

# Optimal Design of Scoring Auction with Multidimensional Quality

Takeshi Nishimura\*

Department of Economics, Hitotsubashi University

## Abstract

This article studies the optimal design of scoring auction used in public procurement. In this auction, each supplier's offer consists of both price and quality, and a supplier whose offer achieves the highest score wins. Che (RAND journal of economics 24:668–680, 1993) shows that a scoring auction implements the optimal mechanism for the buyer in an environment with one-dimensional quality. The environment we consider has the feature that quality is multi-dimensional. In this environment, the complementarity or substitutability among quality attributes in terms of the production cost and the valuation significantly affects the optimal form of scoring rule. We show that there exists a quasi-linear scoring rule which implements the optimal mechanism for the buyer and is supermodular in quality if the virtual surplus is quasisupermodular in quality. We further investigate how the buyer should classify quality attributes when using a scoring rule which is additively separable in the attributes.

*Keywords:* Scoring auction, Optimal auction design, Procurement, Supermodularity

*JEL Classification:* C72 · D44 · D86 · H57

*URL for the paper:* [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2160246](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2160246)

---

\*I am grateful to my advisor Akira Okada for his invaluable guidance and encouragement. I would also like to thank Reiko Aoki, Gary Biglaiser, Makoto Hanazono, Hideshi Itoh, R. Vijay Krishna, Takashi Kunimoto, Jun Nakabayashi, Ichiro Obara, Sergio Parreiras, Olivier Tercieux, and seminar participants at Kansai Game Theory Seminar, Game Theory Workshop 2012, Nagoya University, Osaka University, GAMES 2012, the 18th Decentralization Conference, the 6th Japan-Taiwan Contract Theory Conference, Asian Meeting of the Econometric Society 2012 for their thoughtful comments and suggestions. This work was supported by Grant-in-Aid for Japan Society for the Promotion of Science (JSPS) Fellows.