Learning, Welfare, and Profits in Service Platforms

Extended Abstract

(Authors’ names blinded for peer review)

Introduction

Two-sided platforms such as Airbnb, Freelancer, and Upwork have revolutionized the service industry by reducing information and search frictions and facilitating trade between buyers and sellers in previously disparate spheres. Such platforms typically act as intermediaries between individual sellers/service providers and buyers/customers and are able to affect the structure and volume of trade through platform design choices, including commission structures and the way in which information is organized and presented to either side of the market.

Because such marketplaces feature a great deal of vertical (and horizontal) differentiation, the efficient gathering of information about the quality of potential service providers is of paramount importance, and this information is predominantly obtained through customers who engage in transactions with the providers. In turn, the platform’s design features affect the rate at which information about (new) providers is generated and, subsequently, the expected quality of service experienced by the customers, the overall system welfare, and the platform’s profits.

Our goal in this paper is to provide prescriptive guidelines on the design of online marketplaces taking into account that the quality of new providers is ex-ante unknown and information about
them can only be generated via experimentation, i.e., customers engaging in transactions with the providers. Our setting features a population of customers seeking service on the marketplace. Customers have access to an outside option (that is drawn from a known distribution). On the other hand, providers differ in their “quality”; in particular, each provider’s quality is drawn from a known distribution and is ex-ante unknown. Information about a provider’s quality can only be obtained after the provider has completed a transaction with a customer; in our benchmark model, a provider’s quality is perfectly revealed to any customer who transacts with her, and the customer subsequently reports her experience (i.e., the provider’s quality) back to the platform in the form of a review. The platform collects feedback from the customers, and presents it to subsequent customers in the form of a review score (that may be more granular than the information the platform has at its disposal).

At any given time, the set of service providers on the platform consists of a combination of experienced providers (i.e., providers for which the platform has information about their quality) and novices. Transaction prices are formed endogenously, i.e., providers set their prices given their equilibrium beliefs about the composition of their competition on the platform and their corresponding prices. Customers decide who to transact with based on the utility they expect to obtain (which, in the benchmark version of the model, is additively separable in the quality of the provider and her quoted price). Importantly, each provider can only engage in a transaction with at most one customer per time period; thus, the platform is intuitively interested in making as many “high-quality” providers available for service as possible.

Overview of Results

First, we characterize the efficient benchmark that determines which set of providers should be engaging in transactions with customers at any time period so as to maximize the aggregate welfare, i.e., the average quality of realized matches minus the outside options of the agents that transact on the platform. The efficient benchmark can be equivalently described by the composition of providers that it induces on the platform; i.e., the types (qualities) of experienced providers and
the total mass of novices that is optimal to make available to customers (as opposed to have them take their outside options).

We then proceed in studying the equilibrium in the marketplace when providers join the platform, continue to provide service endogenously, and choose their prices (taking into account the actions of other providers). First, we assume that the platform is interested in maximizing aggregate welfare at equilibrium (which might be reasonable, for example, when the platform generates most of its revenues through advertising, e.g., Yelp). In addition, the platform does not engage in direct monetary transfers with providers or customers, but has control over how information about providers’ quality is displayed to customers. We establish that disclosing all available information is inefficient; in particular, the level of experimentation with novices is inefficiently low. Similarly, the quality threshold below which experienced providers find it optimal to quit providing service is lower than the efficient benchmark. We next characterize the information provision policy that maximizes equilibrium welfare: the platform employs a granular review system that distinguishes between “High” and “Low” experienced providers and “Novices”. By disclosing less information than it has access to, the platform is able to restore (part of) the efficiency loss due to the agents’ equilibrium behavior.

Finally, we study an alternative setting where the platform determines the size of its commission from each transaction in addition to designing its information disclosure policy, with the goal of maximizing its profits. We establish that it is always optimal for the platform to employ a granular review system (that pools several quality types under the same score) although this could lead to potentially lower prices for high quality providers (that are pooled with lower quality ones). Compared to the case where the platform is interested in maximizing equilibrium welfare, the information provision policy that leads to the highest equilibrium profits induces less experimentation.