

Upgrade auctions in build-to-order automobile production with loss-averse customers

Andreas Matzke, Thomas Volling, Thomas S. Spengler

Institute of Automotive Management and Industrial Production, Technische Universität Braunschweig
Katharinenstrasse 3, 38106 Braunschweig, Germany
{andreas.matzke, t.volling, t.spengler}@tu-braunschweig.de

Abstract

Upgrades help matching capacity and demand when firms offer products or services at different quality levels. Prices for upgrades can be determined in upgrade auctions. This paper aims at assessing upgrade auctions in a build-to-order automobile production setting. In this setting, limited short-term flexibility accounts for residual capacity for options and lost sales. With upgrade auctions, residual option capacity is matched with upgradeable customer orders. We model the Stackelberg game of one manufacturer and a set of customers. The manufacturers' decision of applying upgrade auctions is evaluated in terms of contribution margin and planning reliability. When the manufacturer offers upgrade auctions, customers seek to maximize utility by buying the option instantly or leaving a bid in the upgrade auction. Due to missing information on capacities and bids, customers' decisions are based on estimations of auction and winning probability. Since automobile customers fear the risk of not getting the option when bidding in the auction, their utility model accounts for loss aversion and reference dependence. We conclude that upgrade auctions can significantly improve capacity utilization and contribution margin from selling options. Particularly, loss aversion prevents potential fixed price buyers from bidding in the auction. The results suggest that further effort of implementing upgrade auctions in automotive industry will likely pay off.

Keywords: Behavioral operations management, Revenue management, Auctions, Upgrades, Automotive industry
