

Competitive Policies for a Production – Distribution System

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Abstract

This paper considers a decentralized dynamic production - distribution control. A discrete deterministic model in which a vendor produces a product and supplies it to the buyer is considered. Specifically, the problem will be characterized by the following assumptions:

- 1. Production rate is sufficient to meet buyer's demand and buyer's demand must be satisfied.
- 2. The final product is distributed by shipping it from the vendor's stock to buyer's stock. Some shippings are controlled by the vendor, the others by the buyer.

Several papers on vendor–buyer integrated production inventory management assume that policies are set by a central decision maker to optimize total system performance. Although vendor and buyer may agree to minimize the total cost, at least one of them has a private incentive to deviate from the agreement.

In the competitive situation, the objective is to determine schedules which minimize the individual average total cost of production, shipment and stockholding. Therefore, especially in the case without prices, an additional problem arises how to divide shipment costs between the agents. We assume that the division of shipment costs is centrally coordinated or negotiated initially.

A class of non-cooperative games, indexed by two parameters connected with partitions of shipment costs, is introduced. In each game, the vendor and buyer independently choose policies to minimize their costs. The games differ in competitive regime – in classes of admissible policies. Some of them were used for finding (conditional) optimal policies for total system cost. Such optimal policies are in general not Nash equilibria. Furthermore, there is a Nash equilibrium in each of the considered games.