Coalition Stability in Assembly Models

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In this paper, we study dynamic supplier alliances in a decentralized assembly system. We examine a supply chain in which \( n \) suppliers sell complementary components to a downstream assembler, who faces a price-sensitive deterministic demand. We analyze alliance/coalition formation between suppliers, using a two-stage approach. In Stage 1, suppliers form coalitions that each agree to sell a kit of components to the assembler. In Stage 2, coalitions make wholesale price decisions, whereas the assembler buys the components (kits) from the coalitions and sets the selling price of the product. Stage 2 is modeled as a competitive game, in which the primary competition is vertical (i.e., supplier coalitions compete against the downstream assembler), and the secondary competition is horizontal, in that coalitions compete against each other. Here, we consider three modes of competition—Supplier Stackelberg, Vertical Nash, and Assembler Stackelberg models—that correspond to different power structures in the market. In Stage 1, we analyze the stability of coalition structures. We assume that suppliers are farsighted, that is, each coalition considers the possibility that once it acts, another coalition may react, and a third coalition might in turn react, and so on. Using this framework, we predict the structure of possible supplier alliances as a function of the power structure in the market, the number of suppliers, and the structure of the demand.

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