Sequential Screening for Online Matching Platforms

An online matching platform attracts users who seek to establish personal (e.g., marriage/dating platforms such as e-Harmony and OkCupid) or business (e.g., recruitment platforms such as Monster and CareerBuilder) connections with each other. A defining feature of matching platforms is that for a match to occur, each user not only has to choose another user, but also has to be chosen (Roth 2015). For this reason, the design and pricing mechanisms in matching platforms often follows reasoning drastically different from other types of two-sided markets (e.g., Airbnb, eBay, TaskRabbit, Uber) where one side provides a service or sells a product to the other side.

Online matching platforms have become increasingly prevalent in recent years. By 2015, 15% of adults in the U.S. have used online dating websites or apps, according to Pew Research Center. In a 2016 study by Consumer Reports, 44% of respondents indicated they found a “serious long-term relationship or marriage” online. Online dating platforms have also gained popularity in the rest of the world: Momo, the largest online dating platform in China, recorded an annual revenue of $1.3 billion in 2017; Matrimony.com, the longest-standing online matchmaking platform in India, has established over 300 specialized websites targeting different market segments.

Different from other types of two-sided markets online matching platforms lack a straightforward quality measure, and users’ preferences are often fluid and subjective (Chen et al. 2018). Accordingly, “a large, active, and demographically interesting user base is usually a platform’s most precious asset” (Van Dijck 2013, p. 36), making managing user composition among the most crucial aspects of a matching platform’s operations strategy. Although the economics literature on matching and marriage markets (see, e.g., Becker 1973; Burdett and Coles 1997; Damiano and Li 2007) is sizable, it mainly focuses on vertical quality differentiation across users such that (1) each user can be of either “high type” or “low type” and (2) users’ types are observable and static. There is a need to incorporate subjective and intertemporal user preferences in formulating an effective strategy of managing user composition.

A natural way to influence user composition is through pricing. In this paper, we focus on analyzing a matching market where user quality is highly subjective and the value of a match is uncertain ex-ante. We study a two-sided market with male and female users. Each user from one side of the market is interested in “marrying” a user from the other side. There are two types of users on each side; types can
be in terms of race, income, profession, political-party affiliation, education, among other user attributes. Additionally, different types of users also differ on how open they are to cross-type matches—consistent with what Potárcă and Mills (2015) have observed in a survey of attitude toward cross-type dating—and how patient they are for a match and availability of outside options (i.e., staying single or finding a match offline).

In a given matching period, a user from one side encounters another user from the other side. A match occurs when both users agree to marry each other, that is, when the match turns out to be more valuable to both users than their outside options. A within-type match (i.e., between two users of the same type) generates a deterministic value to each user. A cross-type match’s outcome, however, is more uncertain and can be higher or lower than the value of a within-type match.

We first analyze a single-period setting in which the platform chooses the entry fee to maximize its total revenue. We show that an online matching platform can use a refund option to induce all users to join the platform, increasing the number of matches and creating value to users through network effects. In doing so, the refund option can improve both social welfare and the platform revenue. The underlying screening mechanism behind the refund option is that users are sequentially screened depending on the realized value of matches. Furthermore, we study a menu of non-linear prices, in which the platform offers different subscription fees paired with different refund amounts. The menu allows the platform to selectively induce user entry, create the optimal diversity in the platform, and hence maximize the value it can capture from the matching service. With this result, we are also able to show that sequential screening mechanisms help to price discriminate among users even when the utility of users is endogenously determined (i.e., utility is a function of other users’ utilities and decisions due to network effects). Finally, we study how the level of diversity in the market and users’ attitudes toward cross-type matches impact access fees, refunds, and platform revenues.

As an extension of our main model, in a multi-period setting, we show that such a refund option can also help the platform to “refresh” the user base over time by encouraging unsuccessful users to leave, and attract new users to join as it can eliminate the downside risk (no match) of a matching platform. Our research reveals that refunds may help to increase quality of matches, social welfare and platform revenue by inducing entry and exit behavior of different types of users over time. Platforms can successfully manage the level of diversity in the market in terms of both tenure and mix of users.

Our paper is mainly relevant to two streams of literature. First, a growing operations management and marketing literature has examined online matching platform design, focusing on communication mechanisms, technology of matchmaking, and recommendation mechanism: Kanoria and Saban (2017) explore a
new format of communications, according to which only female users can initiate communications; Wu et
al. (2017) examine a dating platform’s choice of matchmaking technology and find the platform can benefit
from a lower technology provision; Halaburda et al. (2017) show an online dating website can achieve more
and better matches by recommending fewer potential matches to each user. Different from these papers,
our paper focuses on the issue of managing user composition and how it affects the quality of interactions
on online matching platforms. Second, methodology-wise, our paper is relevant to the literature on sequen-
tial screening (Courty and Hao 2000; Gallego and Şahin 2010; Akan et al. 2015). Our work enriches this
literature by considering network effect and subjective user types, which allows us to generate substantially
different messages.

References

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**31**(3) 326–341.

Mifflin Harcourt, Boston, MA.

York, NY.
