Available online at www.sciencedirect.com

ScienceDirect

Journal of Economic Theory 153 (2014) 33–45

JOURNAL OF Economic Theory

www.elsevier.com/locate/jet

Notes

Auctioning and selling positions: A non-cooperative approach to queueing conflicts ☆

Yuan Ju [a,*], Youngsub Chun [b], René van den Brink [c]

[a] *Department of Economics and Related Studies, University of York, Heslington, York, YO10 5DD, UK*
[b] *Department of Economics, Seoul National University, Seoul 151-746, Republic of Korea*
[c] *Department of Econometrics and Tinbergen Institute, VU University, De Boelelaan 1105, 1081 HV, Amsterdam, The Netherlands*

Received 30 January 2014; final version received 15 April 2014; accepted 21 May 2014

Available online 27 May 2014

Abstract

Complementary to the axiomatic and mechanism design studies on queueing problems, this paper proposes a strategic bargaining approach to resolve queueing conflicts. Given a situation where players with different waiting costs have to form a queue in order to be served, they firstly compete with each other for a specific position in the queue. Then, the winner can decide to take up the position or sell it to the others. In the former case, the rest of the players will proceed to compete for the remaining positions in the same manner; whereas for the latter case the seller can propose a queue with corresponding payments to the others which can be accepted or rejected. In this paper we show that, when the players are competing for the first position in the queue, then the subgame perfect equilibrium outcome of the corresponding mechanism coincides with the well-known maximal transfer rule, while an efficient queue is always formed in equilibrium. We also argue that changing the mechanism so that the players compete for the last position implements the minimal transfer rule. The analysis discovers a striking relationship between pessimism and optimism in this type of decision making.

☆ We are grateful to the editor, the associate editor and an anonymous reviewer for their valuable suggestions and constructive comments. Part of the research was conducted when Yuan Ju visited the Department of Economics at Seoul National University, whose hospitality is kindly acknowledged. Ju's work was supported by the Research and Impact Support (RIS) Fund of the University of York. Chun's work was supported by the National Research Foundation of Korea Grant funded by the Korean Government (NRF-2013S1A3A2055391). We thank David Pérez-Castrillo for his helpful comments.

* Corresponding author.
E-mail addresses: yuan.ju@york.ac.uk (Y. Ju), ychun@snu.ac.kr (Y. Chun), jrbrink@feweb.vu.nl (R. van den Brink).

http://dx.doi.org/10.1016/j.jet.2014.05.007

JEL classification: C71; C72; D60

Keywords: Queueing problem; Minimal transfer rule; Maximal transfer rule; Shapley value; Bidding mechanism; Implementation

1. Introduction

Consider a group of players to be served in a facility. The facility can handle only one player at a time and players differ in their unit waiting cost. The queueing problem is concerned with finding the order to serve the players and the corresponding monetary transfers. The problem has been well studied in the literature from both the normative perspective [10,2–4,11,15] and the mechanism design (incentive) perspective [5,18,12,13]. This paper aims to investigate the problem along an alternative angle, that is, we adopt a strategic approach to build up a natural and intuitive bargaining protocol such that players can negotiate among themselves to resolve the queueing conflicts. Exploring this bargaining approach for queueing problems is not only important in its own right as providing a new toolbox and contributing to an open area of the problem, but has more significant implications: First, it helps understand the strategic features of the allocation rules and makes a fresh review of their plausibility. Next, we can make a better comparison between different rules and associate axiomatic properties with individuals' rational behavior. Furthermore, new insights on fundamental and methodological issues can be developed.

Two well-known rules for the queueing problem were introduced by applying solutions developed for TU (transferable utility) games. Maniquet [10] introduced the minimal transfer rule, which corresponds to the Shapley value of TU games, when the worth of a coalition is defined to be the minimum waiting cost incurred by its members under the optimistic assumption that they are served before non-coalitional members. Chun [2] introduced the maximal transfer rule, which also corresponds to the Shapley value, when the worth of a coalition is defined to be the minimum waiting cost incurred by its members under the pessimistic assumption that they are served after non-coalitional members. Given the connection between the Shapley value for TU games and the minimal and the maximal transfer rules for queueing problems, various bargaining protocols implementing the Shapley value in the literature (Gul [6], Hart and Mas-Colell [7], Pérez-Castrillo and Wettstein [17], Ju and Wettstein [8]) offer a venue enabling us to construct non-cooperative mechanisms to implement rules for queueing problems.

However, this task is not straightforward, especially when considering that the potential mechanism needs to match the underlying context of the queueing problem. Unlike in a TU game where a player's stand-alone value is fixed, in a queueing problem, no specific queue is predominantly determined as a default choice and therefore, a player's stand-alone value is not well defined, but depends on which position this player may take. For example, the queueing game of Chun [2] defines a player's stand-alone value by having this player be served last after anyone else. However, to construct a bargaining protocol it is impossible to make every player be served last simultaneously in order to apply this stand-alone value. Similar arguments carry over to the queueing game defined by Maniquet [10]. Moreover, if we directly follow the protocol of Pérez-Castrillo and Wettstein [17] implementing the Shapley value, it would actually fail to implement the minimal transfer rule since the underlying queueing game violates zero-monotonicity. Hence, this bargaining protocol cannot be directly applied to the queueing context.