

Contingent Penalty and Contingent Renewal Supply Contracts in High-Tech Industry

Mirjam S. Meijer¹, Willem van Jaarsveld¹, Ton de Kok¹ and Christopher S. Tang²

¹Department of Industrial Engineering and Innovation Sciences, Eindhoven University of Technology, Eindhoven, The Netherlands

²UCLA Anderson School of Management, University of California, Los Angeles, Los Angeles, California, USA

Abstract: Unlike consumer goods industry, a high-tech manufacturer (OEM) often amortizes new product development costs over multiple generations, where demand for each generation is based on advance orders and additional uncertain demand. Also, due to economic reasons and regulations, high-tech OEMs usually source from a single supplier. Relative to the high retail price, the wholesale price for a supplier to produce high-tech components is low. Consequently, incentives are misaligned: the OEM faces relatively high under-stock costs and the supplier faces high over-stock costs. In this paper, we examine supply contracts intended to align the incentives between a high-tech OEM and a supplier so that the supplier will invest adequate and yet nonverifiable capacity to meet the OEM's uncertain demand. When focusing on a single generation, the manufacturer can coordinate a decentralized supply chain and extract all surplus by augmenting a traditional wholesale price contract with a "contingent penalty" should the supplier fail to fulfill the OEM's demand. When the resulting penalty is too high to be enforceable, we consider a new class of "contingent renewal" wholesale price contracts with a stipulation that the OEM will renew the contract with the incumbent supplier for the next generation only when the supplier can fulfill the demand for the current generation. By using non-renewal as an implicit penalty, we show that the contingent renewal contract can coordinate the supply chain. While the OEM can capture the bulk of the supply chain profit, this innovative contract cannot enable the OEM to extract the entire surplus.

Keywords: supply chain management, supply contracts, high-tech industry, contingent penalty