A Symmetric Capacity-Constrained Differentiated Oligopoly Model for the United States Pediatric Vaccine Market with Linear Demand

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The United States pediatric vaccine market is examined using Bertrand-Edgeworth-Chamberlin price competition. The proposed game captures oligopolistic interactions between symmetric, capacity-constrained manufacturers in a differentiated, single-product market with linear demand. Results indicate that unique pure strategy equilibrium exists in the case where the capacities of the manufacturers are at their extreme. For the capacity region where no pure strategy equilibrium exists, there exists a mixed strategy equilibrium where the distribution function, its support, and the expected profit of the manufacturers are characterized. Three game instances are introduced to model the United States pediatric vaccine market. In each instance, the manufacturers are assumed to have equal capacity in producing vaccines. Vaccines are differentiated based upon the number of reported adverse medical events for that vaccine. Using the game theoretic model, equilibrium prices are computed for each monovalent vaccine. Results indicate that the equilibrium prices for monovalent vaccines are lower than the federal contract prices. The numerical results provide both a lower and upper bound for the vaccine equilibrium prices in the public sector, based on the capacity of the vaccine manufacturers. Results illustrate the importance of several model parameters such as market demand and vaccine adverse events on the equilibrium prices.