will get the product for sure. Furthermore, consumers with the degree equal to the upper threshold will get the product with probability strictly less than 100%.

We conduct a sensitivity analysis and study the behavior of optimal distribution strategy varying price of the product, strength of the network effects–value for conspicuous consumption, and network structure. Optimal distribution strategy changes with product price in non-monotone fashion. Seller's optimal profit increases with the increase in value for conspicuous consumption. Our findings suggest that the smaller the consumer degree is, the more value she creates for the company if weighted by losses in profits to incentivize this consumer to buy. Finally, more connected networks result in higher profits to the company.

References

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