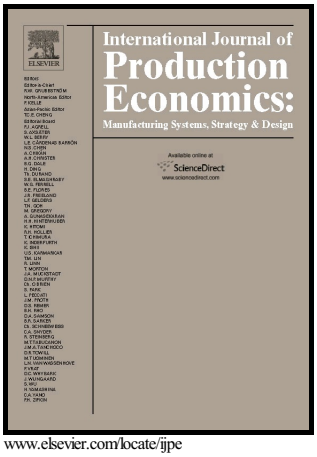

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www.elsevier.com/locate/ijpe

PII: S0925-5273(15)00372-2
DOI: http://dx.doi.org/10.1016/j.ijpe.2015.09.034
Reference: PROECO6241

To appear in: *Intern. Journal of Production Economics*

Received date: 8 January 2015
Revised date: 27 September 2015
Accepted date: 28 September 2015

Cite this article as: Dong Li and Anna Nagurney, A general multitiered supply chain network model of quality competition with suppliers, *Intern. Journal of Production Economics,* http://dx.doi.org/10.1016/j.ijpe.2015.09.034

A General Multitiered Supply Chain Network Model of Quality Competition with Suppliers

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revised July and September 2015

Abstract

In this paper, we develop a general multitiered supply chain network equilibrium model consisting of competing suppliers and competing firms who purchase components for the assembly of their final branded products and, if capacity permits, and it enhances profits, produce their own components. The competitive behavior of each tier of decision-makers is described along with their strategic variables, which include quality of the components and, in the case of the firms, the quality of the assembly process itself. The governing equilibrium conditions of the supply chain network are formulated as a variational inequality and qualitative properties are presented. The algorithm, accompanied with convergence results, is then applied to numerical supply chain network examples, along with sensitivity analysis in which the impacts of capacity disruptions and complete supplier elimination are investigated.

Keywords: supply chains, networks, suppliers, quality competition, game theory, variational inequalities