TAKING MARKET FORCES INTO ACCOUNT IN THE DESIGN OF PRODUCTION-DISTRIBUTION NETWORKS: A POSITIONING BY ANTICIPATION APPROACH

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ABSTRACT. This paper presents an approach to take into account market opportunities when designing production-distribution networks. Three types of sub-markets found in several industrial contexts are analyzed: spot markets, contracts and Vendor Managed Inventory (VMI) agreements. For contracts and VMI agreements, customer preferences with respect to different logistics policies are considered. A price-supply function is proposed to model the spot market behavior. The production-distribution network design problem is formulated as a two-stage stochastic program with fixed recourse. Finally, a sample average approximation method (SAA), based on Monte Carlo sampling techniques, is used to solve the model.

1. **Introduction.** The performance of a supply chain for a given product-market depends critically on the structure of its production-distribution network, i.e. the number, location, mission, technology and capacity of the facilities of the firms involved, but also on its capacity to make winning offers to its potential customers. A supply chain structure leading to lower prices, better service and better quality products than those of competitors leads to higher market shares and thus to higher revenues. By assuming that the demand for products is predetermined, classical network design models overlook this important aspect of the problem. The exact nature of the network design problems encountered in practice depends very much on the industrial context in which they occur, and on the breadth of the markets considered. Networks covering several countries lead to much more complex design problems because factors such as exchange rates, duties and income tax must be taken into account. This paper presents a generic methodology to explicitly consider market forces when designing international production-distribution networks for make-to-stock products.