Flexibility and Relationships in Online Marketplaces
Prescriptions for Pricing and Matching
(Extended Abstract)

Online marketplaces continue to burgeon in importance as economic actors, exemplified by Airbnb and Uber reaching $12 and $20 billion, respectively, in bookings in 2016. However, online marketplaces for freelance labor or home services, have faced considerable challenges beyond those encountered by these established success stories. In particular, while Airbnb and Uber have thrived in markets where consumers highly value flexibility in time and location (benefits that enjoy economies of scale), numerous online platforms have struggled to gain similar traction in, e.g., the home services markets, where consumers’ trust in—and potentially valuable relationships with—their individual service providers is paramount.

We examine this problem from the prescriptive of data-driven marketplace design and operations. Using a unique, comprehensive data set provided by the leading online labor platform connecting freelancers to jobs posted by business clients, we present empirical evidence relating the operational performance of the platform’s pricing and matching regimes to a simple market characteristic: whether clients derive greater relative value (a) by pursuing repeat relationships with trusted freelancers or (b) by exploiting the platform as an intermediary to flexibly hire different freelancers.

Labor markets operated by online platforms serving as intermediaries have grown drastically over the past decade, with market leader Upwork’s portal alone in 2014 exceeding USD $940M globally (2.8M jobs posted) and USD $600M (1.5M jobs posted) in the US in transactional volume (Upwork (2017)). Rather than crowding out existing hiring, lower online costs for search and recommendations/recruiting have been
credited with filling positions that would not have been filled otherwise, expeditiously and often remotely, yielding substantial welfare benefits (Horton (2017b)). In this increasingly important marketplace, our study seeks to identify key operational levers to better match freelancer supply with demand, while accounting for important dynamic follow-on effects impacting relationships and availability.

Our contributions are both theoretical and empirical. On the modeling side, we develop a framework that synthesizes and extends prior work from the mechanism design (Balseiro et al. (2017)) and dynamic equilibrium literatures, yet (computationally) tractably accommodates the richness of our setting and data. Notably, the matching policies chosen by the marketplace intermediary have follow-on consequences for the distribution of multi-dimensional freelancer types and relationships on the platform, as captured by our model’s equilibrium steady state.

To fruitfully apply our framework, we estimate the demand-side preferences for relationships and flexibility within each of Upwork’s myriad freelance labor markets, which span diverse categories including data entry, graphic design, and web development. A central empirical challenge is to control for freelancers’ unobservable (to the researcher but not necessarily to the hiring client) quality in a setting where observations involve freelancers mixing across choice sets, rather than presenting a traditional panel. To do so, we use moment inequalities (to our knowledge, their first application in the field of operations management) that (a) transparently capture the preferences clients reveal through their observed hiring choices, for specially chosen pairs of choice-set observations that difference away freelancer fixed effects; and (b) remain unaffected by several phenomena, including clients endogenously and selectively negotiating wages with potential hires, that would bias traditional discrete choice estimates. Indeed, our methodology surprisingly uncovers that the data entry market values flexibility while the web development market values relationships. Notably, such patterns are not captured by traditional discrete choice estimation, in a manner consistent with expected bias.

Thus we demonstrate a complete methodological infrastructure, extending from the
econometric measurement of relationship-versus flexibility-driven preferences in an online marketplace to the tractable computation of effective operational policies for matching and pricing in dynamic equilibrium – in turn supporting managerial prescriptions and intuitive insights tailored to individual markets. We discuss how both components are designed with challengingly rich data in mind: As in studies in similar settings (Horton (2017a)), we observe detailed measures of workers’ attributes and extensive transactional histories, encompassing over three million relevant transactions. Moreover, our methodology exploits as an instrument a recent, natural experiment on the platform, whereby a new, tiered pricing regime enacting fees based on each freelancer-client pair’s level of mutual experience was introduced, first in select marketplaces and then at large.

We contribute to several bodies of literature in operations management, including those on the operations of online marketplaces and on the role of intermediaries in operations (Belavina and Girotra (2012)). While past work develops some theoretical underpinnings for the advantages of relationships and flexibility, we (A) present empirical evidence on the existence and significance of these benefits in online marketplaces and (B) supply novel prescriptions on how to manage these benefits from the perspective of data-driven marketplace design.

References


