

The Hong Kong Polytechnic University
Department of Logistics and Maritime Studies
Research Seminar

Equilibrium Strategies in Priority Queues with Balking

by

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The Hong Kong Polytechnic University

(Conducted in English)

Abstract:

We consider an $M/M/1$ queueing system with a pay-for-priority option, and study customers' joint decisions between joining/balking and pay-for-priority. The equilibrium strategies are thus two-dimensional. First, we fully characterize the equilibrium structure and identify the Pareto-dominant strategies of such a game analytically, under both the observable and unobservable settings. Interestingly, the equilibrium structure, the system throughput, and the service provider's optimal price for priority premium can all be non-monotone in the service reward, which departs from the existing models of priority queues without balking. In particular, we find that an increase in service reward can actually hurt the firm's revenue (everything else being equal). Second, we compare the server's revenue between the observable and the unobservable settings. We find that the service provider is better off with the observable setting when the system load is either low or high, but benefits more from the unobservable setting when the system load is medium. The fact that the optimal setting switches twice as the system load increases, is rather interesting; we explain the intuitions behind it in this paper. Finally, we demonstrate the implications of these findings by applying our model framework to Papa John's Pizza, based on publicly available information. Our analysis suggests that Papa John's could benefit from providing customers with wait information while slightly decreasing its fee for Papa Priority.

Bio:

Jinting Wang received the B.Sc. degree from Hebei Normal University, Shijiazhuang, China, in 1994, the M.Sc. degree from Hebei University of Technology, Tianjin, China, in 1997, and the Ph.D. degree from the Chinese Academy of Sciences, Beijing, China, in 2000.

He is a Professor and the Deputy Director in the Department of Mathematics, Beijing Jiaotong University, Beijing, China. His research interests include issues related to queueing theory, reliability and the applications of game theory and queueing theory in wireless communication and networking. He has published over 80 papers in international journals such as *IEEE Transactions on Vehicular Technology*, *IEEE Transactions on Cognitive Communications and Networking*, *Production and Operations Management*, *Queueing Systems*, *European Journal of Operational Research*, *Journal of Multivariate Analysis*, *Journal of Network and Computer Applications*, etc. He is a member of the Operations Research Society of China (ORSC), and now he serves as the President of Reliability Society and the Vice-Presidents of the Queueing Society affiliated with ORSC, and as Vice-President of Beijing Operations Research Society. He was the recipient of the Outstanding Research Award for Young Researchers from ORSC in 2004. In 2011, he was honored with the Program for New Century Excellent Talents in University by the Ministry of Education of China.

Dr. Wang is currently serving as an Editor for several professional journals such as *International Journal of Operations Research*, *International Journal of Smart Grid and Green Communications* and other two Chinese journals.

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All are welcome!