Personalized Ranking: A Boost for Women?

Yutong Chen[1] Wei Jiang[2]

December 7, 2024

Extended Abstract

As the digital economy reshapes traditional marketplaces, ranking algorithms have become pivotal in determining visibility and opportunities for sellers. While these algorithms hold the promise of creating equitable marketplaces, they can also entrench existing biases. Previous research (Chen, 2024) has highlighted gender gaps resulting from uniform ranking algorithms, but the shift toward personalized ranking algorithms introduces new complexities. Building on this prior work, this study proposes a simple theoretical model to analyze the implications of personalized rankings for female physicians, the group being discriminated on the online healthcare platform. Our model incorporates consumer preferences to calculate physicians' indirect utility, which determines their ranking. The indirect utility is determined by consumer preference parameters, service prices, a physician's gender (for simplicity, this also captures the gender-related portion of the physician's other attributes), other attributes orthogonal to gender, and a stochastic term following a Type I extreme value distribution. While uniform ranking algorithms employ mean consumer preferences, personalized rankings adjust based on individual preferences, creating user-specific lists of recommended providers. This shift does not necessarily benefit female physicians and may even exacerbate inequities under certain conditions. Specifically, the outcomes depend on the share of consumers with biased beliefs and the degree of bias. We simulate the model to examine how the prevalence and intensity of consumer bias against female physicians affect their ranking distributions. Our findings show that as the share of biased consumers and/or the degree of bias increases, female physicians' rankings systematically decline, reducing their visibility and potential earnings. While Donnelly et al. (2024) demonstrate that personalized rankings enhance consumer surplus, our results reveal that they may disadvantage groups subject to consumer bias, such as female physicians. Compared to previous research (Roth et al., 2021), our study provides a model that is broadly applicable to various contexts where algorithms sort sellers based on biased consumer preferences. These results underscore the importance of incorporating equity considerations into algorithmic design to prevent unintended consequences for marginalized groups.

Keywords: Online Consumer Search, Physician Rankings, Discrimination
JEL codes: J16, D83

---

[1] Department of Economics, University of Texas at Arlington; Email: yutong.chen@uta.edu
[2] Department of Mathematics and Division of Data Science, University of Texas at Arlington; Email: wei.jiang@uta.edu

Reference

Chen, Y. (2024). Does the gig economy discriminate against women? Evidence from physicians in China. *Journal of Development Economics*, *169*, 103275.

Donnelly, R., Kanodia, A., & Morozov, I. (2024). Welfare effects of personalized rankings. *Marketing Science*, *43*(1), 92-113.

Roth, J., Saint-Jacques, G., & Yu, Y. (2022, June). An Outcome Test of Discrimination for Ranked Lists. In *Proceedings of the 2022 ACM Conference on Fairness, Accountability, and Transparency* (pp. 350-356).