

SEMINAR SERIES

**Department of Operations & Business Analytics
University of Cincinnati**

**Fee-For-Service Contracts in Pharmaceutical Distribution Supply Chains: Design,
Analysis, and Management**

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Abstract: Fee-For-Service (FFS) contracts, first introduced in 2004, dramatically changed the way the pharmaceutical distribution supply chains are designed, managed, and operated. Investment buying (IB), forward buying in anticipation of drug price increases, used to be the way the distributors made most of their profits! FFS contracts limit the amount of inventory distributors can carry at any time (by imposing an inventory cap) and require inventory information sharing from the distributors to the manufacturers while compensating the distributors with a per-unit fee. In spite of its widespread popularity, FFS model has never been rigorously analyzed and its effectiveness carefully tabulated. In this paper, we formulate the multi-period stochastic inventory problems faced by the manufacturer and the distributor under the FFS and IB models, derive their optimal policies and develop procedures to compute the policy parameters. We show that FFS contracts can improve the total supply chain profit - the manufacturer and distributor are now able to share a larger pie. Thus, there exists a range of the per-unit fees that leads to pareto-improvement. Simulation results show that such improvement is about 1.7% on average and as much as 5.5% and the improvement increases as the inventory cap decreases. Determining the pareto-improving per-unit fees is a source of contention in FFS contract negotiation and we propose a simple, yet effective, heuristic for computing them. Further, supply chain transparency facilitated by the FFS contracts can significantly reduce the manufacturers supply-demand mismatch costs (by about 3.63% on average and as much as 13.01%) and we show that the manufacturer should take advantage of this transparency especially when the inventory cap and drug price increase are high and demand variance is low. We believe that these results have the potential to improve the efficiency of pharmaceutical distribution supply chains, thus reducing the healthcare costs that are such a big burden on the U.S. economy.

Bio: Srinagesh Gavirneni is an associate professor of operations management in the Johnson Graduate School of Management at Cornell University. His research interests are in the areas of supply chain management, inventory control, production scheduling, simulation, and optimization. His papers have appeared in *Management Science*, *Manufacturing & Service Operations Management*, *Operations Research*, *European Journal of Operational Research*, *Operations Research Letters*, *IIE Transactions*, and *Interfaces*. Previously, he was an assistant professor in the Kelley School of Business at Indiana University, the chief algorithm design engineer of SmartOps, a software architect at Maxager Technology Inc., and a research scientist with Schlumberger. His undergraduate degree from IIT-Madras is in mechanical engineering, and he has received an M.Sc. from Iowa State University and a Ph.D. from Carnegie Mellon University.